FINAL REPORT

As Required by

THE ENDANGERED SPECIES PROGRAM

TEXAS

Grant No. E – 75H -2

Endangered and Threatened Species Conservation

Habitat Conservation Planning Assistance for Hays County Regional Habitat Conservation Plan

Prepared by:

Craig Farquhar

TEXAS PARKS & WILDLIFE

Carter Smith
Executive Director

Clayton Wolf
Division Director, Wildlife

9 July, 2010

FINAL REPORT

STATE: ____Texas_____ **GRANT NUMBER:** ___E – 75H - 2_____

GRANT TITLE: Habitat Conservation Planning Assistance for Hays County Regional Habitat Conservation Plan – Segment 2

REPORTING PERIOD: _1 May 2009 – 30 Apr 2010_

OBJECTIVE(S):

To satisfy issuance criteria and complete documentation initiated in Segment 1 of the Hays County RHCP for the conservation of covered terrestrial species in Hays County.

Summary Of Progress:

Please see Attachment A.

Significant Deviations:

None.

Location: Hays County, Texas

Cost: ___A final financial performance report will be submitted separately_____

Prepared by: _Craig Farquhar_ **Date:** _9 July 2010

Approved by: _____ **Date:**___9 July 2010_____
C. Craig Farquhar, Ph. D.

ATTACHMENT A

MEMORANDUM

DATE: July 8, 2010

TO: Jeff Hauff
Hays County Grants Administrator

FROM: Clifton Ladd and Amanda Aurora

SUBJECT: Final grant report on Hays County HCP

Accomplishments

Task 1. Revise the submitted March 4, 2009 Draft Hays County RHCP based on post-submittal USFWS comments and work with the USFWS to complete a final draft RHCP.

The USFWS provided comments on the Fourth Draft RHCP on April 21, 2009. Representatives of the County and USFWS worked from May 1 through September 25, 2009 through numerous meetings and by email and telephone to resolve all outstanding issues. The Sept. 28, 2009 Final Draft RHCP was accepted by the USFWS on October 8, 2009.

Task 2. Assist the USFWS as requested to revise the draft EIS supporting the Hays County RHCP in preparation for further review and processing by the USFWS.

The County submitted a Preliminary Draft EIS to USFWS with the Fourth Draft RHCP on March 31, 2009. Representatives of the County and USFWS worked through numerous meetings and by email and telephone through October 2009. The USFWS accepted the document as the Draft EIS on October 14, 2009.

Task 3. Assist the USFWS as requested with preparation of notices, materials, and public meetings related to the ESA, NEPA, and relevant state law regarding the development of regional habitat conservation plans.

The Notice of Availability and Public Hearing were published in the Federal Register on November 2, 2009. A Public Hearing on the draft RHCP and Draft EIS was held on November 18, 2009 at the San Marcos Activity Center (San Marcos, TX), which also met the requirements for a public hearing under state law.

Task 4. Revise the final draft RHCP as needed based on comments received during the NEPA process to prepare a Final Hays County RHCP.

County representatives submitted a summary of the comments received on the final draft RHCP the responses to those comments to the USFWS on March 15, 2010.

Task 5. Assist the USFWS as requested to revise the draft EIS based on comments received during the NEPA process to prepare a Final EIS supporting the Hays County RHCP.

The US Environmental Protection Agency (EPA) Dallas regional office requested an extension of the comment period until February 11, 2010, and the USFWS agreed to the extension.
The EPA sent a letter dated February 8, 2010 indicating "Lack of Objection" on the Draft EIS.
Three public comments were received during the comment period. County representatives submitted a summary of the comments received on the Draft EIS and the responses to those comments to the USFWS on March 15, 2010.

Task 6. Assist the USFWS as requested with the preparation of other documents needed to complete issuance of the requested incidental take permit.

Representatives of the County requested instructions from the USFWS regarding preparation of other documents (December 1, 2009). The USFWS indicated it would not need any assistance preparing other documents.

Task 7. Provide the final report to TPWD 90 days after USFWS issuance of the incidental take permit to the County.

The County is currently (June 30, 2010) awaiting final action by the USFWS, anticipating issuance of the permit by the end of July 2010.

Billing Code: 4310-55-P

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

[FWS–R2–ES–2010-N173]

[20124-1112-0000-F2]

Regional Habitat Conservation Plan, Hays County, Texas

AGENCY: Fish and Wildlife Service, Department of the Interior.

ACTION: Notice of availability of final environmental impact statement, final Hays County regional habitat conservation plan, and draft record of decision.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), make available the final environmental impact statement (EIS), the final Hays County regional habitat conservation plan (RHCP) under the National Environmental Policy Act of 1969 (NEPA), and our draft record of decision (ROD). Our intended action is the issuance of a 30-year incidental take permit (ITP) for the Preferred Alternative (described below) under the Endangered Species Act of 1973, as amended (ESA), to Hays County, Texas (the County), to incidentally take golden-cheeked

warbler (*Dendroica chrysoparia*) and black-capped vireo (*Vireo atricapilla*). Under the RHCP, the County will mitigate for take by establishing a preserve system of 10,000 – 15,000 acres to mitigate for incidental take of covered species. Each preserve acquisition will be subject to Service approval and will generate mitigation credits based on the number of acres and quality of potential occupied habitat for the covered species.

DATES: We will issue a ROD and make a final permit decision no sooner than 30 days after publication of this notice. Comments on the final EIS and RHCP will be accepted for 30 days after publication of this notice.

ADDRESSES: For where to review documents and submit comments see **Reviewing Documents and Submitting Comments** in SUPPLEMENTARY INFORMATION.

FOR FURTHER INFORMATION CONTACT: Mr. Adam Zerrenner, Field Supervisor, Austin Ecological Services Field Office, 10711 Burnet Road, Suite 200, Austin, TX 78758; telephone 512/490-0057.

SUPPLEMENTARY INFORMATION: We, the U.S. Fish and Wildlife Service (Service), announce the availability of the Hays County final environmental impact statement; final regional habitat conservation plan, which we developed in compliance with the agency decision-making requirements of the National Environmental Policy Act (NEPA) of 1969, as amended;

and our record of decision,. We intend to implement the preferred alternative, which is implementation of the RHCP. We have described all alternatives in detail, and evaluated and analyzed them in our May 2010 final EIS and the final RHCP.

Based on our review of the alternatives and their environmental consequences as described in our final EIS, we intend to implement the preferred alternative (the proposed action). The selected proposed action is the issuance of a section 10(a)(l)(B) incidental take permit (ITP) to Hays County, Texas (the County), for incidental take of golden-cheeked warbler (*Dendroica chrysoparia*) and black-capped vireo (*Vireo atricapilla*). We refer to both species collectively as "the covered species."

The term of the permit is 30 years (2011-2041). The County will implement mitigation and minimization measures according to the schedule in the RHCP. Under the RHCP, the County will mitigate for take by establishing a preserve system of 10,000 – 15,000 acres to mitigate for incidental take of covered species. Each preserve acquisition will be subject to Service approval and will generate mitigation credits based on the number of acres, and quality, of potential occupied habitat for the covered species. The number of mitigation credits allowed for each preserve will be based on, and commensurate with, Service policy and guidelines regarding mitigation (such as, but not limited to, the Guidance for the *Establishment, Use, and Operation of Conservation Banks*) in order to ensure that the quality of the mitigation is equal to or greater than the quality of the habitat impacted.

Background

The County applied to us for an ITP. As part of the permit application, the County developed and will implement the RHCP to meet the requirements of an ITP. Our issuance of an ITP would allow the County to take the covered species resulting from proposed construction, use, or maintenance of public or private land development projects; construction, maintenance, or improvement of transportation infrastructure; installation or maintenance of utility infrastructure; construction, use, or maintenance of institutional projects or public infrastructure; and management activities within Hays County, Texas, during the 30 year ITP term.

The Secretary of the Interior has delegated the authority to the Service to approve or deny an ITP in accordance with the ESA. To act on the County's permit application, we must determine that the RHCP meets the approval criteria specified in the ESA, including our regulations in the Code of Federal Regulations (CFR) at 50 CFR 17.22 and 17.32. The issuance of an ITP is a Federal action subject to NEPA compliance, including the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of the NEPA (40 CFR 1500-1508).

On November 2, 2009, we issued a draft EIS and requested public comment on our evaluation of the potential impacts associated with issuance of an ITP for implementation of the RHCP and to evaluate alternatives, along with the draft RHCP (74 FR 56655). We included public comments and responses associated with the Draft EIS and Draft RHCP in an appendix to the final EIS.

Purpose and Need

The purpose of the section 10(a)(l)(B) permit is to authorize incidental take associated with the otherwise legal activities listed in the background section.

We identified key issues and relevant factors through public scoping and also through working with a Citizens Advisory Committee; Biological Advisory Team; and comments from the public. These issues included the need for: (1) development to continue in the County; (2) minimization of impacts on covered species; and (3) mitigation of impacts on covered species. We thoroughly examined these issues in the draft and final EIS and RHCP. No new significant issues arose following publication of the draft documents.

Environmentally Preferable Alternative

Our selected alternative is the Proposed RHCP, the preferred alternative (Alternative B) as described in the final EIS. This alternative provides for the issuance of an ITP to the County for take that would occur as a result of projects described above. This alternative includes implementation of RHCP measures to minimize and mitigate the potential take of federally listed species to the maximum extent practicable. The intent of this alternative is to allow continued development in the County; to minimize the biological, environmental, and socioeconomic impacts; to satisfy the habitat and species needs; and meet issuance criteria of section 10 of the ESA.

For golden-cheeked warblers, the take associated with direct and indirect impacts to 9,000 acres of habitat are authorized over the life of the permit. These impacts shall be mitigated by a combination of purchasing mitigation credits in nearby conservation banks and by

purchasing high quality habitat within Hays County for designated golden-cheeked warbler preserves. For black-capped vireos, the take associated with direct and indirect impacts to 1,300 acres of habitat are authorized over the life of the permit. Impacts will be mitigated primarily through habitat restoration, habitat management, enhancement of existing protected black-capped vireo habitat, or an alternate, Service-approved mitigation program.

We considered three additional alternatives in the final EIS:

Alternative A (No Action): The No Action alternative assumed that we would not issue a regional permit for the County. Although development could occur on lands not occupied by endangered species, development activities that would cause take of listed species would require individual authorizations through section 7 or section 10(a)(1)(B) of the ESA. Individual entities could also elect to avoid take on properties containing endangered species by avoiding direct and indirect impacts on the species (i.e., take-avoidance). Processing individual section 10(a) permits could cause delays in permit issuance, because we often take 1 to 2 years to process an individual permit.

Alternative C (Moderate Preserve System with a Take Limit): Compared with that under Alternative B, this alternative features the acquisition of a modestly sized, pre-determined preserve system and limits the amount of incidental take that would be authorized by the ITP. This alternative illustrates a conservation program that could be relatively easy for the County to afford, but (due to relatively smaller size of the preserve system compared to the proposed

RHCP) might not satisfy the anticipated need for incidental take authorization over the duration of the plan.

Alternative D (Large-scale Preserve System): Compared with that under Alternative B, this alternative involves a conservation program that utilizes a pre-determined preserve approach. Under this alternative, the preserve system would be large enough to authorize the incidental take of any remaining golden-cheeked warbler or black-capped vireo habitat in the County, outside of the target acquisition area of the preserve system, during the duration of the plan.

Decision

We intend to issue an ITP allowing the County to implement the preferred alternative (Alternative B), as it is described in the final EIS. This intention is based on a thorough review of the alternatives and their environmental consequences. Implementation of this decision entails the issuance of the ITP, including all terms and conditions governing the permit. Implementation of this decision requires adherence to all of the minimization and mitigation measures specified in the RHCP, as well as monitoring and adaptive management measures.

Rationale for Decision

We intend to select the preferred alternative (Alternative B) for implementation based on multiple environmental and social factors, including potential impacts and benefits to covered

species and their habitat, the extent and effectiveness of minimization and mitigation measures, and social and economic considerations.

In order for us to be able to issue an ITP, we must ascertain that the RHCP meets the criteria set forth in 16 U.S.C. § 1539(a)(2)(A) and (B). We have made that determination. These criteria, and how the RHCP satisfies these criteria, are summarized below:

1. The taking will be incidental. We find that the take will be incidental to otherwise lawful activities, including the proposed construction, use, or maintenance of public or private land development projects; construction, maintenance, or improvement of transportation infrastructure; installation or maintenance of utility infrastructure; construction, use, or maintenance of institutional projects or public infrastructure; and management activities. The take of individuals of covered species will be primarily due to habitat destruction and/or alteration.

2. The applicant will, to the maximum extent practicable, minimize and mitigate the impacts of such takings. The County has committed to a wide variety of conservation measures, land acquisition, management activities, monitoring, adaptive management, and other strategies designed to avoid and minimize harm to the covered species and mitigate for any unavoidable loss. Impacts to the covered species will be minimized and mitigated as described in the environmentally preferable alternative section above.

3. The applicant will develop an HCP and ensure that adequate funding for the HCP will be provided. The County has developed the RHCP and committed to fully funding all of the obligations necessary for its implementation. These obligations include the cost for purchase and

management of golden cheeked warbler and black capped vireo, mitigation lands in perpetuity, enforcement of conservation easements, and monitoring of species populations and habitat. In addition, the County has committed to implement adaptive management measures that: identify areas of uncertainty and questions that need to be addressed to resolve such uncertainty; developed alternative management strategies and determine which experimental strategies to implement; integrate a monitoring program that is able to acquire the necessary information for effective strategy evaluation; and incorporate feedback loops that link implementation and monitoring to the decision-making process that result in appropriate changes in management. To accomplish RHCP implementation, the County estimated that costs could total up to $182.6 million. The County will fund the actual costs of implementing the RHCP by application and mitigation fees, the County General maintenance and operations fund contributions, and the County Conservation Investments.

The Service's No Surprises Assurances are discussed in the RHCP, and measures to address changed and unforeseen circumstances have been identified. Adaptive management in the form of conservation, mitigation, or management measures and monitoring will be implemented to address changed circumstances over the life of the permit that were able to be anticipated at the time of RHCP development. Unforeseen circumstances would be addressed through the Service's close coordination with the County in the implementation of the RHCP. The County has committed to a coordination process to address such circumstances.

We have, therefore, determined that the County's financial commitment and plan, along with the County's willingness to address changed and unforeseen circumstances in a cooperative fashion, is sufficient to meet this criterion.

4. The taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild. As the Federal action agency considering whether to issue an ITP to the County, we have reviewed the issuance of the ITP under section 7 of the ESA. Our biological opinion concluded that issuance of the ITP will not jeopardize the continued existence of the golden cheeked warbler and black capped vireo in the wild. No critical habitat has been designated for either of the covered species, and thus none will be affected.

5. The applicant agrees to implement other measures that the Service requires as being necessary or appropriate for the purposes of the HCP. We have cooperated with the County in the development of the RHCP. We commented on draft documents, participated in advisory group meetings, and worked closely with the County in every step of plan and document preparation, so that conservation of the covered species would be assured and recovery would not be jeopardized. The RHCP incorporates our recommendations for minimization and mitigation of impacts, as well as steps to monitor the effects of the RHCP and ensure success. Annual monitoring, as well as coordination and reporting mechanisms, have been designed to ensure that changes in conservation measures can be implemented if measures prove ineffective or impacts exceed estimates. It is our position that no additional measures are required to implement the intent and purpose of the RHCP to those detailed in the RHCP and its associated ITP.

We have determined that the preferred alternative best balances the protection and management of suitable habitat for covered species, while allowing and providing a streamlined process for ESA compliance for continued development in Hays County. Considerations used in this decision include: (1) mitigation will benefit the golden cheeked warbler and black capped vireo, mitigation lands will be managed for the species in perpetuity, and other conservation measures will protect and enhance habitat; (2) mitigation measures for the covered species will fully offset anticipated impacts of development to the species and provide recovery opportunities; and (3) the RHCP is consistent with the golden cheeked warbler and black capped vireo recovery plans.

Section 9 of the Act and its implementing regulations prohibit the "taking" of threatened or endangered species. However, under limited circumstances, we may issue permits to take listed wildlife species incidental to, and not the purpose of, otherwise lawful activities.

Reviewing Documents and Submitting Comments

Please refer to TE-220793-0 when requesting documents or submitting comments. You may obtain copies of the final EIS and final RHCP by going to the Hays County Regional Habitat Conservation Plan website at *http://hayscountyhcp.com/documents*. Alternatively, you may obtain compact disks with electronic copies of these documents, as well as the draft ROD, by writing to Mr. Adam Zerrenner, Field Supervisor, 10711 Burnet Road, Suite 200, Austin, TX 78758; telephone 512/490-0057; facsmilie 512/490-0974. The application, final RHCP, final EIS, and draft ROD will also be available for public inspection, by appointment, during normal

business hours (8 a.m. to 4:30 p.m.) at the Austin office. During the public comment period (see **DATES**), submit your written comments or data to the Field Supervisor at the Austin address

Public comments submitted are available for public review at the Austin address listed above. This generally means that any personal information you provide us will be available to anyone reviewing the public comments (see the **Public Availability of Comments** section below for more information).

A limited number of printed copies of the final EIS and final RHCP are also available for public inspection and review at the following locations (by appointment only at government offices):

- Department of the Interior, Natural Resources Library, 1849 C. St., NW., Washington, DC 20240;
- U.S. Fish and Wildlife Service, 500 Gold Avenue, SW., Room 4012, Albuquerque, NM 87102;
- San Marcos Public Library, 625 E. Hopkins Street, San Marcos, TX, 78666-6313;
- Hays County Precinct 3 Office, 14306 Ranch Rd 12 , Wimberley, TX; 78676, and
- Hays County Precinct 4 Office, 101 Old Fitzhugh Rd, Dripping Springs, TX, 78620.

Persons wishing to review the application or draft ROD may obtain a copy by writing to the Regional Director, U.S. Fish and Wildlife Service, P.O. Box 1306, Room 4012, Albuquerque, NM 87103.

Public Availability of Comments

Written comments we receive become part of the public record associated with this action. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, you should be aware that the entire comment – including your personal identifying information – may be made publicly available at any time. While you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

Authority

We provide this notice under section 10(c) of the Act (16 U.S.C. 1531 *et seq*.) and its implementing regulations (50 CFR 17.22) and NEPA (42 U.S.C. 4371 *et seq*.) and its implementing regulations (40 CFR 1506.6).

_____ December 7, 2010

Joy E. Nicholopoulos

Acting Regional Director, Region 2

Albuquerque, New Mexico

[FR Doc. 2011-11761 Filed 05/12/2011 at 8:45 am; Publication Date: 05/13/2011]

Hays County

Regional Habitat Conservation Plan

PREPARED FOR

HAYS COUNTY COMMISSIONERS' COURT

111 E. San Antonio Street
San Marcos, Texas 78666

PREPARED BY

Loomis Partners, Inc.

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FINAL
(JUNE 22, 2010)

EXECUTIVE SUMMARY

The Hays County Regional Habitat Conservation Plan ("RHCP") was developed by the Hays County Commissioners' Court with the assistance of the Citizens' Advisory Committee, Biological Advisory Team, County staff, and a team of environmental, legal, and economic consultants. The RHCP was developed in connection with the County's application for an Endangered Species Act (ESA) Section 10(a)(1)(B) incidental take permit authorizing the take of two federally endangered songbirds, the golden-cheeked warbler and the black-capped vireo. The ESA requires that an applicant for an incidental take permit prepare a habitat conservation plan that describes, among other things, how the impacts caused by take authorized by the permit will be minimized and mitigated to the maximum extent practicable. Pursuant to ESA Section 10(a)(1)(B), the RHCP describes a locally controlled approach for compliance with the ESA. The County's permit would authorize incidental "take" of the golden-cheeked warbler and black-capped vireo, and the RHCP describes the mitigation provided for the impacts of such take. The RHCP is also designed to benefit a host of other wildlife species, water resources, and people. The conservation program of the RHCP is based on a phased conservation banking approach with a goal of assembling between 10,000 and 15,000 acres of preserve land over the 30-year duration of the RHCP. The RHCP will help the County serve the needs of its growing population and will promote responsible economic development, good public infrastructure, and open space preservation (including habitat protection for endangered species).

1.0 PURPOSE AND NEED FOR THE HAYS COUNTY RHCP

- The population of Hays County is expected to increase 150% to 300% over the next 30 years, making it one of the fastest growing populations in Texas (see Section 4.1). Population growth will drive new private land development and public infrastructure projects in the county.
- Projected development and infrastructure projects could cause the loss of approximately 22,000 acres of potential habitat for the federally endangered golden-cheeked warbler in Hays County over the next 30 years. Similarly, the county could lose approximately 3,300 acres of potential black-capped vireo habitat (see Section 5.2).
- The ESA prohibits the "taking" of federally endangered or threatened species without authorization. Take includes activities that result in significant habitat modification or degradation resulting in actual death or injury of listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering (see Section 1.4.1.1).
- The ESA allows for take of listed species that is incidental to otherwise lawful activities by issuance of an incidental take permit. Application to the U.S. Fish and Wildlife

Service (USFWS) for such a permit requires the development of a habitat conservation plan. As noted above, these plans describe the measures a permit applicant will take to minimize and mitigate the impacts to the listed species to the maximum extent practicable (see Section 1.4.1.1).

- The RHCP will allow the County and other public and private entities to obtain ESA incidental take authorization in a more efficient, streamlined, and timely manner (see Section 7.4). Processing individual incidental take authorizations (i.e., authorization where a RHCP is not available) typically take 1 to 2 years. Under the RHCP, incidental take authorization could be obtained within a matter of weeks and potentially at less cost than obtaining individual incidental take authorization.

2.0 BENEFITS TO HAYS COUNTY AND THE COMMUNITY

- The RHCP will benefit the golden-cheeked warbler and black-capped vireo in Hays County by (see Section 6.1):
    - Creating a preserve system within Hays County that effectively mitigates for incidental take of the golden-cheeked warbler and black-capped vireo and coordinates and consolidates mitigation requirements from projects scattered across the county into larger, more biologically significant preserve blocks. The RHCP preserve system will protect sufficient acres of warbler and vireo habitat to generate enough mitigation credits to balance the anticipated level of participation in the RHCP. The County's goal is to protect and manage between 10,000 and 15,000 acres for endangered species in Hays County in perpetuity.
    - Encouraging compliance with the ESA by providing an efficient means of authorization. By implementing the RHCP and providing an efficient and reliable mechanism for ESA compliance, the County is hopeful that there will be an increase in ESA compliance across Hays County, resulting in more conservation actions for these species.
    - Providing for perpetual management and monitoring of preserve lands to maintain, enhance, or create quality habitat for the golden-cheeked warbler and black-capped vireo.
    - Contributing to the recovery of the warbler and vireo by protecting large areas of habitat for these species in Hays County and helping to promote connectivity among other existing endangered species preserves in the region (see Section 3.2.1.4 and Section 3.2.2.4).
- Implementing the RHCP will benefit Hays County in the following ways (see Section 1.3):

- The RHCP will provide a streamlined process for ESA compliance for County-sponsored projects, such as the construction or improvement of roads, bridges, and other County infrastructure. The RHCP was initiated in response to a need for ESA compliance during the planning and construction of Winters Mill Parkway near Wimberley. With the passage of the 2008 Road Bond program and the general obligation of the County to provide services to its growing population, other County projects are likely to require permitting through the ESA in the coming years. The RHCP will reduce the time and potentially the cost associated with obtaining incidental take authorization for future County projects by streamlining tasks such as assessing impacts and providing appropriate mitigation.
- The RHCP is compatible with other County initiatives to protect open spaces, such as described in the Parks and Open Space Master Plan and envisioned by the 2006 Parks and Open Space bond program. The RHCP preserve system may create opportunities for compatible, nature-based recreational uses (on a case-by-case basis) and will contribute to water quality protection by permanently protecting large blocks of open space.
- The RHCP may give the County a means to secure other funding opportunities for land conservation, such as federal grants for endangered species habitat protection.

- Private landowners, business entities, organizations, and other municipalities may also benefit by implementation of the RHCP (see Section 1.3), including:
  - The RHCP provides a locally created solution to endangered species issues that incorporates stakeholder concerns and gives long-term ESA permitting assurances to the County and RHCP participants.
  - The RHCP offers a new, voluntary option for ESA compliance that would be available to private landowners, businesses, and other entities in Hays County. This new compliance option would reduce the time and cost associated with obtaining incidental take authorization under the ESA, particularly with respect to developing individual HCPs, waiting for applications to be processed by the USFWS, and obtaining appropriate mitigation for project impacts.

    With regard to projects that may involve a federal nexus, voluntary participation in the RHCP may assist the federal action agency by providing a convenient mitigation option, should the federal action agency choose to mitigate for effects to threatened or endangered species covered by the RHCP. However, this does not displace the requirement for federal action agencies to consult with the USFWS pursuant to Section 7 of the ESA prior to arranging specific mitigation

(i.e., no mitigation, in lieu fee, or other mitigation activity shall be completed by the federal action agency until conclusion of their Section 7 consultation). Although voluntary mitigation through an appropriate habitat conservation plan may expedite a consultation, it is no guarantee of such. Further mitigation strategies under Section 7 of the ESA are not bound by those in the RHCP.

- The RHCP will facilitate the protection of open spaces that represent the rural tradition of Hays County and contribute to a high quality of life for all citizens.

- The RHCP is a conservation plan for endangered species, but is anticipated to have broader environmental benefits such as:
  - Coordinated conservation planning with a long-term focus over a regional scale to take better advantage of conservation opportunities in a rapidly changing landscape.
  - Long-term protection and management of natural resources vital to the health of the region's Hill Country ecosystems, including wildlife, woodlands, and water.

3.0 BASIC ELEMENTS OF THE RHCP

- The "permit area" for the RHCP includes all of Hays County, and the County's Permit will have a term of 30 years (i.e., 2010 through 2039) (see Section 1.5).
- The RHCP and Permit will cover incidental take of the endangered golden-cheeked warbler and endangered black-capped vireo (the warbler and vireo are the "covered species" in the RHCP). The RHCP may also benefit 56 other potentially rare or sensitive species in Hays County and will provide funding to study one or more of these species (see Section 3.0).
- Activities that could cause take of the covered species and that would be covered by the Permit include construction, operation, and maintenance of public projects and infrastructure and residential, commercial, and industrial development (see Section 5.1).
- The RHCP will cover up to 9,000 acres of acres of habitat loss for the warbler and up to 1,300 acres of habitat loss for the vireo resulting from participating projects over 30 years. The 10,300 acres of take authorization will be sufficient to provide ESA compliance for the amount of anticipated participation in the RHCP (see Section 5.2).
- To mitigate for take of the covered species authorized by the Permit, Hays County will create a preserve system and operate a "phased" conservation bank (see Section 6.3). Under the phased conservation bank approach, habitat protection would always occur in advance of authorized impacts through the RHCP.

- The preserve system will be assembled on a phased basis as needed to create mitigation credits for the conservation bank and as potential preserve parcels become available from willing partners.
- The County will preserve between 10,000 and 15,000 acres by the end of the 30-year permit duration, in order to utilize the full amount of take authorization sought in the RHCP (see Section 5.2); however, there is no pre-determined preserve system size, location, or configuration.
- Habitat for the covered species protected within the preserve system will create mitigation credits for the conservation bank.
- Banking mitigation credits allows an equivalent amount of take authorization to be accessed. Therefore, mitigation will always be provided before an equivalent amount of take authorization can be used by the County or issued to RHCP participants.
- Defined processes for habitat determinations and mitigation assessments, and defined mitigation ratios, provide the basis for ensuring that mitigation is commensurate with impacts.

- Preserve system acquisitions may include fee simple land purchases, conservation easements with landowners, or similar agreements (see Section 7.2).
- Hays County will be committed to manage and monitor the preserve system for the benefit of the covered species, in accordance with the RHCP and terms of the Permit, in perpetuity (see Section 6.4).
- The County will implement various measures to avoid or minimize impacts to the covered species, including disseminating maps of potential habitat for the covered species, requesting subdivision or development applicants to provide information about endangered species within their project areas, requiring RHCP participants to implement measures that help prevent the spread of oak wilt and to observe seasonal restrictions on clearing and construction in or near habitat for the covered species, and implementing a public education and outreach program (see Section 6.2).

Summary of RHCP Elements

Category	Criteria/Amount	Notes
Environmental Baseline		
Potential GCW Habitat	170,355 acres	estimated from Loomis GCW habitat model (all quality classes) (see Section 3.2.1.3)
Potential BCV Habitat	23,855 acres	estimate reported in Wilkins et al. (2006) (see Section 3.2.2.3)

Summary of RHCP Elements

Category	Criteria/Amount	Notes
Projected Land Development		
Private-sector Projects	48,095 acres	estimated by TXP and CMR (2008) (see Section 4.2.2)
Public-sector Projects	9,600 acres	estimated as 20% of projected private-sector development, based on current distribution of public tax exempt lands vs. residential and commercial lands (see Section 5.2)
Estimated Habitat Loss/Impact		
GCW	22,000 acres	estimates based on projections of land development and distribution of potential habitat across census tracts (see Section 5.2)
BCV	3,300 acres	
Estimated RHCP Participation Rates		
Private-sector	33%	see Section 5.2.1 and Section 5.2.2
Public-sector	75%	
Authorized Incidental Take		
GCW	9,000 acres	expressed as acres of impact to potential habitat; calculated from estimates of habitat loss and participation rates (see Section 5.2.1 and Section 5.2.2)
BCV	1,300 acres	
Preserve System Goal	10,000 to 15,000 acres	assumes preserves will include some areas of non-habitat (see Section 6.3.1)
Minimum Preserve Block Size (typical)	500 acres	smaller preserves may be allowed with USFWS approval (see Section 6.3.1)
Mitigation Credit Creation (typical)		
GCW	1 acre of potential GCW habitat = 1 GCW mitigation credit	actual number of credits created by an acquisition determined by consultation with USFWS (see Section 6.3.2)
BCV	1 acre of dedicated BCV management area = 1 BCV mitigation credit	
Standard Mitigation Ratios (actual mitigation ratios may be adjusted to account for existing impacts or exceptional habitat quality/importance)		
Direct Impacts	1 acre of direct impact = purchase of 1 mitigation credit	assessed within project area boundaries where vegetation is physically altered by clearing or development or has a substantial change of use (see Section 7.4.3

Summary of RHCP Elements

Category	Criteria/Amount	Notes
		and Section 7.4.4)
Indirect Impacts	1 acre of indirect impact = purchase of 0.5 mitigation credit	assessed out to 300 feet from edge of direct impact and may extend outside of project area boundary; may also be assessed on isolated remnant patches of habitat (see Section 7.4.3 and Section 7.4.4)
Participation Fees (as illustrated in the Funding Plan)		
Application Fees	$500 to $5,000 per application	actual fee depending on level of service required to process application (see Section 7.4.1)
Mitigation Fees	$7,500 per mitigation credit	estimated starting fee; may be adjusted at discretion of County (see Section 8.2.2)

4.0 PRESERVE SYSTEM MANAGEMENT AND MONITORING

- All RHCP preserve lands will be managed in perpetuity in accordance with the terms of the Permit and the RHCP (see Section 6.4).
- The objectives of the RHCP preserve management and monitoring program are to maintain the biological value of the preserve system in perpetuity (see Section 6.4.1).
- The RHCP preserve management and monitoring program involves a cyclical, adaptive process including describing baseline conditions, evaluating threats, planning management activities to address threats, and monitoring management targets to evaluate results (see Section 6.4.1).
- The major tasks involved with the preserve system management and monitoring program include completing Baseline Preserve Evaluations (see Section 6.4.3) and Land Management Plans (see Section 6.4.4) and conducting surveys of the covered species and their habitats (see Section 6.4.5). Each of these major tasks will be repeated and/or updated at least once every five years (see Section 6.4.6).
- The County will submit annual reports to the USFWS documenting compliance with the terms and conditions of the Permit and the results of the management and monitoring activities within the preserve system (see Section 7.6).

5.0 PARTICIPATION PROCESS

- Participation in the RHCP by other public or private entities would be voluntary. A potential participant will have no obligation to pay mitigation fees or provide other

compensation to Hays County related to the RHCP; unless incidental take authorization under the Permit is granted (see Section 7.4).

- The County may elect to withhold mitigation credits from sale to participants for its own use or if such participation would not conform with the goals or provisions of the RHCP (see Section 7.4.5).
- Potential participants may use habitat maps developed for the RHCP to provide a preliminary indication of whether mitigation may be needed (see Section 6.2.1).
- The County would determine the specific amount of mitigation needed to participate in the RHCP through an on-site habitat determination and project-specific impact assessment (see Section 7.4.2 and Section 7.4.3).
- Typically, each acre of potential habitat for the covered species that would be directly impacted by a participating project would require the purchase of one mitigation credit from the County. Indirect impacts to potential habitat would require the purchase of 0.5 mitigation credit (see Section 7.4.4 and Section 7.4.5).
- Potential RHCP participants would obtain incidental take authorization under the RHCP through the purchase of the required number of mitigation credits or (on a case-by-case basis at the discretion of the County) by providing preserve land in lieu of mitigation fees (see Section 7.4.7).
- Participation in the RHCP would be formalized by the execution of a Participation Agreement between Hays County and the applicant and the issuance of a Certificate of Participation by Hays County (see Section 7.4.6).
- Participants in the RHCP would be authorized to take covered species up to the amount specified by their Participation Agreement. Participants would also be required to abide by all other terms of the Participation Agreement, which will include minimization measures such as seasonal clearing and construction restrictions (see Section 6.2.3, Section 6.2.4, and Section 7.4.6).

6.0 RHCP FUNDING PLAN

- The funding plan presented in the RHCP is based on a set of assumptions as described in Section 8.0, including those listed below.
    - The RHCP will bank and either use or sell approximately 9,000 warbler mitigation credits and 1,300 vireo mitigation credits during the duration of the plan (see Section 5.2).
    - Parcels comprising the preserve system will include some areas that are not habitat for the covered species. The funding plan assumes that approximately

12,000 acres of preserve land will be acquired to create the needed 10,300 mitigation credits (see Section 8.1.1).

- The cost to purchase potential preserve land in fee simple is approximately $11,500 per acre. The cost to purchase a conservation easement is approximately 50 percent of the fee simple cost (see Section 8.1.1).
- Approximately 75 percent of the preserve system will be acquired via conservation easement and approximately 25 percent of the preserve system will be purchased by the County fee simple (see Section 8.1.1).
- Mitigation fees begin at $7,500 per credit, and increase by $1,000 every 5 years (see Section 8.2.2).
- The County will annually budget up to 10 percent of the taxable value created by new development within the County after Permit issuance to help fund RHCP implementation (see Section 8.2.3).
- The County will contribute approximately $5 million to the RHCP for preserve land acquisition prior to permit issuance, funded from the 2006 Parks and Open Space Bond, to create a positive initial mitigation credit balance for the RHCP (see Section 8.2.4).

- Hays County will fund or otherwise provide for the RHCP conservation program using three types of resources: 1) participation fees charged to RHCP participants; 2) annual contributions from County tax revenues; and 3) conservation investments from the County or other sources. Other funding sources, such as grants or debt financing may be available, but are not modeled in the funding plan (see Section 8.0 and Section 8.2).
- The County will evaluate and adjust the RHCP budget annually to adequately implement the program, fund preserve acquisitions, and manage the preserve system in accordance with the terms of the Permit (see Section 8.2.3).
- The funding plan demonstrates that sufficient funding is available to acquire the target preserve system under the phased conservation bank approach, to provide for the perpetual management and monitoring of the preserve system, and to supply the necessary staff, equipment, and materials to administer the RHCP. The funding plan is an illustration of the resources that would be needed to implement the RHCP as anticipated, based on the stated assumptions (see Section 8.0 and Section 8.3).

Approximate RHCP Budget Summary[1].

	Years 0 – 10	Years 11 – 20	Years 21 – 30	Term Total	Average Annual
Preserve Land	3,914 acres	4,040 acres	4,046 acres	12,000 acres	400 ac/yr
RHCP Costs					
Land Acquisition	$34.1 million	$48.2 million	$65.0 million	$147.5 million	$4.9 million/yr
Staffing & Administration	$1.9 million	$6.2 million	$14.6 million	$22.8 million	$0.8 million/yr
Preserve Management	$1.1 million	$3.1 million	$6.7 million	$11.0 million	$0.4 million/yr
Outreach & Research	$0.3 million	$0.1 million	$0.2 million	$0.6 million	$19,000/yr
Contingency	$0.1 million	$0.2 million	$0.4 million	$0.8 million	$27,000/yr
Total Costs	**$37.6 million**	**$58.0 million**	**$87.0 million**	**$182.6 million**	**$6.1 million/yr**
RHCP Revenue					
Application Fees	$0.1 million	$0.2 million	$0.2 million	$0.5 million	$17,000/yr
Mitigation Fees	$26.1 million	$32.6 million	$39.2 million	$97.9 million	$3.3 million/yr
Allocated Tax Revenue	$6.4 million	$25.2 million	$47.5 million	$79.2 million	$2.6 million/yr
County Conservation Investments	$5.0 million	$0	$0	$5.0 million	n/a
Total Revenues	**$37.6 million**	**$58.0 million**	**$87.0 million**	**$182.6 million**	**$6.1 million/yr**
Net Cost & Revenue	**$0**	**$0**	**$0**	**$0**	**$0**

[1]All dollar figures include 3 percent annual inflation. Refer to Section 8.0 and Appendix F and Appendix G for more detail.

TABLE OF CONTENTS

List of Figures

List of Tables

List of Appendices

1.0 INTRODUCTION AND BACKGROUND

1.1 Introduction

The Hays County Regional Habitat Conservation Plan ("RHCP") was developed by the Hays County Commissioners' Court with the assistance of County staff, citizen and biological advisory committees, and a team of environmental, legal, and economic consultants. The RHCP describes a locally developed approach for compliance with the federal Endangered Species Act (ESA) in Hays County, Texas. The RHCP focuses on authorizing incidental "take" of the endangered golden-cheeked warbler (*Dendroica chrysoparia*, GCW) and providing, to the maximum extent practicable, for the minimization and mitigation of the impacts of such take. The RHCP also supports take authorization and mitigation for the endangered black-capped vireo (*Vireo atricapilla*, BCV) and may benefit a variety of other wildlife species, water resources, and people. The conservation program of the RHCP is based on a phased conservation banking approach with a goal of assembling between 10,000 and 15,000 acres of preserve land over the 30-year duration of the RHCP. In addition to protecting habitat for endangered species, the RHCP will help the County serve the needs of its growing population and promote responsible economic development, good public infrastructure, and open space preservation.

A habitat conservation plan, such as the RHCP, is a mandatory prerequisite to obtaining an incidental take permit under Section 10(a) of the ESA. Incidental take permits and their associated habitat conservation plans offer non-federal entities a way to comply with the ESA when conducting otherwise lawful activities that are likely to cause "take" of animals protected by the ESA. Hays County is seeking an incidental take permit to cover County actions and to streamline ESA compliance for private citizens, businesses, and other entities in the county.

A typical habitat conservation plan involves a single individual or entity who applies for an incidental take permit and develops a conservation plan to minimize and mitigate the impacts of a single project in a discrete area. In contrast to individual habitat conservation plans, a "regional" habitat conservation plan generally covers a larger geographic area, multiple landowners, and, often, multiple species. Local or regional governmental entities are often the applicants and are responsible for the implementation of the conservation program contained in the plan. Regional habitat conservation plans are not specifically mentioned in the ESA, but the U.S. Fish and Wildlife Service (USFWS), which administers the ESA, encourages their development (USFWS and National Marine Fisheries Service (NMFS) 1996).

Development of the RHCP was funded by a combination of federal grant dollars, County staff services, and local matching funds. The Hays County Commissioners' Court approved a grant application to the USFWS for a habitat conservation planning grant in April 2005. The USFWS responded favorably to the County's grant application, awarding $753,750 to the County to develop a plan. The award was announced in September 2005, and was the largest

HCP planning grant to a county that year. The federal award required a non-federal match of $251,250, which the County provided through in-kind services and matching funds. The Texas Parks and Wildlife Department (TPWD) administered the grant for the USFWS and negotiated an interlocal agreement with Hays County to disburse the funds in May 2006.

1.2 Purpose and Need for Action

The purpose of the RHCP is to support an ESA Section 10(a)(1)(B) incidental take permit by establishing a conservation program that minimizes and mitigates to the maximum extent practicable the impacts of authorized take of the golden-cheeked warbler and black-capped vireo in Hays County.

The RHCP is needed because population growth in Hays County over the next few decades will drive a variety of new land development and infrastructure projects and result in other land use changes across the county. These anticipated land use changes will increasingly come into conflict with sensitive natural resources, including federally listed species. The RHCP will provide a streamlined mechanism for the County and its citizens to comply with the ESA.

1.3 Benefits of a Habitat Conservation Plan

By developing and implementing the RHCP, the County will achieve a number of benefits for its citizens and the environment, including:

- Supporting populations of federally endangered golden-cheeked warblers and black-capped vireos in Hays County by protecting and managing habitat for these species in perpetuity;
- Local solutions to endangered species issues that incorporate stakeholder concerns and give long-term ESA permitting assurances to the County and RHCP participants;
- New, voluntary options for ESA compliance that would be available to private citizens, businesses, and other entities in Hays County. These new compliance options would reduce the time and cost associated with obtaining incidental take authorization under the ESA;
- Coordinated conservation planning with a long-term focus over a regional scale to take better advantage of conservation opportunities in a rapidly changing landscape;
- Long-term protection and management of natural resources vital to the health of the region's Hill Country ecosystems, including wildlife, woodlands, and water;
- Protection of open spaces that represent the rural tradition of Hays County and contribute to a high quality of life for all citizens; and

- Compatibility with other County initiatives to protect open spaces and provide nature-based recreational opportunities (see Section 6.4.7 regarding public access to preserves), such as the Parks and Open Space Master Plan and the 2006 open space bond program.

The RHCP will also compliment other regional conservation efforts in central Texas. Several conservation plans or sustainability programs are under development or currently operating in the region, including the Balcones Canyonlands Conservation Plan in Travis County, the Williamson County Regional Habitat Conservation Plan, the Comal County Regional Habitat Conservation Plan, the San Marcos River Habitat Conservation Plan, the Barton Springs-Edwards Aquifer Habitat Conservation Plan, the Southern Edwards Plateau Habitat Conservation Plan, and the Edwards Aquifer Recovery Implementation Program. However, the operating areas or missions of these and other central Texas programs do not include incidental take authorization or long-term coordinated protection for the golden-cheeked warbler and black-capped vireo in Hays County. The RHCP will help fill this gap and contribute to the growing trend toward regional solutions for the conservation of rare species and sensitive resources.

1.4 Legal and Regulatory Framework for the RHCP

The development of habitat conservation plans and the issuance of incidental take permits are governed by the provisions of the ESA and related USFWS policy. The ESA specifies the required content of a habitat conservation plan and the criteria for issuance of an incidental take permit. Other legal requirements for the issuance of an incidental take permit are related to the National Environmental Policy Act (NEPA), which requires a broader analysis of the environmental impacts resulting from the activities covered by an ESA incidental take permit. Both laws require opportunities for public involvement and comment in the development of a habitat conservation plan, particularly regional plans.

In addition to the ESA and NEPA, Texas state law contains several procedural and substantive requirements that are applicable to the development of regional habitat conservation plans by local governments. However, the issuance of an incidental take permit by the USFWS is not contingent upon state law.

1.4.1 Federal Law

1.4.1.1 Endangered Species Act and Related Regulation and Policy

Section 9 of the Endangered Species Act (ESA) prohibits "take" of any federally endangered wildlife species (16 United States Code (USC) § 1538(a)). As defined by the ESA, "take" means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" (16 USC § 1532(19)).

"Harm" is further defined by USFWS regulations as "an act which actually kills or injures wildlife and may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns including breeding, feeding or sheltering." "Harass" in the definition of take is defined by USFWS regulations as "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding or sheltering" (50 Code of Federal Regulations (CFR) § 17.3).

Section 10(a)(1)(B) of the ESA (16 USC § 1539(a)(1)(B)), authorizes the USFWS to issue a permit allowing take of species providing that the taking is "incidental to, and not the purpose of, the carrying out of an otherwise lawful activity."

Section 10(a)(2)(A) of the ESA provides that the USFWS must issue an incidental take permit provided that the applicant meets several substantive criteria, including that the applicant submit a conservation plan that: (1) describes the impact that will likely result from the taking; (2) identifies the steps the applicant will take to minimize and mitigate the impacts and the funding available to implement those steps; (3) describes what alternative actions to taking were considered and the reasons the alternatives were not chosen; and (4) includes other measures that the USFWS may require as necessary or appropriate for purposes of the conservation plan (16 USC § 1539(a)(2)(A)). The USFWS Habitat Conservation Planning and Incidental Take Permit Processing Handbook ("HCP Handbook") also provides guidance on the elements of a habitat conservation plan.

The ESA does not mention regional habitat conservation plans, but the HCP Handbook encourages the development of regional plans (USFWS and NMFS 1996). ESA implementing regulations also give permittees "no surprises" assurances, which provide certainty as to their future obligations under a habitat conservation plan (50 CFR §§ 17.22, 17.32, 222.2; 63 Federal Register (FR) 8859).

Section 7(a)(2) of the ESA requires that each federal agency must consult with the USFWS to ensure that agency actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat (16 USC § 1536(a)(2)). "Jeopardize" is defined by the regulations as "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, number, or distribution of that species" (50 CFR § 402.02). As described in the HCP Handbook, issuance of an incidental take permit is considered an action for which Section 7(a)(2) applies (USFWS and NMFS 1996). With respect to the issuance of incidental take permits, the USFWS functions as both the "action" agency and the "resource" agency, so that the USFWS is actually consulting with itself. According to the HCP Handbook, the consultation must include consideration of the direct and indirect effects on the species, as

well as the impacts of the proposed project on listed plants and critical habitat, if any (USFWS and NMFS 1996).

1.4.1.2 National Environmental Polity Act and Environmental Impact Statements

The issuance of an incidental take permit is a federal action subject to the requirements of the National Environmental Policy Act (NEPA) (42 USC §§ 4321-4327). NEPA requires federal agencies to (1) study proposed projects to determine if they will result in significant impacts to the human environment; and (2) review the alternatives available for the project and consider the impact of the alternatives on the human environment (42 USC § 4332(c)). The scope of NEPA is broader than the ESA in that it requires the agency to consider the impacts of the action on the "human environment," including a variety of resources such as water, air quality, cultural and historic resources, and socioeconomic resources. In the context of a habitat conservation plan and incidental take permit, the scope of the NEPA analysis covers the direct, indirect, and cumulative effects of the proposed incidental take and the beneficial effects of the proposed mitigation and minimization measures described in the habitat conservation plan (USFWS and NMFS 1996).

The HCP Handbook describes the USFWS procedures for complying with NEPA with respect to habitat conservation plans. Most large-scale, regional habitat conservation plans require preparation of an Environmental Impact Statement (EIS) to comply with NEPA.

1.4.2 State Law

Texas state law establishes requirements related to the development of regional habitat conservation plans by Texas governmental entities, including counties and municipalities (Subchapter B, Chapter 83 of the Texas Parks and Wildlife Code). Among other things, state law requires that the governmental entity or entities participating in the development of a regional habitat conservation plan (otherwise known as "plan participants") must appoint a Citizens Advisory Committee and a Biological Advisory Team, comply with open records and open meetings laws and public hearing requirements, in certain circumstances provide notice to affected landowners, and acquire identified preserves by specific deadlines.

In addition, plan participants are prohibited from:

- Imposing any sort of rule or regulation related to federally listed species (other than regulations involving groundwater withdrawal) unless that rule or regulation is necessary to implement a habitat conservation plan or regional habitat conservation plan for which the plan participant was issued a federal permit (Texas Parks and Wildlife Code § 83.014(a));
- Discriminating against a permit application, permit approval, or provision of utility service to land that has been designated as a habitat preserve for a regional habitat conservation plan, is designated as critical habitat under the ESA, or has

listed species or listed species habitat (Texas Parks and Wildlife Code § 83.014(b));

- Limiting or denying water or wastewater service to land that has been designated as habitat preserve or potential habitat preserve, is designated as critical habitat under the ESA, or has federally listed species or listed species habitat present (Texas Parks and Wildlife Code § 83.014(c));
- Requiring a landowner to pay a mitigation fee or set aside, lease, or convey land as a habitat preserve as the condition to the issuance of a permit, approval, or service (Texas Parks and Wildlife Code § 83.014(d)); and
- Accepting a federal permit in conjunction with a regional habitat conservation plan unless the qualified voters of the plan participant have authorized the issuance of bonds or other debt financing in an amount equal to the estimated cost of acquiring all land for habitat preserves within the time frame required by Chapter 83 (see below) or the plan participant has otherwise demonstrated that adequate sources of funding exist to acquire all land for habitat preserves within the required timeframe (Texas Parks and Wildlife Code § 83.013(d)).

In addition to the above prohibitions, Texas state law stipulates that the mitigation included in a regional habitat conservation plan, including any mitigation fee and the size of proposed habitat preserves, must be based on the amount of harm to each listed species the plan will protect (Texas Parks and Wildlife Code § 83.015(a)-(b)). However, after notice and hearing by the plan participants, a regional habitat conservation plan, its mitigation fees, and the size of proposed habitat preserves may be based partly on any of the USFWS recovery criteria for listed species covered by the plan (Texas Parks and Wildlife Code § 83.015(f)).

According to Texas state law, governmental entities participating in a regional habitat conservation plan must make offers to acquire any land designated in the plan as a proposed habitat preserve no later than four years after the issuance of the federal permit or six years after the initial application for the permit, whichever is later. Acquisition of all habitat preserves identified in a regional habitat conservation plan must be completed no later than the sixth anniversary of the date the incidental take permit was issued (Texas Parks and Wildlife Code § 83.018(c)).

Finally, state law imposes a requirement that before adopting a regional habitat conservation plan, plan amendment, ordinance, budget, fee schedule, rule, regulation, or order with respect to a regional habitat conservation plan, the plan participant must hold a public hearing and publish notice of such hearing in the newspaper of largest general circulation in the county in which the participant proposes the action. Such notice must include a brief description of the proposed action and the time and place of a public hearing on the proposed action. The plan participant must publish notice in accordance with the foregoing requirements,

and must do so not later than the thirtieth day prior to the public hearing (Texas Parks and Wildlife Code § 83.019).

1.4.3 Local Policy and Community Guidance

Other guidance for the RHCP was provided by the Hays County Commissioners' Court, County staff, the Citizens Advisory Committee, the Biological Advisory Team, public comments, and the grant application.

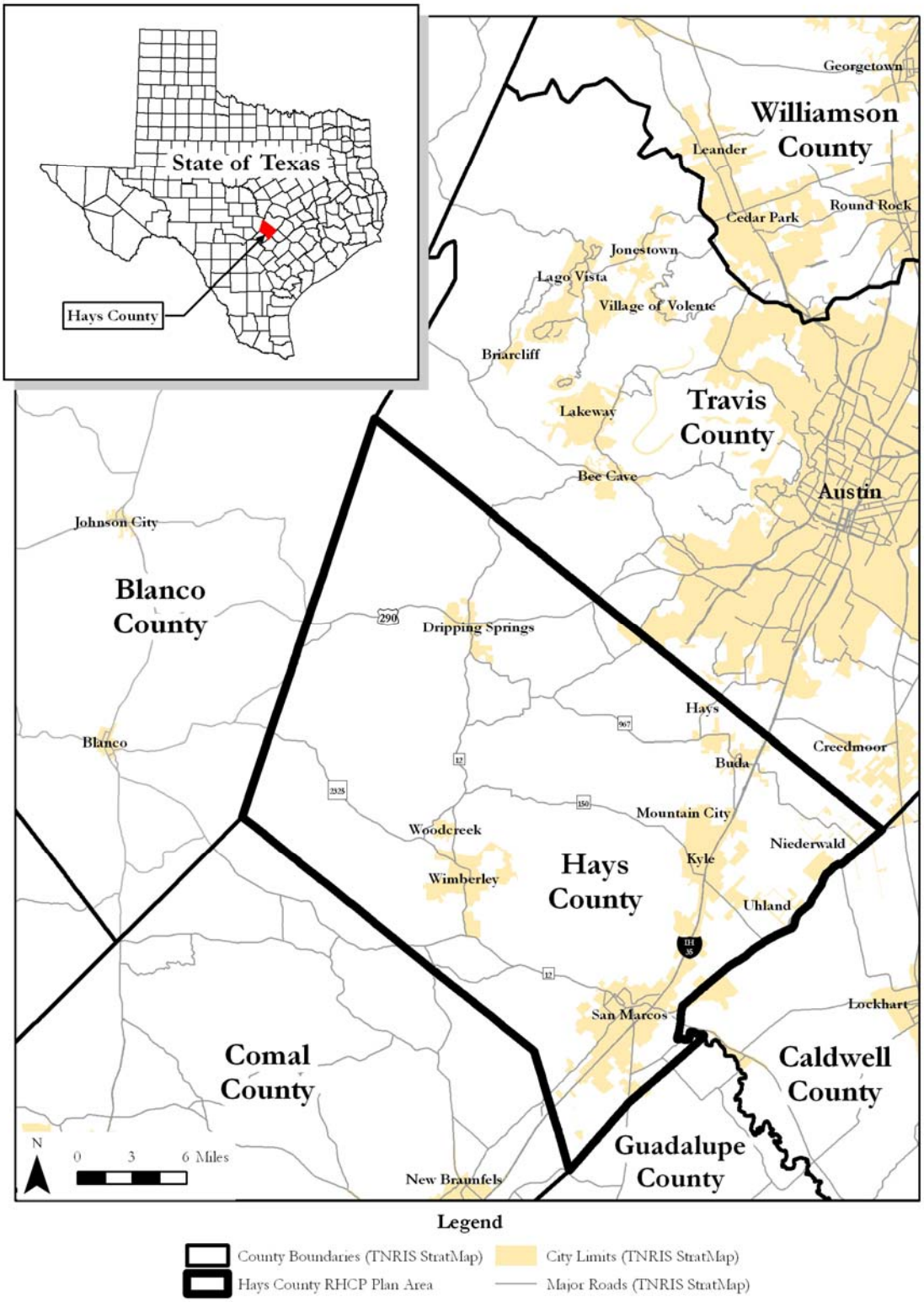
Detailed guidance on the scope of the RHCP was provided by the Citizens Advisory Committee and the Biological Advisory Team. The Citizens Advisory Committee provided input on the preferred conservation strategy, including stakeholder preferences for preserve system size, acquisition mechanisms, and funding. The Biological Advisory Team recommended a list of species to address in the RHCP, including the species that should be considered for incidental take authorization.

1.5 Plan Area and Permit Duration

The Plan Area for the RHCP is the entire extent of Hays County, Texas (Figure 1-1). Public or private entities conducting otherwise lawful activities within Hays County that may cause incidental take of the species covered by the Plan may elect to participate in the RHCP to obtain authorization for incidental take of the covered species.

The proposed term for the incidental take permit (the "Permit") associated with the RHCP is 30 years. While the Permit is valid, Hays County and other voluntary participants in the RHCP have incidental take authorization for the golden-cheeked warbler and black-capped vireo on lands enrolled in the RHCP (provided that all the terms and conditions of the Permit are met). At the end of the Permit term, Hays County will have the option of renewing the Permit. Whether renewed or not, Hays County will manage and maintain all preserve land acquired as mitigation under the RHCP in perpetuity.

Figure 1-1. Hays County RHCP Plan Area and Surrounding Communities.



2.0 NATURAL ENVIRONMENT OF HAYS COUNTY

Hays County is located in central Texas and covers approximately 434,335 acres, based on county boundaries provided by the Texas Natural Resources Information Service (TNRIS) Strategic Mapping Program (StratMap).

2.1 Ecoregions

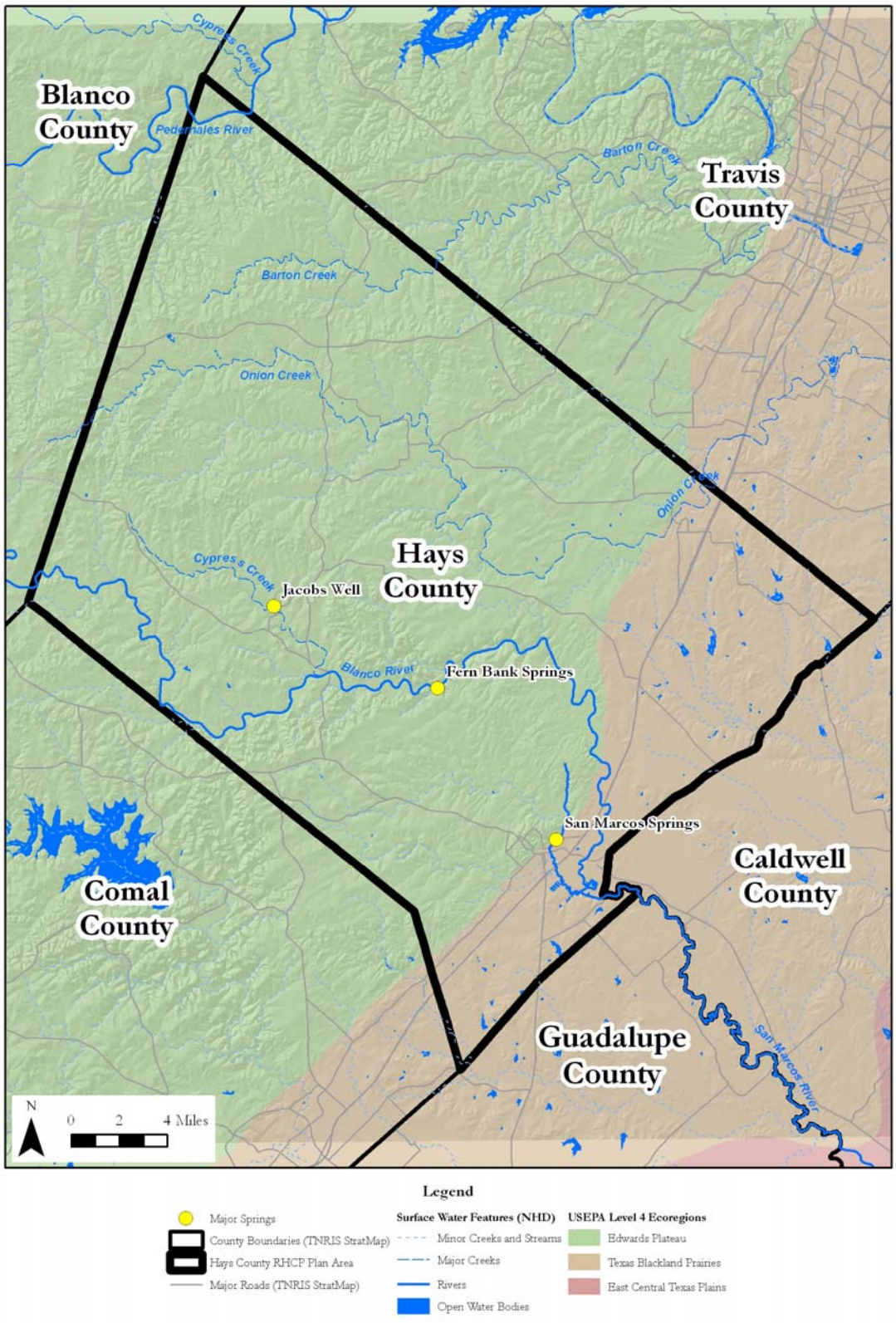
Hays County lies on the edge of the Edwards Plateau and Texas Blackland Prairie ecoregions, as described by the U.S. Environmental Protection Agency (USEPA) (Griffith et al. 2004).

The western three-quarters of Hays County (generally west of Interstate Highway 35) are within the Balcones Canyonlands portion of the Edwards Plateau ecoregion. The Balcones Canyonlands form the southeastern boundary of the Edwards Plateau. Vegetation in this region of Hays County is characterized by a mosaic of plateau live oak (*Quercus fusiformis*), Ashe juniper (*Juniperus ashei*), and honey mesquite (*Prosopis glandulosa*) parks and woodlands. This portion of Hays County has generally shallow, rocky soils over limestone bedrock formations. Some of the limestone formations are highly porous, with numerous caves and other underground cavities that provide channels for surface water to recharge the underlying Edwards Aquifer. The Balcones Canyonlands subregion is crossed by spring-fed streams, many of which have eroded steep-sided canyons in the limestone bedrock. Several large, perennial rivers or streams occur within Hays County over the Edwards Plateau (including the Blanco River, San Marcos River, Pedernales River, Barton Creek, Onion Creek, and Cypress Creek), and many of these waterways are fed by major springs (Griffith et al. 2004, McMahan et al. 1984).

The eastern one-quarter of Hays County (generally east of Interstate Highway 35) is within the Northern Blackland Prairie portion of the Texas Blackland Prairie ecoregion. The majority of the Northern Blackland Prairie subregion (including portion found in Hays County) has been converted to cropland, non-native pasture, and expanding urban uses around major cities. The rolling to nearly level plains of the Northern Blackland Prairie subregion are underlain by interbedded chalks, marls, limestones, and shales. Soils in this part of the county are mostly fine-textured, dark, calcareous, and productive (Griffith et al. 2004, McMahan et al. 1984).

Figure 2-1 shows the boundaries of the ecoregions in Hays County and the locations of major water features and aquifer zones.

Figure 2-1. Ecoregions and Major Water Features in Hays County.



2.2 Vegetation Communities and Land Cover

The 2001 National Land Cover Dataset (a nation-wide land use and land cover map) identifies 15 different land cover types in Hays County, as shown on Figure 2-2. Forests, shrubland, and grasslands or crop fields are the dominant land cover types in the county. Forested areas cover approximately 42 percent of the county, shrubland vegetation covers approximately 30 percent of the county, and grasslands and crop fields cover approximately 21 percent of the county. The dataset identifies only slightly more than five percent of the county as developed land, associated primarily with the cities of San Marcos, Kyle, Buda, Wimberley, and Drippings Springs, and the Interstate Highway 35 and U.S. Highway 290 corridors. Table 2-1 lists the approximate acreage of each land cover type identified by the 2001 National Land Cover Dataset in Hays County.

Table 2-1. 2001 National Land Cover Dataset Land Use/Land Cover Classifications for Hays County.

Category	Approx. Area (acres)	Percent of County
Open Water	1,901	0.4%
Developed, Open Space	15,139	3.5%
Developed, Low Intensity	4,877	1.1%
Developed, Medium Intensity	2,358	0.5%
Developed, High Intensity	1,144	0.3%
Barren Land	486	0.1%
Deciduous Forest	51,339	11.8%
Evergreen Forest	132,510	30.5%
Mixed Forest	156	0.0%
Shrub/Scrub	130,693	30.1%
Herbaceous	75,983	17.5%
Hay/Pasture	5,131	1.2%
Cultivated Crops	10,512	2.4%
Woody Wetlands	2,086	0.5%
Emergent Herbaceous Wetlands	3	0.0%

The U.S. Geological Survey (USGS) identified changes between the 1992 and 2001 versions of the National Land Cover Dataset (USGS 2003). Between 1992 and 2001, Hays County lost approximately 14 percent of its forest cover, with approximately 81 percent of the lost forest cover converted to grassland/shrub cover and approximately 10 percent converted to urban cover (Table 2-2).

Figure 2-2. National Land Cover Dataset 2001 Land Use/Land Cover Classifications for Hays County.

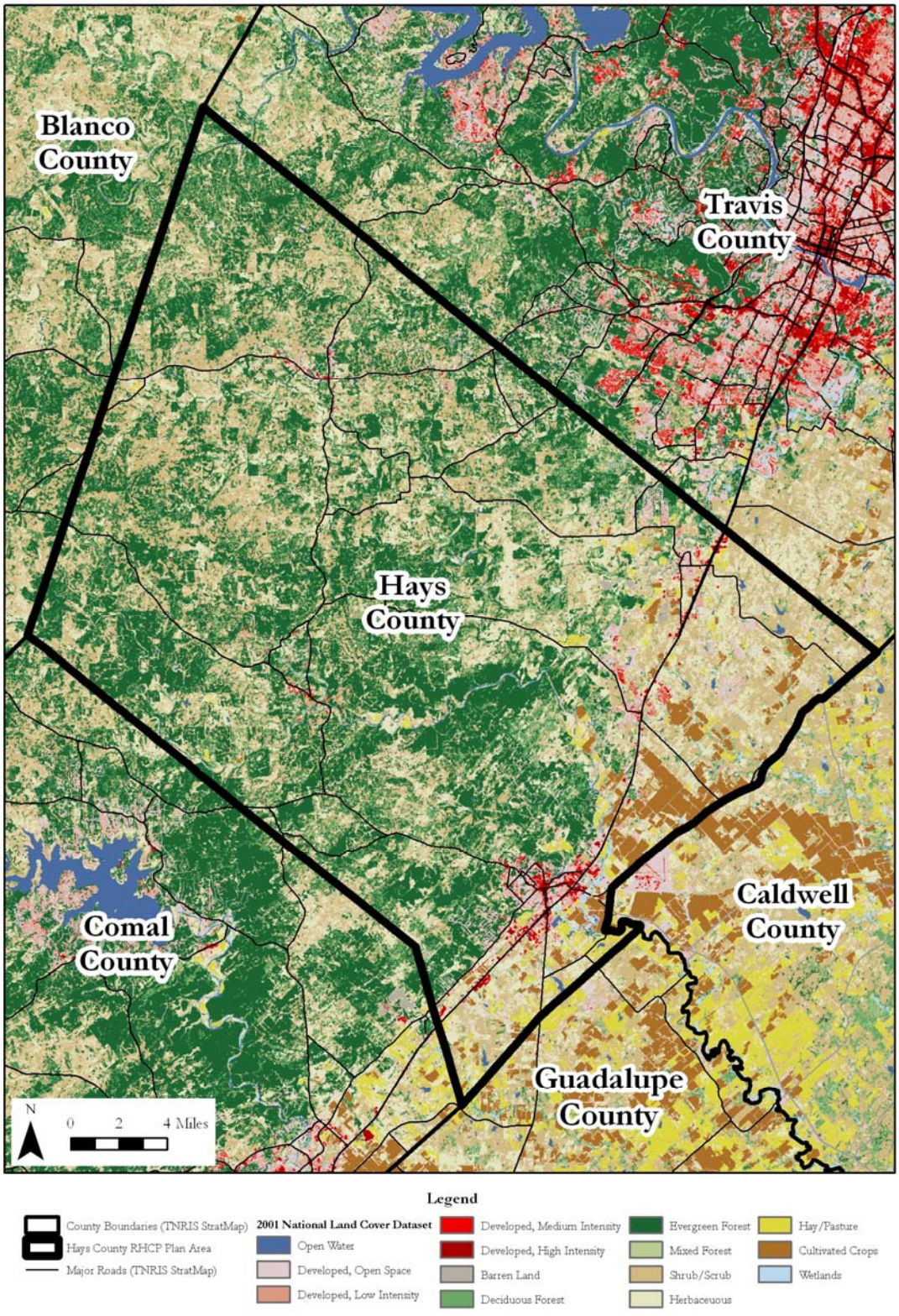


Table 2-2. Land Use/Land Cover Changes Between the 1992 and 2001 Versions of the National Land Cover Dataset[1].

Land Cover Category	Gain (ac)	Loss (ac)	Net Change (ac)	% Change from 1992
Open Water	343	2	341	22%
Urban	4,450	27	4,423	23%
Barren	282	11	271	126%
Forest	2,573	33,684	(31,111)	-14%
Grassland/Shrub	28,822	4,334	24,488	13%
Agriculture	2,649	1,752	897	6%
Wetlands	691	0	691	48%

[1] U.S. Geological Survey. 2003. National Land Cover Database NLCD 1992/2001 Change (edition 1.0). U.S. Geological Survey, Sioux Falls, SD. www.mrlc.gov/multizone.php.

2.3 Aquifers and Geology

Hays County is underlain by the Edwards Aquifer and the Trinity Aquifer.

The Edwards Aquifer (the Balcones Fault Zone region) extends across approximately 4,350 square miles over portions of eleven Texas counties from Bell County to Kinney County. The aquifer is composed of the porous limestones of the Edwards Group, Georgetown Limestone, and Comanche Peak Limestone formations (Ashworth and Hopkins 1995). The aquifer includes three distinct units, two of which (the San Antonio segment and the Barton Springs segment) occur in Hays County. The groundwater divide between the San Antonio and Barton Springs segments of the Edwards Aquifer is thought to occur west of the City of Kyle.

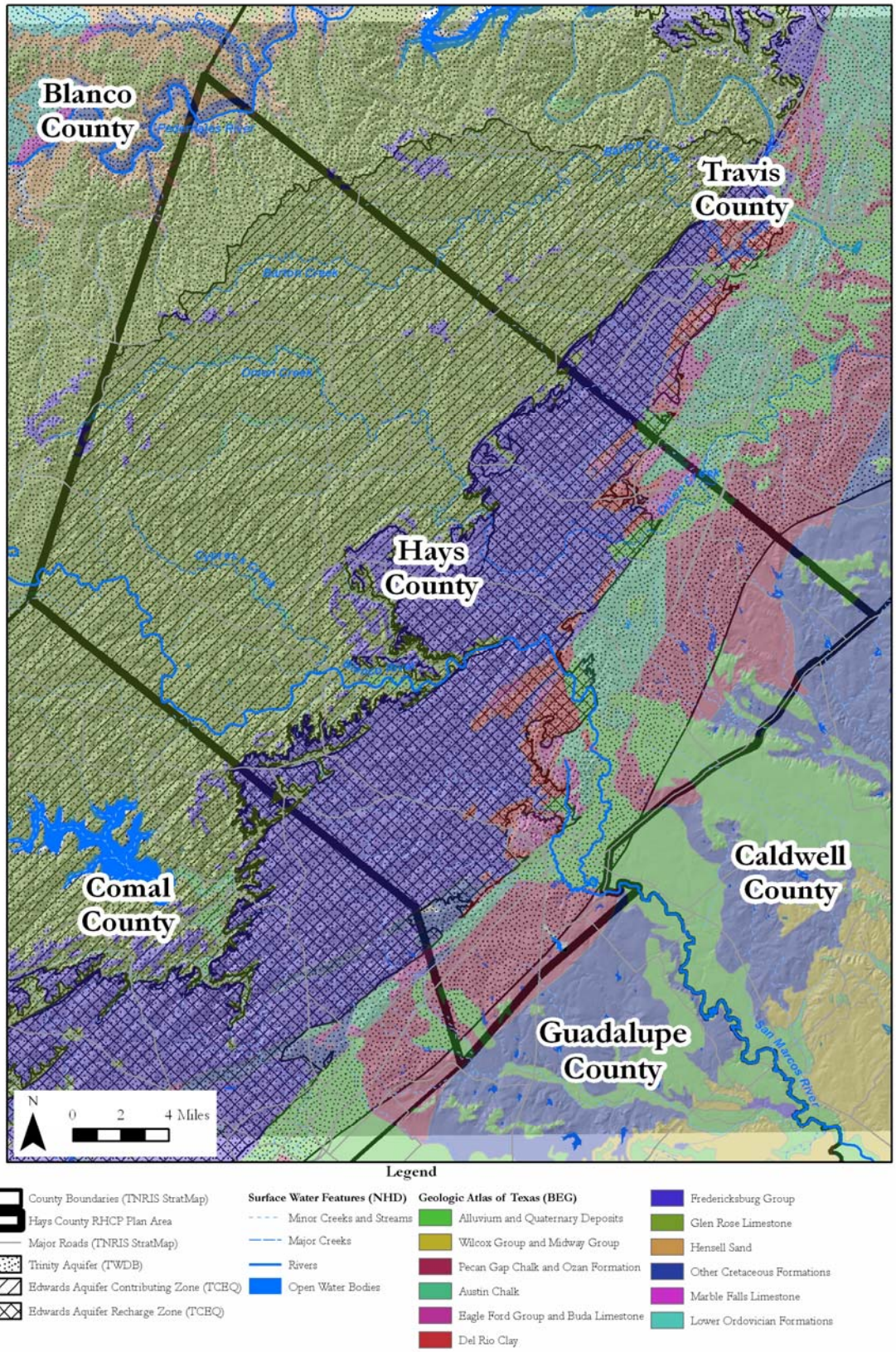
The Trinity Aquifer is composed of Trinity Group geologic formations, which include upper and lower members of the Glen Rose formation in Hays County, and extends across a wide band including 55 counties in the central part of Texas. The Glen Rose formation outcrops at the surface in portions of Hays County west of the Edwards Aquifer recharge zone (Ashworth and Hopkins 1995, Hays Trinity Groundwater Conservation District 2005) (Figure 2-3).

2.4 Water Resources

Hays County is crossed by several rivers and major creeks, including the Blanco River, San Marcos River, Pedernales River, Cypress Creek, Onion Creek, and Barton Creek (Figure 2-1). These major waterways, and the numerous minor streams and creeks that feed them, are valuable surface water resources for the county and support wildlife, riparian habitat, recreational uses, and scenic vistas.

Several notable spring systems occur in Hays County, including San Marcos Springs and Fern Bank Springs (which have been designated as critical habitat for several federally listed species) and Jacob's Well. Many other minor springs also occur across the county, discharging water from the Edwards Aquifer, Trinity Aquifer, and local groundwater sources (Figure 2-1).

Figure 2-3. Geological Formations and Aquifers in Hays County.



3.0 SPECIES ADDRESSED

3.1 Description of Coverage Categories

The RHCP includes measures designed to minimize and mitigate, to the maximum extent practicable, incidental take of golden-cheeked warblers and black-capped vireos by the County and other RHCP participants over the term of the Permit. The conservation measures proposed for the warbler and vireo may also provide some benefits for one or more of 56 other potentially rare or sensitive species in Hays County (Table 3-1). The species addressed in the RHCP fall into three categories:

Species Covered for Incidental Take – The golden-cheeked warbler and black-capped vireo are the "covered species" included in the RHCP. Hays County seeks incidental take authorization for these covered species.

Evaluation Species – There are 40 "evaluation species" included in the RHCP. Evaluation species are currently unlisted, but could become listed in the future (many have been petitioned for listing as threatened or endangered by organizations such as the WildEarth Guardians and the Center for Biological Diversity). Insufficient information about these species currently exists to support the level of analysis required to meet the ESA issuance criteria for an incidental take permit; therefore the County will not seek incidental take coverage for these species at this time. However, conservation measures taken under the RHCP for the covered species (particularly the protection of large blocks of Texas Hill Country habitat) may collaterally benefit the evaluation species. In addition, the RHCP also supports research to help gather information on the biology, habitat, distribution, and/or management of one or more of these species. The research supported by the RHCP may help preclude a possible need in the future to list some of these species, or help streamline the process of obtaining incidental take coverage if any of these species become listed in the future. Most of the rare, sensitive, or little-known karst-dwelling species currently known to exist in Hays County are addressed in the RHCP as evaluation species.

Additional Species – Species placed in this category include several of the currently listed aquatic species, as well as unlisted plants and unlisted aquatic animals. Hays County is not currently seeking incidental take authorization for any of the 16 "additional species" in this category because either: 1) the species are not likely to be impacted by covered activities or any potential impacts would be negligible and difficult to substantiate; 2) insufficient information is available to adequately evaluate take or impacts and mitigation; and/or 3) Hays County lacks mechanisms to address important threats to the species (i.e., Texas counties have few powers with respect to ensuring the protection of aquatic resources; rather the Texas Legislature has made the Texas Commission on Environmental Quality (TCEQ) the primary protector of water quality and groundwater districts the primary protector of water quantity in the state). Further,

some of the important impacts to these and other aquatic species may be addressed by existing voluntary measures for water quality protection in the Edwards Aquifer (i.e., the TCEQ optional measures for water quality protection under the Edwards Aquifer Rules) or the emerging Edwards Aquifer Recovery Implementation Program (this effort is currently underway, and representatives of Hays County stakeholders are participants in the effort). Other entities are also pursuing the development of habitat conservation plans that would cover some or all of the listed aquatic species and their designated critical habitats in Hays County, such as the San Marcos River Habitat Conservation Plan and the Barton Springs-Edwards Aquifer Habitat Conservation Plan. However, as described for the evaluation species, conservation measures taken under the RHCP for the covered species may collaterally benefit one or more of the additional species.

Table 3-1. Species Addressed in the RHCP.

Common Name	Scientific Name	Taxa	Habitat
	COVERED SPECIES		
Golden-cheeked warbler**	*Dendroica chrysoparia*	Birds	Juniper-Oak Woodland
Black-capped vireo**	*Vireo atricapilla*	Birds	Deciduous Shrubland
	EVALUATION SPECIES		
Aquifer flatworm	*Sphalloplana mohri*	Turbellarians	Aquatic/Karst
Flattened cavesnail	*Phreatodrobia micra*	Mollusks	Aquatic/Karst
Disc cavesnail	*Phreatodrobia plana*	Mollusks	Aquatic/Karst
High-hat cavesnail	*Phreatodrobia punctata*	Mollusks	Aquatic/Karst
Beaked cavesnail	*Phreatodrobia rotunda*	Mollusks	Aquatic/Karst
a cave-obligate leech	*Mooreobdella* n. sp. ***	Hirudinea	Aquatic/Karst
a cave-obligate crustacean	*Tethysbaena texana*	Crustaceans	Aquatic/Karst
a cave-obligate amphipod	*Allotexiweckelia hirsuta*	Crustaceans	Aquatic/Karst
a cave-obligate amphipod	*Artesia subterranea*	Crustaceans	Aquatic/Karst
a cave-obligate amphipod	*Holsingerius samacos*	Crustaceans	Aquatic/Karst
a cave-obligate amphipod	*Seborgia relicta*	Crustaceans	Aquatic/Karst
Balcones cave amphipod	*Stygobromus balconis*	Crustaceans	Aquatic/Karst
Ezell's cave amphipod	*Stygobromus flagellatus*	Crustaceans	Aquatic/Karst
a cave-obligate amphipod	*Texiweckelia texensis*	Crustaceans	Aquatic/Karst
a cave-obligate amphipod	*Texiweckeliopsis insolita*	Crustaceans	Aquatic/Karst
Texas troglobitic water slater	*Lirceolus smithii*	Crustaceans	Aquatic/Karst
a cave-obligate decapod	*Calathaemon holthuisi*	Crustaceans	Aquatic/Karst
Balcones cave shrimp	*Palaemonetes antrorum*	Crustaceans	Aquatic/Karst
a cave-obligate spider	*Cicurina ezelli*	Arachnids	Karst
a cave-obligate spider	*Cicurina russelli*	Arachnids	Karst
a cave-obligate spider	*Cicurina ubicki*	Arachnids	Karst
undescribed cave-obligate spider	*Eidmannella* n. sp. ***	Arachnids	Karst
undescribed cave-obligate spider	*Neoleptoneta* n. sp. 1 ***	Arachnids	Karst
undescribed cave-obligate spider	*Neoleptoneta* n. sp. 2 ***	Arachnids	Karst
undescribed cave-obligate spider	*Neoleptoneta* n. sp. eyeless ***	Arachnids	Karst
a pseudoscorpion	*Tartarocreagris grubbsi*	Arachnids	Karst

Table 3-1. Species Addressed in the RHCP.

Common Name	Scientific Name	Taxa	Habitat
a cave-obligate harvestman	*Texella diplospina*	Arachnids	Karst
a cave-obligate harvestman	*Texella grubbsi*	Arachnids	Karst
a cave-obligate harvestman	*Texella mulaiki*	Arachnids	Karst
a cave-obligate harvestman	*Texella renkesae*	Arachnids	Karst
a cave-obligate springtail	*Arrhopalites texensis*	Hexapods	Karst
an ant-like litter beetle	*Batrisodes grubbsi*	Insects	Karst
Comal Springs diving beetle	*Comaldessus stygius*	Insects	Aquatic/Karst
Edwards Aquifer diving beetle	*Haideoporus texanus*	Insects	Aquatic/Karst
a cave-obligate beetle	*Rhadine austinica*	Insects	Karst
a cave-obligate beetle	*Rhadine insolita*	Insects	Karst
undescribed beetle	*Rhadine* n. sp. (*subterranea* group) ***	Insects	Karst
undescribed beetle	*Rhadine* n. sp. 2 (*subterranea* group) ***	Insects	Karst
Blanco River springs salamander	*Eurycea pterophila*	Amphibians	Aquatic/Karst
Blanco blind salamander	*Eurycea robusta*	Amphibians	Aquatic/Karst
	ADDITIONAL SPECIES		
Hill Country wild-mercury	*Argythamnia aphoroides*	Plants	Terrestrial
Warnock's coral-root	*Hexalectris warnockii*	Plants	Terrestrial
Canyon mock-orange	*Philadelphus ernestii*	Plants	Terrestrial
Texas wild-rice**	*Zizania texana*	Plants	Aquatic
Texas fatmucket	*Lampsilis bracteata*	Mollusks	Aquatic
Golden orb	*Quadrula aurea*	Mollusks	Aquatic
Texas pimpleback	*Quadrula petrina*	Mollusks	Aquatic
Texas austrotinodes caddisfly	*Austrotinodes texensis*	Insects	Aquatic
Comal Springs riffle beetle**	*Heterelmis comalensis*	Insects	Aquatic/Karst
a mayfly	*Procloeon distinctum*	Insects	Aquatic
San Marcos saddle-case caddisfly	*Protoptila arca*	Insects	Aquatic
Comal Springs dryopid beetle**	*Stygoparnus comalensis*	Insects	Aquatic/Karst
Fountain darter**	*Etheostoma fonticola*	Fishes	Aquatic
San Marcos salamander*	*Eurycea nana*	Amphibians	Aquatic/Karst
Eurycea species (northern Hays County)* or **	*Eurycea* species	Amphibians	Aquatic/Karst
Texas blind salamander**	*Eurycea rathbuni*	Amphibians	Aquatic/Karst

* Federally threatened species

** Federally endangered species

*** The designation "n. sp." indicates a "new species" within a genus that has not yet been assigned a species name by acknowledged experts.

3.2 Species Covered for Incidental Take

3.2.1 Golden-cheeked Warbler

The USFWS published an emergency listing of the golden-cheeked warbler as endangered on May 4, 1990 (55 FR 18844). A proposed rule to list the warbler as endangered was also published by the USFWS on the same day. The final rule was published on

December 27, 1990 (55 FR 53153). The USFWS has not designated critical habitat for the golden-cheeked warbler. The Texas Parks and Wildlife Department (TPWD) also lists the species as endangered (TPWD 2007).

Conservation of the golden-cheeked warbler is the primary focus of the RHCP due to the documented presence of the species and the extent of potential habitat in the county.

3.2.1.1 Species Description and Life History

The golden-cheeked warbler is a small (approximately five inches long) insectivorous bird. Adult males have black on the crown, nape, back, throat, and upper breast. The wings are black with two white wing bars. The cheeks are a bright golden-yellow with a black eyeline. The underparts are white streaked with black on the flanks. Adult females are similar but duller; the crown and back are olive-green with some black streaking (Ladd and Gass 1999).

The warbler migrates between wintering grounds in southern Mexico and Central America and breeding grounds on the Edwards Plateau and adjacent areas in central Texas. The species arrives in central Texas in early to mid-March to breed. Nesting activities are typically completed by the end of July, and the species begins migration south in June or July (Ladd and Gass 1999). Most warblers have left central Texas by early to mid-August (Wahl et a1. 1990). For the purpose of the RHCP, the breeding season of the golden-cheeked warbler is defined as March 1 through July 31.

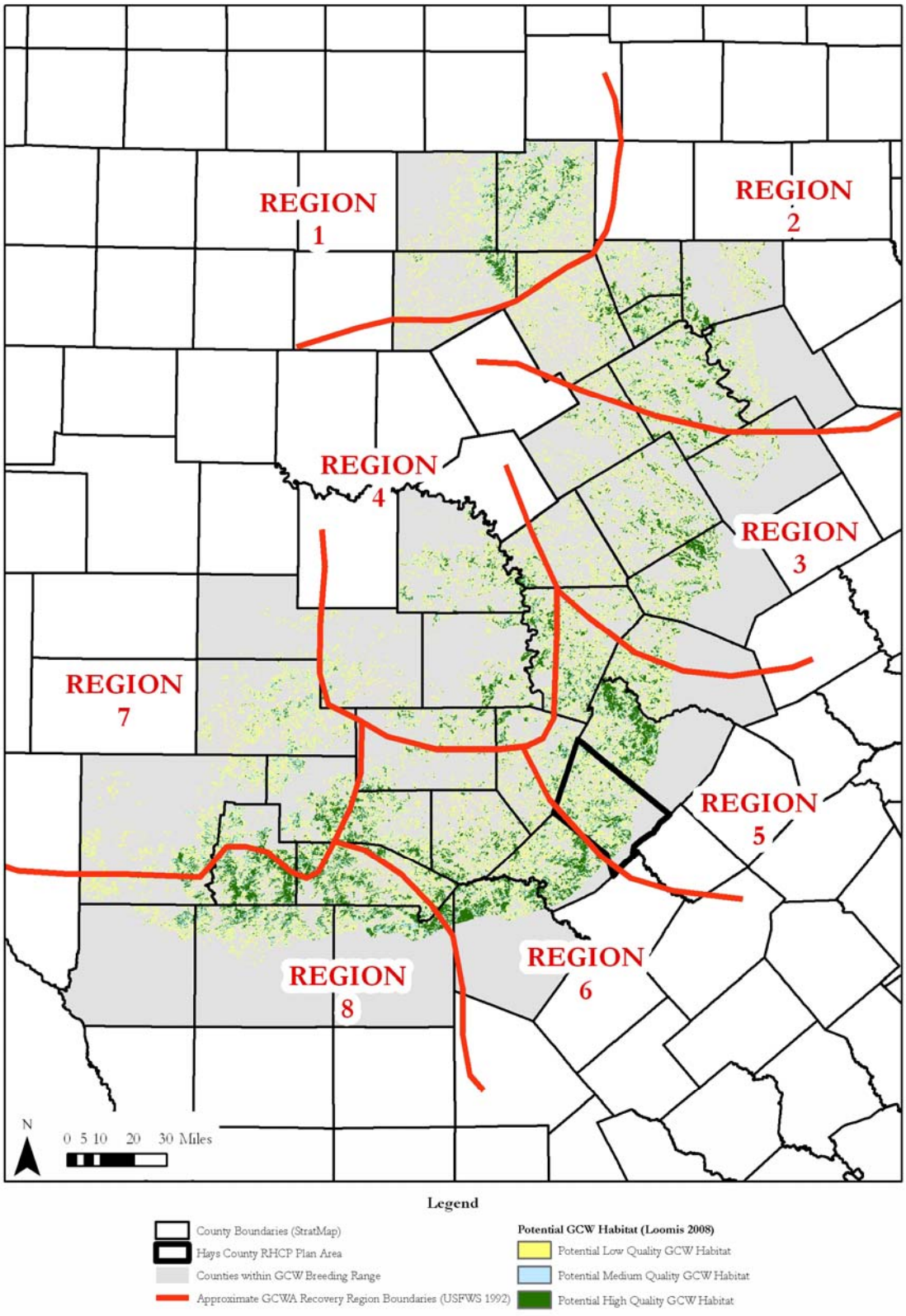
The golden-cheeked warbler is the only bird in Texas that nests exclusively within the state's boundaries (Oberholser 1974). The warbler has been recorded from 41 of the 254 Texas counties, of which 26 are currently known to have breeding populations. Counties with known breeding populations include Bandera, Bell, Bexar, Blanco, Bosque, Burnet, Comal, Coryell, Edwards, Gillespie, Hays, Johnson, Kendall, Kerr, Kimble, Lampasas, Llano, Medina, Palo Pinto, Real, San Saba, Somervell, Travis, Uvalde, Williamson, and Young (Ladd and Gass 1999, SWCA 2003).

Male warblers are territorial during the breeding season and defend territories that have been shown to range from approximately four to ten acres (Ladd and Gass 1999). Coldren (1998) found that territory size was inversely related to reproductive success, such that large territories may be an indicator of poor habitat quality (most likely due to reduced food availability and foraging opportunities). Male warblers announce and defend territories partly by singing high-pitched, buzzy songs loudly from conspicuous perches near the tops of trees. Females do not sing or defend territories, and have less conspicuous behavior (Ladd and Gass 1999).

Early studies found warbler territory densities ranging between 9.5 and 20 pairs per 100 acres (USFWS 1992). Wahl et al. (1990) suggests that an approximate range-wide measure of warbler territory density in areas of suitable habitat was 6.1 territories per 100 acres. Territory

density in high quality habitat has been shown to be greater than 12.1 territories per 100 acres (Wahl et al. 1990).

Figure 3-1. GCW Counties of Occurrence and 1992 Recovery Regions.



More recent studies by the U.S. Army Corps of Engineers and The Nature Conservancy on portions of Fort Hood, by the City of Austin and Travis County on the Balcones Canyonlands Preserve, and by the USFWS on the Balcones Canyonlands National Wildlife Refuge have reported territory densities for intensively studied areas. Reported warbler territory density on several study areas on Fort Hood in Bell County between 1992 and 2007 ranged between approximately 4.3 and 8.9 territories per 100 acres (Jette et al. 1998, Hollimon and Craft 1999, Peak 2005, Peak 2007a). The City of Austin and Travis County have monitored several 100-acre study plots with "prime" habitat on the Balcones Canyonlands Preserve in Travis County between 1998 and 2006, and have reported warbler territory densities that range between approximately 6.5 and 26.3 territories per 100 acres (City of Austin 2006, 2005, 2004, and 2003; Travis County 2007, 2006, 2004, and 2003). The City of Austin has also monitored two 100-acre study plots in "transitional" habitat, and has observed warbler territory densities ranging from approximately 2.3 and 8.0 territories per 100 acres on these plots (City of Austin 2005, City of Austin 2003). Territorial density data from the Balcones Canyonlands National Wildlife Refuge between 1997 and 2008 showed a range of approximately 10 to 18.7 territories per 100 acres in prime habitat and approximately 1.5 to 5.6 territories per 100 acres in transitional habitat (Sexton 2008). However, no studies of warbler density have been conducted in Hays County.

Golden-cheeked warblers eat a diet of insects, spiders, and other arthropods during the breeding season, generally taken from the upper two-thirds of the canopy (Pulich 1976). The warbler forages in both Ashe junipers and deciduous trees present in its breeding habitat (Pulich 1976); however, deciduous trees (particularly oaks) appear to be more important as a foraging substrate in the early part of the breeding season (Wahl et al. 1990). Golden-cheeked warblers generally forage within their territories, but are known to leave the territory to visit springs, seeps, shallow pools, creeks, or local water sources in the landscape (Pulich 1976).

Soon after arrival on breeding grounds in central Texas, male and female golden-cheeked warblers form pairs. Nest building commences within several days of pairing (Ladd and Gass 1999). Female golden-cheeked warblers are thought to select nesting sites and build nests within the territory of her mate (Pulich 1976). Strips of Ashe juniper bark, available only from mature trees, are the primary and most essential component of golden-cheeked warbler nests (Pulich 1976).

Females typically lay three or four eggs in mid-April (rarely five eggs), occasionally laying a second clutch May (Pulich 1976). The incubation period is typically ten to 12 days (Ladd and Gass 1999). Young birds remain in the nest approximately nine to 12 days and are fed by both parents (Ladd and Gass 1999). Parents continue to feed fledglings for approximately one month, after which independent young may join mixed foraging groups that frequently utilize more open habitat (Ladd and Gass 1999).

3.2.1.2 Habitat Description

In Texas, the golden-cheeked warbler is an inhabitant of old-growth or mature regrowth juniper-oak woodlands in the Edwards Plateau, Lampasas Cut-Plain, and Llano Uplift (Pulich 1976, Wahl et al. 1990, USFWS 1992). Regrowth woodlands suitable for warblers typically require 25 to 50 years to mature under favorable conditions (USFWS 1992), depending partially on soil condition and the retention of oaks after clearing (Ladd and Gass 1999). Golden-cheeked warblers are typically found in areas of steep slopes, canyon heads, draws, and adjacent ridgetops (Pulich 1976, Ladd 1985).

Species Composition

Ashe juniper and various oak species are the most common tree species throughout the golden-cheeked warbler's breeding range. The peeling bark of mature Ashe juniper trees is essential for nest building, and deciduous trees (especially deciduous oaks) are important for foraging (Wahl et al. 1990).

Ashe juniper is nearly always the dominant tree in nesting habitat (Ladd and Gass 1999), but has been shown to comprise anywhere between ten and 83 percent of total trees at several sites scattered throughout the range of the species (USFWS 1992). Campbell (2003) reports that the range of juniper canopy cover in suitable golden-cheeked warbler habitat is between ten and 90 percent. Some mature Ashe juniper with peeling bark is necessary to provide material for nest construction.

Spanish oak (*Quercus buckleyi)*, plateau live oak, shin oak (*Quercus sinuata* var. *sinuata*), cedar elm (*Ulmus crassifolia*), walnut (*Juglans* spp.), hackberry (*Celtis* spp.), and Texas ash (*Fraxinus texensis*) are common in golden-cheeked warbler habitat, particularly in the central part of the warbler's range (Pulich 1976, Ladd and Gass 1999). Models predicting warbler use of woodland vegetation suggest that a higher density of deciduous oaks is positively associated with increased warbler density (Wahl et al. 1990).

Canopy Cover and Height

Golden-cheeked warblers utilize moderate to dense forest or woodland habitat with a high percent canopy cover in the middle and upper layers (Ladd and Gass 1999). Total tree cover measured at several sites across the breeding range of the warbler averaged 70 percent at 10 feet, 74 percent at 16 feet, and 70 percent above 18 feet (Ladd and Gass 1999). Others have described appropriate habitat as having as little as approximately 35 percent canopy cover (Campbell 2003).

Wahl et al. (1990) found that average canopy height of golden-cheeked warbler habitat was approximately 22 feet. Higher warbler densities have been associated with greater average tree height and greater variability in average tree height (Wahl et al. 1990).

Patch Size and Landscape Matrix

The golden-cheeked warbler is a slightly forest-interior species (Coldren 1998, DeBoer and Diamond 2006) that also utilizes woodland edges, particularly after young have fledged (Kroll 1980, Coldren 1998).

Ladd and Gass (1999) state that prime habitat is found in patches of at least 250 acres, but smaller habitat patches are also utilized by the species (USFWS 1992). Coldren (1998) also found that warblers selected for habitat patches larger than 250 acres, and selected against utilizing smaller patches of habitat. However, much of the available habitat for the species is within these smaller patches. DeBoer and Diamond (2006) found that approximately 32 percent of available warbler habitat range-wide was in patches of less than 250 acres. Arnold et al. (1996) reports that warblers have been observed consistently occupying and successfully reproducing in patches of at least 57 acres. Similarly, Butcher (2008) found evidence to suggest that the minimum patch size needed for warbler reproduction was between approximately 37 acres and 50 acres. However, larger patches have been shown more likely to result in better pairing and reproductive success (Coldren 1998) than smaller patches.

Magness et al. (2006) found that at least 40 percent of the landscape must have woodland cover for a site with suitable habitat to be occupied by golden-cheeked warblers (woodland cover was defined as having at least 30 percent woody canopy cover). The study further found that at least 80 percent of the landscape must have suitable woodland habitat before the probability of occupancy of a site by golden-cheeked warblers exceeds 50 percent. This relationship held at a variety of spatial scales representing approximately 1X, 4X, 6X, and 66X of a typical territory size. The authors assert that the amount of juniper-oak woodland within approximately 500 acres surrounding a site is an important predictor of occupancy (Magness et al. 2006).

Terrain

Golden-cheeked warbler habitat is frequently associated with steep canyon slopes and generally rough terrain (Ladd 1985). DeBoer and Diamond (2006) showed that occupied habitat patches generally had steeper and more variable slopes than unoccupied habitat patches. The Golden-cheeked Warbler Recovery Plan (USFWS 1992) provides a number of possible explanations for the association, including increased water availability favoring the growth of deciduous trees and food availability, greater protection from wild fires, and greater protection from land clearing activities due to the difficulty in accessing and working on steep slopes. However, warblers are not restricted to canyon slopes, and suitable habitat (i.e., mature juniper-oak woodlands) may also be found on adjacent ridge tops and uplands (Ladd and Gass 1999).

Edge Effects

Conditions at the edge of golden-cheeked warbler habitat patches appear to influence the occupancy, territory distribution, territory size, pairing success, and reproductive success of

the species (Coldren 1998). Coldren (1998) found that reproductive success was higher in territories placed at least approximately 500 feet from a patch edge. Peak (2007) and Reidy (2007) found that nest survival decreased as the density of forest edges in the landscape increased. Coldren (1998) suggests that the character of habitat patch boundaries (i.e., "hard" versus "soft" edges, degree of human disturbance of adjacent land uses, amount of edge) may be more important to the species than the presence of natural gaps in woodland canopy cover. Food availability, nest predation (particularly by snakes and birds, such as crows and jays), and nest parasitism by brown-headed cowbirds may also contribute to edge effects, as influenced by patch size and the nature of the surrounding landscape (Engels 1995, Coldren 1998, Stake et al. 2004, USFWS 1992).

The golden-cheeked warbler appears to be less likely to occupy habitat adjacent to land uses with hard edges and high levels of human disturbance, particularly residential and commercial development (Engels 1995, Coldren 1998), and more likely to occupy habitat patches adjacent to soft edges associated with agricultural and grassland uses (Coldren 1998). Warblers also generally placed territories farther from habitat edges with adjacent high-disturbance land uses, such as residential and transportation development (Coldren 1998).

Edge effects have been shown to influence warbler breeding behavior or success at distances between approximately 330 feet to 980 feet from the edge of a habitat patch (Coldren 1998, Sperry 2007). The density of forest edge within 330 feet of a warbler nest has also been shown to influence nest survival, such that nest survival was higher in areas with less forest edge (Peak 2007b).

Other Habitats

Other habitats utilized by golden-cheeked warblers in central Texas, particularly by fledglings and family groups later in the breeding season, include woodlands and woodland edges with less species diversity, canopy cover, and canopy height than is typical for breeding or nesting habitat. Upland oak savannas and drier, sparser juniper woodlands may also be used later in the breeding season (Ladd and Gass 1999).

3.2.1.3 Hays County Golden-cheeked Warbler Population

The golden-cheeked warbler was first reported to occur in Hays County in the early 1890's (Pulich 1976). However, Pulich (1976) found that records of the species in Hays County were not numerous, possibly due to a history of land-clearing activity. Current records of golden-cheeked warblers in Hays County are also sparse, but available data show that the species has been recently recorded from across much of the county.

Several golden-cheeked warbler localities in Hays County were identified from available datasets provided by the USFWS, the Texas Natural Diversity Database, and Loomis Partners, Inc. (Loomis) (generalized warbler locations are shown in Figure 3-2). These localities represent warbler observations recorded by various observers between 1990 and 2005. Each of these

recent warbler localities occur in areas identified as potential habitat by the Loomis warbler habitat model, including some areas identified as potential low or moderate quality habitat and areas with a less than 50 percent probability of occupancy (see discussion of habitat models below).

Pulich (1976) estimated that the warbler population in Hays County was approximately 1,500 pairs in 1962 and approximately 150 pairs in 1974. There are no recent estimates of the total number of golden-cheeked warblers in Hays County reported in the literature.

Pulich (1976) estimated approximately 75,000 acres of "virgin Ashe juniper" in Hays County in 1962 and approximately 7,500 acres of this potential warbler habitat in 1974. The 1992 Golden-cheeked Warbler Recovery Plan (USFWS 1992) reports that approximately 50,644 acres of potential warbler habitat were present in Hays County in 1988, based on estimates adapted from Wahl et al. (1990).

Loomis developed a more recent estimate of the amount of potentially suitable warbler habitat in Hays County based on the average amount of canopy cover in an approximately 10-acre landscape (Loomis 2008, included in Appendix A). The Loomis habitat model estimates that approximately 34,110 acres of potential high quality warbler habitat (i.e., areas of woodland vegetation with an average canopy cover of at least 70 percent) may occur in Hays County (Table 3-2). Areas of potential high quality habitat identified by this recent habitat model are likely to be most comparable to the earlier estimates of available habitat, although other moderate or low quality regrowth habitat may also be used by the species.

When including more marginal potential habitats (identified as woodland areas with as little as 30 percent average canopy cover), the Loomis habitat model suggests that total extent of potential warbler habitat in Hays County may include as much as 170,355 acres (Loomis 2008) (Table 3-2). Since golden-cheeked warblers are known to utilize habitats that are less than prime, the true amount of habitat currently available across the range of the species is likely to lie between the potential high quality habitat estimates and the total potential habitat estimates generated by the Loomis model.

Table 3-2. Potential Golden-cheeked Warbler Habitat[1] and Occupancy Probability[2] in Hays County.

Habitat Class	Total Acres of Potential Habitat	Acres of Potential Habitat Not Likely to be Occupied	Acres of Potential Habitat May be Occupied	Acres of Potential Habitat Likely to be Occupied
Potential Low Quality Habitat	66,580	13,969	42,193	10,419
Potential Medium Quality Habitat	69,665	6,736	41,389	21,540
Potential High Quality Habitat	34,110	1,013	14,751	18,346
All GCW Habitat Classes	170,355	21,718	98,333	50,305

[1]Potential habitat and relative quality classes as identified by the Loomis habitat model. See Loomis (2008) in Appendix A for a discussion of model methodology and results.

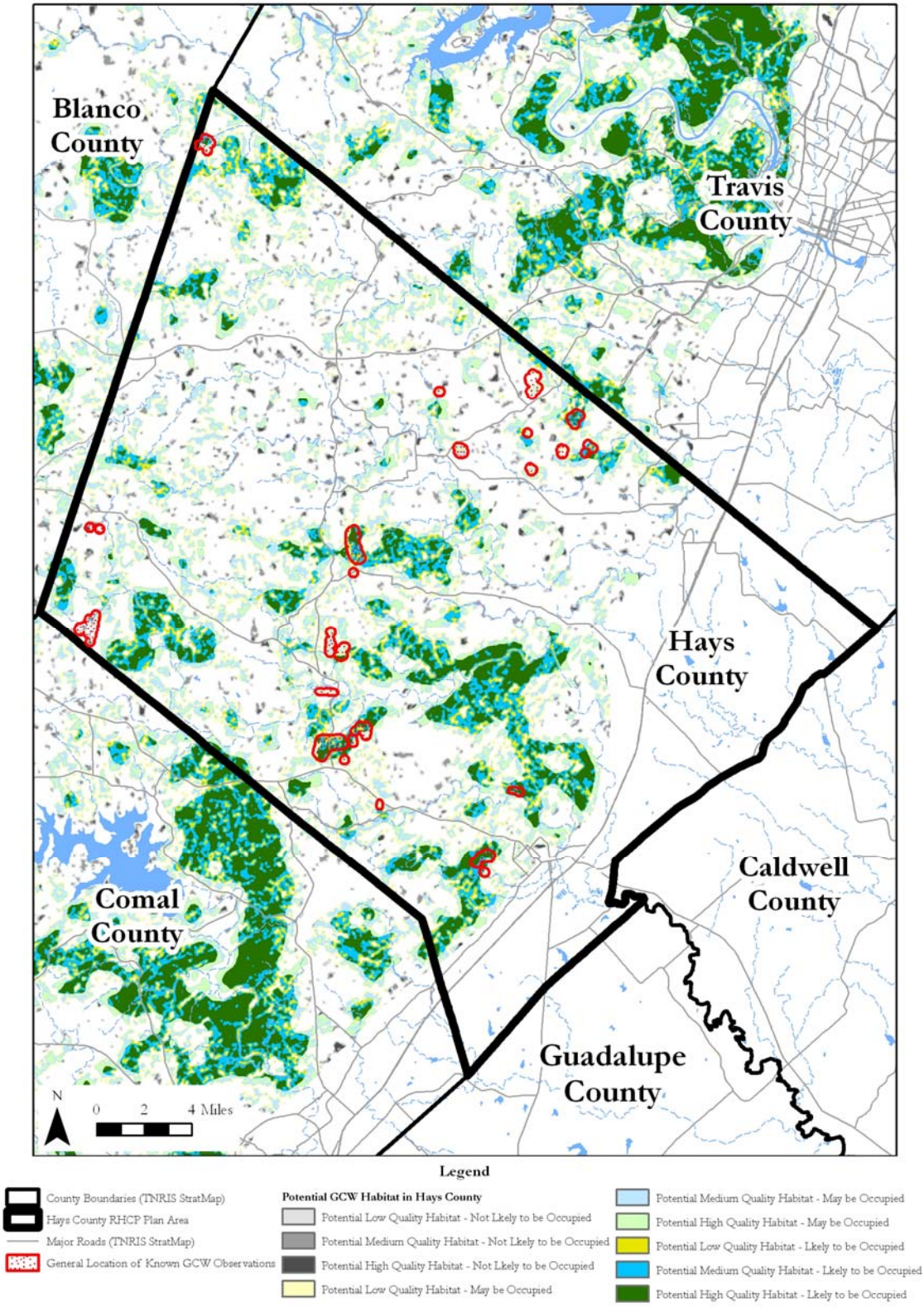
[2]Occupancy probabilities based on an analysis of the Loomis habitat model using the methodology described in Magness et al. (2006). See Appendix A for a discussion of the Magness occupancy model and the occupancy analysis of the Loomis habitat model.

Not all areas of potential habitat are expected to be used by the species. Magness et al. (2006) developed a spatial model to predict the probability that potential habitat is occupied by the species. Applying the Magness et al. (2006) occupancy model to the Loomis model of potential habitat yields an estimate of 148,638 acres (87 percent) of the potential habitat in Hays County (including potential high, medium, and low quality habitat) with a probability of being occupied by the species (i.e., the habitat occurs in a landscape with at least 40 percent suitable habitat). Only approximately 50,305 acres (30 percent of the total area of potential habitat) has a probability of occupancy that exceeds 50 percent (i.e., the habitat occurs in a landscape with at least 80 percent suitable habitat) (Table 3-2).

The extent of potential warbler habitat in Hays County, as identified by the Loomis model, and the relative potential for occupancy by the species (based on the methodology described by Magness et al. (2006)) is shown Figure 3-2.

For comparison, other researchers have also recently developed or are working on models that identify potential warbler habitat across the range of the species, including the Missouri Resource Assessment Partnership (MoRAP) of the University of Missouri (Diamond 2007) and the Biodiversity and Biocultural Conservation Laboratory at the University of Texas at Austin (Fuller et al. 2008a). The preferred models described in Diamond (2007) suggest that there may be as much as 64,441 acres to 71,784 acres of potential high quality warbler habitat in Hays County (i.e., habitat quality ranks 4 and 5 from preferred models "C" and "D"), and the preferred Diamond (2007) habitat models identify as much as approximately 161,000 acres of potential warbler habitat in Hays County in all quality classes. Fuller et al. (2008a) are working on a niche model based on a maximum entropy algorithm to identify areas with a probability of being suitable warbler habitat. Preliminary work by Fuller et al. (2008a) predicts that approximately 26,608 acres in Hays County may have a "high" probability of being suitable habitat and approximately 67,629 acres in Hays County may have a "good" or "high" probability of being suitable warbler habitat.

Figure 3-2. Potential GCW Habitat in Hays County.



3.2.1.4 Threats and Recovery Goals

Important threats to the golden-cheeked warbler include various factors related to habitat destruction and fragmentation in the species' breeding and wintering ranges. (Wahl et al. 1990, USFWS 1992, Ladd and Gass 1999). Oberholser (1974) discussed three main causes for the decline in the amount of suitable warbler habitat: land clearing for agricultural use, land development, and reservoir construction. Of these, land clearing for agricultural use and land development are activities occurring in Hays County. Nest parasitism by brown-headed cowbirds may also have contributed to the golden-cheeked warbler's population decline (Pulich 1976, USFWS 1992).

Warbler wintering habitat in Central America has been affected by lumbering operations (particularly in pine and pine-oak forests), mining, firewood-cutting, and land-clearing for agriculture (Lyons 1990). Conservation efforts are being undertaken in the affected areas to prevent habitat loss (Alliance for the Conservation of Pine-Oak Forests of Mesoamerica 2008).

The 1992 Golden-cheeked Warbler Recovery Plan (USFWS 1992) identifies the criteria to be met for the warbler to be considered for downlisting from endangered to threatened status. These recovery criteria include the protection of sufficient breeding habitat to ensure the continued existence of at least one viable, self sustaining warbler population in each of the eight recovery regions delineated in the recovery plan, where the potential for gene flow exists across regions to ensure long-term viability of the protected populations (USFWS 1992). Hays County lies predominantly within Recovery Region 5, which also includes all of Travis County and portions of Williamson, Blanco, and Burnet counties (Figure 3-1).

As of the date of this RHCP, the USFWS has started the processes of performing a five-year status review for the golden-cheeked warbler and reconvening the golden-cheeked warbler recovery team. An updated recovery plan for the species (including potential revisions to the boundaries of recovery regions) may be developed by the USFWS, based on the results of five-year status review and the recommendations of any reconvened recovery team. However, for the purpose of developing this RHCP, the existing 1992 Golden-cheeked Warbler Recovery Plan (USFWS 1992) provided guidance for the conservation plan.

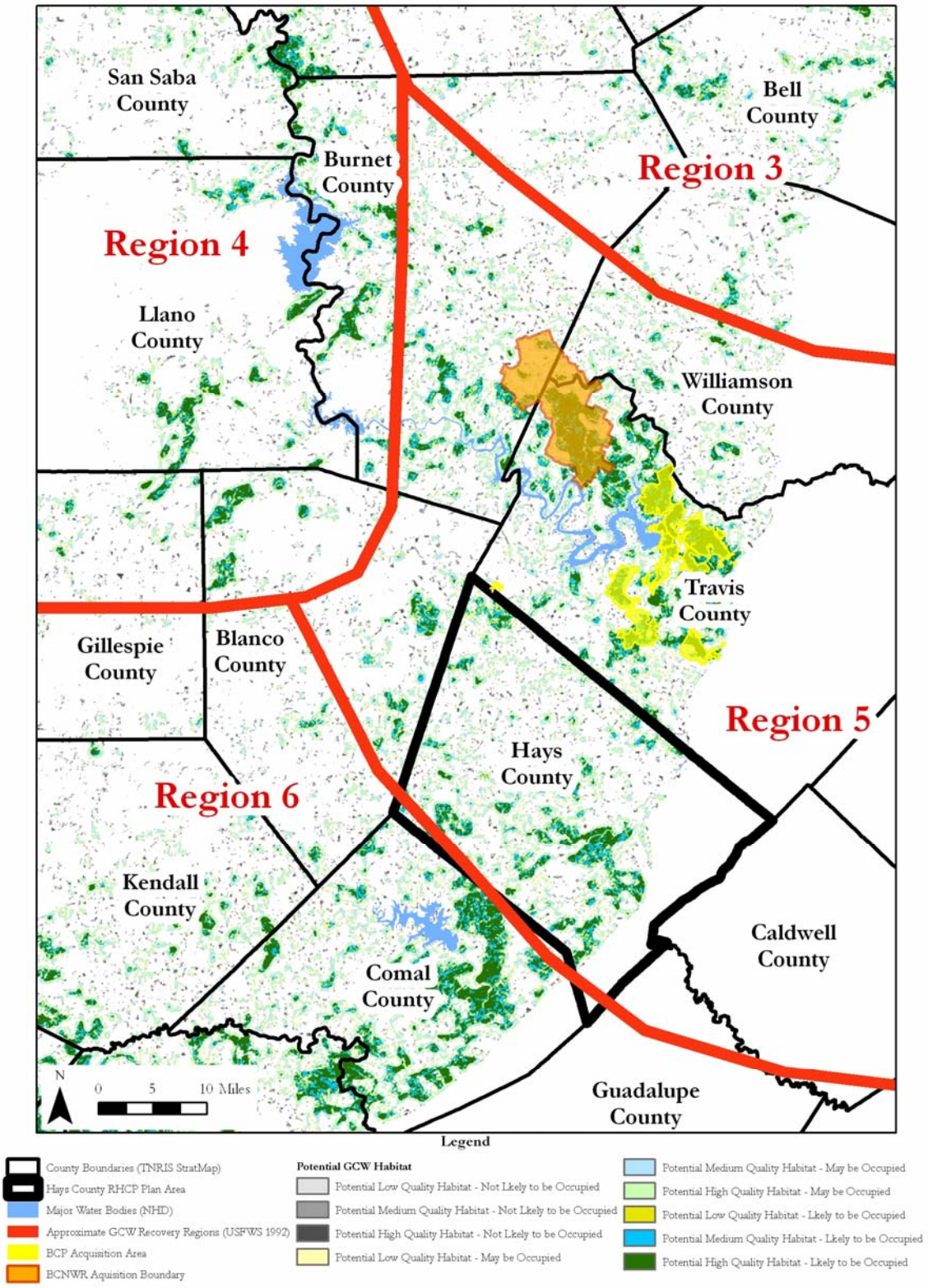
Participants at the "Population and Habitat Viability Workshop" held in August 1995 recommended protection of sufficient habitat for a carrying capacity of 3,000 breeding pairs for each warbler recovery region, with habitat management measures to include prevention of habitat damage by herbivores, habitat restoration, maintenance of high percent canopy cover of trees, oak wilt prevention, predator and nest parasite control, limiting human impacts in habitat, and planning at the landscape level (USFWS 1996a).

Attaining the recovery goals for the golden-cheeked warbler includes the identification of "focal areas" for protection that include a single, viable warbler population or one or more smaller populations that are interconnected (USFWS 1992). Within Recovery Region 5, it

appears that a focal area has already largely been protected through the establishment of the Balcones Canyonlands Preserve and the Balcones Canyonlands National Wildlife Refuge in Travis, Williamson, and Burnet counties (Figure 3-3). Currently, these areas comprise approximately 48,250 acres of permanently preserved and managed lands dedicated to the protection of endangered species. These two preserve systems contain approximately 28,440 acres of potential high quality warbler habitat, based on the results of the Loomis warbler habitat model.

Hays County lacks the very large, contiguous blocks of potential warbler habitat that are present in some adjacent counties (i.e., Travis County and, to a lesser extent, Comal County) (Figure 3-3). The potential warbler habitat in Hays County, while fairly abundant, is distributed in smaller, more isolated patches (Figure 3-2). Therefore, Hays County generally lacks an obvious "focal area" to contribute to the recovery goals for Recovery Region 5. Achieving the recovery goals for the warbler also requires the protection and management of "abundant and scattered patches of habitat" outside of the focal protection areas (USFWS 1992). The RHCP will protect patches of habitat for the golden-cheeked warbler outside of the established and potential focal protection areas to the north and south of Hays County. In this way, the RHCP will contribute to the recovery of the species.

Figure 3-3. Golden-cheeked Warbler Focal Area Preserves in Recovery Region 5.



3.2.2 Black-capped Vireo

The USFWS lists the black-capped vireo as endangered. It was first proposed for endangered status on December 12, 1986 (51 FR 44808) and was given endangered status on October 6, 1987; the rule becoming effective on November 5, 1987 (52 FR 37420). The USFWS has not designated critical habitat for the black-capped vireo. The black-capped vireo was state-listed as threatened on March 1, 1987 and endangered on December 28, 1987.

The USFWS includes Hays County within the black-capped vireo Recovery Region 3 (USFWS 1991). However, the Black-capped Vireo Population and Habitat Viability Assessment Report (USFWS 1996b) recommended that Hays County be included in a redrawn Recovery Region 2. A status review of the vireo by the USFWS was completed on June 19, 2007. The review assessed the current status of the species in the context of these revised recovery region boundaries, and recommended that the species be downlisted to threatened status (USFWS 2007).

3.2.2.1 Species Description and Life History

The black-capped vireo is a small, insectivorous bird that is approximately 4.5 inches long. Characteristic features of the male vireo include a black crown, nape, and face, and white "spectacles" formed by white eye-rings (interrupted over the eye) with a white band connecting the eye-rings. Females of the species are similar, but are duller and have a slate-gray cap. For both sexes, the back of the bird is olive green, the wings and tail are blackish with yellow-green edgings, the breast and belly are white with greenish-yellow flanks, and the wings have two pale yellow wing bars. The bill is black and the irises are brownish-red to red (Oberholser 1974, Farrand 1983).

Black-capped vireos are migratory and are present in Texas during the breeding season. The vireos arrive in Texas from late March to mid-April, with adult males arriving before females and first-year males. The majority of black-capped vireo breeding activities occur between mid-April and the end of July. However, the species is known to produce more than one clutch per season and adults may continue to rear young until mid-September (Grzybowski 1995). Although, Grzybowski (1995) also notes that black-capped vireo populations along the periphery of the Edwards Plateau have a slightly advanced schedule for spring migration and breeding. The birds leave their breeding grounds in the late summer and early fall, generally beginning in August and continuing through September and early October (Grzybowski 1995). Adult males are typically the last to migrate south (USFWS 1991). For the purpose of the RHCP, the breeding season of the black-capped vireo is defined as March 15 through August 31.

The present known breeding range of the black-capped vireo extends from central Oklahoma through Dallas, the Edwards Plateau, Concho Valley, Callahan Divide, and Big Bend National Park in Texas to the Mexican states of Nuevo Leon and Tamaulipas. The species

winters entirely in Mexico along the Pacific slopes of the Sierra Madre Occidental Mountains from southern Sonora to Oaxaca (Wilkins et al. 2006).

Black-capped vireos are territorial, and territories tend to be clustered in patches of suitable habitat. Territory clusters tend to be either small (less than ten territories) and composed of primarily young, second-year males, or large (frequently 15 or more territories) and composed of older, after-second-year males (USFWS 1991). Reproductive success and survivorship has been positively associated with cluster size (USFWS 1991). Second-year males tend to occupy poorer quality habitats that have vegetation characteristics more similar to areas of non-habitat than areas occupied by older males (Grzybowski et al. 1994).

Individual black-capped vireo territories are generally between 2.5 and 25 acres (with most covering approximately two to four acres) (Wilkins et al. 2006, Graber 1957, Tazik and Cornelius 1989). Territories are defended by the male through song and occasionally aggressive behaviors (Graber 1957). Adult male black-capped vireos, particularly those from large territory clusters, exhibit strong site fidelity and usually return to the same site and territory each year. Females also usually return to the same site each year, but may move among territories in the cluster both between seasons and between same-season nesting attempts (Graber 1957). Members of smaller breeding clusters tend to disperse more frequently to other sites (Graber 1957, USFWS 1991).

Nesting begins upon the arrival of females and continues through August. Nests are small, open-cup, hanging structures constructed in the forks of branches in very dense, deciduous foliage. Nests are typically placed one to four feet from the ground. Both sexes are known to contribute to nest building (Graber 1957). Black-capped vireos may complete up to six clutches in a single season, which typically lasts from early April through late July (USFWS 1991). A new nest is constructed for each nesting attempt (Graber 1957).

Egg laying begins the day after completion of the nest. Individual clutches contain three to four eggs (Graber 1957), with an estimated seasonal clutch size of between 12 and 20 eggs (USFWS 1991). Male vireos aggressively guard active nests (USFWS 1991). The incubation period extends from 14 to 19 days, which is longer than most other small, open-cup nesting passerines, and duties are shared by both parents. Hatchlings stay in the nest for nine to 12 days, and are fed by both adults. Females brood newly hatched young for four to six days. Fledglings are attended by one or both parents for usually 30 to 45 days after leaving the nest (Graber 1957, USFWS 1991).

Black-capped vireos are active birds that glean insects, spiders, larvae, and other food items from foliage, usually within the upper strata of the canopy (Graber 1957, Grzybowski 1995).

3.2.2.2 Habitat Description

The black-capped vireo uses heterogeneous scrub habitat that has a patchy distribution of shrub clumps and thickets with a few scattered trees and abundant deciduous foliage to ground level (Graber 1957, 1961; USFWS 1991; Grzybowski 1995). While the habitats occupied by the vireo may differ greatly across its range, the most common and distinguishing habitat element throughout the range of the species is the presence of dense, low, deciduous foliage at ground level to approximately three meters (USFWS 1991, Grzybowski et al. 1994, Maresh 2005). This low, dense, deciduous cover provides foraging and nesting sites, as well as protective cover from adverse weather and predators (Grzybowski et al. 1994).

Other black-capped vireo habitat variables, such as the amount of heterogeneity in vegetation structure, the degree of openness in the woody canopy, and the species composition of the habitat are highly variable throughout the range of the species and within regional areas. Due to the high degree of variation in these other habitat variables, they are thought to be less influential in comprising suitable vireo habitat than presence of low, dense, deciduous foliage (Maresh 2005).

Black-capped vireos may co-occur with golden-cheeked warblers, with vireos utilizing dense, deciduous foliage at the edge of warbler habitat patches (Grzybowski et al. 1994).

Species Composition

Typical plant species in black-capped vireo habitat on the Edwards Plateau include plateau live oak, shin oak, and various sumacs (*Rhus* spp.). Less common species include Texas mountain laurel (*Sophora secundiflora*), agarito (*Berberis trifoliolata*), and beebrush (*Aloysia gratissima*). Ashe juniper is usually not the dominant species, although it may be co-dominant with the oaks (Graber 1961, USFWS 1991, Grzybowski 1995).

Canopy Cover and Height

Black-capped vireos utilize patchy, shrubland habitat. Horizontal woody canopy cover in vireo habitat generally averages between 30 and 60 percent, with most of this cover due to deciduous shrubs (USFWS 2007). However, Maresh (2005) reported that canopy cover at several sites across Texas varied from less than 10 percent to greater than 90 percent. Ashe juniper generally comprises less than 10 percent of the total woody canopy cover. Closely spaced shrub clusters separated by grassy vegetation create the heterogeneous cover required by the species (USFWS 1991).

Dense, vertical cover of deciduous foliage between ground level and approximately 10 feet is a primary characteristic of black-capped vireo habitat. Vireos place nests in this low shrub cover, usually within areas of the densest foliage (USFWS 1991).

While vireos are typically associated with low, shrubby habitat, they have also been observed utilizing dense foliage "aprons" around widely spaced clusters of tall trees in open

woodlands and at the edge of patches of dense woodlands, where the canopy height may exceed 20 feet (Maresh 2005).

Patch Size and Landscape Matrix

Black-capped vireos nest in clusters of individual territories, and the minimum size for a patch of suitable habitat is thought to be between ten and 12 acres (Graber 1957). Graber (1957) also suggests that linear clusters of shrubby vegetation, such as along fence lines and road sides, do not constitute suitable black-capped vireo habitat.

Black-capped vireo habitat may also be associated with certain geologic formations (i.e., Fredericksburg limestones in Texas), poor soils, and topographic features that might create more favorable conditions for maintaining low, patchy, shrublands (USFWS 1991). However, any potential relationships between soils, geology, and vireo habitat are poorly understood.

Fire and Other Disturbances

In many parts of the black-capped vireo range (including the eastern edge of the Edwards Plateau), the shrubland vegetation used by the species is an early successional vegetation type frequently maintained by fire or moderate browsing by wildlife or livestock (heavy browsing can reduce vireo habitat). Other land management practices may also create or maintain suitable habitat conditions for the vireo. In other parts of the species' range, suitable breeding habitat is a stable vegetation type maintained by the abiotic characteristics of the area (Farquhar and Gonzalez 2005).

Some researches have found that black-capped vireos tend to occupy sites with a history of severe disturbance (Grzybowski et al. 1994). Where vegetation succession occurs fairly rapidly, severe disturbances, such as those caused by fire, may retard the growth of Ashe juniper and favor the bushy growth of deciduous species such as oaks and sumacs (USFWS 1991, Wilkins et al. 2006). Periodic disturbance of the habitat may be beneficial for maintaining suitable vireo habitat, depending on site conditions and proper implementation (Grzybowski 1994). Vireos have been shown to recolonize sites as little as two years after a fire (Tazik et al. 1993), and the habitat benefits from such disturbances have been estimated to last up to 20 or 30 years (Tazik et al. 1993, Dufault 2004). Burning intervals suggested for maintaining vireo habitat have ranged from 4 to 10 years (Campbell 2003) or even 25 years (Tazik et al. 1993).

3.2.2.3 Hays County Black-capped Vireo Population

Graber (1957) identified breeding populations of the black-capped vireo in Hays County in the late 1950's located at the El Rancho Cima Boy Scout Camp and at locations within a couple of miles south and east of Wimberley. Accurate locations for these three historic observations are not available. The Texas Natural Diversity Database maintained by the Texas Parks and Wildlife Department (which is a limited dataset based on voluntary submissions of sighting records) identifies three occurrences of the black-capped vireo in Hays County (one

reported in 1993 and the other two reported in 1999) (Texas Parks and Wildlife Department 2008). However, the USFWS has not received any records of the species in the county since 2000 (Wilkins et al. 2006).

The habitat estimates reported in Wilkins et al. (2006), which are based on the results of roadside surveys in the late 1990's (Maresh and Rowell 2000), identify approximately 23,855 acres of potential black-capped vireo habitat in Hays County. However, due to sampling issues associated with the original roadside surveys, the county-wide estimates of potential vireo habitat are likely to overestimate the amount of occupied and potential suitable habitat. Therefore, they may not be reliable and are of limited utility (Wilkins et al. 2006). The distribution of this potential habitat across the county is not available.

The Biodiversity and Biocultural Laboratory at the University of Texas at Austin has been developing a model that predicts the location of suitable vireo habitat in Hays County. Fuller et al. (2008b) have used a niche model constructed using a maximum entropy algorithm to identify areas with a probability of being suitable vireo habitat. Preliminary work by Fuller et al. (2008b) predicts that approximately 2,069 acres in Hays County may have a "high" probability of being suitable vireo habitat and approximately 11,772 acres in Hays County may have a "good" or "high" probability of being suitable vireo habitat.

The current population of black-capped vireos in Hays County is unknown, since a detailed population survey of the county has not been completed and only a few observations of the species have been reported in recent years. However, given the increasingly optimistic status of the vireo overall (the recent status review proposed that the species be downlisted in part due to the larger number of known populations) (USFWS 2007), the documented presence of the species on many private lands in the region (USFWS 2007), and the likely abundance of potential habitat in the county (Wilkins et al. 2006), the species is still likely to occur in Hays County.

3.2.2.4 Threats and Recovery Goals

The major threats to the black-capped vireo cited at the time the species was listed as endangered included habitat loss through conversion to other uses, heavy grazing and browsing pressure by domestic livestock and wildlife, and brood parasitism by brown-headed cowbirds (USFWS 2007). Since listing, new information suggests that vegetational succession may also be a major concern for the species (USFWS 2007). The recent status review of the vireo by the USFWS states that habitat loss, grazing and browsing, brood parasitism, and vegetational succession remain the primary threats to the species, although the relative importance of each of these threats may have changed since the time of listing (USFWS 2007).

The 2007 status review found that habitat loss and fragmentation due to the conversion of rangeland to other uses has likely decreased the amount of available habitat for the black-capped vireo across Texas, particularly on the Edwards Plateau, and remains a major threat (USFWS 2007).

The status review found that fewer domestic livestock on the Edwards Plateau, particularly goats, may have decreased the overall threat from grazing and browsing. However, heavy grazing and browsing by domestic livestock may still have an important negative impact on localized vireo populations. While the density and abundance of domestic livestock on the Edwards Plateau may be decreasing, the populations of white-tailed deer and other exotic, browsing ungulates may have increased, which may be of concern to the species (USFWS 2007).

Brood parasitism by brown-headed cowbirds has been identified as a major factor in the low reproductive success of some black-capped vireo populations. Cowbird abundance is correlated with the number and proximity of domestic livestock feeding areas, and the relative abundance of cowbirds in Texas has generally been decreasing over the last ten years. In addition to the general decline of the abundance of cowbirds in North America, cowbird trapping and removal efforts are likely to have reduced parasitism rates on many of the managed populations. The status review states that the overall threat to the species from brood parasitism in Texas has likely decreased since the time of listing (USFWS 2007).

Vegetational succession, particularly the invasion and growth of Ashe juniper into formerly open rangelands, has limited vireo habitat across much of the range of the species. The status review identifies fire suppression, overgrazing, and drought as contributing factors to the increase of Ashe juniper in the landscape. The status review suggests that vegetational succession may be an increasing threat to the vireo, but little data is available to quantify the magnitude of the threat (USFWS 2007).

In addition to the major threats to the species, the status review identifies predation from red-imported fire ants as a potentially increasing threat to the species (USFWS 2007).

The 2007 status review recommends that the species be down listed from endangered to threatened status (USFWS 2007). The recommendation for downlisting is based on observations that total known population of black-capped vireos in Texas is much larger than that known at the time of listing due to an increase in the overall population size and/or increased survey efforts that identified populations at new locations (including on private lands). Given a larger known population, the magnitude of the major threats to the species may be generally less than previously suspected. However, the status review cautions that threats to this species still exist and its recovery depends on the implementation of management actions to reduce these threats (USFWS 2007).

The 1991 Black-capped Vireo Recovery Plan is currently considered to be out-of-date and in need of revision (USFWS 2007), primarily because the known vireo population is currently much larger than the known population at the time of listing and the relative magnitude of the primary threats to the species is likely to have changed since listing. However, the recovery criteria listed in the 1991 Recovery Plan included a call for the protection of at least one viable vireo population composed of at least 500 to 1000 breeding pairs in each of six

recovery regions in Texas, Oklahoma, and Mexico. It is not clear whether a viable vireo population is currently protected in the recovery region that includes Hays County.

3.3 Evaluation Species

The County is not currently seeking incidental take authorization for the evaluation species addressed in the RHCP, and none are currently listed as threatened or endangered. However, the County recognizes that these species may be rare or sensitive and that some may have the potential to become listed species during the duration of the Permit. The protection of large tracts of land described in the RHCP conservation program will provide collateral benefits to the evaluation species. The RHCP also supports new research to help fill information gaps on the biology, life history, distribution, and/or management of one or more of these species (see Section 6).

The evaluation species include 40 karst species, including terrestrial and aquatic species, that depend on similar habitats. Evaluation species descriptions, known localities, and habitat requirements (as currently known) are described in Appendix B.

Zara Environmental, LLC mapped five cavernous bedrock outcrops in Hays County that provide habitat for terrestrial and aquatic karst species (see report in Appendix C). From youngest to oldest they are the Buda Limestone, the main outcrop of the Edwards Aquifer (Georgetown, Person, and Kainer Formations), outliers of the Kainer Formation that are geographically isolated from other outcrops of Edwards Limestone, the lower member of the Glen Rose Formation, and the Cow Creek Limestone. A detailed description of each of these outcrops, including examples of caves and karst features that occur within those outcrops, is included in Appendix C. Figure 3-4 shows the extent of karst terranes in Hays County and the general locations of known karst features.

Approximately 140,000 acres of Hays County are underlain by the five cavernous bedrock outcrops identified above, and approximately 89 caves, sinkholes, springs, and other karst features are known to occur in the county (Appendix C). Terrestrial karst evaluation species are known to occur in 16 of the karst features in Hays County, and aquatic karst evaluation species are known to occur in 17 other karst features in Hays County. Four of the 89 known karst features in Hays County are known to be occupied by terrestrial and aquatic karst evaluation species (Figure 3-4).

A number of regulations and other programs currently exist or are being proposed to support the conservation of potentially rare or sensitive karst and aquatic species in Hays County. Many of these programs focus on protecting or improving the quality and quantity of water resources in the county, while others aim to protect underground karst and cave habitats. A list of programs that may contribute to the conservation of the evaluation species included in the RHCP is found in Appendix D.

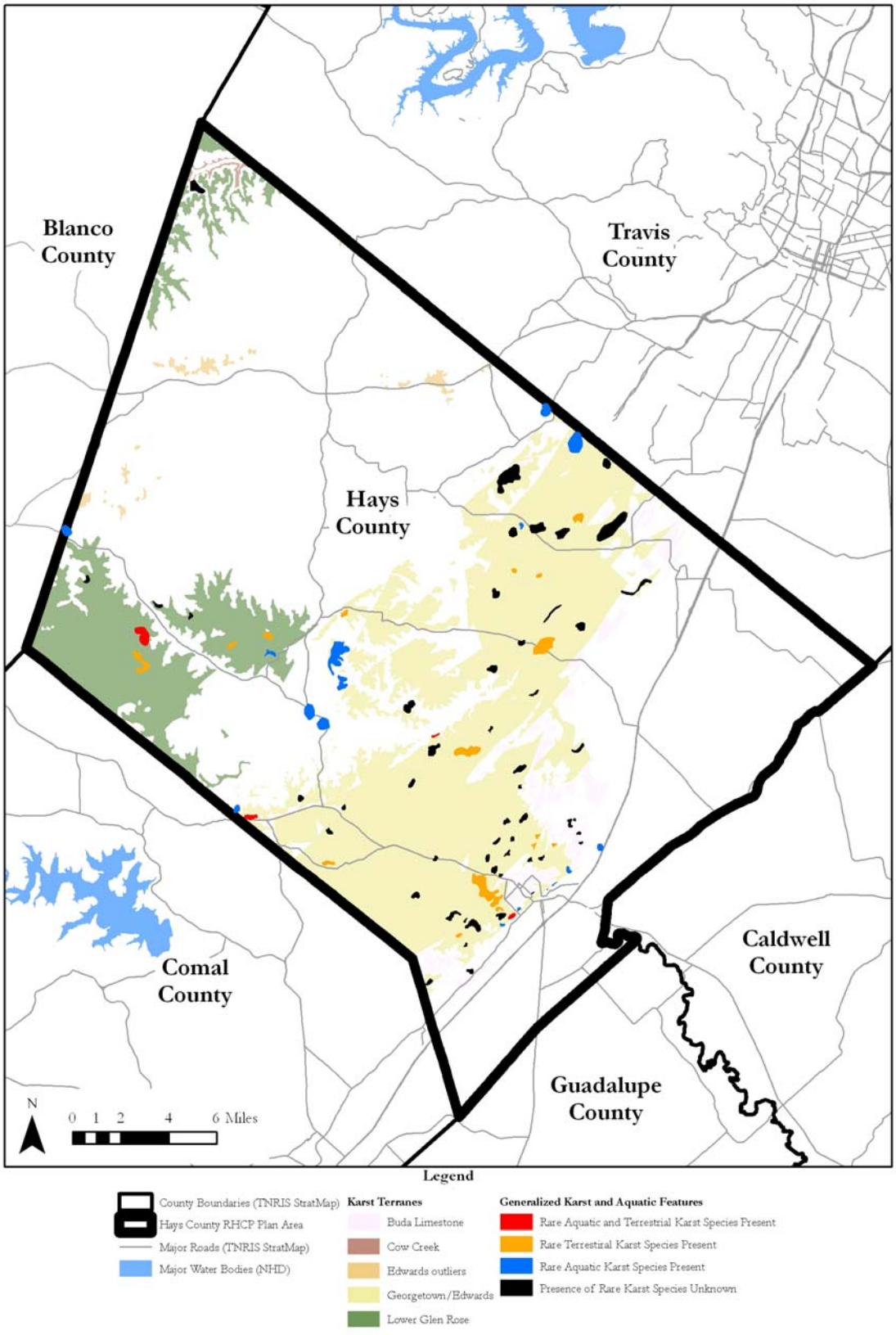
3.4 Additional Species

Conservation measures taken under the RHCP may collaterally benefit 16 "additional" species, including six listed aquatic species, three unlisted plants, and six unlisted aquatic animals. The list of additional species also includes the northern Hays County *Eurycea* salamander, which is likely to be determined to represent additional populations of one of the currently listed salamanders (Dr. Jean Krejca, Zara Environmental LLC, personal communication; see Appendix B). The County is not seeking incidental take authorization for these additional species, but includes measures in the RHCP that may provide collateral conservation benefits to these species.

Species descriptions, known localities, and habitat requirements for the additional species (as currently known) are included in Appendix B.

As for the evaluation species, existing or proposed regulations and other programs may contribute to the conservation of the additional species included in the RHCP. These programs are listed and described in Appendix D.

Figure 3-4. Karst Terranes and General Locations of Karst Features in Hays County.



4.0 POPULATION AND LAND USE

Hays County is situated along the Interstate Highway 35 corridor between the major population centers of Austin and San Antonio. Hays County is included in the Austin-Round Rock Metropolitan Statistical Area (MSA), and was the second fastest growing county in the MSA (which also includes Bastrop, Caldwell, Travis, and Williamson counties) with an estimated 58.9 percent population growth between 1996 and 2006 (Texas A&M University Real Estate Center 2007).

Despite the recent increases in population, which has been primarily focused in the communities along Interstate Highway 35, Hays County remains a mostly rural county with agricultural land uses dominating the landscape.

4.1 Population

4.1.1 Current Population

The 2000 Census reported a population of 97,589 in Hays County. The current population of Hays County, estimated for January 1, 2007 by the Texas State Data Center, was approximately 137,940 (Texas State Data Center 2007). This represents an estimated 41 percent increase in the total population of Hays County since the 2000 census.

Table 4-1. Census 2000 Population and Estimated 2007 Population in Hays County and Local Communities.

Community	Census 2000 Population	Estimated 2007 Population[1]	Percent Change
Hays County	97,589	137,940	41%
Bear Creek	360	400	11%
Buda	2,404	5,339	122%
Dripping Springs	1,548	1,962	27%
Hays	233	243	4%
Kyle	5,314	23,285	338%
Mountain City	671	745	11%
Niederwald	584	498	-15%
San Marcos	34,733	48,997	41%
Uhland	386	456	18%
Wimberley	3,797	4,386	16%
Woodcreek	1,274	1,476	16%

[1]Estimated 2007 populations reported by the Texas State Data Center (2007).

The fastest growing communities in Hays County include the cities of Buda and Kyle, which are located along the Interstate Highway 35 corridor between San Marcos and Austin.

4.1.2 Population Projections

To help forecast possible changes within Hays County during the 30-year term of the Permit, population projections were developed for the RHCP by TXP (an Austin-based economic analysis and public policy consulting firm) and Capital Market Research ("CMR," an Austin-based market research firm specializing in real estate research, land development economics, and market analysis) (TXP and CMR 2008). The projections were based on an analysis of historic and recent demographic and economic data (such as population, income, employment, and economic activity). The RHCP population estimate takes into account the most recently available population estimates for Hays County (July 2007), employment data (quarterly and annual information for 2007), migration rates, and information related to land development activity within Hays County.

Based on the TXP and CMR analysis, the population of Hays County is expected to increase from 97,589 in the year 2000 to an estimated 375,873 by the year 2040 (Table 4-2), which is a projected population increase of approximately 285 percent.

TXP and CMR used historic census tract population estimates and recent household and land development information to allocate the population forecast among the 14 census tracts delineated in the county. Figure 4-1 shows the boundaries of these 14 census tracts in Hays County, as delineated by the U.S. Census Bureau, and in relation to communities in Hays County.

Household and land development information used to help allocate the Hays County population forecast among census tracts included a review of building permit data and septic tank permit data provided by the cities of Buda, Kyle, and San Marcos; the Hays County Health Department; and the Capital Metropolitan Planning Organization. TXP and CMR also compiled a survey of currently approved residential subdivision lots that are available for future development (including a tally of the number of undeveloped residential lots in subdivisions approved for development or those with continued or pending sales efforts). The data provided a record of residential construction in Hays County by census tract since the year 2000.

Several census tracts in Hays County are projected to increase in population faster than the overall growth rate for the county, including the census tracts corresponding to the southern tip of Hays County (Census Tract 10400), the Dripping Springs area (Census Tract 10801), and the Kyle-Buda area (Census Tracts 10902, 10903, and 10904). The most extreme population growth is expected in Census Tract 10904, which is associated with the city of Kyle (Table 4-2).

Figure 4-1. Census Tracts in Hays County.

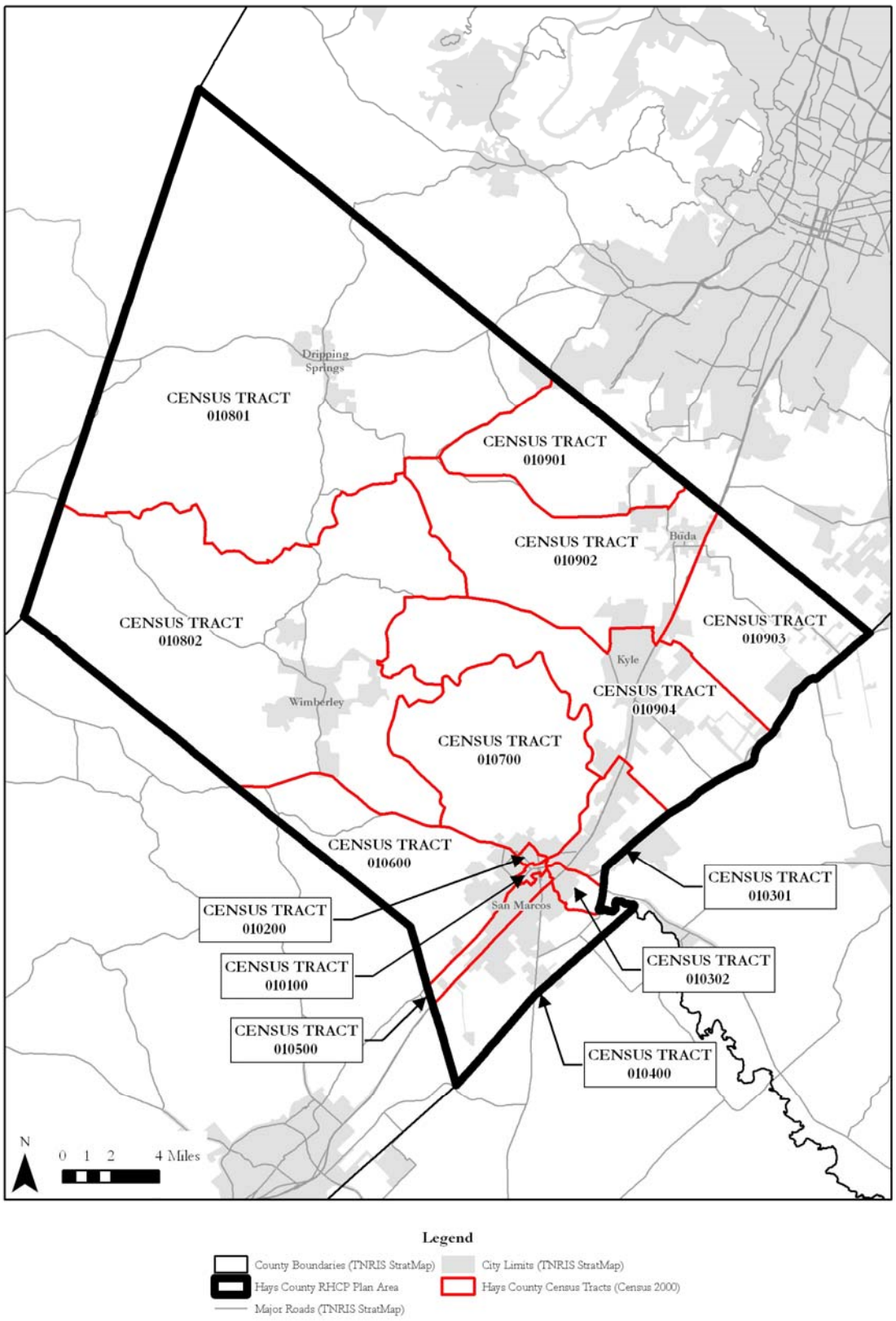


Table 4-2. Projected Population Estimates for Hays County and Census Tracts by Decade (TXP and CMR 2008).

Census Tract	Census 2000 Population	Projected 2040 Population	Estimated Percent Change (2000 - 2040)
Hays County	97,589	375,873	285%
CT 010100	1,908	3,799	99%
CT 010200	5,656	10,513	86%
CT 010301	10,176	22,600	122%
CT 010302	4,326	7,646	77%
CT 010400	4,343	18,691	330%
CT 010500	2,783	7,162	157%
CT 010600	7,904	18,689	136%
CT 010700	8,113	21,050	159%
CT 010801	12,908	66,295	414%
CT 010802	10,153	27,939	175%
CT 010901	6,609	15,872	140%
CT 010902	5,512	28,237	412%
CT 010903	8,643	52,076	503%
CT 010904	8,555	75,304	780%

4.2 Land Uses and Development Activities

4.2.1 Current Land Uses

4.2.1.1 Hays Central Appraisal District Data

The Hays Central Appraisal District (HCAD) maintains a database of real property that includes information regarding the ownership, legal description, market value, improvements, and appraised land use of parcels within the county. The HCAD appraisal database was linked to a geographic database of parcel boundaries developed by the Capital Area Council of Governments (CAPCOG) in 2005. This 2005 geographically linked appraisal district data allowed for an analysis of land uses for different regions of the county.

The 2005 HCAD appraisal database included nine different categories of land uses for parcels within the county. These nine general land use categories included single-family residential (code "A"), multi-family residential (code "B"), vacant (code "C"), agricultural (code "D", farm and ranch improvements (code "E"), commercial or industrial (code "F"), utility (code "J"), personal property (code "M"), and residential inventory (code "O") groups. The primary land use code for each parcel was identified from the database (i.e., if more than one code was listed for a parcel, the first code was used). Approximately 8 percent of land in the

geographic database for Hays County was unclassified and had no identified land use code (Table 4-3).

Figure 4-2 shows the distribution of land uses across Hays County, based on HCAD land use data.

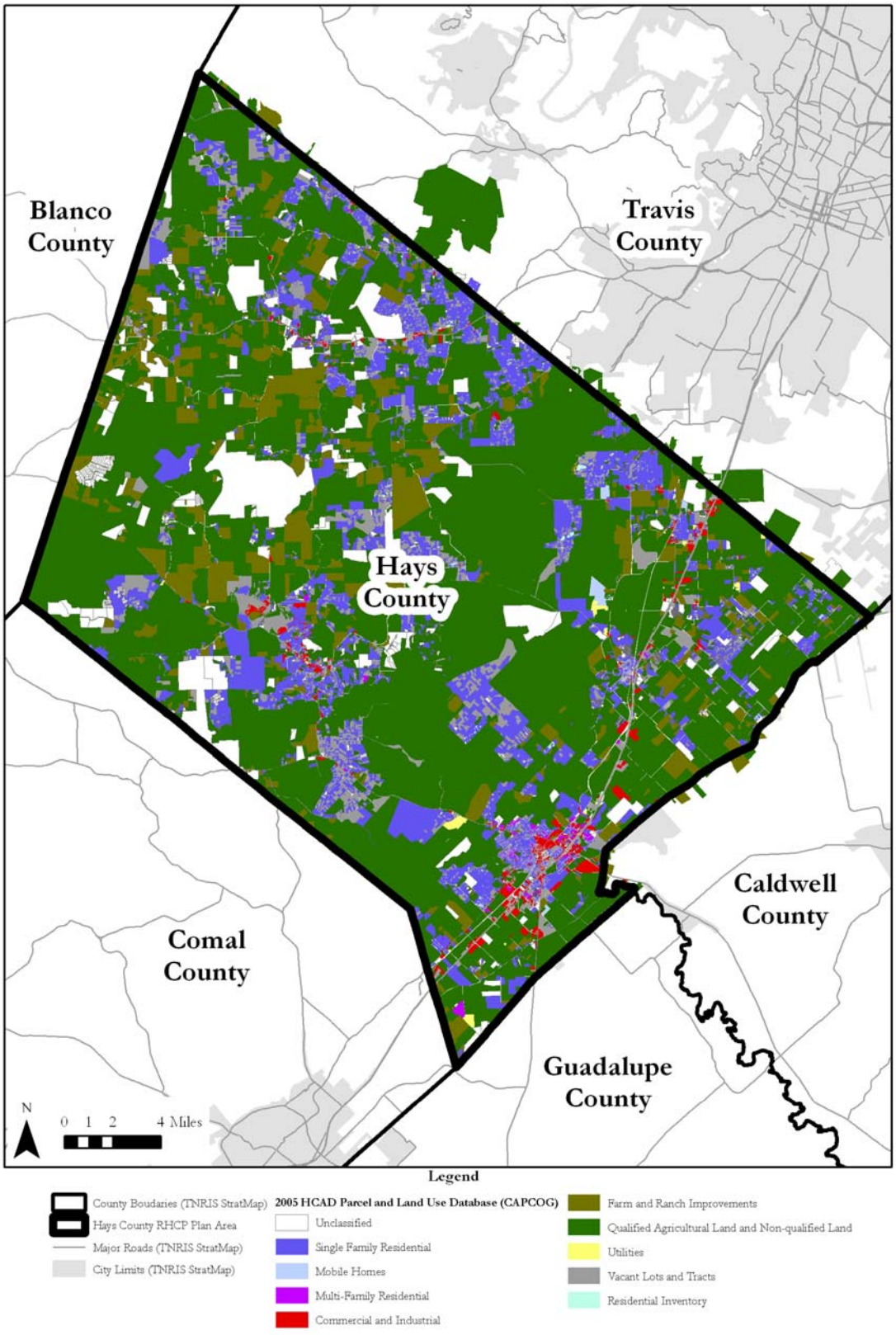
Approximately 71 percent of Hays County was classified as agricultural land or as farm and ranch improvements in 2005. Single family residential use was the next most extensive land use classification in the county, with approximately 14 percent of Hays County land classified as single family residential. Parcels classified as vacant were also common in the county, and composed approximately 8 percent of the acreage of the county. Other land use categories (including multi-family residential, commercial or industrial, and utility uses) each represented less than 1 percent of the acreage of the county (Table 4-3).

Acreage within each of the principal land use categories is shown in Table 4-3.

Table 4-3. Acres Classified by Land Use Type for Parcels in Hays County by Census Tract, based on 2005 HCAD Appraisal Data.

Census Tract	Single-family and Multi-family Residential (Code A or B)	Vacant Land (Code C)	Agricultural Land (Code D)	Farm and Ranch Improvements (Code E)	Commercial or Industrial (Code F)	Utility (Code J)	Personal Property, Residential Inventory, and Unclassified Land (Code M, O, or Blank)
Hays County	58,395	25,379	260,465	41,382	4,195	700	34,801
010100	175	20	1	-	71	2	11
010200	232	39	-	-	94	-	3
010301	971	542	3,510	387	562	20	589
010302	348	91	939	30	96	-	3
010400	1,549	614	9,281	861	570	125	1,190
010500	307	275	1,515	18	472	7	91
010600	5,141	1,754	15,627	661	118	211	840
010700	5,044	2,230	27,787	1,607	169	3	321
010801	17,592	8,167	70,812	18,033	364	8	16,965
010802	13,439	7,444	52,307	11,334	620	23	8,076
010901	3,867	803	14,455	770	95	20	236
010902	3,061	1,574	24,604	2,846	358	202	1,901
010903	3,511	688	16,138	1,923	289	64	1,483
010904	3,159	1,138	23,489	2,912	318	16	3,092

Figure 4-2. 2005 HCAD Parcels and Land Use Codes.



4.2.1.2 Parcel Size Distribution

The 2008 HCAD parcel database for Hays County identifies approximately 57,400 individual parcels in the county. The majority of these parcels are relatively small, such that approximately 91 percent of the parcels are no more than 10 acres. However, the county contains approximately 250 parcels that are of at least 500 acres. In terms of combined acreage, the individual parcels that are at least 500 acres include approximately 165,000 acres (i.e., approximately 38 percent of the area of the county).

4.2.1.3 Currently Protected Open Space

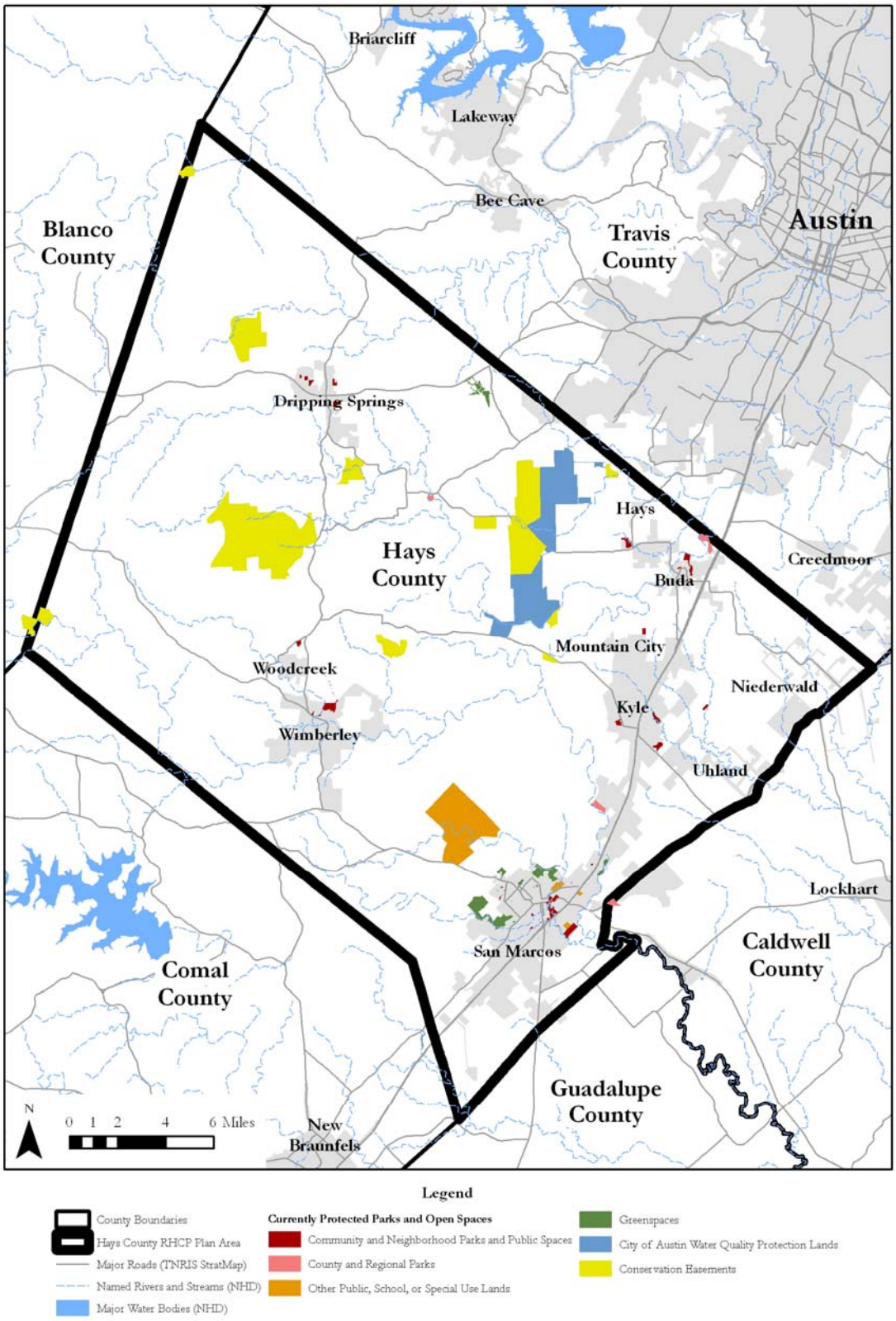
Hays County has a number of community or regional parks, greenbelts/greenspaces, preserves, academic research tracts, and privately owned conservation easements that protect open spaces from intensive development (Figure 4-3). While the primary purpose of these previously protected lands may not be endangered species conservation, a number of these properties may have some conservation value for the species addressed in the RHCP, particularly large tracts with limited public access. Table 4-4 lists the approximate acreage of currently protected parks and open spaces in Hays County.

Table 4-4. Acreage of Currently Protected Parks and Open Spaces in Hays County.

Type of Land	Acres
Community and Neighborhood Parks	705
County and Regional Parks	289
Other Public, School, and Special Use Lands	3,606
Greenspaces	1,053
Conservation Easements	12,569
City of Austin Water Quality Protection Lands	5,517
Total Acres	23,739

These existing protected open spaces include approximately 9,880 acres of potential habitat for the golden-cheeked warbler, including approximately 1,400 acres of potential high quality warbler habitat (based on the Loomis warbler habitat model described in Appendix A). Approximately 13,640 acres of these protected properties lie over the Edwards Aquifer recharge zone. The currently protected open spaces include approximately 13,600 acres of karst terrane that may be suitable for the development of caves or other karst features, and approximately 22 known karst features may be included within these properties. Of the karst features occurring at least partially within the previously protected properties, 13 are known locations for evaluation or additional species addressed in the RHCP.

Figure 4-3. Currently Protected Parks and Open Spaces in Hays County.



4.2.2 Projected Land Development

TXP and CMR used Hays County census tract population forecasts, estimates of the projected number and average size of new residences needed to support the projected population increase, and the estimated area of other new commercial, industrial, and institutional projects to estimate the amount new land development (i.e., the construction of homes, businesses, and related infrastructure) that could be associated with projected population increases in Hays County during the term of the Permit (TXP and CMR 2008).

The land development projections for the RHCP were compiled by TXP and CMR as follows:

1. Hays County Economic and Demographic Assessment: As a starting point, county-wide and city-specific data were collected and analyzed. Collected datasets included total population, employment, labor force, personal income, wages, tax base (sales and property), building permits, and new home unit values. Because Hays County is part of the Austin-Round Rock MSA, similar datasets were collected for the MSA. The analysis assumes that Hays County's growth has been and will largely continue to be influenced by economic forces driving Austin and Travis County.

2. Hays County Real Estate Analysis: TXP and CMR collected historical residential real estate data, compiled by year and census tract, within Hays County. This information was used to assess annual absorption trends and the character of new housing units in the county. Current and future large-scale developments, such as master-planned communities, were identified, as well as any other factors (i.e., existing or planned infrastructure) that would influence the location of future populations.

3. Create Hays County Population and Employment Forecast: TXP and CMR reviewed third-party forecasts of relevant economic and demographic variables, as available (e.g., population, economic activity and employment by major sector, personal income, etc.) at the aggregate county level. Examples include forecasts provided by the Texas State Data Center and Texas Water Development Board. Using the most recent population and employment data, as well as overall regional economic trends (e.g., slowing housing sector and potential for a national recession), a 30-year population and employment forecast was developed.

4. Allocate Population at the Census Tract Level: Combining the results of Steps 1 through 3, TXP and CMR allocated a portion of the population forecast to each census tract using current household density and estimates of the number of acres per housing unit. The initial allocation was then adjusted to take into

account planned subdivisions, the amount of total land available for development, septic permit activity, and recent trends in commercial development.

5. Estimate the Area Affected by New Development: The final step combined the population forecast with current land use trends for each census tract, such as homes per acre and people per household, to estimate the number of acres that may be affected by new land development in census tracts within the county.

Based on the TXP and CMR analysis, approximately 48,095 acres of land in Hays County may be converted from undeveloped land uses to developed land uses during the term of the Permit. The potential impacts from anticipated land development to habitats for the covered species are described in Section 5.2.

5.0 POTENTIAL TAKE AND CUMULATIVE IMPACTS

5.1 Covered Activities

As discussed in Section 4.0, Hays County has experienced rapid population growth that is expected to continue for the next few decades. This population growth will fuel land use changes across the county. Many of these changes will involve the conversion of undeveloped land to developed uses, with the construction of a variety of public and private development projects and the addition of new or upgraded infrastructure. Some of these anticipated development activities may impact the species covered by the RHCP.

The Permit issued in conjunction with the RHCP will authorize incidental take of the covered species that is associated with otherwise lawful activities. These activities include, but are not limited to:

- The construction, use, and/or maintenance of public or private land development projects, including but not limited to single- and multi-family homes, residential subdivisions, farm and ranch improvements, commercial or industrial projects, government offices, and park infrastructure;
- The construction, maintenance, and/or improvement of roads, bridges, and other transportation infrastructure;
- The installation and/or maintenance of utility infrastructure, including but not limited to transmission or distribution lines and facilities related to electric, telecommunication, water, wastewater, petroleum or natural gas, and other utility products or services;
- The construction, use, maintenance, and/or expansion of schools, hospitals, corrections or justice facilities, and community service development or improvement projects;
- The construction, use, or maintenance of other public infrastructure and improvement projects (e.g., projects by municipalities, counties, school districts); and
- Any management activities that are necessary to manage potential habitat for the covered species within the RHCP preserve system that could temporarily result in incidental take.

This RHCP is not intended to restrict or address ordinary ranching practices or juniper (i.e., "cedar") removal programs that may be covered under other authorizations, such as U.S. Department of Agriculture programs implemented by the Natural Resources Conservation Service (i.e., impacts from 2002 Farm Bill brush clearing programs were addressed by USFWS

Consultation Number 2-12-05-F-021) (USFWS 2004). Not all woodland or brushy vegetation containing junipers constitutes warbler habitat.

5.2 Incidental Take of Covered Species

Land development activities have the potential to impact habitat for the golden-cheeked warbler and black-capped vireo, which could result in incidental take. Approximately 48,100 acres of new development associated with residential and commercial projects is forecast to occur in Hays County during the term of the Permit (see Section 4.2.2). Additional impacts to habitat may occur in relation to the construction or improvement of roads and other public infrastructure. For the purposes of this RHCP, the extent of public sector land development is assumed to add another 9,600 acres of developed land to Hays County during the term of the Permit. This estimate is based on a review of the current distribution of public tax exempt properties and residential/commercial properties identified in the property tax appraisal rolls, whereby public tax exempt properties were found to represent approximately 20 percent of the acreage of residential and commercial properties in Hays County (i.e., 9,600 acres is approximately 20 percent of 48,100 acres). Therefore, the total area of anticipated land development (including both private and public-sector projects) is estimated to be approximately 57,700 acres over the duration of the RHCP.

Not all land development activities will affect the covered species due a number of factors, including the fragmented distribution of potential habitat for the warbler and vireo in Hays County (meaning that some development will occur in areas that are not likely to be suitable habitat for the covered species), the probability that not all areas identified as potential habitat are actually occupied by the species, and the implementation of measures during the land development process that avoid impacting potential habitat.

Incidental take of the covered species under the RHCP will be measured in terms of the direct and indirect impacts to acres of potential habitat resulting from the activities described in Section 5.1. Impacts to habitat will be used as a proxy for impacts to individual birds, breeding pairs, or territories, since reliable estimates of the total population of warblers and vireos in Hays County are not available.

Using habitat as a proxy for take of individual warblers and vireos is consistent with the USFWS approach with respect to both birds, and has been utilized in myriad incidental take permits and ESA Section 7 consultations with respect to those species. This approach also appears consistent with the limited case law addressing the issue of habitat as a proxy. For example, in *Arizona Cattle Growers' Association v. U.S. Fish and Wildlife Service*, the Ninth Circuit Court of Appeals held that the use of ecological conditions, such as impacting acres of potential habitat, may be used as a surrogate for defining the amount or extent of incidental take so long as these conditions are linked to the take of the covered species (273 F.3d 1229, 1249-50 [9th Cir. 2001]; see also *Oregon Natural Resources Council v. Allen*, 476 F.3d 1031, 1037 [9th Cir. 2007]).

Because expressing the numerical value of take of individual golden-cheeked warblers and black-capped vireos is impracticable, as described in greater detail below, the RHCP expresses take as the number of acres of potential habitat for the covered species that will be impacted, directly or indirectly, by covered activities.

While surveys for the warbler and vireo provide valuable information for determining the extent of occupation of a given area, they do not provide a precise mechanism for predicting the number of warblers or vireos that may actually be "taken" by the proposed action. The effectiveness of bird surveys in counting the number of birds in an area can be somewhat limited. For example, males of these species are far more easily observed than females or fledglings during surveys, due to their frequent vocalizations.

Moreover, the acreage of habitat impacted or protected by a particular action is a relatively stable metric of take and mitigation, compared to the number, size, and location of individual bird territories on a property that may vary from year to year. In addition, the impacts of a given activity may not be fully felt in a single season and may be spread over several or even many years, during which utilization of a given area may vary quite significantly for reasons unrelated to the activity in question. This variability is influenced by species preferences or environmental factors that may include natural year-to-year variations in the precise habitat utilized by individual birds, variations in individual bird behavior that influence detectability, variations in the ability of surveyors to detect and accurately map individual birds, and survey methodology. Therefore, estimates of take and mitigation based on impacts to territories as delineated by surveys in any given year are highly variable.

For these reasons, it is not possible to predict the precise number of warblers or vireos that may, over time, be "taken" or "preserved" as a result of the activities covered by or the mitigation measures to be taken pursuant to the RHCP. Therefore, take and mitigation in this document are not characterized by a precise bird count, but by the loss or preservation of habitat for the covered species, the relative quality of which is determined primarily by an assessment of vegetative characteristics that may influence occupancy of habitat by the covered species.

5.2.1 Golden-cheeked Warbler

Table 5-1 estimates the amount of potential warbler habitat (identified by the Loomis warbler habitat model) that may be impacted by the covered activities within Hays County during the term of the Permit.

Table 5-1. Incidental Take Assessment for the Golden-cheeked Warbler.

Census Tract	Estimated Developable Acres[1]	Potential GCW Habitat in Developable Areas (acres)[2]	Percent of Developable Land as Potential Habitat	Projected Acres of New Land Development[3]	Estimated Habitat Acres Impacted by New Develpment[4]
Hays County	327,226	131,479	40%	57,715	21,632
CT 010100	21	-	0%	223	-
CT 010200	39	-	0%	637	-
CT 010301	4,439	-	0%	1,697	-
CT 010302	1,060	-	0%	314	-
CT 010400	10,756	-	0%	1,543	-
CT 010500	1,808	-	0%	929	-
CT 010600	18,042	11,042	61%	1,852	1,130
CT 010700	31,624	17,037	54%	2,676	1,445
CT 010801	97,012	40,054	41%	22,140	9,077
CT 010802	71,085	41,227	58%	11,320	6,566
CT 010901	16,028	7,578	47%	3,004	1,412
CT 010902	29,024	7,517	26%	1,883	490
CT 010903	18,749	-	0%	3,683	-
CT 010904	27,539	7,024	26%	5,814	1,512

[1]Land identified by HCAD as vacant land, agricultural land, or farm and ranch improvements, which is most likely to be subject to future development (see Table 4-3).

[2]Based on the Loomis habitat model (all habitat quality classes) for census tracts located substantially over the Edwards Plateau ecoregion.

[3]Based on private-sector land development estimates from TXP and CMR (see Section 4.2.2), and including an additional 20 percent for public-sector development projects.

[4]Calculated as the Percent of Developable Land as Potential Habitat multiplied by the Projected Acres of New Land Development for each census tract.

Approximately 22,000 acres of potential warbler habitat may be impacted by the covered activities in Hays County during the term of the Permit (Table 5-1). This loss of potential habitat includes approximately 18,000 acres associated with private-sector activities and approximately 4,000 acres associated with public-sector projects over the 30-year term of the Permit.

Participation in the RHCP will be voluntary, and it is likely that not all of the anticipated impacts to potential habitat will actually be authorized through the RHCP (particularly for private-sector projects). Some project proponents may elect to seek individual authorization for incidental take from the USFWS, some may choose to design projects to avoid impacting potential habitat, and others may determine that ESA compliance is not necessary. Hays County estimates that private-sector participation in the RHCP will approach 33 percent of the total amount of anticipated private-sector habitat loss (i.e., approximately 6,000 acres of the anticipated 18,000 acres of private-sector habitat loss would be authorized under the RHCP).

The County also estimates that most (i.e., approximately 75 percent) of the potential habitat loss associated with public-sector projects would be authorized under the RHCP (i.e., approximately 3,000 acres). Therefore, the amount of incidental take authorization that is likely to be utilized by potential participants in the RHCP (including both public- and private-sector participants) is approximately 9,000 acres.

Hays County seeks incidental take authorization for up to 9,000 acres of direct or indirect impact to potential golden-cheeked warbler habitat in Hays County during the term of the Permit. This amount of incidental take authorization should provide sufficient flexibility under the phased conservation banking approach described in Section 6 to allow the RHCP to accommodate the projected need for incidental take authorization during the Permit term.

5.2.2 Black-capped Vireo

Approximately 23,855 acres of potential black-capped vireo habitat may occur in Hays County, based on estimates by Wilkins et al. (2006). This potential habitat is generally located within the census tracts west of Interstate Highway 35 and probably concentrated over the Fredericksburg limestones that outcrop in the Edwards Aquifer recharge zone (Section 3.2.2.2). However, the actual distribution of this habitat across the county is not known. For the purposes of estimating the amount of incidental take authorization needed to cover impacts to the black-capped vireo in Hays County, the RHCP assumes that 75 percent of the potential vireo habitat (approximately 17,891 acres) is evenly distributed across the Edwards Aquifer recharge zone and 25 percent of the potential vireo habitat (approximately 5,964 acres) is evenly distributed across the remainder of Hays County census tracts west of Interstate Highway 35.

Table 5-2 shows the estimated distribution of potential vireo habitat among census tracts and estimates the amount of potential vireo habitat that may be impacted by new land development activities within Hays County during the term of the Permit.

Table 5-2. Incidental Take Assessment for the Black-capped Vireo.

Census Tract	Developable Acres[1]	Acres of Potential BCV Habitat[2]	Percent of Developable Land as Potential Habitat	Projected Acres of New Land Development[3]	Estimated Habitat Acres Impacted by New Development[4]
Hays County	327,226	23,855	7%	57,715	3,298
CT 010100	21	-	0%	223	-
CT 010200	39	-	0%	637	-
CT 010301	4,439	-	0%	1,697	-
CT 010302	1,060	-	0%	314	-
CT 010400	10,756	-	0%	1,543	-

Table 5-2. Incidental Take Assessment for the Black-capped Vireo.

Census Tract	Developable Acres[1]	Acres of Potential BCV Habitat[2]	Percent of Developable Land as Potential Habitat	Projected Acres of New Land Development[3]	Estimated Habitat Acres Impacted by New Development[4]
CT 010500	1,808	68	4%	929	37
CT 010600	18,042	3,952	22%	1,852	407
CT 010700	31,624	4,540	14%	2,676	375
CT 010801	97,012	2,969	3%	22,140	664
CT 010802	71,085	3,755	5%	11,320	566
CT 010901	16,028	2,510	16%	3,004	481
CT 010902	29,024	3,655	13%	1,883	245
CT 010903	18,749	-	0%	3,683	-
CT 010904	27,539	2,406	9%	5,814	523

[1]Land identified by HCAD as vacant land, agricultural land, or farm and ranch improvements (see Table 4-3).
[2]Calculated for census tracts located west of Interstate Highway 35 and assuming an even distribution of 75 percent of the potential habitat across the Edwards Aquifer recharge zone and 25 percent across other portions of these census tracts.
[3] Based on private-sector land development estimates from TXP and CMR (see Section 4.2.2), and includes an additional 20 percent for public-sector development projects.
[4]Calculated as the Percent of Developable Land as Potential Habitat multiplied by the Projected Acres of New Land Development for each census tract.

Approximately 3,300 acres of potential vireo habitat may be impacted by new land development activities in Hays County during the term of the Permit (Table 5-2). This loss of potential habitat includes approximately 2,800 acres associated with private-sector activities and approximately 500 acres associated with public-sector projects over the 30-year term of the Permit.

Participation in the RHCP will be voluntary, and it is likely that not all of the anticipated impacts to potential vireo habitat will actually be authorized through the RHCP. Some project proponents may elect to seek individual authorization for incidental take from the USFWS, some may choose to design projects to avoid impacting to potential habitat, and others may decide that ESA compliance is not necessary.

Hays County estimates that private-sector participation in the RHCP will approach 33 percent of the total amount of anticipated private-sector habitat loss (i.e., approximately 925 acres of the anticipated 2,800 acres of private-sector habitat loss would be permitted through the RHCP). The County also estimates that most (i.e., approximately 75 percent) of the habitat loss associated with public-sector projects would be permitted through the RHCP (i.e., approximately 375 acres). Therefore, the amount of incidental take authorization that is likely to be utilized by potential participants in the RHCP (including both public- and private-sector participants) is approximately 1,300 acres.

Hays County seeks incidental take authorization for up to 1,300 acres of direct or indirect impact to potential black-capped vireo habitat in Hays County during the term of the Permit. This amount of incidental take authorization should provide sufficient flexibility under the phased conservation banking approach described in Section 6 to allow the RHCP to accommodate the potential need for incidental take authorization during the Permit term.

5.3 Cumulative Effects to Covered Species

The ESA requires an analysis of the cumulative effects of a proposed federal action. Under the ESA, cumulative effects are defined as the effects of future, non-federal actions that are reasonably certain to occur within the action area. This cumulative effects analysis is used to help the USFWS determine whether the proposed action is likely to result in jeopardy for a federally listed species or in the destruction or adverse modification of designated critical habitat for a federally listed species (USFWS and NMFS 1998).

Indicators of future, non-federal activities that are reasonably certain to occur may include, but are not limited to, those that have been approved by state or local agencies or governments, activities where such approval is imminent, activities where project proponents have made commitments or assurances that the activity will proceed (including the obligation of funds or venture capital), or the initiation of contracts for the activity. However, the "reasonably certain to occur" standard does not require that the action will occur. Cumulative effects analyses under Section 7 of the ESA do not address the potential impacts of speculative, non-federal actions that may never be implemented, nor do they address the effects of past or present activities in the action area (USFWS and NMFS 1998).

Non-federal activities in Hays County that are reasonably certain to occur include ongoing residential construction in currently platted subdivisions that have not yet reached full build-out and construction of new residential, commercial, and/or mixed-use subdivisions that are currently undergoing the subdivision approval process and are likely to be approved. A number of road improvement projects are included in the approved Hays County 2008 road bond proposition and would also be reasonably certain to occur. A summary of future, non-federal activities in Hays County that are reasonably certain to occur is included in Table 5-3.

Table 5-3. Summary of New Development Associated with Reasonably Certain Projects in Hays County.

Census Tract[1]	Future Capacity in Existing Developments (approx. acres)[2]	New Developments Seeking Local Approvals (approx. acres)[3]	2008 Road Bond Proposed Transportation Projects (approx. acres)[4]	All Reasonably Certain Projects (acres)
CT 010500	-	-	-	-
CT 010600	1,541	3,171	295	5,007

Table 5-3. Summary of New Development Associated with Reasonably Certain Projects in Hays County.

Census Tract[1]	Future Capacity in Existing Developments (approx. acres)[2]	New Developments Seeking Local Approvals (approx. acres)[3]	2008 Road Bond Proposed Transportation Projects (approx. acres)[4]	All Reasonably Certain Projects (acres)
CT 010700		235	77	312
CT 010801	5,822	1,574	184	7,580
CT 010802	438	685	218	1,341
CT 010901	475	2,087	120	2,682
CT 010902	2,411	35	109	2,555
CT 010904	2,654	2,410	-	5,064
Total	13,341	10,197	1,003	24,541

[1]Analysis limited to census tracts located substantially over the Edwards Plateau ecoregion.
[2]Based on analysis by Capitol Market Research with data from City of Buda, Dripping Springs, Kyle, San Marcos & Wimberley (April 2008). Acreage calculation assumes each developed lot covers approximately 1 acre.
[3]Based on data provided by Hays County, City of San Marcos, and City of Dripping Springs (October 2008).
[4]Projects identified in the "Hays County 2008 Road Bond Proposition." Acreage estimated based on the approximate project length (as mapped by the Hays County GIS department) and an estimated project width of 200 feet.

While it may appear that approximately 24,500 acres of new land development or road improvements meets the definition for reasonably certain to occur non-federal activities, not all of this future development will affect potential habitat for the covered species. Some of this development may occur in areas that are not potential habitat and some project proponents may choose to design projects to avoid impacting potential habitat. Other project proponents may decide that ESA compliance is not necessary. It is also likely that some portion of this reasonably certain to occur development will seek incidental take coverage through the RHCP and become part of the proposed action (see the estimated RHCP participation rates described in Section 5.2). It should also be noted that the estimate of new land development from future, non-federal reasonably certain to occur activities explained above is less than the total projection of future land development used to develop the incidental take estimate in Section 5.2, since the requirements for assessing cumulative impacts under Section 7 of the ESA are more narrow than the assumptions used to project future land development for the take analysis.

With respect to the warbler, the 24,500 acres of future, non-federal, reasonably certain to occur activities could affect approximately 10,350 acres of potential warbler habitat (based on the amount of development projected for each census tract and the proportion of that census tract mapped as potential habitat). Applying the estimated RHCP participation rates for public and private-sector projects described in Section 5.2 suggests that approximately 3,630 acres of this impact to potential warbler habitat would be authorized under the RHCP. Therefore, the remaining cumulative impacts from future, non-federal, reasonably certain to occur activities

(i.e., those not authorized under the RHCP) would be associated with approximately 6,720 acres of impact to potential warbler habitat.

Similarly for the vireo, the 24,500 acres of future, non-federal, reasonably certain to occur activities could affect approximately 2,660 acres of potential vireo habitat. Applying the estimated RHCP participation rates for public and private-sector projects described in Section 5.2 suggests that approximately 930 acres of this impact to potential vireo habitat would be authorized under the RHCP. Therefore, the remaining cumulative effects from future, non-federal, reasonably certain to occur activities would be associated with approximately 1,730 acres of impact to potential vireo habitat.

This cumulative impacts analysis projects that approximately 6,720 acres of impact to potential warbler habitat and approximately 1,730 acres of impact to potential vireo habitat may be associated with future, non-federal, reasonably certain to occur activities that would not seek incidental take authorization through RHCP. Some of these impacts may be mitigated for through individual ESA authorizations, while others may occur without ESA authorization or mitigation.

When analyzing whether issuance of the Permit to the County and implementation of the RHCP will jeopardize the covered species or result in the destruction or adverse modification of critical habitat, the USFWS determines whether the aggregate effects of the factors analyzed under the environmental baseline, the effects of the proposed action, and the cumulative effects within the action area (when viewed against the status of the species or critical habitat) are likely to jeopardize the continued existence of the species or result in the destruction or adverse modification of critical habitat.

Table 4-3 shows that approximately 63,290 acres of Hays County (approximately 15 percent of the county) was appraised for developed land purposes (i.e., residential, commercial/industrial, and utility uses) in 2005. It is unknown to what extent this prior land development may have affected the covered species; although some degree of habitat loss or degradation is likely to have occurred. A comparison of land cover changes between 1992 and 2001 suggest that Hays County lost approximately 14 percent of its forest cover during that period (see Table 2-2). It is possible that a comparable amount of potential warbler habitat may have been lost between 1992 and 2001, which could represent a loss of approximately 24,000 acres of potential warbler habitat (i.e., 14 percent of the 170,335 acres of potential warbler habitat in Hays County as identified by the Loomis warbler habitat model).

Assuming that land development has historically affected potential vireo habitat in proportion to the total amount of habitat currently available in the county (i.e., approximately five percent of Hays County may support potential habitat for the black-capped vireo), the approximately 63,290 acres of currently developed land could have affected approximately 3,200 acres of potential vireo habitat.

The environmental baseline conditions in Hays County also include approximately 23,700 acres of previously protected open spaces that are largely protected from future land development. These properties may contain approximately 9,880 acres of potential warbler habitat (based on the results of the Loomis warbler habitat model) and are likely to contain potential vireo habitat as well. While the conservation of the covered species may not explicitly be part of the missions for these previously protected parcels, limiting future development on these parcels reduces the degree of potential threat to habitats contained within them.

The RHCP will support the authorization of up to 9,000 acres of impact to potential warbler habitat and up to 1,300 acres of impact to potential vireo habitat over the duration of the Permit. Further, full implementation of the RHCP will result in the permanent protection (and management) approximately 9,000 acres of potential warbler habitat and 1,300 acres will be managed as vireo habitat.

Therefore, the combined effect of prior actions, the RHCP, and future cumulative activities in Hays County could be the loss or degradation of approximately 40,000 acres of potential golden-cheeked warbler habitat and 6,200 acres of potential black-capped vireo habitat during the period between approximately 1990 and 2040. These figures represent potentially adverse effects to approximately 23 percent of the total amount of potential warbler habitat and approximately 26 percent of the total amount of potential vireo habitat estimated to occur in Hays County.

It is the applicant's view that it is highly unlikely that the cumulative loss of even as much as approximately 25 percent of the potential warbler and vireo habitat in Hays County since the 1990's would cause a substantial adverse effect on either species, either regionally or range-wide.

With respect to the warbler, Hays County does not appear to contain any particularly large blocks of high quality warbler habitat that might be described as a "focal area" as envisioned in the 1992 Golden-cheeked Warbler Recovery Plan. The Balcones Canyonlands Preserve and the Balcones Canyonlands National Wildlife Refuge may already provide a permanently protected viable population of warblers in Golden-cheeked Warbler Recovery Region 5, and the remaining 75 percent of potential warbler habitat in Hays County that would not be subject to cumulative impacts could still provide ample opportunities for the preservation of parcels of interconnecting habitat among existing and/or future focal areas in other counties. Indeed, previously protected open spaces in Hays County may include approximately 9,880 acres of potential warbler habitat (see Section 4.2.1.3) and an additional 9,000 acres of warbler habitat would be protected under the RHCP if the full take authorization was utilized. Therefore, it is the applicant's view that it is unlikely that the aggregate impacts of prior actions in Hays County, the RHCP, and future cumulative activities in the county would substantially and adversely affect the survival or recovery of the golden-cheeked warbler in the wild, either regionally or range-wide.

The aggregate impacts of past activities, the RHCP, and future cumulative activities in Hays County may be more difficult to access for the black-capped vireo, since much less is known about the status of the species or the distribution of its potential habitat in the county, compared to the warbler. However, similar to the warbler, Hays County does not appear to be particularly significant with respect to the overall status of the species in its recovery region. Few observations of vireos have been recorded from Hays County, and none of the records suggest that these observations corresponded to large or robust colonies of breeding vireos. In terms of habitats, possible losses of potential vireo habitat by development in recent decades could be balanced by the creation of new habitats elsewhere in the county. The comparison of the 1992 and 2001 National Land Cover Datasets suggests that there was an approximately 13 percent increase in the extent of grassland or shrubland vegetation across Hays County during that period (indeed, most of the forest cover lost during that time was converted to grassland or shrubland areas). Grassland and shrubland vegetation holds potential for being black-capped vireo habitat. For these reasons, it is the applicant's view that it is unlikely that the aggregate impacts of prior actions in Hays County, the RHCP, and future cumulative activities in the county would substantially and adversely affect the survival or recovery of the black-capped vireo in the wild.

No critical habitat has been designated by the USFWS for either the warbler or vireo, therefore no cumulative impacts on critical habitat for these species are anticipated.

6.0 CONSERVATION PROGRAM

The RHCP conservation program is designed to meet the specific regulatory requirements of the ESA with regard to the species covered for incidental take by the Permit (i.e., the golden-cheeked warbler and black-capped vireo). The ESA requires that the conservation program of a habitat conservation plan include measures to minimize and mitigate impacts to the covered species to the maximum extent practicable. The amount of incidental take sought by the Permit would allow impacts to a maximum of 9,000 acres of potential warbler habitat and 1,300 acres of potential vireo habitat in Hays County.

The conservation program described below includes a number of actions that Hays County commits to implement that minimize and mitigate the anticipated impacts of the incidental take that will be permitted through the RHCP to the maximum extent practicable. The stated commitment to implement these conservation actions is not intended to and does not restrict the County's ability to engage in additional conservation actions at its discretion, should additional resources become available. The conservation actions implemented pursuant to this RHCP will occur within Hays County.

6.1 Goals and Objectives

6.1.1 Community Goals and Objectives

The RHCP may contribute to a number of local community goals, such as: 1) provide a locally-developed method for ESA compliance; 2) maintain open space and quality of life in Hays County; and 3) encourage partnerships with private landowners and local organizations as conservation partners.

The RHCP may simplify compliance with the ESA. It may streamline ESA compliance and reduce uncertainty, time, and costs for the County and other RHCP participants.

The RHCP may compliment the County's initiatives to protect open space and aquifer recharge areas. The RHCP may also compliment County efforts to establish parks and provide water access for county residents.

6.1.2 Biological Goals and Objectives

The biological goals and objectives of the RHCP are to:

1. Create a preserve system within Hays County that effectively mitigates for incidental take of the golden-cheeked warbler and black-capped vireo and coordinates and consolidates mitigation requirements from projects scattered across the county into larger, more biologically significant preserve blocks.

Objectives to accomplish this goal include the establishment of a preserve system that includes between 10,000 and 15,000 acres (which is expected to be sufficient to generate enough mitigation credits to balance the anticipated level of participation in the RHCP).

2. Design the preserve system to provide perpetual conservation value to the golden-cheeked warbler and black-capped vireo.

To help meet this goal, preserve blocks (which may be composed of multiple adjacent parcels) will meet certain design criteria. Preserve blocks will typically contain a minimum of 500 contiguous acres.

3. Encourage compliance with the ESA by providing an efficient means of authorization.

By implementing the RHCP and providing an efficient and reliable mechanism for ESA compliance, the County is hopeful that there will be an increase in ESA compliance across Hays County. Increased compliance with the ESA has long-term benefits for the covered species.

4. Provide for perpetual management and monitoring of preserve lands to maintain, enhance, or create quality habitat for the golden-cheeked warbler and black-capped vireo.

Management of the preserves will include documenting habitat conditions, establishing sound preserve boundaries, limiting (and possibly prohibiting) access to protected habitats, and reducing threats. Required monitoring activities will measure key habitat and population parameters and the results will be used to inform adaptive management decisions.

5. Where possible, maximize the value of the preserve system for multiple rare species in Hays County.

Hays County will consider the conservation benefits to the evaluation and additional species when evaluating potential preserve acquisitions. The County will evaluate acquired preserve lands for the presence of evaluation or additional species to create an inventory of conserved resources within the RHCP preserve system, when resources allow. The County may implement appropriate management practices within the preserve system when these practices are compatible with the management of habitat for the warbler and vireo, and when it is practicable to do so. The RHCP identifies research priorities for evaluation species, and the County will support research projects (as applicable and practicable) to fill knowledge gaps that could assist with the creation or implementation of more focused conservation measures for one or more of these species.

6.2 Avoidance and Minimization Measures

Hays County encourages public and private entities whose activities may impact the covered species in Hays County to avoid and minimize impacts to the species included in the RHCP, including the evaluation and additional species. As described in the sections below, the

RHCP may help Hays County residents avoid or minimize impacts to the species addressed in the RHCP in several ways, including by providing guidance on the location of potential habitat for covered species, encouraging project proponents to include endangered species considerations in project planning, requiring RHCP participants to observe seasonal clearing restrictions and oak wilt precautions, and increasing awareness and understanding of endangered species issues by the general public.

The use of avoidance and minimization measures by project proponents in Hays County may reduce the amount of incidental take for golden-cheeked warblers and black-capped vireos requiring authorization under the RHCP.

6.2.1 Publication and Distribution of Habitat Maps

Hays County has maps of potential habitat for the golden-cheeked warbler that were developed for use in the development and implementation of the RHCP. The County also has maps of karst geology and the general locations of known caves and other major karst features that are published in this RHCP. Maps of potential vireo habitat may also become available during the term of the Permit. Hays County will make these maps or similar information (which could include updates of the information used to develop the RHCP) available to the public for review (the County may charge a nominal fee to cover the costs of producing such information) and promote their use during the land development process. The County will make this information available to the public within six months of Permit issuance.

The public may use the maps of potential habitat as a guideline to help plan the location or design of proposed development projects so that impacts to species may be avoided or minimized, or to help determine if more detailed habitat assessments may be necessary. These maps will not be used to make definitive habitat determinations for the purpose of participation in the RHCP. The County will use on-site habitat determinations to determine the basis for participation in the RHCP.

6.2.2 Hays County Subdivision and Development Process Application Forms

Hays County will encourage participation in the RHCP by requesting that entities seeking subdivision or development approval from the County determine whether a project area may contain potential habitat for one or more of the covered species and provide the basis for that determination. Subdivision or development permit applicants will be encouraged to provide this information (along with other currently requested site information, such as whether a project occurs within an aquifer recharge zone) on the County's "Subdivision Plat Submittal Form for Supplemental Information for Hays County, Texas" or similar form. The County will modify such forms within six months of Permit issuance to include a request for this additional, supplemental project information.

As described above, the County will make maps of potential habitat for the covered species and/or descriptions of habitat conditions for the covered species available to the public to assist with the identification of potential endangered species habitat on project areas. The County may assess a nominal fee to cover the costs of providing such information. If requested by a project proponent, County RHCP staff may conduct habitat assessments of project areas for the covered species (see Section 7.4 for a description of the RHCP participation process, including on-site habitat determinations).

In accordance with state law, the County may not withhold approval of permits or services for reasons related to endangered species issues. The County will not require any subdivision or land development applicant to participate in the RHCP or require the applicant to seek other means of achieving ESA compliance. Participation in the RHCP will be voluntary.

For projects that may affect potential habitat for the covered species, the County will provide information about the RHCP (including contact information for County RHCP staff and the U.S. Fish and Wildlife Service) to subdivision and development applicants and encourage them to seek habitat determinations and participate in the RHCP, if incidental take authorization for the covered species is needed.

To assist in minimizing impacts to the species addressed in the RHCP, the County will also provide subdivision and development applicants with information regarding oak wilt from the Texas Forest Service and the TCEQ Edwards Aquifer Rules, such as TCEQ's "Optional Enhanced Measures for the Protection of Water Quality in the Edwards Aquifer" and "Optional Enhanced Measures for the Protection of Water Quality in the Edwards Aquifer and Related Karst Features that May Be Habitat for Karst Dwelling Invertebrates." The County may assess a nominal fee to cover the costs of providing such information.

6.2.3 Seasonal Clearing and Construction Restrictions for Covered Species

With regard to projects authorized for incidental take through participation in the RHCP, Hays County will minimize impacts to the covered species during their respective breeding seasons by imposing seasonal clearing and construction restriction on RHCP participants.

These seasonal clearing and construction restrictions will apply to RHCP participants (including Hays County) between March 1 through July 31 for activities affecting potential golden-cheeked warbler habitat and between March 15 through August 31 for activities affecting potential vireo habitat, unless a survey conducted during that species' breeding season indicated that the species in not present within 300 feet of the planned activity. The survey must be conducted in the same year as the start of the planned clearing or construction activity affecting habitat for the covered species. The dates for seasonal restrictions are supported by the breeding phenologies presented in Ladd and Gass (1999) and Grzybowski (1995), as discussed in Section 3.2.

Notwithstanding the above, construction activities related to specific projects covered for incidental take through the RHCP and that do not involve the removal of potential habitat may continue during the breeding seasons of the covered species within 300 feet of potential habitat and without a breeding season survey demonstrating the species is not present, provided that 1) the construction activities are part of a continuous set of clearing and/or construction activities that began during the non-breeding season; 2) are performed in a reasonably prompt and expeditious manner; and 3) the disturbance activity is mitigated appropriately for all direct and indirect effects on and off of the project site.

The seasonal clearing and construction restrictions will be included as a term in the Permit and individual Participation Agreements (see Section 7.4.6). With respect to projects authorized for impacts to the covered species through the RHCP, the County's subdivision development inspectors will have the right to inspect for compliance with the terms of Participation Agreements with RHCP participants, including those terms related to seasonal clearing and construction restrictions. The County may suspend or revoke the rights of any RHCP participant that is not in compliance with the terms of its Participation Agreement.

6.2.4 Oak Wilt Prevention in GCW Habitat

Hays County will minimize potential impacts to warbler habitat from oak wilt by requiring that all RHCP participants follow the Texas Forest Service or professional arborist's guidelines for the prevention of oak wilt when clearing or trimming trees within or within 300 feet of potential golden-cheeked warbler habitat.

The Texas Forest Service recommends eliminating diseased red oaks (such as Spanish oak), handling firewood properly, and painting wounds on healthy oaks to prevent the spread of oak wilt. According to the Texas Forest Service, all wounding of oaks (including trimming, limbing, and pruning) should be avoided from February through June. The least hazardous periods for trimming are during the coldest days in midwinter and extended hot periods in mid- to late summer. Regardless of season, all trimming cuts or other wounds to oak trees, including freshly-cut stumps and damaged surface roots, should be treated immediately with a wound or latex paint to prevent exposure to contaminated insect vectors.

Oak wilt precautions will be included as a term in the Permit and in individual Participation Agreements (see Section 7.4.6). With respect to projects authorized for take of the covered species through the RHCP, the County's subdivision development inspectors will have the right to inspect for compliance with the terms of Participation Agreements, including those related to oak wilt prevention. The County may suspend or revoke the rights of any RHCP participant not in compliance with the terms of its Participation Agreement.

6.2.5 Outreach and Education

Hays County will develop a public education and outreach program to educate landowners and residents about the species addressed in the RHCP, including the evaluation and additional species.

The County will prepare and distribute information about the habitat characteristics of the covered species to encourage participation in the RHCP. The materials will include information about the importance of avoiding disturbance of these species during their breeding seasons.

The County will prepare educational materials about the ESA and the RHCP for distribution to persons or entities applying for subdivision or development-related permits or approvals. These materials will briefly describe the responsibilities of private entities under the ESA, the goals of the RHCP, and how to participate in the RHCP. The purposes of this component of the outreach and education program are to help minimize potential impacts to covered species and to encourage participation in the RHCP. However, the County will not condition approval of subdivision plats, development permits, or other local permits or services on participation in the RHCP or compliance with the ESA. The County will prepare and publish educational materials mentioned above related to the covered species, habitats for the covered species, compliance with the ESA, and participation in the RHCP within six months after Permit issuance.

To help the public avoid or minimize potential impacts to evaluation and additional species, Hays County will prepare and distribute educational materials regarding karst and aquatic habitats in the county. Such materials may include topics such as the use of buffers around streams, springs, and karst features; reducing impervious cover and promoting low density and conservation developments; and the use of other water quality controls to reduce the amount of pollutants entering water ways. The County will also distribute a list of existing regulatory programs pertaining to the conservation of water and karst resources, such as the TCEQ optional measures for water quality protection (see Appendix D for examples of existing and proposed programs). Materials related to the evaluation and additional species and their habitats and conservation will be developed and published by the County within the first two years of Plan implementation.

Hays County will also carry out a program of outreach and education for the general public. The purpose of the program will be to help the public understand the purpose of the RHCP and how to become involved in it. The County will coordinate with other organizations, as appropriate, to participate in forums to educate interested landowners and others about the RHCP. The County will develop a plan and begin implementation of an outreach and education program within two years of Permit issuance.

6.3 Mitigation Measures for Covered Species

Over the term of the Permit, Hays County will assemble a system of preserve lands that will be protected and managed in perpetuity for the primary benefit of the golden-cheeked warbler and black-capped vireo. This preserve system will provide the mitigation needed to offset the impacts from incidental take of the covered species that is permitted through the RHCP.

Under the RHCP, the County will establish a preserve system in the form of a phased conservation bank with a target acquisition goal of between 10,000 and 15,000 acres over the 30-year duration of the RHCP. The County will assemble the preserve system on a phased basis, banking mitigation credits only after parcels are acquired. Each preserve acquisition will be subject to USFWS approval and will generate mitigation credits based on the number of acres of potential habitat for the covered species protected and in accordance with current USFWS policies and guidelines regarding mitigation. The mitigation credits created by preserve acquisitions will be "banked" by the County and may be then used by the County for its own projects or sold to RHCP participants. The banking of mitigation credits will allow an equivalent amount of RHCP take authorization to be accessed (up to the maximum amount authorized for each covered species). Thus, the County will not be able to use or sell more mitigation credits than had been previously created or "banked" by preserve acquisitions. At no time will the County use or sell mitigation credits without sufficient credits in the "bank," and sufficient mitigation credits will always be available for participating projects prior to the County authorizing such take. Pre-determined processes for habitat determinations and mitigation assessments, defined mitigation ratios, and current USFWS policies and guidelines regarding mitigation provide the basis for ensuring that mitigation is commensurate with impacts (see Section 6.3.2 and Section 7.4).

The preserve system will include County owned and managed lands, and may also include preserve parcels owned and/or managed by other entities that agree to cooperate with the County, such as local municipalities, conservation organizations, or private landowners. Regardless of the property owner, the Permit and RHCP will require the on-going management and monitoring of the preserve system in perpetuity to maintain the conservation value of the protected habitat over time.

By protecting large tracts of land from future development, the RHCP preserve system may also provide collateral conservation benefits to the other species addressed in the RHCP, as well as contribute to the protection of water quality, scenic vistas, and cultural heritage in Hays County. The preserve system may also provide opportunities for certain recreational activities, such as hiking and nature watching, to the extent that such activities do not negatively affect the covered species. As described in the following sections, opportunities for more intensive recreational use of publicly-held preserve lands may also be provided where possible (such as

picnic areas, swimming areas, camping grounds, and playing fields), when impacts to endangered species habitat are avoided.

6.3.1 RHCP Preserve and Conservation Bank

Hays County will acquire preserve blocks on a phased basis using a conservation banking approach over the term of the Permit, with potential preserve acquisitions evaluated as they are needed and become available. In order to utilize the full take authorization, the County will acquire between 10,000 and 15,000 acres of preserve land by fee-simple land acquisitions and/or conservation easements (or other conservation mechanisms) with other landowners. No pre-determined preserve system of any particular size, location, or configuration has been designated for the RHCP.

As shown by Figure 3-2, the distribution of potential warbler habitat in Hays County is relatively patchy and fragmented. Therefore, most large parcels of land in the county that would be suitable for inclusion in the RHCP preserve system would likely contain a mosaic of habitat and non-habitat areas. To assemble a preserve system that generates approximately 9,000 acres of warbler mitigation credits and 1,300 vireo mitigation credits at a typical rate of one credit for each acre of potential habitat (see Section 6.3.2), additional acreage will likely be needed.

A preserve system containing approximately 10,000 to 15,000 acres should be sufficient to create enough mitigation credits to meet the anticipated demand for incidental take authorization through the RHCP, provided that approximately 80 percent of the total preserve system is potential habitat for the golden-cheeked warbler and approximately 12 percent is managed for the benefit of the black-capped vireo. If these assumptions are not met, the County may need to acquire additional acreage to create the desired number of mitigation credits, or suspend the use or sale of mitigation credits under the RHCP until sufficient credits are banked.

The RHCP preserve system will be composed of individual preserve blocks. The individual preserve blocks may be single tracts of land or may be composed of multiple adjacent tracts. However, individual preserve blocks will typically include at least 500 total acres, unless otherwise approved by the USFWS. All preserve acquisitions will be reviewed and approved by the USFWS prior to generating mitigation credit for the RHC and mitigation credits will be awarded in accordance with current USFWS policies and guidelines regarding mitigation,.

To help prioritize potential preserve acquisitions as opportunities become available over time, additional guidance regarding preferred preserve characteristics is provided in Appendix E. Attainment of these additional preserve system characteristics is not required to meet the mitigation commitments under the RHCP and the Permit; indeed, circumstances meeting these additional characteristics may not arise during the duration of the RHCP or be practicable to achieve. Rather, the additional guidelines are intended to help the County choose among potential preserve parcels as opportunities become available over time. Actual additions to the

RHCP preserve system will be considered for acquisition as the County deems necessary to implement the RHCP and as appropriate parcels become available from willing partners.

6.3.2 Mitigation Credit Generation

Protection and management of golden-cheeked warbler and black-capped vireo habitat within the RHCP preserve system will create mitigation credits that the County can use to offset incidental take from County projects or sell as mitigation to voluntary RHCP participants.

It is recognized that there are myriad factors involved with each preserve acquisition, and the County and the USFWS will work together on each preserve acquisition to determine, in each instance, how many mitigation credits a particular preserve will generate. The number of mitigation credits allowed for each preserve will be based on, and commensurate with, USFWS policy and guidelines regarding mitigation (such as, but not limited to, the "Guidance for the Establishment, Use, and Operation of Conservation Banks") in order to ensure that the quality of the mitigation is equal to or greater than the quality of the habitat impacted.

In general, it is anticipated that each preserve parcel will yield one warbler mitigation credit for each acre of potential warbler habitat identified within that parcel. The amount of potential warbler habitat on a preserve parcel will be established by a habitat determination following the process described in Section 7.4.2. Similarly, the amount of vireo mitigation credit generated by an acquisition will be determined by the County and the USFWS, based on the number of acres within a preserve parcel dedicated for vireo habitat management. It is anticipated that each acre dedicated for vireo habitat management will generate one vireo mitigation credit. Variations to the typical habitat acres-to-credit ratio may be possible on a case-by-case basis, considering factors such as relative habitat quality, habitat patch size, proximity to other protected habitats or intensive land uses, and the presence of habitat buffers.

Under the RHCP, the County may use its incidental take authorization only up to the amount of available mitigation credits banked from preserve acquisitions. Potential habitat for the covered species will be permanently protected in the RHCP preserve system before mitigation credits are created or used, such that mitigation is always provided prior to the authorization of impacts. The County will not use or convey to other parties more incidental take authorization than it has mitigation credits available. If more mitigation credits are needed to meet the demand for incidental take authorization, the County may, at the County's discretion, acquire additional preserve parcels to generate the mitigation credits. The County also will not use or convey to other parties more mitigation credits than the total amount of incidental take authorized by the Permit for each of the covered species.

6.3.3 Role of Existing Protected Open Spaces

Approximately 23,739 acres of parks and open space has been protected in Hays County prior to the development of the RHCP. These previously protected parks and open spaces

include publicly owned lands for water quality protection, privately owned lands protected by conservation easements, lands used by academic institutions for agricultural and natural resource research, and parks and greenbelts. Each of these areas is largely protected from future land development; however, the primary purpose of these protected lands may not be for the conservation of endangered species.

The previously protected lands in Hays County may include approximately 9,880 acres of potential golden-cheeked warbler habitat, based on the Loomis warbler habitat model (see Section 4.2.1.3). It is likely that some of these tracts also contain suitable habitat for the black-capped vireo. Many of these previously protected properties occur over the Edwards Aquifer recharge zone and karst terranes, and some contain karst features known to include one or more of the evaluation or additional species addressed in the RHCP. Though the protected lands appear not to be managed specifically for endangered species protection, the previously protected open spaces may have a role in the RHCP preserve system.

Hays County may seek opportunities to partner with the owners and managers of previously protected open space lands to explicitly protect and manage habitat for the golden-cheeked warbler, black-capped vireo habitat, and other species of concern on these lands. With the approval of the USFWS, increasing conservation value for warbler and/or vireo habitat on previously protected lands may generate mitigation credits (albeit at a reduced rate) for the RHCP on a case-by-case basis. Any areas of warbler or vireo habitat within previously protected open spaces for which the USFWS agrees to award mitigation credits to the RHCP will be permanently protected and managed in accordance with the terms of the Permit.

Previously protected open space parcels may help RHCP preserve parcels meet the recommended minimum preserve block size (i.e., 500 acres), even if the previously protected parcels are not included in the RHCP preserve system. For example, if a potential RHCP preserve parcel containing approximately 200 acres is adjacent to a 400-acre parcel of previously protected open space (such as one of the existing conservation easements in Hays County), the potential RHCP preserve parcel may be considered to have met the recommended minimum preserve block size since the total size of the permanently protected block of open space would exceed 500 acres.

6.4 Preserve Management and Monitoring Program

6.4.1 Management and Monitoring Objectives

All RHCP preserve lands, including County-owned preserve parcels and parcels included in the preserve system via conservation easements or other agreements, will be managed in perpetuity in accordance with the terms of the Permit and the RHCP. The County will also manage RHCP preserve lands in accordance with all other applicable local, state, and federal laws.

The objective of the RHCP preserve management and monitoring program is to maintain the conservation value of the preserve system in perpetuity. Maintaining the conservation value of the preserve system involves eliminating or minimizing threats that could decrease the extent or quality of potential habitat for the covered species within the preserve system, compared to the condition of that habitat at the time of acquisition. The County may elect to, but will not be required, to implement management practices that are designed to increase or enhance the mitigation value of a preserve parcel after acquisition to meet the mitigation commitment under the RHCP.

The RHCP preserve management and monitoring program is a cyclical, adaptive process involving the following general steps:

1. Documenting baseline preserve conditions to provide the basic information needed to inform management and monitoring decisions;
2. Evaluating threats to the covered species and their habitats within the preserve system and planning appropriate management strategies and practices to eliminate or minimize such threats;
3. Implementing management plans; and
4. Monitoring populations of the covered species and their habitats to track the results of management practices or programs, identify trends in populations and habitat conditions, and evaluate whether the management program successfully maintained the conservation value of the preserve system. Monitoring data feeds back into updated baseline evaluations and the cycle repeats.

Specific provisions and minimum requirements for each of these steps are described in the following sections.

Within six months of Permit issuance, Hays County will prepare standard methodologies and formats for the content of required preserve management documents, including the baseline preserve evaluations, land management plans, and annual reports. These documents will be reviewed and approved by the USFWS before use. Hays County will implement (or cause to be implemented) all management and monitoring activities in accordance with these standards.

6.4.2 Preserve Managers

Hays County is ultimately responsible for ensuring that the preserve system is managed and monitored in accordance with the terms of the Permit and the RHCP. However, specific planning and implementation activities for individual preserve parcels/blocks may be tasked to designated preserve managers other than the County.

Preserve managers may include the County, a private landowner, or other entity as determined by specific, legally enforceable agreements (such as the terms of a conservation easement or an interlocal agreement). The County will designate a preserve manager (or multiple

preserve managers, if management duties are to be split between parties) for each preserve parcel at the time of acquisition. All preserve managers will be approved by the USFWS. Preserve managers will coordinate with Hays County and the USFWS, as appropriate, to ensure that preserves are managed in accordance with the terms and conditions of the Permit and the management and monitoring program described in the RHCP.

6.4.3 Baseline Preserve Evaluations

Baseline preserve evaluations for RHCP preserve system acquisitions will document the presence and condition of natural and human resources within the preserve. The evaluations will provide the basic information needed to inform management and monitoring decisions for the preserve system.

The baseline preserve evaluations will be prepared for each preserve parcel and the document will be updated at least once every five years, in accordance with the schedule in Section 6.4.6. The preserve manager will be responsible for the preparation of the baseline preserve evaluations and will ensure that qualified biologists conduct the evaluation. Biologists conducting portions of the baseline preserve evaluations for the RHCP that pertain to the covered species or their habitats must hold or be covered by an USFWS Threatened and Endangered Species permit that authorizes the biologist to conduct surveys for the golden-cheeked warbler and black-capped vireo. This standard will help ensure that those conducting habitat assessments for the RHCP are sufficiently familiar with the habitats used by the covered species. Baseline preserve evaluations (and updates to these documents) will be submitted by preserve managers to Hays County by October 31 of the year in which they are prepared.

The baseline preserve evaluation will include the following minimum information:

- The acreage of potential habitat for the golden-cheeked warbler and black-capped vireo present on the parcel, as identified by a habitat determination (see Section 7.4.2).
- A detailed map showing the specific location and extent of potential warbler and vireo habitat on the parcel.
- An estimate of the relative quality of potential warbler and vireo habitat on the parcel and documentation of the habitat characteristics used to justify the quality estimate.
- An estimate of the number of warblers and vireos occurring on the property and the extent (i.e., number of acres) and location of occupied and unoccupied habitat within the parcel.
- A description and map of other major vegetation communities and special or unique habitats on the parcel that may warrant special management consideration.

- A description and map of all structures or other property improvements on the parcel, including the size or aerial extent, condition, and use of such improvements. Improvements to be described include, but are not limited to, buildings, roads or trails, utilities, and dams and impoundments.
- A description and map of all current land uses on the parcel, including areas used for agricultural purposes, recreational purposes, or easements.
- A description and assessment of potential threats to the covered species or their habitats within the preserve system, such as information including (but not limited to) deer, feral hogs, cowbirds, fire ants, and invasive species. Such assessment will also include the potential impacts of land uses (including recreational uses) within or adjacent to the preserve on the covered species or their habitats, as applicable.
- Other information regarding the property that may be relevant to the management of the parcel in accordance with the terms of the Permit and the goals and objectives of the RHCP.

6.4.4 Land Management Plans

Land management plans will direct management actions within specific preserve blocks or parcels in a manner that is consistent with the management objectives described in Section 6.4.1. Each preserve parcel will be covered by a land management plan; although multiple adjacent parcels may be covered under a single plan. The preserve manager will be responsible for the preparation and implementation of the land management plan for that parcel and will ensure that qualified biologists prepare the document. Biologists preparing land management plans for the RHCP must hold or be covered by an USFWS Threatened and Endangered Species permit that authorizes the biologist to conduct surveys for the golden-cheeked warbler and black-capped vireo.

Land management plans will be prepared and/or updated by the preserve manager every five years, in accordance with the schedule in Section 6.4.6, unless the preserve manager finds that changed conditions warrant a revised plan before the next scheduled review date. Hays County may also require the review and revision of a land management plan before the scheduled review date, in order to implement adaptive management provisions, respond to changed circumstances, or otherwise maintain compliance with Permit conditions. Land management plans and subsequent updates will be submitted to Hays County by October 31 of the year in which they are prepared, and the County will submit land management plans to the USFWS for review and approval prior to implementation.

Land management plans will rely on the best available information regarding the biology and management of the covered species and the information contained in the most recent baseline preserve evaluation, as described in Section 6.4.3.

At a minimum, land management plans will address the following topics and incorporate the concepts listed below:

1. Creating and maintaining effective preserve boundaries with adequate fencing and appropriate signage forbidding unauthorized access;
2. Limiting use of areas within the preserve, as appropriate, to only those activities that do not appreciably reduce the conservation value of the preserve;
3. Preserving, reproducing, or enhancing the ecological processes that create and maintain habitat for the covered species, including but not limited to vegetational succession, oak regeneration, and fire management/use of prescribed fire to the extent practicable;
4. Minimizing the effects of land uses adjacent to protected habitat to the extent practicable by:
    a. Managing populations of urban-adapted, non-native, and/or invasive animals within the preserve system, including but not limited to feral cats and dogs, feral hogs, brown-headed cowbirds, white-tailed deer, and red imported fire ants;
    b. Attempting to prevent the introduction and control the establishment or spread of non-native and/or invasive plants within the preserve system (which may include management of Ashe juniper); and
    c. Preventing and/or controlling oak wilt and other diseases or infestations affecting the covered species or their habitats.
5. Choosing preserve management practices that minimize adverse effects to the species addressed by the RHCP;
6. Minimizing the potential negative effects of major vegetation management practices (such as selective clearing practices or prescribed burning to create or maintain black-capped vireo habitat or manage stands of Ashe juniper) by:
    a. Conducting major vegetation management practices outside of the breeding seasons for the covered species (defined as March 1 through July 31 for the golden-cheeked warbler and March 15 through August 31 for the black-capped vireo);
    b. Limiting the extent of major vegetation management activities in potential habitat for covered species (i.e., management activities that could substantially decrease the extent of potential habitat in the treated area) to avoid impacting the majority of such habitat in a preserve block in a single year; and

c. To the extent practicable, choosing specific management practices that minimize the disturbance, removal, or compaction of top soil (thereby preserving soil structure and texture) in the treated area, including but not limited to practices that utilize hand tools instead of heavy equipment or, if it is necessary to use heavy equipment, choosing equipment with rubber tires instead of tracks; and

7. Monitoring the sources and impacts of potential threats to the covered species or their habitats, as applicable to each parcel.

Hays County will not be required to implement management practices that are designed to increase or enhance the mitigation value of a preserve block after acquisition to meet the mitigation commitment under the RHCP. However, additional management and monitoring objectives are included in Appendix E to help guide the implementation of such activities should the County have the additional resources and desire to do so. Implementation of management activities to achieve these additional management objectives is not required to meet the mitigation commitments under the RHCP and the Permit; nor is implementation of this additional guidance necessary to meet the ESA incidental take permit issuance criteria.

6.4.5 Preserve Monitoring and Reporting

The preserve manager will be responsible for completion of all required preserve monitoring and reporting for that parcel and will ensure that qualified biologists conduct the work. All personnel conducting surveys or other monitoring studies within the preserve system for the covered species or their habitats will hold or be covered by a valid USFWS Threatened and Endangered Species permit that authorizes the biologist to conduct surveys for the golden-cheeked warbler and black-capped vireo.

Required monitoring studies within the preserve system will include regular surveys of populations of the covered species and habitat characteristics for the covered species according to the schedule in Section 6.4.6. Standard methods and minimum procedures for these required monitoring studies are specified below and will apply to all preserve parcels within the RHCP preserve system.

In addition to the required species and habitat monitoring, potential threats to the covered species and their habitats within the preserve system will also be regularly monitored, as applicable to each preserve parcel. Types of threat monitoring could include measuring populations of predator/competitor species, invasive plants or infestations/diseases, or the effects of public access or other preserve uses. In terms of threats to populations of and habitats for the covered species, the monitoring needs of preserve parcels will likely differ across the preserve system and may change over time. Therefore, the threats monitoring program for each preserve parcel will be described within the land management plan for that parcel.

Hays County will submit all reports documenting the results of monitoring surveys within the RHCP preserve system to the USFWS by December 1 of each year, as a part of the RHCP annual report (see Section 7.6).

6.4.5.1 Monitoring Populations of Covered Species

Monitoring studies for populations of the covered species will, at a minimum, provide information on the number of warbler and vireos utilizing the RHCP preserve system and identify areas of occupied and unoccupied habitat within the preserve system. These monitoring studies will also be used to track trends in population sizes and habitat use over time.

Territory Mapping Surveys

Preserve managers will estimate the number of warblers and vireos utilizing each preserve parcel and use this information to prepare or update the baseline preserve evaluation for that parcel. This information will be obtained via breeding season surveys completed at least once every five years, as described in Section 6.4.6, for the warbler and vireo using methods that are sufficient to estimate the number of individuals of each species utilizing each preserve parcel during the survey year.

The standard methods to be used for territory mapping surveys of the covered species are described below and are based on bird territory spot-mapping methods. The methodology is adapted from the November 2007 version of the USFWS minimum procedures for determining the presence/absence of golden-cheeked warblers and black-capped vireos, with additional guidance on data collection and territory interpretation provided by the International Bird Census Committee (1970) and Bibby et al. (2000). Alternate survey methods may be used provided that such methods are approved by Hays County and the USFWS in advance and are sufficient to achieve the survey purpose.

The standard methods to be used for territory mapping surveys for the covered species are described below:

1. All personnel conducing population surveys for the covered species will be covered by an USFWS Threatened and Endangered Species permit that authorizes the biologist to conduct surveys for the golden-cheeked warbler and black-capped vireo.
2. Surveys will be completed during the breeding seasons of the covered species, as follows:
    a. Survey season for the golden-cheeked warbler starts March 15 and ends May 15; and
    b. Survey season for the black-capped vireo starts April 10 and ends July 1. A minimum of 50 percent of the survey visits for the vireo will be completed between April 10 and May 31.

3. Survey visits may begin 30 minutes before sunrise and will end no later than eight hours after sunrise.

4. Surveys will include all areas of potential habitat for the covered species within a preserve parcel, including areas of potentially low quality or transitional habitat.

5. A complete survey will include at least five survey visits to each 100-acre unit of potential habitat within the preserve parcel, with each visit spaced at least five days apart.

6. Survey time for each visit will be at a rate of at least four hours for every 100 acres of potential habitat surveyed. A minimum of one hour of survey time per visit is required regardless of the number of acres surveyed. Therefore, the total survey time for a complete survey is at least 20 hours per 100 acres of potential habitat (with a minimum of five hours of total survey time for survey areas smaller than 25 acres).

7. Surveys will be conducted on days when weather conditions are suitable for the detection of the covered species. Surveys will not be conducted on days with moderate or heavy rainfall or when sustained winds exceed approximately 25 miles per hour.

8. Survey routes travelled during each visit will be designed to evenly cover the area of potential habitat for the covered species within a parcel (i.e., the survey area). The routes will be varied among visits to ensure that surveyors walk within 300 feet of all portions of the survey area at least once during the five survey visits. Starting and ending points and/or survey direction will also be varied for each survey visit.

9. Surveyors will quietly and slowly walk the survey route and record all detections of the covered species on field notes and maps (i.e., spot mapping observations). GPS receivers capable of at least three meter accuracy will be used to record the location of precise detections in the field.

10. Detections of the covered species will be recorded on detailed field maps and in field notes with standard mapping symbols as described in International Bird Census Committee (1970). Field maps will be at a scale of no more than 1 inch = 400 feet and will contain base information sufficient to identify the observer's location and the location of bird detections, such as aerial imagery and/or topography. New field maps will be used for each survey visit. Additional field notes will be recorded as described below to interpret results.

11. Information about each warbler or vireo detection will be recorded on field maps and/or in field notes, including:

a. Species (i.e., warbler or vireo), sex, and age (i.e., adult or juvenile);

b. Detection type: a precise vs. imprecise detection, a territorial vs. non-territorial detection (i.e., singing male vs. non-singing male), or an aggressive encounter between multiple birds;

c. Detection location precision (i.e., a standardized estimate of the precision of a detection location; for example, the true location of the bird is within 30, 60, 90, 120, 180, or 240+ feet of the recorded location);

d. Observations of movement for individual birds and observations of contemporary contacts between multiple birds; and

e. Other data, as applicable, such as observations of nests or behaviors.

12. Field data for bird detections will be entered into a GIS database (to include all GPS data and digitized versions of non-GPS data – including all point observations, precision buffers, and movement/contemporary lines). Data from individual surveys visits will be overlaid to interpret the results for a complete survey.

13. Bird detection data will be interpreted to estimate territory boundaries for individual warblers and vireos within or immediately adjacent to the preserve parcel, as described in Bibby et al. (2000). Approximate territory boundaries will be digitized and added to the GIS database of the survey results.

14. A report will be prepared for each survey documenting the results of the survey and estimating the number of warbler and vireos utilizing the preserve parcel. Reports will include the following information:

    a. A description of the survey area, including parcel name, location, ownership, total size, acres of potential habitat for each of the covered species (i.e., the size of the survey area), and a general description of habitat conditions;

    b. Conditions for each survey visit, including date, surveyor name, starting/ending times of survey visits, total survey time, and starting and ending weather conditions (i.e., temperature, wind speed and direction, cloud cover, and precipitation);

    c. A summary of survey results, including the number of bird detections, the estimated number of warbler and vireo territories completely within, partially within, and immediately adjacent to the survey area.

d. A set of maps showing: 1) the location of the parcel and the extent of potential habitat within the parcel; 2) the combined survey routes for the complete survey; and 3) the combined survey results for the complete survey including individual bird detections and approximate territory boundaries.

e. Digital copies of the survey report and the GIS database of survey results (including bird detections, approximate territory boundaries, parcel boundaries, and areas of potential habitat). All GIS data will be submitted in Texas State Plane Coordinates (South Central Zone), NAD83 datum, and map units of feet.

Preserve managers will submit survey reports to Hays County by October 31 of the year in which they were performed. Surveys not conducted in accordance with these standard methods (including the reporting requirements) may be rejected by Hays County and the USFWS for the purposes of meeting the requirements for management and monitoring of the RHCP preserve system.

Habitat Occupancy Surveys

Baseline preserve evaluations for preserve parcels require an estimate of the amount and location of occupied and unoccupied habitats within their boundaries, with respect to the covered species. Occupancy monitoring within the RHCP preserve system will use occupancy modeling methods, as generally described by MacKenzie et al. (2002), MacKenzie et al. (2006), Rhodes et al. (2006), and Royle and Nichols (2003). The purpose of these occupancy surveys is to determine species presence or non-presence in potential habitat within the preserves and to track changes in habitat use over time using a survey methodology that incorporates more statistical rigor than traditional spot-mapping methods.

Occupancy monitoring surveys will be conducted at least once every five years for each preserve parcel, as described in Section 6.4.6.

The standard methods to be used for habitat occupancy surveys of the covered species are described below. Alternate survey methods may be used provided that such methods are approved by Hays County and the USFWS in advance and are sufficient to achieve the survey purpose.

The standard methods for occupancy monitoring surveys for the covered species include the following:

1. All personnel conducing occupancy monitoring surveys for the covered species must be covered by an USFWS Threatened and Endangered Species permit that authorizes the biologist to conduct surveys for the golden-cheeked warbler and black-capped vireo.

2. Surveys will be completed during the breeding seasons of the covered species, as follows:

    a. Survey season for the golden-cheeked warbler starts March 15 and ends May 15; and

    b. Survey season for the black-capped vireo starts April 10 and ends July 1.

3. Separate surveys will be conducted for warblers and vireos when habitat for each occurs within the same preserve parcel.

4. Survey visits may begin 30 minutes before sunrise and will end no later than eight hours after sunrise.

5. Surveys will include all areas of potential habitat for the covered species within a preserve parcel, including areas of potentially low quality or transitional habitat.

6. At least ten survey stations per 100 acres of potential habitat will be established, with each station positioned within potential habitat for the survey species and at least 200 meters apart. Survey stations will be arranged in a regular grid and positioned no closer than 100 meters of a preserve parcel edge, to the extent practicable given the size and shape of the particular survey area. The locations of all survey stations will be recorded in the field with GPS receivers capable of at least three meter accuracy.

7. Each survey station will be visited up to five times during the survey season or until presence of the survey species is established during that year. There will be at least 24 hours between visits to a station and all visits to a station will be completed within 30 days of the first visit.

8. Surveys at each station will last up to five minutes per visit or until presence of the survey species is established during that visit.

9. The order in which survey stations are visited will be varied among survey visits.

10. Surveys will be conducted on days when weather conditions are suitable for the detection of the survey species. Surveys will not be conducted on days with moderate or heavy rainfall or when sustained winds exceed approximately 25 miles per hour.

11. Surveyors will denote presence or absence of the survey species at each survey station for each visit to that station. Once presence has been established at a survey station, additional visits to that station are not needed for that year's survey. Presence at a survey station will be established with a visual or auditory observation of the survey species from that station, regardless of the sex, age,

territorial behavior, precise location of the individual bird, or number of individuals of that species observed at that station.

12. Presence/non-presence data for the survey species will be analyzed with occupancy modeling software, such as the PRESENCE software program developed by Darryl MacKenzie of Proteus Research & Consulting Ltd. under contract to the U.S. Geological Survey, to estimate occupancy and detection probabilities (with standard errors) for the survey species.

13. A report will be prepared for each survey documenting the results of the survey and indicating areas of presence or non-presence of the survey species. Reports will include the following information:

    a. A description of the survey area, including parcel name, location, ownership, total size, acres of potential habitat for each of the covered species (i.e., the size of the survey area), and a general description of habitat conditions;

    b. Conditions for each survey visit, including date, surveyor name, starting/ending times of survey visits, total survey time, and starting and ending weather conditions (i.e., temperature, wind speed and direction, cloud cover, and precipitation);

    c. A matrix of detections for the survey species. Detection matrices will identify survey stations in rows and survey visits in columns, with a notation of absence, presence, or no visit for each cell in the matrix;

    d. A summary of survey results, including estimates (with standard errors) of occupancy and detection probabilities for each of the covered species. Methods or statistical models used to derive occupancy and detection probabilities will be identified and described;

    e. A map showing the location of the parcel, the extent of potential habitat within the parcel, and the location of survey stations classified by occupancy status; and

    f. Digital copies of the survey report and the GIS database of survey results (including survey stations classified by occupancy status, parcel boundaries, and areas of potential habitat). All GIS data will be submitted in Texas State Plane Coordinates (South Central Zone), NAD83 datum, and map units of feet.

Preserve managers will submit survey reports to Hays County by October 31 of the year in which they were performed. Surveys not conducted in accordance with these standard methods (including the reporting requirements) may be rejected by Hays County and the

USFWS for the purposes of meeting the requirements for management and monitoring of the RHCP preserve system.

6.4.5.2 Habitat Monitoring for the Covered Species

While regular habitat determinations (as described in Section 7.4.2) to identify the extent of potential habitat for the covered species in the preserve system are required as part of the regular baseline preserve evaluations, these assessments do not measure habitat variables or characteristics that might be important indicators of habitat suitability or quality. Monitoring habitat variables will allow Hays County and RHCP preserve managers identify and track potential changes in the suitability or quality of habitats for the covered species in the preserve system over time. The monitoring methods described in this section are intended to provide long-term data for identifying trends in the composition, structure, and general health of protected habitats for the covered species across the preserve system.

Consistent with habitat monitoring methods used for the Balcones Canyonlands Preserve in Travis County, habitat monitoring in the RHCP preserve system will be based on the Land Condition Trend Analysis (LCTA) process developed by the U.S. Army (see Tazik et al. 1992) to monitor changes in land conditions over time. For the purposes of the RHCP, a modified LCTA methodology will be used that focuses on the collection of data related to land use, surface disturbances, ground cover, canopy cover, species composition, and vegetation structure, as described below. Habitat monitoring surveys will be conducted at least once every five years, as described in Section 6.4.6.

The standard methods for habitat monitoring in the RHCP preserve system using modified LCTA methods for the covered species includes the following:

1. Long-term habitat monitoring plots will be permanently established throughout the preserve system within areas of potential habitat for the covered species.
2. At least one plot will be established for each 100 acres of potential habitat within the preserve system. At least one plot will be established within each preserve parcel.
3. The distribution of plots between areas of warbler and vireo habitat will be made in proportion to the total acreage of these habitats within the preserve system.
4. Plots will be 100 meters long and 6 meters wide, with a 100 meter line transect along the longitudinal axis of the plot.
5. Plots will be randomly located within areas of potential habitat for the covered species. The orientation of each plot will be determined randomly, so long as the plot remains within the area identified as potential habitat for the covered species. The starting point of the line transect for each plot will be recorded with a GPS receiver capable of at least three meter accuracy.

6. Plots will be monitored at least once every five years.

7. Monitoring will include the land use, line transect, and belt transect methods described in Tazik et al. (1992), which characterize land uses and maintenance activities, surface disturbances, ground cover, canopy cover, plant species composition, plant density, plant heights, and plant distributions in the plot. Photographs of each plot will also be taken from the starting point of the line transect.

8. A report will be prepared for each preserve parcel documenting the results of the habitat monitoring. Reports will include plot locations (including GPS coordinates and the orientation of the plot) and all data forms, spreadsheets, maps, sketches, and photographs from each plot.

Alternate habitat monitoring methods may be used provided that such methods are approved by Hays County and the USFWS in advance and are sufficient to achieve the survey purpose.

Preserve managers will submit habitat monitoring reports to Hays County by October 31 of the year in which they were performed. Surveys not conducted in accordance with these standard methods (including the reporting requirements) may be rejected by Hays County and the USFWS for the purposes of meeting the requirements for management and monitoring of the RHCP preserve system.

6.4.6 Schedule for Major Preserve Management and Monitoring Tasks

Each of the major preserve management and monitoring tasks described in Section 6.4 are required to be completed or updated once every five years. To simplify the scheduling and completion of these tasks, since preserve parcels will be acquired on a phased basis over the term of the permit, preserve managers will complete each type of major task across the entire preserve system (as it exists at the time) according to the following schedule:

- Years ending in 0 or 5: Territory Mapping Surveys;
- Years ending in 1 or 6: Habitat Occupancy Surveys;
- Years ending in 2 or 7: Habitat Monitoring Surveys;
- Years ending in 3 or 8: Baseline Preserve Evaluations; and
- Years ending in 4 or 9: Land Management Plans.

Interim surveys, evaluations, or land management plans may be prepared for preserve parcels that are acquired early in the five-year cycle.

6.4.7 Management of Public Access and Other Preserve Uses

Individual preserve parcels will include various types of habitat, and some may be more suitable than others for different levels of public access or non-habitat uses. Land management plans will specify which areas are managed primarily for habitat and which areas may be appropriate for public access or other uses. While the RHCP and Permit may permit certain types of public access and use of the preserve system with approval of the USFWS on a case-by-case basis, inclusion of land in the RHCP preserve system, either by fee simple acquisition by the County or via conservation easements (or other agreements) on land owned by other entities, does not require or imply that public access must be allowed. Public access to RHCP preserves, in accordance with the RHCP and Permit, is at the discretion of the parcel owner and must be approved by the USFWS.

Provisions for other uses of privately owned RHCP preserve parcels will be determined on a case-by-case basis by the specific terms of a conservation easement or similar agreement, as negotiated by the landowner, Hays County, and the USFWS. Access to the preserves by preserve managers in the performance of land management activities will be covered by the Permit.

6.4.7.1 Public Access within the RHCP Preserve System

All public access to RHCP preserve parcels will be in accordance with the terms of the Permit and the provisions stated below. Public access to RHCP preserves may be permitted, but not required or mandated under this RHCP, with USFWS approval on a case-by-case basis. Preserve owners may allow public access only if allowed by the permit, this RHCP, and the land management plan approved by the USFWS. Preserve owners are not obligated to allow public access, and may discontinue public access at any time and for any reason.

Public access within RHCP preserve parcels will be classified as either "passive use" or "active use." Passive use public access, as defined below, is expected to have no or negligible adverse effects on the covered species or their habitats and may be allowed within areas of potential habitat for the covered species without requiring the use of credits from the RHCP conservation bank. Active use public access may result in more than negligible adverse effects to the covered species and is not allowed in areas of potential habitat (unless such effects are mitigated with credits from the conservation bank, as described below).

Passive use public access is defined as human foot traffic on approved trails or other defined areas outside of the breeding seasons for the covered species. For the purpose of these public access criteria, the breeding season of the golden-cheeked warbler is defined as March 1 through July 31 (see Section 3.2.1.1) and the breeding season of the black-capped vireo is defined as March 15 through August 31 (see Section 3.2.2.1). The use of wheeled vehicles or equipment, such as bicycles or skates, does not meet the definition of passive use (except as needed for preserve users with disabilities). Domestic animals also do not meet the definition of

passive use (except as needed for preserve users with a physical handicap). All approved trails or other defined areas of public use will be identified in the land management plan for a preserve parcel, which will be approved by the USFWS.

A limited number of other public activities may be allowed within areas of potential habitat, if provided for by an approved land management plan, and will be considered to be passive uses. These activities are:

- Groups of no more than ten hikers guided by a preserve manager may be allowed within areas of potential habitat, even during the main portion of the breeding seasons of the covered species.
- Hunting game within areas of potential habitat for the covered species outside of the breeding seasons of the covered species.

All other public uses of RHCP preserve parcels will be considered active uses. Active uses may include, but are not limited to, bicycling (or use of any other wheeled device not required because of physical handicap), dog walking or horseback riding (or activities involving any other pet or domesticated animal), swimming, boating, tubing, rafting, fishing, picnicking, camping, and rock-climbing. All areas of active public use will be delineated in the land management plan for that preserve parcel, which will be approved by the USFWS. Active (as opposed to passive) public uses of the RHCP preserve system will be restricted to areas that are more than 300 feet away from areas of potential habitat for the covered species that occur on lands protected pursuant to this RHCP. If active public uses are proposed within or within 300 feet of areas of potential warbler or vireo habitat within the preserve system, this habitat will not generate mitigation credit for the RHCP. Any potential mitigation needs for the direct and indirect effects of active use areas in potential habitat may be addressed in accordance with the RHCP participation process described in Section 7.4.

In all cases, at least one territory survey, one habitat occupancy survey, and one habitat monitoring survey will be completed within the RHCP preserve parcel prior to allowing any type of public access within that parcel. All parcels proposed for public access will also have an approved land management plan in place prior to allowing any type of public access within that parcel.

6.4.7.2 Infrastructure Management on Preserve Lands

Lands added to the preserve system, whether by fee simple acquisition or conservation easement, may include existing infrastructure facilities. In addition, it may be necessary for certain infrastructure to be placed within the preserve system in the future. Many types of infrastructure facilities may exist within the preserve lands, including electric transmission and distribution lines and substations, water lines, wastewater lines, gas and petroleum pipelines, and public roads. Some infrastructure facilities may be above ground (e.g., most electric facilities), while others may be below ground (e.g., water, wastewater, gas, and petroleum lines). This

section provides the requirements and recommendations for the infrastructure management needed to provide reliable service and to reduce impacts to, and as appropriate, mitigate for the covered species and their habitat.

Existing Infrastructure within Preserve Lands

The owners and managers of infrastructure facilities and easements in the preserve system will utilize best management practices, to the extent feasible and as appropriate for each specific industry (i.e., electricity providers, water service providers, etc.) to minimize, and as appropriate, mitigate for the adverse environmental effects of the operation and maintenance (O&M) of such facilities.

For utility service providers with existing facilities within the RHCP preserves whose O&M activities will take covered species, the County will request that the utility service provider obtain incidental take authorization for the take associated with such activities, which could include participation in the RHCP. Hays County will require utility service providers with infrastructure facilities within the preserve system that seek incidental take coverage through the RHCP to prepare O&M plans and submit them to the County for review and approval in order to receive the benefit of Permit coverage for their activities. The O&M plan will include a description of the facilities, planned/scheduled maintenance procedures, a schedule for implementation of routine management practices (with a preference for conducting such activities outside of the breeding seasons of the covered species), natural resource management considerations (including habitats for the covered species and other resources, such as soils and waters), and emergency maintenance procedures. The County's review and approval of utility infrastructure O&M plans shall not be unreasonably withheld or delayed.

Preserve management plans prepared by the County and managing partners will map and describe utilities and infrastructure within each preserve parcel.

New Infrastructure Corridors

No new infrastructure corridors will be allowed within RHCP preserves except as authorized on a case-by-case basis at the discretion the County with the approval of the USFWS. In such cases, applications to the RHCP for mitigation assessments for new facilities will include a description of the design, temporary and permanent construction easements, erosion and sedimentation control plans (temporary and permanent), restoration plans, draft operation and maintenance plan, and a summary of routing alternatives.

New facilities will avoid crossing preserve lands and will minimize impacts to covered species to the extent feasible. New infrastructure rights-of-way that cannot feasibly avoid crossing preserve lands should be placed within or parallel to existing easements whenever feasible. New infrastructure easements will be assessed for direct and indirect habitat impacts

outside of preserve lands and within preserve lands. Mitigation assessments within preserve lands will be assessed at a level that is at least double the cost of mitigation required outside preserve lands, to compensate for any lost mitigation within the preserve.

6.5 Adaptive Management Provisions

Adaptive management, as described by the USFWS in the Five-point Policy Initiative addendum to the HCP Handbook (65 FR 35242), is an integrated method for addressing uncertainty in the conservation of species covered by a habitat conservation plan. The purpose of adaptive management is to streamline and improve the decision-making process for the conservation program. The RHCP adaptive management provisions are consistent with the guidance provided by the HCP Handbook (USFWS and NMFS 1996).

The USFWS's framework for addressing adaptive management in habitat conservation plans includes: 1) identifying areas of uncertainty and questions that need to be addressed to resolve this uncertainty; 2) developing alternative management strategies and determining which experimental strategies to implement; 3) integrating a monitoring program that is able to acquire the necessary information for effective strategy evaluation; and 4) incorporating feedback loops that link implementation and monitoring to the decision-making process that result in appropriate changes in management.

The RHCP management and monitoring program described in Section 6.4 includes cycles of regular review and revision of baseline assessments, management plans, and monitoring data to adapt to new conditions or incorporate new information. These built-in adaptive strategies address uncertainty regarding effective habitat management practices for the covered species and public access or use issues.

6.5.1 Uncertainty in the Effectiveness of the Preserve Design Criteria

The conservation program identifies the typical design criteria for preserve blocks that will have mitigation value under the RHCP. The design criteria require that individual preserve blocks must typically include at least 500 total acres. Arnold (1996) and Butcher (2008) have shown that golden-cheeked warblers successfully reproduce in patches of habitat as small as approximately 37 acres to 57 acres. The design criteria for RHCP preserves requires that individual preserve blocks include five to eight times this minimum acreage of potential habitat. The preserve design criteria do not require specific preserve parcel or habitat patch configurations for the preserve system.

While the preserve design criteria currently appear to substantially exceed the minimum patch size threshold for warbler reproduction, Coldren (1998) points out that the internal ecosystem processes within a patch of habitat are influenced by the types of land uses adjacent to and in the vicinity of the patch. Habitat patches of similar size and vegetation characteristics may not be ecologically equivalent due to differences in their surroundings. Golden-cheeked

warbler occupancy of habitat patches was shown to be positively associated with adjacent agricultural and grassland uses, but negatively associated with nearby residential or commercial uses (Arnold 1996, Coldren 1998). Therefore, while the minimum patch size for successful warbler reproduction in a largely rural or agricultural landscape may be approximately 37 to 57 acres, the minimum successful patch size in a largely urban or developed landscape may be much larger.

6.5.2 Strategies for Dealing with Uncertainty in the Preserve Design Criteria

The RHCP conservation program is currently thought to be conservative with respect to uncertainty regarding the preserve design criteria. The preserve design criteria are many times larger than the best available estimates of the minimum patch size needed to sustain golden-cheeked warbler reproduction. This safeguard and the requisite approval from the USFWS prior to an acquisition generating mitigation credits are the primary strategy for dealing with uncertainty in the preserve design criteria.

Alternatively, if (due to increases in adjacent or nearby developed land uses) monitoring shows that RHCP preserves blocks are not large enough or do not contain sufficiently large habitat patches to support occupancy by the covered species such that the conservation value of the preserves has been reduced, Hays County will negotiate with the USFWS to amend the RHCP and Permit to increase the standards for the preserve design criteria that would be applied to subsequent preserve acquisitions. The County will also work with the USFWS to modify preserve management practices, within the limits of existing preserve management budgets and contingency funds, as appropriate to help prevent, reduce, or reverse the loss of conservation value on existing preserve blocks.

6.5.3 Monitoring to Assess the Effectiveness of the Preserve Design Criteria

The management and monitoring program described in Section 6.4 requires a detailed baseline assessment of each preserve parcel, including regular monitoring of populations and habitats of the covered species. The management and monitoring program will provide sufficient data to evaluate whether potential habitat within the preserves is used by the covered species.

6.5.4 Process for Revising Preserve Design Criteria

Hays County and the USFWS will review the data from the baseline evaluations and monitoring surveys to determine if the RHCP preserve system is providing adequate mitigation to balance the impacts of incidental take authorized by the permit. If the monitoring surveys show that a preserve block that is completely or substantially surrounded by development has not been occupied by the warbler for five consecutive years, the USFWS may require Hays County to amend the preserve design criteria to be applied to subsequent preserve acquisitions or to modify management practices within existing preserves, as described in Section 6.5.2.

Similarly, if the monitoring surveys show that a preserve block with a designated vireo management area has not been occupied by the species for ten consecutive years, the USFWS may require Hays County to amend the preserve design criteria to be applied to subsequent preserve acquisitions, as described in Section 6.5.2.

6.6 Voluntary Conservation Measures for Evaluation Species

In order to generate additional information about the evaluation species and their habitats, the County will spend $25,000 per year for first ten years of the RHCP on research or studies of one or more of these species. The County will coordinate the use of these funds with USFWS.

Hays County will also commit to working with the USFWS, as opportunities may arise during the duration of the RHCP, on regional solutions to the conservation of karst and karst-aquatic species, including the evaluation and additional species addressed in the RHCP. This commitment may involve participation in regional workgroups or similar efforts to develop strategies to conserve these species and their habitats, or implementation of measures or programs within the County's regulatory authority to further the conservation of these species.

7.0 PROGRAM IMPLEMENTATION

7.1 Program Administration

Hays County will have the primary responsibility for the implementation of the RHCP and complying with the terms and conditions of the Permit. Hays County may create one or more staff positions dedicated to the administration and implementation of the RHCP and/or contract with outside consultants for assistance with RHCP implementation. Hays County may also designate, with USFWS approval, a separate preserve manager to oversee the management and monitoring of some preserve parcels (see Section 6.4.2).

Activities required to implement the RHCP conservation program are described in Section 6.0. Other activities required to administer the RHCP, including managing the participation process, tracking mitigation credits and debits, completing preserve acquisitions, managing the distribution of research funds, and monitoring/reporting compliance with the terms of the Permit, are described below.

Hays County retains the express right to terminate the RHCP at any time, provided that the County will remain obligated to perform any action that is required by conditions of the RHCP and the Permit to be performed, up to the date of termination. Further, Hays County will be responsible for the perpetual operation and maintenance of all preserves acquired under the RHCP through the date of termination.

7.2 Preserve Acquisitions

Hays County may seek voluntary conservation partners, including private landowners, organizations, or municipalities, to achieve the permanent protection of habitat for the covered species by adding properties to the RHCP preserve system. The County may acquire preserve parcels by fee simple land purchases from willing sellers or by the establishment of conservation easements (or other agreements) with other property owners.

The USFWS will review and approve all RHCP preserve acquisitions prior to the creation of mitigation credits associated with a particular acquisition, and will award mitigation credits in accordance with current USFWS policies and guidelines regarding mitigation.

7.2.1 Fee Simple Purchase by Hays County

Fee simple additions to the RHCP preserve system are those preserve parcels purchased outright by Hays County for the RHCP. Hays County will maintain full control over the use and management of fee simple acquisitions, subject to any pre-existing easements or other encumbrances (such as utility or access easements).

7.2.2 Preserve Management Agreements

Hays County may enter into agreements with other municipalities, land trusts, conservation organizations, or other entities that allow land owned by these other entities to become part of the RHCP preserve system and possibly generate mitigation credit for the RHCP. The preserve management agreements will be negotiated on a case-by-case basis and the specific provisions may vary, but each will be designed to conserve habitat for the covered species and promote the biological goals of the RHCP. The USFWS will review and approve preserve management agreements prior to execution.

In all cases, parcels added to the RHCP preserve system through such agreements will be managed in accordance with the terms and conditions of the Permit and the management and monitoring criteria described in the RHCP.

The USFWS will be a beneficiary to any such agreements with authority to enforce the agreement.

7.2.3 Conservation Easements

Hays County may assemble some of the RHCP preserves through the use of conservation easements that are recorded in the real property records of the County. The property subject to the easement will be incorporated into the RHCP preserve system, but will remain under the ownership of the grantor or successive owners. Conservation easements for the RHCP preserve system will be reviewed and approved by the USFWS prior to the creation of mitigation credits for the Plan.

The County will negotiate the terms of individual conservation easements on a case-by-case basis. In all cases, the easements will be designed to preserve, in perpetuity, the conservation value of the property with respect to the covered species. Conservation easements will include provisions necessary to comply with all applicable terms and conditions of the Permit and the preserve management and monitoring program described in the RHCP. In addition, each conservation easement will provide that the County has the right to enter the property and enforce the terms of the easement, and report the findings to the USFWS.

7.3 Conservation Bank Credits and Debits

RHCP preserve acquisitions will generate mitigation credits for the RHCP conservation bank (see Section 6.3.2) that the County may use to offset the impacts of its activities that adversely affect the covered species or that the County may sell to RHCP participants. The County will track the addition of credits to and the debit of credits from the RHCP conservation bank, as such credits are created or used, to ensure that the bank does not experience a negative credit balance. The County will also ensure that the sale of credits does not exceed the total amount of incidental take authorized by the Permit (i.e., 9000 warbler credits and 1,300 vireo

credits). Either a negative credit balance (even if temporary) or sales exceeding the authorized limit would be a violation of the Permit.

The County will establish a conservation bank ledger prior to the acquisition of the first RHCP preserve parcel to record and track all bank transactions as they occur. The ledger will identify transaction dates, the property and/or conservation partner contributing the credits, the entity purchasing the credits, the number of credits added to debited from the bank, and the resulting bank balance. The ledger will be provided to the USFWS for review as part of the RHCP annual report (see Section 7.6).

Mitigation credit valuation will be in accordance with current USFWS policies and guidelines regarding mitigation and will be approved by the USFWS prior to disbursement of any credits from a given preserve parcel.

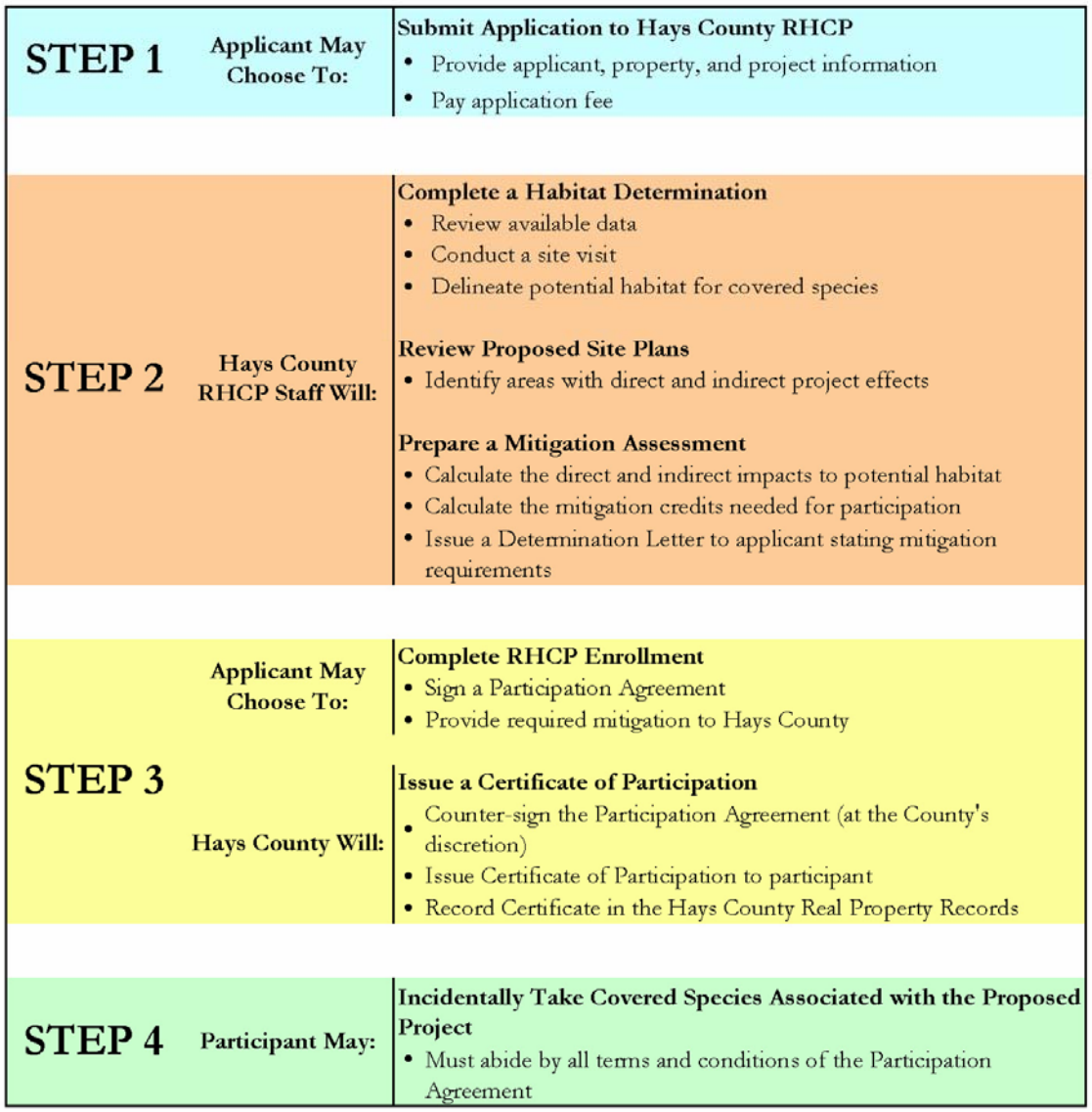
7.4 Participation Process

Provided that Hays County has a sufficient number of mitigation credits available, landowners or other entities with projects that impact the covered species may comply with the ESA (with respect to the covered species) by entering into a Participation Agreement with Hays County, which includes paying the appropriate mitigation fee and receiving a Certificate of Participation. Certificates of Participation will only authorize incidental take of the covered species within the Plan Area.

Landowners wishing to participate in the RHCP must submit a completed application to the County, along with an application fee and any additional materials required by the County. Once the required form, materials, and fee have been submitted to the County, and the County has completed any necessary assessments and evaluations, the County will issue a "Determination Letter" that will set forth the amount of authorized take associated with a project. In addition, the Determination Letter will state the applicant's cost of participation in the RHCP and the period within which the Determination Letter will remain effective. The County may determine, at the County's discretion, that it will not extend available credits to a particular applicant if the County determines that it is necessary to retain credits for its own uses or that such participation would not conform with the goals or provisions of the RHCP.

Figure 7-1 summarizes the RHCP participation process and the specifics of each step are described below.

Figure 7-1. Hays County RHCP Participation Process.



7.4.1 Application to the Hays County RHCP

Potential participants seeking a habitat determination and/or a mitigation assessment for incidental take authorization through the RHCP will submit a completed application to the County.

Information to be provided with the application must include the following:

- Applicant and property owner contact information;
- Identify whether a habitat determination and/or a mitigation assessment is requested;

- Detailed property information, including boundary maps, legal descriptions, and/or digital GIS or CAD data;
- Authorization for County biologists to enter the property for an on-site habitat assessment and the information needed to coordinate access to the property;
- If a mitigation assessment is requested, a detailed site plan for the proposed project that shows the location and extent of all proposed land development and clearing activities and describes the uses of any proposed open spaces or easements;
- Other applicable information about the property and the applicant, such as prior habitat determinations or species survey information, as required by the County; and
- Any applicable fees for processing applications.

The County RHCP staff or consultants contracted by the County will review and process each complete application. Estimated fees for processing an application for a habitat determination and/or mitigation assessment may typically range from $500 to $5,000 per application. The County will determine the required application fee for each application on a case-by-case basis, taking into account the level of effort required by the County to process each application. This fee may be adjusted by Hays County at any time to cover processing costs.

Habitat determinations will identify the number of acres of potential golden-cheeked warbler and black-capped vireo habitat present on a project area (see Section 7.4.2). Mitigation assessments will determine the number of acres expected to be impacted by a proposed project and identify the number of mitigation credits needed to obtain incidental take authorization through the RHCP (see Section 7.4.3 and Section 7.4.4). The mitigation assessment will typically be based on a 1:1 mitigation ratio (i.e., one acre of mitigation for each acre of impact) that takes into account the expected direct and indirect impacts to potential habitat. The assessment will be determined from an on-site evaluation and site plans submitted by applicants. The USFWS reserves the right to review and approve all mitigation assessments under the RHCP (see Section 7.4.5)

Participation in the RHCP, even after submission of an application, is voluntary. An applicant will have no obligation (other than application fees) to pay mitigation fees or provide other compensation to Hays County related to the RHCP, unless the applicant enters into a Participation Agreement with the County (see Section 7.4.6).

If a federal agency is involved with a project seeking to mitigate for impacts to the covered species through the RHCP, the federal agency must complete consultation with the USFWS pursuant to Section 7 of the ESA prior to submitting an application for mitigation credits to the County. Section 7 of the ESA requires that all federal agencies consult with the

USFWS to ensure that the actions authorized, funded, or carried out by such agencies do not jeopardize the continued existence of any threatened or endangered species or adversely modify or destroy critical habitat of such species.

7.4.2 On-site Habitat Determination

On-site habitat determinations will be performed by County biologists (either on staff or under contract by the County) and the USFWS reserves the right to review and approve all habitat determinations under the RHCP. Biologists conducting on-site habitat assessments for the Hays County RHCP must hold or be covered by an USFWS Threatened and Endangered Species Permit that authorizes the biologist to conduct surveys for the golden-cheeked warbler and black-capped vireo. This standard will help ensure that those conducting habitat assessments for the RHCP are sufficiently familiar with the habitats used by the warbler and vireo.

Habitat determinations will involve a review of various published materials and data pertaining to habitat conditions on a project area, as available and applicable. These materials may include aerial imagery, habitat models, prior survey data, soils and geology, topography, and similar information. The County RHCP staff or County-contracted consultants will also conduct a site visit to the project area to determine actual habitat conditions and delineate potential habitat on the site.

Identification and delineation of golden-cheeked warbler and black-capped vireo habitat within the project area boundaries will be made based on the habitat criteria described by the Texas Parks and Wildlife Department (Campbell 2003, et seq.).

The habitat determination will also identify any areas of potential habitat for the covered species that may be of particularly high quality or high importance to the conservation of the species in Hays County, based on characteristics such as (but not limited to) dense canopy cover, very large habitat patch size, demonstrated occupancy by relatively high densities of the covered species, or close proximity to other conservation areas. Similarly, the habitat determination will identify areas with existing indirect impacts resulting from development within or adjacent to the project area. Such existing indirect impacts will be limited to areas of potential habitat within 300 feet of a land cover or land use that is incompatible with the conservation of the covered species. County biologists (either on staff or under contract by the County) will use their best professional judgment when making habitat quality/importance determinations or assessing existing impacts.

The completed habitat determination will include a map showing the project area boundaries and the location and extent of potential habitat within the project area, as delineated from the review of background information and the on-site assessment. The habitat determination will include a calculation of the acreage of potential habitat on the project area. The habitat determination will also identify the location and size of any area determined to be of

particular importance to the covered species and describe the factors contributing to such findings. Similarly, the habitat determination will also identify the location and extent of any area of potential habitat within the project area affected by existing indirect impacts and will document the factors contributing to such findings.

On-site habitat determinations will remain valid for a period of three years, unless land clearing, vegetation management, or other process alters habitat conditions on the site.

Exceptions to on-site habitat determinations will be allowed if the applicant provides survey data (that was collected in accordance with USFWS protocol for warbler and vireo surveys) that demonstrates that a patch of potential habitat that meets the Texas Parks and Wildlife Department (TPWD) warbler or vireo habitat description is unoccupied. Absence of the species from a patch of potential habitat may be established with three consecutive years of presence/absence survey results from within the five years prior to application, or as allowed by the USFWS on a case-by-case basis. All presence/absence surveys and survey reports must be conducted in accordance with USFWS survey protocol for golden-cheeked warblers and black-capped vireos.

Hays County will send a copy of all habitat determinations completed under the RHCP to the USFWS for their review and approval, in accordance with the process described in Section 7.5.

7.4.3 Site Plan Review

A "project area" for the purpose of participation in the RHCP includes all areas subject to land development activities in connection with a single and complete project, as would be shown on a recorded plat or sealed site plan.

Site plans submitted to Hays County with an application for a mitigation assessment must be sufficiently detailed to identify the location and extent of all proposed land development activities that would result in the removal or alteration of woody vegetation within the project area, including lots, streets, drainage improvements, utility infrastructure, easements, and similar areas. Site plans used for participation in the RHCP must be based on recorded plats and/or final site plans, unless authorized on a case-by-case basis by the County.

Site plans submitted to support an application to participate in the RHCP must be provided as a simple hard copy layout on a single sheet and in digital CAD or GIS format. Digital site plan data must be georeferenced to North American Datum 1983 and Texas State Plane grid coordinates (south central zone) and in linear units of feet. Line or area shapes in the digital format must be clearly labeled or attributed to correspond with the information on the hard copy site plan sheet.

Hays County RHCP staff or County-contracted consultants will review site plans submitted by potential plan participants and identify areas of potential warbler and vireo habitat

that will be directly or indirectly impacted by the proposed project. For the purpose of determining the amount of mitigation that potential plan participants must provide to obtain a Participation Certificate through the RHCP, directly and indirectly impacted areas will be defined as follows:

- RHCP direct impact areas: Areas of direct impact will include all areas of potential habitat where the vegetation will be physically affected or altered by clearing or land development activities, or where the proposed use of the area will significantly change from pre-project conditions. The County may assess a nominal fee to cover the costs of providing such information. Direct impact areas will include all areas of potential habitat that occur on portions of individual lots or tracts to be used for residential, commercial, industrial, or institutional use, even if the proposed applicant will not complete the development of those areas before transferring them to another party. Direct impacts will also areas of potential habitat within community parks, easements, or other open spaces where the addition of improvements, management of vegetation, or use of the area substantially alters the pre-project conditions.
- RHCP indirect impact areas: Areas of indirect impact will include all areas of potential habitat that are within 300 feet of the edge of an area with direct effects. Indirect impact areas may extend outside of a project area. Areas of indirect impact may also include small and isolated remnant fragments of potential habitat that would not be expected to be used by the species after completion of the proposed project.

Impacts to potential habitat will be determined separately for golden-cheeked warblers and black-capped vireos.

7.4.4 Mitigation Ratios

Mitigation ratios will determine the number of mitigation credits needed for a particular project to participate in the RHCP and will be based on the type of impact and the relative quality/importance of the habitat impacted. The USFWS reserves the right to review and approve all mitigation assessments.

Typically, each acre of potential warbler or vireo habitat that will be directly impacted by a proposed site plan (as defined above in Section 7.4.3) will require the purchase of one mitigation credit from the Hays County RHCP. Each acre of potential warbler or vireo habitat that will be indirectly impacted by a proposed site plan (as defined above in Section 7.4.3, even if these impacts occur outside of the project area boundary) will require the purchase of 0.5 mitigation credit from the RHCP. Given the relatively even and fragmented distribution of potential warbler and vireo habitat in Hays County (see Figure 3-2 in particular) it is anticipated that most applicants will participate in the RHCP at these standard mitigation ratios.

Under certain circumstances, Hays County may chose to assess impacts for participating projects at a different mitigation ratio, based on the presence of existing impacts or if the affected habitat is particularly important to the conservation of the covered species. For example, if an area of potential habitat is within 300 feet of an existing county road or residential subdivision (as indicated by the County's habitat determination of the applicant's project area), the County may assess direct and indirect impacts to the affected habitat at 50 percent of the standard mitigation ratios described above. Conversely, if the potential habitat to be affected by the site plan is determined to be of particularly high quality or high importance to the covered species (see Section 7.4.2 for examples of situations that could warrant higher mitigation ratios), then the County may assess mitigation needs at two or three times the standard mitigation ratios described above.

7.4.5 Mitigation Assessments and Determination Letters

Hays County RHCP staff will determine the amount of mitigation needed to authorize incidental take associated with a specific project, based on the results of the on-site habitat determination, the site plan review, and the applied mitigation ratios. Mitigation requirements will be expressed as the number of mitigation credits that the applicant must purchase from the County to participate in the RHCP. When the applicant desires, the County may, at the County's discretion, accept land as mitigation in lieu of purchasing mitigation credits.

The mitigation assessment will apply only to the specific project area and site plan submitted and reviewed during the application process. Any changes to the site plan that would change the extent or location of direct or indirect impacts to habitat will require a new application and mitigation assessment for participation in the RHCP.

The total mitigation assessment for a potential participant to obtain incidental take coverage under the RHCP is the sum of the mitigation credits needed to offset the direct and indirect impacts to potential warbler and vireo habitat, according to the mitigation ratios described above. Mitigation credits will not be required for portions of the project area with no adverse impacts to potential warbler or vireo habitat.

The County will work collaboratively with the USFWS to ensure that mitigation assessments are performed in accordance with the methodology described in this RHCP. The USFWS reserves the right to review and approve all mitigation assessments. The County will provide the mitigation assessment for each individual participant to the USFWS, and the USFWS will notify the County when the assessment is received. Once received by the USFWS, the USFWS will review the mitigation assessment within ten federal working days and notify the County if it has any objections. If the County has not received any objections from the USFWS within ten federal working days after notification of reciept, the County may proceed with the participation process.

The USFWS will review the County's mitigation assessments during a probationary period of five years from the date of issuance of the permit. However, three years after issuance, the USFWS will consult with the County and, if the USFWS is satisfied with the accuracy of the County's mitigation assessments, the Service's review of mitigation assessments may be reduced or eliminated.

The County will issue a Determination Letter to the applicant identifying the amount potential habitat impacted and the number of mitigation credits needed to enroll the project area in the RHCP. Determination Letters will remain valid for a period of three years. The County reserves the right to refuse participation to an applicant, if the County determines that it is necessary to retain credits for its own uses or that such participation would not conform with the goals or provisions of the RHCP, including the creation of a preserve system to protect habitats for the covered species. Hays County will send a copy of all Determination Letters to the USFWS at the time such information is transmitted to the applicant.

7.4.6 Participation Agreements and Certificates of Participation

Applicants who elect to participate in the RHCP will enter into a Participation Agreement with the County. By entering into the Participation Agreement, the applicant agrees to be bound by and comply with the terms of the Agreement and applicable terms of the Permit, and in return, benefits from the authorizations granted by the Permit. Applicants will also be required to comply with all other applicable laws. In each Participation Agreement, the USFWS shall be named as a third-party beneficiary with the right to enforce all terms of the Participation Agreement. Once the applicant has signed the Participation Agreement, the applicant must return it to the appropriate County personnel for the County's signature. The County will submit a copy of the fully-executed Participation Agreement to the USFWS promptly after all signatures have been obtained.

Once all required signatures have been obtained, the County will issue to the applicant, now a "participant," a "Certificate of Participation" and will also return to the participant one fully-executed copy of the Participation Agreement. Hays County will record the issued Certificate of Participation, which will include a specific designation of the land to which the certificate applies, in the Real Property Records of Hays County. A copy of the recorded Certificate of Participation must be posted at the relevant property site during any activities affecting the potential habitat of species addressed in the Certificate of Participation. The Certificate of Participation must be posted from the time vegetation clearing begins until the construction is completed. For residential development, "completed construction" means that all roads and utilities are completed to the extent they meet all applicable legal or other requirements and have obtained all requisite approval (governmental or otherwise). For commercial, industrial, and multi-family developments, "completed construction" means that buildings are suitable for occupancy.

So long as the Permit remains in effect and a participant is in compliance with its Participation Agreement, that participant shall be deemed to have (with respect to the property covered by the Participation Agreement) the full rights, benefits, and authorizations of the Permit. The USFWS agrees that a breach by a participant of its obligations under a Participation Agreement will not be considered a violation by the County or any other participant of this Permit. In the event a participant has materially breached its Participation Agreement and, after reasonable notice by the County and opportunity to cure, such participant fails to cure, remedy, rectify, or adequately mitigate the effects of such breach, then the County or the USFWS may terminate that participant's Participation Agreement.

Certificates of Participation are not transferable, except to subsequent owners of the property to which the certificates apply.

The County will provide to the USFWS for its review and approval the general forms of Participation Agreements and Certificates of Participation that the County will use in its participation process.

7.4.7 Forms of Mitigation

7.4.7.1 Mitigation Fees

Mitigation fees provide the necessary mitigation for an applicant to obtain incidental take coverage from the RHCP and will be based on the results of the completed mitigation assessment. The mitigation assessment (as communicated to the applicant in the form of a Determination Letter) will identify the number of mitigation credits required to mitigate for incidental take on a project area. The price of a mitigation credit will be determined by Hays County and will be set at a level that balances the need to generate revenue for the acquisition and management of lands within the RHCP preserve system and to implement other parts of the conservation program with encouraging vigorous participation in the RHCP.

The fee for purchase of a mitigation credit under the RHCP will be determined at the discretion of Hays County. (For the purposes of illustrating the funding plan in Section 8.0, the fee per credit is assumed to start at $7,500.) As described in Section 8.1, Hays County may periodically review and adjust this fee, as needed to implement the RHCP. Fee adjustments may be made at any time during the term of the Permit at the discretion of the County.

The RHCP contemplates periodic changes to the participation fees set forth herein, as well as minor changes to the County's budget to satisfy the requirements of the ESA, its implementing regulations, the Permit, and the RHCP. The RHCP has been developed and approved in accordance with all provisions of Chapter 83 of the Texas Parks and Wildlife Code. State law (Texas Parks and Wildlife Code § 83.019(a)) requires that a public hearing be held before a plan participant adopts any "regional habitat conservation plan, plan amendment, ordinance, budget, fee schedule, rule, regulation, or order..." Since the RHCP contemplates periodic fee and budget changes and will be approved pursuant to this requirement, future

periodic changes to participation fees does not require additional public notice and hearing under state law. The County's right to periodically adjust participation fees and modify its budget with respect to the RHCP was set forth with specificity in the RHCP, and the RHCP was adopted after the requisite public hearing. Therefore, additional notice and hearing pursuant to Texas Parks and Wildlife Code Section 83.019(a) is not required.

7.4.7.2 On-site Mitigation Land in Lieu of Fees

RHCP participants may elect to set aside and preserve potential habitat for the covered species within a project area. On-site land contributions that meet the minimum required criteria for RHCP preserves described in Section 6.3.1 (or that are adjacent to existing preserves, such that the total size of the preserve block meets the minimum criteria) may be accepted by the County in lieu of participation fees. All such transactions will be negotiated on a case-by-case basis and will be supported by appraisals and other analyses acceptable to the County. The acceptance of any land in lieu of mitigation fees must also be approved by the USFWS.

The County may also require the commitment of additional funds, resources, or restrictions during the negotiation of a conservation easement on or fee simple dedication of on-site mitigation land to help compensate for any special management or monitoring considerations associated with the site.

The management and monitoring provisions described for other RHCP preserve lands in Section 6.4 will apply to all accepted on-site mitigation land.

7.4.7.3 Off-site Mitigation Land in Lieu of Fees

A potential plan participant may offer Hays County off-site mitigation land (i.e., lands located outside of the project area) in lieu of the participation fees associated with a proposed project. Any off-site mitigation land must be located within the Plan Area. Hays County may accept either a conservation easement on or fee title transfer of the off-site mitigation land, at its discretion.

Acceptance of off-site mitigation land in lieu of participation fees will remain at the sole discretion of Hays County and may involve additional requirements. All such transactions will be negotiated on a case-by-case basis and will be supported by appraisals and other analyses acceptable to the County. The acceptance of any land in lieu of mitigation fees must also be approved by the USFWS.

The management and monitoring provisions described for other RHCP preserve lands in Section 6.4 will apply to all accepted off-site mitigation land.

7.5 Evaluation Species Research Program

As a voluntary measure to help develop new information about the rare, sensitive, or little-known karst species in Hays County, the County will solicit proposals to fund research or

studies on one or more of the karst evaluation species addressed in the RHCP or their habitats. The County will commit to provide $25,000 per year (in 2009 dollars) for the first ten years of the RHCP to fund such research, as described in Section 6.6. The purpose of the funding is to develop information that the County may use to help evaluate whether and/or how to address such species in the RHCP should one or more become federally listed in the future.

Hays County will develop a process for soliciting and evaluating annual requests for proposals on karst evaluation species and habitats in Hays County during the first year of the RHCP. The proposals will be evaluated with respect to the research priorities described in Section 6.6, and the County will confer with the USFWS on selecting specific research projects chosen for funding through the RHCP.

7.6 Compliance Monitoring and Reporting

Hays County will submit an annual report to the local and regional offices of the USFWS by December 1 of each year to document progress towards achieving the goals and objectives of the RHCP and demonstrate compliance with the terms and conditions of the Permit.

The report will cover the period of October 1 through September 31, which coincides with the County's fiscal year. The due date will provide ample time to collect, review, and summarize data related to RHCP administration and preserve management and monitoring. The report will be prepared by Hays County RHCP staff, with the assistance of those entities with management and monitoring responsibilities under the RHCP.

Specifically, annual reports will include:

- A summary of current participation in the RHCP, including the number of participants and a list of properties and acreages covered for incidental take;
- A summary of the lands and habitat included in the RHCP preserve system, including total acres and acres of habitat protected and managed within County-owned preserves, managing partner preserves, and RHCP conservation easements;
- A summary of the number of mitigation credits generated by RHCP preserve system acquisitions and debited through sale to RHCP participants or used by Hays County (i.e., the conservation bank ledger);
- A summary of the financial status of the RHCP, including administrative and management costs and revenues generated for the RHCP;
- A summary of management activities conducted on RHCP preserve lands for covered species;
- The results of biological monitoring activities conducted on RHCP preserve lands, including all reports documenting surveys of the covered species and their habitats;

- A summary of the status of community education and outreach programs and voluntary conservation measures for the evaluation and additional species, including the results of any research conducted through the RHCP;
- Recommended modifications to the conservation program or preserve management plans via the adaptive management process;
- Any compliance-related issues and actions involving individual participants of the RHCP; and
- Other pertinent information or recommendations, as appropriate.

The USFWS will review the annual reports and determine whether Hays County is in compliance with the terms of the RHCP, the Permit, and other applicable agreements. The USFWS may request additional information from Hays County to determine if the County is in compliance with the terms and conditions of the Permit.

7.7 Permit Amendment Process

Amendments to the RHCP and/or the Permit may be necessary during the term of the Permit. These amendments may include relatively minor changes to the RHCP and/or Permit, or major changes that substantially alter the covered activities, mitigation provided by the conservation program, or other substantive aspects of RHCP implementation. Amendments to the RHCP and Permit will be made in accordance with applicable law and regulations.

Minor amendments are defined as those that have little or no impact on the amount of incidental take authorized by the Permit, the degree of negative impacts to the covered species from covered activities, or the biological effectiveness of the conservation program. Minor amendments may include, but are not limited to:

- Administrative changes addressing the implementation of the RHCP, such as staff duties, participation procedures, fee structures, reporting requirements, and oversight;
- Minor modifications to management or monitoring methods; and
- Similarly minor alterations to the RHCP and/or incidental take permit that could arise from changed or unforeseen circumstances, adaptive management provisions, or other circumstances.

Minor amendments may be incorporated into the RHCP and/or incidental take permit administratively provided that both the County and the USFWS agree on the proposed changes, the proposed amendments are documented in written form, and the proposed amendments do not significantly change the net effect of the covered activities on the species or the amount of incidental take requested by the original plan and incidental take permit.

Major amendments are those that would substantially alter the scope of the RHCP. Major amendments are likely to change the amount of take or impacts authorized by the incidental take permit, and/or have a significant impact on the structure, implementation, or effectiveness of the conservation program. Incorporating major amendments may require completion of a formal amendment procedure similar to the original permit application process. This procedure may include public review through the Federal Register, additional analysis to comply with NEPA requirements, and an internal USFWS ESA Section 7 consultation (USFWS and NMFS 1996).

8.0 FUNDING PLAN

Both the ESA and state law require that a habitat conservation plan indicate the funding that will be available to implement the plan. Under the ESA, the USFWS must find, among other things, that "the applicant will ensure that adequate funding for the plan will be provided." This requirement is, of course, most important in circumstances in which species impacts may precede implementation of the offsetting mitigation actions. In this RHCP, however, no impacts to covered species will be authorized unless mitigation credits already exist as created through the acquisition of RHCP preserves. In other words, by virtue of the RHCP's structure, funding and actual acquisition of preserves will in all events precede any impacts to covered species mitigated by those preserves. There is by definition, therefore, no likelihood that an authorized impact might go unmitigated if funding does not materialize. In these circumstances, the burden to demonstrate the availability of specific funding is lessened.

For this RHCP, Hays County will demonstrate that sufficient funding is available to acquire a preserve system under the phased conservation bank approach, provide for the perpetual management and monitoring of the preserve system, and supply the necessary staff, equipment, and materials to administer the RHCP. This funding plan is an illustration of the resources that would be needed to implement the RHCP as anticipated based on a variety of assumptions described in the sections below.

Under the phased conservation bank approach, the County may not use or extend more take authorization at any given time than can be offset by the number of mitigation credits created via preserve acquisitions. As described in Section 5.2, Hays County anticipates that there will be a need over the term of the Permit to provide approximately 9,000 warbler mitigation credits and approximately 1,300 vireo mitigation credits for use by the County or RHCP participants. This level of need is based on projections of the total amount of habitat loss anticipated over the term of the Permit and estimated levels of participation in the RHCP.

Given the fragmented nature of the potential warbler habitat in Hays County (i.e., most large tracts include a mosaic of habitat and non-habitat), approximately 10,000 to 15,000 acres of preserve land may be needed to protect enough habitat for the County to meet the anticipated need for mitigation credits under the RHCP. For the purposes of illustrating the potential costs to implement the RHCP, the target number of preserve acres modeled in the funding plan assumes that an additional 20 percent more land will be needed to protect a sufficient number of credit-generating potential habitat acres (i.e., 9,000 acres of warbler habitat plus 1,300 acres of vireo habitat). Therefore, this funding plan is based on a preserve size of 12,000 acres (i.e., approximately 20 percent greater than 10,300 acres).

This section demonstrates the availability of reliable and well accepted sources of funding. Hays County will fund or otherwise provide for the RHCP conservation program using three types of resources: 1) participation fees charged to RHCP participants; 2) County tax

revenues; and 3) conservation investments from the County or other sources. The funding plan assumes that participation fees will be a primary source of recurring annual funding for the RHCP, until the County reaches the limit of its incidental take authorization. County tax revenues will supplement participation fees as needed to implement the RHCP during the life of the Permit and will be a stable source of funding in perpetuity. County conservation investments are expected to provide initial RHCP preserve acres.

While the County contemplates using innovative agreements with willing landowners to reduce preserve acquisition costs, as well as seeking other state, federal, and non-governmental organization grants, these potential sources are considered somewhat more speculative and difficult to quantify and therefore have not been used in the illustrative funding models. Moreover, the mix and scale of the available sources depicted in the funding model is not intended to bind the County to a particular allocation of these sources, but to demonstrate that the sources are available and, in a variety of combinations, provide a reliable basis for financing of the RHCP.

Hays County will annually review the funding plan to ensure that adequate funding and program resources are provided to meet obligations under the Permit and establish a budget for other aspects of RHCP implementation. As such, the County may periodically take steps to adjust funding plan components including, but not limited to, increasing or decreasing the annual level of County tax revenues applied to the RHCP, increasing or decreasing the purchase price of a mitigation credit, suspending or otherwise restricting the use or sale of mitigation credits, and utilizing debt instruments to fund preserve acquisitions.

8.1 Cost Estimates

Estimated annual RHCP implementation costs, based on a preserve size of 12,000 acres and other assumptions described throughout Section 8.0, are illustrated in Appendix F. The following sections describe the key components and assumptions of the estimated implementation costs.

8.1.1 Land Acquisition

As described above, the funding plan is based on the assumption that the County will acquire 12,000 acres of preserve land during the term of the Permit in order to create enough mitigation credits to meet the expected need for incidental take authorization through the RHCP. It is anticipated that the RHCP preserve system will be composed of preserve parcels acquired in fee simple directly by the County and through the acquisition of conservation easements on private lands. The funding plan assumes that 25 percent of the land in the RHCP preserve system will be acquired in fee simple and the remaining 75 percent of the preserve system will be acquired as conservation easements. This assumed distribution of fee simple purchases and conservation easement acquisitions matches interest in the community for the use

of conservation easements as a way to partner with current landowners in preserving the county's natural resources and as a means of controlling land acquisition and maintenance costs.

Land acquisition costs used in the funding plan are based on recent sales of large, agricultural tracts in Hays County and assumptions regarding the relative costs of acquiring preserves via fee simple land transactions or by acquiring conservation easements.

The price per acre for land suitable for inclusion in the RHCP preserve system was estimated from a review of sales information for large tracts of undeveloped land across Hays County during 2007 and 2008. Based on this review, the estimated 2009 fee simple purchase price for potential RHCP preserve land is $11,500 per acre (not including anticipated real estate transition costs).

The funding plan assumes that the per acre cost to acquire preserve lands through the purchase of conservation easements will be 50 percent of the fee simple per acre price (i.e., approximately $5,750 per acre in 2009, not including anticipated real estate transition costs).

Real estate transactions, such as the purchase of fee simple preserve lands or conservation easements, often include costs associated with land appraisals, land surveys, environmental reviews, attorney fees, recordation fees, trash removal, and initial security measures. The funding plan assumes that these transaction costs will total approximately 3 percent of the fee simple per acre land price (i.e., approximately $345 per acre in 2009). Therefore, the total acquisition cost for fee simple preserve acquisitions in 2009 is estimated to be $11,845 per acre and the total acquisition cost for conservation easement acquisitions in 2009 is estimated to be $6,095 per acre. For the purposes of estimating costs over the 30-year term of the Permit, land prices in the funding plan are inflated annually by 3 percent.

Cumulative preserve acquisition expenses for the RHCP are estimated at approximately $147.5 million over 31 years (the funding plan assumes that approximately 664 acres will be acquired prior to Permit issuance). Appendix F provides annual land acquisition estimates.

8.1.2 Staffing and Plan Administration

Hays County anticipates that additional County staff will be necessary to administer the RHCP conservation program, including a program manager, biologists, preserve rangers, and maintenance personnel. The County may also opt to contract with non-County professionals to provide the necessary staffing to implement the RHCP, either in addition to or in place of hiring County staff. However, for the purposes of this funding plan, the County assumes that it will hire the necessary staff to implement the RHCP.

The funding plan assumes that one to two biologist-level staff and one maintenance-level staff will be necessary to perform the tasks needed to administer the RHCP and manage the preserve system during the early years of the preserve management program. The biologist-level staff positions will be responsible for initially setting up the RHCP program, in addition to the

other necessary administrative and biological tasks. It is assumed that County RHCP staff will complete most of the RHCP preserve management and monitoring tasks described in Section 6.4, including species and habitat surveys, baseline preserve evaluations, and land management planning. As additional preserve lands are acquired over the term of the Permit, additional biologists, maintenance personnel, and preserve rangers may be needed to adequately manage and monitor the preserve lands.

Staffing costs include salaries and benefits in accordance with County policy and hiring standards. For the purpose of the funding plan, staffing costs are inflated annually by 3 percent.

Other administrative costs addressed in the funding plan include costs associated with providing office space, equipment (such as computers and software), and materials for the RHCP staff. Annual administrative costs are also inflated annually by 3 percent.

Cumulative staffing and administrative costs are estimated to be approximately $22.8 million over 30 years. Annual estimates for staffing and administrative costs are provided in Appendix F.

8.1.3 Preserve Management

Most of the labor associated with the management of the preserve system will be performed by RHCP staff, including species surveys and habitat monitoring, baseline preserve evaluations, and land management plans. However, the County may contract or use volunteers for the implementation of some services. Table 8-1 provides estimates of the staff time that may be needed to implement the major management and monitoring tasks scheduled in Section 6.4.6.

Table 8-1 Estimated Annual Effort for Major Monitoring and Management Planning Activities for the RHCP Preserve System.[1]

Task	Estimated Annual Effort Per 500 Acres
Species Territory Mapping Surveys	200 hours
Habitat Occupancy Surveys	200 hours
Habitat Characterization Studies	200 hours
Baseline Preserve Evaluations	Initial evaluation: 100 hours / Updates: 40 hours
Land Management Planning	Initial plan: 100 hours / Updates: 40 hours

[1]Estimtes include field time, data management/analysis, and reporting.

Specific preserve management practices that are likely to require assistance for labor and/or equipment may include fencing and signage installation, trash removal, road maintenance, vireo habitat restoration, brown-headed cowbird trapping, deer removal, feral hog removal, and fire ant treatment. Each of these items is addressed in the illustrative funding plan and the estimated budget for each is dependent on the size of the preserve system.

Other costs associated with preserve management and monitoring include the purchase of field equipment and vehicles for RHCP staff.

The estimated budget for each of the preserve management items was based primarily on the recent experience of the Balcones Canyonlands Preserve managers in Travis County.

The funding plan does not address preserve management costs associated with authorized public access to County-owned preserve parcels. If such access is allowed within the preserve system, Hays County will provide the funds necessary to adequately address such costs.

Preserve management costs, as illustrated in Appendix F and not including labor provided by RHCP staff, total approximately $11.0 million over 30 years.

8.1.4 Education and Outreach

Funding for presentation materials, program flyers and postage is included in the program costs. Education and outreach costs begin in the second year of the program and are budgeted at $2,500 per year. These costs increase to $5,000 and $7,500 in Years 10 and 20 of RHCP implementation, respectively. These costs are also adjusted for inflation by 3 percent annually.

Over the term of the Permit, costs associated with public education and outreach programs are estimated to be approximately $274,000, as shown in Appendix F.

8.1.5 Research for Evaluation Species

The RHCP conservation program includes a voluntary research program to be focused on the evaluation species of concern (see Section 6.6 and Section 7.5). The research program is proposed for funding at $25,000 per year for the first ten years of the Plan (adjusted for inflation by increasing costs annually by 3 percent). The total contribution to research for evaluation species is approximately $287,000 over the first ten years of the Permit.

8.1.6 Contingency Funds

Hays County will budget for miscellaneous contingencies associated with the implementation of the RHCP. The annual contingency budget is $7,500 in 2008 dollars for the first ten years of the RHCP and escalated by $5,000 for each subsequent ten year period. The contingency is also adjusted for inflation by 3 percent annually. The County may use the contingency funds to address special or unanticipated needs related to the administration of the RHCP program or the management of the preserve system.

8.1.7 Combined Budget for RHCP Implementation

Cumulative implementation costs for the RHCP, including land acquisitions, staffing and administration, preserve management, education and outreach, research, and contingency costs, are approximately $182.6 million over the 30-year Permit term. This total cost includes

approximately $5 million contributed prior to Permit issuance to purchase approximately 664 acres of preserve land. Estimated implementation costs for each ten year period of the Permit, given the assumptions described above, are included in Table 8-2. Appendix F provides detailed implementation cost estimates over the life of the Permit.

Table 8-2. Estimated RHCP Implementation Costs by Decade.

Category	Years 0 - 10[1]	Years 11 - 20	Years 21 - 30	Entire Plan Duration
Preserve Land Acquisition	$34,140,622	$48,297,796	$65,014,734	$147,453,152
Staffing and Administration	$1,906,760	$6,226,876	$14,638,290	$22,771,926
Preserve Management	$1,135,157	$3,137,643	$6,703,102	$10,975,902
Education, Outreach, and Research	$314,358	$81,730	$164,778	$560,866
Contingency	$121,621	$245,172	$439,316	$806,109
Total Implementation Costs	**$37,618,518**	**$57,989,217**	**$86,960,220**	**$182,567,955**

[1] Includes conservation investments for preserve acquisitions prior to Permit issuance.

8.2 Revenue Sources

Estimated annual RHCP revenues are shown in Appendix F. The following sections describe the key components and assumptions of the anticipated RHCP funding sources.

8.2.1 Application Fees

As described in Section 7.4.1, Hays County may assess an application fee to potential RHCP participants seeking a habitat determination and/or mitigation assessment for the covered species. The amount of this fee is estimated to range from approximately $500 to $5,000 per application, depending on the size of the property, the complexity of the project, and the services requested. Since the amount of the application fee is not fixed and the specific number of applicants is unknown, revenues created from application fees are estimated at $30 per mitigation credit sold for the purposes of this funding plan. Under this assumption, application fees generate approximately $502,000 over the term of the Permit. Annual estimates of application fee revenue are provided in Appendix F.

8.2.2 Mitigation Fees

Hays County anticipates selling or using 9,000 warbler mitigation credits and 1,300 vireo credits over the 30 years of the Permit. The County anticipates using some portion of these credits for its own projects. To estimate the revenue generated by the sale of mitigation credits, the funding plan assumes that the County will use five percent of the available credits and will sell the remaining 95 percent of the mitigation credits to RHCP participants.

For purposes of forecasting revenues generated by mitigation fees, the price for each mitigation credit is set at $7,500 for the initial five years of the Permit and increased by $1,000 every five years over the balance of the term of the Permit. The funding plan does not adjust these fees for annual inflation. Over the term of the Permit, mitigation fees may generate approximately $97.9 million for the RHCP.

8.2.3 County Budget Contributions

Hays County will allocate revenues from the County's general maintenance and operations (M&O) fund to support the implementation of the RHCP. On an annual basis, the County's budget contribution will be used to fill gaps between revenues generated from application and mitigation fees (see above) and RHCP implementation costs. Appendix G shows the estimated annual tax base growth, projected M&O fund revenues, and the County's anticipated annual RHCP budget contributions through the life of the Permit.

To help assure affordability by the County, the amount of the annual budget contribution is set not to exceed approximately 10 percent of the cumulative growth in the M&O fund resulting from the taxable value of new development in the County during the life of the Permit. Projections of tax revenue generated by new development are calculated from the projected value of all new commercial or residential structures and projected increases in land values for newly developed properties in the County (see Appendix G, based on an analysis by TXP for the RHCP).

The amount of annual County budget contributions is modeled in the funding plan, based on the assumptions described in this section. However, the actual amount of the allocation will vary from this funding model during implementation according to actual participation in the RHCP, preserve size, and staffing levels at any given time. As such, Hays County will need to adjust the RHCP budget annually, including the size of its budget contribution, as the RHCP is implemented to ensure that adequate funding is provided.

As illustrated in Appendix F and Appendix G, the amount of County general M&O funds that may be needed to implement the RHCP is estimated to be approximately $79.2 million over 30 years.

The County will continue to budget funds from its general M&O revenues after Permit expiration to ensure that the RHCP preserve system is managed and monitored in perpetuity in accordance with the terms of the Permit and the goals and objectives of the RHCP.

8.2.4 Conservation Investments

Hays County has already invested heavily in parks and open space conservation. On July 8, 2008 the Hays County Commissioners' Court voted to set aside $13 million in bond funds from the May 2006 Parks and Open Space bond program of for the acquisition of property with "recharge land, habitat for endangered species, open space and access to major waterways."

Specific properties to be acquired with the bond funds that will contain RHCP mitigation value have not been identified, but the RHCP funding plan assumes that the County will dedicate at least $5 million of the remaining bond to the acquisition of RHCP preserve lands. Under the assumptions described in Section 8.1.1 regarding land acquisitions, $5 million would acquire approximately 664 acres. The purchase of land using the 2006 bond funds is anticipated before initiation of the RHCP.

8.2.5 Combined RHCP Revenues

RHCP revenues have been estimated for each year of the RHCP following issuance of the Permit. Estimated total revenues for the term of the Permit are approximately $182.6 million. Estimated revenues for each ten year period of RHCP implementation are included in Table 8-3. Appendix E provides detailed annual revenue estimates for the life of the Permit.

Table 8-3. Estimated RHCP Revenues (Funding Sources) by Decade.

Category	Years 0 - 10[1]	Years 11 - 20	Years 21 - 30	Entire Plan Duration
Application Fees	$125,195	$159,838	$216,810	$501,843
Mitigation Fees	$26,068,000	$32,585,000	$39,220,750	$97,873,750
County General M&O Fund Contributions	$6,423,411	$25,244,379	$47,522,660	$79,190,450
County Conservation Investments	$5,001,912	$0	$0	$5,001,912
Total Revenues	**$37,618,518**	**$57,989,217**	**$86,960,220**	**$182,567,955**

[1] Includes conservation investments for preserve acquisitions prior to Permit issuance.

8.3 Comparison of Costs and Revenues

Estimated expenditures and revenues for each ten year period of the RHCP are summarized in Table 8-2 and Table 8-3 and detailed annual budget estimates are included in Appendix F. Based on the assumptions stated throughout Section 8.0, the funding plan illustrates that sufficient funds are available to cover anticipated RHCP implementation costs over the term of the Permit.

9.0 NO SURPRISES POLICY

An important incentive to encourage participation in the RHCP is the assurance provided by the USFWS regulation known as the "No Surprises" rule (63 FR 8859, codified at 50 CFR §§ 17.22, 17.32, 222.2). Under the No Surprises Rule, the USFWS assures incidental take permittees that, so long as an approved habitat conservation plan is being properly implemented, no additional land use restrictions or financial compensation will be required of the permittee with respect to the covered species, even if unforeseen circumstances arise after the permit is issued indicating that additional mitigation is needed.

The No Surprises Rule recognizes that the permittee and the USFWS can reasonably anticipate and plan for some changes in circumstances affecting a species or geographic area covered by a habitat conservation plan (e.g., the listing of additional species as threatened or endangered or a natural catastrophic event in areas prone to such events). To the extent that changed circumstances are provided for in the habitat conservation plan, the permittee must implement the appropriate measures in response to the changed circumstances if and when they occur.

This section describes the changed circumstances anticipated by and provided for in the RHCP and explains the USFWS's assurances to Hays County with respect to any unforeseen circumstances.

9.1 Changed Circumstances

As defined in the No Surprises rule (63 FR 8859), changed circumstances are defined as "circumstances affecting a species or geographic area covered by a conservation plan that can reasonably be anticipated by plan developers and the Service and that can be planned for..."

A habitat conservation plan must identify provisions to help compensate for any negative impacts to covered species from changed circumstances to qualify for No Surprises assurances. If circumstances change, the permittee must implement any provisions included in the habitat conservation plan and/or incidental take permit that address such circumstances.

Hays County and the USFWS recognize that many changes in human conditions and attitudes, development pressures, environmental conditions, and scientific understanding of ecological systems, among other things, could and will occur over the 30-year Hays County RHCP planning horizon and duration of the incidental take permit. To address this situation, the RHCP contains a procedure by which the USFWS and the County will deal with reasonably anticipated changes in circumstances affecting the species covered by the RHCP.

Changed circumstances that can reasonably be anticipated by Hays County and the USFWS and that can be planned for are:

1. The levels of funding currently anticipated to adequately cover preserve operation and management costs become inadequate to meet future needs;
2. Protected habitat for covered species within the RHCP preserve system is temporarily lost or substantially degraded due to catastrophic events;
3. Protected habitat for covered species within the RHCP preserve system is lost or substantially degraded and is unable to regenerate, due to global climate change;
4. One or more of the covered species become delisted and no longer have the protection of the Endangered Species Act; and
5. One or more of the covered species becomes extinct.

The following sections describe how Hays County will address each of the changed circumstances listed above, if they occur during the life of the Permit.

9.1.1 Inadequate Funding for Preserve Management

The anticipated costs to Hays County for operating and managing the RHCP preserve system are estimated in Section 8.0. The financial models used to develop the Plan incorporated the best available data to estimate anticipated costs and available funding. The funding plan described in Section 8.0 is adequate for meeting Hays County's obligations to fully implement the RHCP and comply with the terms and conditions of the Permit.

However, in the event that circumstances change with respect to anticipated costs or available revenue, Hays County will implement one or more of the following procedures as needed to ensure that the mitigation value of the preserve system is protected:

1. Use funds budgeted for voluntary conservation actions under the RHCP, as feasible given any encumbrances for the use of these funds, for the implementation of essential preserve management activities;
2. Reduce or suspend funding for non-essential aspects of the RHCP conservation program, such as outreach and education programs, and use funds for the implementation of essential activities;
3. Negotiate alternative preserve management, monitoring, or reporting requirements with the USFWS to reduce the cost of RHCP implementation;

Hays County will notify the USFWS if changes in funding levels occur that substantially affect the implementation of the RHCP and management of the preserve system. The County will coordinate with the USFWS to implement one or more of the procedures described above to ensure protect the mitigation value of the preserve system.

9.1.2 Protected Habitat is Temporarily Lost or Degraded due to Catastrophic Events

Catastrophic events such as wild fires, tornadoes, floods, outbreaks of tree diseases (e.g., oak wilt), prolonged periods of severe drought, and similar events could temporarily remove or degrade potential habitat for the covered species within the RHCP preserve system. Many of these events are a normal part of the central Texas ecosystem and may be reasonably foreseen.

In response to catastrophic events, Hays County will act to minimize damage to potential habitat for the covered species, to the extent practicable. The County will notify the USFWS of loss or damage to habitat within the preserve system within 30 days if more than 100 acres of potential habitat for the warbler or ten acres of potential habitat for the vireo is affected. Hays County will update the baseline assessment and land management plan for an affected preserve block(s) within one year of a catastrophic event that affects more than 100 acres of warbler habitat or ten acres of vireo habitat. The updates to the management plan will focus management activities on regenerating suitable habitat in an amount equal to or in excess of the amount of habitat that was lost or substantially degraded by the catastrophic event.

9.1.3 Protected Habitat is Permanently Lost or Degraded due to Global Climate Change

The RHCP preserve system will permanently protect large areas of potential habitat for the golden-cheeked warbler and black-capped vireo. It is possible that large scale changes to vegetation communities or species distributions due to global climate change could cause the permanent loss of habitat for the covered species within the RHCP preserve system and Hays County. Unlike habitat lost due to reasonably foreseeable catastrophic events, it is possible that global climate change could irreparably change the vegetative conditions of the RHCP preserve system and prevent the regeneration of suitable habitat for the covered species.

Global climate change has the potential to alter the regional distribution of plant and animal communities by large-scale changes in average temperature, levels and frequency of precipitation, groundwater regimes, and fire regimes. Climate change could cause areas currently containing suitable habitat for the covered species to increase or decrease in extent and quality. Climate change could also cause areas not currently considered to be suitable habitat for the covered species, including areas currently outside of the known ranges of the species, to become suitable habitat and the species could adapt to use such habitat.

There is currently insufficient knowledge upon which to base a projection of the potential for the RHCP preserve system to increase or decrease in value to the covered species over the next 30 years as a result of climate change. Nor is there sufficient knowledge at present upon which to design alternative or additional mitigation measures that would compensate for any adverse effects of climate change on the preserves.

Accordingly, if global climate change causes the RHCP preserve system to increase or decrease significantly in relative value with regard to continued survival of one or more of the

covered species, Hays County will consult with the USFWS to determine whether any changes in preserve management practices are appropriate to respond to the effects of climate change. However, any changes to the preserve system or management program agreed to be appropriate for addressing the impacts of climate change will not require the acquisition or management of additional preserve lands.

To the extent that knowledge about the effects of climate change on the covered species is gained over the life of the Hays County RHCP from information collected as part of the RHCP's management program or through research endorsed by the USFWS, Hays County will seek advice from the USFWS about the implications of such knowledge. Hays County will also take such knowledge into account when revising management plans and evaluating subsequent preserve acquisitions.

9.1.4 Covered Species Become Delisted

The goal of the ESA is to conserve endangered and threatened species to ensure their long-term survival in the wild. At that point species are "recovered," and protection of the ESA is no longer necessary. To delist species, the USFWS is required to determine that threats have been eliminated or controlled, based on several factors including population sizes and trends and the stability of habitat quality and quantity. For delistings that result from recovery, the ESA requires the USFWS to monitor the species for at least five years in order to assess their ability to sustain themselves without the protective measures of the ESA. Conservation programs like the RHCP may contribute to the recovery of one or more of the covered species.

If one or more of the covered species becomes delisted due to recovery, Hays County may discuss with the USFWS any potential changes or amendments to the RHCP or Permit conditions that may be appropriate under this changed circumstance.

9.1.5 Covered Species Become Extinct

Despite the presence of conservation programs like the Hays County RHCP, one or more of the covered species could become extinct due to a variety of factors across their ranges, including conditions at wintering grounds.

If one or more of the covered species becomes extinct in the wild, Hays County and the USFWS may negotiate an amendment to the Permit and RHCP to remove the conservation obligations with respect to the extinct species.

9.1.6 Changed Circumstances Not Provided for in the Plan

If additional conservation or mitigation measures are deemed necessary to respond to changed circumstances and such measures were not provided for in the RHCP, the USFWS will not require any conservation or mitigation measures in addition to those provided for in the Plan without the consent of the County, provided that the RHCP is being properly implemented.

9.2 Unforeseen Circumstances

"Unforeseen circumstances" are changes in circumstances affecting a species or geographic area covered by a habitat conservation plan that could not reasonably have been anticipated by plan developers and the USFWS at the time of the conservation plan's negotiation and development, and that result in a substantial and adverse change in the status of any covered species. The USFWS will have the burden of demonstrating that unforeseen circumstances exist and must base the determination on the best scientific and commercial data available. The USFWS shall notify the County in writing of any unforeseen circumstances the USFWS believes to exist.

No Surprises assurances apply to the species that are "adequately covered" under this RHCP. Species are considered to be "adequately covered" if the RHCP satisfied the permit issuance criteria contained in ESA section 10(a)(2)(B) with respect to that species. The species currently considered adequately covered under this RHCP, and thus benefited by the No Surprises policy, are the golden-cheeked warbler and black-capped vireo.

The No Surprises rule states that USFWS may require additional conservation measures of an incidental take permittee as a result of unforeseen circumstances "only if such measures are limited to modifications within conserved habitat areas, if any, or to the conservation plan's operating conservation program for the affected species, and maintain the original terms of the conservation plan to the maximum extent possible." The USFWS shall not require the commitment of additional land, water, or financial resources by the permittee without the consent of the permittee, or impose additional restrictions on the use of land, water, or other natural resource otherwise available for use by the permittee under the original terms of the incidental take permit. No Surprises assurances apply only to the species adequately covered by the habitat conservation plan, and only to those permittees who are in full compliance with the terms of their plan, incidental take permit, and other supporting documents.

In the event of an unforeseen circumstance, the USFWS shall provide at least 30 days written notice of a proposed finding of unforeseen circumstances to Hays County and will work with the County to develop an appropriate response to the new conditions. The County shall have the opportunity to submit information to rebut the proposed finding, if it deems necessary. The USFWS may request that the County alter the conservation program to address the unforeseen circumstance, provided that the requested alterations are limited to the conservation program and maintain the original terms of the RHCP to the maximum extent possible. Pursuant to the No Surprises policy, the USFWS may not require the dedication of additional resources, including land, water, funding, or restrictions on the use of resources otherwise available for development or use by RHCP participants.

10.0 ALTERNATIVES CONSIDERED

Section 10(a)(2)(A) of the ESA requires that habitat conservation plans include a description of the "alternative actions to such taking the applicant considered and the reasons why such alternatives are not being utilized."

The alternatives considered in the RHCP include a "No Action" alternative that is required for analysis under the National Environmental Policy Act (NEPA). The No Action alternative reflects the status quo, where Hays County does not have a local, comprehensive solution for ESA compliance.

The three other alternatives considered by Hays County are based on a regional habitat conservation plan framework and have several common elements, including:

- The Plan Area will include all of Hays County;
- The plan duration and Permit term will be 30 years from the date of approval;
- The species covered for incidental take include the golden-cheeked warbler and black-capped vireo;
- The area of potential habitat loss for the covered species in Hays County over the term of the Permit would be approximately 22,000 acres for the warbler and 3,300 acres for the vireo;
- The preserve system would be assembled with a mix of fee simple acquisitions and conservation easements;
- Mitigation credit would be generated based on the amount of potential habitat for covered species on a preserve parcel at a rate of one credit for each acre of potential habitat;
- The typical criteria for a preserve block includes a minimum size of 500 acres;
- Perpetual monitoring and management of preserves;
- Voluntary participation in the plan that is open to all project proponents whose projects could impact warbler and/or vireo habitat within Hays County; and
- Mitigation for project participants would be assessed based on the amount of potential habitat impacted by a project and paid as a per acre fee or, in certain circumstances, as land in lieu of fees. The USFWS reserves the right to review and approve all mitigation assessments.

The ability of each alternative to help resolve the anticipated conflicts between the needs of a growing population and sensitive environmental features provide the basis for evaluating the

alternatives. The alternatives are also compared according to their ability to contribute towards the goals and objectives described in Section 6.1.

10.1 No Action Alternative

The "No Action" alternative is the scenario whereby Hays County would not undertake the development of a regional habitat conservation plan nor seek an incidental take permit with a long-term, county-wide scope. This alternative also functions as the "no take" alternative pursuant to the HCP Handbook.

Under this alternative, Hays County would continue to be responsible for compliance with the ESA during the planning and construction of County-sponsored projects. Such projects could include the construction or widening of county roads, the upgrading of low water crossings or bridges, and the construction of new county facilities. Compliance with the ESA under the No Action alternative would occur on a project-by-project basis. The County would not provide assistance to other entities seeking to comply with the ESA, nor would the County be involved in efforts to consolidate mitigation from different permitting actions across the county.

For each Hays County project that could affect endangered species, the County would be responsible for identifying potential habitat on the project area and conducting species surveys to estimate potential impacts. The County would need to coordinate directly with the USFWS to determine mitigation needs and obtain incidental take authorization for each project. The County would also need to identify and obtain appropriate conservation land or other forms of mitigation for each project where mitigation for incidental take was required.

Since mitigation would be assessed on a project-by-project basis, it is likely that mitigation requirements for these individual projects would be higher than under a more coordinated conservation approach. Nevertheless, the resulting mitigation lands would likely be small and scattered across the County, since each mitigation commitment would be tailored to the needs of a single, specific project. It is possible that mitigation for County projects could also be obtained outside of the County.

Compliance with the ESA on an individual project-by-project basis would likely extend schedule and cost of important public infrastructure projects and delay project completion. The County could also have more difficulty finding and obtaining appropriate mitigation for individual projects.

Management and monitoring of relatively small and isolated preserves could also be more difficult and costly under the No Action alternative. Smaller preserves would be more subject to the negative impacts of adjacent land uses, since more of the preserve land would be located near a preserve edge. More intensive management and monitoring could be needed to maintain the mitigation value of these smaller preserves.

Due to the limited conservation value of a system of relatively small and isolated preserves, it is likely that public access to the preserves would not be allowed.

Under the No Action alternative, Hays County would have no involvement with or responsibility for the actions of non-county entities with respect to ESA compliance. Hays County would not dedicate staff or funds to assisting the public with compliance and would have no obligation to provide mitigation for incidental take caused by entities other than the County. Like Hays County, other project proponents in the county would be responsible for determining whether compliance with the ESA is necessary for a particular project and individually negotiating with the USFWS to obtain authorization for incidental take. Individual compliance with the ESA through a Section 7 consultation or a Section 10 incidental take permit is often a time consuming and costly process.

Currently, public knowledge of ESA requirements and the enforcement presence by the USFWS in Hays County is generally low. It is likely that many land development projects in recent years have proceeded without complying with the ESA (only one habitat conservation plan has been approved in Hays County for the golden-cheeked warbler since the species has been listed). The No Action alternative does not include a public education and outreach component by the County to increase awareness of endangered species issues, provide information on how to minimize impacts to covered species, or streamline ESA compliance for other entities. Therefore, the No Action alternative is likely to result in the continued loss and fragmentation of endangered species habitat in Hays County without appropriate mitigation.

10.2 Moderate Preserve System with a Take Limit

One of the regional alternatives considered by Hays County features the acquisition of a modestly sized preserve system of approximately 3,000 acres and limiting the amount of incidental take authorized by the permit. This alternative illustrates a conservation program that could be relatively easy for the County to afford, but might not satisfy the anticipated need for incidental take authorization over the duration of the permit.

Under the Moderate Preserve/Limited Take alternative, Hays County would identify specific criteria for the location, configuration, habitat composition, and acquisition schedule of the 3,000-acre preserve system. The preserve system would be designed and managed to maximize the conservation value of the protected lands. Since maximizing the mitigation value of the preserve lands would be the primary goal of this conservation program, it is likely that public access to the preserves would not be allowed. Hays County would commit to acquiring a preserve system that met the all of the preserve design criteria described in the habitat conservation plan.

In return for the commitment to acquire a well-designed and managed preserve system that met the identified criteria, Hays County would be authorized to incidentally take a limited area of warbler or vireo habitat outside of the target acquisition area. Since the preserve system

would be acquired under a specific set of criteria designed to maximize its conservation value, the amount of incidental take authorized by the permit could be slightly greater than a one-to-one mitigation ratio. Assuming that the USFWS agreed to such a mitigation ratio, the amount of habitat loss for the covered species that could be authorized under this alternative could be as much as approximately 3,600 acres. Increasing the amount of incidental take authorized under the Moderate Preserve/Limited Take alternative would require a major amendment of the incidental take permit.

The conservation program described in this alternative includes a pre-determined preserve system that identifies properties for possible acquisition that are not already owned by the County. Implementing the Moderate Preserve/Limited Take alternative would trigger several provisions of Texas state law related to the development of regional habitat conservation plans by local governments. Under state law, the County must acquire the targeted properties within four years of permit issuance.

Given the rapid pace of population growth in Hays County, it is possible that the County and/or voluntary plan participants could use the 3,600 acres of permitted incidental take before the end of the Permit term. Loss of potential habitat for the covered species in Hays County during the Permit term is projected to reach approximately 22,000 acres for the warbler and approximately 3,300 acres for the vireo. Assuming the participation rates described in Section 5.2, the plan would need to provide approximately 10,300 acres of incidental take authorization to meet the expected need. The 3,600 acres of incidental take authorization allowed under the Moderate Preserve/Limited Take alternative would only be sufficient to cover approximately 35 percent of the expected 30-year need.

10.3 Preferred Alternative: Phased Conservation Bank with a Moderate Preserve Goal (the Hays County RHCP)

The Hays County RHCP incorporates the County's preferred conservation strategy of establishing a conservation bank that would be assembled on a phased basis with a target acquisition goal over the 30-year term of the Permit. Under this alternative, the County would seek incidental take authorization for the covered species that would be sufficient to cover the anticipated need based on estimates of private and public sector land development activities, the amount of potential habitat impacted by those activities, and the level of anticipated participation in the RHCP by project proponents in those sectors (see Section 5.2).

The County would assemble a preserve system on a phased basis, banking mitigation credits as parcels are acquired. The preserve acquisitions would generate mitigation credits based on the number of acres of potential habitat in the preserve. The credits could be used by the County or sold to plan participants. However, the County would not be able to use more take authorization at any given time than it has mitigation credits banked from actual preserve acquisitions. The County has identified a target goal for acquiring between 10,000 and 15,000

acres by the end of the Permit term. A preserve system of this size should contain sufficient acres of habitat for the covered species to generate at least 9,000 acres of warbler mitigation credits and 1,300 acres of vireo mitigation credits at a typical ratio of one credit created for each acre of potential habitat protected in the preserve. The number of mitigation credits created by acquisition of the preserve system should also be sufficient to meet the anticipated need for incidental take authorization for the County and potential RHCP participants over the term of the Permit (see Section 5.2).

Public access to preserves could be allowed where the activity would not appreciably reduce the conservation value of the preserve.

The proposed RHCP utilizing a Phased Bank/Moderate Goal approach would include provisions for public education and outreach regarding endangered species issues and provide information to help the community avoid impacts to sensitive natural resources. The RHCP would also provide some resources, when practicable, for activities specifically designed to benefit other species addressed in the RHCP.

10.4 Large-Scale Preserve System

The Large-Scale Preserve System alternative would create a regional plan administered by Hays County with a conservation program utilizing a pre-determined preserve approach. Under this alternative, the preserve system would be large enough to authorize the incidental take of all remaining warbler or vireo habitat in Hays County outside of the target acquisition area of the preserve system.

Under the Large-Scale Preserve System alternative, Hays County would identify specific criteria for the location, configuration, habitat composition, and acquisition schedule of the preserve system. The preserve system would be designed and managed to maximize the conservation value of the protected lands. Since maximizing the mitigation value of the preserve lands would be the primary goal of this conservation program, it is likely that only very limited public access to the preserves would be allowed. Hays County would commit to acquiring a preserve system that met the all of the criteria described in the habitat conservation plan.

In return for the commitment to acquire a large-scale, well-designed, and appropriately managed preserve system that met the identified criteria, Hays County would be authorized to incidentally take all of the remaining areas of warbler or vireo habitat outside of the target acquisition area. Since the preserve system would be acquired under a specific set of criteria designed to maximize its conservation value, the amount of incidental take authorized by the permit could be greater than a one-to-one mitigation ratio.

Under this alternative, Hays County would assemble a pre-determined preserve system of 30,000 acres. The County would be able to permit incidental take associated with the loss or

degradation of the remaining approximately 143,000 acres of potential warbler habitat and approximately 20,000 acres of potential vireo habitat in Hays County.

The conservation program described in this alternative includes a pre-determined preserve system that identifies properties for possible acquisition that are not already owned by the County. Implementing the Large-Scale Preserve alternative would trigger several provisions of Texas state law related to the development of regional habitat conservation plans by local governments. Under state law, the County must acquire the targeted properties within four years of permit issuance.

10.5 Comparison of Alternatives

The primary characteristics of the four alternatives described above are summarized in Table 10-1.

Table 10-1. Comparison of the Alternatives Considered.

Alternative	Incidental Take Authorized*	Preserve Size	Conservation Strategy
No Action	n/a	n/a	No Regional HCP -- Project-by-project Negotiation and Permitting through USFWS
Moderate Preserve/Limited Take	3,600 acres	3,000 acres	Regional HCP with a Pre-determined Preserve System
Proposed Hays County RHCP (Phased Bank/Moderate Goal)	10,300 acres	10,000 to 15,000 acres	Regional HCP with a Phased Conservation Bank
Large-Scale Preserve System	163,000 acres	30,000 acres	Regional HCP with a Pre-determined Preserve System

* Take is measured in acres of incidental habitat impact for the covered species.

10.5.1 Meeting the Project Purpose

The purpose of the proposed project is for Hays County to develop a regional habitat conservation plan that would allow the County to streamline ESA compliance for its own projects, to coordinate conservation planning for endangered species, and to extend the program to other entities in Hays County.

The No Action alternative would not result in a regional habitat conservation plan and would neither streamline ESA compliance nor coordinate mitigation efforts. Therefore, the No Action alternative would not satisfy the purpose of the proposed project.

The remaining alternatives would each result in the development of a regional habitat conservation plan that would streamline ESA compliance for County projects. Each of these

alternatives would extend incidental take authorization for the covered species to other entities in Hays County seeking to comply with the ESA. These regional alternatives would allow the County to consolidate mitigation requirements into a coordinated, regional preserve system. Therefore, the three regional habitat conservation plan alternatives would satisfy the purpose of the proposed project.

10.5.2 Meeting the Need for Incidental Take Authorization

Hays County currently has approximately 170,355 acres of potential warbler habitat scattered across the county with varying degrees of quality. Of this potential habitat, approximately 22,000 acres of potential warbler habitat and is projected to be lost or substantially impacted by land development activities over the next 30 years. Similarly, approximately 23,855 acres of potential vireo habitat may occur in Hays County, with approximately 3,300 acres of this habitat projected to be lost or degraded over the next 30 years. Given the assumptions described in Section 5.2, approximately 9,000 acres of incidental take authorization for the warbler and 1,300 acres of take authorization for the vireo may be needed over the term of the Permit.

Under the No Action alternative, Hays County would only seek incidental take authorization on a project-by-project basis for County projects. This approach would satisfy the County's need for incidental take authorization, but would not help meet the need for incidental take authorization for any other projects in Hays County.

The Moderate Preserve/Limited Take alternative would only meet a portion of the anticipated need for incidental take authorization over the 30-year permit duration (i.e., only approximately 35 percent of the anticipated need). It is likely that the plan would utilize all of the incidental take authorization before the end of the permit term, which would suspend any new participation in the plan until a major permit amendment to increase the amount of authorization incidental take (and acquire additional preserve land) could be completed. The Moderate Preserve/Limited Take alternative would not meet the expected 30-year need for incidental take authorization in Hays County without a permit amendment.

The flexibility of the proposed RHCP (i.e., the Phased Bank/Moderate Goal alternative) would allow the County to meet the anticipated need for incidental take authorization over the next 30 years. The phased bank approach would allow the County to acquire preserves as needed to meet the actual demand for mitigation credits over the term of the Permit, but would also include a defined goal to demonstrate commitment to the conservation of the covered species. This alternative would provide sufficient incidental take authorization to operate the plan for 30 years.

The Large-Scale Preserve System alternative would provide incidental take authorization in excess of the projected 30-year need. This alternative would allow the incidental take of all remaining potential habitat for the covered species in Hays County outside of the preserve

system. A permit amendment would allow Hays County to continue to operate the plan beyond the original 30-year permit term, since no additional take or mitigation would need to be provided.

10.5.3 Funding and State Law Constraints

The No Action, Moderate Preserve/Limited Take, and the proposed RHCP alternatives are each practical for Hays County to implement given the current financial status of the County. Each of these alternatives is also consistent with the applicable provisions of Texas state law concerning regional habitat conservation plans.

However, the Large-Scale Preserve System alternative is not a practicable alternative in terms of available funding and state law considerations.

The estimated cost to acquire 30,000 acres of preserve land under the Large Scale Preserve System alternative at the current average cost of undeveloped land in Hays County (i.e., approximately $11,500 per acre) is approximately $345 million. Undertaking this level of financial commitment within four years is beyond the means of Hays County.

Acquiring 30,000 acres in four years is very likely beyond Hays County's ability to manage. Acquiring an average of 7,500 acres per year for four years would require resources that are well beyond the County's and any other Central Texas local government's ability to assemble and manage in a timely and affordable basis. This level of sustained real estate activity by a local government entity would be unprecedented in the State of Texas.

Finding owners of 30,000 acres of habitat land that are "willing sellers" in a four year period, even by including conservation easements with private landowners, at an affordable price is highly improbable. The potential for individual landowners to delay or disrupt the acquisition program through reluctance or refusal to sell targeted or key properties creates an unacceptable risk under this alternative.

10.5.4 Conclusions

The No Action Alternative would not satisfy the purpose of the proposed project, which is to develop a regional, locally supported option for ESA compliance that allows for coordinated conservation planning. Therefore, Hays County has rejected this alternative.

The Moderate Preserve/Limited Take alternative is structured as a regional habitat conservation plan, but the scale of this alternative would not meet the anticipated need for incidental take authorization over the permit term. Therefore, Hays County has also rejected this alternative.

The Large-Scale Preserve System alternative would provide the highest level of conservation among the four alternatives. However, funding the acquisition of a 30,000-acre pre-determined preserve system would not be possible given the resources available to Hays

County. Further, Texas state law regarding local governments and regional habitat conservation plans would require that the entire preserve be acquired from willing sellers within four years of permit issuance. It is highly unlikely that Hays County would be able to complete the preserve system within these constraints. Therefore, Hays County has rejected the Large-Scale Preserve System alternative.

The proposed RHCP with a Phased Bank/Moderate Goal conservation approach would meet the purpose of the proposed project, would satisfy the need for incidental take authorization over the 30-year term of the Permit, and would be feasible for Hays County to implement. Therefore, the proposed Hays County RHCP is the County's preferred alternative.

11.0 COMPLIANCE WITH ESA ISSUANCE CRITERIA

Hays County anticipates that the RHCP meets the issuance criteria required by Section 10(a)(2)(A) of the ESA. However, legally, the USFWS must determine whether or not the RHCP meets the issuance criteria.

The RHCP describes the impacts that are likely to result from the expected taking in the county over the Permit term, the steps that Hays County will implement to minimize and mitigate the impacts, the funding available to implement those steps, and alternatives that were considered by Hays County in the formulation of the RHCP.

Before issuing an incidental take permit pursuant to Section 10(a)(1)(B) of the ESA, the USFWS must find that the RHCP meets certain "issuance criteria" described in Section 10(a)(2)(B). Specifically, the USFWS must find that the take of listed species will be incidental to an otherwise lawful activity; that the applicant will, to the maximum extent practicable, minimize and mitigate the impacts of the taking; that adequate funding sources are available and committed to long-term implementation of the plan; and that the taking covered by the permit will not jeopardize the survival and recovery of the species in the wild. The following section summarizes how the RHCP meets the issuance criteria.

11.1 Incidental Nature of the Taking

The RHCP covers the impacts associated with take that will be incidental to otherwise lawful activities, and not the purpose of such activities. Incidental take in the county may be caused by the loss of habitat associated with construction of residential developments, commercial developments, roadways and improvements, utilities and other infrastructure, school construction, and other lawful land uses, as described in Section 5.1.

11.2 Minimization and Mitigation of Impacts

As detailed in Section 6.0, Hays County will, to the maximum extent practicable, minimize and mitigate the impacts of taking the covered species.

11.2.1 Minimization Measures

The RHCP encourages public and private entities engaged in land development or infrastructure projects in the county to avoid or minimize impacts to the covered species.

The RHCP promotes the avoidance or minimization of impacts by providing maps and other guidance on the location of potential habitat for the covered species (Section 6.2.1). The County will publish maps of potential habitat for the covered species (as available), karst geology, and the general locations of known caves and other karst features so that potential RHCP participants and other members of the public will have access to the available information.

The County will also modify its application process for subdivision and development approvals by requiring that applicants provide preliminary information on the possible presence or absence of habitat for the covered species within project sites. The County will use this information to encourage (but not require) participation in the RHCP (Section 6.2.2).

The RHCP also includes provisions for minimizing disturbance to the golden-cheeked warbler and the black-capped vireo during their nesting seasons through seasonal restrictions on clearing activities (Section 6.2.3). Preventing the establishment and/or spread of oak wilt disease is also included in the RHCP, to minimize unintended damage to habitats for the covered species (Section 6.2.4).

The County will prepare and distribute materials for the general public to enhance awareness of endangered species issues in Hays County and promote the conservation of natural resources (Section 6.2.5).

The County will utilize its subdivision development inspectors to monitor for compliance with the terms and conditions of Participation Agreements with RHCP participants, such as adherence to site plans used as the basis for determining participation, seasonal clearing and construction restrictions, and oak wilt precautions.

11.2.2 Mitigation of Impacts to Covered Species

The mitigation measures described in Section 6.3 will offset the impacts of the activities covered by the Permit. The conservation measures described in this section will be beneficial to the covered species, evaluation species, and additional species.

The golden-cheeked warbler and black-capped vireo will benefit from the system of preserves that will be established, managed, and monitored in perpetuity pursuant to Section 6.3. The lands included in the preserves will include suitable breeding habitat protected in patches of sufficient size to minimize impacts associated with adjacent land uses. In addition to the protection of breeding habitat, the covered species will benefit from habitat management and monitoring (Section 6.4) and public awareness programs (Section 6.2.5). These efforts are consistent with recommendations in the birds' recovery plans.

All of the species addressed in the RHCP will benefit from the public education efforts that will occur during the implementation of the RHCP. Over the life of the RHCP, it is anticipated that substantial funding will be invested by the County in education and outreach efforts (lectures, videos, brochures) intended to increase public awareness of the species' habitat requirements and conservation needs.

The mitigation measures contained in the RHCP are the maximum that can practicably be implemented by Hays County. As shown in Section 8.0, the County is committing substantial financial resources to implement the RHCP. This commitment is the maximum amount economically and politically feasible for the County.

11.3 Adequacy of Funding

Hays County will ensure that adequate funding for the RHCP and procedures to deal with changed and unforeseen circumstances are implemented. The expected costs and revenue sources for the RHCP over the 30-year period of the Permit are detailed in Section 8.0. The proposed funding sources are reliable and will enable the County to meet the purposes of the RHCP.

11.4 Survival and Recovery of the Species

Section 7(a)(2) of the ESA requires that each federal agency must consult with the USFWS to ensure that agency actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat (16 USC § 1536(a)(2)).

As discussed in Section 5.3, it is the applicant's view that the incidental take authorized by the Permit will not reduce the likelihood of survival and recovery of the covered species in the wild. Rather, implementation of this Hays County RHCP will provide a net benefit to the covered species by preserving larger blocks of contiguous habitat than would be provided by individual permit authorizations that will be managed specifically for those species in perpetuity, and by supporting objectives in the species' recovery plans, including preserve acquisition, preserve management, scientific research, and public awareness.

With respect to the other listed species in Hays County that are not covered for incidental take by the RHCP (i.e., Texas wild rice, Comal Springs riffle beetle, Comal Springs dryopid beetle, fountain darter, San Marcos salamander, Texas blind salamander, and possibly the undescribed northern Hays County Eurycea salamander), it is the applicant's view that issuance of the Permit and issuance of the RHCP will not jeopardize these species or result in the destruction or adverse modification of critical habitat.

The RHCP and Permit authorize incidental take of the warbler and vireo primarily through the clearing of potential habitat for these species that would be associated with a variety of land development activities; it does not authorize the land development itself. This RHCP and permit will not authorize incidental take of species not covered by the permit.

Even assuming that land development is interrelated to the authorized take, it is the applicant's view that the cumulative effects of this interrelated land development in Hays County would likely be negligible when compared to the extent of the Edwards Aquifer recharge and contributing zones. The RHCP assumes that approximately 48,100 acres of land development may occur in Hays County during the 30-year term of the Permit. This area represents less than two percent of the total area of the Edwards Aquifer recharge and contributing zones and any effects would be distributed over 30 years.

It is the applicant's view that additional factors are likely to limit any cumulative impact of potentially interrelated land development on the listed aquatic species in Hays County. Land development activities in Hays County are already subject to a baseline set of water quality protection measures (primarily the Edwards Aquifer Rules), administered by the TCEQ. As described in Appendix D, local water quality ordinances may also apply to land development within city jurisdictions. The RHCP promotes the avoidance and minimization of impacts to listed aquatic species in Hays County through education and outreach efforts and by the protection of large blocks of undeveloped land in the RHCP preserve system. The RHCP encourages the use of the TCEQ optional enhanced measures for water quality protection (which are designed to avoid take of listed aquatic species due to water quality impacts associated with land development) and will distribute these measures to subdivision and development applicants. Other emerging conservation efforts for listed aquatic species include the Edwards Aquifer Recovery Implementation Program, the Barton Springs-Edwards Aquifer Conservation District Habitat Conservation Plan, and the San Marcos River Habitat Conservation Plan.

12.0 COMPLIANCE WITH TEXAS STATE LAW

As described in Section 1.4.2, Texas state law establishes certain requirements related to the development of regional habitat conservation plans by governmental entities, including counties. The requirements are codified as Subchapter B, Chapter 83 of the Texas Parks and Wildlife Code. The law imposes procedural requirements, such as the requirement to establish a Citizens Advisory Committee, appoint a Biological Advisory Team, comply with open records and open meetings laws, comply with public hearing requirements, provide a grievance process to Citizens Advisory Committee members, and acquire pre-determined preserves by specific deadlines.

The RHCP has been formulated in compliance with all of the procedural requirements regarding regional habitat conservation plans. A Citizens Advisory Committee with 17 members (including the requisite number of landowner members) was established in June 2007. A Biological Advisory Team with seven members was established by September 2007. Both committees have held numerous meetings and have discussed the scientific, economic, and policy issues associated with the RHCP. The committees reviewed multiple drafts of the RHCP and provided comments on the drafts. All meetings of the committees have been conducted in compliance with open records and open meeting laws.

Under Chapter 83, governmental entities participating in a RHCP are prohibited from taking any of the actions cited below. Hays County will continue to comply with state law, including but not limited to the following provisions:

1. Imposing any sort of regulation related to endangered species, unless the regulation is necessary to implement an RHCP for which the governmental entity was issued a federal permit (Texas Parks and Wildlife Code § 83.014(a)).
2. Discriminating against a permit application, permit approval, or request for utility service to land that has been designated a habitat preserve for an RHCP (§ 83.014(b)).
3. Limiting water or wastewater service to land that has been designated as habitat preserve (§ 83.014(c)).
4. Requiring a landowner to pay a mitigation fee or set aside, lease, or convey land as habitat preserve as a condition to the issuance of a permit, approval, or service (§ 83.014(d)).

In addition, Chapter 83 stipulates that the mitigation in a regional habitat conservation plan must be based on the amount of harm to each endangered species the plan will protect. However, after notice and hearing, a regional habitat conservation plan may include additional conservation measures if they are based on the USFWS recovery criteria for the species covered by the plan. In this case, the preserve system for golden-cheeked warblers and black-capped

vireos established by the conservation bank will constitute mitigation for the loss of potential habitat that the County will experience over the 30-year term of the Permit. Mitigation will be based on the results of an on-site habitat determination, a review of specific site plans for each participating project, and defined mitigation ratios, as described in Section 7. 4.

Chapter 83 stipulates that governmental entities participating in an RHCP must demonstrate that adequate sources of funding exist to acquire land designated for habitat preserves within four years. In the RHCP, no parcel of land has been designated as a proposed habitat preserve; therefore, the RHCP need not demonstrate that adequate sources of funding exist to acquire any specific parcel within a specific time frame.

Finally, Chapter 83 mandates that a plan proponent must hold a public hearing and publish notice of the hearing in the newspaper prior to adopting a regional habitat conservation plan. In this case, the County held a public hearing on November 18, 2009 after publishing a notice of hearing on the RHCP website (www.hayscountyhcp.com) and in the following printed publications:

- San Marcos Daily Record (October 16, 2009);
- Austin American Statesman (October 19, 2009);
- Hays Free Press (October 21, 2009); and
- Federal Register (Vol. 74, No. 210, Page 56655; November 2, 2009).

13.0 GLOSSARY OF TERMS AND ABBREVIATIONS

Adequately covered - Species are considered to be "adequately covered" by a habitat conservation plan if the plan meets all of the incidental take permit issuance criteria contained in ESA Section 10(a)(2)(B) with respect to that species. The species currently considered adequately covered under the Hays County RHCP are the golden-cheeked warbler and black-capped vireo.

BCV – Abbreviation for the "black-capped vireo," which is one of the covered species in the RHCP.

Biological Advisory Team ("BAT") – A committee of scientific and resource management experts assembled to assist with the development of the RHCP, in accordance with the requirements of Texas Parks and Wildlife Code Chapter 83.

CAD – Abbreviation for "Computer Aided Design," which is computer software typically used by engineers to design development and other land-based projects.

CAPCOG – Abbreviation for "Capital Area Council of Governments."

Certificate of Participation – Document issued by Hays County to a RHCP participant upon execution of a Participation Agreement and payment of mitigation fees. Hays County will record the issued Certificate of Participation, which will include a specific designation of the land to which the certificate applies, in the Real Property Records of Hays County. A copy of the recorded Certificate of Participation must be posted at the relevant property site during any activities affecting the potential habitat of species addressed in the Certificate of Participation.

Changed circumstances – Changed circumstances are defined in federal regulations as "circumstances affecting a species or geographic area covered by a conservation plan that can reasonably be anticipated by plan developers and the Service and that can be planned for..."

Citizens Advisory Committee ("CAC") – A committee of community stakeholders, including landowner representatives, assembled to assist with the development of the RHCP, in accordance with the requirements of Texas Parks and Wildlife Code Chapter 83.

Covered species – Species included in the RHCP for which incidental take authorization under the ESA is sought.

Critical habitat – Specific geographic areas, whether occupied by a listed species or not, that are essential for its conservation and that have been formally designated by rule published in the Federal Register.

Determination Letter – A letter issued to a RHCP applicant by Hays County that identifies the applicant's cost of participation in the RHCP.

Endangered Species Act ("ESA") – The Endangered Species Act of 1973, as amended, is federal legislation intended to provide a means to conserve the ecosystems upon which

endangered and threatened species depend and provide programs for the conservation of those species, thus preventing extinction of plants and animals.

Environmental Impact Statement ("EIS") – A document that describes and evaluates the environmental impacts of a proposed action under the National Environmental Policy Act ("NEPA").

GCW – Abbreviation for the "golden-cheeked warbler," which is the primary covered species in the RHCP.

GIS – Abbreviation for "Geographic Information System," which is computer software that processes geographic data and is commonly used to map and analyze landscape features.

Habitat conservation plan ("HCP") – A document prepared to support an application to the USFWS for an incidental take permit under Section 10(a)1(B) of the Endangered species Act. A habitat conservation plan must describe the impacts to the species, the steps to minimize and mitigate such impacts, the alternatives considered, and other measures required by the USFWS.

Habitat determination – Habitat determinations are prepared by Hays County for potential RHCP participants and document the location and extent of potential habitat within a project area, as delineated from the review of background information and the on-site assessment. The habitat determination will also include a calculation of the acreage of potential habitat on a project area.

Harm – An action defined by the ESA as an "act that actually kills or injures wildlife and may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns including breeding, feeding or sheltering." Harm of federally endangered wildlife is prohibited by Section 9 of the ESA.

HCAD – Abbreviation for "Hays Central Appraisal District."

Incidental take – Take that results from, but is not the purpose of, carrying out an otherwise lawful activity.

Incidental take permit ("Permit") – A permit issued by the USFWS to a non-federal entity that authorizes incidental take of a federally endangered or threatened species under Section 10(a)1(B) of the ESA. "Permit" in this document refers to the incidental take permit associated with the RHCP.

Issuance criteria – Before issuing an incidental take permit, the USFWS must find that a habitat conservation plan meets certain "issuance criteria" described in Section 10(a)(2)(B). The USFWS must find that the take of listed species will be incidental to an otherwise lawful activity; that the applicant will, to the maximum extent practicable, minimize and mitigate the impacts of the taking; that adequate funding sources are available and committed to long-term implementation of the plan; and that the taking covered by the permit will not jeopardize the survival and recovery of the species in the wild.

Jeopardy – An action defined by the ESA as an action that would reasonably be expected, directly or indirectly, to appreciably reduce the likelihood of the survival and recovery of the species.

M&O funds – Abbreviation for "Maintenance and Operations Funds."

Mitigation – Actions that compensate for adverse impacts to a resource.

Mitigation assessment – The amount of mitigation needed to authorize incidental take associated with a specific project under the RHCP, based on the results of an on-site habitat determination and a site plan review. Mitigation assessments are prepared by Hays County for RHCP applicants.

MoRAP – Abbreviation for "Missouri Resource Assessment Partnership."

MSA – Abbreviation for "Metropolitan Statistical Area."

National Environmental Policy Act ("NEPA") – The National Environmental Policy Act requires federal agencies to undertake an assessment of the environmental effects of their proposed actions prior to making decisions. Two major purposes of the environmental review process are better informed decisions and citizen involvement.

NLCD – Abbreviation for "National Land Cover Dataset."

NMFS – Abbreviation for the "National Marine Fisheries Service."

No Surprises Rule – Assurances provided by the USFWS that provide certainty as to a permittee's future obligations under a habitat conservation plan. So long as an approved habitat conservation plan is being properly implemented, no additional land use restrictions or financial compensation will be required of the permittee with respect to the covered species, even if unforeseen circumstances arise after the permit is issued indicating that additional mitigation is needed.

Participation Agreement – An agreement between the County and a RHCP applicant whereby the applicant agrees to be bound by and comply with the applicable terms of the Permit, and in return, benefits from the authorizations granted by the Permit. In each Participation Agreement, the USFWS shall be named as a third-party beneficiary with the right to enforce all terms of the Participation Agreement.

Plan Area – The area of operation for the Hays County RHCP. The Plan Area includes the extent of Hays County, Texas.

RHCP – Abbreviation for the "Hays County Regional Habitat Conservation Plan." The RHCP supports an application by Hays County for an ESA Section 10(a)1(B) incidental take permit from the USFWS.

RHCP participants – Any non-federal entity, including private citizens, businesses, organizations, or state or local governments or agencies, that voluntarily obtains incidental take authorization for the golden-cheeked warbler and/or black-capped vireo through the Hays County RHCP.

Take – An action defined by the ESA meaning to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct with respect to a

federally listed species. Take may include significant habitat modification or degradation if it kills or injures wildlife by significantly impairing essential behavioral patterns including breeding, feeding, or sheltering. Take of federally endangered wildlife is prohibited by Section 9 of the ESA.

Tax Increment Allocation ("TIA") –

TNRIS – Abbreviation for "Texas Natural Resources Information Service."

TPWD – Abbreviation for the "Texas Parks and Wildlife Department."

Unforeseen circumstances – Changes in circumstances affecting a species or geographic area covered by a habitat conservation plan that could not reasonably have been anticipated by plan developers and the USFWS at the time of the conservation plan's negotiation and development, and that result in a substantial and adverse change in the status of any covered species.

USEPA – Abbreviation for "U. S. Environmental Protection Agency."

USFWS – Abbreviation for the "U.S. Fish and Wildlife Service."

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APPENDIX A

Mapping Potential Golden-cheeked Warbler Breeding Habitat Using Remotely Sensed Forest Canopy Cover Data

Loomis Partners, Inc. (2008)

Mapping Potential Golden-cheeked Warbler Breeding Habitat Using Remotely Sensed Forest Canopy Cover Data

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Table of Contents

List of Figures

List of Tables

1.0 Introduction

1.1 Purpose and Objectives

This study describes a method for mapping potential golden-cheeked warbler (*Dendroica chrysoparia*, GCW) habitat and estimating the relative quality of this habitat based on the average amount of woodland canopy cover in the landscape.

This study was initiated to support the development of the Hays County Regional Habitat Conservation Plan, which includes the golden-cheeked warbler as one of the covered species. A regional accounting of the extent, location, and relative quality of potential warbler habitat was needed to facilitate development of this Plan. However, this mapping product has broader application to planning efforts throughout the range of the warbler. Previously published range-wide information on the extent of golden-cheeked warbler habitat was based on satellite data collected between 1979 and 1981 and analyzed with dated software (Wahl et al. 1990). Further, the actual mapping product of that effort is no longer available. Therefore, recent, range-wide maps and specific county-level maps of the extent and distribution of potential warbler habitat were lacking.

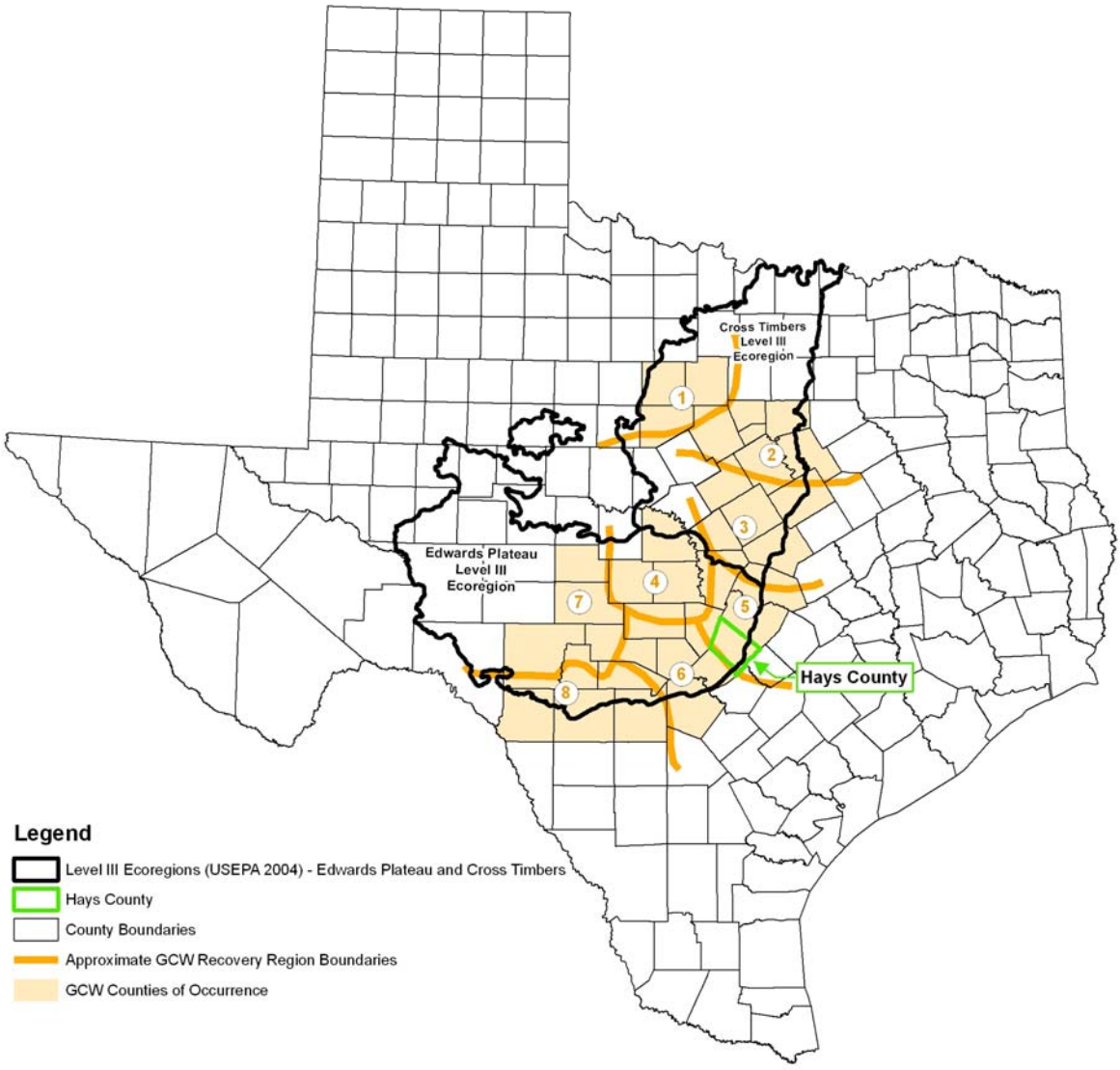
1.2 Golden-cheeked Warbler

The golden-cheeked warbler is a small (about five inches long) insectivorous bird. The warbler was listed as federally endangered by the U.S. Fish and Wildlife Service (USFWS) on December 27, 1990 (55 FR 53153), and the Texas Parks and Wildlife Department also lists the species as endangered in the State of Texas.

The golden-cheeked warbler migrates between wintering grounds in southern Mexico and Central America and breeding grounds in central Texas (Ladd and Gass 1999). Ladd and Gass (1999) describe the breeding range of the warbler as including portions of the Edwards Plateau, Lampasas Cut Plain, Central Mineral Region (or Llano Uplift), Comanche Plateau, Western Cross Timbers and North Central Prairies physiographic regions, as delineated by Kier et al. (1977). Within the range of the warbler, these physiographic regions generally correspond to portions of the Edwards Plateau and Cross Timbers Level III Ecoregions, as mapped by the U.S. Environmental Protection Agency (2004) at a scale of 1:250,000 (Figure 1).

The golden-cheeked warbler is the only bird in Texas that nests exclusively within the state's boundaries (Oberholser 1974). The species has been recorded from 41 of the 254 Texas counties, of which 25 are currently known to have breeding populations. Counties with known breeding populations are Bandera, Bell, Bexar, Blanco, Bosque, Burnet, Comal, Coryell, Gillespie, Hays Johnson, Kendall, Kerr, Kimble, Lampasas, Llano, Medina, Palo Pinto, Real, San Saba, Somervell, Travis, Uvalde, Williamson, and Young (Ladd and Gass 1999).

Figure 1. GCW recovery units and the Edwards Plateau and Cross Timbers ecoregions.



In Texas, the golden-cheeked warbler is an inhabitant of old-growth or mature regrowth juniper-oak woodlands (Pulich 1976, Wahl et al. 1990, USFWS 1992). Ashe juniper (*Juniperus ashei*) and various oak species are the most common tree species throughout the golden-cheeked warbler's breeding range (USFWS 1992). Models predicting warbler use of woodland vegetation suggest that a higher density of deciduous oaks is positively associated with increased warbler density (Wahl et al. 1990).

The golden-cheeked warbler is a slightly forest-interior species (Coldren 1998, DeBoer and Diamond 2006) that also utilizes woodland edges, particularly after young have fledged (Kroll 1980, Coldren 1998). Typical nesting areas are located in dense forest or woodland habitat with a high percent canopy cover in the middle and upper layers (Ladd and Gass 1999). Total tree cover measured at several sites across the breeding range of the warbler averaged 70 percent at three meters, 74 percent at five meters, and 70 percent above 5.5 meters (Ladd and Gass 1999). Others have reported that the species will utilize areas with less overstory canopy cover (down to

approximately 35 percent), particularly during the later part of the breeding season (Ladd and Gass 1999, Campbell 2003).

Ladd and Gass (1999) state that prime warbler habitat is found in patches of at least 250 acres (i.e., 100 hectares), but smaller habitat patches are also utilized by the species (USFWS 1992). Much of the available habitat for the species is within these smaller patches. DeBoer and Diamond (2006) estimated that approximately 32 percent of available warbler habitat range-wide was in patches of less than 100 hectares. However, larger patches have been shown more likely to be occupied by warblers (Coldren 1998, DeBoer and Diamond 2006) and result in better pairing and reproductive success than smaller patches (Coldren 1998).

Male warblers are territorial during the breeding season and defend territories that have been shown to range from approximately four to ten acres (Ladd and Gass 1999).

1.3 National Land Cover Database 2001

The National Land Cover Database (NLCD) 2001 includes land cover classifications, tree canopy cover classifications, and urban impervious cover classifications for the conterminous U.S. and Puerto Rico at a pixel resolution of 30 meters. The dataset was developed by the Multi-Resolution Land Characteristics Consortium (MLRC) to provide relevant land cover information for a variety of scientific, economic, and governmental applications, such as analyzing ecosystem status and health, studying biodiversity patterns, and developing land management policies. The MRLC is an umbrella organization comprised of 13 government programs across 10 federal agencies. The NLCD 2001 is based on Thematic Mapper data derived from Landsat 5 and Landsat 7 imagery collected circa 2001. This dataset updates an earlier publication produced in 1992 (Homer et al. 2004).

For the tree canopy cover classification, the MRLC used a supervised classification method with training data generally obtained from 1-meter resolution digital orthoimagery quarter quadrangles. Additional processing was completed to reduce errors resulting from spectrally similar features (i.e., shrub and grass cover misclassified as tree canopy cover). The NLCD 2001 tree canopy cover dataset assigns a canopy cover density value of 0 to 100 percent to each 30-meter by 30-meter pixel. Preliminary estimates of the accuracy of the dataset suggest that the canopy cover data has an average error range of six to 17 percent deviation from the predicted value (Homer et al. 2004).

2.0 Methods

2.1 Habitat Mapping

NLCD 2001 tree canopy cover data were processed using ESRI ArcGIS software (version 9.2) with the Spatial Analyst extension. The model used the overlapping neighborhood focal functions of the Spatial Analyst extension that create an output raster where the value at each location is a function of the input cells in a specified neighborhood around the location. For this

model, the focal statistic output for each cell was the mean canopy cover of a 7-cell by 7-cell rectangular neighborhood centered on each target cell.

Canopy cover data for each golden-cheeked warbler recovery unit were analyzed independently for faster processing. Recovery unit boundaries were provided in ESRI shapefile format by the Austin Ecological Services Office of the U.S. Fish and Wildlife Service.

Analysis of the NLCD 2001 tree canopy cover data for each golden-cheeked warbler recovery unit followed the processing steps described below with ArcGIS (version 9.3) software using Spatial Analyst geoprocessing tools.

1. Expand the boundary of each warbler recovery unit by 200 meters to avoid edge effects at the boundary during processing;
2. Extract the NLCD 2001 tree canopy cover data for each of eight expanded recovery units;
3. Calculate the mean canopy cover of the surrounding 7-cell by 7-cell rectangular neighborhood of each 30-meter pixel in the recovery unit (i.e., an approximately 10.9-acre area surrounding each target pixel);
4. Extract areas representing potential habitat from the mean canopy cover dataset that are within 3 cells (i.e., 90 meters) of areas with at least 50 percent mean canopy cover;
5. Reclassify mean canopy cover values within potential habitat areas as:
    a. "not likely to be potential habitat" (i.e., mean landscape canopy cover is less than 30 percent; assigned value = NoData);
    b. "potential low quality habitat" (i.e., mean landscape canopy cover is between 30 and 50 percent and is within 90 meters of higher quality potential habitat; assigned value = 1);
    c. "potential medium quality habitat" (i.e., mean landscape canopy cover is between 50 and 70 percent; assigned value = 2); or
    d. "potential high quality habitat" (i.e., mean landscape canopy cover is between 70 and 100 percent; assigned value = 3);
6. Clip the layer to the original extent of the recovery unit boundaries; and
7. Clip each potential habitat raster to the boundary of Edwards Plateau or Cross Timbers Level III Ecoregions as mapped by the U.S. Environmental Protection Agency (2004) at a 1:250,000 scale.

2.2 Probability of Occupancy Analysis

Magness et al. (2006) found that at least 40 percent of the landscape must have woodland cover for a site with suitable habitat to be occupied by golden-cheeked warblers (woodland habitat was defined as vegetation having at least 30 percent woody canopy cover). The study further found that at least 80 percent of the landscape must have woodland habitat before the probability of occupancy of a site by golden-cheeked warblers exceeds 50 percent. This relationship held at a variety of spatial scales (i.e., 3.1 ha, 12.6 ha, 50.2 ha, or 200.9 ha representing approximately 1X, 4X, 6X, and 66X of a typical territory size), and the authors assert that the amount of juniper-oak woodland within 200 hectares surrounding a site is an important predictor of occupancy.

The Magness occupancy model was applied to the habitat map described in Section 2.1 to identify the probability of potential habitat being occupied by the warbler. The results of the Loomis habitat model replaced the "woodland cover" input in the Magness occupancy model. All classes and patch sizes of potential warbler habitat identified by the Loomis model were treated equally in the occupancy analysis.

The processing steps used to run the occupancy analysis using ArcGIS software and the Spatial Analyst extension are described below.

1. Mosaic the individual habitat rasters for each warbler recovery region into a single range-wide raster layer;
2. Reclassify the three habitat classes within the range-wide habitat raster into habitat (value = 1) or non-habitat (value = 0);
3. Calculate the percentage of an 800-meter radius circular neighborhood around each raster cell that is identified as potential habitat;
4. Classify the percent habitat raster values into:
    a. "not likely to be occupied" (0 – 40% habitat in the neighborhood; assigned value = 0);
    b. "may be occupied" (40 – 80% habitat in the neighborhood; assigned value = 10);
    c. "likely to be occupied" (80 – 100% habitat in the neighborhood; assigned value = 20).
5. Add the classified occupancy raster to the original habitat raster to identify the potential for occupancy for each cell of potential habitat. The combined models identify the relative quality of potential habitat and relative probability of occupancy.
    a. Raster values of 1, 2, or 3 = potential low (1), medium (2), and high quality (3) habitat that is not likely to be occupied;

b. Raster values of 11, 12, or 13 = potential low (11), medium (12), and high quality (13) habitat that may be occupied;

c. Raster values of 21, 22, and 23 = potential low (21), medium (22), and high quality (23) habitat that is likely to be occupied.

2.3 Comparison with Mapped Warbler Occurrences

2.3.1 Loomis GCW Observations

Golden-cheeked warbler observations from all presence/absence, territory level, and incidental or modified protocol surveys conducted by Loomis for the species between 2001 and 2008 were compiled into a single database and classified by the sex/age of the bird (i.e., male, female, and juvenile) and the precision of the observation location (i.e., 10 meters, 30 meters, 50 meters, 80 meters, or 100 meters). Precise observations were typically recorded with GPS equipment in the field and had a precision of approximately 10 meters or less.

2.3.2 Hays County GCW Observations

Mapped occurrences of golden-cheeked warblers in Hays County were assembled from the USFWS, the Texas Natural Diversity Database (TXNDD) maintained by the Texas Parks and Wildlife Department, and survey data from Loomis that were not included in the USFWS or TXNDD datasets.

Data from the USFWS were received from the Austin Ecological Services office in November 2006 in GIS format. The data included point records with attribute fields for the observation year and source, notes regarding the quality of the data, and other comments. Much of the attribute documentation was incomplete and lacked notation regarding quality control. The data were compiled from the work of several different surveyors and were dated from between the years 1990 and 2004.

The TXNDD element of occurrence records were obtained in GIS polygon format from the Texas Parks and Wildlife Department in October 2006. The digital polygon records were adapted from original point records compiled on paper maps by the Texas Parks and Wildlife Department that were symbolized by the precision of the record (i.e., second, minute, or general observations). The precision of the original point records were incorporated into the polygon shapes of the updated digital records. Golden-cheeked warbler records in the TXNDD were dated from approximately 1991 to 2005.

Additional point observations in GIS format were provided from survey data collected by Loomis in 2004 that were not included in either the USFWS or TXNDD databases. These observations were collected with GPS equipment in the field or digitized from detailed paper maps as part of a presence-absence survey.

To facilitate comparison of the known warbler localities in Hays County with the Loomis potential habitat map, the point records were generalized to compensate for unknown (but suspected) differences in mapping precision resulting from the variety of surveyors collecting the data, the time period of the content, and the lack of quality control associated with many of the observations in the USFWS dataset. Point records from the USFWS and Loomis were buffered by 300 meters and the resulting polygons were combined with the TXNDD polygons. Overlapping polygons were merged to form discrete polygons representing the vicinity known warbler observations.

3.0 Results

3.1 Potential GCW Habitat Map and Occupancy Analysis

The process described in Section 2 produces a raster dataset with a resolution of 30 meters that identifies the location and relative quality of potential golden-cheeked warbler habitat, based on a landscape analysis of mean tree canopy cover within a 7-cell by 7-cell rectangular neighborhood. The 7-cell by 7-cell rectangular neighborhood covers approximately 10.9 acres, centered on the target cell and approximates the size of a single golden-cheeked warbler territory. The relative quality of potential habitat was divided into three classes:

- Class 1 – "potential low quality habitat" (i.e., mean landscape canopy cover is between 30 and 50 percent and is within 90 meters of higher quality potential habitat);
- Class 2 - "potential medium quality habitat" (i.e., mean landscape canopy cover is between 50 and 70 percent); and
- Class 3 - "potential high quality habitat" (i.e., mean landscape canopy cover is between 70 and 100 percent).

All areas with less than 30 percent mean landscape canopy cover were considered not likely to be potential golden-cheeked warbler habitat. Areas with less than 50 percent mean landscape canopy cover that were isolated (i.e., more than 90 meters distant) from areas with greater mean cover were also considered not likely to be warbler habitat.

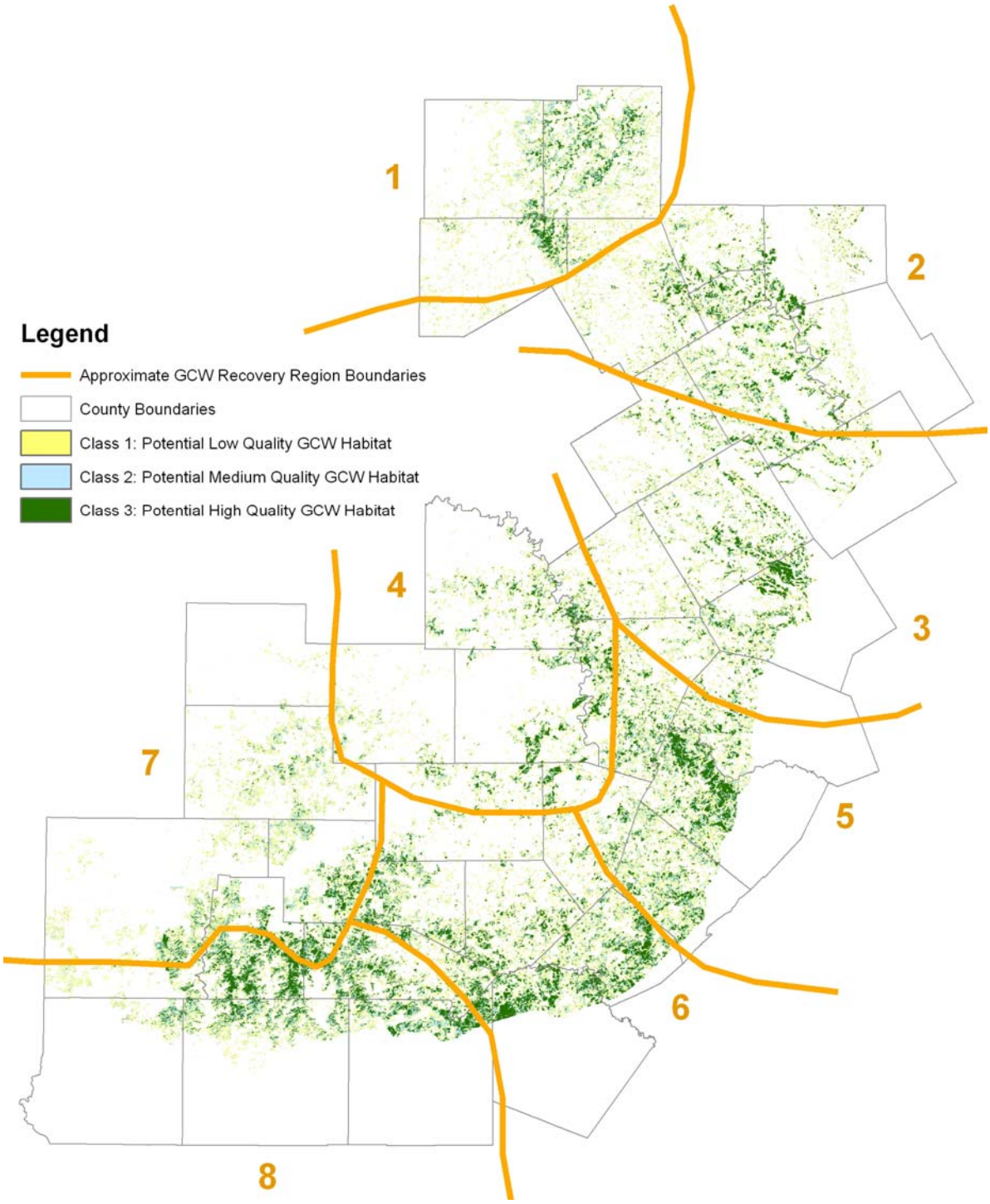
Figure 2 shows the results of the potential habitat model for the range of the species.

The map identifies approximately 4.1 million acres of potential golden-cheeked warbler habitat throughout the range of the species, including nearly 1.6 million acres of potential high quality habitat (Table 1).

The occupancy analysis was based on the methodology described in Magness et al. (2006) and suggests that at least 40 percent of the neighboring landscape must be potential habitat before an area of suitable habitat at a particular location would likely be occupied by the golden-cheeked warbler. At least 80 percent of the neighboring landscape (defined as circle with an 800 meter radius

around a particular location) must be potential habitat before the probability of occupancy at a particular location increases to at least 50 percent.

Figure 2. Potential GCW habitat over the range of the species.



For this analysis, the relative probability of occupancy was divided into three classes:

- "not likely to be occupied" – the percentage of potential habitat in the landscape was between 0 and 40 percent;
- "may be occupied" – the percentage of potential habitat in the landscape was between 40 and 80 percent;
- "likely to be occupied" – the percentage of potential habitat in the landscape was between 80 and 100 percent.

The occupancy analysis suggests that approximately 2.07 million acres of potential warbler habitat range-wide (approximately 50 percent of the total area of potential habitat) is present within a landscape context that has between 40 percent and 80 percent potential habitat and may be occupied by the species. The analysis also suggests that approximately 1.16 million acres of potential warbler habitat (approximately 28 percent of the total area of potential habitat) is present within a landscape context that has at least 80 percent potential habitat and is relatively likely to be occupied by the species (Table 1).

Table 1. Area of potential GCW habitat within each recovery region.

Class	Description	Total Acres of Potential Habitat	Potential Habitat Not Likely to be Occupied	Potential Habitat May be Occupied	Potential Habitat Likely to be Occupied
Recovery Region 1					
1	Potential Low Quality Habitat	164,725	69,742	79,543	15,440
2	Potential Medium Quality Habitat	164,129	32,663	89,198	42,268
3	Potential High Quality Habitat	60,300	1,943	25,412	32,945
Subtotal Region 1		389,155	104,348	194,154	90,653
Recovery Region 2					
1	Potential Low Quality Habitat	207,833	105,485	93,415	8,932
2	Potential Medium Quality Habitat	181,483	55,681	103,239	22,563
3	Potential High Quality Habitat	99,233	8,541	57,259	33,434
Subtotal Region 2		488,549	169,707	253,913	64,929
Recovery Region 3					
1	Potential Low Quality Habitat	204,553	95,785	100,071	8,697
2	Potential Medium Quality Habitat	186,693	51,501	114,222	20,970
3	Potential High Quality Habitat	110,618	8,815	65,616	36,186
Subtotal Region 3		501,864	156,101	279,909	65,854
Recovery Region 4					
1	Potential Low Quality Habitat	165,838	74,539	78,831	12,468
2	Potential Medium Quality Habitat	151,831	34,967	84,135	32,729
3	Potential High Quality Habitat	82,985	4,510	38,223	40,252
Subtotal Region 4		400,654	114,016	201,189	85,449

Class	Description	Total Acres of Potential Habitat	Potential Habitat Not Likely to be Occupied	Potential Habitat May be Occupied	Potential Habitat Likely to be Occupied
Recovery Region 5					
1	Potential Low Quality Habitat	218,281	53,508	134,488	30,285
2	Potential Medium Quality Habitat	234,956	26,577	138,396	69,983
3	Potential High Quality Habitat	148,070	3,900	56,147	88,023
Subtotal Region 5		601,307	83,985	329,031	188,291
Recovery Region 6					
1	Potential Low Quality Habitat	238,850	71,750	131,452	35,647
2	Potential Medium Quality Habitat	258,562	34,688	136,256	87,618
3	Potential High Quality Habitat	191,848	5,104	67,385	119,360
Subtotal Region 6		689,259	111,541	335,093	242,625
Recovery Region 7					
1	Potential Low Quality Habitat	199,964	73,601	97,263	29,100
2	Potential Medium Quality Habitat	185,029	31,257	93,069	60,703
3	Potential High Quality Habitat	75,734	1,948	26,055	47,731
Subtotal Region 7		460,728	106,807	216,387	137,534
Recovery Region 8					
1	Potential Low Quality Habitat	195,747	46,239	104,128	45,380
2	Potential Medium Quality Habitat	246,440	21,315	107,829	117,296
3	Potential High Quality Habitat	175,774	2,527	46,696	126,551
Subtotal Region 8		617,961	70,081	258,652	289,228
Entire GCW Range					
1	Potential Low Quality Habitat	1,595,791	590,651	819,191	185,950
2	Potential Medium Quality Habitat	1,609,124	288,649	866,344	454,132
3	Potential High Quality Habitat	944,562	37,288	382,793	524,481
Range-wide Potential GCW Habitat		4,149,478	916,587	2,068,328	1,164,563

Hays County is predominantly within golden-cheeked warbler Recovery Region 5. Only a small portion of the southern edge of the county lies within Recovery Region 6 (Figure 3). Hays County contains approximately 170,355 acres of potential warbler habitat (approximately 39 percent of the area of the county) in all three quality classes (Table 2). The potential habitat in Hays County represents approximately 28 percent of the total amount of potential habitat in Recovery Region 5 and approximately 4 percent of the total amount of potential habitat range-wide.

The occupancy analysis suggests that approximately 58 percent of the potential habitat in Hays County (approximately 98,333 acres) may be occupied by the species (i.e., the habitat is within a landscape that has between 40 percent and 80 percent potential habitat). Approximately 30 percent of the potential habitat in Hays County (approximately 50,305 acres) is relatively likely to be occupied

by the species (i.e., the habitat is within a landscape that has at least 80 percent potential habitat and the probability of occupancy is greater than 50 percent).

Figure 3. Potential GCW habitat in Hays County, Texas, and the relative potential for occupancy.

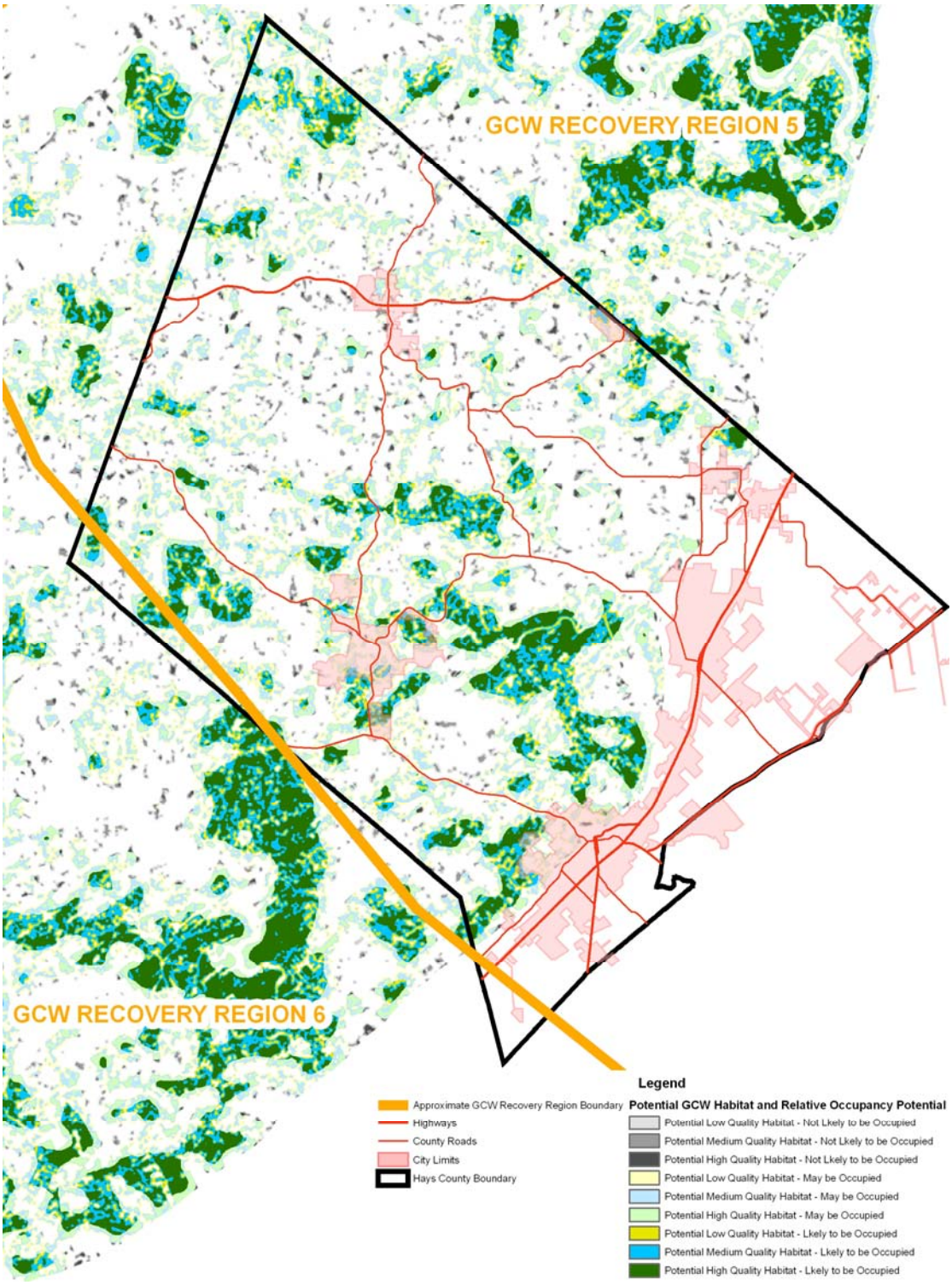


Table 2. Area of potential GCW habitat in Hays County, Texas.

Class	Description	Total Acres of Potential Habitat	Potential Habitat Not Likely to be Occupied	Potential Habitat May be Occupied	Potential Habitat Likely to be Occupied
1	Potential Low Quality Habitat	66,580	13,969	42,193	10,419
2	Potential Medium Quality Habitat	69,665	6,736	41,389	21,540
3	Potential High Quality Habitat	34,110	1,013	14,751	18,346
Total Hays County Potential GCW Habitat		170,355	21,718	98,333	50,305

3.2 Comparison with Mapped Warbler Occurrences

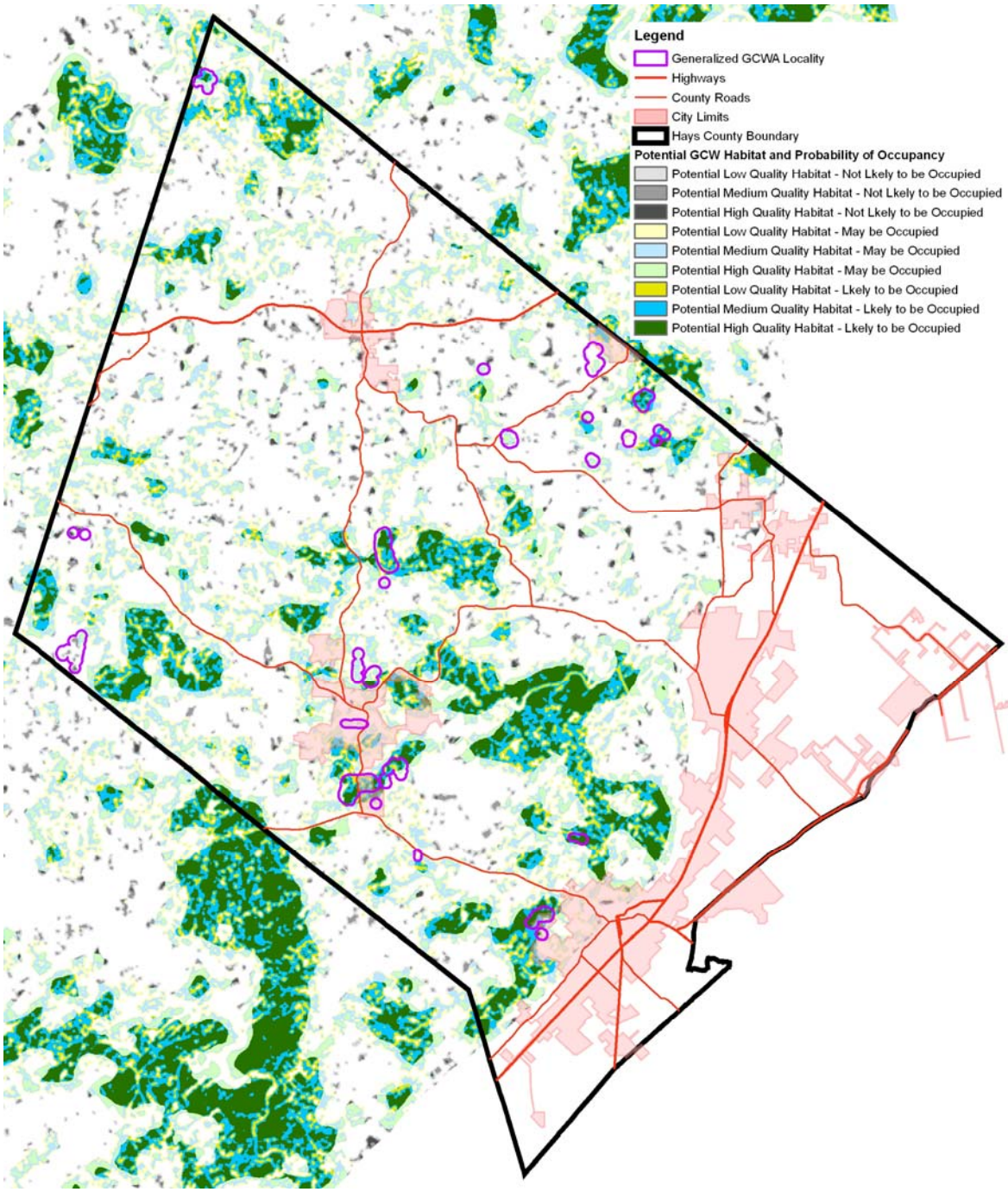
The Loomis warbler observation data was compiled from surveys by the firm completed between 2001 and 2008 included 5,347 precisely located warbler point observations from 42 surveys conducted on approximately 14,500 acres in nine Texas counties. The Loomis warbler observations were compared to the results of the potential habitat map and the occupancy model.

Most of the precisely located warbler observations (5,276 observations or approximately 98.7 percent of the total) fell within areas identified as potential high, medium, or low quality habitat by the Loomis model. Approximately 1.3 percent, or 71 observations, fell outside of areas identified as potential habitat. Most of the observations (78.6 percent or 4,203 observations) were located in areas identified as potential high quality habitat.

Approximately 85 percent of the precise warbler observations fell within potential habitat that was identified as "likely to be occupied" by the occupancy model. Approximately 13 percent of the observations fell within potential habitat that was identified as "may be occupied" by the occupancy model. Approximately 0.7 percent of the precise observations fell within areas of potential habitat that were identified by the occupancy model as "not likely to be occupied".

Twenty-four generalized golden-cheeked warbler localities in Hays County were identified from observation datasets provided by the USFWS, the TXNDD, and Loomis (Figure 4). All of these known localities (which represent the area within 300 meters of recorded observations) contain potential warbler habitat identified by the Loomis habitat model.

Figure 4. Known GCW localities in Hays County, Texas.



4.0 Discussion

The habitat model described above produces a map of potential golden-cheeked warbler habitat based on the average amount of tree canopy cover in the local landscape (i.e., an approximately 10.9-acre area around each 30-meter x 30-meter raster cell). Potential habitat is

further classified by the average density of this canopy cover as a relative indicator of habitat quality or suitability. While not explicitly evaluated in this paper, the model is generally consistent with vegetation conditions shown on recent aerial images for Hays County. The model also corresponds with most golden-cheeked warbler localities recorded in Hays County since the 1990s and to the compiled Loomis warbler observations in Hays County and other areas from 2001 through 2008.

By using canopy cover density, the model tends to exclude as potential habitat relatively large areas of open woodlands (i.e., less than 50 percent canopy cover), while smaller patches of very dense woodland are more likely to be identified as potential habitat (albeit with a lower average canopy cover).

Since golden-cheeked warblers are known to occasionally utilize relatively low density woodland or savanna vegetation, especially during the latter part of the breeding season, the current model includes areas with as little as 30 percent average landscape canopy cover that are adjacent to (i.e., within 90 meters of) areas with at least 50 percent average landscape canopy cover (a more typical canopy cover estimate for warbler breeding habitat). The model also smoothes over small gaps or openings in patches of otherwise dense woodland vegetation. These small woodland openings are common across the landscape and are often found in individual warbler territories.

An implicit assumption in the Loomis habitat model is that any relatively large area of dense to moderately dense woodland is potential warbler habitat. The model does not account for species composition, stand age, or canopy height of the forest stand or other possibly relevant habitat factors. However, across the range of the warbler, and in particular for the Edwards Plateau, much of the woodland cover (especially dense woodland cover) is dominated or co-dominated by Ashe juniper and oak species. While the model does not include explicit considerations for stand age and canopy height, most dense woodlands (i.e., particularly those mapped as Class 3 habitat) are likely to be mature stands with relatively tall canopies. Younger, shorter regrowth woodland stands, including juniper monocultures, could also be classified as potential warbler habitat, but would likely be mapped as Class 2 (medium quality) or Class 1 (low quality) potential habitat.

The model suggests that 170,355 acres of potential golden-cheeked warbler habitat are available in Hays County. This is a generous estimate of the amount of available habitat, since the model tends to smooth over small-scale variations in the woodland canopy and includes some areas that could be used as late-season dispersal habitat. The model also includes some patches of vegetation that may have the vegetative characteristics of potential habitat, but are relatively small and isolated and may lack the appropriate landscape context to be occupied by the species. The occupancy model, based on the analysis described in Magness et al. (2006), suggests that approximately 98,333 acres of this potential habitat (approximately 58 percent of the total) may be occupied by the species, with an additional approximately 50,305 acres of potential habitat (approximately 30 percent of the total) with a greater than 50 percent chance of being occupied.

The total estimate of potential warbler habitat in Hays County (170,355 acres) is much larger than other estimates of available warbler habitat in Hays County. Wahl et al. (1990) estimated that

approximately 52,382 acres of potential warbler habitat occurred in Hays County, based on an analysis of Landsat data from 1979.

This prior classification of potential warbler habitat was partially based on the "spectral signatures of sites identified as quality nesting habitat" that were mapped on 1:24,000 scale U.S. Geological Survey topographic maps. This "quality nesting habitat" is most likely to be similar to areas identified by the Loomis model as potential high quality habitat. The Loomis model identifies approximately 34,110 acres of potential high quality habitat in Hays County, which is less than the estimate reported in Wahl et al. (1990). The Hays County estimate of potential habitat (all classes) that is likely to be occupied by the species (i.e., 50,305 acres) is more in line with the prior estimate reported in Wahl et al. (1990). However, it is likely that some of the potential habitat identified as "may be occupied" or "not likely to be occupied" may still be utilized by the species, as suggested by the 14 percent of Loomis precise warbler observations that fell within these categories.

The potential habitat map for Hays County corresponds well to the localities shown to be occupied by warblers since 1990. All of the generalized warbler location polygons contain some areas identified as potential habitat by the model. Some of these polygons also contain potential habitat identified by the occupancy model as "not likely to be occupied," further indicating that not all potential habitat identified as "not likely to be occupied" by the occupancy model is truly unoccupied.

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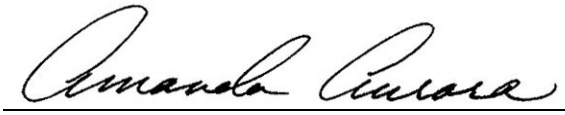
6.0 Signatures

Prepared By:



Signature

Amanda Aurora
Senior Biologist, C.W.B.
Printed Name

August 12, 2008
Date

Signature

Clifton Ladd
Senior Biologist, C.W.B.
Printed Name

August 12, 2008
Date

APPENDIX B

Descriptions of Evaluation and Additional Species Addressed in the Hays County RHCP

Loomis Partners, Inc. and Zara Environmental, LLC
(2008)

Hays County
Regional Habitat Conservation Plan
Evaluation and Additional Species

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October 30, 2008

Table of Contents

1.0 Introduction

The Hays County Regional Habitat Conservation Plan (RHCP) includes 56 species addressed as "evaluation" or "additional" species in the plan. In many cases the known distribution of these taxa includes only a handful of localities, and many already fit the criteria of globally endangered by the World Conservation Union (Baillie et al. 2004). With more collecting effort in the Hays County, some species records will undoubtedly increase in number accompanied with an increase of the overall size of their range. In cases where undescribed species are considered (e.g. *Neoleptoneta* n. sp. eyeless), it is possible that the range in the species description will be different than the estimation made herein. The species description in the scientific literature should be the ultimate source for information on these as-yet unrecognized species.

2.0 Evaluation Species

There are 40 evaluation species included in the RHCP. Evaluation species are currently unlisted, but could become listed in the future. Insufficient information about these species currently exists to support the level of analysis required to meet the ESA issuance criteria for an incidental take permit; therefore the County is not currently seeking incidental take coverage for these species through the RHCP.

The evaluation species include 40 karst species, including terrestrial and aquatic species that depend on similar habitats. Evaluation species descriptions, known localities, and habitat requirements (as currently known) are described below.

The karst species included in the RHCP as evaluation species show adaptations to a dark, low energy environment. These adaptations include eyelessness or eye reduction, loss of pigment, elongation of appendages, lower metabolism, longer lifespans, and a life history strategy favoring the production of fewer, larger offspring (Culver 1982) when compared to the most recent common surface ancestor. This suite of adaptations is evident across nearly all cave and aquifer adapted taxa, creating convergent morphologies for similar groups worldwide.

For the majority of these karst species, little is known of their biology, including breeding, diet, home ranges, microhabitat, demography, behavior, longevity, species associations, or life history. Only a handful of field studies on the karst invertebrates exist (Holsinger and Longley 1980).

The known ranges of the karst evaluation species are limited. All of the karst species are known to occur only in Texas; most are known from fewer than ten localities. Several species are single site endemics that are known from only one location in Hays County.

Aquifer flatworm (*Sphalloplana mohri*)

Aquifer flatworm (*Sphalloplana mohri*) is a subterranean flatworm that is white to pinkish in color and known for being the largest member of this genus (typically as large as 20 to 30 mm) (Figure 1). One of the distinctive features of this species is that it has 40 to 50 pharynges, or tube-like feeding structures. Hyman (1938) first mentioned the species and later described it (1939) from Ezell's Cave (Hays County), the type locality. The species name is in honor of Mr. C. E. Mohr who collected the specimens. Mitchell (1968) described four other *Sphallophana* species from Texas outside of Hays County; but in a single sentence, Kenk (1977) dubbed the characters used by Mitchell as natural variation of a single species and lumped them all into the first name, *S. mohri*. Thus, the full range of this species includes two localities in Hays County (Ezell's Cave and the Artesian Well) and four other localities: Cascade Caverns (Kendall County), Spanish Wells (Travis County), Harrell's Cave (San Saba County), and Zesch Ranch Cave (Mason County) (Kenk 1977). According to this taxonomy, synonyms for this species are: *Sphalloplana kutscheri, S. sloani, S. zeschi*, and *S. reddelli*.

Figure 1. Aquifer flatworm (*Sphalloplana mohri*) from Ezell's Cave, Hays County, Texas (photo by J. Krejca).

Flattened cavesnail (*Phreatodrobia micra*)

The flattened cavesnail (*Phreatodrobia micra*) was described by Pilsbry and Ferriss (1906) as having a small shell (1.15 to 1.2 mm diameter) that is nearly flat, spiral, and weakly striated. These authors placed this aquifer-adapted snail in the genus *Valvata*; in later papers authors placed the species in *Horatia* and *Hauffenia* (Burch 1982, Pilsbry 1916). Hershler and Longley (1986) described the new hydrobiid snail genus *Phreatodrobia*, and placed all central Texas Hydrobiidae in that group. The authors derived the name from the Greek word 'phreatos,' meaning groundwater, because of

the habitat of the group. *P. micra* is a small species (the shell width is about 1 mm; the specific name 'micra' refers to the small size) with a flat spiral shell known for certain from six localities in three Texas counties. The type locality for *P. micra* is from drift debris of the Guadalupe River about four miles above New Braunfels in Comal County. The other Comal County locations include Honey Creek Cave and Hueco Springs (Hershler and Longley 1986). Kendall County locations include Cave-Without-A-Name (theDead Man's Cave System), Century Caverns, and an unverified record from Cascade Caverns. Hays County locations include the Artesian Well and San Marcos Springs.

Disc cavesnail (*Phreatodrobia plana*)

Hershler and Longley (1986) described the disc cavesnail (*Phreatodrobia plana*) as a small species (shell width between 0.75 and 1.1 mm) with a flat spiral shell. The specific name 'plana' is in reference to the flat shape of the shell. It occurs in Comal County at Natural Bridge Caverns and in Hays County at San Marcos Springs (the type locality) and the Artesian Well.

High-hat cavesnail (*Phreatodrobia punctata*)

The high-hat cavesnail (*Phreatodrobia punctata*) was described by Hershler and Longley (1986) as a small species (shell height averaging 1.13 mm) with a broadly conical shell. The specific name 'punctata' is in reference to the tiny depressions on the larger whorls of the shell. It occurs at only two localities: in Travis County at Barton Springs and in Hays County at San Marcos Springs (the type locality).

Beaked cavesnail (*Phreatodrobia rotunda*)

Hershler and Longley (1986) describe the beaked cavesnail (*Phreatodrobia rotunda*) as a large species (shell width of 2 mm) with a flat spiral shell and a flattened base. The specific name 'rotunda' is in reference to the rounded outline of the shell. It is endemic to Hays County, with only two known localities: San Marcos Springs (the type locality) and the Artesian Well.

A cave-obligate leech (*Mooreobdella* n. sp.)

There are only two known aquifer-adapted leeches in the world: one is in Romania (where biologists uncovered over 20 new species during the exploration of Movile Cave) and the other is in Hays County, Texas (Culver and Sket 2000). The Hays County *Mooreobdella* is a blind, depigmented, small (5 to 15 mm long) aquatic leech endemic to the county (Figure 2). Beyond the distribution, virtually nothing is known about this species and it has not yet been described by taxonomists. The known distribution includes three sites in Hays County: San Marcos Springs, Ezell's Cave, and the Artesian Well.

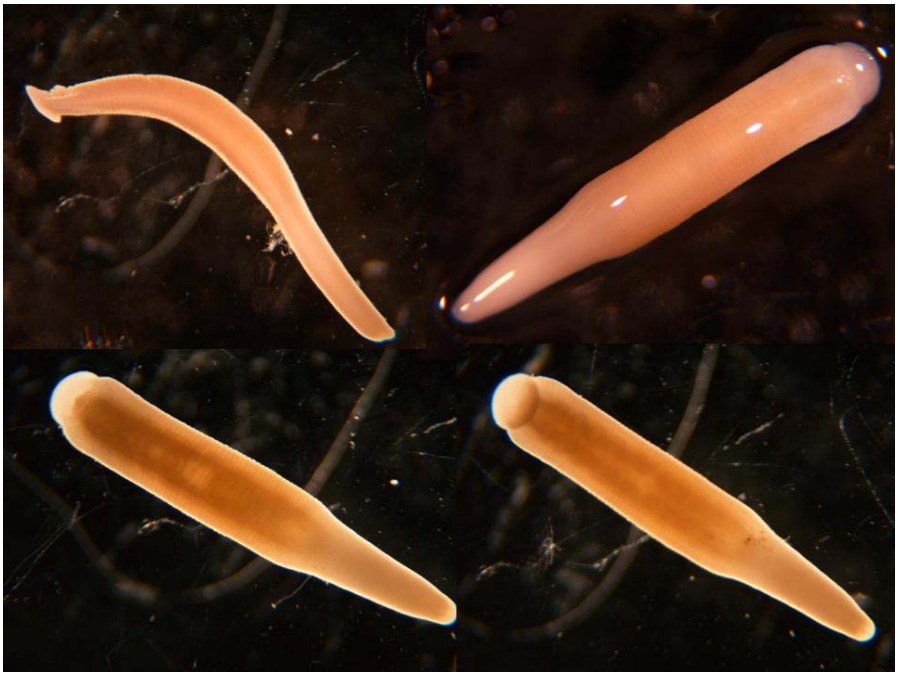

Figure 2. Aquifer leech (*Mooreobdella* n.sp.) from San Marcos Springs, Hays County, Texas (photo by R. Gibson).

A cave-obligate crustacean (*Tethysbaena texana*)

The cave-obligate crustacean (*Tethysbaena texana*) is the only thermosbaenacean (a rare order of crustaceans) known from the continental United States. This species is 3 mm long and transparent to white in color (Figure 3). It was originally described as *Monodella texana* by Maguire (1964, 1965) and placed in the new genus by Wagner (1994). The genus name means 'walkers of the Tethys sea.' The Tethys sea was a Mesozoic era ocean between Laurasia and Gondwana, and fauna that inhabit the current Mediterranean Sea, Carribean Ocean, Gulf of Mexico, and adjacent landmasses are said to have a Tethyan distribution (reflecting the migration of landmasses since the Mesozoic). This species description was very interesting to biogeographers because, at the time, it was the only locality for that order outside of the Mediterranean. Since then, researchers have found thermosbaenaceans elsewhere, including other parts of Europe, the Carribbean, and Africa. Nevertheless, this is considered an old crustacean group with a Tethys Sea relict distribution of interest to biogeography (Jaume 2008). This interest inspired a redescription of the species in order to verify taxonomic relationships (Stock and Longley 1981).

This species is known from seven sites in Bexar, Comal, Hays, and Uvalde counties (all but one are referred to by Stock and Longley (1981)). In Bexar County, the species has been observed at the Artesia Pump Station Well and Verstraeten Well No. 1. In Comal County, the species has been observed at Hueco Springs (Gibson et al. 2008). In Hays County, *T. texana* is known from the Artesian Well, Diversion Spring (Randy Gibson personal communication; collected by Eathen Chappell and Trey Kunz on 29 June 2005), and Ezell's Cave. In Uvalde County, the species has been recorded from the George Ligocky Farm Well.

Figure 3. *Tethysbaena texana*, the only thermosbaenacean known from the continental United States. This individual is from Ezell's Cave, Hays County, Texas (photo by J. Krejca).

A cave-obligate amphipod (*Allotexiweckelia hirsuta*)

The amphipod family Hadziidae consists mostly of marine or brackish species, with the only freshwater species being cave- or aquifer- adapted. The family is considered of marine origin, and the distribution is tied to the old Tethys Sea region (Holsinger and Longley 1980).

The hadziid amphipod *Allotexiweckelia hirsuta* is the only member of the genus. Holsinger and Longley (1980) describe it as a medium-sized (8 to10 mm), fragile-bodied subterranean species known from three localities: Artesian Well (the type locality in Hays County), the O.R. Mitchell Well No. 2 (Bexar County), and the Verstraeten Well No. 1 (Bexar County). The sexes are generally similar, except mature females are larger than mature males in the samples examined. Holsinger and Longley (1980) showed that during a year and a half of continuous sampling of the Artesian Well in the mid seventies, this species represented 0.66 percent of the total number of amphipods collected. Beyond this ratio, and the morphological description and species range, almost nothing is known from this species. The species is similar in appearance to *Texiweckelia texensis* shown in Figure 7.

A cave-obligate amphipod (*Artesia subterranea*)

There are only two species in the genus *Artesia*, and both occur only in Texas. Originally, the genus was placed in its own family, Artesiidae, and the authors considered that family a marine relict closely affiliated with the family Bogidiellidae (Holsinger and Longley 1980). Later researchers found new material intermediate to the two groups that lent support to uniting the two families under Bogidiellidae (Botosaneanu and Stock 1989). A phylogenetic analysis was performed on the entire family to validate the placement within Bogidiellidae (Koenemann and Holsinger 1999).

The cave-obligate amphipod (*Artesia subterranea*), is a medium-sized (6 to 7 mm), relatively slender-bodied subterranean species described from a single locality: the Artesian Well (Figure 4) (Holsinger and Longley 1980). Recent work by Gibson et al. (2008) identified this species from two other sites: Ezell's Cave (Hays County) and Comal Springs (Comal County). Since then, the species was also found at San Felipe Springs (Val Verde County, R. Gibson personal communication). Based on the nature of all of these localities, Gibson et al. (2008) suggest this species primarily inhabits deeper areas of the aquifer. Holsinger and Longley (1980) report the sexes are similar, but present in a slightly skewed ratio in favor of males (1.3 males for every female). Also during a year and a half of continuous sampling of the Artesian Well in the mid seventies, this species represented 1.07 percent of the total number of amphipods collected. Beyond this ratio, and the morphological description and species range, almost nothing is known from this species.

Figure 4. Aquifer amphipod (*Artesia subterranean*) from San Felipe Springs, Val Verde County, Texas (photo by R. Gibson).

A cave-obligate amphipod (*Holsingerius samacos*)

The hadziid amphipod *Holsingerius samacos* is known from a single locality in Hays County, the Artesian Well (Holsinger and Longley 1980). Originally described as *Texiweckelia samacos* by Holsinger and Longley (1980), the species later underwent revision by Barnard and Karaman (1982) where those authors created a new genus in honor of the prolific freshwater amphipod taxonomist, Dr. John Holsinger, and named this species as the type for the new genus. It is a medium-sized (7 mm), fragile-bodied, subterranean species, with males having a different gnathopod structure than females. *H. samacos* were rare in collections during a year and a half of continuous sampling of the Artesian Well in the mid seventies, with the species accounting for only 0.26 percent of the total number of amphipods collected. Beyond this ratio, and the morphological description and species

range, almost nothing is known from this species. *H. samacos* is similar in appearance to *Texiweckelia texensis* shown in Figure 7.

A cave-obligate amphipod (*Seborgia relicta*)

The amphipod family Sebidae is primarily marine, and its members are small, weakly pigmented, and largely eyeless species found in benthic habitats. Due to their small size and predisposition for dark bottom habitats, it is thought that during marine transgressions they have invaded both interstitial freshwater habitats, as well as caves (Holsinger and Longley 1980). When *Seborgia relicta* was described, the genus was only known from a single species in an oligohaline-brackish water lake on an island in the British Solomon Islands of the South Pacific. *S. relicta* was the first freshwater member of the genus to be recognized (currently there are two species of this family in Texas).

Holsinger described *S. relicta* as very small (1 to 2 mm) and subterranean (Figure 5), noting the remarkable similarities between the species and also slightly expanding the characteristics of the genus to accommodate the new species (Holsinger and Longley 1980). The sexes are generaly similar, with males slightly smaller than females. During a year and a half of continuous sampling of the Artesian Well in the mid seventies, this species represented 1.11 percent of the total number of amphipods collected. The sex ratio in that sample was 4.6 to 1 in favor of females. Ovigerous females, each with 1 to 3 eggs, were present in samples taken year round, indicating it is likely they breed throughout the year (Holsinger and Longley 1980).

The species is known from five sites including the type locality of the Artesian Well in Hays County (Holsinger and Longley 1980), Ezell's Cave in Hays County, Comal and Hueco Springs in Comal County (all from Gibson et al. 2008), and the Hondo Creek alluvium in Medina County (Holsinger 1992).

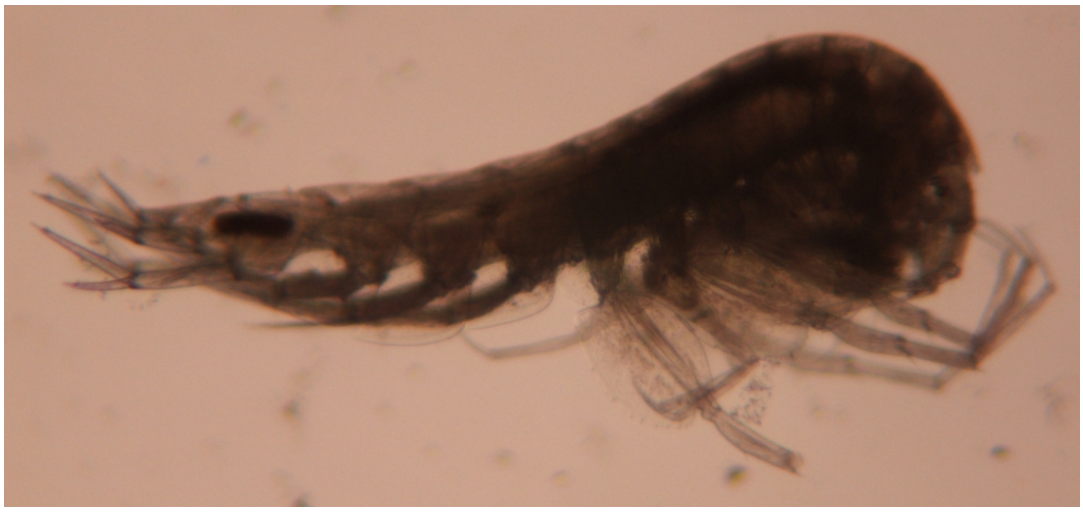

Figure 5. Aquifer amphipod (*Seborgia relicta*) from Ezell's Cave, Hays County, Texas (photo by R. Gibson).

Balcones cave amphipod (*Stygobromus balconis*)

The amphipod family Crangonyctidae is a group with freshwater origins (Holsinger and Longley 1980). Hubricht (1943) originally described *Stygobromus balconis* as *Stygonectes balconis* from two localities (Boyett's Cave in Hays County and Cave Without a Name in Kendall County). Later, Holsinger redescribed the species (1966) then split out *Stygonectes bifurcatus* from *S. balconis*, such that the current distribution of the species is not in Kendall County (1967). Then Holsinger (1978) synonomized *Stygobromus*, *Stygonectes*, and *Apocrangonyx* after suggestions by Karaman (1974) and Holsinger (1977), placing this species in its current genus, *Stygobromus*.

Hubricht (1943) described this amphipod as blind, straw-colored in life, and relatively large (up to 12 mm long) (Figure 6). The Balcones cave amphipod is currently known from four localities, including two in Hays County (Autumn Woods Well (misidentified in Gluesenkamp and Krejca 2007 as *Stygobromus russelli*) and Boyett's Cave (Hubricht 1943)), and two in Travis County (Ireland's Cave and Whirlpool Cave).

Figure 6. Aquifer amphipod (*Stygobromus balconis*) from Autumn Woods Well, Hays County, Texas (photo by J. Krejca).

Ezell's cave amphipod (*Stygobromus flagellatus*)

Benedict (1896) originally placed the crangonyctid, Ezell's cave amphipod (*Stygobromus flagellatus*), in the genus *Crangonyx*, but Hay (1903) later designated this taxon as the type-species of *Stygonectes*. After that Holsinger (1978) lumped *Stygonectes* into *Stygobromus*. In an earlier paper, Holsinger (1966) reported that this species was very rare in the two localities it was known from at the time, with very few specimens in existence. Later, Holsinger and Longley (1980) reported it as the second most frequently collected amphipod at the Artesian Well, where during a year and a half

of continuous sampling in the mid seventies, this species represented 26.37 percent of the total number of amphipods collected. These authors report on four of the six currently known localities: the Artesian Well, San Marcos Springs, Ezell's Cave, and Rattlesnake Cave (all Hays County). Recently Gibson et al. (2008) reported on two new county records at Comal Springs (Comal County) and Barton Springs (Travis County). *S. flagellatus* is similar in appearance to *Stygobromus balconis* shown in Figure 6.

A cave-obligate amphipod (*Texiweckelia texensis*)

Holsinger (1973) first placed the hadziid amphipod *Texiweckelia texensis* in the genus *Mexiweckelia*, and at the time it was the first range extension of that genus from Mexico into Texas. Later, Holsinger and Longley (1980) assigned the species to *Texiweckelia*. Holsinger (Holsinger 1973, Holsinger and Longley 1980) describes this as a medium (6 to 8 mm long), eyeless, depigmented subterranean species distinguished by long, attenuated appendages (Figure 7). Males have different gnathopod structure than females. During a year and a half of continuous sampling of the Artesian Well in the mid seventies, this species represented 8.38 percent of the total number of amphipods collected. Juveniles were present in samples taken year-round, indicating that breeding likely takes place throughout the year (Holsinger and Longley 1980). *T. texensis* is known from three sites, and only in Hays County. Holsinger and Longley (1980) document it from the Artesian Well and San Marcos Springs. Recent collections in Ezell's Cave also contained this species (R. Gibson, personal communication).

Figure 7. Aquifer amphipod (*Texiweckelia texensis*) from Ezell's Cave, Hays County, Texas (photo by R. Gibson).

A cave-obligate amphipod (*Texiweckeliopsis insolita*)

Holsinger first placed the hadziid amphipod *Texiweckeliopsis insolita* in the genus *Texiweckelia* (Holsinger and Longley 1980). Barnard and Karaman (1982) then assigned it to the new genus *Texiweckeliopsis* (genus name derived from 'opsis' to indicate likeness to *Texiweckelia*), and named this species as the type for the new genus. *T. insolita* is a relatively small (4 mm), fragile bodied subterranean species with a rather slender body and distinguishable from congeners by the structure of the mouthparts (but its overall appearance is similar to *Texiweckelia texensis* in Figure 7) (Holsinger and Longley 1980). Males have different gnathopod structure than females.

During a year and a half of continuous sampling of the Artesian Well in the mid seventies, this species represented the majority (61.01 percent) of the total number of amphipods collected. The sex ratio in that sample was 1.6 to 1 in favor of females. Adults outnumbered juveniles 8.45 to 1. However, juveniles were present in samples taken year round, though they were in greater numbers during late summer and fall (Holsinger and Longley 1980). The species is known from three sites including the type locality in Hays County (Artesian Well), San Marcos Springs, and Verstraeten Well No. 1 in Bexar County. No image is available for the species, but it is similar in appearance to the species in Figure 6.

Texas troglobitic water slater (*Lirceolus smithii*)

Asellid isopods are freshwater in origin, and the genus *Lirceolus* is endemic to Texas and Mexico (Figure 8). Several authors researched the placement of *Lirceolus* within the family (Lewis 1988, Lewis and Bowman 1996), and recently genetic work on *Lirceolus* showed patterns of relatedness that follow surface river drainage basins (Krejca 2005).

Urlich (1902) used a single incomplete individual of the Texas troglobitic water slater (*Lirceolus smithii*) to describe the species within *Caecidotea*, with the species name honoring Dr. H. M. Smith, who was in charge of scientific inquiry of the U.S. Fish Commission, the entity that drilled and owned the Artesian Well and that was a precursor the present day U. S. Fish and Wildlife Service. It was not until an account by Bownam and Longley (1976) that the species was described based on a series of whole specimens from the Artesian Well and placed into the new genus *Lirceolus*. They proposed that it was related to the the asellid isopod *Lirceus*. Those authors describe it as blind and unpigmented, slender (body about 3.5 times as long as wide) and small (up to 4 mm). They also note that the small size and troglobitic nature of this species suggests that it requires minimal respiratory surface. The type locality is the Artesian Well (Bowman and Longley 1976), and recently Gibson et al. (2008) identified it from Diversion Springs. It is a Hays County endemic and these are the only two localities it is known from.

Figure 8. Aquifer isopod (*Lirceolus cocytus*) from Sótano de Amezcua, Coahuila, Mexico. This species is similar in morphology to *Lirceolus smithii* (photo by J. Krejca).

A cave-obligate decapod (*Calathaemon holthuisi*)

Strenth (1976) described this medium-sized (carapace 8 mm long), aquifer dwelling shrimp that lacks pigment and has reduced eyes. The specific name refers to Dr. Holthuis who had initially examined the first specimens of this species. Based on a similar general morphology, Strenth (1976) placed it in the genus *Palaemonetes*. Recently Bruce and Short (1993) assigned it to a new genus based on mouthparts that are very different than *Palaemonetes*, modified for filter feeding. *Calathaemon holthuisi* is a Hays County endemic, known only from Ezell's Cave. However, there is an unverified new locality at the Artesian Well (R. Gibson, personal communication 2008). *C. holthuisi* is similar in appearance to *Palaemonetes antrorum* shown in Figure 9.

Balcones cave shrimp (*Palamonetes antrorum*)

Benedict (1895) first described this aquifer dwelling shrimp, and later Ulrich (1902) further described it. *Palamonetes antrorum* is large (10 to 20 mm), white to transparent, and has eye-stalks with very degenerate eyes (Figure 9). The mouthparts closely resemble surface species in this genus, adapted to micropredatory or scavenging feeding methods (Bruce and Short 1993). The species has been recorded from eight sites, including four wells in Bexar County (Artesia Pump Station Well, O.R. Mitchell Well, Verstraeten Well No. 1, and Verstraeten Well No. 2) and four sites in Hays County (Artesian Well, Ezell's Cave, Frank Johnson's Well, and Wonder Cave). However, one of the Hays County sites (Wonder Cave) is severely impacted by habitat modification and commercialization, and all recent attempts to find any aquatic fauna there have been unsuccessful.

Furthermore, there are two localities where blind shrimp have been reported but not verified: Jacob's Well in Hays County and Carson Cave in Uvalde County.

Figure 9. Aquifer shrimp (*Palaemonetes antrorum*) from Ezell's Cave, Hays County, Texas (photo by J. Krejca).

A cave-obligate spider (*Cicurina ezelli*)

Spiders, particularly in the genus *Cicurina*, are speciose in central Texas caves, and four *Cicurina* in Bexar County are on the USFWS endangered species list (USFWS 2000). While blind *Cicurina* spiders are not exceptionally rare, adult males are traditionally used for specific identification and they are exceedingly rare in collections. Therefore, there are many localities with undetermined *Cicurina* species because the only collections that exist are juveniles or females. In Hays County, there are eleven localities for an unidentified blind *Cicurina* that may be additional localities for these species, or they may represent undescribed species. Most likely further collection and identification efforts in the county will change the known distribution of these species drastically.

Gertsch (1992) described *Cicurina ezelli* based on female specimens only. The holotype is 2.6 mm long and eyeless, and the specific name is after the type locality(Ezell's Cave). The species is a Hays County endemic that is known from only two localities: Ezell's Cave and Grapevine Cave. *C. ezelli* is similar in appearance to *C. bandida* shown in Figure 10.

Figure 10. *Cicurina bandida* managed within Travis County as part of a regional HCP (USFWS 1996) from Flint Ridge Cave, Travis County, Texas (hoto by J. Krejca).

A cave-obligate spider (*Cicurina russelli*)

Gertsch (1992) described *Cicurina russelli* based on female specimens only. The holotype is 5.8 mm long and eyeless. The species is named in honor of the renowned speleologist William Russell. The species is a Hays County endemic known from only one locality: Boyett's Cave. No image is available for the species, but *C. russelli* is similar in appearance to *C. bandida* shown in Figure 10.

A cave-obligate spider (*Cicurina ubicki*)

Gertsch (1992) described *Cicurina ubicki* based on female specimens only. The holotype is approximately 5.2 mm long and eyeless. The species is named in honor of the arachnid taxonomist and collector, Darrell Ubick. The species is a Hays County endemic known from two localities: Fern Cave and McGlothlin Sink. No image is available for the species, but it is similar in appearance to *C. bandida* in Figure 10.

Undescribed cave-obligate spider (*Eidmannella* n. sp.)

There are approximately six species of cave-dwelling *Eidmanella* spiders in Texas, including eyeless species that are most likely troglobitic. This new species definitively occurs in Ezell's Cave, and possibly also occurs in McCarty Cave and McGlothlin Sink. The species description will be the ultimate source for information on the biology, taxonomy, and distribution of the species. No images are available for this species, but it is similar in appearance to *E. rostrata* in Figure 11.

Figure 11. ***Eidmanella rostrata*** **from a cave in northern Bexar County, Texas (photo by J. Krejca).**

Undescribed cave-obligate spiders (*Neoleptoneta* n. sp. 1, *Neoleptoneta* n. sp. 2, and *Neoleptoneta* n. sp. eyeless)

Cave-dwelling leptonetid spiders include two species in the genus *Neoleptoneta* that occur on the USFWS endangered species list (USFWS 1988 and 2000). Hays County has up to three undescribed species in this group that are each only known from a single locality (*Neoleptoneta* n. sp. eyeless, *Neoleptoneta* n. sp. 1, and *Neoleptoneta* n. sp. 2). The localities are Katy's Cave (P. Paquin, pers. comm. 2007), Burnett Ranch Cave, and Boyett's Cave. James Cokendolpher is the taxonomist working on species descriptions, and those descriptions will be the ultimate source for information on their biology, taxonomy, and distribution. No images are available for these species, but they are similar in appearance to the species shown in Figure 12.

Figure 12. ***Neoleptoneta myopica,*** **a federally listed species that occurs in Travis County, Texas (photo by J. Krejca).**

A pseudoscorpion (*Tartarocreagris grubbsi*)

Pseudoscorpions commonly become cave adapted, and those cave-adapted species are typically rare with limited distributions. One species in central Texas (the Tooth Cave pseudoscorpion, *Tartarocreagris texana*) occurs on the USFWS endangered species list (USFWS 1988). Hays County has five known species of pseudoscorpions with limited distributions (*Tyrannochthonius* n. sp., *Tyrannochthonius* sp. prob. *texanus*, *Tartarocreagris comanche, Tartarocreagris cookei,* and *Tartarocreagris grubbsi*). However, all except for one of them are epigean in morphology and likely to not be limited to caves (Muchmore 1992 and 2001). Most likely have much larger ranges than is currently known.

Muchmore (2001) described *Tartarocreagris grubbsi* as a medium-sized (3.9 mm) hypogean species with two indistinct eyes, and light brown and tan in color. It is named after the collector of the type specimens, Andrew G. Grubbs. This Hays County endemic occurs in only Wissman's Sink. While no images are available for this species, *T. grubbsi* is similar in appearance to the pseudoscorpion shown in Figure 13.

Figure 13. Pseudoscorpion (unidentified) from Lakeline Cave in Williamson County, Texas. (photo by J. Krejca).

A cave-obligate harvestman (*Texella diplospina*)

There are four known species of *Texella* harvestman in Hays County, and this genus has three species in central Texas that occur on the USFWS endangered species list (USFWS 1988, 1993, and 2000). The Hays County species occur in as few as one, and up to ten, localities. Two caves are known to have two different species of *Texella*: Ladder Cave has *Texella mulaiki* and *T. diplospina* and Ezell's Cave has *T. mulaiki* and *T. renkesae.*

Ubick and Briggs (1992) described *Texella diplospina* as brownish orange, 1.41 to 1.74 mm long, medium body roughness, and well developed eyes. The specific name refers to two pairs of spines on the female genitalia. This Hays County endemic occurs in only Ladder Cave. No images are available for this species, but it is in the *reddelli* subgroup (Ubick and Briggs 1992) and similar in appearance to *T. reyesi* shown in Figure 14.

Figure 14. *Texella reyesi*, a species in the *reddelli* subgroup, from a cave in Travis County, Texas (photo by J. Krejca).

A cave-obligate harvestman (*Texella grubbsi*)

Ubick and Briggs (1992) described *Texella grubbsi* as brownish orange, 1.62 to 1.82 mm long, with a coarsely rough body and well developed eyes. The specific name is in honor of the caver and biologist Andrew G. Grubbs. The species occurs in Hays, Travis, and Burnet counties at seven localities. The Hays County site (Burnett Ranch Cave) is the type locality, and other Hays County sites include Wissman's Sink and Wissman's Sink #2. Travis County sites include Cave Y and Kretschmarr Double Pit. Burnet County sites include two surface localities. No images are available for this species, but it is in the *reddelli* subgroup (Ubick and Briggs 1992) and similar in appearance to the species in Figure 14.

A cave-obligate harvestman (*Texella mulaiki*)

Described by Goodnight and Goodnight (1942) with the type locality listed only as 'Hays County', later authors presumed this site to be Ezell's Cave because of the high amount of visitations by biologists to this site. Ubick and Briggs (1992) also found this species in Ezell's Cave and described it as strongly troglomorphic, with yellowish orange body, yellowish white appendages, 1.49 to 2.21 mm long, and with a reduced eye mound with the retina and cornea absent (Figure 15). The

species is sympactric with *T. diplospina* and *T. renkesae*, but occupies relatively deeper portions of the caves. They are uncommon in Ezell's Cave, where a 15-month faunal inventory found only seven specimens. In Fern Cave, the same number of specimens were found in a few hours of collecting. This same study suggests they are attracted to baits, with a possible preference toward cheese (Ubick and Briggs 1992).

Ubick and Briggs (1992) list this species from ten caves and Ubick and Briggs (2004) list the species from five additional localities, for a total distribution including: Ezell's Cave, Boggus Cave, Fern Cave, Ladder Cave, McCarty Cave, McGlothlin Sink, Michaelis Cave, and Tricopherous Cave in Hays County; and Cave X, Flint Ridge Cave, Get Down Cave, Maple Run Cave, Salamander Mountain Cave, Slaughter Creek Cave, and Whirlpool Cave in southern Travis County.

Figure 15. *Texella mulaiki* from Ezell's Cave, Hays County, Texas (photo by J. Krejca).

A cave-obligate harvestman (*Texella renkesae*)

Ubick and Briggs (1992) described this species as brownish orange, 1.54 to 1.92 mm long, with a medium body roughness and well developed eyes. The specific name is in honor of Ms. Saelon Renkes, one of the collectors of the holotype. This Hays County endemic is known from only two caves: Ezell's Cave and Maggens Sink Hole. No images are available for this species, but it is in the *reddelli* subgroup (Ubick and Briggs 1992) and similar in appearance to the species in Figure 13.

A cave-obligate springtail (*Arrhopalites texensis*)

Springtails are tiny insects commonly cited as food sources for other cave arthropods that are predators, such as spiders, harvestmen, and pseudoscorpions. For this reason, they are very

important for the cave ecosystem, but their small size and poorly worked taxonomy hamper our understanding of species' ranges. The abundant springtails in Texas caves are in another family, Sinellidae, and also occur outside of caves. The arrhopilitid springtails are much less common and typically seen in association with extremely wet surfaces or on the surface tension of pools.

Christiansen and Bellinger (1996) described *Arrhopalites texensis* as white without a trace of pigment, but had only mounted specimens to examine. Based on other arrhopilitid springtails in Texas that may or may not be this species, the color of large individuals can be a washed out yellow to light peach (Figure 16). The genus shows sexual dimorphism and males are rare in collections. Christiansen and Bellinger (1996) remark that the species appears to be widespread in Texas caves, but rarely abundant. They list it from seven or eight localities in five counties. The type locality is Haby Salamander Cave in Bandera County. Bexar County records include Alligator Lizard Cave and Wurzbach Bat Cave. Hays County records include Grapevine Cave and Wissman's Sink No. 2. A single Travis County record is from Whirlpool Cave. Williamson County records include T.W.A.S.A. Cave and a possible record from Venom Cave (represented only by a male and therefore not known with certainty to be this species).

Figure 16. Arrhopilitid springtail from Bexar County, possibly *Arrhopilites texensis*. Total length of this individual is less than 1 mm (photo by J. Krejca).

An ant-like litter beetle (*Batrisodes grubbsi*)

This ant-like litter beetle is a troglobite known only from a single cave in Hays County, Grapevine Cave, but is related to other species in central Texas that occur on the USFWS endangered species list (USFWS 1993). Chandler (1992) describes it as a 2.32 to 2.48 mm long with only remnant eyes. The species is named in honor of the principal collector of the series, Andrew G.

Grubbs. No image is available for this species, but Figure 17 shows a congeneric species known from caves in central Texas.

Figure 17. Image of *Batrisodes unicornis* from a cave in Bexar County, Texas. This is a congener to *Batrisodes grubbsi*, a troglobite known only from a single cave in Hays County, Texas (photo by J. Krejca).

Comal Springs diving beetle (*Comaldessus stygius*)

Spangler and Barr (1995) described the new genus *Comaldessus* based on Comal Springs, and named *Comaldessus stygius* as the type species. They described *C. stygius* as having an elongate, nearly parallel sided and somewhat flattened body shape, rudimentary eyes, and a pale reddish-brown, thin, and nearly transparent outer layer. Other subterranean adaptations include well-developed sensory hairs on various parts of the body (Figure 18). The specific name 'stygius' is after the Greek river Styx, a river in the netherworld. This species is currently known from Comal Springs and possibly Fern Bank Springs (Gibson et al. 2008).

Figure 18. *Comaldessus stygius* from Fern Bank Springs, Hays County, Texas (photo by R. Gibson).

Edwards Aquifer diving beetle (*Haideoporus texanus*)

This aquifer dwelling beetle is a small (3.4 to 3.7 mm long), elongate, oval-shaped and somewhat flattened member of the family Dytiscidae (subfamily Hydroporinae, tribe Hydroporini), unique at the time of description in that it was the only North American aquatic beetle with reduced, apparently nonfunctional eyes and reduced body pigmentation (Young and Longley 1976). Another likely subterranean adaptation of this species is a greater development of fine sensory hairs on the back of the wing covers. It is known from the Artesian Well and Comal Springs (Gibson et al. 2008). There are no images of this species available but it is quite similar to the species in Figure 18.

A cave-obligate beetle (*Rhadine* sp. cf. *austinica*)

This new species is a Hays County endemic known from two sites, Dahlstrom Cave and Michaelis Cave. The species description will be the ultimate source for information on the biology, taxonomy, and distribution of the species. There are no images available for this species, but it is similar in appearance to *Rhadine austinica* (Figure 19).

Figure 19. *Rhadine austinica* from Blowing Sink Cave, Travis County, Texas (photo by J. Krejca).

A cave-obligate beetle (*Rhadine insolita*)

Barr (1974) described *Rhadine insolita* from a single specimen. It is 8.3 mm long, moderately slender, and with minute, rudimentary eyes. The specific name is from 'insolitus,' or unusual, based on the odd location of a pair of hairs on the middle body segment. The species is now known from two localities: the type is Fischer Cave in Comal County and the other locality is Grapevine Cave in Hays County. No image is available for this species; however, it is similar to *Rhadine tenebrosa*, Figure 20.

Figure 20. *Rhadine tenebrosa* from Sandtleben Cave in Uvalde County, Texas (on right) and *Rhadine howdeni* from Moon Mountain Cave, Uvalde County, Texas (on left) (photo by J. Krejca).

Undescribed beetle (*Rhadine* n. sp. (subterranea group))

This new species is a Hays County endemic known from only a single locality, Boyett's Cave. The species description will be the ultimate source for information on the biology, taxonomy, and distribution of the species. There are no images available for this species, but it is similar in appearance to *Rhadine subterranea* (Figure 21).

Figure 21. *Rhadine subterranea* from Temples of Thor Cave, Williamson County, Texas (photo by J. Krejca).

Undescribed beetle (*Rhadine* n. sp. 2 (subterranea group))

This new species is a Hays County endemic and definitively occurs in three caves: Ezell's Cave, Lime Kiln Quarry Cave, and McCarty Cave. The species description will be the ultimate source for information on the biology, taxonomy, and distribution of the species. This species is extremely slender and may be the most troglomorphic member of the genus (Figure 22) (James Reddell, pers. comm.).

Figure 22. *Rhadine* n. sp. 2 [*subterranea* group] from Ezell's Cave in Hays County, Texas (photo by J. Krejca).

Blanco River springs salamander (*Eurycea pterophila*)

Burger et al. (1950) described this species as externally similar to *Eurycea neotenes*, but distinctive in the skeleton. The characteristics of this medium-sized (40 to 65 mm) neotenic salamander include a flattened head, lidless eyes, three well-developed gills, short forelegs, and a mottled brown and yellow color as seen from the top (Figure 23). This species has been synonomized with *E. neotenes* based on morphological characters (Sweet 1978), then recognized again based on allozyme and geographic evidence (Chippindale et al. 2000). It occurs in at least three counties (Blanco, Hays, Kendall, and possibly Comal), with at least eleven sites in Hays County: Ben McCulloch Springs, Blanco River Spring, Cypress Creek Spring, Fern Bank Springs, Grapevine Cave, Jacob's Well, Rancho Cima Dam Spring, Smith Creek Lower and Upper Springs, Spring 1 mi. SE Signal Hill, Spring 1.5 mi. E Payton (Sweet 1977, Chippindale et al. 2000, D. Hillis, pers. comm. 2008). Previously thought to be restricted to the drainage of the Blanco River drainage basin, recent work by Bendick (2006) showed this species to also occur in the Guadelupe River drainage basin.

Figure 23. Image of *Eurycea pterophila* from Jacob's Well, Hays County, Texas (photo by J. Krejca).

Blanco blind salamander (*Eurycea robusta*)

Eurycea robusta is known from a single existing specimen that was collected in 1951 from groundwater in a narrow vertical fissure in the bed of the Blanco River northeast of San Marcos (Potter and Sweet 1981). It is a large (10 cm total length) stout-bodied, depigmented salamander with external gills, very reduced eyes, robust limbs and a thick tail with moderately high fins. Recent efforts to re-expose the collection locality, which is presumably buried under stream sediments gravels, were unsuccessful (Gluesenkamp and Krejca 2007). Russell (1976) provided new information on the distribution of both *E. robusta* and *E. rathbuni* in relation to hydrogeology, and theorized that although *E. robusta* came from a block of Austin Chalk, that unit is not particularly cavernous and the salamander may have actually come up from cave passages in the underlying Edwards Limestone.

3.0 Additional Species

The RHCP addresses 16 "additional" species for which Hays County is not currently seeking incidental take authorization. Some of the additional species are not currently listed as threatened or endangered, some are not likely to be impacted by covered activities, and/or little is known about them to adequately evaluate take or impacts and mitigation. Species placed in this category include several of the currently listed aquatic species, as well as unlisted plants and unlisted aquatic animals.

Hill Country wild-mercury (*Argythamnia aphoroides*)

Hill Country wild-mercury (*Ditaxis aphoroides*, also known as *Argythamnia aphoroides*) is narrowly endemic to the Edwards Plateau and the southwestern portion of north-central Texas. It grows in shallow to moderately deep sandy or rocky limestone soils, including clays and clay loams over limestone. Hill Country wild-mercury is found on rolling upland terrains in grasslands mixed with live oak woodlands. The species has been recorded from Hays County, but Mahler (1988) did not report any currently known populations from the county (Diggs et al. 1999, Texas Parks and Wildlife Department 2007). The species has a global conservation ranking indicating that the species

is imperiled across its entire range with a high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors (NatureServe 2007).

Warnock's coral-root (*Hexalectris warnockii*)

Warnock's coral-root (*Hexalectris warnockii*), also known as Texas purple-spike) is a native Texas orchid found growing under juniper-oak woodlands on the Edwards Plateau. The species also occurs in the Trans-Pecos regions of Texas. On the Edwards Plateau, the orchid grows in deep leaf litter and humus over rocky limestone soils (Diggs et al. 1999, Liggio and Liggio 1999). Warnock's coral-root has been recorded in Hays County (Liggio and Liggio 1999). The species has a global conservation ranking indicating that the species is vulnerable to extirpation or extinction or may be imperiled across its entire range with a moderate to high risk of extinction due to a restricted range, few populations (often 80 or fewer), recent or widespread and possibly steep declines, or other factors (NatureServe 2007).

Canyon mock-orange (*Philadelphus ernestii*)

Canyon mock-orange (*Philadelphus ernesti*) is a small, flowering shrub that grows on shaded, limestone outcrops in mesic canyons and along streams on the Edwards Plateau. The species is rare and endemic to the Texas Hill Country (Lynch 1981, Texas Parks and Wildlife Department 2007). Canyon mock-orange has a global conservation ranking indicating that the species is imperiled across its entire range with a high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors (NatureServe 2007).

Texas wild-rice (*Zizania texana*)

Texas wild-rice (*Zizania texana*) is an aquatic, perennial grass that is generally three to seven feet long. The plant grows in the swift-moving waters of the upper San Marcos River. Texas wild-rice was federally listed as endangered on April 26, 1978 (43 FR 17910). Critical habitat for Texas wild-rice has been designated at Spring Lake and the headwaters of the San Marcos River to its confluence with the Blanco River (USFWS 1995).

Texas fatmucket (*Lampsilis bracteata*)

The Texas fatmucket (*Lampsilis bracteata*) is a freshwater mussel that occurs in streams and small rivers in the Colorado and Guadalupe river basins (Howells et al. 1996, NatureServe 2007). While the Texas fatmucket has not been recorded from Hays County, it has been found in several adjacent and nearby counties (Howells et al. 1996). However, only five small populations are thought to remain and the current status of three of these populations is questionable due to flood scouring or dewatering (NatureServe 2007). The species has a global conservation ranking indicating that the species is imperiled across its entire range with a high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors (NatureServe 2007).

Golden orb (*Quadrula aurea*)

The golden orb (*Quadrula aurea*) is a freshwater mussel that appears to be restricted to flowing waters ranging from only a few centimeters to over three meters deep with san, gravel, and cobble bottoms (NatureServe 2007). The golden orb has been recorded from the San Antonio, Guadalupe, Colorado, Brazos, Nueces, and Frio river systems. However, its current distribution is though to only include the Guadalupe, Nueces, Frio, and San Marcos rivers (Howells et al. 1996, NatureServe 2007). The golden orb has a global conservation ranking indicating that the species is imperiled across its entire range with a high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors (NatureServe 2007).

Texas pimpleback (*Quadrula petrina*)

The Texas pimpleback (*Quadrula petrina*) is a freshwater mussel that utilizes mud, gravel, and sand substrates in large to medium sized rivers that have slow flow rates. The species has been found in sites with less than one meter of water. The Texas pimpleback occurs within the Guadalupe and Colorado river basins. While it has been recorded from the Llano, San Saba, Pedernales rivers, the species is currently known to occur only within the Concho River, Colorado River, and a tributary of the Colorado River in Runnels County (Howells et al. 1996, NatureServe 2007). The Texas pimpleback has a global conservation ranking indicating that the species is imperiled across its entire range with a high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors (NatureServe 2007).

Texas austrotinodes caddisfly (*Austrotinodes texensis*)

Caddisflies are slender, elongated, moth-like insects with a winged, terrestrial adult stage and an aquatic caterpillar-like larval stage. The Texas austrotinodes caddisfly (*Austrotinodes texensis*) has been observed at Fern Bank Springs in Hays County, and appears to be endemic to the karst springs and spring runs of the Edwards Plateau. This species has a global conservation ranking indicating that the species is imperiled across its entire range with a high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors (NatureServe 2007).

Comal Springs riffle beetle (*Heterelmis comalensis*)

The Comal Springs riffle beetle, *Heterelmis comalensis*, is a very small (1.7 to 2.1 mm long) elmid beetle, elongate with approximately parallel sides, coated with fine hairs, and reddish-brown in color (Bosse et al. 1988) (Figure 24). Larvae are up to 10 mm long, with an elongate tubular body. The specific name is for the type locality, Comal Springs. Biologists find adults and larvae of this aquifer species primarily in drift nets or cotton cloth traps at spring upwellings (Gibson et al. 2008). This species is known from two localities: San Marcos Springs in Hays County and Comal Springs in Comal County.

The beetle was listed as federally endangered on December 18, 1997 (62 FR 66295). Critical habitat was designated for the Comal Springs riffle beetle at Comal Springs and San Marcos Springs on July 17, 2007 (72 FR 39247). The critical habitat designation in Hays County includes 10.5 acres

associated with the surface aquatic habitat at the spring outlets and within Spring Lake (except for the slough portion of the lake that lacks spring outlets) (72 FR 39247).

Figure 24. *Heterelmis comalensis* from a captive population in the U.S. Fish and Wildlife Service Hatchery in San Marcos , Texas (photo by J. Krejca).

A mayfly (*Procloeon distinctum*)

Mayflies are small to medium-sized insects with a winged adult stage and aquatic immature stage. Larvae of *Procloeon distinctum* have been found in submergent vegetation at the lower reaches of riffles and runs. The species has a global conservation ranking indicating that the species is imperiled across its entire range with a high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors (NatureServe 2007).

San Marcos saddle-case caddisfly (*Protoptila arca*)

The San Marcos saddle-case caddisfly (*Protoptila arca*) appears to prefer swiftly moving and well oxygenated, warm water approximately one to two meters deep. While the species is known to be locally very abundant, it has only been recorded from a few localities in Hays County including an artesian well, the upper reaches of the San Marcos River in deeper runs on rocks and substrates in faster flowing waters, and within and downstream of Spring Lake (NatureServe 2007, R. Gibson, pers. comm.. 2008, Texas Parks and Wildlife Department 2007). The San Marcos saddle-case caddisfly has a global conservation ranking indicating that the species is critically imperiled across its entire range with a very high risk of extinction due to extreme rarity (often five or fewer known populations), very steep population declines, or other factors. (NatureServe 2007).

Comal Springs dryopid beetle (*Stygoparnus comalensis*)

The Comal Springs Dryopid Beetle, *Stygoparnus comalensis*, is a long (3 to 4 mm), slender aquatic beetle with a thin outer covering and reddish-brown color (Barr and Spangler 1992) (Figure 25). Larvae are elongate, cylindrical and yellowish-brown. Originally described only from Comal Springs, the type locality and source of the specific name, Barr (1993) discovered them at a second locality, Fern Bank Springs in Hays County. Biologists find adults and larvae of this aquifer species primarily in drift nets or cotton cloth traps at spring upwellings (Gibson et al. 2008).

The beetle was listed as federally endangered on December 18, 1997 (62 FR 66295). The species is only known to occur at Comal Springs at the headwaters of the Comal River in Comal County and Fern Bank Springs approximately 20 miles northeast of Comal Springs in Hays County (USFWS 1995). Critical habitat was designated for the Comal Springs dryopid beetle at both locations on July 17, 2007. The Fern Bank Springs critical habitat unit includes the aquatic habitat at the spring outlet and a 50-foot wide buffer around the spring outlet that includes adjacent riparian habitat. The total size of the critical habitat area at Fern Bank Springs is 1.4 acres (72 FR 39247).

Figure 25. *Stygoparnus comalensis* from a captive population in the U.S. Fish and Wildlife Service Hatchery in San Marcos, Texas (photo by J. Krejca).

Fountain darter (*Etheostoma fonticola*)

The fountain darter (*Etheostoma fonticola*) is a reddish-brown freshwater fish that is typically less than one inch long (USFWS 1995). The USFWS listed the fountain darter as federally endangered on October 14, 1970 (35 FR 16047). The species is currently known to occur in Spring Lake and the headwaters of the San Marcos River downstream to approximately the confluence of the Blanco River. The fountain darter is also known to occur throughout the Comal River (USFWS 1995). Critical habitat for the fountain darter is designated at Spring Lake and the headwaters of the San Marcos River to approximately 0.5 mile below the Interstate Highway 35 bridge (USFWS 1995).

San Marcos salamander (*Eurycea nana*)

Bishop (1941) described this small, slender, light reddish-brown, neotenic salamander. It is approximately 4 to 6 mm long, lungless, and retains external gills throughout life. Chippindale et al. (1998) reviewed the history of taxonomic status of the species, and studied allozyme and morphological characteristics to justify the validity as a species. The San Marcos salamander can be distinguished from other central Texas *Eurycea* based on a narrower head, light reddish brown body color and dark eye ring, and allozyme characteristics. The habitat for this salamander consists of spring openings and rocky substrates at Spring Lake and below the dam where there is consistently cool, clean, clear, and flowing water. Moss and algae provide habitat for prey species, including amphipods and shrimp. Population estimates have ranged from 17,000 to 53,000 individuals (USFWS 1995). There is no image available for this species, but it is similar in appearance, and even historically synonomized, with the salamander species in Figure 26.

The salamander was listed as federally threatened on July 14, 1980 (45 FR 47355). The species is only known to occur in and just downstream of Spring Lake. Critical habitat for the San Marcos salamander is designated at Spring Lake and approximately 164 feet downstream from the Spring Lake Dam in the upper reaches of the San Marcos River (USFWS 1995).

Figure 26. *Eurycea neotenes* from a spring in northern Bexar County, Texas (photo by J. Krejca).

Eurycea species (northern Hays County) (*Eurycea* species)

There are four known populations of *Eurycea* salamanders that occur in northern Hays and southern Travis County between San Marcos Springs and Barton Springs. These populations share genetic similarity with the San Marcos salamander (*Eurycea nana*), yet are morphologically aligned with the Barton Springs salamander (*Eurycea sosorum*) (David Hillis, Paul Chippindale, Nate Bendick, personal communication, 2007) (Figure 27). Both the San Marcos salamander and the Barton Springs salamander are federally listed species. While these are preliminary findings and not yet documented in technical literature or addressed by regulatory entities (i.e., the USFWS), the most likely outcome of this documentation is that within the next five years biologists will describe these populations as a range extension for the federally listed San Marcos salamander or Barton Springs salamander. The four locations where this salamander has been documented are Blowing Sink Cave

and Cold Springs in Travis County (Andy Gluesenkamp, Nate Bendick, personal communication, 2007) and Stuart Springs (also known as Springs on Little Bear Creek) and Spillar Ranch Springs in Hays County (David Hillis, personal communication, 2007). Estimates of the number of salamanders at these four sites are not available. Overall, the very low densities at all known localities suggest population numbers that are quite low. As with other *Eurycea* species, these populations probably rely on consistently clean flowing water and substrates that encourage prey species (crustaceans).

Figure 27. *Eurycea* sp. from Stuart Springs, Hays County, Texas (photo by D. Chamberlain).

Texas blind salamander (*Eurycea rathbuni*)

The Texas blind salamander was originally placed in its own genus, *Typhlomolge*, and later brought into the genus *Eurycea*. A full history of the many changes in taxonomic status, as well as a phylogenetic hypothesis based on molecular methods, is available in Chippindale et al. (2000). It is an unpigmented, fully aquatic, large (up to 13 cm long) cave-adapted salamander distinguishable from other central Texas *Eurycea* by the lack of pigment that leaves it with a pearlescent color, extremely broad and flattened head shape, long spindly arms, deeply finned tail, and extremely reduced eyes visible as two small dark spots beneath the skin (Figure 28). The salamander is one of only three vertebrate species of the Edwards Aquifer, the other two are blind catfish that occur in only Bexar County, Texas. As the largest aquifer organism in Hays County, it is the top predator, feeding on aquifer invertebrates, including crustacea and snails. A recent study summarized historic qualititative population estimates and used mark-recapture techniques to estimate current populations. At one site the population ranged from 10 to 93 individuals, and densities were recorded at two sites as 0.0026/m^2 and 2.08/m^2 (Krejca and Gluesenkamp 2007). Russell (1976) provides a summary of the distribution of the species, including a discussion of geology.

The salamander was listed as federally endangered on March 11, 1967 (32 FR 4001). The Texas Blind Salamander is a Hays County endemic, recorded from a small geographical cluster of eight sites: Diversion Spring, Ezell's Cave, Johnson's Well, Primer's Well, Rattlesnake Cave, Side seeps in Sessom's Creek, Artesian Well, and Wonder Cave. The Wonder Cave locality is severely impacted by habitat modification and commercialization and all recent attempts to find any aquatic fauna there have been unsuccessful. No critical habitat has been designated for the Texas blind salamander (USFWS 1995).

Figure 28. ***Eurycea rathbuni*** **from Rattlesnake Cave, Hays County, Texas (photo by J. Krejca).**

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APPENDIX C

Karst Sensitivity Map for Hays County

Zara Environmental, LLC (2008)

ZARA
ENVIRONMENTAL LLC
118 W. Goforth Road
Buda, Texas 78610
www.zaraenvironmental.com

KARST SENSITIVITY MAP FOR HAYS COUNTY

Edwards Aquifer as seen from inside Ezell's Cave, Hays County, Texas

Prepared for
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14 August 2008

Abstract

We used biological and geological data to create a map detailing areas of sensitivity with respect to geology, cave and karst feature distribution, and karst and aquatic species distribution in Hays County, Texas. The map delineates all geologic outcrops that may contain caves and karst features (karst terranes), and within those outcrops there are Generalized Cave Locations showing where known caves and karst features occur. The Generalized Cave Locations, delineated using detailed geologic maps and probable hydrologic catchment, are further divided into two categories: those that are known to contain rare species and those that are not. The Biological Advisory Team to the Hays County Regional Habitat Conservation Plan (RHCP) used various filters to create the list of rare species, including distribution within the county, state distribution (S-ranks), global distribution (G-ranks) and state and federal protection. For purposes of the RHCP these rare species are identified Evaluation Species of Concern, which include the first 40 taxa in Table 1, and Additional Species of Concern which are the final five federally listed species in Table 1.

Land planners should generally consider all geologic outcrops that may contain caves and karst features more sensitive than non-karst terranes. Their characteristics include rapid recharge of unfiltered surface water into the subsurface and high flow velocities within the system - features that increase the likelihood and severity of contamination events. Within the sensitive karst terranes, Generalized Cave Locations with known karst features are more sensitive than those areas outside of the Generalized Cave Locations, with the caveat noted below. Among the Generalized Cave Locations, those known to have rare species in them are more sensitive than those without, also noting the caveat below.

The caveat is that this report is an accumulation of the data available to us at this point. There have been very few systematic efforts to map caves, karst features, or terrestrial cave invertebrate distribution in Hays County. The cave and karst invertebrate results summarized herein are primarily the product of sporadic cave surveys done by recreational speleologists using inconsistent methods over several decades. Due to these shortcomings, the distribution of caves and species is not representative of what actually exists, but rather of our current state of knowledge. For this reason it is quite likely that a cave fauna inventory would not only find cave and karst features previously unmapped, but possibly new localities for rare karst species.

Methods

Biology

We consulted a variety of sources to accumulate rare troglobite species distribution data for the county (Table 1). We used the database of karst invertebrates in the Texas Memorial Museum (maintained by James Reddell) as a foundation for species range data. Other recent publications cited in the results provided information relevant to Hays County. Additionally, we conducted interviews of active taxonomists, cave biologists and land managers (James Reddell, William Russell, Randy Gibson, Dave Hillis, Dee Ann Chamberlain, Nico Hauwert Nate Bendick, Andy Gluesenkamp, Chris Thibodaux, Andy Grubbs, Peter Sprouse, Pierre Paquin and Pat Connor). James Reddell provided a list of taxa from an unpublished report on the fauna of caves along a proposed extension to Wonder World Drive in San Marcos, Texas.

There have been no systematic efforts to survey the karst fauna of Hays County. Of the known caves and karst features, biologists made collections in less than 25% of them, and

of those, very few have been intensely surveyed with the goal of identifying every species in the cave. The bulk of the species records summarized herein are the result of sporadic collections made by recreational speleologists using inconsistent methods over several decades. During a single study performed on the proposed extension to Wonder World Drive in San Marcos, surveyors made an effort to systematically bioinventory 11 caves, karst features, and wells, but even this study only consisted of one or two visits to those sites (though the report also summarized historic visits). Given the low numbers of individuals, small physical sizes, and sheltering habits of troglobites, they have low detectabilities and require greater than ten visits to find the majority of taxa that occur in a cave (Krejca and Weckerly 2007). Ezell's Cave is the only cave in Hays County visited orders of magnitude more times by biologists than any other cave in the county, and most in the state. It is famous for access to the Edwards Aquifer and a population of Texas Blind Salamanders, *Eurycea rathbuni*. However even this cave, visited at least 50 times by invertebrate biologists, yielded a new record for *Rhadine* n. sp. 2 (*subterranea* group) in 2007, demonstrating that multiple visits are required in order to find taxa with low detection probabilities.

There is a single locality with remarkable diversity worthwhile of mention because of the many synonyms. In this report, we call it the Artesian Well, but it also is referred to as: Old Federal Fish Hatchery well, U.S. Fish Commission well, Artesian Well at/in San Marcos, San Marcos Artesian Well, Artesian well on [TSU/SWT] campus.

Given the scope of this project, we made only a minimal attempt to describe the biogeography of the taxa in Table 1. Reviewing the geologic unit(s) these 45 species are known from and the geographic spread of the localities yielded no obvious correlations. We recommend performing additional work, including species surveys, phylogenetics, and analyses of endemicity in order to make and test biogeographical hypotheses. Some of these are discussed in the recommendations section.

Geology

We consulted several geologic maps to take advantage of the best-resolution mapping available and to create the composite geologic basemap for this project. Hanson and Small (1995) provided the mapping of Edwards Limestone at the member level. The Geologic Atlas of Texas (University of Texas 1979; 1981a; 1981b; 1983) was used to compare the overall extent of the Edwards Limestone to the Hanson and Small (1995) maps. The GAT maps also served as the basis for delineating Glen Rose outcrops. While the upper member of the Glen Rose formation has been formally subdivided and mapped in northern Bexar County (Clark, 2003), that scale of mapping has not yet been published for Hays County. These publications include maps created at a regional scale, and the boundaries of the karst terranes of Hays County presented here have a similar resolution; local studies will lead to a refinement of our understanding of the limits and distribution of karst resources in Hays County. The scope of this project did not include ground-truthing the geological mapping.

Based on the distribution of known karst features relative to bedrock geology, we designated five types of bedrock outcrop where karst features are likely to form, and refer to them as karst terranes. These outcrops are, from youngest to oldest, the Buda Limestone, the main outcrop of the Edwards Aquifer (Georgetown, Person, and Kainer Formations), outliers of the Kainer Formation that are geographically isolated from other outcrops of Edwards Limestone, the lower member of the Glen Rose Formation, and the Cow Creek Limestone. We acknowledge, as discussed below, that the distribution of known karst features is strongly biased by the places where people have been able to look for them. Future surveys in the karst terranes are likely to discover additional caves and karst

features, but karst features are not likely to be found outside of these karst terranes (white or 'non-karstic' areas in Figure 1). However, it must be noted that while it is unlikely to find caves outside of the karst terranes, it is not impossible. In five specific cases there are occupied springs and wells that are outside of mapped karst terranes, and they are explained here. We derived four spring locations occupied by *Eurycea pterophila* from Heitmuller and Reece (2007). In Figure 1 they appear as a single red polygon spanning the western border of the county and just north of the Lower Glen Rose areas, two red polygons in the south central part of the county between the Lower Glen Rose and Georgetown/Edwards outcrops, and a single red polygon on the northern border of the county just north of the northernmost extent of the Georgetown/Edwards outcrops. These are springs that may be discharging from buried cavernous limestone, or they may be innacurately located. A final occupied location outside of mapped karst terranes is in the southeast part of the county east of the majority of mapped Georgetown/Edwards outcrops. This is the single known locality for *Eurycea robusta*, which was collected from a narrow vertical fissure located in the Austin Chalk (a non-cavernous unit), but probably originated from the underlying Edwards Limestone (Russell 1976).

There has been no formal or professional survey of all of the karst of Hays County. There have been few formal karst surveys in any areas of the county. The known caves are known because of the efforts of individuals, almost exclusively volunteers, who have tried to catalogue what caves they found or heard of. There are many reasons that caves have gone undocumented, but the primary reason is limited access to private property. The variable level of urbanization also plays a role. While access to land might be better while property is being developed, caves are also destroyed or obscured during development. The Texas Speleological Survey (TSS) generously allowed access to their database, which contained references to 361 karst features. Of these, 268 had recorded locations and 93 did not. After careful inspection of the data and consultation with several speleologists familiar with the area, we added several new caves to the list, and determined that some features consisted of duplicate names to previously known caves. Interpretation of the karst terranes was based on a final list of 301 caves and karst features (Table 2). The locations of these features came from trusted sources, but most have not been field verified by the authors. Therefore if this map is used to determine exact boundaries for sensitive parcels, field verification should be performed. There are still over 70 records of caves and karst features for which locations and descriptions could not be obtained. These features may have been destroyed since they were discovered or may be on property which is now inaccessible. Old descriptions may be inadequate, or the modern landscape may have changed too much in recent years to use old descriptions to estimate locations.

We constructed the maps presented here as shapefiles in ArcMap 9.2 (Figures 1 and 2). The reference is to UTM Zone 14 North coordinates and North American Datum 1983. The TCEQ Edwards Aquifer Recharge Zone shapefile is in UTM Zone 14 North coordinates and North American Datum 1927. No specific locations of caves or karst features are given. Instead, we created Generalized Cave Locations, polygons around precise locations of caves, springs, and other karst features. To make the Generalized Cave Locations we plotted precise feature locations over a topographic map and a composite geology map (based on all of the geologic maps cited above). Then we drew polygons around those precise locations based on geologic interpretation and a buffer around the location. This method, per agreement with the TSS, avoids publishing exact cave locations in a form that could enable trespassing and vandalism on private or public property. The geologic and geomorphologic interpretation used to create the polygons included the member-scale mapping of Hanson and Small (1995) in the Edwards Limestone, and the probable hydrologic catchment of specific caves. Catchment areas were based on topography and an interpretation of the

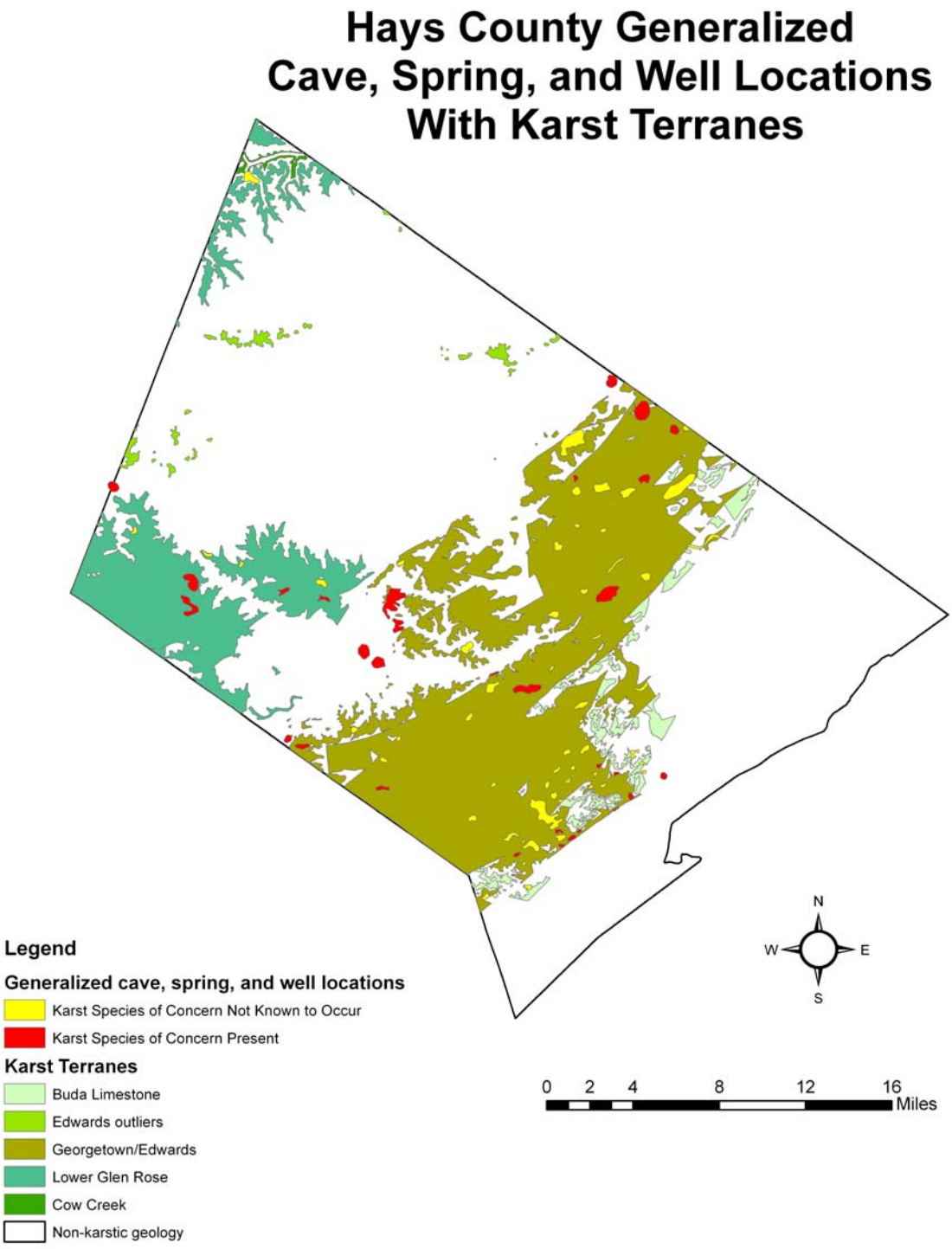

Figure 1. Hays County karst terranes and Generalized Cave Locations, showing distribution of rare species.

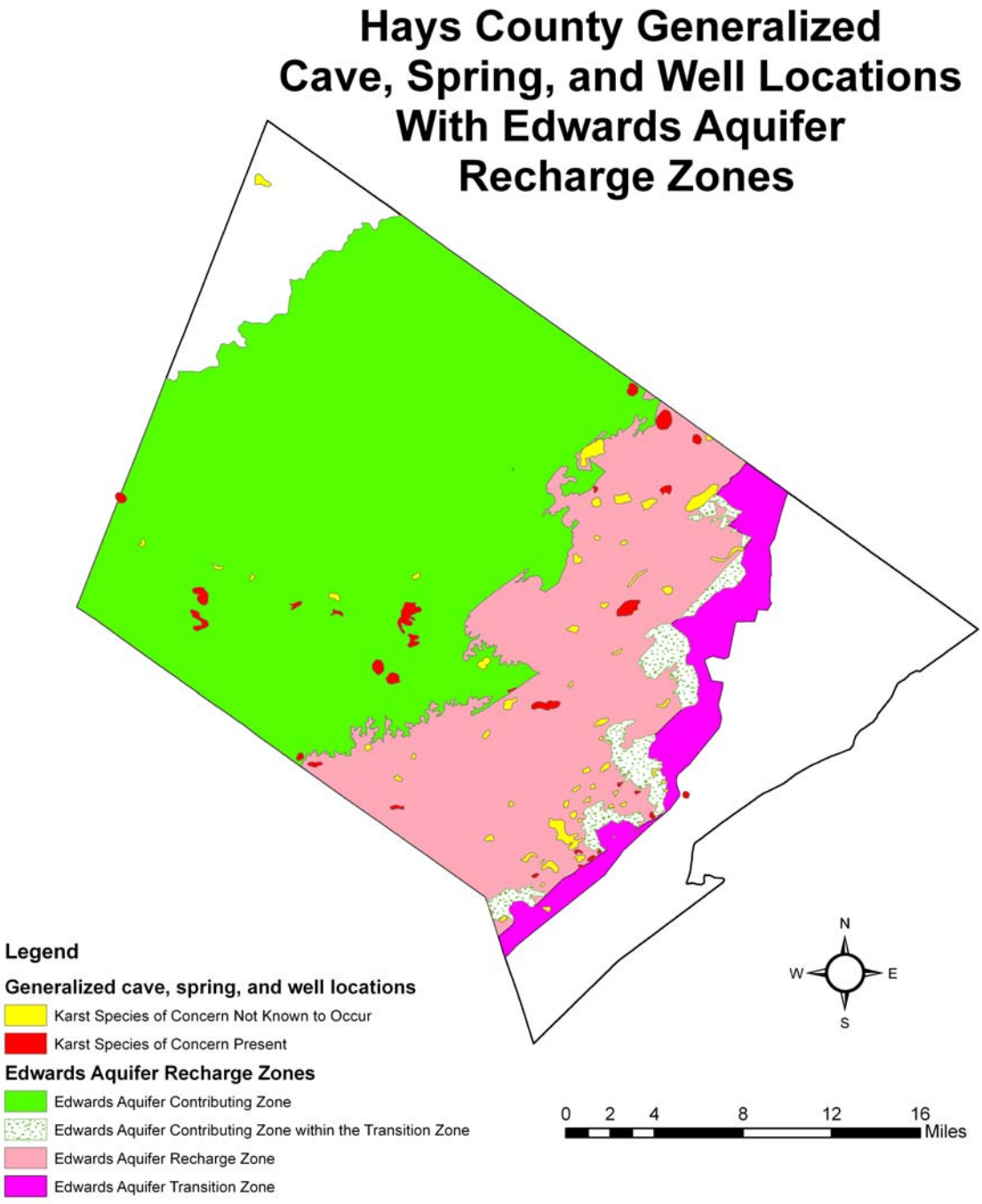

Figure 2. TCEQ Edwards Aquifer Recharge Zones in Hays County showing locations of rare species.

speleogenesis of individual caves, when possible. We interpreted the speleogenesis based on the physiographic settings of caves, as well as cave maps, personal knowledge of the authors, verbal descriptions, or photos from other speleologists. Extensive examples of how geologists interpret speleogenesis can be found in Klimchouk et al. (2000).

In several cases reliable cave locations indicated that the regional-scale bedrock mapping was incorrect. In these cases we adjusted karst terrane boundaries to include the following caves: Academy Cave, Bethke Ranch Cave, Fern Bank Spring, Finger Cave, Kira's Karst Park, Quarry Cave, Quarry Sink, Radiance Sink, part of the San Marcos Spring complex, Sites' Cave, Spring 015, WWD-24, WWD-59, and WWD-60. Similarly we included a set of springs in the top of the upper member of the Glen Rose Limestone, which are almost certainly discharging water that recharged through the adjacent Edwards uplands.

Results

Each taxon listed in Table 1 is discussed in detail in another appendix of the Hays County Regional Habitat Conservation Plan. In many cases the known distribution of these taxa includes only a handful of localities, and many already fit the criteria of globally endangered by the World Conservation Union (Baillie et al. 2004). With more collecting effort in the county, some species records will undoubtedly increase in number accompanied with an increase of the overall size of their range. In cases where undescribed species are considered (e.g. *Neoleptoneta* n. sp. eyeless), it is possible that the range in the species description will be different than the estimation made herein. The species description in the scientific literature should be the ultimate source for information on these as-yet unrecognized species.

The lack of systematic karst surveys of the karst terranes of the county and a lack of detailed information about many of the caves that have been reported limit the analysis we can perform of the karst of Hays County. Ideally, we would base analyses on detailed cave maps and geologic observations for each cave. That information is not readily available, and that level of analysis is beyond the scope of this project.

We present a basic discussion below, addressing the cavernous nature of bedrock in Hays County from youngest to oldest. Before describing the karst terranes, we note several features excluded by the karst terranes. East of the Balcones fault zone, bedrock mapping is difficult due to the lack of outcrops. East of the Balcones fault zone, there are two karst features which might be located in the Austin Chalk (Cave on old Haupt place, small holes on Plum Creek). Veni (1998) noted that the Austin Chalk is cavernous in some parts of central Texas. These features cannot be assigned confidently to the Austin Chalk due to disagreement between the maps consulted, so we do not include the extent of the Austin Chalk in the set of karst terranes. These features may also be located stratigraphically lower, in a non-karstic rock overlying the Buda Limestone. If so, they could result from collapse or piping into karst features in the underlying Buda Limestone. Little is known about these features, and due to the uncertainty of their nature and geology, we did not represent these features with Generalized Cave Locations.

The Buda Limestone outcrops primarily in the central and southeast part of the county, along the eastern boundary of the Balcones fault zone. It forms occasional caves in Hays County, and is underlain by the Del Rio Clay, which is relatively impermeable. Of the 301 karst features analyzed in this project, six are located in the Buda Limestone (Academy Cave, Bethke Ranch Cave, Ken Barnes' Cave, Quarry Sink, Sink (Ogden 10) and Sink (Ogden 11)). Caves in the Buda Limestone are likely to be relatively shallow and discharge along the Buda/Del Rio contact. However, in low lying areas where this contact is not

exposed, the possibility exists that water entering karst features in the Buda Limestone (within the Edwards Aquifer Contributing Zone within the Transition Zone) continues downward into the Georgetown Formation and ultimately reaches the Edwards Aquifer.

The Georgetown Formation and Edwards Limestone are cavernous in Hays County. They form many caves; solutional development in these rocks is also evident in the density of sinkholes and other non-enterable karst features found whenever a formal karst survey is conducted. The cavernous nature of the Edwards Limestone is further displayed in its springs. There are major fault-controlled springs along the southeastern boundary of the Edwards Plateau in San Marcos. The San Marcos Springs are karst springs issuing from a network of conduits and solutionally enlarged fractures, discharging water from the Edwards Aquifer. These springs are the most productive in the county, and are among the largest of the major Edwards Aquifer springs of central Texas.

Smaller springs discharge near the base of the Edwards Limestone and its contact with the underlying upper member of the Glen Rose Limestone. These springs likely form when water enters the Edwards Limestone and travels downward through the Edwards Limestone along solutional passages, then travels horizontally along bedding planes when it encounters the less soluble upper member of the Glen Rose limestone. Such springs have been noted east of Wimberley along Lone Man Creek and Smith Creek. These springs are known to the TSS as Springs 001, 002, 003, 004 and 005. The low number of known springs elsewhere along the Edwards/Glen Rose contact is likely due to the lack of spring mapping. Researchers do not yet know whether these smaller perched springs have a different set of fauna.

Geologists treat the lithology of the Georgetown Formation and Edwards in two parts: the main body of the Georgetown Formation and Edwards Limestone, and erosional outliers of Edwards Limestone. The main portions of Georgetown Formation and Edwards Limestone outcrops occur in the central part of the county, in the densely faulted Balcones fault zone. Of the 301 karst features analyzed, 247 occur in this extensive area. There are also remnants of the oldest members of the Edwards Limestone on isolated hilltops in the northern part of the county. These outcrops range up to 25 m in thickness. Currently, no caves or karst features are known from this set of outcrops. The lack of karst features is probably a sampling artifact, as solutional features are likely to be found in this limestone regardless of current thickness. The physical isolation of these outcrops could have implications for distribution of cave organisms, if inhabited karst features exist in these places.

The upper member of the Glen Rose Limestone forms springs near its contact with the overlying Edwards Limestone, as discussed above. These springs are likely formed by water recharging through the Edwards Limestone and discharging along the top of the less soluble upper Glen Rose limestone. The records we consulted show 17 springs recorded in the upper member of the Glen Rose Limestone. Of these, five springs listed above are close to the top Glen Rose Limestone and are likely discharging water from karst flow systems in the overlying Edwards Limestone. Twelve more springs are located lower in the upper member of the Glen Rose Limestone and are not associated with any known karst features. These springs may correlate to lithology within the member, and may indicate a thin but relatively extensive unit of karstic rock, similar to the biostromes of Interval D of the upper member of the Glen Rose Limestone in northern Bexar County (Clark 2003 and 2004). At Camp Bullis Training Area in northern Bexar County, the Interval D biostrome mapped by Clark has developed a set of caves over a large area that is both hydrologically and biologically significant (George Veni and Associates 2006). The five springs near the top of the Glen Rose Limestone are included in the Edwards Limestone karst terrane, while the 12 springs

located lower in the upper member of the Glen Rose Limestone are not assigned to a karst terrane due to a lack of resolution in the stratigraphy.

The lower member of the Glen Rose Limestone is cavernous, forming a number of significant caves and springs, such as Jacob's Well. These outcrops occur in two groups: one in the western corner of the county, and one in the northern corner of the county. The outcrops are centered on the Blanco River and Cypress Creek in the western corner of the county. In the northern corner of the county, the outcrops are exposed along the steep slopes leading down to the Pedernales River. Of the 301 karst features analyzed in this project, 16 occur in the lower member of the Glen Rose Limestone. All are from the western outcrop area. The northern outcrop area is located in steep terrain, which makes searching for karst features more difficult. The steep terrain also makes it likely that karst features found in this area would be springs, seeps and paleosprings. Most karst feature locations come from recreational cavers searching for new caves, and since small springs and paleosprings rarely yield substantial amounts of cave passage, many cavers aren't likely to report such features. Therefore, the absence of karst features in the northern outcrop of the lower member of the Glen Rose Limestone is probably a sampling bias introduced by a lack of systematic searching.

Outcrop of the Cow Creek Limestone is limited to the far northern corner of the county. The Cow Creek Limestone lies below the Glen Rose Limestone and Hensell Sand, along the steep slopes leading down to the Pedernales River. We know of a single karst feature – Dead Man's Hole –in this area. Researchers have not recently visited this location due to access restrictions. While it is likely to be karstic, its origins are not well understood. It may be an old phreatic passage that has since been abandoned and breached, or it may be an old collapse feature into an older underlying void. Formed at the head of a steep drainage, it is likely that the feature periodically acts as a spring and discharges groundwater from the surrounding area. If so, it may host an interesting aquatic fauna. Caves are known elsewhere in the Cow Creek Limestone (Veni 1997), and further searching for karst features in the Hays County outcrop is warranted.

Discussion

Karst terranes are extremely sensitive to degradation from human activities. This is because karst systems are highly interconnected and heterogeneous, characterized by rapid recharge of unfiltered surface water into the subsurface, and high flow velocities within the system. This behavior makes these systems vulnerable from both biological and hydrological perspectives (Ford and Williams 1989, White 1988).

While we performed this analysis on the known caves and karst features of Hays County, the list is incomplete. In karst terranes, enterable caves are always outnumbered by karst features (Curl 1966). More caves and many more karst features and small springs that have not yet been documented exist in Hays County in areas that are undergoing rapid development. Many karst features go unrecognized during development, contributing to biological and hydrological degradation to the karst resources. Researchers have conducted few karst surveys in Hays County, but the number of known caves indicates that a great number of karst features exist. The need for professional karst surveys is illustrated by comparing the results of one such survey with what is known in the rest of the county. Veni (2002) surveyed a tract of land in the San Marcos area. In that 4.2 km^2 area, eight caves and 112 karst features were found. There is no evidence to show that this is an atypical cave density for the area, and when extrapolated for the entire Georgetown Formation and Edwards Limestone outcrop of Hays County, we could expect to find 752 caves and 10,533

karst features in the additional 395 km^2 of that outcrop. We currently only know of 90 caves and 14 karst features outside of that survey area.

The karst features of the Georgetown Formation and Edwards Limestone recharge the Edwards Aquifer. Development over these outcrops poses groundwater contamination risks, as well as decreasing the amount of recharge entering the Aquifer (Hansen and Small 1995). This well-developed karst network provides habitat for a rich invertebrate fauna. Karst invertebrates are able to occupy non-enterable karst features as well as caves, so all karst features, not just caves, should be treated as biologically and hydrologically vulnerable.

Species distribution

The World Conservation Union and NatureServe databases consider species with restricted ranges (e.g. five or fewer localities) in urbanizing areas critically imperiled (Baillie et al. 2004). It is possible that the documented localities of these species represent the real ranges of these species, or future collecting efforts may find they are more widespread. Researchers have done little collecting in comparison to other areas in central Texas, such as Travis and Williamson Counties.

The distribution of these species in relation to the geology is not clear from the cursory examination we have performed. Some taxa are known from all areas, including the Georgetown Formation, Edwards Limestone, and lower member of the Glen Rose Limestone, others from only one of those members, and still others from only single caves. To create a more detailed map, we recommend performing an endemicity analysis, a detailed review of geologic controls between sites where we have biological data, and an algorithm to subdivide the karst terrane. It may be possible to identify vicariant events responsible for range boundaries such as surface rivers that bisect cavernous rock, subsurface drainage basins, and faults that juxtapose cavernous and non-cavernous rock. Different members of the Edwards Limestone or subdivisions of the lower member of the Glen Rose Formation may correlate with species ranges.

In other areas of Texas where federally listed terrestrial karst species occur (Travis, Williamson and Bexar counties), more in-depth studies revealed limits to the biogeography of those species. These studies created Karst Fauna Regions (KFRs), or geographic areas delineated based on discontinuity of cave habitat that may obstruct communication between troglobite populations (Reddell 1993, Veni 1992, Veni 1994, USFWS 1994, USFWS 2000). Karst Fauna Regions were further subdivided into karst zones based on probability of containing habitat suitable for listed karst invertebrate species. The KFRs and karst zones are an integral part of the regulation, management and recovery for the listed species in those three counties. The map of karst terrane created herein has not been subdivided to this level, it simply shows all possible karst in the county overlain with all rare karst invertebrate localities. It was not in the scope of this project to perform an endemicity analysis for the species or hydrogeologic investigation at the level of those performed in these other areas.

Biology in the Trinity Aquifer

Regulatory entities focus on activities in and over the Edwards Aquifer because of the federally listed aquatic organisms in Hays County (*Eurycea nana, Eurycea rathbuni, Heterelmis comalensis, and Stygoparnus comalensis*), the Texas Commission on Environmental Quality Edwards Aquifer Rules, and the Edwards Aquifer Authority jurisdiction. However much of Hays County is underlain by the Trinity Aquifer, and at least

one and probably two aquifer-restricted organisms occur in both aquifers in Hays County. In a genetic analysis of aquifer isopods, closely related *Lirceolus hardeni* populations occurred in both Edwards (Rattlesnake Cave) and Trinity (Jacob's Well) localities, indicating that species boundaries do not follow aquifer boundaries (Krejca 2005). Reliable reports from SCUBA divers at one Trinity locality, Jacob's Well, indicate that the blind shrimp *Palaemonetes antrorum* occurs there (though no samples were collected), and this species is also known from Edwards Aquifer localities for the endangered salamander, *Eurycea rathbuni*.

Some aquifer species occur in both the Trinity and the Edwards aquifers, demonstrating that at least some aquifer fauna are not bound by these geologic units. Other rare salamanders and aquifer invertebrates occur in the Trinity (Heitmuller and Reece 2007), including *Eurycea* species (Chippindale et al. 2000) and crustaceans. The Trinity Aquifer receives less environmental regulation than the Edwards Aquifer.

Recommendations

In order to rank sensitivity, consider probabilities of species ranges, and in general further subdivide the map of karst terranes included herein, a Karst Fauna Region and karst zone map needs to be created. The data accumulated during this project is the first step toward creating that product, and other elements of KFRs and karst zones are covered in the discussion section. Other steps that will help create a robust analysis of Karst Faunal Regions and karst zones involve gathering biological data on more of the known caves and locating more of the approximately 70 caves on record which do not currently have viable locations. Datasets including phylogenetics and analyses of endemicity can help make and test biogeographical hypotheses (e.g. Krejca 2005).

Karst surveys should be conducted in all the karst terranes discussed in this document. Furthermore, areas adjacent to currently defined karst terranes should also be searched for karst features, as the regional-scale geologic mapping on which the karst terranes are based may not be precise at the local scale.

Biological investigations on the species discussed herein are needed to better manage the habitat. Most of the species are only mentioned in the literature by their species descriptions and taxonomic standing. The species descriptions provide the basics of their physical characteristics, their range, and occasionally information on collection methods. Subsequent papers use preserved specimens to refine taxonomy, while biological, life history, or field investigations are entirely absent.

Taxonomy is needed for all of the species lacking a description, and also needed for overlooked groups such as mites, ostracods and copepods. Two copepods, *Cyclops cavernarum* and *Cyclops learii* are likely aquifer adapted and known only from the Artesian Well, but the descriptions are useless for identification (*nomina dubia*), therefore they were not considered herein. Placing names on known species is extremely important to further taxonomy of higher groups and to serve as a first step to performing more in-depth research.

This map delineates sensitive karst terranes but does not rank these areas or give specific recommendations for land management practices in these sensitive areas. Examples of land management practices include impervious cover restrictions, runoff filtration, and the use of best management practices around karst features and caves. Future work should include ranking and creation of management recommendations.

Acknowledgements

The Texas Speleological Survey is an archive for karst data in the State of Texas. It is an all-volunteer, non-profit organization. Years of dedicated work by its directors make projects such as this possible. Future investigators are encouraged to communicate with the TSS on karst projects to better understand the areas in which they are working, and to provide information on their work and discoveries with the TSS in order to allow them to better fulfill their mission. This study benefited from consultation with several biospeleologists familiar with the karst of Hays County, including James Reddell of the Texas Memorial Museum, William Russell of the Texas Speleological Survey, Randy Gibson and Pat Connor of the U.S. Fish & Wildlife Service, Dave Hillis of The University of Texas, Dee Ann Chamberlain, Nico Hauwert and Nate Bendick of the City of Austin, Andy Gluesenkamp of the Texas Memorial Museum, Chris Thibodaux of Karst Tec Consulting, Andy Grubbs, Pierre Paquin of SWCA, and Peter Sprouse of Zara Environmental. Robin Gary of the USGS provided considerable help with the GIS database for the second map iteration which included aquatic species. Editing of the document was performed by Clif Ladd and Amanda Aurora of Loomis Austin, Inc., Alan Glen of Smith|Robertson, and Kellie Cowan and Krista McDermid of Zara Environmental.

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Personnel

Bev Shade, M.Sc., P.G., took this document from the inception as a list of cave locations to the original version of this map, including providing interpretation of the caves and karst features, writing all parts of the geology oriented text, and creating the first version of the map. Bev wrote her thesis on a silicate karst region in northeastern Minnesota, characterizing a heterogeneous karst flow system that clearly demonstrates multiple porosities. As part of the research lab of Dr. Calvin Alexander, she assisted with all aspects of dye tracing tests, including preparation of dye lots and charcoal detectors, field implementation, QA/QC, lab analysis of samples and calculation of actual dye concentrations through linear regression on known standards compared with non-gaussian curve models of spectra. Bev worked for six years professionally with central Texas karst issues.

Dr. Jean Krejca performed the biological reviews of all the species, managed the project, and wrote the non-geological text. She is a subterranean species specialist. Jean has a Bachelor's degree in Zoology, and a Ph.D. in Evolution, Ecology and Behavior from the University of Texas. Her dissertation work focused on cave adapted aquatic fauna, biogeography and hydrology of Texas and North Mexico. Since 1991 she has worked as a cave biologist and her experience in that area spans across the United States (Arkansas, California, Texas, Nevada, Illinois, Missouri, Indiana, Tennessee, North and South Carolina) as well as Mexico, Belize, Thailand and Malaysia. Her publication list on these areas is extensive. Texas cave biology experience started in 1997 and includes detailed collections of aquatic cave fauna for research, monitoring for endangered species, and working as a Karst Invertebrate Specialist for the U.S. Fish and Wildlife Service. In 2003 she co-founded Zara Environmental LLC where she continued her work from independent consulting and expanded to perform land management for landowners with endangered species, consult on endangered species permits, and perform custom research projects. In addition she has been involved with a variety of public outreach efforts such as public talks, field trips, and cave biology photography. She holds a USFWS endangered species permit (TE028652-0) and several state permits covering karst invertebrates and salamanders in Texas.

Marcus O. Gary created the second round of maps, including reorganizing the GIS files into a database format. Marcus is a Ph.D. candidate hydrogeologist specializing in karst forming processes and the implications that karst geology has on natural resource management. Marcus received an Associate of Science degree in Marine Technology at the College of Oceaneering, a B.S. degree in hydrogeology and environmental geology at the University of Texas, and is currently working on a volcanogenic karst dissertation project at the University of Texas. His research has been internationally recognized for investigating of the world's deepest underwater sinkhole and interpreting the geologic mechanisms that formed the karst system. For eight years he worked in the Texas Water Science Center of the U.S. Geological Survey, performing a multitude of tasks related to water resources. Projects included developing methods to quantify spring flow using acoustic technology, monitoring stage and water chemistry parameters at springs, performing a geochemical investigation of the Barton Springs Segment of the Edwards Aquifer, providing diving support for coring and karst monitoring projects, serving as a dive safety officer for the Central Region, and designing and implementing a variety of continuous monitoring projects at locations across Texas. His work at Zara since 2007 includes geologic assessments, drainage basin delineation, and dye tracing.

Table 1. List of karst and aquatic Evaluation and Additional Species of Concern in Hays County. Additional Species of Concern are federally listed and marked with a double asterisk. Abbreviations are as follows: Co. = County; dist. = distribution; TMM = Texas Memorial Museum; JKK = Jean K. Krejca; JRR = James R. Reddell; WWD = Wonder World Drive.

Order	**Family**	**Species**	**Hays County cave name**	**Notes on rarity**	**Range**	**source of information**
Tricladida	Kenkiidae	*Sphalloplana mohri*	Artesian Well, Ezell's Cave	6 sites	Hays, Kendall, Mason, San Saba, Travis	TMM database 2001, Kenk 1977
Taenioglossa	Hydrobiidae	*Phreatodrobia micra*	Artesian Well, San Marcos Springs	6 reliable sites	Comal, Hays, Kendall	TMM database 2001
Taenioglossa	Hydrobiidae	*Phreatodrobia plana*	Artesian Well, San Marcos Springs	3 sites	Comal, Hays	TMM database 2001
Taenioglossa	Hydrobiidae	*Phreatodrobia punctata*	San Marcos Springs	2 sites	Hays, Travis	TMM database 2001
Taenioglossa	Hydrobiidae	*Phreatodrobia rotunda*	Artesian Well, San Marcos Springs	2 sites	Hays	TMM database 2001
Pharyngobdellida	Erpobdellidae	*Mooreobdella* n.sp.	Artesian Well, Ezell's Cave, San Marcos Springs	3 sites	Hays	TMM database 2001, R. Gibson pers. comm. 2008
Thermosbaenacea	Thermosbaenidae	*Tethysbaena texana*	Artesian Well, Diversion Spring, Ezell's Cave	7 sites	Comal, Bexar, Hays, Uvalde	Stock and Longley 1981, Gibson et al. 2008, R. Gibson pers. comm. 2008
Amphipoda	Bogidiellidae	*Artesia subterranea*	Artesian Well, Ezell's Cave	3 sites	Comal, Hays, Val Verde	Holsinger and Longley 1980, Gibson et al. 2008
Amphipoda	Crangonyctidae	*Stygobromus balconis*	Autumn Woods Well, Boyett's Cave	4 sites	Hays, Travis	TMM database 2001, R. Gibson pers. comm.
Amphipoda	Crangonyctidae	*Stygobromus flagellatus*	Artesian Well, San Marcos Springs, Ezell's Cave, Rattlesnake Cave	6 sites	Comal, Hays, Travis	Holsinger 1966, Holsinger 1967, Holsinger and Longley, 1980, Gibson et al. 2008
Amphipoda	Hadziidae	*Allotexiweckelia hirsuta*	Artesian Well	3 sites	Hays, Bexar	TMM database 2001
Amphipoda	Hadziidae	*Holsingerius samacos*	Artesian Well	1 site	Hays	TMM database 2001
Amphipoda	Hadziidae	*Texiweckelia texensis*	Artesian Well, Ezell's Cave, San Marcos Springs	3 sites	Hays	Holsinger and Longley, 1980, R. Gibson pers. comm.
Amphipoda	Hadziidae	*Texiweckeliopsis insolita*	Artesian Well, San Marcos Springs	3 sites	Bexar, Hays	Holsinger and Longley, 1980

Table 1, continued. List of karst and aquatic Evaluation and Additional Species of Concern in Hays County

Order	Family	Species	Hays County cave name	Notes on rarity	Range	source of information
Amphipoda	Sebidae	*Seborgia relicta*	Artesian Well, Ezell's Cave	5 sites	Comal, Hays, Medina	Holsinger and Longley 1980, Holsinger 1992, Gibson et al. 2008
Isopoda	Asellidae	*Lirceolus smithii*	Artesian Well, Diversion Springs	2 sites	Hays	Bowman and Longley 1976, Gibson et al. 2008
Decapoda	Palaemonidae	*Palaemonetes antrorum*	Artesian Well, Ezell's Cave, Johnson's Well, Wonder Cave	8-10 sites	Bexar, Hays, possibly Uvalde	TMM database 2001
Decapoda	Palaemonidae	*Calathaemon holthuisi*	Artesian Well, Ezell's Cave	2 sites	Hays	TMM database 2001, Strenth 1976, R. Gibson, pers. comm. 2008
Aranae	Dictynidae	*Cicurina ezelli*	Ezell's Cave, Grapevine Cave	2 sites	Hays	TMM database 2001
Aranae	Dictynidae	*Cicurina russelli*	Boyett's Cave	1 site	Hays	TMM database 2001
Aranae	Dictynidae	*Cicurina ubicki*	Fern Cave, McGlothlin Sink	2 sites	Hays	TMM database 2001
Aranae	Leptonetidae	*Neoleptoneta* n. sp. eyeless	Katy's Cave	1 site	Hays	Pierre Paquin, pers. comm. 2007
Aranae	Leptonetidae	*Neoleptoneta* n. sp. 1	Burnett Ranch Cave	1 site	Hays	TMM database 2001
Aranae	Leptonetidae	*Neoleptoneta* n. sp. 2	Boyett's Cave	1 site	Hays	TMM database 2001
Aranae	Nesticidae	*Eidmanella* n. sp.	Ezell's Cave, McCarty Cave, McGlothlin Sink	1-3 sites	Hays	TMM database 2001
Pseudoscorpionidae	Neobisiidae	*Tartarocreagris grubbsi*	Wissman's Sink	1 site	Hays	TMM database 2001 and Muchmore 2001
Opiliones	Phalangodidae	*Texella diplospina*	Ladder Cave	1 site	Hays	TMM database 2001
Opiliones	Phalangodidae	*Texella grubbsi*	Burnett Ranch Cave, Wissman's Sink, Wissman's Sink #2	7 sites	Hays, Travis, Burnet	TMM database 2001 (Burnett Ranch Cave), Ubick and Briggs 2004 (all others)

Table 1, continued. List of karst and aquatic Evaluation and Additional Species of Concern in Hays County

Order	Family	Species	Hays County cave name	Notes on rarity	Range	source of information
Opiliones	Phalangodidae	*Texella mulaiki*	Boggus Cave, Ezell's Cave, Fern Cave, Ladder Cave, McCarty Cave, McGlothlin Sink, Michaelis Cave, Tricophorous Cave	15 sites	Hays, Travis	Ubick and Briggs 2004 (Ezell's Cave, Tricophorous Cave), TMM database 2001 (Ezell's Cave and all others)
Opiliones	Phalangodidae	*Texella renkesae*	Ezell's Cave, Maggens Sink Hole	2 sites	Hays	TMM database 2001 (Ezell's Cave), Ubick and Briggs 2004 (Maggens Sink Hole)
Collembola	Sminthuridae	*Arrhopilites texensis*	Grapevine Cave, Wissman's Sink No. 2	7-8 sites	Bandera, Bexar, Hays, Travis, Williamson	TMM database 2001
Coleoptera	Carabidae	*Rhadine insolita*	Grapevine Cave	2 sites	Hays, Comal	TMM database 2001
Coleoptera	Carabidae	*Rhadine* n. sp. 2 [*subterranea* grp.]	Ezell's Cave, Lime Kiln Quarry Cave, McCarty Cave	3 sites	Hays	JRR pers. comm. 10 April 2007 and JKK personal collections (Ezell's Cave), TMM database 2001 (all others)
Coleoptera	Carabidae	*Rhadine* sp. [*subterranea* group] eyed	Boyett's Cave	1 site	Hays	TMM database 2001
Coleoptera	Carabidae	*Rhadine* sp. cf. *austinica*	Dahlstrom Cave, Michaelis Cave	2 sites	Hays	JRR pers. comm. 10 April 2007 (Dahlstrom Cave), TMM database 2001 (Michaelis Cave)
Coleoptera	Dytiscidae	*Comaldessus stygius*	Fern Bank Springs	2 sites	Comal, Hays	Gibson et al. 2008
Coleoptera	Dytiscidae	*Haideoporus texanus*	Artesian Well	2 sites	Comal, Hays	Young and Longley 1976
Coleoptera	Pselaphidae	*Batrisodes grubbsi*	Grapevine Cave	1 site	Hays	Muchmore 2001

Table 1, continued. List of karst and aquatic Evaluation and Additional Species of Concern in Hays County.

Order	Family	Species	Hays County cave name	Notes on rarity	Range	source of information
Caudata	Plethodontidae	*Eurycea pterophila*	Ben McCulloch Springs, Blanco River Spring, Cypress Creek Spring, Fern Bank Springs, Grapevine Cave, Jacob's Well, Rancho Cima Dam Spring, Smith Creek Lower and Upper Springs, Spring 1 mi. SE Signal Hill, Spring 1.5 mi. E Payton	Over 10 sites	Blanco, Hays, Kendall, possibly Comal	Sweet 1977, Chippindale et al. 2000, J. Krejca, pers. comm. 2008
Caudata	Plethodontidae	*Eurycea robusta*	Underneath Blanco River at I-35	1 site	Hays	
Coleoptera	Elmidae	*Heterelmis comalensis* **	San Marcos Springs	2 sites	Comal, Hays	Gibson et al. 2008
Coleoptera	Dryopidae	*Stygoparnus comalensis* **	Fern Bank Springs	2 sites	Comal, Hays	Gibson et al. 2008
Caudata	Plethodontidae	*Eurycea nana* **	San Marcos Springs	1 site	Hays	
Caudata	Plethodontidae	*Eurycea rathbuni* **	Diversion Spring, Ezell's Cave, Johnson's Well, Primer's Well, Rattlesnake Cave, Side seeps in Sessom's Creek, Artesian Well, Wonder Cave	8 sites	Hays	Chippindale et al. 2000, Glenn Longley, pers. comm. 2008, Bill Russell pers. comm. 2008
Caudata	Plethodontidae	*Eurycea* sp. federally listed **	Spillar Ranch Springs, Stuart Springs	5 sites	Hays, Travis	Dave Hillis, Dee Ann Chamberlain, and Nate Bendik, pers. comm. 2008

Table 2. List of all 301 localities and alternate names.

Name	Alternate Names	Feature Type	Name	Alternate Names	Feature Type
967 Blowhole		Sinkhole	Cave (Ogden 18)		Cave
A.J. Rod Cave	T.H.E. Cave, Katy's Cave, probably is Cady's Cave (as in biology table)	Cave	Cave (Ogden 19)		Cave
Academy Cave	Cave (Ogden 6)	Cave	Cave (Ogden 2)		Cave
Amber Cave		Cave	Cave (Ogden 3)		Cave
Antioch Cave		Cave	Cave (Ogden 4)	could be Reider Cave #1	Cave
Anyway Cave	WWD-29	Cave	Cave (Ogden 5)	could be Reider Cave #2	Cave
Artesian Well	Old Federal Fish Hatchery well (or U.S. Fish Commission well), Artesian Well at/in San Marcos, San Marcos Artesian Well, Artesian well on (TSU/SWT) campus	Well	Cave (Ogden 8)		Cave
Artisan's Caves (1)		Cave	Cave on old Haupt Place		Cave
Artisan's Caves (2)		Cave	Connie's Cave		Cave
Arrowhead Cave		Cave	Contour Cave		Cave
Ash Cave	Cave (Odgen 1)	Cave	Corrie Smith Cave No. 1		Cave
Autumn Woods Well		Well	Corrie Smith's Filled-In Cave		Cave
Backyard Cave	Back Yard Cave	Cave	County Line Bat Cave		Cave
Ballroom Cave		Cave	Coyote Cave		Cave
Barbed Wire Pot		Cave	Cripple Crawfish Cave	Crippled Crawfish Cave	Cave
Barber Falls Pool		Cave	Cypress Creek Spring		Spring
Barton Creek Springs		Spring	Dahlstrom Cave		Cave
Bear Cave		Cave	Dakota Ranch Cave		Cave
Ben McCulloch Spring		Spring	Dead Man's Hole	Dead Man's Cave	Cave
Bell Spring		Spring	Deep hole on old Cox Place		Cave
Bethke Ranch Cave		Cave	Diamond Cave		Cave
Big Mouth Cave		Cave	Donaldson Cave	WWD-25	Cave
Blackwell Sinkhole		Sinkhole	Dripping Springs		Spring
Blanco River Spring		Spring	Dupont Spring		Spring
Blue Monday Cave		Cave	Easy Breeze Cave		Cave
Boggus Cave	WWD-17	Cave	Electrical Cord Cave	WWD-76T	Cave
Bonnie's Cave		Cave	Elm Cave		Cave
Bonnie's Cave No. 2		Cave	Ezell's Cave		Cave
Boyett's Cave	Devil's Backbone Cave	Cave	Fenceline Sink	WWD-24	Feature
Burnett Ranch Cave		Cave	Fern Bank Spring	Little Arkansas Spring	Cave
Calamity Cave	WWD-132	Cave	Fern Cave		Cave
Calhoun's Pit	Calhoun's Cave	Cave	Finger Cave		Cave
Calvin's Cave		Cave	Flatrock Cave		Cave
Cam Shaft Cave	MAY be Stephens' Sink (Hanson & Small 1995)	Cave	Formation Cave	Boy Scout Cave	Cave
Cave (Ogden 14)		Cave	Fox Cave	WWD-86	Cave
Cave (Ogden 15)		Cave	Fritz's Cave		Feature
Cave (Ogden 16)		Cave	G.W. Sink		Cave
Cave (Ogden 17)		Cave	Grapevine Cave	Ice Box Cave	Cave

Table 2, continued. List of all 301 localities and alternate names.

Name	Alternate Names	Type	Name	Alternate Names	Feature Type
Gweyn's Cave		Cave	Pseudosink		Sinkhole
Hagemann's Well		Well	Pucker Cave	Puckett's Cave	Cave
Halifax Bat Cave	Goat Cave Nance Bat Cave, prob. Also Halifax Mine	Cave	Pulpit Cave	Treehouse Cave	Cave
Hoskins Hole		Cave	Puzzle Pit		Cave
Indian Run Sink and Collapse Area	WWD-23 (Indian Run Sink)	Sinkhole	Quarry Sink		Cave
Ingrahm Sink		Sinkhole	Quarry Cave	King Quarry Cave, Lime Kiln Quarry Cave	Cave
Jacob's Well		Cave	Rancho Cima Dam Spring		Spring
Jacobs Well Spring	NOTE: this is what everyone means by "Jacob's Well"	Spring	Radiance Sink		Cave
Johnson's Well	Johnson Well, Frank Johnson Well, Frank Johnson's Well, WWD-67	Well	Rattlesnake Cave	Frank Johnson's Cave, Salamander Cave, Natural Well, Natural Well Cave	Cave
Kali Kate's Cave	Cal Cave, Calcate Cave, Kate Cave	Cave	Rattlesnake Cave (2)	This is NOT in San Marcos	Cave
Ken Barnes' Cave	predominant name is probably Big Mouth Cave	Cave	Rattlesnake Spring	Rattlesnake Sink	Spring
Kira's Karst Park		Cave	Rattlesnake Well		Well
Kirby Spring		Spring	Rector Williams' Cave	Williams' Pit	Cave
Koenig Ranch Spring		Spring	Reider Cave No. 1		Cave
Koenig Ranch Spring	S45A	Spring	Reider Cave No. 2	could be Cave (Ogden 5)	Cave
Kunkel Cave		Cave	Root Beard Cave		Cave
Ladder Cave		Cave	Runoff Cave		Cave
Little Wilkins Cave		Cave	Rutherford Ranch Sink		Sinkhole
Magen's Sink	Maggens Sink Hole	Cave	San Marcos Spring		Spring
Marcia's Well		Cave	San Marcos Springs: Cabomba Spring		Spring
McCarty Cave	McCarty Bat Cave McCarty Lane Bat Cave	Cave	San Marcos Springs: Catfish Hotel Spring		Spring
McGlothin Sink	McGlothin Cave, Cave (Ogden 7)	Cave	San Marcos Springs: Crater Spring	Crater Bottom Spring	Spring
Michaelis Cave	Michaelis Sink	Cave	San Marcos Springs: Cream of Wheat Spring		Spring
Morton's Cave	Morton Ranch Cave	Cave	San Marcos Springs: Deep Hole Spring		Spring
Mouse Cave		Cave	San Marcos Springs: Diversion Spring		Spring
Mustang Branch Sink		Sinkhole	San Marcos Springs: Hotel Spring		Spring
North Bank Sinks		Sinkhole	San Marcos Springs: Kettleman Spring		Spring
North Bank Sinks		Cave	San Marcos Springs: Mystery Spring		Spring
Plum Tree Cave		Cave	San Marcos Springs: Ossified Forest Spring		Spring
Primer's Well	Primer's Fissure, WWD-3	Cave	San Marcos Springs: Riverbed Spring		Spring

Table 2, continued. List of all 301 localities and alternate names.

Name	Alternate Names	Feature Type	Name	Alternate Names	Feature Type
San Marcos Springs: Salt & Pepper Spring 1		Spring	Spring 012		Spring
San Marcos Springs: Salt & Pepper Spring 2		Spring	Spring 013		Spring
San Marcos Springs: Weissmuller Spring	Johnnie Spring	Spring	Spring 014		Spring
Seep on Sessoms Creek		Spring	Spring 015		Spring
Sink (Ogden 10)		Sinkhole	Spring 1.5 mi E Payton		Spring
Sink (Ogden 11)		Sinkhole	Spring 1 mi SE Signal Hill		Spring
Sink (Ogden 12)	could be Rattlesnake Cave	Sinkhole	Stephens' Sink	may be Cam Shaft Cave	Sinkhole
Sink (Ogden 13)		Sinkhole	Stonehaven Sink		Sinkhole
Sink (Ogden 20)		Sinkhole	Stuart Springs	Taylor Springs, Springs on Little Bear Creek, Ann Ashmun's Springs	Spring
Sink (Ogden 9)		Sinkhole	Tarbutton's Cave	Dugger Cave, Tarbutton's Showerbath Cave	Cave
Sink Spring		Spring	Taylor Bat Cave	Bat Cave Pandora's Box Cave	Cave
Sites' Cave	Site's Pit	Cave	Technical Cave	WWD-41	Cave
Slip Cave	WWD-78T	Cave	Tower Dig		Feature
Small holes near Plum Creek		Feature	Tricopherous Cave	WWD-121, Tricoferous Cave	Cave
Smith Rattlesnake Cave		Cave	Twin Entrance Cave		Cave
Smith Creek Upper Spring		Spring	Unnamed Spring (new)		Spring
Smith Creek Lower Spring		Spring	Underneath Blanco River at I-35		Feature
Snake Cave	WWD-131	Cave	Walnut Spring		Spring
Sofa Cave		Cave	Warton No. 1		Cave
Spillar Ranch Springs		Spring	Warton No. 2		Cave
Spring (on Blanco River south of Turkey Hollow)		Spring	Weismuller Spring		Spring
Spring 001		Spring	Wenger's Cave		Cave
Spring 002		Spring	Wimberley Bat Cave		Cave
Spring 003		Spring	Windy Cave	WWD-22	Cave
Spring 004		Spring	Winnie Phillips Bat Cave	Winnie Phillips Cave	Cave
Spring 005		Spring	Wissman's Sink		Cave
Spring 006		Spring	Wissman's Sink #2		Cave
Spring 007		Spring	Wonder Cave	Bevers' Cave, Beaver Cave, San Marcos Cave	Cave
Spring 008		Spring	WWD-10		Feature
Spring 009		Spring	WWD-100		Feature
Spring 010		Spring	WWD-101		Feature
Spring 011		Spring	WWD-102		Feature

Table 2, continued. List of all 301 localities and alternate names.

Name	Alternate Names	Feature Type	Name	Alternate Names	Feature Type
WWD-103		Feature	WWD-52		Feature
WWD-104		Feature	WWD-53		Feature
WWD-105		Feature	WWD-55		Feature
WWD-106		Feature	WWD-56		Feature
WWD-11		Feature	WWD-57T		Feature
WWD-110		Feature	WWD-58		Feature
WWD-111		Feature	WWD-58T		Feature
WWD-112		Feature	WWD-59		Feature
WWD-113		Feature	WWD-59T		Feature
WWD-114		Feature	WWD-6		Feature
WWD-116		Feature	WWD-60		Feature
WWD-117		Feature	WWD-60T		Feature
WWD-119		Feature	WWD-61		Feature
WWD-12		Feature	WWD-61T		Feature
WWD-120		Feature	WWD-62		Feature
WWD-123		Feature	WWD-62T		Feature
WWD-124		Feature	WWD-63		Feature
WWD-127		Feature	WWD-63T		Feature
WWD-129		Feature	WWD-64		Feature
WWD-13		Feature	WWD-64T		Feature
WWD-14		Feature	WWD-65		Feature
WWD-15		Feature	WWD-66		Feature
WWD-16		Feature	WWD-66T		Feature
WWD-17		Feature	WWD-67T		Feature
WWD-18	Rabbit Sink	Feature	WWD-68		Feature
WWD-20		Feature	WWD-68T		Feature
WWD-21		Feature	WWD-69		Feature
WWD-27		Feature	WWD-69T		Feature
WWD-28		Feature	WWD-7		Feature
WWD-30		Feature	WWD-70T		Feature
WWD-31		Feature	WWD-71		Feature
WWD-32		Feature	WWD-71T		Feature
WWD-33		Feature	WWD-72		Feature
WWD-34		Feature	WWD-72T		Feature
WWD-35		Feature	WWD-74T		Feature
WWD-36		Feature	WWD-75		Feature
WWD-37		Feature	WWD-77T		Feature
WWD-38		Feature	WWD-8		Feature
WWD-4		Feature	WWD-80		Feature
WWD-40		Feature	WWD-83		Feature
WWD-42		Feature	WWD-84		Feature
WWD-43		Feature	WWD-87		Feature
WWD-44		Feature	WWD-88		Feature
WWD-45		Feature	WWD-89		Feature
WWD-46		Feature	WWD-90		Feature
WWD-47		Feature	WWD-91		Feature
WWD-48		Feature	WWD-92		Feature
WWD-49		Feature	WWD-93		Feature
WWD-50		Feature	WWD-95		Feature
WWD-51		Feature	WWD-96		Feature
			WWD-97		Feature

APPENDIX D

Existing and Proposed Programs Supporting Conservation of Water and Karst Resources in Hays County

Existing and Proposed Programs Supporting Conservation of Water and Karst Resources in Hays County

This list briefly describes programs or regulations (both existing and proposed) that either directly or indirectly support the conservation of water and karst resources in Hays County; however the list is not all inclusive. Rather it is intended to highlight some of the important programs contributing to the conservation of these resources, and by extension, benefiting the RHCP evaluation and additional species in Hays County.

Proposed Hays County Development Regulations (Publication Draft July 14, 2008)

Hays County is in the process of updating its subdivision and development regulations and has released a public draft of the proposed regulations dated July 14, 2008. The proposed development regulations include chapters regarding subdivisions, stormwater management, conservation developments, and other provisions.

Chapter 705 - Some of the general requirements for subdivisions under the proposed regulations include provisions for minimum lot sizes, floodplain and stormwater management, and parks and open space dedication.

Chapter 725 - Proposed regulations related to stormwater management include a provision that developments must satisfy all applicable water quality requirements in areas governed by another jurisdiction. The following water quality requirements promulgated by other jurisdictions govern portions of Hays County:

- The City of Austin water quality and environmental ordinances, effective in the ETJ of the City of Austin.
- The City of Buda Water Quality Ordinance, effective in the ETJ of the City of Buda.
- The City of Dripping Springs Water Quality Ordinance, effective in the ETJ of the City of Dripping Springs.
- The City of Kyle Water Quality Ordinance, effective in the ETJ of the City of Kyle.
- The City of San Marcos Environmental Ordinances, effective in portions of the ETJ of the City of San Marcos.
- The Lower Colorado River Authority (LCRA) Highland Lakes Watershed Ordinance, applicable in portions of western Hays County, within the watersheds of the Highland Lakes.
- The TCEQ Edwards Aquifer Program, for those portions of the County designated as being within either the contributing zone or the recharge zone of the Edwards Aquifer, as adopted under Title 30, Texas Administrative Code (TAC), Chapter 213.
- The TCEQ Construction Site Stormwater Permitting Program, regulating all construction activities disturbing more than one (1) acre, anywhere within Hays County. (I) The TCEQ Municipal Separate Storm Sewer System (MS4) Permitting Program, effective February 11, 2008, for those portions of the County designated as "Urbanized Areas" by the U.S. Census Bureau, as identified in the County's "Storm Water Management Program" (SWMP) approved by the Texas Commission on Environmental Quality. Urbanized areas subject to

the requirements of the SWMP are designated in the SWMP and are located in eastern Hays County, adjoining the City of Austin.

The proposed provisions of Chapter 725 also includes incentives for water quality protection features, including stream offsets or buffer zones and non-structural water quality controls (i.e., xeriscaping plants, integrated pest management plans, integrated fertilizer/nutrient management plans, and road sweeping activities).

Chapter 765 - The proposed Hays County development regulations provides guidance and criteria for the voluntary design and construction of "conservation developments." Conservation developments are intended to accomplish the following objectives:

- To allow for greater flexibility and creativity in the design of developments;
- To encourage the permanent preservation of open space, ranch and agricultural lands, woodlands and wildlife habitat, natural resources including aquifers, water bodies and wetlands, and historical and archeological resources;
- To promote interconnected greenspace and corridors throughout the community;
- To protect community water supplies;
- To encourage a more efficient form of development that consumes less open land and conforms to existing topography and natural features better than a conventional subdivision;
- To facilitate the construction and maintenance of housing, streets, utilities, and public service in a more economical and efficient manner;
- To facilitate the provision of community services in a more economical and efficient manner;
- To foster stewardship of the land and wildlife in the County; and
- To preserve the vestiges of central Texas rural and natural character remaining in Hays County.

Design aspects of the proposed conservation development regulations include: designation of permanent conservation space, protection of scenic and historic preservation buffers, preparation and implementation of an ecological assets management plan, impervious cover limitations, energy/water/materials conservation. The proposed regulations also reference provisions related to preferred development areas.

Texas Commission on Environmental Quality (TCEQ) Edwards Aquifer Protection Program

TCEQ's Edwards Aquifer Rules (Title 30, Texas Administrative Code, Chapter 213) "regulate activities having the potential for polluting the Edwards Aquifer and hydrologically connected surface streams in order to protect existing and potential uses of groundwater and maintain Texas Surface Water Quality Standards." Chapter 213 also includes rules related to the contributing zone of the Edwards Aquifer. See the attached pamphlet from TCEQ (Publication RG-011) entitled "Rules Protecting the Edwards Aquifer Recharge, Contributing, and Transition Zones" for general guidance on when the Edwards Aquifer Rules apply and the type of protective practices required.

TCEQ Optional Enhanced Measures for the Protection of Water Quality in the Edwards Aquifer

The September 2007 "Optional Enhanced Measures for the Protection of Water Quality in the Edwards Aquifer" are an appendix to the TCEQ technical guidance document RG-348 detailing best management practices for compliance with the agency's Edwards Aquifer Rules (Title 30, Texas Administrative Code, Chapter 213). The TCEQ optional enhanced measures, as published in September 2007, have been reviewed by the USFWS. The USFWS concurred that implementation of these voluntary water quality measures "will protect endangered and candidate species form impacts due to water quality degradation". The voluntary measures, if fully implemented by a project proponent, will result in "no take" of the species addressed by the measures due to water quality impacts. A complete copy of the optional enhanced measures for water quality protection is attached to this document.

However, the USFWS "no take" concurrence only applies to impacts to the Barton Springs salamander, fountain darter, Georgetown salamander (*Eurycea naufragia*, which does not occur in Hays County), the San Marcos salamander, and the San Marcos gambusia. Presumably, the measures would also apply to the northern Hays County *Eurycea* salamander populations, since these salamanders are likely to be identified as either a San Marcos salamander or a Barton Springs salamander. The TCEQ optional enhanced measures state that the "no take" concurrence does not apply to projects that: 1) occur outside the area regulated under the Edwards Aquifer Rules; 2) result in water quality impacts that may affect federally listed species not specifically named above; 3) result in impacts to federally listed species that are not water quality related; or 4) occur within one mile of spring openings that provide habitat for federally listed species.

The optional enhanced water quality measures include provisions for identifying sensitive features in a project area, suggests impervious cover limitations, the establishment of natural buffer zones around streams and sensitive features, filling of features discovered during construction, and gating caves with entrances large enough to accommodate a person. The measures also specify additional requirements for erosion and sedimentation controls, design criteria for permanent hazardous materials traps and total suspended solids removal, and controlling stormwater discharge. Recognizing that the lack of maintenance can be one of the primary causes of failure of water quality control structures, the 2007 TCEQ optional enhanced measures also include more stringent monitoring and maintenance requirements.

Compliance with the September 2007 TCEQ water quality avoidance measures as written will enable project proponents to avoid take of the threatened or endangered species in Hays County directly addressed by the measures due to water quality impacts. Project proponents seeking to avoid water quality impacts to the San Marcos salamander, the northern Hays County *Eurycea* salamander (likely to be the San Marcos salamander or the Barton Springs salamander), fountain darter, or San Marcos gambusia are responsible for fully and completely implementing the voluntary TCEQ optional enhanced water quality measures.

TCEQ Optional Enhanced Measures for the Protection of Water Quality in the Edwards Aquifer and Related Karst Features that May Be Habitat for Karst Dwelling Invertebrates

The Hays County RHCP includes a number of species that depend on sensitive karst habitats, such as caves. While none of these karst species is currently listed as federally threatened or endangered, many have been petitioned for listing and could become listed during the term of the Permit.

To promote the conservation of these unlisted karst species, Hays County encourages the voluntary implementation of the TCEQ "Optional Enhanced Measures for the Protection of Water Quality in the Edwards Aquifer and Related Karst Features that May Be Habitat for Karst Dwelling Invertebrates." These optional measures (here after referred to as the "Optional Enhanced Measures for Karst Habitats") are also an appendix to the TCEQ technical guidance document RG-348 for implementation of the Edwards Aquifer Rules. A complete copy of the optional enhanced measures for karst habitats is attached to this document.

The purpose of the TCEQ Optional Enhanced Measures for Karst Habitats is to protect karst habitats from impacts related to water quality degradation from land development activities. The TCEQ optional enhanced measures for karst habitats, as published in September 2007, have been reviewed by the USFWS. The USFWS concurred that implementation of these voluntary water quality measures "will protect endangered and candidate species from impacts due to water quality degradation."

To avoid water quality impacts to listed karst invertebrates, the voluntary guidelines require several conservation measures in addition to compliance with the normal Edwards Aquifer Rules, including:

- The preparation of a Geological Assessment to identify sensitive features on the project area prior to detailed site planning and the assessment of these features for potential karst habitat;
- The determination of the feature footprint and surface and subsurface drainage basins for each feature identified as potential habitat for karst invertebrates and the delineation of buffer zones around these drainage basins;
- The limitation of activities within buffer zones to low impact uses, the protection of cave entrances by fences or gates; and
- The preparation and implementation of a monitoring and maintenance plan for buffer zones and the retention of records documenting maintenance activities.

While the optional enhanced karst measures do not specifically apply to the karst species in Hays County, the water quality benefits and other karst habitat protections provided by the implementation of the guidelines would benefit the unlisted karst species included in the RHCP.

Regional Water Quality Protection Plan for the Barton Springs Segment of the Edwards Aquifer and Its Contributing Zone

A regional planning group composed of representatives of cities, counties, and groundwater conservation districts in northern Hays County and southwestern Travis County, together with stakeholder and technical advisory groups and a consultant team, developed a regional water quality plan for the Barton Springs segment of the Edwards Aquifer. The plan was completed on June 20, 2005. The purpose of the effort was to develop a regional water quality protection plan to implement local water quality protection measures.

The regional water quality plan includes the following watershed management and water quality protection measures:

- Natural area and open space conservation
- Transferable development rights
- Comprehensize site planning and pre-development review
- Stream buffer zones
- Impervious cover limits
- Control of hydrologic regime
- Structural BMPs for discharges from developed land
- Local enforcement of construction site controls

- Wastewater management, including increased inspections and treatment
- Alternative water sources/uses and conservation (i.e., rainwater harvesting and water conservation)
- Restrictions on use, storage, and disposal of potentially harmful materials
- Proper vegetative management
- Proper agricultural practices
- Protection of endangered and threatened species
- Public education and outreach

The plan also includes recommendations for implementing the regional strategy by recommending specific measures for all public entities in the planning region and additional recommendations tailored to the regulatory capabilities of municipalities and counties.

TCEQ REGULATORY GUIDANCE
Field Operations Support Division
RG-011 ● April 2008

Rules Protecting the Edwards Aquifer Recharge, Contributing, and Transition Zones

A large number of people in Texas, including San Antonio's growing population, depend on the Edwards Aquifer for drinking water. The aquifer is an underground water-bearing formation that lies beneath a belt of counties along I-35 and US 90 in Central Texas.

Eight of these counties—Williamson, Travis, Hays, Comal, Bexar, Medina, Uvalde, and Kinney—fall under the Edwards Aquifer rules of the Texas Commission on Environmental Quality (TCEQ). These rules were established to ensure that contaminated runoff does not harm the quality of water in the Edwards Aquifer.

What this pamphlet covers (and what it doesn't).

This pamphlet will help you find out (1) whether the Edwards Aquifer rules apply to you, (2) the type of protective practices you may have to adopt, and (3) where to get more information.

This regulatory guidance pamphlet provides general information about the Edwards Aquifer rules, and is not intended to be a substitute for the official Edwards Aquifer rules or any other final TCEQ rules. To see the official Edwards Aquifer rules, please refer to Title 30 of the Texas Administrative Code (TAC), Chapter 213. These rules are available on our Web site, at <www.tceq.state.tx.us/goto/rules>.

What are the "Recharge, Contributing, and Transition, Zones"?

As was mentioned above, aquifers are underground water-bearing formations. In protecting water quality in aquifers, the focus is placed primarily on activities in their recharge, contributing, and transition zones.

The *recharge zone* of an aquifer is the area where geologic layers of the aquifer are exposed at the surface, and water infiltrates into the aquifer through cracks, fissures, caves, and other openings throughout these layers. In this zone, contaminants in surface water can readily enter the aquifer.

The *contributing zone* of an aquifer includes all watersheds that feed runoff into rivers and streams that flow over the recharge zone.

In the *transition zone,* geologic features such as faults and fractures present possible avenues for contaminants in surface water to reach the aquifer.

The recharge, contributing, and transition, zones are shown on official maps.

How do I tell which zone I am in?

There are several ways to find out what zone of the aquifer you're in.

You can look it up in our Edwards Aquifer map viewer, which is located on the TCEQ Web site, at <www.tceq.state.tx.us/goto/eapp/mapviewer>. (These maps are not official, but the Web page has links to sources for the official maps.)

In addition, you can also contact your regional TCEQ office, and staff there will be able to help. They also have hard copies of the aquifer maps available for viewing. Contact information for these offices is provided at the end of this pamphlet.

Who is NOT affected?

If you are conducting the following activities, you are not affected by the Edwards Aquifer rules (but you still may have to follow other TCEQ rules that are in effect statewide):

- Clearing vegetation without disturbing the soil,
- Farming, ranching, and other agricultural activities except concentrated animal feeding operations that are regulated under 30 TAC, Chapter 321.
- Maintenance of existing facilities (no added site disturbance).
- Resurfacing paved roads, parking lots, sidewalks, or other impervious surfaces.
- Exploring for, developing, or producing oil, gas, or geothermal resources.

• Building single-family homes on lots over five acres, with no more than one single-family residence per lot.
• Building fences or engaging in other similar activities where there is little or no potential for (1) contaminating groundwater or (2) changing topographic, geologic, or sensitive features.

Who IS affected?

If (1) you are carrying out construction-related or post-construction activity on the recharge or transition zones and (2) your activity has a potential for polluting the aquifer and surface streams that recharge it, then you are affected by the Edwards Aquifer rules. Some examples of activities covered by these rules are:
• Constructing buildings, utility stations, utility lines, roads, highways, or railroads.
• Filling, clearing, excavating, or carrying out any other activity that alters or disturbs topographic, geologic, or recharge characteristics of a site.
• Conducting other activities that may pose a potential for contaminating the Edwards Aquifer or surface streams that recharge it.

On the *recharge and transition zones,* you are affected by the Edwards Aquifer rules if you install underground or aboveground storage tanks (USTs or ASTs) or piping, and the installation is designed to store either hazardous substances or fuels, lubricating oils, mineral spirits, or other petroleum-based liquids.

On the *contributing zone,* you are affected by the Edwards Aquifer rules if (1) you disturb more than five acres or (2) you are conducting activities as part of a large plan of development that may disturb five or more acres.

I AM affected, so what do I have to do?

This section describes the steps you have to take, depending on what you plan to do on your land, —to protect water quality during and after construction. The first order of business is to determine whether you must prepare and submit an Edwards Aquifer Protection Plan (EAPP).

Protect water quality during construction— when an EAPP is NOT required.

In all cases, before any work begins, *you must install erosion and sediment (E&S) controls* that meet the requirements of the Edwards Aquifer rules, and you must maintain these controls throughout the construction process.

In certain cases, however, you do not have to file an EAPP. The activities exempted from an EAPP (but still requiring E&S controls) are:
• Installing natural gas, telephone, electric, water, or other utility lines that do not carry pollutants.
• Installing one or more permanent AST facilities with a cumulative volume of 500 gallons or less.
• Installing equipment used to transmit electricity that uses oil circuit breakers (construction of supporting structures, however is not exempt).
• Constructing a single-family residence or any associated residential structure when the construction is for the individual landowner on his or her own property, as long as the construction does not cause the site's impervious cover to exceed 20 percent.

You must wait until vegetation is established and the exposed soil in the construction area is stabilized before removing the E&S controls for the activities listed above.

Protect water quality during construction— when an EAPP IS required.

If you are involved in activities other than those listed above, you must submit an EAPP. Consult with your TCEQ regional office on how to prepare and submit one. The plan must show how contaminants will be removed from runoff—both during construction and after your construction is complete—by implementing and maintaining permanent best management practices (BMPs) designed by a Texas Licensed Professional Engineer. One of the main concerns for water quality is silt and sediment carried from the site and into the aquifer by storm water runoff.

You must get your EAPP approved before you start any activity that could cause runoff contamination, such as:
• Disturbing the soil—for example, by clearing, bulldozing, or excavating.

• Beginning to construct roads, highways, or buildings.
• Installing AST facilities over the recharge and transition zones that have a cumulative volume of 500 gallons or more stored in tanks, and any UST facilities that are to be used for storing hazardous substances or liquid petroleum fuels (UST facilities are the only regulated activity in the transition zone).

Of course, before any work begins, you must also install E&S controls that meet the requirements of the Edwards Aquifer rules, and you must maintain these controls throughout the construction process.

Getting your plan reviewed and approved.

Submit your plan to the TCEQ regional office that serves the county in which your development is located. The eight counties that fall under the Edwards Aquifer rules are served by either the San Antonio office or the Austin office (see contact information at the end of this pamphlet).

Applications for activities in the recharge, contributing, and transition zones will receive a two-stage review. In the first stage, called administrative review, we determine whether your application is complete. If your application is submitted in person during a scheduled meeting with staff, we will complete this review as part of our meeting.

The second stage of the review focuses on technical aspects of your application. In the technical review, we determine whether your plan will adequately protect surface water and the aquifer as you carry out the intended activity.

No site disturbance may begin until both of these review periods are completed and an approval letter has been issued.

We may inspect your site periodically to ensure that you are complying with (1) the temporary provisions of your approved plan during construction and (2) the plan's permanent provisions after construction.

Where can I find more answers?

Two TCEQ publications offer thorough information on the Edwards Aquifer rules: *Complying with the Edwards Aquifer Rules: Technical Guidance on Best Management Practices* (RG-348) and *Optional Enhanced Measures for the Protection of Water Quality in the Edwards Aquifer: An Appendix to RG-348* (RG-348a).

You can find forms, checklists, publications and other information regarding our Edwards Aquifer Protection Program on our Web site, at <www.tceq.state.tx.us/goto/eapp>.

You can also contact Edwards Aquifer Protection Program staff at the TCEQ regional office that serves your county:

Williamson, Travis, or Hays County

Austin Regional Office, TCEQ
2800 S IH-35, Ste. 100
Austin, TX 78704-5700
Phone: 512-339-2929 • *Fax:* 512-339-3795

Comal, Bexar, Medina, Uvalde, or Kinney County

San Antonio Regional Office, TCEQ
14250 Judson Rd.
San Antonio, TX 78233-4480
Phone: 210-490-3096 • *Fax:* 210-545-4329

September 2007
RG-348A

Optional Enhanced Measures for the Protection of Water Quality in the Edwards Aquifer (Revised)

Appendix A to RG-348—
Complying with the Edwards Aquifer Rules:
Technical Guidance on Best Management Practices

Prepared by the
Chief Engineer's Office, Water Programs

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Optional Enhanced Measures for the Protection of Water Quality in the Edwards Aquifer (Revised)

Appendix A to RG-348—
Complying with the Edwards Aquifer Rules:
Technical Guidance on Best Management Practices

Prepared by
Chief Engineer's Office, Water Programs

RG-348A
September 2007

Texas Commission on Environmental Quality
P.O. Box 13087, MC-203
Austin, Texas 78711-3087

CONTENTS

Figures

Tables

1. Introduction

One of the goals of the Texas Commission on Environmental Quality (TCEQ) Edwards Aquifer Rules is "the existing quality of groundwater not be degraded, consistent with the protection of public health and welfare, propagation and protection of terrestrial and aquatic life, the protection of the environment, the operation of existing industries, and the maintenance and enhancement of long-term economic health of the state" (Title 30 Texas Administrative Code §213.1(1)). This document presents optional water quality protection measures that may be implemented in areas subject to the TCEQ Edwards Aquifer Rules (30 TAC Chapter 213).

The optional water quality measures and best management practices (BMPs) contained in this document have been reviewed by the United States Fish and Wildlife Service (USFWS), which has issued a concurrence that these voluntary enhanced water quality measures will protect endangered and candidate species from impacts due to water quality degradation. USFWS approved the predecessor document to this revised appendix on February 14, 2005. This revised and updated appendix was approved by correspondence from Dr. Benjamin N. Tuggle, USFWS Regional 2 Director to Governor Rick Perry dated September 4, 2007. This letter identified the following species as being included under this "no take" concurrence:

- Barton Springs salamander *(Eurycea sosorum)*,
- fountain darter *(Etheostoma fonticola)*,
- Georgetown salamander *(Eurycea naufragia)*,
- San Marcos salamander *(Eurycean nana)*, and
- San Marcos gambusia *(Gambusia georgei)*.

This concurrence is not a delegation of the USFWS's responsibilities under the Endangered Species Act (ESA), but rather an acknowledgement that the TCEQ Edwards Aquifer Protection Program with these enhanced water quality measures addresses known threats to the identified species.

If these practices contained in this document are used, they are expected to result in "no take" of these species from degradation of water quality by non-Federal landowners and other non-Federal managers.[1] This "no take" concurrence does not cover projects that: (1) occur outside the area regulated under the Edwards Aquifer Rules; (2) result in water quality impacts that may affect Federally-listed species not specifically named above; (3) result in impacts to Federally-listed species that are not water quality related; or (4) occur within one mile of spring openings that provide habitat for Federally-listed species.

It is the responsibility of the applicant to determine the potential for impacting endangered species and take appropriate action based upon this information. The USFWS maintains a county-by-county list of endangered species on its web site at <www.fws.gov/southwest/es/EndangeredSpecies/lists/>. This list is subject to change as new biological information is gathered and should NOT be used as the sole and final source for identifying species that may be impacted by a project. Please contact the appropriate USFWS field office(s) to get additional information.

[1] Section 9 of the Endangered Species Act (Act) and Federal regulations adopted under section 4(d) of the Act prohibit the "take" of endangered and threatened species without special exemption. Take of listed species is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in such conduct. Harass is further defined as an intentional or negligent act or omission that creates the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavioral patterns. Harm includes significant habitat modification or degradation that results in death or injury to listed species.

These optional measures are designed to enhance the protection of the species covered under this document by providing for a higher level of water quality protection and can be used by those who wish to avoid harming listed species from water quality impacts. It is the responsibility of the applicant to determine whether the optional water quality measures and best management practices described in this document are appropriate for their project.

While these measures are not mandatory under the Edwards Aquifer Protection Program, they may be submitted to the TCEQ for review as part of an Edwards Aquifer Protection Plan or a Contributing Zone Plan. An applicant who chooses to implement the measures and best management practices contained in this document will still have to comply with all other applicable requirements for the development of land under the Edwards Aquifer Protection Program and rules.

The TCEQ cannot grant variances to the measures and best management practices contained in this document. If the applicant wishes to implement these water quality measures to fulfill the "no take" concurrence by USFWS, variances from the water quality measures and best management practices under the TCEQ Edwards Aquifer Protection Program will not be allowed as part of the approved plan. If the applicant wishes a variance, the TCEQ cannot issue a plan approval letter which indicates the plan is in compliance with the measures contained in this document. If the water quality measures required to be in compliance with this document cannot be implemented fully, the applicant may initiate direct consultation with USFWS to determine if their development will result in "no take" thereby ensuring that the requirements of the Endangered Species Act have been met.

The optional water quality measures contained in this document may be implemented by applicants conducting regulated activities in the areas subject to the TCEQ Edwards Aquifer Protection Program as delineated in the rules found in Title 30 Texas Administrative Code Chapter 213 Edwards Aquifer at <www.tceq.state.tx.us/rules/index.html> and on maps available at <www.tceq.state.tx.us/compliance/field_ops/eapp/program.html>.

Activities within the Contributing Zone that disturb less than five acres, or are not part of a larger common plan of development or sale with the potential to disturb cumulatively five or more acres, are not subject to regulation under Subchapter B of the Edwards Aquifer Rules. Therefore, these activities are not eligible to be reviewed by the TCEQ.

The following sections describe the process and requirements for implementing the optional enhanced measures and best management practices. Section 2 describes the site planning process and the need for a Geological Assessment early in the project development phase. BMPs are described for sensitive features identified during the assessment or after construction has begun. Section 3 presents the sizing requirements for sediment basins used to manage construction runoff and Section 4 covers hazardous material traps and the calculations used to size storm water treatment systems for post construction runoff management. Section 5 describes the requirements for managing runoff volume to help preserve stream morphology and prevent channel erosion. Finally, Section 6 presents the additional maintenance requirements to comply with these optional measures.

2. Site Planning

In many cases in the past large tracts have been subdivided and roads and lots laid out before considering requirements for storm water treatment. This historical procedure will result in numerous difficulties when implementing these optional measures due to requirements for setbacks from creeks, streams, and sensitive features. Consequently, two steps should proceed any work to lay-out the subdivision or other development. These are the geological assessment and identification of stream buffers as described below.

2.1. Sensitive Features

Sensitive features comprise a large variety of types including caves, solution cavities, solution enlarged fractures, sinkholes or other karst surface expression that meet the definition for sensitive feature in the Edwards Aquifer Rules and identified using the "Instructions to Geologists for Geological Assessments" (TCEQ-0585). Sensitive features must be identified before the tract is subdivided and proposed locations for roads defined so that they may be avoided. A geological assessment must be conducted for all proposed developments including residential subdivisions that are built on less than 10 acres. A geologic assessment must also be conducted for projects on the contributing zone of the aquifer for which the applicant desires coverage under this document.

> Isolated sensitive features identified in the Geological Assessment may not be sealed, but instead must be protected by natural buffer areas from the potential impacts of storm water runoff from any new development in the area. The configuration of the buffer areas are described on the following page. Sealing of sensitive features will only be permitted where they are numerous, extensive, and impossible to avoid. Sealing of surface sensitive features will require approval from the Executive Director of the TCEQ.

These sensitive features are analogous to icebergs in that the surface expression represents only a fraction of the spatial extent of the feature that exists just below the soil profile. Because these features can accept recharge over a substantial area providing treatment of runoff only within the depression may lead to degradation of water quality in the aquifer.

Consequently, the best protection of these features is provided by a natural buffer area sized based on the drainage area for the feature. The drainage area for a cave or sinkhole frequently will include a well-defined bowl-shaped depression, which may be a few feet to many yards across and which represents the local collapse zone over a subterranean cavity. The top of the sharp slope break present at the perimeter of such a collapse zone should constitute the edge of the feature for the purposes of calculating setbacks, since the steep slopes within such a bowl usually provide little or no water quality filtration.

> The natural buffer around a feature should extend a minimum of 150 feet in all directions. Where the boundary of the drainage area to the feature lies more than 150 feet from the feature, the buffer should extend to the boundary of the drainage area or 300 feet, whichever is less.

In some cases where several point recharge features occur in close proximity setback provisions may be applied collectively or setbacks may overlap, provided that the minimum standard setback for each feature is retained. No storm water conveyance systems (storm drains, roadside swales,

etc.) that would bring runoff from outside the existing drainage area should have outfalls where the runoff would be directed to a sensitive feature by the natural topography.

The "natural state" of a buffer will typically be a combination of dense native grasses and forbs in a mosaic of shrubs and trees. Native vegetation, particularly live oak trees, should be preserved within the catchment area of caves or sinkholes. Stream flow occurring along the branches and trunks of large trees may enhance infiltration by channeling rainfall to the root zone (Thurow et al., 1987). Introduction of ornamental turf or landscaping within the catchment area is not recommended because it will probably require soil amendments, frequent maintenance, and application of fertilizers, pesticides, and herbicides. The existing soil structure and vegetation are compatible with pre-existing recharge conditions and should require little maintenance.

It is recommended that the buffers around a point recharge feature or cluster of contiguous point recharge features be maintained in a natural state to the maximum practical extent. This implies a construction-free zone. Activities and structures allowed within buffer zones are limited. Residential yards and hiking trails may be located in buffer zones as long as they are at least 50 feet from the feature. The allowance of "yards" within a buffer zone should not be taken to imply that regular landscaping is appropriate for buffers. In addition, pesticides and fertilizers should not be applied within the buffer area.

Temporary runoff protection measures should be installed according to the recommendations presented in RG-348 during any construction activities within drainage area of the feature. Temporary erosion control measures should be placed as near the construction as possible to minimize disturbance within the buffer zones and drainage areas.

Where extenuating circumstances exist and development over a significant point recharge feature and its catchment is proposed, the developer can consider demonstrating that **no feasible alternatives to construction over the sensitive feature exist.** Feasibility of alternatives should be based primarily on technical, engineering, and environmental criteria. Feasibility should not be based predominantly on marketing or economic considerations or special or unique conditions which are created as a result of the method by which a person voluntarily subdivides or develops land. An example of a situation where sealing a sensitive feature might be warranted is when the number and distribution of features is such that access is precluded to a substantial portion of the tract that might otherwise be developable.

2.2. Sensitive Features Identified During Construction

Many sensitive features, such as solution cavities and caves, are not identified during the Geological Assessment, but are discovered by excavation during the construction phase of a project. This is especially common during utility trenching. The features encountered at this phase of a project must be protected to ensure that water quality and the stability of the utility installation are protected. Rerouting of the utility is always an option and realignment of the line should be considered.

Features discovered during construction of roads, houses, or other facilities, which do not involve below grade utility installation, shall be filled with concrete. Gravel to “fist sized” rock or sacks of gravel may be placed in feature prior to placement of the concrete as long as a minimum of eighteen (18) inches of concrete is used to close the feature.

Table 2-1 describes the various types of features and the minimum treatment required when constructing sewers, storm drains or other underground utilities. There are two main strategies for

dealing with these features depending on their extent. Small, isolated solution cavities may be completely filled with concrete. An example of the proper method of dealing with this type of feature is shown in Figure 2-1. The feature is completely filled with concrete and typical bedding and backfill material is used in the trench.

Table 2-1. Minimum Protective Standards for Sewer and Storm Drain Trenches

(from Table 5-1 Edwards Aquifer Guidance Document RG-348, Revised July 2005)				
Case	**Description**	**Concern**	**Treatment**	**Notification/ Approval**
1	Sensitive feature is less than or equal to six (6) inches in all directions and is located above the embedment of the pipe. All rock within and surrounding the feature is sound.	Not environmental nor pipe integrity	No abatement required.	None required.
2	Sensitive feature is either larger than six (6) inches in at least one direction or is located within the level of the pipe embedment. No portion of the sensitive feature may intersect the plane of trench floor. All rock within and surrounding the feature is sound.	Environmental	The sensitive feature shall be filled with concrete. Gravel to "fist sized" rock or sacks of gravel may be placed in feature prior to placement of the concrete as long as a minimum of eighteen (18) inches of concrete is used to close the feature).	Requires notification and prior **written** approval from the TCEQ.
3	Sensitive feature intersects the plane of the trench floor is less than four (4) feet in any direction. All rock within and surrounding the feature is sound.	Environmental	Sensitive feature shall be filled with concrete. Gravel to "fist sized" rock or sacks of gravel may be placed in feature prior to placement of concrete at least eighteen (18) inches of concrete is used to close the feature. The sewer line or storm sewer lines shall be concrete encased for width of the sensitive feature plus a minimum of five (5) feet on either end. The encasement shall provide a minimum of six (6) inches of concrete on all sides of the pipe and shall have compression strength of at least 2,500 psi (28-day strength). The concrete may be steel reinforced.	Requires notification and prior **written** approval from the TCEQ.
4	Sensitive feature intersects the plane of the trench floor and any opening in trench floor is greater than four (4) feet in any direction or the trench floor is unstable.	Environmental & Structural	Requires an engineered resolution at least as protective as Case 3 above. Additional protective measures, including rerouting of line, may be required.	Requires notification and prior **written** approval from the TCEQ.

All plans submitted to the TCEQ regional office shall have a signed and dated seal of a Texas licensed Professional Engineer. All plans will be reviewed on a case-by-case basis and additional protective measures or additional information may be required.

Other features discovered during trenching operations are much more extensive and filling of the feature is neither possible nor desirable. In cases where there does not appear to be substantial, active flow in the feature, it may be possible to isolate the section in the vicinity of the trench from the rest of the cave system. An example of this type of installation is shown in Figure 2-2. Sand bags are installed to restrict fill to the vicinity of the trench and concrete is used to fill the lower part of the trench and support the pipe.

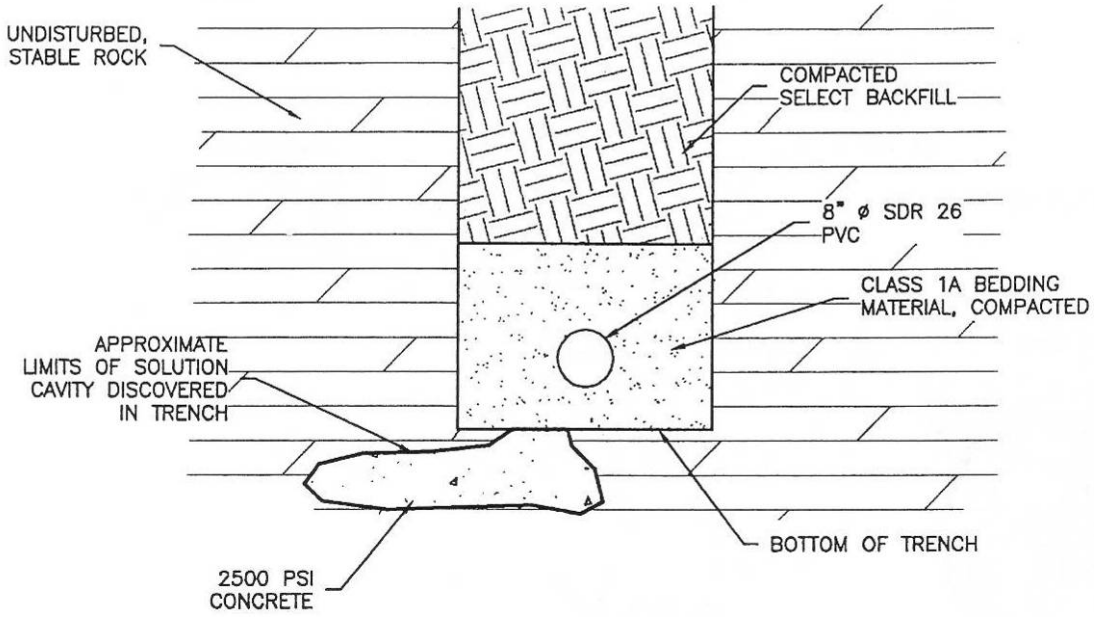

Figure 2-1. Filled Solution Feature (courtesy Kathryn Woodlee)

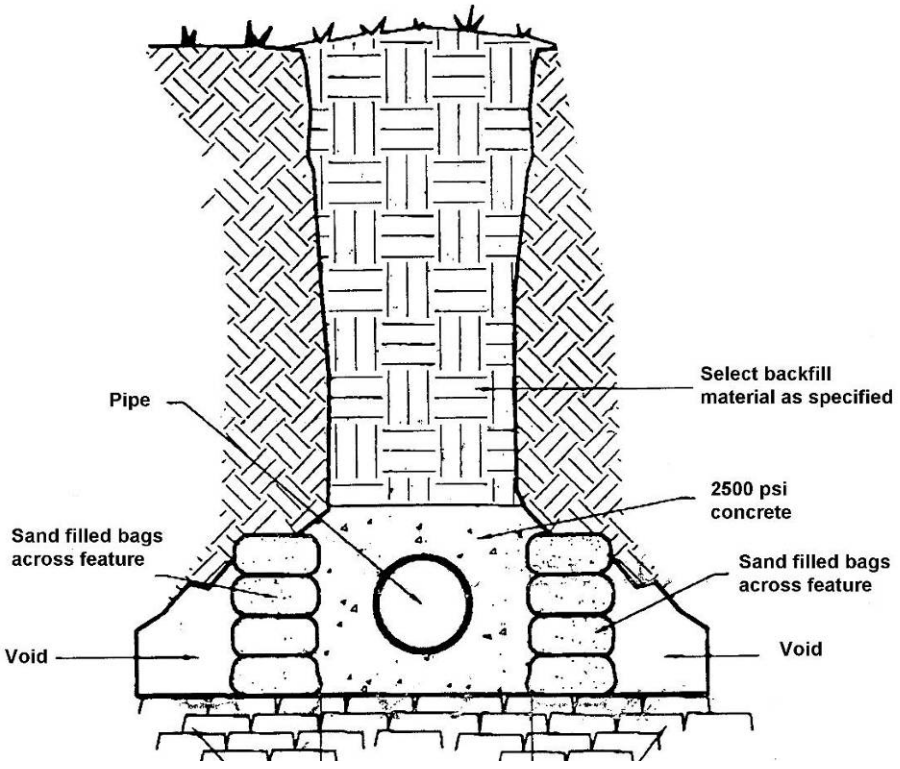

Figure 2-2. Example of Filled Void in Trench Excavation (courtesy Donald Bayes)

In some cases, it might not be desirable to permanently encase the utility pipe in concrete, especially where the pipe may need to be removed for repair or replacement. In those circumstances an outer steel encasement pipe can be installed and the utility pipe installed inside of it. Section and profile views of this type of installation are shown in Figure 2-3 and Figure 2-4.

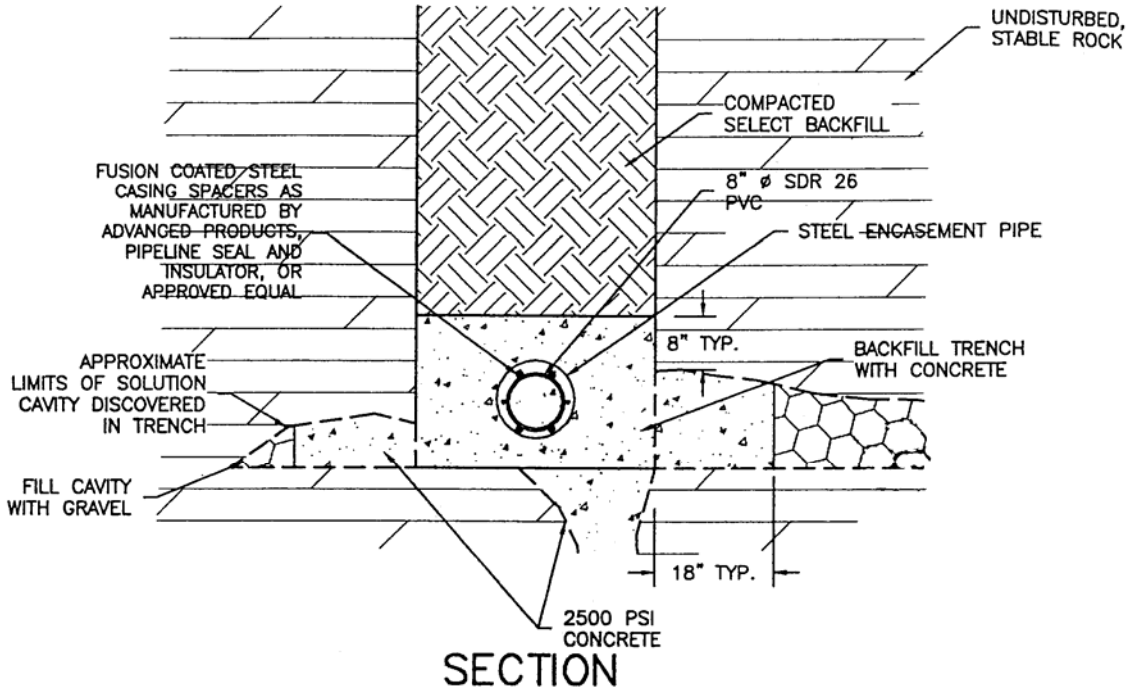

Figure 2-3. Utility Pipe Encased in External Steel Pipe (courtesy of Kathryn Woodlee)

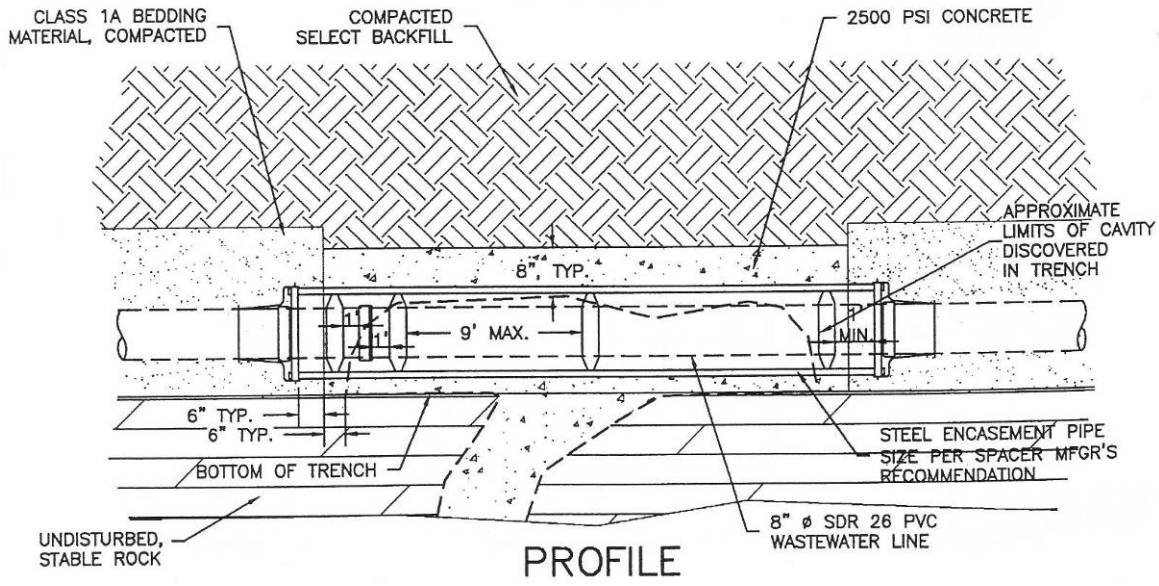

Figure 2-4. Profile View of Encased Utility Pipe (courtesy of Kathryn Woodlee)

When a larger feature appears be an active conduit for flow, it may be appropriate to maintain hydrologic connectivity across the trench excavation. This can be accomplished by installing a 3-inch Schedule 40 PVC pipe between the two isolated cave sections. An example of this type of installation is shown in Figure 2-5.

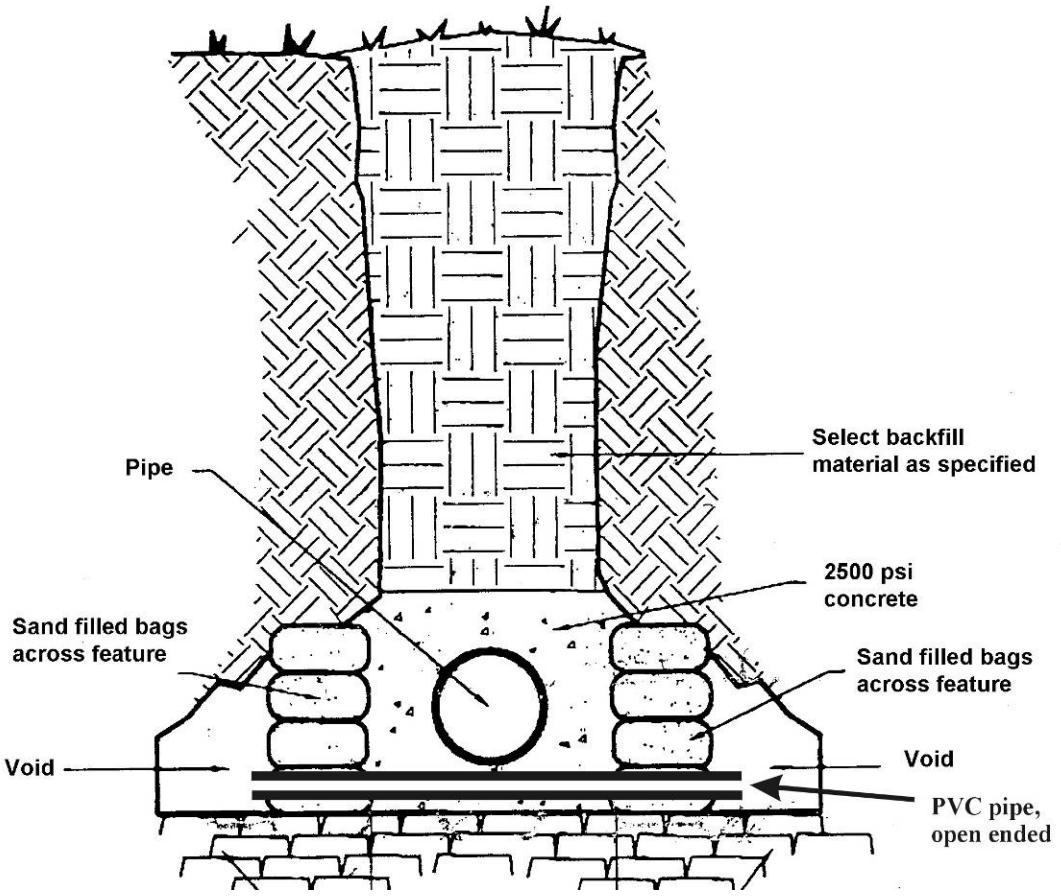

Figure 2-5. Cavity Fill with Pipe to Preserve Hydrologic Connectivity

Temporary covering of voids when construction activities are halted can be accomplished by covering with filter fabric and then plywood weighted with concrete blocks. This will prevent sediment from the trench being inadvertently introduced into the cavity.

2.3. Caves

Openings of caves are sensitive features that should have natural buffers as described above. In addition, the size of the opening creates the opportunities for other pollutants to enter the aquifer. Many caves in the Edwards were historically used for trash, debris, and garbage disposal. The material found in caves often includes paint, solvents, and other toxic/hazardous materials. Run-off entering the caves can leach toxic compounds and convey them to the aquifer. Consequently, caves that are identified in the geological assessment and that have openings large enough to accommodate a person must be fitted with a cave gate such as the one shown in Figure 2-6.

The gate has two main purposes. The first is to reduce access to the cave and prevent the disposal of wastes in these sensitive features. The second purpose is to prevent untrained individuals from accessing the cave where they might potentially become trapped. The gate should also provide a lockable access for qualified individuals to perform hydrogeological or biological studies. The discussion of cave gates below is modified from Warton (2002).

Many of these caves are habitat for endangered species; consequently, the gate should provide for free exchange of air, water, organic debris, and small mammals that are important components of the cave ecosystem. If caves or other sensitive features contain Federally-listed endangered species, such as karst invertebrates, project planners should contact the USFWS to ensure that their activities will not "take" a listed species. The applicant may also wish to consult the TCEQ's *Optional Enhanced Measures for the Protection of Water Quality in the Edwards Aquifer and Related Karst Features that may be Habitat for Karst Dwelling Invertebrates: Appendix B to RG-348.*

Figure 2-6. Typical Cave Gate with Secure Entrance (Mike Warton, PBS&J)

In Central Texas, the most common type of cave entrance occurs as a sinkhole, often found along rock joints. Entrance openings are usually positioned on semi-flat ground or along hillside slopes. The orientation of entrance openings is usually vertical. Horizontal development within caves may occur at shallow depths. In this type of cave structure, the key position of a prospective cave gate is usually horizontal, with some degree of recess in to the entrance.

The concept of gate "transparency" implies specifically that the gate is a non-solid covering that will not impede, block, or prevent the vertical fall of air, water, or natural organic materials from entering the cave similar to what occurs naturally. Thus, the transparent gate is semi-open for these functions. In the cave entrance ecosystem, surface related and nocturnal invertebrate species may regularly pass through the gate in a manner not significantly altered by the presence of the gate. In Texas, endangered invertebrate species are troglobitic in nature, never leave the cave environment, and never use or access the gate. They are critically dependent on the gate's ability to allow un-impeded wash-in, or transport of organic food source materials to enter and replenish the cave. Up to seven common types of ground mammals also frequent Texas caves and have important natural roles in the cave ecosystem. Their points of access and egress through the cave gate are specific in location. The gate must facilitate their easiest points of access. The access portal design and size are set to an eight-inch diameter or square opening as shown in Figure 2-7.

Figure 2-7. Mammal Access Portals along Edge of Gate

2.3.1. Gate Construction

Prior to gate construction, the cave's entrance may require certain preparations for acceptance of the gate. In welded construction where gates are custom built and fitted on site, commercially made welding blanket mats should be draped across the entrance opening in basket position in order to prevent contamination of the cave by slag and welding residues. The gate is a level horizontal grid cover constructed from 2-inch by 2-inch by 3/8-inch steel angle. The most important structural component is the supporting sub-structured arrangement of cross beams and drilled anchor points. Anchors are usually 1/4-inch to 1-inch diameter rebar from 8-inches to 10-inches in length (Figure 2-8).

Horizontal beam supports are built by welding together two pieces of angle iron to form a box-shaped beam that is solid welded to the point set anchors. Once the substructure is completed, the grid panel arrangement of bar angles may begin. The bar angles are placed on their edge sides,

with angle peak pointed either to the left or to the right (all pointed in the same direction throughout the gate). By placing the angles on their edge side, the barrier thickness aspect of the gate panel becomes almost three inches thick, instead of the 3/8-inch thickness of the angle. Bar spacing throughout the gate and across the panel are set to provide a clear opening of 1.5 inches if the cave is not used by bats, otherwise the opening should be 5.75 inches. The direction of airflow exchange to and from the cave's entrance may determine the left or right pointing positions of angle peaks. The angle shape would be turned to such a position that "cups" and promotes the best airflow exchange. It should provide the level of airflow conductivity that is a substantial or prominent characteristic of the cave. In this construction, the location and position of the gate's access and egress door is pre-determined. The access door assembly is: (1) typically 30 inches square; (2) transparent in design; (3) a hinged door; and (4) contains a concealed lock mechanism and access point as shown in Figure 2-9. The round hole in the gate is sized so that a person can reach through the gate to access the lock with is concealed below the gate. The concealed lock box location in these gates prevents any direct attack. The lock box is designed to house a 2-inch wide lock with 3/8-inch shackle.

After the access door is installed, the last stage of the construction is usually the placement of horizontal stiffeners across angle expanses. One-inch or 2-inch wide by 3/8-inch thick flat bar stock is used for the stiffeners. Stiffener spacing usually does not exceed a distance of five feet. Following the completion of all welding, the last stage of gate completion is to apply a protective metal coating with a high quality rust inhibitive paint. This is carefully hand brushed on instead of sprayed. Following gate completion, the under hanging blanket basket is removed and the site should be thoroughly cleaned of any foreign materials.

Figure 2-8. Example of Anchor Rebar

2.4. Stream Buffers

Natural buffer areas adjacent to streams and natural drainage ways play an important role in maintaining predevelopment water quality. The riparian vegetation stabilizes stream channels and

Figure 2-9. Example Cave Gate Access

floodplain areas, reducing erosion. In addition, they provide an area to filter overland flow from adjacent development. Consequently, all streams should have an undisturbed native vegetation buffer on each side as follows:

- Streams draining 640 acres (one square mile) or greater should have a minimum buffer of 300 feet from the centerline on each side of the stream.
- Streams draining less than 640 acres but 320 or more acres should have a minimum buffer of 200 feet from the centerline on each side of the stream.
- Streams draining less than 320 acres but 128 or more acres should have a minimum buffer of 100 feet from the centerline on each side of the stream.
- Streams or swales draining less than 128 acres but 40 or more acres should have a minimum buffer of 50 feet from the centerline on each side of the drainage.
- Streams or swales draining less than 40 acres but 5 or more acres should have a minimum buffer of 25 feet from the centerline on each side of the drainage.

Site plans submitted for TCEQ review must show the location of all stream buffers in addition to the plan elements required by the Edwards Aquifer Rules. If the area within the designated buffer has been altered by clearing, construction, or other activities, then USFWS must be consulted.

Buffer zones should generally remain free of construction, development, or other alterations, although storm water treatment systems can be constructed there if the natural drainage to the site is less than 128 acres. The number of roadways crossing through the buffer zones should be minimized and constructed only when necessary, such as when a significant portion of the site can only be reached by crossing a buffer zone. An example of a situation when a road crossing was necessary is shown in Figure 2-11. Note that there is only a single crossing of each buffer.

Other alterations within buffer zones could include utility crossings, but only when necessary, fences, low impact parks, and open space. Roadways and utilities crossings should be approximately perpendicular to the buffer zone. Low impact park development within the buffer zone should be limited to trails, picnic facilities, and similar construction that do not significantly alter the existing vegetation. Parking lots and roads significantly alter existing vegetation and are not considered low impact. Neither golf course development nor wastewater effluent irrigation shall take place in the buffer zone.

These restrictions are an important reason why buffer zones must be identified before the tract is subdivided. Various types of development are consistent with stream buffers as demonstrated below. One type is a typical suburban single-family development with a lot density, three to four lots per acre that necessitates the use of curb and gutter. In this scenario essentially all the impervious cover is connected. Storm water runoff drains directly to the street where it is captured in an inlet and conveyed by storm sewer in a system that requires larger pipe diameters as more and more area contributes. Discharge is then directed to a creek at the lower end of the development or to a constructed trapezoidal channel.

The conventional design philosophy has been to convey the storm water runoff quickly and safely away from the subdivision. Depending upon local requirements, a water quality pond may be constructed just prior to discharge to the creek. Even if a pond is provided, little or no utilization of buffers occurs. Figure 2-10 provides an example of a 144-lot single-family subdivision bound on one side by a creek with 150 feet of buffer width on each side. In this case a sedimentation-filtration pond is provided at the downstream end. For this example, approximately 39 acres of development are conveyed to the pond, totally bypassing the buffer.

Figure 2-11 is an example of small, clustered single-family lots situated around stream buffers. This clustering leaves large undisturbed areas of land as well as setbacks from the creeks. These small lots, 60 – 80 feet of frontage, require storm sewers, but with the creek setbacks, sufficient area is available for frequent storm sewer discharges up-gradient from the creek buffer. While it is difficult to completely offset the hydrologic impact of a development of this density, the setbacks and maximizing of sheet flow minimizes the impacts. In-stream ponds are provided in this example to supplement the vegetative measures for water quality and provide peak flow control.

Figure 2-12 is an example of a larger, rural lot subdivision (individual lots larger than one acre) with buffers meeting the criteria described in this document. These size lots offer an opportunity to maximize sheet flow and reduce the area contributing to a concentrated discharge that must then be returned to sheet flow by the methods discussed previously. Traditionally, the roadways would have a roadside ditch on both sides. However, in a design maximizing sheet flow, the half of the roadway draining to the low side of the right-of-way is allowed to continue as sheet flow into the large single-family lot (Figure 2-13). Also note that the limit of disturbance is only a fraction of the lot size (Figure 2-14).

Greater building setbacks allow the builder to easily route any drainage around the house. Drainage or conservation easements must be shown on approved plats and deed restrictions provided to the home buyer limit landscaping to native or native adapted plants that require little or no fertilizers and are disease resistant. With these simple design features, the effective buffer width along streams is increased and unconnected impervious cover is maximized. On the uphill side of the roadway, the roadside swale has multiple points of discharge under the roadway, much as a storm sewer in a more dense development. This drainage is then conveyed in an easement along lot lines and then returned to sheet flow at the buffer.

Figure 2-10. Traditional Development Adjacent to Stream Buffer (courtesy Murfee Engineering)

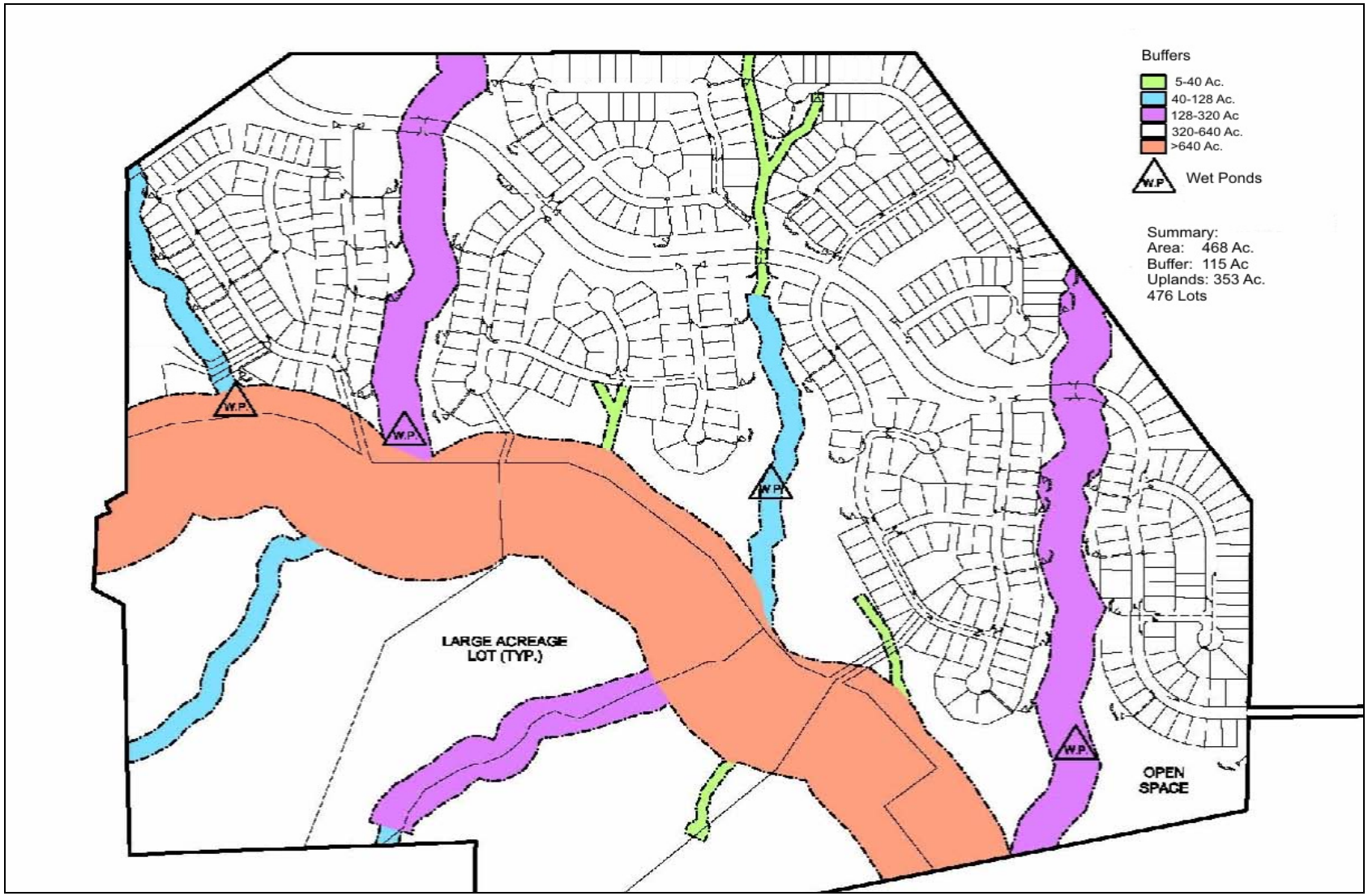

Figure 2-11. Example of Small Lot Cluster Type Development (courtesy Murfee Engineering)

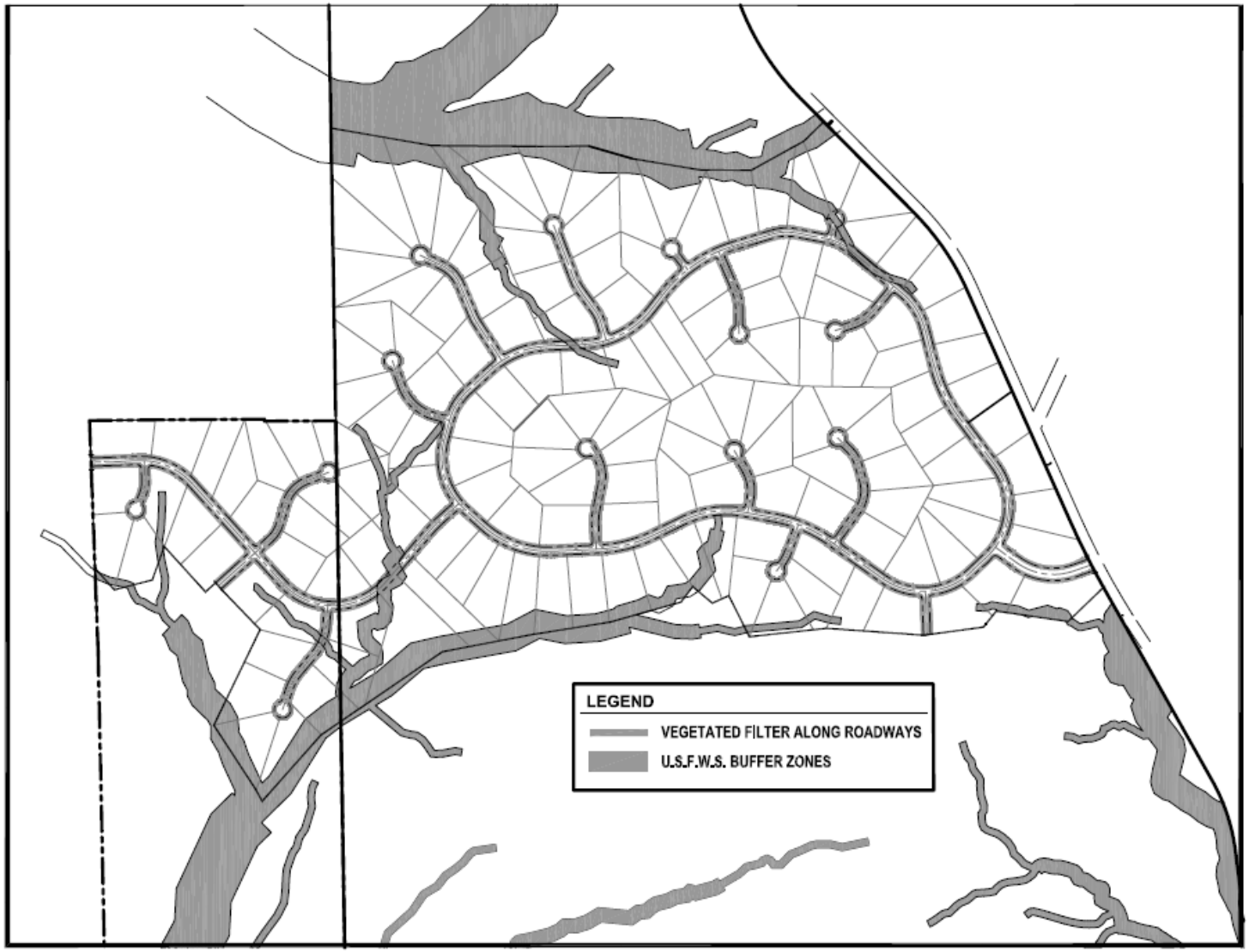

Figure 2-12. Example of Large Lot Low Density Development (courtesy Murfee Engineering)

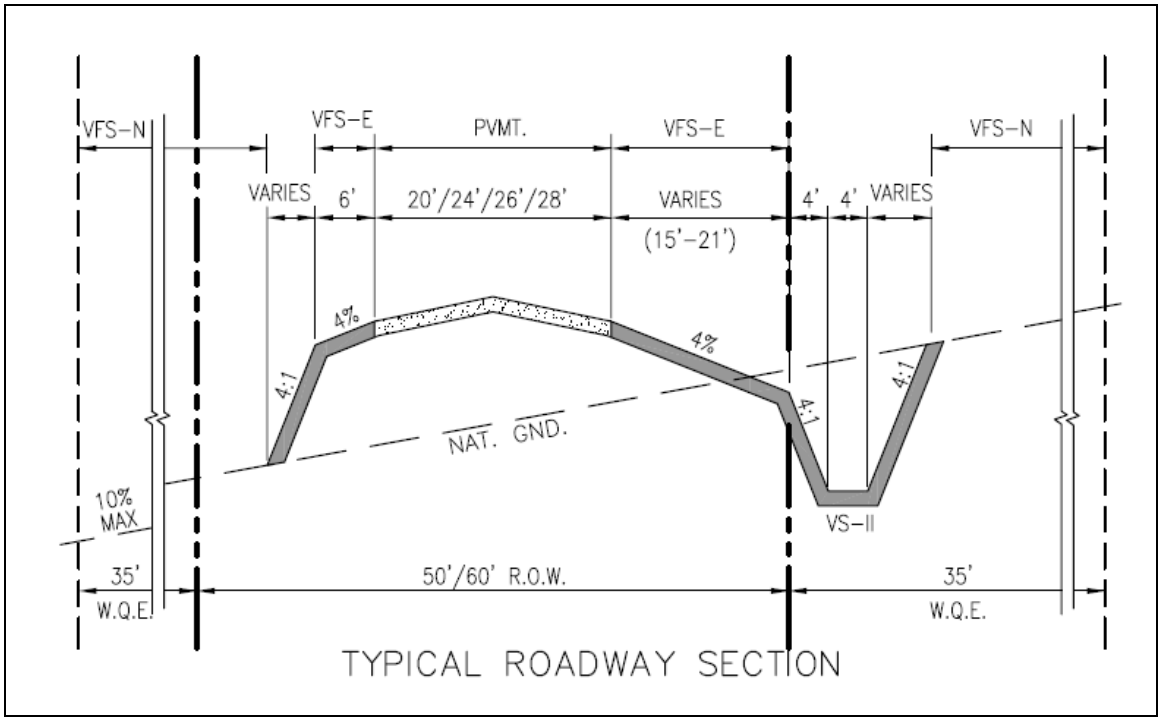

Figure 2-13. Detail of Road Section Showing Vegetated Treatment Areas

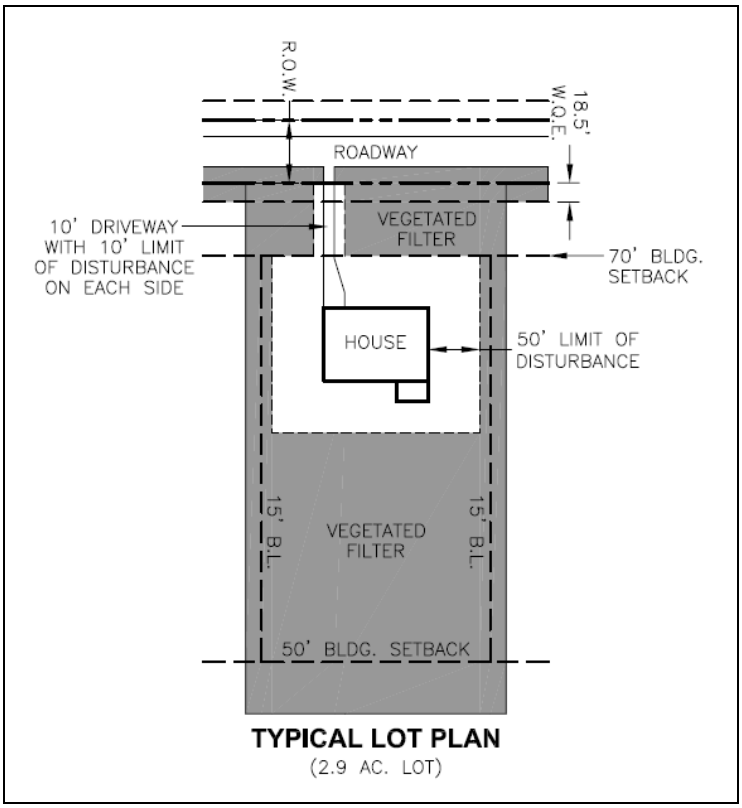

Figure 2-14. Detail of Lot Layout with Water Quality Easements

3. Construction

Erosion and control measures for construction activities are described in RG-348. These measures also apply to construction activities conducted in compliance with these enhanced protection measures with the following additional requirements.

1) Sediment basins and traps, which are required for common drainage areas serving at least 10 acres, will be designed to capture the runoff from the 2-yr, 24-hour storm. These volumes area shown in Table 3-1.

Table 3-1. Capture Volumes for Sediment Basins

County	Cubic Feet/Acre
Bexar	8,000
Comal	8,000
Hays	8,000
Kinney	7,250
Medina	8,000
Travis	8,000
Uvalde	8,000
Williamson	8,000

2) Temporary sediment basins and traps must not be installed in the buffer areas of natural drainages with a tributary area of more than 128 acres.

4. Permanent BMP Implementation

This section describes the configuration and sizing of permanent best management practices (BMPs) to meet the requirements of these optional measures. Additional information regarding design criteria and maintenance of BMPs is contained in RG-348.

4.1. Hazardous Material Traps (HMT)

Roadways capable of conveying at least 25,000 vehicles a day must include a hazardous material trap (HMT). These HMTs must be designed to retain a spill of 10,000 gallons of liquid hazardous material. These may be of a variety of designs including those used previously by the Texas Department of Transportation (TxDOT). Figure 4-1 demonstrates how an HMT can be sited within the footprint of the storm water control (a sand filter in this case) to achieve both objectives without increasing the land or hydraulic head required. Note that the invert of the openings from the splitter box to the HMT is set slightly lower than those into the sedimentation basin. This allows any hazardous spills as well as the first flush of runoff to be captured by the HMT. Once the HMT is full the backwater level rises and allows the remaining runoff to enter the sedimentation basin directly.

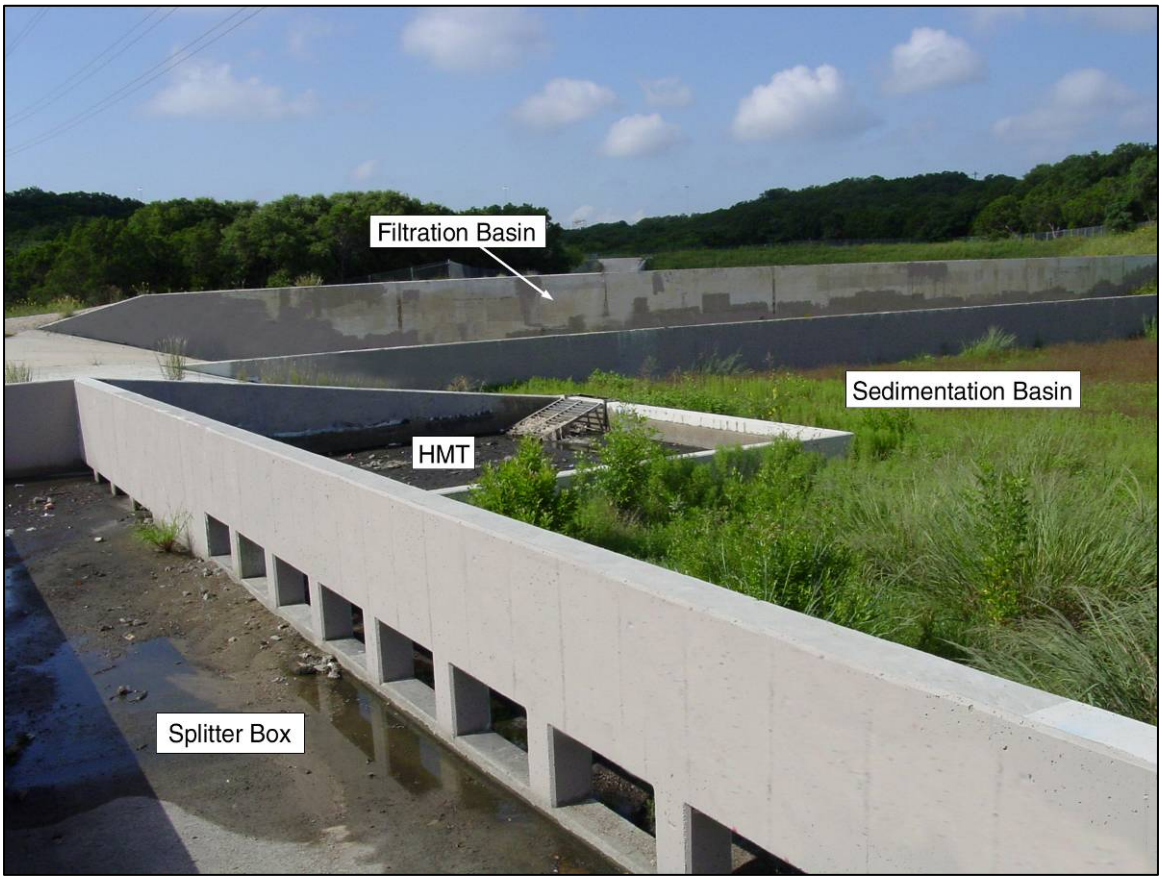

Figure 4-1. Hazardous Material Trap inside Sand Filter

To eliminate the need for manual draining of a hazardous material trap after a rain event, TxDOT developed an automatic siphon system to drain the HMT when it fills with rainwater. Figure 4-2 shows a typical siphon detail from a set of TxDOT construction plans.

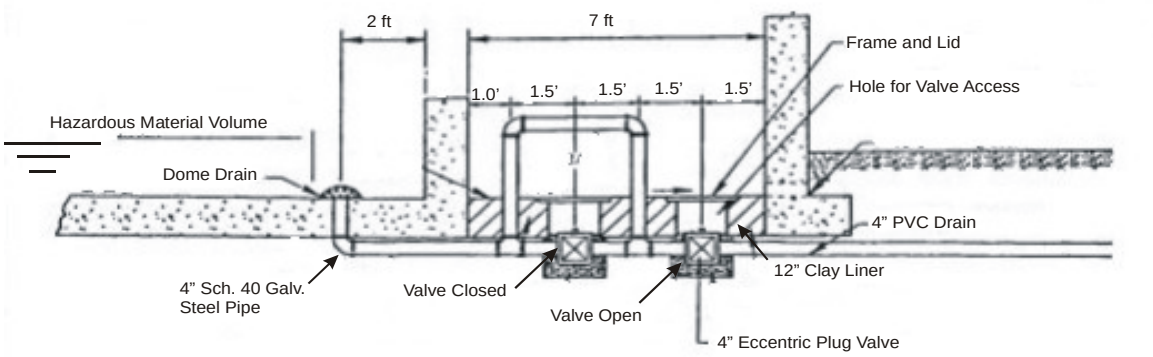

Figure 4-2. Typical TxDOT Automatic Siphon Detail

The siphon device is designed to drain the trap after it becomes full from a rain event, but is installed at an elevation above the full capacity of the trap. Therefore, as long as a hazardous material spill does not occur during a rain event the system should contain the spill. The siphon is provided with bypass and shutoff valves so that alert on-scene responders can shutoff the automatic siphon and thereby maintain some containment even in the event of a concurrent rain/spill. Other options for spill containment are presented in the main section of RG-348.

4.2. Total Suspended Solids (TSS) Removal

4.2.1. Step 1: Required TSS Removal

> Reduction of 80% of the annual TSS load in storm water runoff from a site is required for all new development, without regard to the proposed level of impervious cover. On redevelopment projects that involve major changes to existing impervious cover and include modification of the drainage system, 80% TSS removal must be achieved for the entire project.

Examples of redevelopment projects where the entire site must be treated include highway widening projects, a change in land use from single family residential to multifamily or commercial, and substantial expansion of impervious cover on an existing commercial development.

All the TSS load calculations are based on Equation 4.1

Equation 4.1 $$L = A \times P \times Rv \times C \times 0.226$$

Where:

L = annual pollutant load (pounds)
A = Contributing drainage area (acres)
P = Average annual precipitation (inches)
Rv = Appropriate runoff coefficient
C = Average TSS concentration (mg/L)
0.226 = units conversion factor

Monitoring data from the City of Austin indicates that the TSS concentration from developed areas is 170 mg/L and that from natural areas is 80 mg/L. Consequently, the required 80% load reduction is calculated as:

Equation 4.2 $$L_M = (0.8 \times 0.226)(A \times P \times 0.9 \times 170)$$

Where:

L_M = Required TSS removal (pounds)
A = Impervious area (acres)
P = Average annual precipitation (inches)

This equation simplifies to:

Equation 4.3 $$L = 27.7(A \times P)$$

Where:

L = Required TSS removal (pounds)
A = Impervious area (acres)
P = Average annual precipitation (inches)

Imperviousness is the percent, or decimal fraction, of the total site area covered by the sum of roads, parking lots, sidewalks, rooftops and other impermeable surfaces. Roof areas directed to rainwater harvesting systems are exempt from the treatment requirement. When calculating the impervious area of a residential development the assumptions shown in Table 4-1 will apply to impervious area on each lot to the lot size, unless the actual future impervious cover is known to be greater. Annual precipitation by county is shown in Table 4-2.

Table 4-1. Impervious Cover Assumptions for Residential Tracts

Lot Size	Assumed Impervious Cover (ft^2)
> 3 acres	10,000
Between 1 and 3 acres	7,000
Between 15,000 ft^2 and 1 acre	5,000
Between 10,000 and 15,000 ft^2	3,500
<10,000 ft^2	2,500

Table 4-2. Average Annual Rainfall by County

County	Average Annual Precipitation (inches)
Bexar	30
Comal	33
Hays	33
Kinney	22
Medina	28
Travis	32
Uvalde	25
Williamson	32

4.2.2. Step 2: Select an Appropriate BMP

Select a BMP or series of BMPs that will achieve at least an 80% reduction in TSS. The higher the efficiency of the BMP, the less runoff that will need to be treated to achieve the required reduction. The TSS removal efficiency for each approved BMP is shown in Table 4-3.

Table 4-3. Approved BMPs and TSS Removal Efficiency

BMP	TSS Reduction (%)
Retention/Irrigation	100
AquaLogic™ Cartridge Filter System	95
Wet Basins	93
Constructed Wetlands	93
Sand Filters	89
Bioretention	89
Vegetated Filter Strips	85
Ext. Detention Basin	75
Grassy Swales	70
Wet Vault	See Section 3.3 of RG-348, Revised July 2005

4.2.3. Step 3: Calculate TSS Load Removed by BMPs

The following section describes how to determine the load removed by a proposed BMP(s). The load removed depends on the amount of TSS entering the BMP(s) and its effectiveness.

The load entering each BMP is calculated from the sum of the contribution of the impervious and pervious areas with their respective storm water concentrations for the BMP catchment area. This calculation assumes that no runoff bypasses the treatment facility and assigns the appropriate runoff coefficient and TSS concentrations to the pervious and impervious areas.

Equation 4.4 $LR = (\text{BMP efficiency}) \times 0.226 \times P \times (AI \times 0.9 \times 170\ \text{mg/L} + AP \times 0.03 \times 80\ \text{mg/L})$

Where:

LR = Load removed by BMP
BMP = TSS removal efficiency (expressed as a decimal fraction from)
AI = impervious tributary area to the BMP (ac)
AP = pervious tributary area (ac)
P = average annual precipitation (inches, Table 4-2)

Which simplifies to:

Equation 4.5 $LR = (\text{BMP efficiency}) \times P \times (AI \times 34.6 + AP \times 0.54)$

4.2.4. Step 4: Calculate Fraction of Annual Runoff to Be Treated

Based on the load reduction calculated above for each of the BMPs installed at the site and the required load reduction, calculate the fraction of annual runoff to be treated using Equation 4.6. This calculation assumes a constant concentration of TSS in the runoff.

Equation 4.6 $$F = \frac{L}{\sum L_R}$$

Where:

F = Fraction of the annual rainfall treated by the BMP
L_R = Load removed for each BMP from Step 3 calculation (pounds)
L = Required load reduction from Step 1 (pounds)

4.2.5. Step 5: Calculate Capture Volume

This step relates the statistical properties of storm size and flow rate in the regulated area to the total volume of runoff. These calculations depend on whether the BMP is a capture and treat device, such as a sand filter system, or a flow through BMP such as a swale or wet vault.

For flow through type devices (swales and wet vaults), the size is calculated using a rainfall intensity of 1.1 inches/hour. Capture volume for capture-and-treat devices is developed from Table 4.4, which relates rainfall depth to the percentage of annual rainfall that occurs in storms less than or equal to this depth—i.e., 100% of the annual rainfall occurs in storms of 4 inches or less on average, while 78% of the annual runoff occurs in storms of an inch or less. For BMPs designed to capture and treat the runoff, the value, F, calculated in Step 4 is used to enter Table 4-4and find the rainfall depth associated with this fraction.

Once the appropriate rainfall depth has been determined from Table 4-4, the water quality volume for each BMP can be calculated from:

Equation 4.7 WQV = Rainfall depth x Runoff Coefficient x Area

Where the rainfall depth is determined from Table 4-4, the runoff coefficient comes from Figure 4-3 or is calculated using Equation 4.8, and the area is the portion of site contributing runoff to the BMP.

Equation 4.8 $Rv = 0.05 + 0.0085(IC)$

Where:

IC = Percent impervious cover

Table 4-4. Relationship between Fraction of Annual Rainfall and Rainfall Depth (inches)

F	Rainfall Depth	F	Rainfall Depth	F	Rainfall Depth	F	Rainfall Depth
1.00	4.00	0.80	1.08	0.60	0.58	0.40	0.29
0.99	3.66	0.79	1.04	0.59	0.56	0.39	0.28
0.98	3.33	0.78	1.00	0.58	0.54	0.38	0.27
0.97	3.00	0.77	0.97	0.57	0.52	0.37	0.25
0.96	2.80	0.76	0.94	0.56	0.50	0.36	0.24
0.95	2.60	0.75	0.92	0.55	0.49	0.35	0.23
0.94	2.40	0.74	0.89	0.54	0.47	0.34	0.23
0.93	2.20	0.73	0.86	0.53	0.46	0.33	0.22
0.92	2.00	0.72	0.83	0.52	0.45	0.32	0.21
0.91	1.91	0.71	0.80	0.51	0.44	0.31	0.20
0.90	1.82	0.70	0.78	0.50	0.42	0.30	0.19
0.89	1.73	0.69	0.75	0.49	0.41	0.29	0.18
0.88	1.64	0.68	0.73	0.48	0.40	0.28	0.18
0.87	1.55	0.67	0.71	0.47	0.38	0.27	0.17
0.86	1.46	0.66	0.69	0.46	0.37	0.26	0.16
0.85	1.37	0.65	0.67	0.45	0.36	0.25	0.15
0.84	1.28	0.64	0.66	0.44	0.34		
0.83	1.20	0.63	0.64	0.43	0.33		
0.82	1.16	0.62	0.62	0.42	0.32		
0.81	1.12	0.61	0.60	0.41	0.31		
0.80	1.08	0.60	0.58	0.40	0.29		

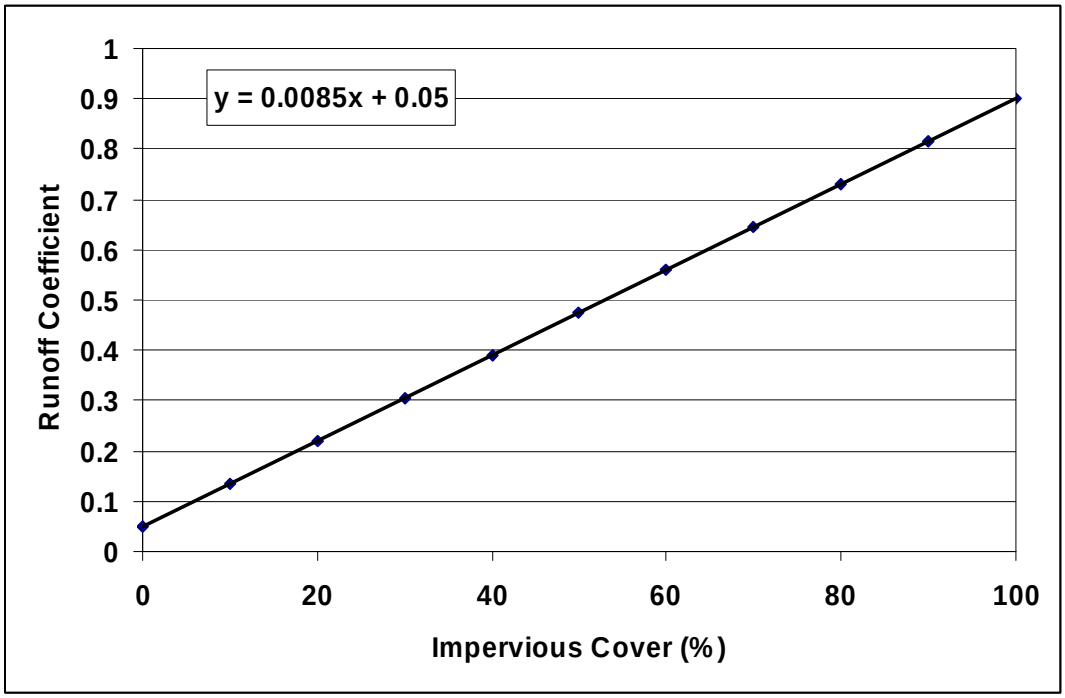

Figure 4-3. Relationship between Runoff Coefficient and Impervious Cover

5. Measures to Protect Stream Morphology

As much as 90% of the sediment and other pollutants carried in urban waterways are derived from the accelerated rate of channel erosion caused by the increase in rate and volume of storm water runoff from impervious cover associated with development (Osborne et al., 2000). In addition, channel degradation also eliminates much of the riparian habitat required for certain species. To reduce the rate of channel erosion, restrictions on the rate of discharge are necessary for storms likely to impact channel morphology as described below.

Flow control is not required for all discharges to surface waters because flow control is not always needed to protect stream morphology. The exemptions listed below are provided to assist in determining which projects should be subjected to this requirement. Any project may be subject to local requirements for flow control to prevent flooding. The following projects and discharges are exempt from flow control requirements to protect stream morphology.

1) Any project able to disperse, without discharge to surface waters, the total 2-year, 24-hour runoff volume for the proposed development condition on site.
2) A road project able to disperse, without discharge to surface waters, the total 2-year, 24-hour runoff volume for the proposed development condition on site.
3) A project constructing less than 10,000 square feet of total impervious surfaces.
4) A project with impervious cover of less than 15% in all subwatersheds on the site.
5) A project discharging directly to the main stem of the:
    a) Blanco River
    b) Frio River
    c) Guadalupe River
    d) Medina River
    e) Nueces River

or

    f) Canyon Lake
    g) Medina Lake

6) In order to be exempted, the discharge must meet all of the following requirements:
    a) The conveyance system must extend to the ordinary high water line of the receiving water, or (in order to avoid construction activities in sensitive areas) flows are properly dispersed before reaching the buffer zone of the stream sufficient to prevent erosion.
    b) Any erodible elements of the conveyance system for the project area must be adequately stabilized to prevent erosion.
    c) Surface water from the project area must not be increased to an existing wetland, stream, or near-shore habitat sufficient to cause a significant adverse impact.
    d) The discharge will not cause negative impacts to habitat along the rivers that support rare or candidate species.

A project that does not meet the criteria above shall construct storm water flow control facilities for any discharge of storm water directly, or through a conveyance system, into surface water. These facilities are only required in subwatersheds on the project site with proposed impervious cover of greater than 15%. Detention is not required in subwatersheds less than 15% impervious

cover. The requirements below apply to projects which discharge into a water body other than those listed in Item 5 above, either directly or indirectly, through a natural or man-made conveyance system. In order to prevent localized erosion, energy dissipation at the point of discharge is required for all projects unless site-specific conditions warrant an exception.

> To protect stream morphology, projects shall limit the peak rate of runoff for the 2-year, 24-hour storm to 50% of the undeveloped rate for that event and limit the 10-year, 24-hour storm peak runoff rate to that calculated for the undeveloped condition for the same storm conditions.

Undeveloped and proposed developed condition runoff volumes and flow rates shall be estimated using TR-55, HEC-1, HEC-HMS, or equivalent software. The design storm for determining both volumes and flow rates is the SCS Type II hyetograph with the storm depths presented in Table 5-1. Projects that extend across a county line should use the average rainfall depths of the two counties. In cases where a local jurisdiction also imposes detention requirement for the 2- and 10-year storm events (e.g. City of Austin), software specified above is used in the calculation, and the rainfall distribution is centered weighted (such as produced by the alternating block method), parameters and methodologies specified by the local authority can be used to calculated runoff volumes and rates.

An agency or local jurisdiction also may require detention basins to be designed to match another return-interval (e.g. 25-year, 50-year, or 100-year) peak flow rate in addition to the 2- and 10-year peak flow rate. In all cases where the discharge is to non-exempt streams, detention basins must be designed to release the 2-year storm at no more than 50% of the 2-year peak flow rate in the undeveloped condition.

If runoff from the subwatershed that will be controlled extends beyond the boundary of the site and the runoff from the offsite portion of the watershed will enter the detention facility, then the detention facility must be sized to control runoff from the offsite portion. When configuring the model for estimating peak runoff rates, use either the current level of development of the offsite portion or assume that the ultimate impervious cover of the offsite portion will be equal to the impervious cover of the subwatershed within the site boundaries, and use whichever is greater.

Table 5-1. Average Annual Rainfall by County (Asquith and Roussel, 2004)

County	2-yr, 24-hour rainfall	10-yr, 24-hour rainfall
Bexar	3.5	6.0
Comal	3.5	6.0
Hays	3.5	6.0
Kinney	3.3	5.5
Medina	3.5	6.0
Travis	3.4	5.5
Uvalde	3.4	6.0
Williamson	3.4	5.5

A typical configuration of storm water treatment and detention to prevent channel erosion would consist of two components. The required water quality volume as calculated according to the methodology in Section 4 is directed to a treatment control such as a wet basin or sand filter. Sand filters should be constructed offline so that runoff in excess of the water quality volume is

bypassed to the detention facility for peak runoff control. On the other hand additional detention can be incorporated into a wet basin with the appropriate outlet configuration to provide the required peak shaving.

6. Maintenance Requirements

Lack of maintenance can be one of the primary causes of BMP failure. Although the current guidelines in RG-348 include recommendations for maintenance, there is currently no system to document when and what type of maintenance was last performed. Consequently, a system needs to be implemented that would facilitate documentation of maintenance activities described in the WPAP or CZP.

> The owner or operator of a BMP constructed to comply with the TSS removal requirement is obligated to provide all the maintenance activities required to maintain the function of the facility and other activities as described in the WPAP and CZP. The owner/operator must maintain records of all maintenance activities for the most recent 3 years. These records must be made available to the TCEQ upon request.

To facilitate inspections and reporting of BMPs that are not functioning correctly, a legible sign must be placed at all ponds, sand filters, detention basins, and bioretention areas. The sign shall be located in plain view of the public and shall provide the name of the owner or operator, the Edwards Aquifer program ID for the project, and a telephone number where the party responsible for the maintenance of the BMP can be contacted.

Equally important to the correct functioning of BMPs is the proper construction of the approved structure. The Edwards Aquifer Rules require that the owners of permanent BMPs or measures must insure that they are constructed and function as designed. A Texas licensed professional engineer must certify in writing that the permanent BMPs or measures were constructed as designed. A copy of this certification must be kept by the owner and made available to the TCEQ upon request.

An important component of water quality protection on the Edwards Aquifer is routine inspection of sewer lines. TCEQ rules in Title 30 TAC Chapter 213 Edwards Aquifer require owners of sewage collection systems to ensure that all existing sewer lines having a diameter greater than or equal to six inches, including private service laterals, manholes, and connections, are tested to determine types and locations of structural damage and defects such as offsets, open joints, or cracked or crushed lines that would allow exfiltration to occur. Existing manholes and lift-station wet wells must be tested using methods for new structures that are approved by the executive director.

The testing of all sewage collection systems must be conducted every five years after being put into use to determine types and locations of structural damage and defects such as offsets, open joints, or cracked or crushed lines that would allow exfiltration to occur. These test results must be certified by a Texas licensed professional engineer. The test results must be retained by the plan holder for five years and made available to the executive director upon request.

In addition, private service lateral connections must be inspected after installing, and prior to covering and connecting to, an organized sewage collection system. A Texas licensed professional engineer, Texas registered sanitarian, or appropriate city inspector must inspect the private service lateral and the connection to the collection system and certify that construction conforms with the applicable provisions of this guidance document, RG-348 (Revised July 2005), and local plumbing codes.

7. References

Asquith, W.H., and Roussel, M.C., 2004, Atlas of depth-duration frequency of precipitation annual maxima for Texas: U.S. Geological Survey Scientific Investigations Report 2004-5041, 106 pp.

Osborne, K.G., Barrett, M., and Maidment, D., 2000, A water quality GIS tool for the City of Austin incorporating non point sources and best management practices, Center for Research in Water Resources Online Report 2000-10 <www.crwr.utexas.edu/reports>, University of Texas at Austin.

Thurow, T.L., Blackburn, W., Warren, S.D., and Taylor, C.A., Jr., 1987, "Rainfall interception by midgrass, shortgrass, and live oak mottes," *Journal of Range Management*, Vol. 40, No. 5, pp. 455-460.

Warton, Mike, 2002, "Solid and Invertebrate Cave Gate Options," in Proceedings of Bat Cave Gate Design: A Technical Interactive Forum, edited by Vories, K. Throgmorton, D., and Harrington, A., Austin, Texas, March 4-6, 2002.

September 2007
RG-348B

Optional Enhanced Measures for the Protection of Water Quality in the Edwards Aquifer and Related Karst Features that May Be Habitat for Karst Dwelling Invertebrates

Appendix B to RG-348—
Complying with the Edwards Aquifer Rules:
Technical Guidance on Best Management Practices

Prepared by the
Chief Engineer's Office, Water Programs

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

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RG-348B
September 2007

Texas Commission on Environmental Quality
P.O. Box 13087, MC-203
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CONTENTS

Figures

1. Introduction

One of the goals of the Texas Commission on Environmental Quality (TCEQ) Edwards Aquifer Rules is "the existing quality of groundwater not be degraded, consistent with the protection of public health and welfare, propagation and protection of terrestrial and aquatic life, the protection of the environment, the operation of existing industries, and the maintenance and enhancement of long-term economic health of the state" (Title 30 Texas Administrative Code §213.1(1)). This document presents optional enhanced water quality measures and best management practices for protecting the Edwards Aquifer which will also result in the protection of the habitat of certain endangered and candidate karst dwelling invertebrates.

The best management practices contained in this document have been reviewed by the United States Fish and Wildlife Service (USFWS), which has issued a concurrence that these voluntary enhanced water quality measures will protect endangered and candidate karst dwelling species from impacts due to water quality degradation. If these practices are used, they are expected to result in "no take" of these species from degradation of water quality by non-Federal landowners and other non-Federal managers.[1] Correspondence from Dr. Benjamin N. Tuggle, USFWS Regional 2 Director to Governor Rick Perry dated September 4, 2007, identified the following species as being included under this "no take" concurrence.

Bexar County	**Travis and/or Williamson Counties**
Madla cave meshweaver *Cicurina madla*	Bee Creek Cave harvestman *Texella reddelli*
Robber Baron Cave meshweaver *Cicurina baronia*	Bone Cave harvestman *Texella reyesi*
Braken Bat Cave meshweaver *Cicurina venii*	Kretschmarr Cave mold beetle *Texamaurops reddelli*
Government Canyon Bat Cave meshweaver *Cicurina vespera*	Tooth Cave pseudoscorpion *Tartarocreagris texana*
Government Canyon Bat Cave spider *Neoleptoneta microps*	Tooth Cave ground beetle *Rhadine persephone*
Cokendolpher cave harvestman *Texella cokendolpheri*	Tooth Cave spider *Neoleptoneta (=Leptoneta) myopica*
Ground beetle (no common name) *Rhadine exilis*	Warton meshweaver *Cicurina wartoni* (Candidate)
Ground beetle (no common name) *Rhadine infernalis*	Coffin Cave mold beetle *Batrisodes texanus*
Helotes mold beetle *Batrisodes venyivi*	

It is the responsibility of the applicant to determine whether the optional water quality measures and best management practices described in this document are appropriate for their project. These optional measures are designed to enhance the protection of the species covered under this document by providing for a higher level of water quality protection and can be used by those who wish to avoid harming listed karst dwelling invertebrate species from water quality impacts.

[1] Section 9 of the Endangered Species Act (Act) and Federal regulations adopted under section 4(d) of the Act prohibit the "take" of endangered and threatened species without special exemption. Take of listed species is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in such conduct. Harass is further defined as an intentional or negligent act or omission that creates the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavioral patterns. Harm includes significant habitat modification or degradation that results in death or injury to listed species.

While these measures are not mandatory under the Edwards Aquifer Protection Program, they may be submitted to the TCEQ for review as part of an Edwards Aquifer Protection Plan or a Contributing Zone Plan. An applicant who chooses to implement the measures and best management practices contained in this document will still have to comply with all other applicable requirements for the development of land under the Edwards Aquifer Protection Program.

TCEQ cannot grant variances to the measures and best management practices contained in this document. If the applicant wishes to implement these water quality measures to fulfill the "no take" concurrence by USFWS, variances from the water quality best management practices under TCEQ Edwards Aquifer Protection Program will not be allowed as part of the approved plan. If the applicant wishes a variance, the TCEQ cannot issue a plan approval letter which indicates that the plan is in compliance with the measures contained in this document. If the water quality measures required to be in compliance with this document cannot be implemented fully, the applicant may initiate direct consultation with USFWS to determine if their development will result in no "take" thereby ensuring that the requirements of the Endangered Species Act have been met.

The optional water quality measures contained in this document may be implemented by applicants conducting regulated activities in the areas subject to the TCEQ Edwards Aquifer Protection Program as delineated in the rules found in Title 30 Texas Administrative Code Chapter 213 Edwards Aquifer, <www.tceq.state.tx.us/rules/ index.html> and on maps available at <www.tceq.state.tx.us/compliance/field_ops/eapp/program.html>. Activities within the Contributing Zone that disturb less than five acres, or are not part of a larger common plan of development or sale with the potential to disturb cumulatively five or more acres, are not subject to regulation under Subchapter B of the Edwards Aquifer Rules. Therefore, these activities are not eligible to be reviewed by the TCEQ.

Section 2 of the document discusses the geologic assessment and its use in planning the development of a site. This allows for the identification of sensitive features and other karst features that may provide habitat suitable for karst dwelling invertebrates and allows the applicant to include the best management practices contained in this document as part of the initial site plan. For the convenience of the applicant, maps illustrating geographic areas where the habitats of karst dwelling invertebrates are known to occur are provided.

It is the responsibility of the applicant to identify potential karst habitat, determine the potential for impacting endangered species, and take appropriate action based upon this information. The information contained in the document *United States Fish and Wildlife Service, Section 10(a)(1)(A) Scientific Permit Requirements for Conducting Presence/Absence Surveys for Endangered Karst Invertebrates in Central Texas* (USFWS, 2006) can be used to make a karst habitat determination. There may be karst features identified on a site that do not meet the criteria to be designated as a "sensitive feature" under the Edwards Aquifer Protection Program, including karst features that are located in the Contributing Zone, but meet the habitat characteristics for karst dwelling invertebrates. If the applicant wants its application to fall under the "no take" concurrence issued by USFWS, these other karst habitat features must be addressed using the measures contained in Section 3.

Section 3 of the document contains a list of best management practices and measures to be implemented, including allowed and prohibited activities, determining the extent of and establishing a buffer zone, protecting the karst-feature surface opening(s), dealing with potential karst habitat discovered during construction, and developing and implementing a maintenance plan for a buffer zone.

2. Site Planning and Geologic Assessment

Historically, large tracts of land were subdivided with the location of roads and lots planned before consideration was given to requirements for water quality protection. This practice has resulted in numerous difficulties when implementing setbacks from sensitive features and implementing other water quality protection practices. Consequently, a geologic assessment should precede any subdivision planning or development.

A complete Geologic Assessment as described under Title 30 Texas Administrative Code §213.5 must be conducted on all tracts (in the Recharge, Transition, and/or Contributing Zone) to identify sensitive karst features in areas that may contain potential karst species habitats. The features in these areas are varied, including caves, solution cavities, solution enlarged fractures, sinkholes or other karst surface expressions that often meet the definition for sensitive in the "Instructions to Geologists for Geological Assessments" (Form TCEQ-0585).

The USFWS (2006) karst invertebrate survey document should be used to identify karst features that provide potential habitat for karst dwelling invertebrates. These areas should be protected using the water quality measures contained in Section 3. There may be karst features that are identified as habitat suitable for karst dwelling invertebrates, but do not meet the "sensitive feature" criteria designation under the Edwards Aquifer Protection Program (such as features that occur in the Contributing Zone). To receive approval under this document, these karst features must also be addressed using the water quality measures contained in Section 3.

2.1. General Geology

In addition to the standard requirements of the Geological Assessment, any feature identified as potential habitat for karst dwelling invertebrates, must be studied to determine both the surface and subsurface drainage to the feature. In general, the land bounded by the contour interval at the cave floor is the area within which water-borne contaminants moving over the surface or through the karst could move toward the feature and potentially enter the aquifer. Outside this contour, potential contaminants would move away from the cave. A hydrogeologic investigation will be useful in determining the surface and subsurface drainage basin of the karst feature, local aquifer recharge areas, and direction of groundwater movement. This information must be used to determine the feature footprint and the size of the buffer zone area and the baseline conditions within the zone required under Section 3. For general information on how to determine subsurface drainage basins see Veni, 2003; Veni, 2004; and Veni and Associates, 2002.

Karst features that meet certain criteria provided in the USFWS, 2006 publication on Conducting Presence/Absence Surveys for Endangered Karst Invertebrates in Central Texas, are the primary habitat of most of the subject invertebrates in Bexar, Williamson, and Travis Counties. The principal cave-containing rock units of the Edwards Plateau are the upper Glen Rose Formation, Edwards Limestone, Austin Chalk, and Pecan Gap Chalk (Veni, 1988).

2.1.1. Bexar County

The Edwards Limestone accounts for one-third of the cavernous rock in Bexar County, and contains 60% of the caves, making it the most cavernous unit in the county. The Austin Chalk outcrop is only second to the Edwards Limestone in total number of caves. In Bexar County, the outcrop of the upper member of the Glen Rose Formation accounts for approximately one-third of the cavernous rock, but only 12.5% of Bexar County caves (Veni and Associates, 2002). The Pe-

can Gap Chalk, while generally not cavernous, has a greater than expected density of caves and passages (Veni and Associates, 2002). A stratigraphic section showing the relationships of these units is presented in Figure 2-1.

Group	Formation	Thickness (Feet)	Lithology
Navarro		500	Marl, clay, and sand in upper part; chalky limestone and marl in lower part.
Taylor	Pecan Gap	300-500	
	Anacacho Limestone		
Austin Chalk	Undivided	200-500	Chalk, marl, and hard limestone. Chalk is largely a carbonate mudstone.
Eagle Ford	Undivided	50	Shale, siltstone, and limestone; flaggy limestone and shale in upper part; siltsone and very fine sandstone in lower part.
Washita	Buda Limestone and Del Rio Clay	100-200	Dense, hard, nodular limestone in the upper part and clay in lower part.
	Georgetown Limestone (unit is within Edwards Aquifer)	20-60	Dense, argillaceous limestone, contains pyrite
Edwards Limestone	Pearson (Edwards Aquifer)	90-150 Marine	Limestone and dolomite; honeycombed limestone interbedded with chalky, porous limestone and massive, recrystalized limestone.
		60-90 Leached and Collapsed Member	Limestone and dolomite. Recrystallized limestone occurs predominantly in the freshwater zone of the Edwards aquifer.
		20-30 Regional dense bed	Dense, argillaceous limestone.
	Kainer (Edwards Aquifer)	50-60 Grainstone	Limestone, hard, miliolid grainstone with associated beds of marly mudstone and wackestones.
		40 Dolomitic	Limestone, calcified dolomite, and dolomite. Leached, evaporitic rocks with breccias towards top. Dolomite occurs principally in the saline zone of the aquifer.
		40-70 Basal Nodular Bed	Limestone, hard, dense, clayey; nodular, mottled, styloitic.
Trinity	Glen Rose	300-400 Upper Part	Limestone, dolomite, shale, and marl. Alternating beds of carbonates and marls. Evaporites and dolomites toward top.
		200-250 Lower Part	Massive limestone with few thin beds of marl.

Figure 2-1. Stratigraphy for Bexar County (Modified from Maclay and Small, 1986)

The karst areas in Bexar County have been delineated into five zones, shown in Figure 2-2, that reflect the likelihood of finding habitats for the endangered invertebrates based on geology, distribution of known caves, distribution of cave fauna, and primary factors that determine the presence, size, shape, and extent of caves with respect to cave development. Geographic Informa-

tion System (GIS) Shape files for Karst Zones are available at <www.fws.gov/ifw2es/ austin-texas/>. These five zones are defined as:

Zone 1: Areas known to contain one or more endangered karst invertebrates;

Zone 2: Areas having a high probability of suitable habitat for the endangered invertebrates;

Zone 3: Areas that probably do not contain the endangered invertebrates;

Zone 4: Areas that require further research but are generally equivalent to zone 3, although they may include sections that could be classified as zone 2 or zone 5; and

Zone 5: Areas that do not contain endangered karst invertebrates.

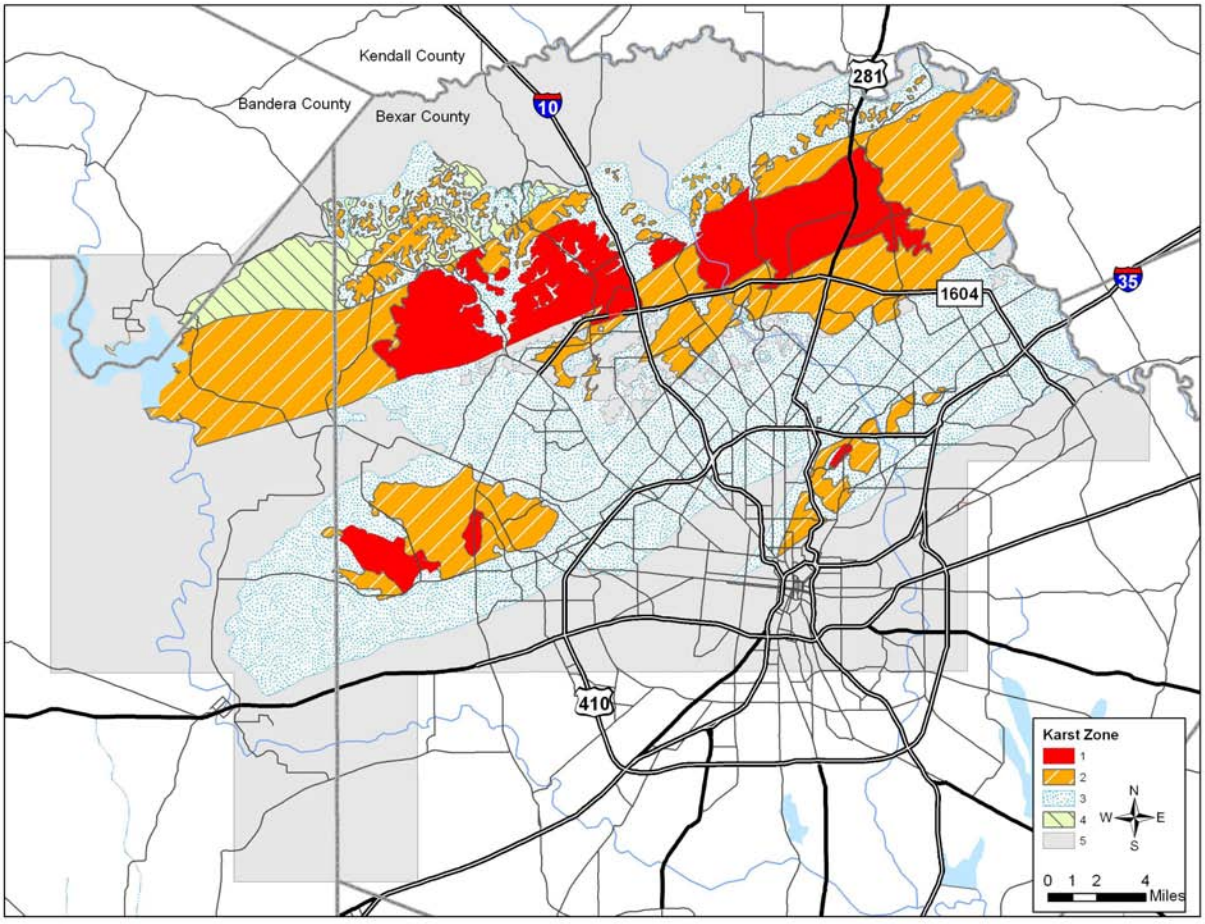

Figure 2-2. Karst Zones in Bexar County (Modified from Veni and Associates, 2002)

2.1.2. Travis and Williamson Counties

The Cretaceous Edwards Limestone is the most extensively karstified rock in Travis and Williamson Counties, and a typical stratigraphic section is presented in Figure 2-3. Other local formations contain consequential caves and karst features elsewhere in Texas; however, with the exception of the Walnut Formation, they generally do not have any significant caves in these two counties.

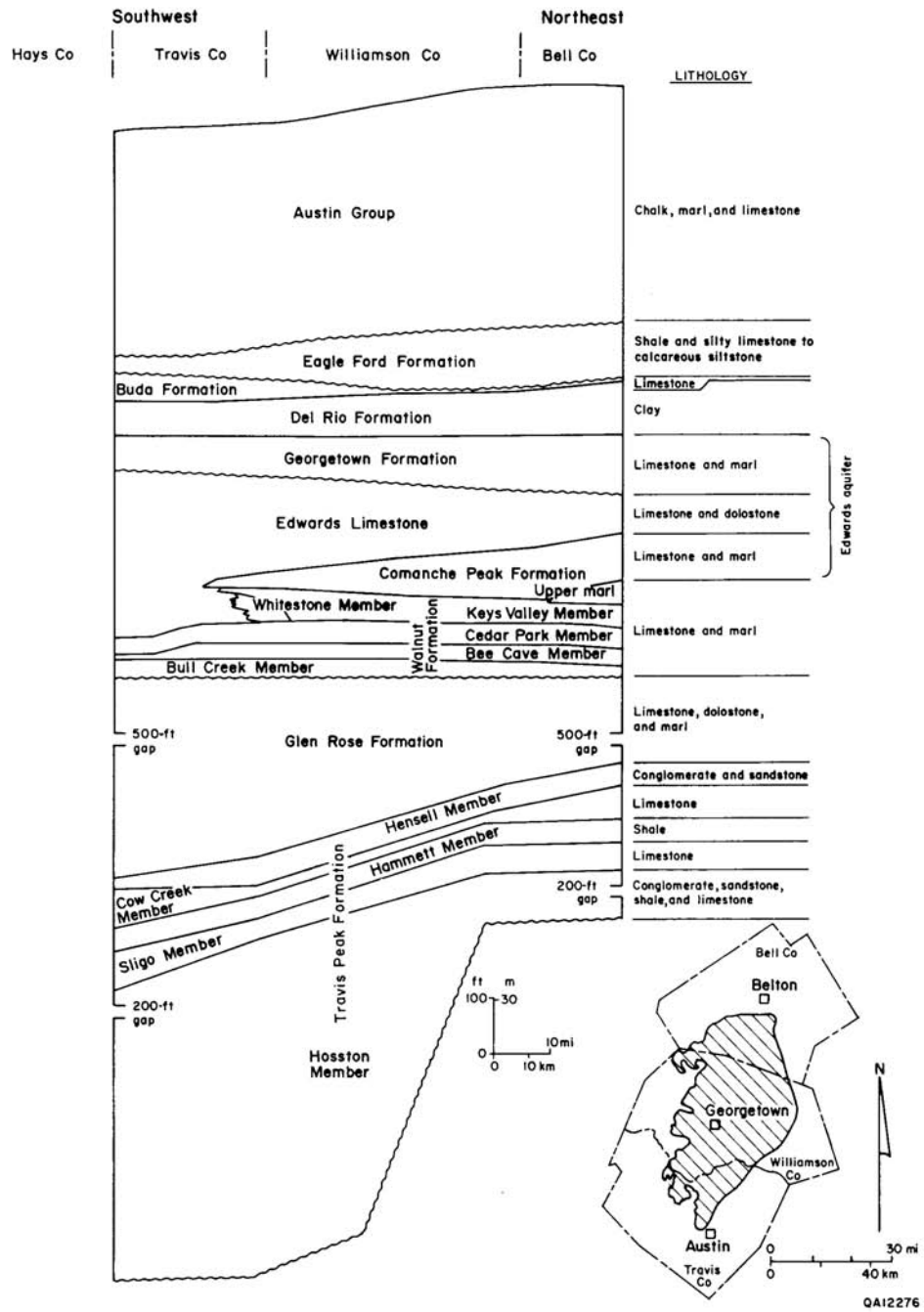

Figure 2-3. Stratigraphic Section in Travis and Williamson Counties (Senger et al., 1990)

Travis and Williamson Counties have been divided into four zones that describe the likelihood of finding endangered karst dwelling species or their habitat (Veni and Associates, 1992). These are:

Zone 1: Areas in the Edwards Group limestone that are known to contain endangered karst dwelling species,

Zone 2: Areas that have a high probability to contain endangered karst dwelling species or other endemic invertebrate karst fauna,

Zone 3: Areas that probably do not contain endangered karst dwelling species or their habitat, and

Zone 4: Areas, largely non-cavernous, that do not contain endangered karst invertebrates.

The location of these zones is presented in Figure 2-4. Geographic Information System (GIS) Shape files for Karst Zones are available at <www.fws.gov/ifw2es/austintexas/>. Together, Zones 1 and 2 comprise about 55,000 acres in Travis County and about 100,000 acres in Williamson County.

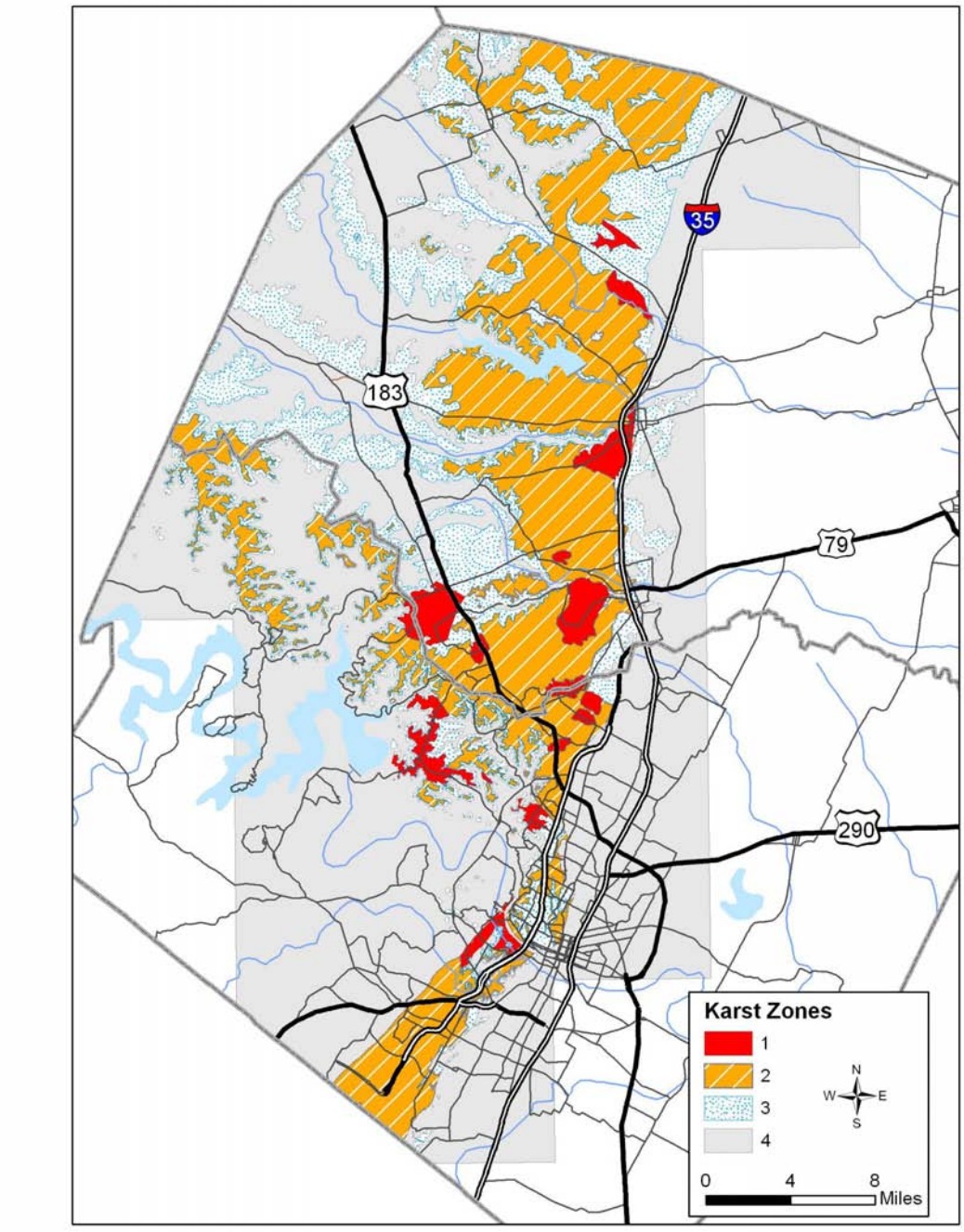

Figure 2-4. Karst Zones in Travis and Williamson Counties (USFWS, 1992)

3. Best Management Practices

Protection of karst dwelling invertebrates from negative impacts requires that both the water quality and environmental integrity of the surrounding area be protected. Protection of surface and subsurface drainage areas adjacent to the identified karst feature is needed for water quality and quantity protection. Consequently, the best water quality protection is provided by the establishment of a buffer zone that minimizes the amount of disturbance in the area of the karst habitat, protects the quantity and quality of water draining to the karst feature, and protects the quality of groundwater which moves into the aquifer.

Once a plan is approved by the Executive Director, the boundaries of the buffer zone must be recorded through a plat, deed restriction, or other enforceable document. Proof of this restriction must be submitted as a GIS coverage to TCEQ along with the geographic area subject to the restriction within 60 days of the Executive Director's approval of the plan.

3.1. Allowed and Prohibited Activities

The types of activities that are allowed within a buffer zone are very limited. These restrictions protect the quality of water entering karst features and the environmental integrity of the buffer zones. Public access may be allowed on defined, low impact hike and bike trails within the buffer zones. Access roads may be provided for emergency vehicles or for buffer/habitat maintenance. Trails and access roads should be carefully placed to avoid erosion, and to avoid directing sediment and potential contaminants in storm water runoff from the trails and access road areas into the feature. All entrances to the buffer area must have clearly legible signs alerting people to the presence of the buffer zone and any restricted activities.

To maintain water quality, the following activities are prohibited within the buffer zone boundaries.

- General use of any fertilizers, herbicides, or pesticides is prohibited. If fire ant infestation becomes acute, consult with USFWS for products approved for use and methods of usage. An acute infestation is defined as: (1) fire ant densities greater than 40 mounds per acre or (2) more than 40 mounds within 344 ft of the entrance to any karst feature habitat.
- Construction of new general use roads, utilities, or other development including water, storm water, or wastewater lines, treatment ponds, structures or other facilities is prohibited.
- Storage, maintenance, or use of motorized vehicles is prohibited. The only motorized vehicles that can be used in the buffer zone area must be used for emergencies or to facilitate the operation, monitoring, or maintenance of buffer zone area.

3.2. Buffer Zone Extent

The buffer zone should include an area large enough to protect the quality of water entering the karst feature and the aquifer, and to maintain the native plant communities that provide filtering of storm water. The size and geometry of the buffer zone surrounding the karst feature(s) should be sufficient to protect:

- The surface drainage to the karst feature
- The subsurface drainage to the karst feature, and
- The known extent of the karst feature.

The size of the buffer also depends on the amount and density of development adjacent to the karst feature(s).

The size and configuration of each karst feature buffer zone should be adequate to maintain natural hydrologic conditions in the feature, such as moist, humid conditions, and to prevent contamination of surface and groundwater entering the feature and the aquifer. The factors that should be considered in determining the size and configuration of the buffer zone include: the pattern and direction of groundwater movement, the direction and area of surface and subsurface drainage, the preservation of the surface plant community above and surrounding the cave or karst feature which provide for natural filtering of storm water, and the presence of other caves or karst features. A buffer zone should contain all of the surface and subsurface drainage area.

Generally, land bounded by the contour interval at the cave floor is the area within which waterborne contaminants moving over the land surface or through the karst could move toward the karst feature and into the aquifer. However, surface drainage to a feature may move in a different direction than the subsurface drainage. A hydrogeologic investigation should be used to determine both the surface and subsurface basins draining to the feature, local recharge areas, slope (strike and dip) of the bedding planes, and direction of groundwater movement. For general information on how to determine subsurface drainage basins see Veni, 2003; Veni, 2004; and Veni and Associates, 2002.

The known extent of underground passages of each of the karst features identified as a potential habitat should also be included within the buffer zone(s). This area may be larger than the surface drainage area of the cave. It is likely that many cave systems are extensive and connect with other caves located throughout the subsurface geologic formation, even though this may not be readily apparent from surface observations. Wherever possible, buffer zone areas should connect to larger undeveloped lands that are not slated for future development. If the subsurface drainage basin cannot be determined using methods described by Veni and Associates 2002, or Veni 2003, 2004, the applicant may use an assumed subsurface drainage area that has a radius of 500 feet from the surface expression of the feature or group of features.[2]

Two configurations of the buffer zones are possible: those with a core buffer zone area and transitional low density residential buffer zone area, and those with no transitional area.

3.3. Low Density Development with a Transitional Area Buffer Zone

The buffer zone for this configuration consists of a core buffer zone area (CBZA) extending a minimum of 500 feet from the known extent of the feature footprint and an additional transitional area buffer zone (TABZ).

The CBZA can contain multiple karst features as long as the boundary of the CBZA is at least 500 feet from the footprint of each feature. The CBZA should be configured to contain all of the surface and subsurface drainage area of the feature(s). If the surface or subsurface drainage area is larger than the 500 foot set back from the karst feature(s), then the larger area must be used as the CBZA. Only allowed activities described in Section 3.1 can be conducted within the CBZA.

[2] This distance is based on an analysis conducted by the US Fish and Wildlife Service of the subsurface drainage areas of 64 caves in Bexar County that contain listed karst invertebrates delineated by Veni (2002). Based on this analysis, 87% of the subsurface drainage areas estimated by Veni (2002) would be included within a setback with a default radius of 500 feet from the feature(s). However, some caves and karst features have subsurface drainage basins that exceed this distance, and an applicant is at a higher risk of impacting listed karst invertebrates if the subsurface drainage basin in their project area extends beyond this default distance. In those situations, these measures would not cover take of listed species from water quality impacts. In addition, this distance is based on Bexar County caves and may not apply directly to Williamson and Travis Counties.

A TABZ must be established between 500 feet and 900 feet from the CBZA and must be outside of the surface and subsurface drainage basins to the feature(s). Low density development is allowed within the TABZ. Low density development typically consists of single family homes on individual lots of approximately two acres or larger. Only those roads and utilities necessary to serve the homes in the TABZ are allowed in the TABZ. Increases from preexisting sediment or contaminant loads into the CBZA area from the TABZ, are prohibited. This prohibition remains in effect both during and after construction.

3.4. Core Buffer Zone Area with No Transitional Area

A CBZA must be provided which extends a minimum of 750 feet in all directions from the known extent of the footprint of any karst feature(s) that may be a potential karst invertebrate species habitat. This area may contain multiple karst features as long as the boundary of the CBZA is at least 750 feet from the footprint of each feature. The CBZA should be configured to contain all of the surface and subsurface drainage to the karst feature(s). If the surface or subsurface drainage area is larger than the 750 foot set back from the karst feature(s), then the larger area must be used as the CBZA. Only allowed activities described in Section 3.1 can be conducted within this area. Storm water containing possible contamination must not be allowed to drain into the CBZA. There are no restrictions, as part of these measures addressing avoidance of water quality impacts, on the type or level of development outside the CBZA.

3.5. Buffer Zones and Pre-Existing Development

In some areas, previously constructed roads, buildings, utility lines or other manmade features may be in close proximity to a karst feature that provides suitable habitat for species of concern. These features may make it infeasible to configure a buffer zone area that meets all the requirements of Sections 3.1 and 3.2. In such cases, the applicant should contact the USFWS to determine the appropriate course of action.

3.6. Buffer Zones and Utility Construction

This section applies to the new construction of utilities not associated with land development on the site. Examples of these types of utilities are pipelines, electric transmission lines, and telecommunication towers. Construction of new utilities is prohibited within the CBZA.

Construction of new pipelines or underground utilities is prohibited within 500 feet of the known extent of the footprint of any karst feature identified as habitat for karst dwelling species. If the surface or subsurface drainage area is larger than the 500 foot set back from the footprint of the karst feature(s), then construction of new pipelines or underground utilities is also prohibited within the surface or subsurface drainage area to any karst feature identified as habitat for karst dwelling species. These areas must be managed as a CBZA, subject to all restrictions under section 3.1, including the prohibition on the general use of any fertilizers, herbicides, or pesticides.

New pipelines or underground utilities for the transmission of liquids must be of double walled construction if they are located between 500 and 750 feet of the footprint of any karst feature(s) or within 250 feet the surface or subsurface drainage area (which ever is larger) that have been identified as habitat for karst dwelling species. Those used for the transmission of wastewater, static hydrocarbon, or hazardous substances must be double walled and equipped with a leak detection method capable of detecting leaks in the inside wall of the double-walled system. The leak

detection system must be capable of immediately alerting the system's owner or operator of possible leaks. Native vegetation should be maintained in the rights-of-way.

New towers supporting electrical transmission lines or telecommunication equipment must not be constructed within 500 feet of the known extent of the footprint of any feature identified as a habitat for karst dwelling species. The towers must be constructed so that they do not affect the flow of water into the feature. Except for the required maintenance of the utility, no other construction is allowed. Native vegetation should be maintained in the CBZA of the rights-of-way.

The utility is not required to own all the land required for buffer zone purposes, but must demonstrate that adjacent landowners will provide for the CBZA when those tracts are eventually developed. Written documentation that memorializes that agreement must be provided to the Executive Director within 60 days of approval. This documentation can be in the form of a recorded deed or a conservation easement / restriction on the property.

If the provisions providing for the buffer zone are not feasible due to existing construction or inability to come to an agreement with adjacent landowners, the applicant should contact the USFWS to determine the appropriate course of action.

3.7. Protection of Caves and Buffer Zones

Surface openings of caves and other karst features that provide habitat for karst dwelling species should be protected with either fencing or cave gates. Cave gate and fencing designs should not impede the natural flow of water to the habitat and should avoid disrupting the karst ecosystem. Other means of protection, such as warning signs and public education, must be utilized as additional protection measures.

Cave gates should provide for free exchange of air, water, organic debris, and small mammals that are important components of the cave ecosystem. Descriptions of recommended cave gates are presented in Chapter 5 of the TCEQ Edwards Aquifer Technical Guidance Manual (RG-348). Soil disturbance should be prevented during installation. The gate should also provide a lockable access for maintenance.

Cave security fences should be located at least 50 feet from the entrance to the cave or karst feature and should be a minimum of six feet high. The fence should be constructed such that neither adults nor children can easily climb over or crawl under the fence. The fence should also be constructed so as not to prevent or deter small to medium-sized vertebrates that may be important components of the karst ecosystem from passing through the fence. This can be accomplished by leaving ground level animal access holes, similar to those used in cave gates, spaced at a rate of at least one for every 16 ft of fence.

3.8. Karst Features Identified During Construction

Many karst features that provide a suitable habitat for the endangered and candidate species, such as solution cavities and caves, are not identified during the Geological Assessment, but are discovered by excavation during the construction phase of a project. This is especially common during utility trenching. A feature encountered at this phase of a project should be covered immediately by a temporary covering (such as a plastic tarp) to prevent contaminants from entering the open feature. All construction activity should stop in the vicinity of the feature and the appropriate TCEQ regional office should be contacted immediately.

The feature should be assessed by a qualified karst geoscientist or biologist to determine whether it is a likely habitat for karst-dwelling species. If the assessment indicates that it is unlikely that the karst feature constitutes a habitat, then no special measures are required under this optional guidance; however, routine TCEQ guidance as specified in the TCEQ Edwards Aquifer Technical Guidance Manual (RG-348) must still be followed.

If a karst feature is identified as a potential habitat, neither this document nor the TCEQ approved plan can be used by the applicant to determine that "no take" for the karst dwelling invertebrates exist. The applicant should contact the USFWS to determine the appropriate course of action.

3.9. Maintenance Plan for Buffer Zones

A maintenance plan describing management practices and measures must be developed and implemented for all defined buffer zones. The maintenance plan must include a monitoring plan and a spill management plan. The maintenance plan must be submitted with and approved as part of the Edwards Aquifer Protection Plan or Contributing Zone Plan.

The maintenance plan must be available for review by TCEQ personnel both during and after construction is completed. All records of maintenance activities or other actions undertaken in the buffer zone must be retained and be made available to TCEQ personnel when requested. It is the responsibility of the applicant to implement all components of the maintenance plan until such time as the legal responsibility for implementing the plan is transferred to another party as provided under Title 30 Texas Administrative Code §213.5(b)(5). The objectives of this plan are to:

- Monitor changes in baseline conditions and respond to changes;
- Protect karst features from damage or harm due to vandalism or contamination;
- Respond to hazardous material spills; and
- Provide for adaptive management when maintenance is ineffective.

3.9.1. Monitoring Plan

The monitoring plan should be sufficient to document whether the management plan is protective of the karst feature and the associated hydrologic input. When a karst feature is identified as a potential habitat for karst dwelling invertebrates, the baseline condition of the following elements in the feature and the proposed buffer zone should be established:

- Hydrological condition,
- Surface vegetation assemblage, and
- Evidence of dumping or vandalism that might affect water quality or species survival.

Hydrologic condition refers to the amount of moisture/surface and subsurface water flow as well as the relative humidity in the feature as described in USFWS 2006 document on Conducting Presence/Absence Surveys for Endangered Karst Invertebrates in Central Texas. Surface vegetation assemblage refers to the species composition, condition, and density. A description of the baseline conditions for both hydrologic conditions and surface vegetation assemblages should be included in the maintenance plan submitted to TCEQ.

The monitoring plan should include instructions on types of inspections to be conducted, guidance on recognizing changes from baseline conditions, and specific recordkeeping and notification requirements. Methods for determining large changes from baseline conditions need to be specified. The frequency of different types of inspections should be included in the plan along with the party responsible for the inspections.

Buffer zones should be inspected monthly in areas where human visitation poses a potential threat to the karst feature in order to help deter and detect illegal dumping or other activities detrimental to the feature, water quality, or the potential habitat. When threats are identified, corrective actions to return the system to its baseline condition must be implemented immediately.

Detailed surveys of the hydrologic conditions, surface vegetation assemblage, and dumping or vandalism should be conducted every three years to evaluate whether changes have occurred in the baseline indicators established in the initial survey. These surveys should be conducted at approximately the same time of the year to facilitate comparison between them. A copy of these surveys should be maintained and made available upon request to the TCEQ.

Large changes from the baseline conditions for the elements listed above must trigger further investigation and implementation of adaptive management measures to restore the natural baseline conditions within the buffer zone. TCEQ and USFWS should be notified when large changes in any of the baseline conditions trigger the need to implement adaptive management measures to restore the natural baseline conditions within the buffer zone.

3.9.2. Spill Management

The maintenance plan should include a section that provides instructions on how to manage spills during and after construction. The objective of this section is to describe measures to prevent or reduce the discharge of pollutants within the buffer zone by: 1) reducing the chance for spills, 2) stopping the source of spills, 3) containing and cleaning up spills, 4) disposing of spill materials properly, and 5) recognizing, reporting, and responding to problems.

The plan should provide for cleaning up as much of the spilled material as possible, and disposing of the spilled material and associate clean-up materials properly offsite. The plan should specify that the spill should never be hosed down and dry material spills should not be buried in the buffer zone. The plan should include information on how to recognize when a spill is minor, semi-significant, or significant/hazardous and who must be notified. It is the responsibility of the applicant or the party responsible for the maintenance plan during and after construction to have all emergency phone numbers readily available.

To the extent that the work can be accomplished safely, the plan should provide for spills of oil, petroleum products, and other substances listed under title 40 Code of Federal Regulations parts 110,117, and 302, and sanitary and septic wastes to be contained and cleaned up immediately. For significant or hazardous spills that are in reportable quantities, notify the TCEQ by telephone as soon as possible and within 24 hours at 512-339-2929 (Austin) or 210-490-3096 (San Antonio) between 8 AM and 5 PM. After hours, contact the Environmental Release Hotline at 1-800-832-8224. More information on spill rules and appropriate responses is available on the TCEQ website at: <www.tceq.state.tx.us/compliance/er/emergency_response.html>. Compliance with this document does not provide USFWS coverage for the “take” of species that may result from a spill. The USFWS should be immediately consulted as to appropriate actions to be taken to protect the species.

3.9.3. Adaptive Management

Adaptive management refers to the process of revising measures and management practices when monitoring indicates that the current management plan has not eliminated changes to the buffer zone that might impact either water quality or the associated karst habitat. The maintenance plan must contain an adaptive management component which would be used if monitoring shows that methods and management practices are ineffective for the protection of water quality, the karst feature(s), or the associated potential karst dwelling species habitat. The plan should address

guidelines for monitoring and provide indicators for when additional adaptive management activities become necessary, such as:

1) Gating of additional karst features found to contain karst dwelling species habitats, and
2) Controlling access by additional fencing of areas around karst features found to contain karst dwelling species habitats.

The TCEQ and USFWS should be notified immediately when large changes in any of the indicators trigger the need to implement adaptive management measures to restore the natural baseline conditions within the buffer zone.

4. Glossary

This glossary was modified from one developed by Veni and others, and is broad in scope to assist non-specialists using this document, but is not meant to cover all possible terms.

Adaptive management: Adaptive management refers to the process of revising management practices when monitoring indicates that the current plan has not eliminated changes to the buffer that might impact either water quality or species survival.

Aquifer: Rocks or sediments, such as cavernous limestone and unconsolidated sand, which store, conduct, and yield water in significant quantities for human use.

Bedding plane: A plane that divides two distinct bedrock layers.

Cave: A naturally occurring, humanly enterable cavity in the earth, at least 5 m in length and/or depth, in which no dimension of the entrance exceeds the length or depth of the cavity (definition of the Texas Speleological Survey).

Cretaceous: A period of the geologic time scale that began 135 million years ago and ended 65 million years ago.

Depth: In relation to the dimensions of a cave or karst feature, it refers to the vertical distance from the elevation of the entrance of the cave or feature to the elevation of its lowest point. See vertical extent for comparison.

Dip: The angle that joints, faults, or beds of rock make with the horizontal; colloquially described as the "slope" of the fractures or beds. "Updip" and "downdip" refer to direction or movement relative to that slope.

Drainage basin: A watershed; the area from which a stream, spring, or conduit derives its water.

Endemic: Biologically, refers to an organism that only occurs within a particular locale.

Footprint: The outline of the cave in plan view; generally refers to defining the horizontal limits of the cave as they relate to the land surface.

Fracture: A break in bedrock that is not distinguished as to the type of break (usually a fault or joint).

Honeycomb: An interconnected series of small voids in rock, commonly formed in karst by near-surface (epikarstic) solution or by phreatic groundwater flow.

Joint: Fracture in bedrock exhibiting little or no relative movement of the two sides.

Karst: A terrain characterized by landforms and subsurface features, such as sinkholes and caves, which are produced by solution of bedrock. Karst areas commonly have few surface streams; most water moves through cavities underground.

Karst feature: Generally, a geologic feature formed directly or indirectly by solution, including caves; often used to describe features that are not large enough to be considered caves, but have some probable relation to subsurface drainage or groundwater movement. These features typi-

cally include but are not limited to sinkholes, enlarged fractures, noncavernous springs and seeps, soil pipes, and epikarstic solution cavities.

Low density development: Low density development typically consists of single family homes on individual lots of approximately two acres or larger, and only those roads and utilities necessary to serve those homes.

Passage: An elongated, roofed portion of a cave or karst feature; usually a conduit for groundwater flow.

Recharge: Natural or artificially induced flow of surface water to an aquifer.

Seep: A spring that discharges a relatively minute amount of groundwater to the surface at a relatively slow rate; typically a "trickle."

Sensitive feature: Defined in the Edwards Aquifer Rules as a permeable geologic or manmade feature located on the recharge zone or transition zone where a potential for hydraulic interconnectedness between the surface and the Edwards Aquifer exists and rapid infiltration to the subsurface may occur.

Sinkhole: A natural indentation in the earth's surface related to solutional processes, including features formed by concave solution of the bedrock, and/or by collapse or subsidence of bedrock or soil into underlying solutionally formed cavities.

Solution: The process of dissolving; dissolution.

Spring: Discrete point or opening from which groundwater flows to the surface; strictly speaking, a return to the surface of water that had gone underground.

Stratigraphic: Pertaining to the characteristics of a unit of rock or sediment.

Strike: The direction of a horizontal line on a fracture surface or on a bed of rock; perpendicular to dip.

5. References

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APPENDIX E

Additional Guidance for RHCP Implementation

ADDITIONAL GUIDANCE FOR RHCP IMPLEMENTATION

The additional guidance included in this Appendix may or may not be practicable for the County to implement as circumstances evolve over the term of the Permit. Neither the implementation of this guidance nor the attainment of any of the conditions described herein are necessary to meet the issuance criteria for an ESA Section 10(a)1(B) incidental take permit or to comply with the terms of the Permit. This guidance is provided exclusively for Hays County to help set discretionary policy regarding certain aspects of RHCP implementation, to the extent allowed by circumstance and availability of resources dedicated to the RHCP as described in the RHCP funding plan.

1.0 ADDITIONAL GUIDANCE FOR PRESERVE ACQUISITIONS

As described in Section 6.3.1 of the RHCP, individual RHCP preserve blocks will typically be at least 500 acres. However, if suitable alternatives are available and practicable, Hays County will aspire to (but is not required to) create a preserve system that achieves the following additional characteristics:

- Individual preserve blocks containing at least 2,000 acres of golden-cheeked warbler habitat and at least 100 acres of land suitable for management as black-capped vireo habitat.
- The majority of preserve blocks located in the southern half of Hays County (generally in the Blanco River and San Marcos River watersheds west of Interstate Highway 35). These watersheds contain the largest remaining patches of potential high quality warbler habitat in the county.
- Preserve blocks that are primarily dedicated to the protection of covered species and that are secondarily chosen based on the benefits to the evaluation species and additional species included in the RHCP (see map of karst habitats in Appendix C).
- Supports a combined system of preserves, parks, and other protected lands that ultimately contains at least 30,000 acres of permanently protected open space in Hays County and supports a variety of uses, including (but not limited to) endangered species conservation and management, outdoor recreation, and water quality protection.

To help evaluate the potential biological value of parcel being considered for inclusion in the RHCP preserve system, Hays County may consider how the property meets the following criteria:

1. Property contains substantial acres of high or moderate quality golden-cheeked warbler habitat (i.e., at least several hundred acres of dense, mature, juniper-oak woodland).
2. Property contains at least 500 acres, or is adjacent to other protected lands such that the total protected area is at least 500 acres (i.e., does the property meet the typical minimum preserve size for the warbler).
3. Property contains substantial areas (i.e., at least 50 acres) that would be suitable for management as black-capped vireo habitat (i.e., deciduous shrubland, particularly areas over Fredricksburg limestones).
4. Property is known to be occupied by the golden-cheeked warbler.
5. Property is known to be occupied by the black-capped vireo.
6. Property could contribute to the assembly of a contiguous preserve block that would contain more than 1,000 acres (i.e., would the acquisition facilitate the creation of larger preserve blocks).
7. Majority of adjacent land is undeveloped, used for agricultural purposes, or includes other types of low intensity uses (i.e., very low density residential use).
8. Property is located within the Blanco River or San Marcos River watersheds west of Interstate Highway 35 (most of the remaining large blocks of warbler habitat occur in these watersheds);
9. Property is located in an area with karst geology (i.e., the Buda Limestone formation, the main outcrop of the Edwards Aquifer [including the Georgetown, Person, and Kainer formations], outliers of the Kainer formation that are geographically isolated from other outcrops of Edwards Limestone, the lower member of the Glen Rose formation, and the Cow Creek Limestone formation).
10. Property includes caves, other karst features, and/or springs that are occupied by one or more of the 56 evaluation or additional species addressed in the Hays County RHCP.

2.0 ADDITIONAL GUIDANCE FOR PRESERVE MANAGEMENT

Land management plans may also include (but are not required to include) strategies and practices to enhance the overall conservation value of the RHCP preserve system by:

1. For the golden-cheeked warbler, improving the quality of potential habitat may include:
    a. Increasing the average woodland canopy cover in warbler habitat to a minimum of 70 percent closure;

b. Increasing the proportion of deciduous oak trees (specifically Spanish oak) in the overstory canopy, such that the composition of deciduous trees in the canopy is between 25 and 50 percent;

c. Increasing the size of individual patches of warbler habitat to a minimum of 1,000 acres to reduce internal habitat fragmentation; and

d. Creating new areas of potential warbler habitat within the interior of the preserve blocks so that at least 90 percent of the potential habitat is at least 300 feet from the preserve boundary.

2. For the black-capped vireo, improving the quality of potential habitat may include:

e. Expanding contiguous areas managed for the vireo to include a minimum patch size of 100 acres; and

f. Creating new areas of potential vireo habitat within the interior of the preserve blocks so that at least 90 percent of the potential habitat is at least 300 feet from the preserve boundary;

3. For the evaluation and additional species, management practices benefiting karst and aquatic species may include:

g. Identifying the location of all caves, springs, and other karst features within the preserve system;

h. Conducting biological surveys of caves and other karst features to increase knowledge of the distribution and relative abundance of species in these habitats (particularly the evaluation and additional species included in the Plan);

i. Regularly monitoring evaluation species and their habitats in the preserve system;

j. Delineating karst management areas around features containing rare fauna (particularly the evaluation and additional species included in the Plan) and implementing specific management practices within karst management areas to help maintain stable karst environments. Management activities may include fencing and/or cave gating to control access to features and controlling red imported fire ant populations;

k. Delineating water quality buffer zones around streams and other water features and implementing specific management practices within these water quality buffer zones to protect surface and subsurface water quality. Management activities within buffer zones may include maintaining native vegetation, limiting construction, and restricting pesticide use;

l. Applying the Texas Commission on Environmental Quality Optional Enhanced Water Quality Measures and Optional Enhanced Measures for Karst Habitats to any development projects within the preserve system, such as playing fields or other park facilities.

APPENDIX F

Annual Budget and Revenue Estimates for RHCP Implementation.

Joe Lessard, Texas Perspectives, Capital Market Research, and Loomis Partners, Inc.

Appendix F. Estimated RHCP Annual Budget.

Plan Year:	0	1	2	3	4	5	6	7	8	9	10
Calendar Year:	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
RHCP PARTICIPATION											
Annual GCW Mitigation Credits Needed/Sold		300	300	300	300	300	300	300	300	300	300
Cumulative GCW Credits Needed/Sold		300	600	900	1,200	1,500	1,800	2,100	2,400	2,700	3,000
Annual BCV Mitigation Credits Needed/Sold		43	43	43	43	43	43	43	43	43	43
Cumulative BCV Credits Needed/Sold		43	86	129	172	215	258	301	344	387	430

Assumptions: Total estimated mitigation need (i.e., 9,000 warbler credits and 1,300 vireo credits) is distributed evenly over term of the Permit.

RHCP PRESERVE SYSTEM ACQUISITIONS											
Preserve Acquisitions											
Preserve Land Acquisitions (acres)	664	290	290	290	290	290	360	360	360	360	360
Cumulative Preserve System Size (acres)	664	954	1,244	1,534	1,824	2,114	2,474	2,834	3,194	3,554	3,914

Assumptions: Includes an initial purchase of 664 acres prior to Permit issuance. Rolling preserve acquisistions made annaully in years 1 - 30 to assemble target preserve size of 12,000 acres.

RHCP ESTIMATED COSTS											
Land Acquisition											
Annual Land Acquisition Costs	$ 5,001,912	$ 2,250,110	$ 2,317,680	$ 2,387,280	$ 2,458,910	$ 2,532,570	$ 3,238,200	$ 3,335,400	$ 3,435,480	$ 3,538,440	$ 3,644,640

Assumptions: 25% of land acquired fee simple and 75% of land acquired by conservation easement. Per acre land costs for a conservation easement are 50% of the fee simple cost. Blended per acre land cost (in 2009 dollars) is $7,533. Per acre costs inflate annually by 3%.

Appendix F. Estimated RHCP Annual Budget

Plan Year:	11	12	13	14	15	16	17	18	19	20
Calendar Year:	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
RHCP PARTICIPATION										
Annual GCW Mitigation Credits Needed/Sold	300	300	300	300	300	300	300	300	300	300
Cumulative GCW Credits Needed/Sold	3,300	3,600	3,900	4,200	4,500	4,800	5,100	5,400	5,700	6,000
Annual BCV Mitigation Credits Needed/Sold	43	43	43	43	43	43	43	43	43	43
Cumulative BCV Credits Needed/Sold	473	516	559	602	645	688	731	774	817	860

Assumptions: Total estimated mitigation need (i.e., 9,000 warbler credits and 1,300 vireo credits) is distributed evenly over term of the Permit.

RHCP PRESERVE SYSTEM ACQUISITIONS										
Preserve Acquisitions										
Preserve Land Acquisitions (acres)	404	404	404	404	404	404	404	404	404	404
Cumulative Preserve System Size (acres)	4,318	4,722	5,126	5,530	5,934	6,338	6,742	7,146	7,550	7,954

Assumptions: Includes an initial purchase of 664 acres prior to Permit issuance. Rolling preserve acquisistions made annaully in years 1 - 30 to assemble target preserve size of 12,000 acres.

RHCP ESTIMATED COSTS										
Land Acquisition										
Annual Land Acquisition Costs	$ 4,212,912	$ 4,339,364	$ 4,469,452	$ 4,603,580	$ 4,741,748	$ 4,883,956	$ 5,030,608	$ 5,181,704	$ 5,337,244	$ 5,497,228

Assumptions: 25% of land acquired fee simple and 75% of land acquired by conservation easement. Per acre land costs for a conservation easement are 50% of the fee simple cost. Blended per acre land cost (in 2009 dollars) is $7,533. Per acre costs inflate annually by 3%.

Appendix F. Estimated RHCP Annual Budget

Plan Year:	21	22	23	24	25	26	27	28	29	30	Total
Calendar Year:	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	
RHCP PARTICIPATION											
Annual GCW Mitigation Credits Needed/Sold	300	300	300	300	300	300	300	300	300	300	9,000
Cumulative GCW Credits Needed/Sold	6,300	6,600	6,900	7,200	7,500	7,800	8,100	8,400	8,700	9,000	
Annual BCV Mitigation Credits Needed/Sold	43	43	43	43	43	43	43	43	43	53	1,300
Cumulative BCV Credits Needed/Sold	903	946	989	1,032	1,075	1,118	1,161	1,204	1,247	1,300	
RHCP PRESERVE SYSTEM ACQUISITIONS											
Preserve Acquisitions											
Preserve Land Acquisitions (acres)	404	404	404	404	404	404	404	404	404	410	12,000
Cumulative Preserve System Size (acres)	8,358	8,762	9,166	9,570	9,974	10,378	10,782	11,186	11,590	12,000	
RHCP ESTIMATED COSTS											
Land Acquisition											
Annual Land Acquisition Costs	$ 5,662,060	$ 5,831,740	$ 6,006,672	$ 6,186,856	$ 6,372,292	$ 6,563,384	$ 6,760,132	$ 6,962,940	$ 7,171,808	$ 7,496,850	$ 147,453,152

Assumptions: Total estimated mitigation need (i.e., 9,000 warbler credits and 1,300 vireo credits) is distributed evenly over term of the Permit.

Assumptions: Includes an initial purchase of 664 acres prior to Permit issuance. Rolling preserve acquisistions made annaully in years 1 - 30 to assemble target preserve size of 12,000 acres.

Assumptions: 25% of land acquired fee simple and 75% of land acquired by conservation easement. Per acre land costs for a conservation easement are 50% of the fee simple cost. Blended per acre land cost (in 2009 dollars) is $7,533. Per acre costs inflate annually by 3%.

Plan Year:	0	1	2	3	4	5	6	7	8	9	10
Calendar Year:	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Staffing and Administration											
Staffing											
Program Manager/Biologist Salary (1 position)	$ 57,812	$ 59,546	$ 61,332	$ 63,172	$ 65,067	$ 67,019	$ 69,030	$ 71,101	$ 73,234	$ 75,431	
Number of Staff Biologists	-	-	1	1	1	1	1	2	2	2	
Staff Biologist Salaries	$ -	$ -	$ 53,332	$ 54,932	$ 56,580	$ 58,277	$ 60,025	$ 123,652	$ 127,362	$ 131,182	
Number of Preserve Rangers	-	-	-	-	-	-	-	-	-	-	
Preserve Ranger Salaries	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
Number of Maintenance Personnel	1	1	1	1	1	1	1	1	1	1	
Maintenance Personnel Salaries	$ 37,810	$ 38,944	$ 40,112	$ 41,315	$ 42,554	$ 43,831	$ 45,146	$ 46,500	$ 47,895	$ 49,332	
Total Staff Salaries	$ 95,622	$ 98,490	$ 154,776	$ 159,419	$ 164,201	$ 169,127	$ 174,201	$ 241,253	$ 248,491	$ 255,945	

Assumptions: Base salaries for RHCP staff are as follows (in 2008 dollars): Program Manager ($40,365/yr), Staff Biologist ($35,100/yr), Preserve Ranger ($45,100), and Maintenance Personnel ($26,400). Annual salary costs include an additional 35% for benefits and are inflated annually by 3%.. Staffing levels are scheduled based on preserve size.

Administrative Costs											
Office Space Rent, Utilities, and Maintenance	$ 6,365	$ 6,556	$ 6,753	$ 6,956	$ 7,165	$ 7,380	$ 7,601	$ 7,829	$ 8,064	$ 8,306	
Office Equipment	$ 1,061	$ 1,093	$ 2,252	$ 2,320	$ 2,390	$ 2,462	$ 2,536	$ 3,918	$ 4,035	$ 4,155	
Miscellaneous Office or Administrative Expenses	$ 2,546	$ 2,622	$ 4,050	$ 4,173	$ 4,299	$ 4,428	$ 4,560	$ 6,264	$ 6,452	$ 6,644	
Total Administrative Costs	$ 9,972	$ 10,271	$ 13,055	$ 13,449	$ 13,854	$ 14,270	$ 14,697	$ 18,011	$ 18,551	$ 19,105	

Assumptions: Rent/Utilities/Maintenance estimated at $6,000/year for every 8 staff positions (in 2008 dollars). Office equipment costs estimated at $1,000/per year for each manager or biologist position (in 2008 dollars). Miscellaneious expenses estimated at $1,200/year for each staff position. All costs are inflated annually by 3%.

Plan Year:	11	12	13	14	15	16	17	18	19	20
Calendar Year:	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Staffing and Administration										
Staffing										
Program Manager/Biologist Salary (1 position)	$ 77,694	$ 80,025	$ 82,426	$ 84,899	$ 87,446	$ 90,069	$ 92,771	$ 95,554	$ 98,421	$ 101,374
Number of Staff Biologists	2	3	3	3	3	4	4	4	5	5
Staff Biologist Salaries	$ 135,118	$ 208,758	$ 215,022	$ 221,472	$ 228,117	$ 313,280	$ 322,680	$ 332,360	$ 427,915	$ 440,750
Number of Preserve Rangers	-	-	-	-	1	1	1	1	1	1
Preserve Ranger Salaries	$ -	$ -	$ -	$ -	$ 97,702	$ 100,633	$ 103,652	$ 106,762	$ 109,965	$ 113,264
Number of Maintenance Personnel	2	2	2	2	2	3	3	3	3	3
Maintenance Personnel Salaries	$ 101,624	$ 104,672	$ 107,812	$ 111,046	$ 114,378	$ 176,715	$ 182,016	$ 187,476	$ 193,101	$ 198,894
Total Staff Salaries	$ 314,436	$ 393,455	$ 405,260	$ 417,417	$ 527,643	$ 680,697	$ 701,119	$ 722,152	$ 829,402	$ 854,282

Assumptions: Base salaries for RHCP staff are as follows (in 2008 dollars): Program Manager ($40,365/yr), Staff Biologist ($35,100/yr), Preserve Ranger ($45,100), and Maintenance Personnel ($26,400). Annual salary costs include an additional 35% for benefits and are inflated annually by 3%.. Staffing levels are scheduled based on preserve size.

Administrative Costs										
Office Space Rent, Utilities, and Maintenance	$ 8,555	$ 8,812	$ 9,076	$ 9,348	$ 9,628	$ 19,834	$ 20,430	$ 21,042	$ 21,674	$ 22,324
Office Equipment	$ 4,281	$ 5,880	$ 6,056	$ 6,236	$ 6,424	$ 8,270	$ 8,520	$ 8,775	$ 10,848	$ 11,172
Miscellaneous Office or Administrative Expenses	$ 8,555	$ 10,572	$ 10,890	$ 11,214	$ 13,475	$ 17,847	$ 18,378	$ 18,927	$ 21,660	$ 22,310
Total Administrative Costs	$ 21,391	$ 25,264	$ 26,022	$ 26,798	$ 29,527	$ 45,951	$ 47,328	$ 48,744	$ 54,182	$ 55,806

Assumptions: Rent/Utilities/Maintenance estimated at $6,000/year for every 8 staff positions (in 2008 dollars). Office equipment costs estimated at $1,000/per year for each manager or biologist position (in 2008 dollars). Miscellaneious expenses estimated at $1,200/year for each staff position. All costs are inflated annually by 3%.

Plan Year:	21	22	23	24	25	26	27	28	29	30	Total
Calendar Year:	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	
Staffing and Administration											
Staffing											
Program Manager/Biologist Salary (1 position)	$ 104,415	$ 107,547	$ 110,773	$ 114,096	$ 117,519	$ 121,045	$ 124,676	$ 128,416	$ 132,268	$ 136,236	$ 2,750,414
Number of Staff Biologists	5	5	6	6	6	6	7	7	7	7	
Staff Biologist Salaries	$ 453,975	$ 467,595	$ 577,950	$ 595,290	$ 613,146	$ 631,542	$ 758,905	$ 781,669	$ 805,119	$ 829,276	$ 10,025,281
Number of Preserve Rangers	1	1	2	2	2	2	2	2	2	3	
Preserve Ranger Salaries	$ 116,662	$ 120,162	$ 247,534	$ 254,960	$ 262,608	$ 270,486	$ 278,600	$ 286,958	$ 295,566	$ 456,648	$ 3,222,162
Number of Maintenance Personnel	4	4	4	4	4	5	5	5	5	5	
Maintenance Personnel Salaries	$ 273,148	$ 281,344	$ 289,784	$ 298,476	$ 307,432	$ 395,820	$ 407,695	$ 419,925	$ 432,525	$ 445,500	$ 5,462,822
Total Staff Salaries	$ 948,200	$ 976,648	$ 1,226,041	$ 1,262,822	$ 1,300,705	$ 1,418,893	$ 1,569,876	$ 1,616,968	$ 1,665,478	$ 1,867,660	$ 21,460,679

Assumptions: Base salaries for RHCP staff are as follows (in 2008 dollars): Program Manager ($40,365/yr), Staff Biologist ($35,100/yr), Preserve Ranger ($45,100), and Maintenance Personnel ($26,400). Annual salary costs include an additional 35% for benefits and are inflated annually by 3%.. Staffing levels are scheduled based on preserve size.

Administrative Costs											
Office Space Rent, Utilities, and Maintenance	$ 22,994	$ 23,684	$ 24,394	$ 25,126	$ 25,880	$ 26,656	$ 27,456	$ 28,280	$ 29,128	$ 30,002	$ 487,298
Office Equipment	$ 11,508	$ 11,856	$ 14,245	$ 14,672	$ 15,113	$ 15,568	$ 18,328	$ 18,880	$ 19,448	$ 20,032	$ 262,334
Miscellaneous Office or Administrative Expenses	$ 25,278	$ 26,037	$ 31,694	$ 32,643	$ 33,618	$ 37,296	$ 41,160	$ 42,390	$ 43,665	$ 47,968	$ 561,615
Total Administrative Costs	$ 59,780	$ 61,577	$ 70,333	$ 72,441	$ 74,611	$ 79,520	$ 86,944	$ 89,550	$ 92,241	$ 98,002	$ 1,311,247

Assumptions: Rent/Utilities/Maintenance estimated at $6,000/year for every 8 staff positions (in 2008 dollars). Office equipment costs estimated at $1,000/per year for each manager or biologist position (in 2008 dollars). Miscellaneious expenses estimated at $1,200/year for each staff position. All costs are inflated annually by 3%.

Plan Year:	0	1	2	3	4	5	6	7	8	9	10
Calendar Year:	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Preserve Management											
Signage Initial investment of $1,000 in year 1. Annual cost of $200 for years 2 through 15 and $500 for years 16 through 30. Assumptions stated in 2008 dollars and inflated annually by 3%.	$	$ 1,061	$ 218	$ 225	$ 232	$ 239	$ 246	$ 253	$ 261	$ 269	$ 277
Cowbird Traps One trap for each 1,000 acres of preserve and replaced every 5 years. Purchase price is $450/trap (in 2008 dollars) and costs inflate annually by 3%.	$	$ -	$ 492	$ -	$ -	$ 538	$ -	$ 571	$ 588	$ -	$ 624
Deer Population Control Estimated at $2,200/year for each 1,000 acres of preserve, includes equipment and labor. Costs inflated annually by 3%.	$	$ -	$ 2,404	$ 2,476	$ 2,550	$ 5,254	$ 5,412	$ 5,574	$ 8,613	$ 8,871	$ 9,138
Feral Hog Control - Equipment Only Hog trap purchased for $1,000 (2008 dollars) and replaced every 10 years. Costs inflate annually by 3%. Preserve staff to operate trap as needed.	$	$ 1,061	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Fire Ant Control Hot water injector purchased for $4,000 (2008 dollars) and replaced every 10 years. Costs inflate annually by 3%. First purchase scheduled for year 2 of the Permit. Preserve staff to operate injector as needed.	$	$ -	$ 4,371	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Vireo Habitat Restoration and Management Estimated at $23,000 for each 43 acres of BCV management area within preserve system (in 2008 dollars) and repeated every 10 years. Costs inflate annually by 3%.	$	$ 24,401	$ 25,133	$ 25,887	$ 26,664	$ 27,464	$ 28,288	$ 29,137	$ 30,011	$ 30,911	$ 63,676
Trash Removal Estimated at $800/year for each 2,500 acres of preserve (in 2008 dollars). Costs inflate annually by 3%.	$	$ 849	$ 874	$ 900	$ 927	$ 955	$ 984	$ 1,014	$ 1,044	$ 1,075	$ 1,107
Fencing Costs Estimated at $25,000/year for each 2,500 acres of preserve (in 2008 dollars). Costs inflate annually by 3%.	$	$ 26,523	$ 27,319	$ 28,139	$ 28,983	$ 29,852	$ 30,748	$ 31,670	$ 32,620	$ 33,599	$ 34,607
Vegetation and Infrastructure Management Estimated at $2,500/year (in 2008 dollars) for every 1,500 acres of preserve. Cost inflated annually at 3%.	$	$ 2,652	$ 2,732	$ 2,814	$ 2,898	$ 2,985	$ 3,075	$ 3,167	$ 6,524	$ 6,720	$ 6,922
Field Equipment and Miscellaneous Materials Estimated at $400 per year for each staff person (in 2008 dollars) and inflated annually at 3%.	$	$ 848	$ 874	$ 1,350	$ 1,392	$ 1,434	$ 1,476	$ 1,521	$ 2,088	$ 2,152	$ 2,216
Vehicles Assumes one vehicle for every two staff in each category, and vehicles replaced every 6 years. Vehicle cost estimated at $24,000 (in 2008 dollars) and inflated annually by 3%.	$	$ 50,924	$ -	$ -	$ -	$ -	$ -	$ 60,808	$ 31,316	$ -	$ -
Vehicle Operating Cost Per vehicle operating costs estimated based on 15,000 miles/year at the federal tax reimbursement rate of $0.585 per mile. Costs inflate annually by 3%.	$	$ 18,630	$ 19,200	$ 19,770	$ 20,370	$ 20,970	$ 21,600	$ 22,260	$ 34,380	$ 35,415	$ 36,495
Ranger Equipment and Vehicle Outfitting Estimated at $10,000 per ranger vehicle purchased (in 2008 dollars). Costs inflated annually by 3%.	$	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Preserve Management Costs	$	$ 126,949	$ 83,617	$ 81,561	$ 84,016	$ 89,691	$ 91,829	$ 155,975	$ 147,445	$ 119,012	$ 155,062

Plan Year:	11	12	13	14	15	16	17	18	19	20
Calendar Year:	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Preserve Management										
Signage Initial investment of $1,000 in year 1. Annual cost of $200 for years 2 through 15 and $500 for years 16 through 30. Assumptions stated in 2008 dollars and inflated annually by 3%.	$ 285	$ 294	$ 303	$ 312	$ 321	$ 825	$ 850	$ 876	$ 902	$ 929
Cowbird Traps One trap for each 1,000 acres of preserve and replaced every 5 years. Purchase price is $450/trap (in 2008 dollars) and costs inflate annually by 3%.	$ 643	$ 662	$ 1,364	$ -	$ 723	$ 1,490	$ 767	$ 2,370	$ -	$ 838
Deer Population Control Estimated at $2,200/year for each 1,000 acres of preserve, includes equipment and labor. Costs inflated annually by 3%.	$ 12,548	$ 12,924	$ 16,640	$ 17,140	$ 17,655	$ 21,822	$ 22,476	$ 27,006	$ 27,818	$ 28,651
Feral Hog Control - Equipment Only Hog trap purchased for $1,000 (2008 dollars) and replaced every 10 years. Costs inflate annually by 3%. Preserve staff to operate trap as needed.	$ 1,427	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Fire Ant Control Hot water injector purchased for $4,000 (2008 dollars) and replaced every 10 years. Costs inflate annually by 3%. First purchase scheduled for year 2 of the Permit. Preserve staff to operate injector as needed.	$ -	$ 5,874	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Vireo Habitat Restoration and Management Estimated at $23,000 for each 43 acres of BCV management area within preserve system (in 2008 dollars) and repeated every 10 years. Costs inflate annually by 3%.	$ 65,586	$ 67,554	$ 69,580	$ 71,668	$ 73,818	$ 76,032	$ 78,312	$ 80,662	$ 83,082	$ 128,361
Trash Removal Estimated at $800/year for each 2,500 acres of preserve (in 2008 dollars). Costs inflate annually by 3%.	$ 1,140	$ 1,174	$ 2,418	$ 2,490	$ 2,564	$ 2,640	$ 2,720	$ 2,802	$ 4,329	$ 4,458
Fencing Costs Estimated at $25,000/year for each 2,500 acres of preserve (in 2008 dollars). Costs inflate annually by 3%.	$ 35,645	$ 36,714	$ 75,630	$ 77,898	$ 80,234	$ 82,642	$ 85,122	$ 87,676	$ 135,459	$ 139,524
Vegetation and Infrastructure Management Estimated at $2,500/year (in 2008 dollars) for every 1,500 acres of preserve. Cost inflated annually at 3%.	$ 7,130	$ 11,016	$ 11,346	$ 11,685	$ 12,036	$ 16,528	$ 17,024	$ 17,536	$ 22,580	$ 23,255
Field Equipment and Miscellaneous Materials Estimated at $400 per year for each staff person (in 2008 dollars) and inflated annually at 3%.	$ 2,855	$ 3,528	$ 3,636	$ 3,744	$ 4,501	$ 5,958	$ 6,138	$ 6,318	$ 7,230	$ 7,450
Vehicles Assumes one vehicle for every two staff in each category, and vehicles replaced every 6 years. Vehicle cost estimated at $24,000 (in 2008 dollars) and inflated annually by 3%.	$ -	$ -	$ 72,608	$ 37,393	$ 38,515	$ 79,340	$ -	$ -	$ 86,698	$ 44,649
Vehicle Operating Cost Per vehicle operating costs estimated based on 15,000 miles/year at the federal tax reimbursement rate of $0.585 per mile. Costs inflate annually by 3%.	$ 37,575	$ 38,700	$ 39,870	$ 41,085	$ 56,400	$ 87,120	$ 89,730	$ 92,430	$ 95,220	$ 98,100
Ranger Equipment and Vehicle Outfitting Estimated at $10,000 per ranger vehicle purchased (in 2008 dollars). Costs inflated annually by 3%.	$ -	$ -	$ -	$ -	$ 16,047	$ -	$ -	$ -	$ -	$ -
Total Preserve Management Costs	$ 164,834	$ 178,440	$ 293,395	$ 263,415	$ 302,814	$ 374,397	$ 303,139	$ 317,676	$ 463,318	$ 476,215

Plan Year:	21	22	23	24	25	26	27	28	29	30	Total
Calendar Year:	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	
Preserve Management											
Signage Initial investment of $1,000 in year 1. Annual cost of $200 for years 2 through 15 and $500 for years 16 through 30. Assumptions stated in 2008 dollars and inflated annually by 3%.	$ 957	$ 986	$ 1,016	$ 1,046	$ 1,077	$ 1,109	$ 1,142	$ 1,176	$ 1,211	$ 1,247	$ 20,145
Cowbird Traps One trap for each 1,000 acres of preserve and replaced every 5 years. Purchase price is $450/trap (in 2008 dollars) and costs inflate annually by 3%.	$ 2,589	$ 889	$ 3,664	$ -	$ 971	$ 4,000	$ 1,030	$ 5,305	$ -	$ 2,252	$ 32,370
Deer Population Control Estimated at $2,200/year for each 1,000 acres of preserve, includes equipment and labor. Costs inflated annually by 3%.	$ 33,728	$ 34,736	$ 40,248	$ 41,454	$ 42,696	$ 48,860	$ 50,330	$ 57,024	$ 58,740	$ 66,000	$ 728,788
Feral Hog Control - Equipment Only Hog trap purchased for $1,000 (2008 dollars) and replaced every 10 years. Costs inflate annually by 3%. Preserve staff to operate trap as needed.	$ 1,918	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4,406
Fire Ant Control Hot water injector purchased for $4,000 (2008 dollars) and replaced every 10 years. Costs inflate annually by 3%. First purchase scheduled for year 2 of the Permit. Preserve staff to operate injector as needed.	$ -	$ 7,894	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 18,139
Vireo Habitat Restoration and Management Estimated at $23,000 for each 43 acres of BCV management area within preserve system (in 2008 dollars) and repeated every 10 years. Costs inflate annually by 3%.	$ 132,213	$ 136,179	$ 140,265	$ 144,474	$ 148,809	$ 153,273	$ 157,872	$ 162,609	$ 167,487	$ 172,512	$ 2,621,920
Trash Removal Estimated at $800/year for each 2,500 acres of preserve (in 2008 dollars). Costs inflate annually by 3%.	$ 4,593	$ 4,731	$ 4,872	$ 5,019	$ 5,169	$ 7,100	$ 7,312	$ 7,532	$ 7,756	$ 7,988	$ 98,536
Fencing Costs Estimated at $25,000/year for each 2,500 acres of preserve (in 2008 dollars). Costs inflate annually by 3%.	$ 143,709	$ 148,020	$ 152,460	$ 157,035	$ 161,745	$ 222,128	$ 228,792	$ 235,656	$ 242,724	$ 250,004	$ 3,082,877
Vegetation and Infrastructure Management Estimated at $2,500/year (in 2008 dollars) for every 1,500 acres of preserve. Cost inflated annually at 3%.	$ 23,955	$ 24,675	$ 30,498	$ 31,410	$ 32,352	$ 33,324	$ 40,047	$ 41,251	$ 42,490	$ 50,016	$ 540,643
Field Equipment and Miscellaneous Materials Estimated at $400 per year for each staff person (in 2008 dollars) and inflated annually at 3%.	$ 8,437	$ 8,690	$ 10,582	$ 10,894	$ 11,219	$ 12,446	$ 13,740	$ 14,145	$ 14,565	$ 16,000	$ 187,427
Vehicles Assumes one vehicle for every two staff in each category, and vehicles replaced every 6 years. Vehicle cost estimated at $24,000 (in 2008 dollars) and inflated annually by 3%.	$ 45,988	$ 94,736	$ 48,789	$ -	$ 103,522	$ 106,628	$ 54,913	$ 113,120	$ 58,257	$ 60,005	$ 1,188,209
Vehicle Operating Cost Per vehicle operating costs estimated based on 15,000 miles/year at the federal tax reimbursement rate of $0.585 per mile. Costs inflate annually by 3%.	$ 101,070	$ 104,130	$ 125,160	$ 128,940	$ 132,825	$ 156,360	$ 161,040	$ 165,840	$ 170,760	$ 197,910	$ 2,369,355
Ranger Equipment and Vehicle Outfitting Estimated at $10,000 per ranger vehicle purchased (in 2008 dollars). Costs inflated annually by 3%.	$ 19,161	$ -	$ -	$ -	$ -	$ -	$ 22,879	$ -	$ -	$ 25,000	$ 83,087
Total Preserve Management Costs	$ 518,318	$ 565,666	$ 557,554	$ 520,272	$ 640,385	$ 745,228	$ 739,097	$ 803,658	$ 763,990	$ 848,934	$ 10,975,902

Plan Year: / Calendar Year:	0 2009	1 2010	2 2011	3 2012	4 2013	5 2014	6 2015	7 2016	8 2017	9 2018	10 2019
Research, Education, and Outreach											
Public Information and Outreach Estimated at $2,500/year beginning year 2 and increase by $2,500 every 10 years of the plan (in 2008 dollars). Cost inflated annually by 3%.		$ -	$ 2,732	$ 2,814	$ 2,898	$ 2,985	$ 3,075	$ 3,167	$ 3,262	$ 3,360	$ 3,461
Research Program for Evaluation Species Commitment to provide $25,000/yr for first 10 years (in 2010 dollars). Costs inflate annually by 3%		$ 25,000	$ 25,750	$ 26,523	$ 27,319	$ 28,139	$ 28,983	$ 29,852	$ 30,748	$ 31,670	$ 32,620
Total Research, Education, and Outreach Costs		$ 25,000	$ 28,482	$ 29,337	$ 30,217	$ 31,124	$ 32,058	$ 33,019	$ 34,010	$ 35,030	$ 36,081
Contingency											
Contingency Fund Initial budget is $10,000/year and increases by $5,000 every 10 years of the plan (in 2008 dollars). Costs inflate annually by 3%.		$ 10,609	$ 10,927	$ 11,255	$ 11,593	$ 11,941	$ 12,299	$ 12,668	$ 13,048	$ 13,439	$ 13,842
Total Estimated RHCP Costs	$ 5,001,912	$ 2,518,262	$ 2,549,467	$ 2,677,264	$ 2,757,604	$ 2,843,381	$ 3,557,783	$ 3,725,960	$ 3,889,247	$ 3,972,963	$ 4,124,675
RHCP ESTIMATED REVENUES											
Application Fees Estimated as $30/mitigation credit sold (2008 dollars) and inflated annually by 3%.		$ 10,976	$ 11,319	$ 11,662	$ 12,005	$ 12,348	$ 12,691	$ 13,034	$ 13,377	$ 13,720	$ 14,063
Mitigation Fees Estimated as $7,500 per mitigation credit in year 1 and increased by $1,000 every 5 years. Mitigation fees are not inflated annually. Assumes County will use 5% of the available credits annually.		$ 2,443,875	$ 2,443,875	$ 2,443,875	$ 2,443,875	$ 2,443,875	$ 2,769,725	$ 2,769,725	$ 2,769,725	$ 2,769,725	$ 2,769,725
County General M&O Fund Contributions Estimated funds needed from Hays County General Maintenance and Operations Fund to balance RHCP budget. General fund contributions do not exceed 10% of the taxable value created from new development and appreciation on new development after Permit issuance (see Appendix F). The value of new development includes the value of new structures, the value of newly developed land, and 3% annual appreciation on the value of new structures and newly developed land.		$ 63,411	$ 94,273	$ 221,727	$ 301,724	$ 387,158	$ 775,367	$ 943,201	$ 1,106,145	$ 1,189,518	$ 1,340,887
County Conservation Investments Pre-permit investments from 2007 Parks and Open Space bond funds or other sources.	$ 5,001,912	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Estimated RHCP Revenue	$ 5,001,912	$ 2,518,262	$ 2,549,467	$ 2,677,264	$ 2,757,604	$ 2,843,381	$ 3,557,783	$ 3,725,960	$ 3,889,247	$ 3,972,963	$ 4,124,675
COST AND REVENUE BALANCE											
Net Annual Budget	-	-	-	-	-	-	-	-	-	-	-

Plan Year:	11	12	13	14	15	16	17	18	19	20
Calendar Year:	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Research, Education, and Outreach										
Public Information and Outreach Estimated at $2,500/year beginning year 2 and increase by $2,500 every 10 years of the plan (in 2008 dollars). Cost inflated annually by 3%.	$ 7,130	$ 7,344	$ 7,564	$ 7,790	$ 8,024	$ 8,264	$ 8,512	$ 8,768	$ 9,032	$ 9,302
Research Program for Evaluation Species Commitment to provide $25,000/yr for first 10 years (in 2010 dollars). Costs inflate annually by 3%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Research, Education, and Outreach Costs	$ 7,130	$ 7,344	$ 7,564	$ 7,790	$ 8,024	$ 8,264	$ 8,512	$ 8,768	$ 9,032	$ 9,302
Contingency										
Contingency Fund Initial budget is $10,000/year and increases by $5,000 every 10 years of the plan (in 2008 dollars). Costs inflate annually by 3%.	$ 21,386	$ 22,028	$ 22,689	$ 23,370	$ 24,071	$ 24,792	$ 25,536	$ 26,303	$ 27,092	$ 27,905
Total Estimated RHCP Costs	$ 4,742,089	$ 4,965,895	$ 5,224,382	$ 5,342,370	$ 5,633,827	$ 6,018,057	$ 6,116,242	$ 6,305,347	$ 6,720,270	$ 6,920,738
RHCP ESTIMATED REVENUES										
Application Fees Estimated as $30/mitigation credit sold (2008 dollars) and inflated annually by 3%.	$ 14,406	$ 14,749	$ 15,092	$ 15,435	$ 15,778	$ 16,121	$ 16,464	$ 16,807	$ 17,150	$ 17,836
Mitigation Fees Estimated as $7,500 per mitigation credit in year 1 and increased by $1,000 every 5 years. Mitigation fees are not inflated annually. Assumes County will use 5% of the available credits annually.	$ 3,095,575	$ 3,095,575	$ 3,095,575	$ 3,095,575	$ 3,095,575	$ 3,421,425	$ 3,421,425	$ 3,421,425	$ 3,421,425	$ 3,421,425
County General M&O Fund Contributions Estimated funds needed from Hays County General Maintenance and Operations Fund to balance RHCP budget. General fund contributions do not exceed 10% of the taxable value created from new development and appreciation on new development after Permit issuance (see Appendix F). The value of new development includes the value of new structures, the value of newly developed land, and 3% annual appreciation on the value of new structures and newly developed land.	$ 1,632,108	$ 1,855,571	$ 2,113,715	$ 2,231,360	$ 2,522,474	$ 2,580,511	$ 2,678,353	$ 2,867,115	$ 3,281,695	$ 3,481,477
County Conservation Investments Pre-permit investments from 2007 Parks and Open Space bond funds or other sources.	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Estimated RHCP Revenue	$ 4,742,089	$ 4,965,895	$ 5,224,382	$ 5,342,370	$ 5,633,827	$ 6,018,057	$ 6,116,242	$ 6,305,347	$ 6,720,270	$ 6,920,738
COST AND REVENUE BALANCE										
Net Annual Budget	-	-	-	-	-	-	-	-	-	-

Plan Year: / Calendar Year:	21 2030	22 2031	23 2032	24 2033	25 2034	26 2035	27 2036	28 2037	29 2038	30 2039	Total
Research, Education, and Outreach											
Public Information and Outreach Estimated at $2,500/year beginning year 2 and increase by $2,500 every 10 years of the plan (in 2008 dollars). Cost inflated annually by 3%.	$ 14,373	$ 14,805	$ 15,249	$ 15,705	$ 16,176	$ 16,662	$ 17,163	$ 17,679	$ 18,210	$ 18,756	$ 274,262
Research Program for Evaluation Species Commitment to provide $25,000/yr for first 10 years (in 2010 dollars). Costs inflate annually by 3%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 286,604
Total Research, Education, and Outreach Costs	$ 14,373	$ 14,805	$ 15,249	$ 15,705	$ 16,176	$ 16,662	$ 17,163	$ 17,679	$ 18,210	$ 18,756	$ 560,866
Contingency											
Contingency Fund Initial budget is $10,000/year and increases by $5,000 every 10 years of the plan (in 2008 dollars). Costs inflate annually by 3%.	$ 38,322	$ 39,472	$ 40,656	$ 41,876	$ 43,132	$ 44,426	$ 45,758	$ 47,130	$ 48,544	$ 50,000	$ 806,109
Total Estimated RHCP Costs	$ 7,241,053	$ 7,489,908	$ 7,916,505	$ 8,099,972	$ 8,447,301	$ 8,868,113	$ 9,218,970	$ 9,537,925	$ 9,760,271	$ 10,380,202	$ 182,567,955
RHCP ESTIMATED REVENUES											
Application Fees Estimated as $30/mitigation credit sold (2008 dollars) and inflated annually by 3%.	$ 18,522	$ 19,208	$ 19,894	$ 20,580	$ 21,266	$ 21,952	$ 22,638	$ 23,324	$ 24,010	$ 25,416	$ 501,843
Mitigation Fees Estimated as $7,500 per mitigation credit in year 1 and increased by $1,000 every 5 years. Mitigation fees are not inflated annually. Assumes County will use 5% of the available credits annually.	$ 3,747,275	$ 3,747,275	$ 3,747,275	$ 3,747,275	$ 3,747,275	$ 4,073,125	$ 4,073,125	$ 4,073,125	$ 4,073,125	$ 4,191,875	$ 97,873,750
County General M&O Fund Contributions Estimated funds needed from Hays County General Maintenance and Operations Fund to balance RHCP budget. General fund contributions do not exceed 10% of the taxable value created from new development and appreciation on new development after Permit issuance (see Appendix F). The value of new development includes the value of new structures, the value of newly developed land, and 3% annual appreciation on the value of new structures and newly developed land.	$ 3,475,256	$ 3,723,425	$ 4,149,336	$ 4,332,117	$ 4,678,760	$ 4,773,036	$ 5,123,207	$ 5,441,476	$ 5,663,136	$ 6,162,911	$ 79,190,450
County Conservation Investments Pre-permit investments from 2007 Parks and Open Space bond funds or other sources.	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,001,912
Total Estimated RHCP Revenue	$ 7,241,053	$ 7,489,908	$ 7,916,505	$ 8,099,972	$ 8,447,301	$ 8,868,113	$ 9,218,970	$ 9,537,925	$ 9,760,271	$ 10,380,202	$ 182,567,955
COST AND REVENUE BALANCE											
Net Annual Budget	-	-	-	-	-	-	-	-	-	-	-

APPENDIX G

Taxable Values and O&M Budget Revenues Comparison.

Joe Lessard (RHCP Economic Consultant) and Loomis Partners, Inc.

Appendix G - Taxable Values and O&M Budget Revenues Comparison

Calendar Year	RHCP Plan Year	Appreciated Current Taxable Property Value[1]	New Development Taxable Value[2]	Total Taxable Property Value	Total M&O Budget Revenue[3]	M&O Budget Revenue from New Development Taxable Value[3]	M&O Budget Contributions to RHCP3	RHCP Budget Contribution as a Percentage of Total M&O Budget	RHCP Budget Contribution as a Percentage of New Development Taxable Value
2008		$ 10,139,833,372	$ -	$ 10,139,833,372	$ 31,575,441	$ -	$ -		
2009		$ 10,444,028,373	$ -	$ 10,444,028,373	$ 32,522,704	$ -	$ -		
2010	1	$ 10,757,349,224	$ 438,081,114	$ 11,195,430,338	$ 34,862,570	$ 1,340,966	$ 63,411	0.18%	4.73%
2011	2	$ 11,080,069,701	$ 934,334,806	$ 12,014,404,507	$ 37,412,856	$ 2,859,999	$ 94,273	0.25%	3.30%
2012	3	$ 11,412,471,792	$ 1,495,938,701	$ 12,908,410,493	$ 40,196,790	$ 4,579,068	$ 221,727	0.55%	4.84%
2013	4	$ 11,754,845,946	$ 1,924,655,476	$ 13,679,501,422	$ 42,597,967	$ 5,891,370	$ 301,724	0.71%	5.12%
2014	5	$ 12,107,491,324	$ 2,393,691,111	$ 14,501,182,435	$ 45,156,682	$ 7,327,088	$ 387,158	0.86%	5.28%
2015	6	$ 12,470,716,064	$ 2,906,301,389	$ 15,377,017,453	$ 47,884,032	$ 8,896,189	$ 775,367	1.62%	8.72%
2016	7	$ 12,844,837,546	$ 3,465,997,123	$ 16,310,834,669	$ 50,791,939	$ 10,609,417	$ 943,201	1.86%	8.89%
2017	8	$ 13,230,182,672	$ 4,076,564,196	$ 17,306,746,868	$ 53,893,210	$ 12,478,363	$ 1,106,145	2.05%	8.86%
2018	9	$ 13,627,088,152	$ 4,742,085,184	$ 18,369,173,336	$ 57,201,606	$ 14,515,523	$ 1,189,518	2.08%	8.19%
2019	10	$ 14,035,900,797	$ 5,466,962,713	$ 19,502,863,510	$ 60,731,917	$ 16,734,373	$ 1,340,887	2.21%	8.01%
2020	11	$ 14,456,977,821	$ 6,255,944,662	$ 20,712,922,483	$ 64,500,041	$ 19,149,447	$ 1,632,108	2.53%	8.52%
2021	12	$ 14,890,687,156	$ 7,114,151,388	$ 22,004,838,544	$ 68,523,067	$ 21,776,417	$ 1,855,571	2.71%	8.52%
2022	13	$ 15,337,407,770	$ 8,047,105,111	$ 23,384,512,881	$ 72,819,373	$ 24,632,189	$ 2,113,715	2.90%	8.58%
2023	14	$ 15,797,530,003	$ 8,821,429,979	$ 24,618,959,982	$ 76,663,441	$ 27,002,397	$ 2,231,360	2.91%	8.26%
2024	15	$ 16,271,455,903	$ 9,650,748,116	$ 25,922,204,019	$ 80,721,743	$ 29,540,940	$ 2,522,474	3.12%	8.54%
2025	16	$ 16,759,599,581	$ 10,538,656,341	$ 27,298,255,922	$ 85,006,769	$ 32,258,827	$ 2,580,511	3.04%	8.00%
2026	17	$ 17,262,387,568	$ 11,488,981,706	$ 28,751,369,274	$ 89,531,764	$ 35,167,773	$ 2,678,353	2.99%	7.62%
2027	18	$ 17,780,259,195	$ 12,505,796,248	$ 30,286,055,443	$ 94,310,777	$ 38,280,242	$ 2,867,115	3.04%	7.49%
2028	19	$ 18,313,666,971	$ 13,593,432,706	$ 31,907,099,677	$ 99,358,708	$ 41,609,498	$ 3,281,695	3.30%	7.89%
2029	20	$ 18,863,076,980	$ 14,756,501,255	$ 33,619,578,235	$ 104,691,367	$ 45,169,650	$ 3,481,477	3.33%	7.71%
2030	21	$ 19,428,969,289	$ 15,999,907,327	$ 35,428,876,616	$ 110,325,522	$ 48,975,716	$ 3,475,256	3.15%	7.10%
2031	22	$ 20,011,838,368	$ 17,328,870,582	$ 37,340,708,950	$ 116,278,968	$ 53,043,673	$ 3,723,425	3.20%	7.02%
2032	23	$ 20,612,193,519	$ 18,748,945,122	$ 39,361,138,641	$ 122,570,586	$ 57,390,521	$ 4,149,336	3.39%	7.23%
2033	24	$ 21,230,559,325	$ 20,222,226,288	$ 41,452,785,613	$ 129,083,974	$ 61,900,235	$ 4,332,117	3.36%	7.00%
2034	25	$ 21,867,476,104	$ 21,789,828,311	$ 43,657,304,415	$ 135,948,846	$ 66,698,664	$ 4,678,760	3.44%	7.01%
2035	26	$ 22,523,500,388	$ 23,457,339,076	$ 45,980,839,464	$ 143,184,334	$ 71,802,915	$ 4,773,036	3.33%	6.65%
2036	27	$ 23,199,205,399	$ 25,230,665,892	$ 48,429,871,291	$ 150,810,619	$ 77,231,068	$ 5,123,207	3.40%	6.63%
2037	28	$ 23,895,181,561	$ 27,116,053,429	$ 51,011,234,990	$ 158,848,986	$ 83,002,240	$ 5,441,476	3.43%	6.56%
2038	29	$ 24,612,037,008	$ 29,120,102,649	$ 53,732,139,657	$ 167,321,883	$ 89,136,634	$ 5,663,136	3.38%	6.35%
2039	30	$ 25,350,398,118	$ 30,101,240,809	$ 55,451,638,927	$ 172,676,404	$ 92,139,898	$ 6,162,911	3.57%	6.69%
						Total	$ 79,190,450		

Notes:

1) 2008 Hays County certified taxable value base appreciated at 3% annually.

2) Values are an estimate of total new value created from new residential and commercial development during tem of Permit within Hays County (including new structures and development-related land value increases). Values also include 3% normal annual appreciation on prior year value.

3) Values are estimated M&O budget revenues and are calculated using the Fiscal Year 2009 M&O tax rate for Hays County of 30.61 cents per $100 of taxable value.

FINAL

ENVIRONMENTAL IMPACT STATEMENT

FOR THE

HAYS COUNTY

REGIONAL HABITAT CONSERVATION PLAN

PREPARED BY:

U.S. Fish and Wildlife Service
Austin Ecological Services Field Office
10711 Burnet Road, Suite 200
Austin, Texas 78758-4460

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FINAL

HAYS COUNTY REGIONAL HABITAT CONSERVATION PLAN ENVIRONMENTAL IMPACT STATEMENT

MAY 1, 2010

Type of Action: Administrative

Lead Agency: U.S. Department of Interior,
Fish and Wildlife Service

Responsible Official: Adam Zerrenner
Field Supervisor
U.S. Fish and Wildlife Service
10711 Burnet Road, Suite 200
Austin, Texas 78758

For Information: Luela Roberts
Chief, Consultations and Habitat Conservation Plans
U.S. Fish and Wildlife Service
10711 Burnet Road, Suite 200
Austin, Texas 78758

Abstract:

Hays County, Texas, is applying for an incidental take permit (Permit) under Section 10(a)(1)(B) of the Endangered Species Act of 1973 (Act), as amended, to authorize incidental take of two endangered bird species: the golden-cheeked warbler (*Dendroica chrysoparia*) and the black-capped vireo (*Vireo atricapilla*), collectively referred to as the "covered species." In support of the Permit application, the County has prepared a regional habitat conservation plan (RHCP) covering a 30-year period from 2010 to 2040. The permit area for the RHCP is Hays County, Texas. While the entire county would be covered by the proposed Permit, potential habitat for the covered species only occurs on the Edwards Plateau ecoregion located across the western approximately two-thirds of the county (generally west of Interstate Highway 35). The area of potential effect for this Environmental Impact Statement varies with the resource being considered, but typically includes the full extent of Hays County.

The requested Permit would authorize incidental take for the covered species associated with up to 9,000 acres of impact to potential golden-cheeked warbler habitat and up to 1,300 acres of impact to potential black-capped vireo habitat within Hays County over the 30-year duration of the plan. Mitigation for the impacts of authorized take would be provided by the conservation program of the RHCP. The RHCP conservation program could also benefit 56

other potentially rare or sensitive species in Hays County (i.e., the RHCP "evaluation" and "additional" species).

The RHCP conservation program uses a phased conservation banking approach with a goal of assembling between 10,000 and 15,000 acres of preserve land over the 30-year duration of the RHCP. The preserve system will be assembled on a phased basis as needed to create mitigation credits for the conservation bank and as potential preserve parcels become available from willing partners; there is no pre-determined preserve size, location, or configuration. Habitat for the covered species protected within the preserve system will create mitigation credits for the conservation bank. Banking mitigation credits would allow an equivalent amount of take authorization to be accessed. Therefore, mitigation would always be provided before an equivalent amount of take authorization could be used by the County or issued to RHCP participants. Defined processes for habitat determinations and mitigation assessments, as well as defined mitigation ratios, provide the basis for ensuring that mitigation is commensurate with impacts. Hays County will manage and monitor the preserve system for the benefit of the covered species in perpetuity, in accordance with the RHCP and terms of the Permit.

As part of the RHCP conservation program, the County will implement various other measures to avoid or minimize impacts to the covered species, including disseminating maps of potential habitat for the covered species, requesting subdivision or development applicants to provide information about endangered species within their project areas, requiring RHCP participants to implement measures that help prevent the spread of oak wilt and to observe seasonal restrictions on clearing and construction in or near habitat for the covered species, and implementing a public education and outreach program. The County will also dedicate funds for research or studies of one or more of the RHCP evaluation species.

The RHCP includes a funding plan that estimates the cost of implementing the conservation program and identifies three types of resources to provide revenue for RHCP implementation: 1) participation fees charged to RHCP participants; 2) annual contributions from County tax revenues; and 3) conservation investments from the County or other sources. Other funding sources, such as grants or debt financing may also be available, but are not modeled in the funding plan.

The natural resource and socioeconomic impacts associated with implementing the proposed RHCP have been described and assessed in this EIS. In developing the RHCP, a number of alternatives were considered, including the No Action alternative, a Moderate Preserve/Limited Take alternative, and a Large-scale Preserve alternative.

TABLE OF CONTENTS

List of Figures

List of Tables

List of Appendices

EXECUTIVE SUMMARY

This Environmental Impact Statement (EIS) describes potential impacts of the proposed action. The proposed action is the issuance of a permit under Section 10(a)(1)(B) of the Endangered Species Act of 1973, as amended (ESA), by the U.S. Fish and Wildlife Service (Service) to Hays County, Texas, to authorize incidental take of the endangered golden-cheeked warbler (*Dendroica chrysoparia*) and black-capped vireo (*Vireo atricapilla*) within the context of the proposed Hays County Regional Habitat Conservation Plan (RHCP).

The lead Federal agency with responsibility for issuing the requested incidental take permit is the Service. The area of potential effect for this EIS is Hays County, Texas.

Purpose and Need

The Proposed Action has both ecological and socioeconomic purposes. The primary ecological purposes of the proposed action are to: 1) support populations of the covered species in Hays County by protecting and managing habitat for these species in perpetuity; 2) contribute to and facilitate the recovery of the covered species in Hays County; and 3) to contribute to the conservation of the 16 other Federally listed and unlisted species that are addressed in the RHCP as "additional species." The socioeconomic purpose of the proposed action is to allow the proponents of otherwise lawful activities to comply with the ESA in a more efficient, effective, and coordinated manner than might occur through individual project approvals.

As the population of Hays County continues to grow, the need for ESA compliance by public and private entities will likely increase. The need for the proposed action is based on an expected increase in population and associated land development activities and other land use changes in Hays County that have the potential to result in take of golden-cheeked warbler and black-capped vireo that either does not comply with the ESA or complies in a less efficient, less coordinated manner than is possible without the Hays County RHCP.

Scoping and Public Participation

Formal scoping for this EIS began on May 16, 2008 with the publication of a Notice of Intent (NOI) to prepare the EIS in the Federal Register (Appendix A). The NOI also announced a public scoping meeting that was held on June 18, 2008 in San Marcos, Texas. In addition to the Federal Register notice, notices of the public scoping meeting were published in area newspapers, including *The Daily Record*, San Marcos, Texas (June 4, 2008) and *Hays County Free Press*, Kyle, Texas (June 4, 2008) (Appendix A). This information was also posted on the Hays County RHCP website (www.hayscountyhcp.com), and notification was sent to local, State, and Federal elected and public officials and agencies in the surrounding areas. Notification of the public scoping meeting and the opening of the public comment period for scoping comments were also sent to interested individuals subscribed to the RHCP's email list.

Six members of the public attended the public scoping meeting. The Service received four comments from the public during the public scoping meetings and no other comments were received by the Service. The official scoping comment period for the EIS extended from May 16, 2008 to July 18, 2008.

In addition to the public scoping process, Hays County also instituted two advisory committees: the Citizens Advisory Committee (CAC) and the Biological Advisory Team (BAT). These committees provided guidance to the County during development of the RHCP. All meetings of these committees were subject to the Texas Open Meetings Act and the Texas Open Records Act. As such, all committee meetings were officially posted by the Hays County Commissioners' Court, and agendas, materials, and minutes were posted on the RHCP website. The website also served as a vehicle for interested persons to submit comments, ask questions, and join an email list regarding the RHCP.

Alternatives Considered

This EIS considers for detailed study the environmental consequences of "no action" (i.e., the Service does not issue Hays County an incidental take permit and Hays County does not implement a regional HCP) and three action alternatives based on a regional HCP framework. The basic characteristics of each alternative are described below.

Alternative A: No Action – Under this alternative, the Service would not issue an incidental take permit to Hays County and Hays County would not implement a regional HCP.

Alternative B: Proposed Hays County RHCP – This alternative implements a regional HCP with a phased conservation banking approach. Under this alternative, the County would acquire habitat preserves over the duration of the plan (with a target acquisition goal of between 10,000 and 15,000 acres) and bank mitigation credits for the covered species. The County would then be able to use credits for its own projects or sell credits to RHCP participants for a corresponding amount of incidental take authorization for the covered species in Hays County. The total amount of incidental take authorization that would be allowed under this alternative would be sufficient to cover the anticipated need for such authorizations, based on estimates of land development, impacts to habitat for the covered species, and RHCP participation.

Alternative C: Moderate Preserve/Limited Take – This alternative features the acquisition of a modestly sized, pre-determined preserve system and limits the amount of incidental take that would be authorized by the incidental take permit. This alternative illustrates a conservation program that could be relatively easy for the County to afford, but (due to the relatively smaller size of the preserve system compared to the proposed RHCP) might not satisfy the anticipated need for incidental take authorization over the duration of the plan.

Alternative D: Large-scale Preserve System – This alternative involves a conservation program that utilizes a pre-determined preserve approach. Under this alternative, the preserve

system would be large enough to authorize the incidental take of any remaining golden-cheeked warbler or black-capped vireo habitat in Hays County outside of the target acquisition area of the preserve system during the duration of the plan.

Comparison of the Alternatives Considered for Detailed Analysis.

Plan Characteristic	Alternatives			
	A - No Action	B - Hays County RHCP	C - Moderate Preserve/Limited Take	D - Large-scale Preserve
Conservation Strategy	Project-by-Project	Regional HCP with a Phased Conservation Bank	Regional HCP with a Pre-determined Preserve System	Regional HCP with a Pre-determined Preserve System
Incidental Take Authorization:				
Golden-cheeked Warbler	unknown	9,000 acres	3,240 acres	143,000 acres
Black-capped Vireo	unknown	1,300 acres	360 acres	20,000 acres
Preserve Size	unknown	approximately 10,000 to 15,000 acres	3,000 acres	30,000 acres
Mitigation Ratio	likely 1 acre of mitigation for each acre of impact	typically 1 acre of mitigation for each acre of impact	typically less than 1 acre of mitigation for each acre of impact	typically less than 1 acre of mitigation for each acre of impact
Education and Outreach Program	No	Yes (for all species included in Table 1-1)	Yes (only for covered species)	Yes (for all species included in Table 1-1)
Public Access to Preserves	Not Likely	Yes - with limitations	Not Likely	Yes – with limitations
Conservation of Other Species	Not Likely	Yes	Not Likely	Yes

Two additional alternatives were contemplated, but not considered for detailed study: a "regulatory alternative" based on creating regulations designed to either require or provide an incentive for the conservation of endangered species habitat and a "county-only alternative" that would only provide incidental take authorization for County projects.

Affected Environment

The description of the affected environment establishes the current environmental conditions considered by the Service to be affected by the alternatives. The impact topics or components of the human environment that are likely to be affected or could potentially be

affected beyond a negligible level by the authorized take, proposed mitigation, or funding and administration of the action alternatives are listed below. The area of potential effect of the action alternatives on the natural or socioeconomic resources analyzed in this EIS is Hays County, since the authorized take, proposed mitigation, and funding and administration of the action alternatives would occur only within Hays County. However, the potential significance of the effects of the action alternatives on the natural and socioeconomic resources may depend on the overall context of a particular resource that could extend beyond the boundary of the county.

The impact topics described and analyzed in detail in this EIS are (see Section 4.1.1):

- Water Resources: Important surface and groundwater resources occur throughout Hays County, and water quality and quantity issues are generally a concern for Hays County citizens. These water resources may also be essential habitat components for some listed species (although listed aquatic species are not covered for incidental take under the action alternatives). Water resources, where they overlap with potential habitat for the covered species, could be affected by activities that result in authorized incidental take of the covered species (primarily activities resulting in habitat loss) or by conservation measures proposed under the action alternatives.
- Vegetation: Vegetation could be affected within Hays County with the implementation of an action alternative, since take of the covered species would be expressed as a specified number of acres of potentially suitable habitat lost or modified, and because mitigation for that take would be the preservation and management in perpetuity of an equivalent amount of suitable habitat for the covered species.
- General Wildlife: Wildlife occupying the habitats that would be lost or modified as a result of activities covered for incidental take and areas protected and managed as mitigation could be affected by the action alternatives.
- Covered Species, Evaluation and Additional Species, and Other Special Status Species: Special status species include the two covered species, 40 evaluation species, 16 additional species, and a variety of other "special status" species in Hays County, such as the listed species in Hays County that are not addressed by the regional HCP alternatives. These species could be affected by the action alternatives in relation to the habitats that would be taken and protected.
- Socioeconomic Resources: While implementation of the action alternatives is not expected to affect overall county-wide trends for population growth, demographics, income, employment, or housing in Hays County (as described later, these socioeconomic factors are driven more by regional economic conditions than by local activities), these aspects of the human environment are important to understanding the interaction between people and the natural environment. Thus

these resources are considered in the analysis below. The action alternatives could also affect the ability of the County to provide services and could affect the cost of ESA compliance for project proponents in Hays County and for the Service.

As described in detail in Section 4.1.2, a variety of other resources or topics were considered but ultimately dismissed from further analysis. The resources or topics considered but dismissed from detailed analysis include energy and depletable resource requirements and conservation, prime and unique agricultural lands, public health and safety, archeological sites, historic structures, and other cultural resources, wetlands and floodplains, geology, ambient noise and air quality, and environmental justice concerns. These resources are not likely to be affected by the authorized take, proposed mitigation, or funding and administration of the action alternatives described above.

Environmental Consequences

National Environmental Policy Act (NEPA) regulations require the analysis of "no action" as a benchmark that enables decision makers to assess the magnitude of the environmental effects of the action alternatives (USFWS 2003). Under the No Action alternative, the current trends projected for human population growth and associated land development in Hays County will continue and impacts to listed species would be authorized under existing Federal programs. If no difference is anticipated between the future condition under the No Action alternative and the action alternatives, then there is no impact to analyze.

Overall, few projects are likely to find that a regional HCP makes all the difference in terms of when and where to develop. Therefore, it is reasonable to assume that the regional HCP action alternatives, compared to the No Action alternative, will have only minor impacts on county-wide extent, timing, and placement of development and any associated impacts to habitat for the covered species over the next 30 years. Since there would likely be no significant difference in land development patterns across the county under the No Action or the action alternatives, consideration of environmental consequences in this EIS is limited to the potential effects of the take that would be authorized by the requested permit, the proposed mitigation activities, or the funding and administration of the regional HCP alternatives.

While other Federal regulatory programs might trigger more comprehensive environmental assessment documentation for particular development projects, it is unlikely that a county-wide EIS-level review would be compiled. By contrast, this EIS provides a detailed environmental impact assessment of relevant impacts for the No Action and the action alternatives throughout the county. This means that if the proposed RHCP or one of the other action alternatives is implemented, the relevant impacts of all ESA compliance options will have been considered in this EIS. Although this does not relieve project proponents who choose options other than participation in a regional HCP from compiling necessary environmental impact assessments at the time they commence with their projects, it does provide assurance that a regional HCP is implemented with a full understanding of the possible impact scenarios,

regardless of the level of landowner participation in a regional HCP. This EIS will also serve as a valuable reference point for projects that do not use a regional HCP compliance option.

The EIS contains a resource-by-resource analysis of direct and indirect impacts for each of the affected resources and analyses of cumulative impacts, unavoidable adverse impacts, irreversible and irretrievable commitment of resources, and short-term use of the environment vs. long-term productivity. A summary of the anticipated impacts of the No Action and three regional HCP alternatives is provided below.

Summary and Comparison of Environmental Effects for Alternatives.

	Alternative A – No Action	Alternative B – Proposed Hays County RHCP	Alternative C – Moderate Preserve/Limited Take	Alternative D – Large-scale Preserve System
Analysis Context	Land development trends would continue as projected converting approximately 57,700 acres to developed uses and affecting approximately 25,300 acres of potential habitat for the covered species over 30 years, with ESA compliance via individual authorizations from the Service.	Land development trends would continue as projected, with incidental take authorization provided by the RHCP for approximately 10,300 acres of impact to potential habitat for the covered species (sufficient to address the anticipated needs of the County and other likely RHCP participants over 30 years).	Land development trends would continue as projected, with incidental take authorization provided by the RHCP for approximately 3,600 acres of impact to potential habitat for the covered species (sufficient to address the anticipated needs of the County and a portion of the needs of other likely RHCP participants).	Land development trends would continue as projected, with incidental take authorization provided by the RHCP for impacts to any potential habitat for the covered species located outside of the target preserve system (as much as approximately 163,000 acres of impact) by the County or other RHCP participants over 30 years.
Water Resources	Generally adverse effects from land development activities on quality and quantity of surface and groundwater moderated by existing regulatory programs and mitigation from individual ESA authorizations – overall **minor to moderate adverse effects**.	Potential adverse effects from land development activities similar to No Action. RHCP conservation program resulting in **negligible to minor positive effects** to water resources, compared to No Action.	Potential adverse effects from land development activities similar to No Action. Relatively small scale of the alternative conservation program resulting in **negligible positive effects** to water resources, compared to No Action.	Potential adverse effects from land development activities similar to No Action. Large scale of the alternative conservation program resulting in **minor to moderate positive effects** to water resources, compared to No Action.

Summary and Comparison of Environmental Effects for Alternatives.

	Alternative A – No Action	Alternative B – Proposed Hays County RHCP	Alternative C – Moderate Preserve/Limited Take	Alternative D – Large-scale Preserve System
Vegetation	Anticipated land development to generally reduce the extent and sustainability of native vegetation communities but moderated by other park/open space initiatives and individual ESA authorizations – overall **moderate adverse effects**.	Potential adverse effects from land development activities similar to No Action. RHCP conservation program would target forest habitats for protection and management resulting in a **moderate beneficial effect** to vegetation, compared to No Action.	Potential adverse effects from land development activities similar to No Action. Relatively small scale of the alternative conservation program (also targeting forest habitats for protection and management) resulting in a **minor beneficial effect** to vegetation, compared to No Action.	Potential adverse effects from land development activities similar to No Action. Large scale of the alternative conservation program (targeting primarily forest habitats for protection and management, but also likely to include other communities) resulting in a **moderate beneficial effect** to vegetation, compared to No Action.
General Wildlife	Anticipated land development to generally reduce habitats, introduce non-native species, and disrupt the balance of natural wildlife communities; however, some urban-adapted species could benefit. Adverse effects moderated by existing regulations, other parks/open space programs, and individual ESA authorizations. Overall **moderate adverse effects** to native wildlife communities.	Potential adverse effects from land development activities similar to No Action. RHCP conservation program, including preserve acquisitions, preserve management, and public education program, to result in **moderate beneficial effect** to native wildlife communities, compared to No Action.	Potential adverse effects from land development activities similar to No Action. Relatively small scale of alternative conservation program to result in **minor beneficial effect** to native wildlife communities, compared to No Action.	Potential adverse effects from land development activities similar to No Action. Large scale of the alternative conservation program resulting in a **moderate beneficial effect** to native wildlife communities, compared to No Action.

Summary and Comparison of Environmental Effects for Alternatives.

	Alternative A – No Action	Alternative B – Proposed Hays County RHCP	Alternative C – Moderate Preserve/Limited Take	Alternative D – Large-scale Preserve System
Covered Species: Golden-cheeked Warbler and Black-capped Vireo	Anticipated land development to result in GCW habitat loss of approximately 13% of Hays County habitat and less than 4% of habitat in Recovery Region 5. Adverse effects moderated by existing GCW preserves and individual ESA authorizations – overall **minor to moderate adverse impact to the GCW**. Projected land use trends likely to result in only **negligible adverse and beneficial effects to the BCV**. Land development could be expected to generally have adverse effects, while other types of land uses (such that might convert forest to shrubland) could have beneficial effects. Any adverse effects could be moderated by individual ESA authorizations.	Potential adverse effects from land development activities similar to No Action. RHCP conservation program, including preserve acquisitions, preserve management, and public education program, to result in **moderate beneficial effect to GCW** in Hays County, compared to No Action. Potential effects from land use trends similar to No Action. RHCP conservation program, including preserve acquisitions, preserve management, and public education program, to result in a **minor to moderate beneficial effect to BCV** in Hays County, compared to No Action.	Potential adverse effects from land development activities similar to No Action. Relatively small scale of alternative conservation program to result in **minor beneficial effect** to GCW in Hays County, compared to No Action. Potential effects from land use trends similar to No Action. Relatively small scale of alternative conservation program to result in **negligible to minor beneficial effect to BCV** in Hays County, compared to No Action.	Potential adverse effects from land development activities similar to No Action. Large scale of the alternative conservation program to result in **moderate beneficial effect** to GCW in Hays County, compared to No Action. Potential effects from land use trends similar to No Action. Large scale of alternative conservation program to result in **moderate beneficial effect to BCV**, compared to No Action.

Summary and Comparison of Environmental Effects for Alternatives.

	Alternative A – No Action	Alternative B – Proposed Hays County RHCP	Alternative C – Moderate Preserve/Limited Take	Alternative D – Large-scale Preserve System
Evaluation & Additional Species	Anticipated land development could result in **negligible to major adverse effects to unlisted evaluation species** (little is currently known about these species), and could be moderated by existing regulatory programs protecting aquifer recharge features and water quality. Anticipated land development could result in **negligible to moderate adverse effects to additional species**, and could be moderated by existing regulatory programs and mitigation provided by individual ESA authorizations.	Potential adverse effects from land development activities similar to No Action. RHCP conservation program could result in **negligible to major beneficial effects for unlisted evaluation species** by incidentally protecting habitat for one or more evaluation species, increasing public awareness of karst issues, and funding research. Potential adverse effects from land development activities similar to No Action. RHCP conservation program could result in **negligible to moderate beneficial effects for additional species** by incidentally protecting habitat for one or more additional species and increasing public awareness of water quality and endangered species issues.	Potential adverse effects from land development activities similar to No Action. Relatively small scale of alternative conservation program could result in **negligible to major beneficial effects for unlisted evaluation species** by incidentally protecting habitat for one or more evaluation species and increasing public awareness of karst issues. Potential adverse effects from land development activities similar to No Action. Relatively small scale of alternative conservation program could result in **negligible to minor beneficial effects for additional species**.	Potential adverse effects from land development activities similar to No Action. Large scale of alternative conservation program could result in **minor to moderate beneficial** effects for unlisted evaluation species by incidentally protecting habitat for one or more evaluation species, increasing public awareness of karst issues, and funding research. Potential adverse effects from land development activities similar to No Action. Large scale alternative conservation program could result in **minor to moderate beneficial effects for additional species**.

Summary and Comparison of Environmental Effects for Alternatives.

	Alternative A – No Action	Alternative B – Proposed Hays County RHCP	Alternative C – Moderate Preserve/Limited Take	Alternative D – Large-scale Preserve System
Other Special Status Species	Anticipated land development could result in **negligible to moderate adverse effects** to other listed species. Adverse effects would be moderated by individual ESA authorizations.	Potential adverse effects associated with increasing human population and land development would be similar to the No Action alternative. RHCP conservation program could result in **negligible to minor beneficial effects**, compared to No Action.	Potential adverse effects associated with increasing human population and land development would be similar to the No Action alternative. Alternative conservation program could result in **negligible beneficial effects**, compared to No Action.	Potential adverse effects associated with increasing human population and land development would be similar to the No Action alternative. Alternative conservation program could result in **negligible to minor beneficial effects**, compared to No Action.
Population, Employment & Economic Trends	No Action alternative is not likely to affect projected population, employment, or general economic trends in Hays County or region.	Implementation of RHCP would not be expected to affect overall population, employment, or general economic trends in Hays County or region.	Alternative C would not be expected to affect overall population, employment, or general economic trends in Hays County or region.	Alternative D would not be expected to affect overall population, employment, or general economic trends in Hays County or region.
Land Use & Housing Trends	Current land use trends and housing trends would be expected to continue under the No Action.	Implementation of RHCP would likely have only **minor beneficial impacts on housing and construction trends**, compared to the No Action alternative. Potential impacts to housing prices in Hays County would likely be negligible under the proposed RHCP, compared to the No Action alternative	Alternative C would likely have only **minor beneficial impacts on housing and construction trends**, compared to the No Action alternative. Potential impacts to housing prices in Hays County would likely be negligible.	Alternative D would likely have only **minor beneficial impacts on housing and construction trends**, compared to the No Action alternative. Potential impacts to housing prices in Hays County would likely be negligible.

Summary and Comparison of Environmental Effects for Alternatives.

	Alternative A – No Action	Alternative B – Proposed Hays County RHCP	Alternative C – Moderate Preserve/Limited Take	Alternative D – Large-scale Preserve System
Hays County Finances	County tax base would continue to grow as projected. County would need to find funding for ESA compliance on a case-by-case basis.	Implementation of RHCP would likely result in **negligible to minor beneficial effect on the use of voter-approved bond funds** compared to the No Action alternative. The use of general operations and maintenance funds for the RHCP could have an overall **minor adverse effect on County general fund services and programs.** Proposed RHCP could have a **minor beneficial effect on the County's tax base.**	Implementation of Alternative C alternative would have **negligible to minor beneficial effect on the use of existing bond funds**. Alternative C alternative would likely have a **minor adverse effect on County general fund services and programs**. Alternative C would likely have a **minor beneficial effect on the County tax base** compared to the No Action alternative	Implementation of Alternative D alternative would have **negligible to minor beneficial effect on the use of existing bond funds**. Alternative C alternative would likely have a **moderate adverse effect on County general fund services and programs**. Alternative C would likely have a **minor beneficial effect on the County tax base** compared to the No Action alternative
ESA Compliance Burden	Costs to landowners and project proponents related to ESA compliance under the No Action alternative could be substantial, resulting in an overall **moderate adverse impact**.	Under RHCP, time and cost savings could be expected for participants in the proposed RHCP and would likely represent a **moderate beneficial impact**.	Limited scope of Alternative C would only be expected to have a **minor beneficial effect** on easing the ESA compliance burden.	Expansive scope of Alternative D would likely result in a **moderately beneficial impact** for easing the ESA compliance burden.

1.0 INTRODUCTION, PURPOSE, AND NEED

1.1 Introduction and Background

The purpose for which this EIS is being prepared is to: (1) Respond to Hays County's application for an incidental take permit for the proposed covered species (black-capped vireo and golden-cheeked warbler (related to activities that have the potential to result in take, pursuant to the ESA section 10(a)(1)(B) and its implementing regulations and policies; (2) Protect, conserve, and enhance the covered species and their habitat for the continuing benefit of the people of the United States; (3) Provide a means and take steps to conserve the ecosystems upon which the covered species depend; (4) Contribute to the long-term survival of covered species through protection and management of the species and their habitat; and (5) Facilitate compliance with the ESA, NEPA, and other applicable federal laws and regulations.

The need for the action is based on the potential that activities proposed within the limits of Hays County could result in take of covered species, thus prompting the need for an incidental take permit.

The County of Hays, Texas is applying for an incidental take permit under Section 10(a)(1)(B) of the Endangered Species Act of 1973, as amended (ESA) from U.S. Fish and Wildlife Service ("Service" or USFWS). The requested permit would authorize the incidental take of two endangered songbirds: the golden-cheeked warbler (*Dendroica chrysoparia*, GCW) and the black-capped vireo (*Vireo atricapilla*, BCV). These species are collectively referred to as the "covered species."

Proposed issuance of an incidental take permit by the Service is a Federal action subject to review under the National Environmental Policy Act of 1969 (NEPA). As part of the NEPA process, the Service prepared an Environmental Impact Statement (EIS) that analyzes the effects of issuing an incidental take permit to Hays County on the human environment.

To support its application for an incidental take permit, Hays County prepared a regional habitat conservation plan (the "Hays County RHCP") that covers a 30-year period from 2010 through 2039. The permit area for the RHCP is Hays County in central Texas (Figure 1-1). While the entire county would be covered by the proposed incidental take permit, potential habitat for the golden-cheeked warbler and black-capped vireo occurs in the portion of Hays County within the Edwards Plateau ecoregion, generally west of Interstate Highway 35. The area of potential effect for this EIS includes the full extent of Hays County, Texas.

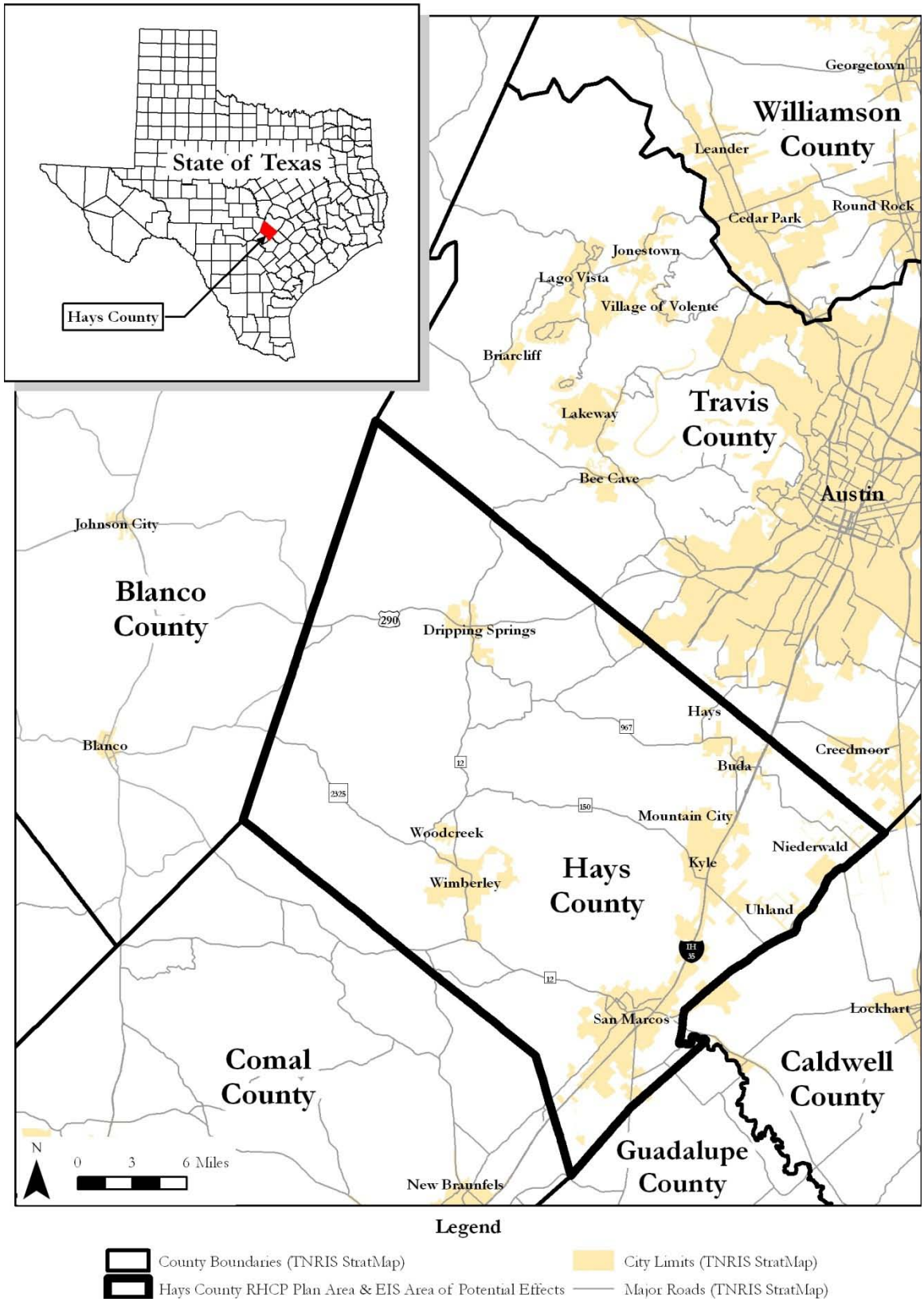
1.1.1 Hays County Background

Hays County is located in central Texas and covers approximately 434,335 acres (based on county boundaries provided by the Texas Natural Resources Information Service (TNRIS) Strategic Mapping Program (StratMap)). The western three-quarters of Hays County (generally

west of Interstate Highway 35) are within the Balcones Canyonlands portion of the Edwards Plateau ecoregion.

The habitats of the Edwards Plateau ecoregion support several federally listed species, including the golden-cheeked warbler and the black-capped vireo, and a number of other unlisted species that may be rare and/or particularly sensitive to habitat changes.

Figure 1-1. Hays County RHCP Plan Area and EIS Area of Potential Effects



Hays County is situated between the major population centers of Austin and San Antonio. The county is currently included in the Austin-Round Rock Metropolitan Statistical Area (MSA), and was the second fastest growing county in the MSA (which also includes Bastrop, Caldwell, Travis, and Williamson counties). Hays County experienced population growth of an estimated 64.7 percent between 1997 and 2007 (Real Estate Center at Texas A&M University (RECenter) 2008a). The population of Hays County is expected to increase from 97,589 in the year 2000 to an estimated 375,873 by the year 2040, which is a projected population increase of approximately 285 percent (TXP and Capitol Market Research 2008).

While Hays County is currently mostly rural, with agricultural land uses dominating the landscape, new land development is expected to accompany the projected population increase and is estimated to result in approximately 57,700 acres of land being converted from undeveloped land uses to developed land uses during the next 30 years (see Section 5.2 of the Hays County RHCP).

Land development activities and certain land management practices within Hays County have the potential to impact habitat for the golden-cheeked warbler and black-capped vireo, which could result in incidental take. The need for ESA compliance will likely increase as the population of Hays County, and associated land development activities, continues to grow. The RHCP is needed to help ensure that development and other types of land uses go forward in an efficient manner with consideration for the protection of rare species in Hays County.

1.1.2 Hays County Regional Habitat Conservation Plan

In support of the incidental take permit application, Hays County prepared a regional habitat conservation plan (the "Hays County RHCP") to establish a conservation program that would minimize and mitigate to the maximum extent practicable the impacts of incidental take of the covered species in Hays County that would be authorized by the permit.

In addition to the covered species, a number of other species are addressed in the Hays County RHCP that would not be authorized for incidental take (Table 1-1). Many of these species are not listed under the ESA. However, some may be rare and/or endemic to Hays County, and without adequate conservation measures, one or more of these species could become listed by the Service in the future.

Table 1-1. Species Addressed in the Hays County RHCP.

Common Name	Scientific Name	Taxa	Habitat
COVERED SPECIES			
Golden-cheeked warbler**	*Dendroica chrysoparia*	Birds	Juniper-Oak Woodland
Black-capped vireo**	*Vireo atricapilla*	Birds	Deciduous Shrubland
EVALUATION SPECIES OF CONCERN			
Aquifer flatworm	*Sphalloplana mohri*	Turbellarians	Aquatic/Karst
Flattened cavesnail	*Phreatodrobia micra*	Mollusks	Aquatic/Karst
Disc cavesnail	*Phreatodrobia plana*	Mollusks	Aquatic/Karst

Table 1-1. Species Addressed in the Hays County RHCP.

Common Name	Scientific Name	Taxa	Habitat
High-hat cavesnail	*Phreatodrobia punctata*	Mollusks	Aquatic/Karst
Beaked cavesnail	*Phreatodrobia rotunda*	Mollusks	Aquatic/Karst
A cave-obligate leech	*Mooreobdella* n. sp. ***	Hirudinea	Aquatic/Karst
A cave-obligate crustacean	*Tethysbaena texana*	Crustaceans	Aquatic/Karst
A cave-obligate amphipod	*Allotexiweckelia hirsuta*	Crustaceans	Aquatic/Karst
A cave-obligate amphipod	*Artesia subterranea*	Crustaceans	Aquatic/Karst
A cave-obligate amphipod	*Holsingerius samacos*	Crustaceans	Aquatic/Karst
A cave-obligate amphipod	*Seborgia relicta*	Crustaceans	Aquatic/Karst
Balcones cave amphipod	*Stygobromus balconis*	Crustaceans	Aquatic/Karst
Ezell's cave amphipod	*Stygobromus flagellatus*	Crustaceans	Aquatic/Karst
A cave-obligate amphipod	*Texiweckelia texensis*	Crustaceans	Aquatic/Karst
A cave-obligate amphipod	*Texiweckeliopsis insolita*	Crustaceans	Aquatic/Karst
Texas troglobitic water slater	*Lirceolus smithii*	Crustaceans	Aquatic/Karst
A cave-obligate decapod	*Calathaemon holthuisi*	Crustaceans	Aquatic/Karst
Balcones cave shrimp	*Palaemonetes antrorum*	Crustaceans	Aquatic/Karst
A cave-obligate spider	*Cicurina ezelli*	Arachnids	Karst
A cave-obligate spider	*Cicurina russelli*	Arachnids	Karst
A cave-obligate spider	*Cicurina ubicki*	Arachnids	Karst
Undescribed cave-obligate spider	*Eidmannella* n. sp.	Arachnids	Karst
Undescribed cave-obligate spider	*Neoleptoneta* n. sp. 1	Arachnids	Karst
Undescribed cave-obligate spider	*Neoleptoneta* n. sp. 2	Arachnids	Karst
Undescribed cave-obligate spider	*Neoleptoneta* n. sp. eyeless	Arachnids	Karst
A pseudoscorpion	*Tartarocreagris grubbsi*	Arachnids	Karst
A cave-obligate harvestman	*Texella diplospina*	Arachnids	Karst
A cave-obligate harvestman	*Texella grubbsi*	Arachnids	Karst
A cave-obligate harvestman	*Texella mulaiki*	Arachnids	Karst
A cave-obligate harvestman	*Texella renkesae*	Arachnids	Karst
A cave-obligate springtail	*Arrhopalites texensis*	Hexapods	Karst
An ant-like litter beetle	*Batrisodes grubbsi*	Insects	Karst
Comal Springs diving beetle	*Comaldessus stygius*	Insects	Aquatic/Karst
Edwards Aquifer diving beetle	*Haideoporus texanus*	Insects	Aquatic/Karst
A cave-obligate beetle	*Rhadine austinica*	Insects	Karst
A cave-obligate beetle	*Rhadine insolita*	Insects	Karst
Undescribed beetle	*Rhadine* n. sp. (*subterranea* group)	Insects	Karst
Undescribed beetle	*Rhadine* n. sp. 2 (*subterranea* group)	Insects	Karst
Blanco River springs salamander	*Eurycea pterophila*	Amphibians	Aquatic/Karst
Blanco blind salamander	*Eurycea robusta*	Amphibians	Aquatic/Karst
ADDITIONAL SPECIES OF CONCERN			
Hill Country wild-mercury	*Argythamnia aphoroides*	Plants	Terrestrial
Warnock's coral-root	*Hexalectris warnockii*	Plants	Terrestrial
Canyon mock-orange	*Philadelphus ernestii*	Plants	Terrestrial
Texas wild-rice**	*Zizania texana*	Plants	Aquatic
Texas fatmucket	*Lampsilis bracteata*	Mollusks	Aquatic
Golden orb	*Quadrula aurea*	Mollusks	Aquatic

Table 1-1. Species Addressed in the Hays County RHCP.

Common Name	Scientific Name	Taxa	Habitat
Texas pimpleback	*Quadrula petrina*	Mollusks	Aquatic
Texas austrotinodes caddisfly	*Austrotinodes texensis*	Insects	Aquatic
Comal Springs riffle beetle**	*Heterelmis comalensis*	Insects	Aquatic/Karst
A mayfly	*Procloeon distinctum*	Insects	Aquatic
San Marcos saddle-case caddisfly	*Protoptila arca*	Insects	Aquatic
Comal Springs dryopid beetle**	*Stygoparnus comalensis*	Insects	Aquatic/Karst
Fountain darter**	*Etheostoma fonticola*	Fishes	Aquatic
San Marcos salamander*	*Eurycea nana*	Amphibians	Aquatic/Karst
Eurycea species (northern Hays County)* or **	*Eurycea* species	Amphibians	Aquatic/Karst
Texas blind salamander**	*Eurycea rathbuni*	Amphibians	Aquatic/Karst

* Federally threatened species

** Federally endangered species

*** The designation "n. sp." indicates a "new species" within a genus that has not yet been assigned a species name by acknowledged experts.

Development of the Hays County RHCP was funded by a combination of Federal grant dollars, local funding, and County staff services. The Hays County Commissioners' Court approved an application to the Service for a habitat conservation planning grant in April 2005. The Service responded favorably to the County's grant application, awarding $753,750 to the County to develop a plan. The Federal award required a non-Federal match of $251,250, which the County provided through in-kind services. The Texas Parks and Wildlife Department (TPWD) administered the grant for the Service and negotiated an interlocal agreement with Hays County to disburse the funds in May 2006.

The grant application defined the initial scope of the Hays County RHCP, which included a focus on the golden-cheeked warbler, but allowed for the consideration of the black-capped vireo and other species in the plan. Detailed guidance on the scope of the Hays County RHCP was provided by the Citizens Advisory Committee (CAC) and the Biological Advisory Team (BAT). The CAC provided input on the preferred conservation strategy, including stakeholder preferences for preserve system size, acquisition mechanisms, and funding. The BAT recommended a list of species to address in the plan, including the species that should be considered for incidental take authorization, and provided other biological guidance.

Other guidance for the Hays County RHCP was provided by the Hays County Commissioners' Court, County staff, the Service, and public comments.

1.2 Purpose and Need for Action

The Proposed Action is issuance of an ESA Section 10(a)(1)(B) incidental take permit by the Service that would authorize to incidentally take the covered species associated with otherwise lawful land use activities in Hays County within the context of the Hays County RHCP. Issuance of the permit would also allow Hays County to extend this authorization to

other non-Federal entities for impacts to the covered species within the county. The Proposed Action has both ecological and socioeconomic purposes.

The primary ecological purposes of the Proposed Action are to: 1) support populations of the covered species in Hays County by protecting and managing habitat for these species in perpetuity; 2) contribute to and facilitate the recovery of the covered species in Hays County; 3) assist the Service in conserving 40 rare, but currently unlisted, karst species found in Hays County (these species are addressed in the RHCP as "evaluation species"); and 4) contribute to the conservation of the 16 other federally listed and unlisted species that are addressed in the RHCP as "additional species."

The conservation actions described in the Hays County RHCP are expected to provide a comprehensive and coordinated strategy for the conservation of rare species throughout Hays County. The RHCP would contribute to the species' long-term survival, while allowing otherwise lawful development to occur through a voluntary alternative to individual project authorizations from the Service.

The socioeconomic purpose of the Proposed Action is to allow the proponents of otherwise lawful activities to comply with the ESA in a more efficient, effective, and coordinated manner than might occur through individual project approvals. The Hays County RHCP would also help to ensure that development goes forward in a manner that is consistent with the protection of rare species.

As the population of Hays County continues to grow, the need for ESA compliance by public and private entities will likely increase. The urgency for addressing habitat and species protection in an organized and predictable manner is underscored by the high rate of growth projected for Hays County.

The need for the Proposed Action is based on an expected increase in population with associated land development activities and other land use changes in Hays County that have the potential to result in take of the covered species that either does not comply with the ESA or complies in a less efficient, less coordinated manner than is possible without the Hays County RHCP.

1.3 Regulatory Framework

1.3.1 Endangered Species Act

The ESA is intended to protect and conserve species listed as threatened or endangered and to conserve the habitats upon which they depend. Furthermore, the ESA mandates that all Federal agencies seek to conserve endangered and threatened species and use their resources and authorities to further such purposes.

Section 9 of the ESA prohibits "take" of any federally listed wildlife species (16 United States Code "USC" § 1538(a)). Take, as defined by the ESA, means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" (16 USC § 1532(19)). Harm is defined in the Service's regulations as an act that actually kills or injures wildlife and may include "significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns including breeding, feeding, and sheltering" (50 Code of Federal Regulations). Harass is further defined as an act or omission which crates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited breeding, feeding, or sheltering" (50 Code of Federal Regulations (CFR § 17.3).

If it is not practicable for a non-Federal entity to design an otherwise lawful land use activity so as to avoid take of a listed species, Section 10(a)(1)(B) of the ESA (16 USC §1539(a)(1)(B)), authorizes the Service to issue an incidental take permit for non-Federal projects or activities not requiring Federal authorization or funding. The permit allows for impacts to the covered species, provided certain conditions are satisfied. These conditions include the preparation of a habitat conservation plan (HCP) outlining the measures that the permittee will undertake to minimize and mitigate "to the maximum extent practicable" the impacts of the taking of the species (ESA (10)(a)(2)(A)).

In addition to the ESA and its implementing regulations, the Service's Habitat Conservation Planning and Incidental Take Permit Processing Handbook (HCP Handbook)(1996) provides overall guidance on the elements of an HCP (USFWS and National Marine Fisheries Service (NMFS) 1996).

Section 7(a)(2) of the ESA requires all Federal agencies, in consultation with the Service, to ensure that any action "authorized, funded, or carried out" by that agency is "not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification" of critical habitat. The Service's issuance of an incidental take permit is an action subject to the provisions of Section 7 the ESA and therefore the Service must consult with itself to determine whether issuance of the proposed incidental take permit will jeopardize the continued existence of the listed species to be taken or result in the adverse modification of those species' critical habitats. Section 7 requires, among other things, an analysis of indirect effects to the listed species at issue, effects on other listed species, including federally listed plants, and effects on critical habitat. The results of the Section 7 consultation are documented in a Biological Opinion prepared by the Service, including the conclusions regarding the likelihood of the issuance of the permit to jeopardize the continued existence of, or destruction or adverse modification of designated critical habitat for any listed species. The intra-service Section 7 consultation must be concluded prior to the issuance of the incidental take permit.

1.3.1.1 Concepts and Benefits of Regional HCPs

Although the ESA does not specifically mention regional HCPs, the HCP Handbook discusses the regional HCP concept. In contrast to individual HCPs, a regional HCP often covers a larger geographic area, numerous landowners, and multiple species. Local or regional governmental entities are often the applicant/permittee, and they commit to implement the conservation program contained in the plan. As stated on page 1-15 of the HCP Handbook, the Service encourages, as one of its "guiding principles," State and local governments and private landowners to undertake regional and multi-species HCPs.

In addition to providing a participatory process for ESA compliance that may be less burdensome for individual landowners, the HCP Handbook describes several other advantages of regional and multi-species HCPs, each of which appears to be applicable to the proposed Hays County RHCP:

1. Maximize flexibility and available options in developing mitigation programs. Individual projects often face limited options when developing mitigation proposals because of individual applicants' limited financial resources or the lack of suitable habitat available for mitigation. The regional HCP approach leads to conservation of less fragmented tracts of habitat that are better for the species and applicants. The regional HCP administrative entity enjoys improved mitigation "buying power" and can pool participant payments to acquire high quality, contiguous tracts for conservation.

2. Reduce the economic and logistic burden of these programs on individual landowners by distributing their impacts. The regional HCP approach introduces an economy of scale in terms of the basic logistical functions by establishing region-wide criteria for participation and consolidating many of the ministerial and other HCP processing steps into one permitting process.

3. Reduce uncoordinated decision making, which can result in incremental habitat loss and inefficient project review. The regional HCP approach allows the applicant and the Service to develop standardized criteria for participants, making it easier to ensure that similarly-situated projects are treated similarly in terms of mitigation requirements.

4. Provide the permittee with long-term planning assurances and increase the number of species for which such assurances can be given. The regulatory certainty that would result from issuance of the Permit could reduce the legal and financial risks associated with public and private development and infrastructure planning. The Hays County RHCP is expected to lead to long-term benefits for the covered species and potentially contribute to their recovery.

5. Bring a broad range of activities under the Permit's legal protection. Because the Permit could cover most types of public and private land use and development activities in Hays County, it could contribute substantially to overall efficiency in executing proposed projects and ensure that mitigation requirements for species impacts are determined using consistent criteria.

6. Reduce the regulatory burden of Endangered Species Act compliance for all affected participants. The RHCP would make it possible for each project that voluntarily conforms to the RHCP to obtain ESA authorization through a streamlined, efficient process, potentially at much less cost than obtaining incidental take authorization under individual section 10(a)(1)(B) permits and section 7(a)(2) consultations (USFWS and NMFS 1996).

In addition to these benefits, the RHCP would also facilitate acquisition of Federal grants by the County through the Service's ESA Section 6 Habitat Conservation Plan Land Acquisition Program. Land acquired with Habitat Conservation Plan Land Acquisition Program funds cannot be used as mitigation in an HCP, but may be used to complement an approved HCP to further assist conservation of federally listed species.

1.3.2 National Environmental Policy Act

The issuance of a Section 10(a)(1)(B) incidental take permit is a Federal action and is therefore subject to NEPA (42 USC 4321 et seq.). NEPA requires that Federal agencies consider all reasonably foreseeable environmental effects of their proposed actions on the human environment. NEPA also requires that the Federal action agency involve and inform the public in the decision-making process; although NEPA does not mandate a specific outcome. NEPA also established the Council on Environmental Quality (CEQ) in the Executive Office of the President to formulate and recommend national policies that ensure that the programs of the Federal government promote improvement of the quality of the environment. The CEQ set forth regulations (40 CFR 1500-1508) to assist Federal agencies in implementing NEPA during the planning phases of any Federal action. These regulations, together with specific Federal agency NEPA implementation procedures, help ensure that the environmental impacts of any proposed decisions are fully considered.

While similar in some respects, the scope of NEPA goes beyond that of the ESA. NEPA analyses must consider the impacts of a Federal action not only on fish and wildlife resources, but also on non-wildlife resources of the human environment, such as water quality, cultural resources, and socioeconomic values.

With respect to HCPs in general, compliance with NEPA is not a direct obligation or requirement of the applicant for the incidental take permit. However, the Service must comply with NEPA when making its decision on the application and implementing the Federal action of

issuing a permit. Consequently, the appropriate environmental analyses must be conducted and documented before an incidental take permit can be issued.

The Service has determined that an Environmental Impact Statement (EIS) is appropriate for this proposed action.

1.3.3 Texas State Law Relevant to Regional HCPs

Texas state law restricts a local government's role in developing, adopting, approving, or participating in a regional HCP (Chapter 83 of the Texas Parks and Wildlife Code). Among other things, state law requires the governmental entity participating in a regional HCP to establish a Citizens Advisory Committee, appoint a Biological Advisory Team, comply with open records/open meetings laws, comply with public hearing requirements, provide a grievance process to Citizens Advisory Committee members, and acquire preserves by specific deadlines.

Under Chapter 83 of the Texas Parks and Wildlife Code, governmental entities participating in a regional HCP are prohibited from:

- Imposing any sort of regulation related to endangered species (other than regulations involving groundwater withdrawal) unless that regulation is necessary to implement a regional HCP for which the governmental entity was issued a Federal permit (Texas Parks and Wildlife Code § 83.014(a)).
- Discriminating against a permit application, permit approval, or request for utility service to land that has been designated a habitat preserve for a regional HCP (Texas Parks and Wildlife Code § 83.014(b)).
- Limiting water or wastewater service to land that has been designated as habitat preserve (Texas Parks and Wildlife Code § 83.014(c)).
- Requiring a landowner to pay a mitigation fee or set aside, lease, or convey land as habitat preserve as a condition to the issuance of a permit, approval or service (Texas Parks and Wildlife Code § 83.014(d)).

In addition to the above prohibitions, Chapter 83 stipulates that the mitigation included in a regional HCP, including any participation fee and the size of habitat preserves, must be based on the amount of harm to each endangered species that the plan will protect. However, after notice and hearing, a regional HCP (including the mitigation fees and size of any proposed preserves) may be based partially upon recovery criteria applicable to the listed species covered by the regional HCP (Texas Parks and Wildlife Code § 83.105).

Chapter 83 also stipulates that governmental entities participating in a regional HCP demonstrate that adequate sources of funding exist to acquire the land for designated habitat preserves within four years of the date of permit issuance or within six years from the date of initial application, or the voters must have authorized bonds or other financing in an amount equal to the estimated cost of acquiring all of the land needed for habitat preserves within that

time frame (Texas Parks and Wildlife Code § 83.013). The deadline is calculated from the time a particular parcel is designated as proposed habitat preserve, a provision that may allow governmental entities flexibility to acquire preserves on a phased basis as the plan is implemented.

Finally, state law imposes a requirement that before adopting a regional HCP, plan amendment, ordinance, budget, fee schedule, rule, regulation, or order with respect to a regional HCP, the plan participant must hold a public hearing and publish notice of such hearing in the newspaper of largest general circulation in the county in which the participant proposes the action. Such notice must include a brief description of the proposed action and the time and place of a public hearing on the proposed action. The plan participant must publish notice in accordance with the foregoing requirements, and must do so not later than the thirtieth day prior to the public hearing (Texas Parks and Wildlife Code § 83.019).

1.4 Decision Needed

Based upon a biological and environmental analysis, the Service will determine whether to issue an ESA Section 10(a)(1)(B) incidental take permit to Hays County authorizing take of the covered species and the implementation of the Hays County RHCP.

2.0 SCOPING AND PUBLIC PARTICIPATION

"Scoping" is the process conducted by the agency preparing an EIS to identify the range of actions, alternatives, and impacts to be considered in the EIS as required by NEPA (40 CFR 1508.25).

NEPA requires a specific process for scoping that usually includes notice in the Federal Register, a public scoping meeting, and a public comment period. In addition to the formal scoping process, Hays County sought other types of public participation to provide guidance on the development of the RHCP, including the formation of advisory committees and the creation of a project website to distribute information to interested parties.

2.1 Public Scoping

2.1.1 Formal Scoping Process

Formal scoping for this EIS began on May 16, 2008 with the publication of a Notice of Intent (NOI) to prepare the EIS in the Federal Register (Appendix A). The NOI described the proposed Federal action (i.e., issuance of an incidental take permit for the Hays County RHCP) and the purpose and need for the action. The NOI also announced a public scoping meeting that was held on June 18, 2008 in San Marcos, Texas. In addition to the Federal Register notice, notices of the public scoping meeting were published in area newspapers, including *The Daily Record*, San Marcos, Texas (June 4, 2008) and the *Hays County Free Press*, Kyle, Texas (June 4, 2008) (Appendix A). These public notices were an invitation to the general public to become involved in the scoping process for the EIS.

The NOI and the media notices informed the public of the scoping meeting date and location, solicited written comments on the scope of the EIS, and provided contact information for Service and County personnel associated with the RHCP. The information was also posted on the Hays County RHCP website and notification was sent to local, State, and Federal elected and public officials and agencies in the surrounding areas. The mailing list and a copy of the scoping letter are included in Appendix A**.** Notification of the public scoping meeting and the opening of the public comment period for scoping comments were also sent to interested individuals subscribed to the RHCP's email list.

Six members of the public attended the public scoping meeting, which consisted of an Open House followed by a brief welcome and overview of the NEPA process and scoping by the Service. Handouts and exhibits were also available to attendees during the meeting (Appendix A). The public was given the opportunity to make comments on the scope of the EIS and a court reporter was available to record verbal comments. In addition to verbal comments, comment forms were provided to attendees and collected during the meeting.

Contact information for the Service was provided to allow attendees to submit written comments via regular mail after the meeting.

The official scoping comment period for the EIS was open from May 16, 2008 to July 18, 2008.

2.1.2 Public Scoping Comments and Responses

The Service received four comments from the public during the public scoping meeting: one verbal comment transcribed by a court reporter and three written comments submitted during the scoping meeting. Copies of the comments from the public scoping meeting are included in Appendix A. No other comments were received by the Service. The issues raised by the public during the EIS scoping period are summarized below, along with the responses from the Service and the County's RHCP project team.

1) "I'm the city engineer for the City of Dripping Springs. And the -- some of the questions we had, or the comments, was like, we'd just like to know basic things like what is the role of the city and its citizens. What role do we have in compliance? And -- you know, what are the expectations for the city during this conservation plan process And those are just basic questions, because we're not here to represent the council. They don't have any like -- you know, any special interests. We're just here to kind of find out and report back to them. So those are just basic questions that I would put on my comment card." *Rick Coneway, P.O. Box 384, Dripping Springs, Texas 78620*

   Response:

   As the Hays County RHCP is currently conceived, municipalities within Hays County will have no specific obligations under the RHCP. However, the County envisions active collaboration with municipalities in the balance of the RHCP development process and in a number of respects after plan adoption. For example, municipalities may direct participants in the plan to gain authorization for building or infrastructure projects that could harm covered species. In addition, the municipalities can play an important role in helping to educate the public and developers about species issues and the availability of the RHCP. There may also be circumstances in which the County, a municipality, and other stakeholders may cooperate in the establishment and maintenance of preserves under the RHCP. This would, of course, be accomplished through the execution of one or more appropriate interlocal agreements. County consultants are also available to make presentations to municipal governing and planning bodies regarding the RHCP and how it may benefit the municipalities.

2) "I believe that the Hays County HCP consultants, citizen's advisory committee, and biological advisory team have thought of pretty much every issue that needed to be considered in the HCP. I am especially interested in being sure that our aquatic resources, recharge zone areas, and aquatic endangered species are protected in this HCP process for

the golden cheeks & black caps. Or at least, not harmed. I hope the HCP will help us move quickly to conserve land to protect our hill country in our county." *Dianne Wassenich, 11 Tanglewood, San Marcos, Texas 78666*

Response:

Comment noted.

3) "I support the development and implementation of a Hays County HCP to protect not only endangered bird species but aquatic species and plants." *Commenter did not identify.*

Response**:**

Comment noted.

4) "The alternative of large-scale conservation is the best & strongest for the county. I support the idea of partnering with Comal County to strengthen the HCP. The drive toward parcel identification should simultaneously look at larger, cheaper tracts further out in the county as well as looking at more expensive, but valuable tracts that will soon be developed. Big picture & vision is important in setting the strategy." *Commenter did not identify.*

Response**:**

Comment noted.

2.1.3 Public Hearing Comments and Responses

The final draft RHCP and the accompanying Draft Environmental Impact Statement (DEIS) were noticed for availability in the Federal Register on November 2, 2009. A public hearing on the draft documents was held in San Marcos on November 18, 2009, and the public comment period closed on February 1, 2010. The Service granted an extension to the comment period to the Environmental Protection Agency, which closed on February 11, 2010.

Three sets of comments on the RHCP were received from the public. No comments on the RHCP or the DEIS were received from government agencies. Below is a summary of the comments received and a response to each.

COMMENTER: James Buratti (1901 Uhland Road, San Marcos, TX 78666)
SUBMITTED: November 17, 2009 via written comment collected at the public hearing

COMMENT SUMMARY: Commenter is concerned about restrictions on public access to conservation lands, and believes that the plan calls for a "de facto ban" on public access to preserves. Commenter asserts that the variety of recreational activities listed as examples of "active uses" have not been shown to be harmful to the endangered species and habitats protected by the plan, and refers to Stake (2000) as evidence that bicycles in golden-cheeked warbler habitat do not impact breeding or nesting success of the species. Commenter suggests that hiking, biking, and equestrian trails can be built to avoid impacts to water quality and habitat, and suggests that seasonal access restrictions would minimize or eliminate impacts to the

golden-cheeked warbler and black-capped vireo. Commenter questions whether aquatic recreational activities would also be banned in preserves.

COMMENT RESPONSE: The RHCP provides for public access to preserves on a case-by-case basis, at the consent of the preserve owner and with prior approval by the USFWS. An approved land management plan that addresses public access and baseline species and habitat monitoring surveys (including a territory mapping survey, a habitat occupancy survey, and a habitat survey) must also be completed prior to any public access of RHCP preserves. The RHCP also provides that some active uses of the preserve system may be allowed (again, on a case-by-case basis with USFWS approval) if impacts to the species are appropriately mitigated. Further, given the distribution of habitat for the golden-cheeked warbler and black-capped vireo across the landscape in Hays County, it is likely that preserves will include some areas that may not currently be suitable habitat for the covered species. These areas may create good opportunities for incorporating public access to preserves. Hays County, preserve parcel owners, and the USFWS will continue to coordinate during RHCP implementation to seek opportunities for public access of preserve lands that do not negatively affect the conservation value of the preserves for the covered species.

COMMENTER: Andrew Hawkins, Save Our Springs Alliance
SUBMITTED: November 18, 2009 via oral comment collected at the public hearing and recorded in the meeting transcript

COMMENT SUMMARY: Commenter is concerned that Hays County will have little discretion under the RHCP to refuse participation for certain projects. Commenter notes that the County should have the discretion to refuse participation by "bad developments" that might be able to meet the required mitigation ratios, but that would have undesirable effects on the community, aquatic species not covered by the RHCP, or other unforeseen effects. Commenter suggests that the County should be able to base mitigation requirements on factors such as important habitat for non-covered species and water quality concerns, in addition to impacts to the covered species.

COMMENT RESPONSE: The RHCP currently gives Hays County the discretion to modify the participation process in a variety of ways to enable the County to achieve the goals and objectives of the RHCP, including the discretion to deny participation in the plan (see Section 7.4.5), to adjust the mitigation ratios required for participation in the plan (see Section 7.4.4), and to adjust the per credit fee charged to plan participants (see Section 7.4.7.1). These discretionary provisions will give the County the flexibility to fine-tune participation in the RHCP and adapt to future circumstances. It is important to note that participation in the plan is the primary factor that will drive the need for and funding/implementation of the beneficial conservation actions described in the RHCP. The purpose of the RHCP is to provide for a streamlined method of achieving compliance with the Endangered Species Act for otherwise lawful activities, but participation in the plan by the community is voluntary. Therefore, robust participation will be needed for the plan to achieve the goal of protecting 10,000 to 15,000 acres of endangered species habitat in Hays County. Finally, Chapter 83 of the Texas Parks and Wildlife Code requires that mitigation fees required of RHCP participants be based on the amount of harm to

the endangered species protected by the plan (in this case, the golden-cheeked warbler and black-capped vireo) and does not allow the County to use the RHCP to require mitigation for other species or natural resources (see Section 83.015 of Chapter 83 of the Texas Parks and Wildlife Code).

COMMENTER: Bill Bunch, Save Our Springs Alliance
SUBMITTED: February 1, 2010 via email to info@hayscountyhcp.com

COMMENT SUMMARY: Commenter urges reconsideration of prior comments submitted by Save Our Springs Alliance on RHCP drafts and emphasizes that Hays County's discretionary authority to deny participation in the RHCP is too narrow. Commenter suggests that replacing the text for "not conform with the goals *and* provisions of the RHCP" to "not conform with the goals *or* provisions of the RHCP" [emphasis added]. Commenter also suggests adding that participation may also be denied if doing so "is important to protecting wildlife habitat, aquifer recharge, water quality, or meeting other community goals, including but not limited to managing traffic, or protecting historic or natural or cultural heritage resources."

COMMENT RESPONSE: We have made the requested revision regarding changing "and" to "or" when describing the County's discretion to deny participation in the RHCP. When describing this discretion in Section 7.4.5, we have also highlighted the protection of habitats for the covered species as one of the goals of the RHCP. Please see the response to the earlier comment addressing discretionary authority.

2.2 Other Public and Stakeholder Involvement

2.2.1 Stakeholder and Technical Advisory Committees

In addition to the public scoping process, Hays County also instituted two advisory committees: the Citizens Advisory Committee (CAC) and the Biological Advisory Team (BAT).

2.2.1.1 Citizens Advisory Committee

The CAC was composed of 17 individuals appointed by the Hays County Commissioners' Court in accordance with state law (Texas Parks and Wildlife Code Chapter 83).

Appointed CAC members included:

Hays County Landowners

- Ms. Catherine Livingston
- Mr. Henry Brooks
- Mr. Chris Carson
- Mr. William Avera
- Mr. T.J. Higginbotham - CAC Assistant Chairperson
- Mr. Scott Johnson

Real Estate, Land Development, and Other Business Interests

- Mr. Chuck Lemmond (homebuilder)
- Mr. Jeff Wilkinson (Pioneer Community Bank)

- Mr. David Goodrum (Wilson Family Communities)

Government and Utilities

- Ms. Melanie Pavlas Snyder (Lower Colorado River Authority)
- Dr. Todd Voetler (Guadalupe-Blanco River Authority)
- Dr. Glenn Longley (Texas State University)

Conservation and Environmental Groups and Individuals

- Ms. Melinda Mallia - CAC Chairperson
- Ms. Melanie Howard (City of San Marcos Parks and Recreation Department)
- Ms. Dianne Wassenich (San Marcos River Foundation)
- Mr. David Baker (Wimberley Valley Watershed Association)

Texas Parks and Wildlife Department

- Ms. Kathy Boydston

CAC meetings were posted and open to the public, as directed under the Texas Open Meetings Act, and all work products of the CAC, as well as information presented at the CAC meetings were available to the public in accordance with the Texas Open Records Act. Meeting notices were announced to interested individuals subscribed to the RHCP's email list, and agendas, minutes, and other materials were posted on the Hays County RHCP website. Members of the CAC met eight times prior to the June 2008 public scoping meeting (Table 2-1).

Table 2-1. Hays County RHCP CAC Meetings.

Meeting Date	Key Issues Discussed[1]
July 5, 2007	▪ Hays County natural resources ▪ Report on the Endangered Species Act ▪ Report on the Hays County RHCP Work Plan ▪ BAT appointments ▪ Adoption of protocol for citizens' comments
September 13, 2007	▪ Selection of CAC Chair and Co-Chair ▪ Appointment of CAC representative to the BAT ▪ Legal requirements of RHCPs in Texas and the primary provisions of other RHCPs ▪ Baseline study of sensitive natural resources and species in Hays County
October 11, 2007	▪ Presentation regarding Edwards Aquifer Recovery Implementation Program and the Balcones Canyonlands Conservation Plan ▪ Draft Hays County RHCP outline ▪ Options for species to include in the RHCP ▪ Options for Hays County RHCP development

Table 2-1. Hays County RHCP CAC Meetings.

Meeting Date	Key Issues Discussed[1]
November 8, 2007	▪ Conceptual options for the Hays County RHCP ▪ Species coverage under the Hays County RHCP ▪ Draft Hays County RHCP outline
January 10, 2008	▪ Species coverage under the Hays County RHCP ▪ Presentation regarding Williamson County RHCP ▪ Conceptual options, potential cost, and possible funding mechanisms
February 20, 2008	▪ Status of Hays County Parks and Open Space Bond, Hays County Citizens Park Advisory Team, Hays County's Memorandum of Agreement with the Trust for Public Land, and possible coordination with the RHCP effort ▪ Hays County RHCP completion, anticipated tasks, and necessary CAC input ▪ Possible Hays County RHCP scenarios and potential cost
March 27, 2008	▪ Updated information on the San Marcos salamander ▪ Presentation regarding golden-cheeked warbler and black-capped vireo habitat ▪ Possible Hays County RHCP scenarios and conservation strategy
June 12, 2008	▪ Presentation regarding the Parks and Open Space Bond allocation process ▪ Hays County RHCP funding ▪ Draft Hays County RHCP
September 11, 2008	▪ Proposed RHCP funding measures and options ▪ Comments submitted on the draft RHCP ▪ Concerns regarding treatment of aquatic species in the RHCP
October 9, 2008	▪ Proposed RHCP funding measures ▪ Proposed RHCP mitigation ratios and preserve design criteria ▪ Treatment of aquatic species in the RHCP
November 13, 2008	▪ Presentation regarding Ashe juniper and water resources ▪ Recommendation for approval of draft RHCP for submittal

[1]Minutes for all meetings can be found on the Hays County RHCP website at www.hayscountyhcp.com/team_cac.

2.2.1.2 Biological Advisory Team

The BAT was composed of six individuals appointed by the Hays County Commissioners Court, including one individual put forth by the landowner members of the CAC. The BAT also included a chairperson who was appointed by the Texas Parks and Wildlife Commission.

BAT members included:

- Dr. Craig Farquhar, Texas Parks and Wildlife Department (expertise in avian ecology) – BAT Chairperson
- Mr. Lee Elliott, The Nature Conservancy (expertise in endangered species and conservation biology)
- Mr. Randy Gibson, USFWS National Fish Hatchery and Technology Center in San Marcos (expertise in aquatic resources)
- Mr. Cal Newnam, Texas Department of Transportation (expertise in endangered species biology)
- Ms. Terri Siegenthaler, Shield Ranch (expertise in natural resource management)
- Mr. Garry Stephens, USDA Natural Resources Conservation Service (expertise in land management)
- Ms. Linda Laack, Environmental Defense Fund (CAC landowner member appointee)

The BAT was charged to assist Hays County with the calculation of harm to the endangered species and the sizing and configuring of the habitat preserves, in accordance with state law (Texas Parks and Wildlife Code Chapter 83). BAT meetings were open to the public as directed under the Texas Open Meetings Act., and all work products of the BAT were available to the public under the Texas Open Records Act. Meeting notices were announced to interested individuals subscribed to the RHCP's email list, and agendas, minutes, and other materials were posted on the Hays County RHCP website. Members of the BAT met seven times prior to the June 2008 public scoping meeting (Table 2-2).

Table 2-2. Hays County RHCP BAT Meetings.

Meeting Date	Key Issues Discussed[1]
October 9, 2007	▪ BAT responsibilities ▪ Hays County RHCP Work Plan ▪ ESA Requirements, Texas law requirements, and primary provisions of other RHCP's ▪ Presentation on the baseline study of sensitive natural resources and species in Hays County

Table 2-2. Hays County RHCP BAT Meetings.

Meeting Date	Key Issues Discussed[1]
November 1, 2007	▪ Briefing on species covered by the Balcones Canyonlands Conservation Plan ▪ Assessment and consideration of options for species coverage in the Hays County RHCP ▪ Briefing on habitat identification for the golden-cheeked warbler, black-capped vireo, and karst invertebrates
December 6, 2007	▪ Briefing on habitat identification for the golden-cheeked warbler, black-capped vireo, and karst invertebrates ▪ Assessment and consideration of options for species coverage in the Hays County RHCP
January 8, 2008	▪ Edwards Aquifer Recovery Implementation Program ▪ Assessment and consideration of options for species coverage in the Hays County RHCP ▪ Biological consideration for species protection and preserve design ▪ Progress of the Hays County RHCP planning process and decision points
February 28, 2008	▪ Options for species coverage in the Hays County RHCP ▪ Presentation regarding the Hays County RHCP alternatives ▪ Progress on habitat maps and proposed habitat determination process ▪ Preserve design criteria
March 28, 2008	▪ Options for species coverage in the Hays County RHCP ▪ Progress on habitat maps and proposed habitat determination process ▪ Preserve design criteria
June 3, 2008	▪ Options for species coverage in the Hays County RHCP ▪ Golden-cheeked warbler habitat map ▪ Draft Hays County RHCP
September 16, 2008	▪ Discussion regarding Ashe juniper and water resources ▪ Review habitat mapping efforts ▪ Review comments on draft RHCP
November 18, 2008	▪ Review comments on draft RHCP ▪ Discuss habitat assessment criteria and mitigation ratios ▪ Recommend approval of the draft RHCP for submittal

[1]Minutes for all meetings can be found on the Hays County RHCP website at www.hayscountyhcp.com/team_bat.

2.2.2 Hays County RHCP Website

Throughout the development of the Hays County RHCP, a website was maintained to offer more opportunities to keep the public and interested stakeholders informed of the process and progress of the project (www.hayscountyhcp.com). The website served as a repository for information on the time and location of CAC and BAT meetings, the status of the project (including the RHCP work plan and progress reports), maps and documents supporting the RHCP, agendas and minutes of CAC and BAT meetings, project team information, and contact information. The website also served as a vehicle for interested persons to send comments, to ask questions, and to join an email list regarding the RHCP.

2.3 Alternatives Development

Federal regulations require that we examine all reasonable alternatives to the proposed action that the applicant considered, including "no action" (40 CFR 1502.14). The No Action analysis is needed to provide a benchmark against which the environmental effects of the "action" alternatives can be measured. Reasonable action alternatives include those that are practical or feasible to implement from a technical and economic perspective, or that may be considered reasonable based on "common sense" (per CEQ's "NEPA's Forty Most-Asked Questions," published with the Service's NEPA Reference Handbook).

There are no rules that dictate the precise method of mitigation that must be included in an HCP. The Service has approved various approaches to mitigation developed in regional HCPs in response to particular circumstances. Rather than require a certain approach, the Service's HCP Handbook states generally that mitigation programs should be based on sound biological principles and must be "commensurate with the impacts they address" (USFWS and NMFS 1996).

The alternatives considered during development of the proposed Hays County RHCP and preparation of this EIS were initially identified from a review of other regional HCP models used in Texas and elsewhere across the country. These models include three general approaches for mitigating impacts to covered species: pre-determined preserves, conservation banks, and regulatory programs.

Under the pre-determined preserve design model, the regional HCP would identify and delineate a "target area" for preserve acquisition. Within this pre-determined target area, the applicant would agree to acquire or otherwise protect a certain amount of habitat for the species covered by the plan. Development would be allowed outside the designated target preserve area through participation in the regional HCP or through individual ESA authorizations. Projects on land within the target preserve area would not be allowed to participate in the regional HCP, but could seek individual ESA authorizations through the Service. This type of plan is premised on protecting an appropriate amount of high-quality habitat up-front, such that the impacts of development in the remainder of the permit area (up to the limit of authorized incidental take)

would be adequately minimized and mitigated and the continued existence of the species would not be jeopardized. The Balcones Canyonlands Conservation Plan in Travis County, Texas and the Riverside County and San Diego Multispecies Conservation Plans in California are examples of regional HCPs based on this model.

In contrast, a conservation banking model for a regional HCP does not designate a "target area" for preserve acquisition. Instead, the applicant would preserve, through a series of transactions over time, parcels of high quality habitat for the covered species within the permit area and receive "credits" from the Service that could be "banked" for future use or sale to other entities. The applicant would coordinate with the Service to determine the appropriate method for establishing the number of credits that would be associated with each parcel protected through the bank. In addition, the applicant would coordinate with the Service to develop a habitat assessment process to determine the number of credits that would be required for a participating entity to adequately mitigate for impacts to the covered species from a particular project. The regional HCP would describe the processes for establishing mitigation credits and assessing mitigation needs for participants, instead of identifying specific properties for potential acquisition. The administration of a regional HCP with a conservation banking strategy requires that the credits be carefully and accurately tracked to ensure the proper administration of the bank.

Another approach for structuring a regional HCP is based on regulations designed to either require or provide an incentive for the conservation of endangered species.

2.3.1 Alternatives Considered for Detailed Study

Hays County considered specific regional HCP alternatives based on the pre-determined preserve and conservation banking models. The County considered the following four alternatives, which are included in the EIS for detailed study:

- No Action – Under this alternative, the Service would not issue an incidental take permit to Hays County and Hays County would not implement a regional HCP. Population growth and development would likely continue as forecast and under the No Action Alternative, and there would be no countywide conservation effort.
- Proposed Hays County RHCP – This alternative is a regional HCP with a phased conservation banking approach. Under this alternative, the County would acquire habitat preserves over the duration of the plan (with a target acquisition goal of between 10,000 and 15,000 acres) and bank mitigation credits for the covered species. The County would then be able to use for its own projects or sell to RHCP participants a corresponding amount of incidental take authorization for the covered species in Hays County. The total amount of incidental take authorization that would be allowed under this alternative would

be sufficient to cover the anticipated need for such authorization based on estimates of land development, impacts to habitat for the covered species, and RHCP participation.

- Moderate Preserve/Limited Take – This alternative features the acquisition of a modestly sized, pre-determined preserve system and limits the amount of incidental take that would be authorized by the incidental take permit. This alternative illustrates a conservation program that could be relatively easy for the County to afford, but (due to the relatively smaller size of the preserve system compared to the proposed RHCP) might not satisfy the anticipated need for incidental take authorization over the duration of the plan.
- Large-scale Preserve System – This alternative involves a conservation program that utilizes a pre-determined preserve approach. Under this alternative, the preserve system would be large enough to authorize the incidental take of any remaining golden-cheeked warbler or black-capped vireo habitat in Hays County outside of the target acquisition area of the preserve system during the duration of the plan.

2.3.2 Alternatives Not Considered for Detailed Study

Two potential alternatives were contemplated, but not considered for detailed study:

2.3.2.1 Regulatory Alternative

As mentioned above, one approach to providing mitigation for a regional HCP is a plan based on regulations designed to either require or provide an incentive for the conservation of endangered species habitat. This approach is not a realistic option for Hays County for several reasons, and was therefore not considered for detailed study in this EIS.

First, Texas counties have limited authority to regulate land use, pursuant to the Texas Constitution. In addition, Chapter 83 of the Texas Parks and Wildlife Code contains a number of specific limitations on the authority of local government to regulate activities for the benefit of endangered species. For example, Section 83.014 of the Texas Parks and Wildlife Code prohibits governmental entities from imposing a "regulation, rule, or ordinance related to endangered species unless the regulation, rule, or ordinance is necessary to implement [a RHCP] for which the governmental entity was issued a Federal permit." The only exception to this prohibition is for regulations that involve groundwater withdrawal. A governmental entity also is prohibited from discriminating against a permit application, and is prohibited from denying a request for utility, water, or wastewater service to land that has been designated a habitat preserve for a regional HCP or as critical habitat for endangered species. Finally, governmental entities are precluded from requiring that a landowner pay a mitigation fee or take any other action as a condition for obtaining a government approval not related to the regional HCP.

In short, the County's ability to pass regulations for the purpose of protecting endangered species is extremely limited, therefore the regulatory approach was not considered for detailed study.

2.3.2.2 County-only Regional HCP

Under this alternative, Hays County would develop a regional HCP that would only cover impacts to the covered species associated with the activities of the County, such as road construction and maintenance, and flood control projects. While Hays County does occasionally require ESA authorization for its infrastructure projects, it was determined that the long-term demand associated with only County projects would be insufficient to establish a meaningful preserve system for the covered species. In addition, this alternative would not materially reduce the Service's workload relating to ESA authorizations within Hays County, nor would this alternative have the effect of encouraging broader ESA compliance by providing more efficient compliance alternatives for other governmental and non-governmental entities within the county. For the foregoing reasons, this alternative was rejected for further analysis.

3.0 ALTERNATIVES CONSIDERED FOR STUDY

3.1 Description of Alternatives Considered for Study

The No Action alternative reflects the status quo, where the Service does not issue Hays County an incidental take permit and Hays County does not implement a regional HCP. The No Action alternative evaluates projected future conditions against current conditions.

The three action alternatives considered for detailed study are based on a regional HCP framework and have several common elements, including:

- The Plan Area will include all of Hays County;
- The plan duration and permit term will be 30 years from the date of approval (i.e., 2010 through 2039);
- The species covered for incidental take include the golden-cheeked warbler and black-capped vireo;
- The projected area of potential habitat loss for the covered species in Hays County over the duration of the plan would be approximately 22,000 acres for the golden-cheeked warbler and 3,300 acres for the black-capped vireo;
- The typical criteria for a preserve block includes a minimum size of approximately 500 acres;
- The preserve system would be assembled with a mix of fee simple land acquisitions and conservation easements;
- Mitigation credit from preserve acquisitions would be generated based on the amount of potential habitat for covered species on a preserve parcel, typically at a rate of one credit for each acre of potential habitat;
- The County will commit to perpetual monitoring and management of preserves;
- Voluntary participation in the plan that is open to all project proponents whose projects could impact the covered species within Hays County;
- Mitigation for project participants would be assessed based on the amount of potential habitat directly or indirectly impacted by a particular project and paid as a per-acre fee or, in certain circumstances, as land in lieu of fees;
- Seasonal clearing restrictions and oak wilt prevention measures for plan participants to minimize impacts of authorized take on the covered species;
- The County will implement education and outreach programs related to endangered species issues in Hays County and ESA compliance and would

request endangered species information from applicants during the development review process; and

- Funding for plan implementation would be generated by participation fees and contributions from the Hays County general fund. Additional funds and/or land may also be sought from grants, charitable and planned giving, and other sources.

3.1.1 Alternative A – No Action

Under the "No Action" alternative, Hays County would not seek and the Service would not issue an incidental take permit, and Hays County would not implement a regional HCP.

Under this alternative, Hays County would continue to be responsible for compliance with the ESA with respect to County projects. Such projects could include the construction or widening of county roads, the upgrading of low water crossings or bridges, and the construction of new county facilities. Compliance with the ESA under the No Action alternative would occur on a project-by-project basis. The County would not provide assistance to other public or private entities seeking to comply with the ESA, nor would the County be involved in efforts to consolidate mitigation from different permitting actions across the county.

For each county-sponsored project that could affect endangered species, the County would be responsible for identifying potential habitat in the project area and conducting species surveys to estimate potential impacts. The County would need to coordinate directly with the Service to determine mitigation needs and obtain incidental take authorization for each project. The County would also need to identify and obtain appropriate conservation land or other forms of mitigation for each project where mitigation for incidental take was required.

Because mitigation for both County and private activities would be assessed on a project-by-project basis, it is likely that mitigation requirements for individual projects would be higher than under a more coordinated conservation approach. Nevertheless, the resulting mitigation lands would likely be small and scattered across the county, since each mitigation commitment would be tailored to the needs of a single, specific project. It is possible that mitigation for County projects could also be obtained outside of the County.

Management and monitoring of relatively small and isolated preserves could be more difficult and costly under the No Action alternative. More intensive management and monitoring could be needed to maintain the mitigation value of these smaller preserves.

Due to the limited conservation value of a system of relatively small and isolated preserves, it is likely that public access to any preserves acquired through individual County ESA authorizations under the No Action alternative would not be allowed.

Under the No Action alternative, Hays County would have no involvement with or responsibility for the actions of non-county entities with respect to ESA compliance. Hays

County would not dedicate staff or funds to assisting the public with compliance and would have no obligation to provide mitigation for incidental take caused by entities other than the County. Like Hays County, other project proponents in the county would be responsible for determining whether compliance with the ESA is necessary for a particular project and individually negotiating with the Service to obtain authorization for incidental take. Individual compliance with the ESA through a Section 7 consultation or a Section 10 incidental take permit is often a time consuming and costly process.

The No Action alternative does not include a public education and outreach component by the County to increase awareness of endangered species issues, provide information on how to minimize impacts to covered species, or facilitate ESA compliance for other entities.

3.1.2 Alternative B – Hays County RHCP (Proposed Alternative)

The Hays County RHCP incorporates the County's preferred conservation strategy of establishing a conservation bank that would be assembled on a phased basis with a target acquisition goal of 10,000 to 15,000 acres over the 30-year duration of the plan. Under this alternative, the County would seek incidental take authorization for the covered species that would be sufficient to cover the anticipated need from County projects and RHCP participants, based on estimates of projected habitat loss for the covered species during the duration of the plan and assumptions regarding the amount of participation in the RHCP.

The Hays County RHCP would include all of the provisions common to the three action alternatives, as listed above in Section 3.1.

The County would assemble a preserve system on a phased basis, banking mitigation credits for the covered species as parcels are acquired. The preserve acquisitions would generate mitigation credits based on the number of acres of potential habitat protected for the covered species. Typically, each acre of potential habitat within a preserve parcel would generate one mitigation credit for the RHCP. The credits could be used by the County or sold to plan participants. However, the County would not be able to use or sell more mitigation credits than had been previously created or "banked" by preserve acquisitions.

The Hays County RHCP could provide incidental take authorization for up to 9,000 acres of impact to golden-cheeked warbler habitat and 1,300 acres of black-capped vireo habitat in Hays County. The amount of the total take authorization was based on the projected amount of potential habitat loss in Hays County over the 30-year plan duration and an estimated participation rate in the RHCP of approximately 33 percent for private-sector projects and approximately 75 percent for public-sector projects. Public-sector projects that occur in the RCHP Plan Area may include those proposed by Hays County or other public entities such as cities, the State, municipal utility districts, school districts, and similar entities. The estimated participation rates are based on the general experience of the Balcones Canyonlands Conservation Plan in adjacent Travis County and expectations of higher levels of ESA

compliance in Hays County due to the availability of a streamlined compliance alternative and more visible enforcement of the ESA by the Service. As such, Hays County determined that these estimated participation rates were reasonable for the purpose of forecasting the approximate amount of incidental take authorization that could support operation of the RHCP for the 30-year duration of the plan.

Since it is likely that most large tracts suitable for inclusion in the preserve system would contain a mosaic of habitat and non-habitat areas, the preserve system may ultimately include approximately 10,000 to 15,000 acres in order to generate sufficient mitigation credits to meet the anticipated need for incidental take authorization under the plan (the funding plan illustrated in the RHCP is based on a preserve size of 12,000 acres).

Public access to preserves may be allowed where the biological value of the protected habitat would be preserved. The RHCP would also provide funding for new research to support the conservation of one or more of the evaluation species addressed in the RHCP.

3.1.3 Alternative C – Moderate Preserve System with a Take Limit

One of the regional alternatives considered by Hays County features the acquisition of a pre-determined, modestly sized preserve system of approximately 3,000 acres and limits the amount of incidental take authorized by the permit. This alternative illustrates a conservation program that could be relatively easy for the County to afford, but would likely not satisfy the anticipated need for incidental take authorization over the duration of the plan.

The Moderate Preserve/Limited Take alternative would include all of the provisions common to the three action alternatives, as listed above in Section 3.1.

Under the Moderate Preserve/Limited Take alternative, Hays County would identify specific criteria for the location, configuration, habitat composition, and acquisition schedule of the 3,000-acre preserve system. The preserve system would be designed and managed to maximize the conservation value of the protected lands. Hays County would commit to acquiring a preserve system that met the all of the preserve design criteria described in the HCP.

In return for the commitment to acquire a well-designed preserve system that met the identified criteria, Hays County would be authorized to incidentally take a limited area of golden-cheeked warbler or black-capped vireo habitat outside of the pre-determined target acquisition area. The amount of habitat loss for the covered species that would be authorized under this alternative could be as much as approximately 3,600 acres (including approximately 3,240 acres of golden-cheeked warbler habitat impacts and approximately 360 acres of black-capped vireo habitat impacts). Increasing the amount of incidental take authorized under the Moderate Preserve/Limited Take alternative would require a major amendment of the incidental take permit.

The conservation program described in this alternative includes a pre-determined preserve system that identifies properties for possible acquisition that are not already owned by

the County. Therefore, implementing the Moderate Preserve/Limited Take alternative would trigger several provisions of Texas state law related to the development of regional HCPs by local governments. Under state law, the County would be required to acquire the targeted properties within six years of permit issuance.

Since maximizing the mitigation value of the preserve lands would be the primary goal of this conservation program, it is likely that public access to the preserves would not be allowed.

Due to the assumption that only limited financial resources would be available to implement the Moderate Preserve/Limited Take alternative, the plan would likely not allocate resources towards the study and conservation of other potentially rare or sensitive species in Hays County.

3.1.4 Alternative D – Large-scale Preserve System

The Large-scale Preserve System alternative would create a regional plan administered by Hays County with a conservation program utilizing a pre-designed preserve approach. Under this alternative, the preserve system would be large enough to authorize the incidental take of any remaining golden-cheeked warbler and black-capped vireo habitat in Hays County outside of the target acquisition area of the preserve system during the term of the permit.

The Large-scale Preserve alternative would include all of the provisions common to the three action alternatives, as listed above in Section 3.1.

Under the Large-scale Preserve System alternative, Hays County would identify specific criteria for the location, configuration, habitat composition, and acquisition schedule of the preserve system. The preserve system would be designed and managed to maximize the conservation value of the protected lands. Hays County would commit to acquiring a preserve system that met all of the criteria described in the plan.

Under this alternative, Hays County would assemble a pre-determined preserve system of 30,000 acres including areas of high quality potential habitat for the golden-cheeked warbler and black-capped vireo. For the purposes of this analysis, it is assumed that 90 percent of the preserve system will be managed for the golden-cheeked warbler (approximately 27,000 acres) and 10 percent will be managed for the black-capped vireo (approximately 3,000 acres). The County would be able to permit incidental take associated with the loss or degradation of the any of the remaining approximately 143,000 acres of potential golden-cheeked warbler habitat and approximately 20,000 acres of potential black-capped vireo habitat in Hays County during the term of the incidental take permit.

However, population growth and land development estimates indicate that not all of the remaining habitat is likely to be impacted during the duration of the plan. The County estimates that only approximately 22,000 acres of golden-cheeked warbler habitat and 3,300 acres of black-capped vireo habitat would be impacted by public or private-sector projects during the next 30 years.

The conservation program described in this alternative includes a pre-determined preserve system that identifies properties for possible acquisition that are not already owned by the County. As such, implementing the Large-scale Preserve alternative would trigger several provisions of Texas state law related to the development of regional habitat conservation plans by local governments. Under state law, the County would be required to acquire the targeted properties within six years of permit issuance.

Given the size of the preserve system proposed under this alternative, it is likely that limited public access to the preserves would be allowed.

Under this alternative, the County would also seek to include specific conservation measures for one or more of the other rare and/or endemic species in Hays County that are listed in Table 1-1. Conservation measures for these species could include specific management and monitoring provisions benefiting karst and/or aquatic species, research programs designed to increase the body of knowledge about these species and their habitats, and education or outreach programs to inform the public about issues concerning the threats to and conservation of these species.

3.2 Comparison of Alternatives

The primary characteristics of the four alternatives described above are summarized in Table 3-1.

Table 3-1. Comparison of the Alternatives Considered for Detailed Analysis.

Plan Characteristic	Alternatives			
	A - No Action	B - Hays County RHCP	C - Moderate Preserve/Limited Take	D - Large-scale Preserve
Conservation Strategy	Project-by-Project Consultations	Regional HCP with a Phased Conservation Bank	Regional HCP with a Pre-determined Preserve System	Regional HCP with a Pre-determined Preserve System
Incidental Take Authorization:				
GCW	unknown	9,000 acres	3,240 acres	143,000 acres
BCV	unknown	1,300 acres	360 acres	20,000 acres
Preserve Size	unknown	approximately 10,000 to 15,000 acres	3,000 acres	30,000 acres
Mitigation Ratio	likely 1 acre of mitigation for each acre of impact	typically 1 acre of mitigation for each acre of impact	typically less than 1 acre of mitigation for each acre of impact	typically less than 1 acre of mitigation for each acre of impact

Table 3-1. Comparison of the Alternatives Considered for Detailed Analysis.

Plan Characteristic	Alternatives			
	A - No Action	B - Hays County RHCP	C - Moderate Preserve/Limited Take	D - Large-scale Preserve
Education and Outreach Program	No	Yes (for all species included in Table 1-1)	Yes (only for covered species)	Yes (for all species included in Table 1-1)
Public Access to Preserves	Not Likely	Yes - with limitations	Not Likely	Yes – with limitations
Conservation of Other Species	Not Likely	Yes	Not Likely	Yes

4.0 AFFECTED ENVIRONMENT

4.1 Identification of the Affected Environment (Impact Topics)

The description of the affected environment establishes the current environmental conditions considered by the Service to be affected by the alternatives, including the Proposed Action (USFWS 2003). In addition, in accordance with 40 CFR 1502.15, the data and analyses presented in this EIS are commensurate with the importance of the impact, whereby less important material is summarized, consolidated, or simply referenced. If specific resources would not be affected or if the impacts would be negligible (i.e., the impact would be at a low level of detection), they are listed as "issues and impact topics considered but dismissed" and not described or analyzed in detail in the "Affected Environment" and "Environmental Consequences" sections of the EIS.

In identifying which resources have the potential to be affected by the alternatives, it is important to keep in mind that NEPA regulations require the analysis of "no action" as a benchmark that enables decision makers to compare the magnitude of environmental effects of the action alternatives (USFWS 2003). If no difference is anticipated between the future condition under the No Action alternative and the action alternatives, then there is no impact to analyze. It is imperative, therefore, to clearly understand and articulate the assumptions used in defining the effects of "no action."

In the case of this EIS, the No Action alternative is defined as the conditions that can be expected if the Service does not implement the proposed action (i.e., the issuance of an incidental take permit to support the Hays County RHCP) or one of the other action alternatives. Under the No Action alternative, the current trends projected for human population growth and associated land development in Hays County will continue and impacts to listed species would be authorized under existing Federal programs.

Neither the proposed RHCP nor the other action alternatives would take the place of existing ESA compliance mechanisms. Rather, the action alternatives provide a voluntary, alternative means of compliance with the ESA for many landowners and other public and private entities in Hays County, as well as for the County itself. Issuing the requested incidental take permit, therefore, is not an "indispensable prerequisite" or an "essential catalyst" for land development in the County, and only the most general causal relationship can be established between issuance of the Permit and potential impacts of development. Similarly, just as implementing an RHCP would not enable land development; failure to implement an RHCP would not impede development because alternative means of ESA compliance are available.

It is possible that the greater efficiency and lower cost of ESA compliance offered by the proposed RHCP or other action alternatives could affect the timing and footprint of specific projects in minor ways. For example, a landowner holding off from developing because of the

costs of obtaining an individual incidental take permit (i.e., costs related to legal and consulting fees for preparation of a habitat conservation plan and NEPA documentation) may decide to develop sooner were a regional HCP option to become available. Another landowner concerned that the time it takes to get an incidental take permit may cause a development project to "miss the market" or will stretch carrying costs too far, may determine that the availability of a regional HCP alleviates those concerns sufficiently to justify moving forward. And yet another landowner who is contemplating an avoidance strategy because it looks cheaper and faster than getting an incidental take permit may determine that participation in a regional HCP is sufficiently cost effective as to justify causing some minor habitat impacts.

In all of those scenarios, development happens either somewhat faster than the No Action alternative or there may be somewhat more impact to habitat than under the No Action alternative. Conversely, implementation of a regional HCP will encourage increased compliance with the ESA by providing a more efficient alternative for ESA authorization. The existence of the proposed RHCP or one of the other action alternatives may, in fact, reduce current levels of unpermitted and, therefore, unmitigated loss of habitat for the covered species. This increase in compliance and the associated mitigation provided with compliance may, in fact, offset any marginal increases in impact associated with a regional HCP causing some development to happen somewhat more quickly or with somewhat greater habitat impact.

These differences between the development scenarios under the No Action alternative and the regional HCP action alternatives, however, are likely to be minor for several reasons. First, the regional HCP alternatives are unlikely to induce market demand or in any other way be a "market maker" for development. Rather, the differences identified above operate at the margin of the economics of specific development projects that are being contemplated because of a complex matrix of economic, legal, and demographic factors affecting the market. It is unlikely that a developer would perceive of a regional HCP alone as justification for moving into the market, when those other factors do not support doing so. In other words, very few development projects rest exclusively on the speed and cost of ESA compliance as the primary justification for whether to engage in the development project.

Second, even for those projects for which ESA compliance is a driver in terms of the timing and footprint for the project, not all will necessarily find a regional HCP alternative to be more desirable than the other ESA compliance options. Finally, for those few projects that perceive of ESA compliance timing and cost as defining the tipping point for when to develop and how much habitat to impact, not all of them will find the difference a regional HCP makes in general to make the difference specifically for the project.

Overall, therefore, few projects are likely to find that a regional HCP makes all the difference in terms of when and where to develop. For these reasons, it is reasonable to assume that the regional HCP action alternatives, compared to the No Action alternative, will have only

minor impacts on the countywide extent, timing, and placement of development and any associated impacts to habitat for the covered species over the next 30 years.

This is a valid assumption since project proponents with endangered species issues will have the ability to complete their projects and remain in compliance with the ESA through currently available alternative means (e.g., avoidance of impacts or compliance via individual ESA authorizations). Project proponents may also complete development projects without regard for potential endangered species habitat, and thereby risk violation of Section 9 of the ESA.

Issuing the requested incidental take permit is not an indispensable prerequisite or an essential catalyst for economic development in Hays County. Therefore, a causal relationship cannot be established between issuance of the permit and the impacts of specific development or land use activities. This critical consideration limits the affected environment to those resources for which a causal relationship can be reasonably established between the resource and the take authorized by the requested permit, the proposed mitigation, or funding and administration of the regional HCP.

While Federal regulatory programs other than the ESA might trigger more comprehensive environmental assessment documentation in particular development project scenarios, it is unlikely that a countywide EIS-level review would be compiled for any one project or in the aggregate. By contract, this EIS provides and environmental impact assessment of relevant impacts for the No Action alternative and the action alternatives. Accordingly, and consistent with CEQ regulations, impacts are discussed in this EIS in proportion to their significance.

Section 4.1.1 of this EIS identifies those resources and issues that may be affected by the authorized take, proposed mitigation, or funding and administration of the action alternatives described in Section 3. These resources and issues that comprise the affected environment are described in detail in the sections below. Section 4.1.2 of this EIS identifies resources and issues that are not likely to be affected by the authorized take, proposed mitigation, or funding and administration of the action alternatives, and provides only enough discussion to show why more study is not warranted (40 CFR 1502.2(b)).

4.1.1 Impact Topics Identified for Detailed Analysis

The impact topics or components of the human environment that are likely to be affected or could potentially be affected beyond a negligible level by the authorized take, proposed mitigation, or funding and administration of the action alternatives are listed below. The area of potential effect of the action alternatives on the natural or socioeconomic resources analyzed in this EIS is Hays County, since the authorized take, proposed mitigation, and funding and administration of the action alternatives would occur only within Hays County. However, the potential significance of the effects of the action alternatives on the natural and

socioeconomic resources may depend on the overall context of a particular resource that could extend beyond the boundary of the county.

The impact topics described and analyzed in detail in this EIS are:

- Water Resources: Important surface and groundwater resources occur throughout Hays County, and water quality and quantity issues are generally a concern for Hays County citizens. These water resources may also be essential habitat components for some listed species (although listed aquatic species are not covered for incidental take under the action alternatives). Water resources, where they overlap with potential habitat for the covered species, could be affected by activities that result in authorized incidental take of the covered species (primarily activities resulting in habitat loss) or by conservation measures proposed under the action alternatives.
- Vegetation: Vegetation could be affected within Hays County with the implementation of an action alternative, since take of the covered species would be expressed as a specified number of acres of potentially suitable habitat lost or modified, and because mitigation for that take would be the preservation and management in perpetuity of an equivalent amount of suitable habitat for the covered species.
- General Wildlife: Wildlife occupying the habitats that would be lost or modified as a result of activities covered for incidental take and areas protected and managed as mitigation could be affected by the action alternatives.
- Covered Species, Evaluation and Additional Species, and Other Special Status Species: Special status species include the two covered species, 40 evaluation species, 16 additional species, and a variety of other "special status" species in Hays County, such as the listed species in Hays County that are not addressed by the regional HCP alternatives. These species could be affected by the action alternatives in relation to the habitats that would be taken and protected.
- Socioeconomic Resources: While implementation of the action alternatives is not expected to affect overall county-wide trends for population growth, demographics, income, employment, or housing in Hays County (as described later, these socioeconomic factors are driven more by regional economic conditions than by local activities), these aspects of the human environment are important to understanding the interaction between people and the natural environment. Thus these resources are considered in the analysis below. The action alternatives could also affect the ability of the County to provide services and could affect the cost of ESA compliance for project proponents in Hays County and for the Service.

4.1.2 Issues and Impact Topics Considered but Dismissed from Detailed Analysis

The Proposed Action is issuance of an incidental take permit to Hays County that would authorize the incidental take of the golden-cheeked warbler and black-capped vireo in Hays County under a regional HCP. As described in Section 4.1, issuing an incidental take permit to Hays County under one of the action alternatives is not an indispensable prerequisite or an essential catalyst for economic development in Hays County. Therefore, this EIS assumes that the regional HCP action alternatives, compared to the No Action alternative, will have only minor impacts on the countywide extent, timing, and placement of development and any associated impacts to habitat for the covered species over the next 30 years. Since a causal relationship cannot be established between issuance of the permit and the impacts of specific land development or land use activities, the affected environment is limited to those resources for which such a relationship can be reasonably established between the resource and 1) the take authorized by the requested permit; 2) the proposed mitigation; or 3) funding and administration of the regional HCP. If specific resources would not be affected by the action alternatives or if the impacts would be negligible compared to the No Action alternative (i.e., the impact would be at a low level of detection), they are addressed in this section of the EIS as "issues and impact topics considered but dismissed."

In accordance with the criteria for implementing NEPA (40 CFR 1500), the Service has determined that the resources discussed in this section are not likely to be affected by the authorized take, proposed mitigation, or funding and administration of the action alternatives described above. As stated in the CEQ regulations for preparing an EIS (40 CFR 1502), impacts shall be discussed in proportion to their significance, and there shall be only brief discussion of issues that are not significant. Consequently, the remaining resources are not described or analyzed in detail in this EIS.

Several of the resources or issue topics listed below could be affected by individual land development or land use activities conducted by potential RHCP participants. However, for the reasons explained in Section 4.1 above, issuance of the incidental take permit cannot be shown to cause such impacts, even indirectly, because the same activities could (and would likely) proceed under all of the alternatives, including the No Action alterative. Therefore, issuance of the permit is not reasonably and foreseeably likely to cause more than negligible potential impacts to the following topics discussed below.

4.1.2.1 Energy and Depletable Resource Requirements and Conservation Potential

The regional HCP alternatives considered in this EIS do not have an energy or resource extraction component and would not require more or less energy or depletable resources than the No Action alternative. Therefore, these topics are dismissed from further analysis.

4.1.2.2 Prime and Unique Agricultural Lands

Soil data from the Natural Resources Conservation Service indicate that approximately 122,655 acres of prime farmland soils occur in Hays County. Most of these prime soils (approximately 64 percent of the total) occur east of Interstate Highway 35 and would not be affected by the regional HCP action alternatives, since participating projects and potential preserve lands would be located west of Interstate Highway 35. In addition, the removal of suitable habitat for the covered species would not be expected to remove prime farmlands from agricultural production, since woodland and shrubland habitats used by the covered species are most typically used as rangeland, not for crop production. Similarly, incidental inclusion of prime farmlands in preserve parcels would not be expected to add prime farmland soils to production, even if they are protected from future development. Therefore, the activities associated with the authorized take, proposed mitigation, or funding/administration of a regional HCP under one of the action alternatives would have only negligible impacts on prime farmland soils in Hays County and this resource is dismissed from further analysis.

4.1.2.3 Public Health and Safety

The regional HCP alternatives considered in this EIS would not contribute to or detract from public health or safety considerations. Therefore, these topics are dismissed from further analysis.

4.1.2.4 Archeological Sites, Historic Structures, and Other Cultural Resources

Previously recorded or currently unrecorded archeological or historical sites or structures may occur within participating project areas or within potential future preserve parcels under one of the regional HCP action alternatives. Removal of suitable habitat for the covered species could change the quality of the historical or archeological characteristics of a site or the incidental inclusion of a site in a preserve parcel would protect it from future development. However, the extent to which participating projects or future preserve parcels overlap with cultural resources is largely unknowable, except to restrict these overlaps to the portion of Hays County that includes suitable habitat for the covered species (i.e., generally west of Interstate Highway 35).

Historic and archeological resources are currently protected by State and Federal laws, including the Texas Antiquities Code administered by the Texas Historical Commission and the National Historic Preservation Act. This EIS assumes that the proponents of all projects covered by a regional HCP action alternative would abide by State and Federal regulations regarding cultural resources. Entities proposing projects on property owned by the State or a subdivision of the State are required by the Texas Antiquities Code to coordinate with the Texas Historical Commission and the proponents of any project receiving Federal permits or funding (such as an incidental take permit under the ESA) are required by the National Historic Preservation Act to coordinate with the State Historic Preservation Officer to determine if the

project would affect properties that are included in or that meet the criteria for listing on the National Register of Historic Places.

Therefore, given the existing protections for cultural resources, the activities associated with the authorized take, proposed mitigation, or funding/administration of a regional HCP under one of the action alternatives would have only negligible impacts on archeological, historical, or other cultural resources in Hays County. As such archeological sites, historic structures, and other cultural resources are dismissed from further analysis.

4.1.2.5 Wetlands and Floodplains

Wetlands nationwide are mapped by the Service's National Wetlands Inventory and floodplains are delineated by the Federal Emergency Management Agency. In Hays County, both types of areas are most commonly associated with perennial or seasonal streams or springs. However, given the typically shallow and rocky soils that occur over most of the county (particularly in the portion of the county that contains suitable habitat for the covered species west of Interstate Highway 35), the area does not include large or substantial areas of wetlands. Except for in the vicinity of San Marcos, most mapped floodplains are relatively narrow (i.e., less than approximately 400 feet across).

Activities causing the loss of suitable habitat for the covered species or the designation of preserve parcels could affect wetlands and floodplains where these resources overlap such activities. However, the potential for such overlap is slight, since suitable habitat for the covered species is does not typically occur in wetland areas. Conversely, the incidental inclusion of wetlands and floodplains within preserve parcels would protect such areas from future land development.

Most wetlands and all types of waters of the U.S. are protected by Section 404 of the Clean Water Act, which is administered by the U.S. Army Corps of Engineers. Projects that affect jurisdictional wetlands and waters of the U.S. by discharging dredged or fill material within such features are required to obtain a permit from the Corps prior to construction, and compensatory mitigation may be required to offset any adverse environmental affects.

Hays County participates in the Federal Emergency Management Agency's National Flood Insurance Program. The County has adopted a permitting process under its Floodplain Ordinance that requires approval of all developments in the unincorporated areas of the county.

This EIS assumes that all projects covered by a regional HCP alternative would be implemented in accordance with all applicable regulations regarding wetlands and floodplains.

Since wetlands and floodplains in Hays County are protected by existing regulations, the activities associated with the authorized take, proposed mitigation, or funding/administration of a regional HCP under one of the action alternatives would have only negligible impacts on wetlands and floodplains in Hays County. As such wetlands and floodplains are dismissed from further analysis.

4.1.2.6 Geology

Hays County is underlain by the Edwards Aquifer and the Trinity Aquifer.

The Edwards Aquifer is composed of the porous limestones of the Edwards Group, Georgetown Limestone, and Comanche Peak Limestone formations (Ashworth and Hopkins 1995). The aquifer includes three distinct units, two of which (the San Antonio segment and the Barton Springs segment) occur in Hays County. The groundwater divide between the San Antonio and Barton Springs segments of the Edwards Aquifer is thought to occur west of the City of Kyle. The Trinity Aquifer is composed of Trinity Group geologic formations, which include upper and lower members of the Glen Rose formation in Hays County. The Glen Rose formation outcrops at the surface in portions of Hays County west of the Edwards Aquifer recharge zone (Ashworth and Hopkins 1995, Hays Trinity Groundwater Conservation District 2005).

The removal or alteration of suitable habitat for the covered species would not be expected to affect the underlying geology of an area, but the designation of preserve parcels under a regional HCP action alternative could protect the underlying geology from future development. Overall, none of the alternatives considered in this EIS are expected to have more than negligible impacts on the underlying geology of Hays County. Therefore, general geology is dismissed from further analysis.

The limestone geology of Hays County supports the area's aquifer systems and provides habitat for karst-adapted species. The functions of the region's geology with respect to aquifers and karst habitats, and the potential impacts of the No Action and action alternatives on these functions, are carried through this EIS under the Water Resources and Hays County RHCP Evaluation and Additional Species impact topics.

4.1.2.7 Ambient Noise and Air Quality

The removal or alteration of suitable habitat for the covered species by the use of heavy machinery and/or fire could temporarily add to the ambient noise levels in the vicinity of projects participating in one of the regional HCP alternatives and affect the overall quality of air in the region. However, the magnitude of any such potential effects would be negligible, if detectible at all. For instance, the use of heavy machinery such as tractors, bulldozers, or skid steer vehicles is a common practice for agricultural land management and the use of such equipment to clear habitat for the covered species is similar to the types of land management practices for other agricultural purposes. Additionally, any increases in ambient noise resulting from clearing activities for participating projects would be temporary in nature.

With respect to air quality, the Environmental Protection Agency (EPA) sets National Ambient Air Quality Standards under the authority of the Clean Air Act. The Texas Commission on Environmental Quality monitors air quality within the State and reports the information to the EPA and the public. Central Texas, including Hays County, may not attain

new federal standards for ground-level ozone in 2009, which could trigger new air quality regulations across the region. However, as for noise pollution, the magnitude of any potential effects from machinery or burning activities related to the clearing of habitat for the covered species under a region HCP alternative would be negligible (since these types of activities already occur commonly across the county for agricultural purposes) and would be temporary in nature. Therefore, noise and air quality are dismissed from further analysis.

4.1.2.8 Environmental Justice

Although not required for consideration by CEQ regulations, all EISs must address "Environmental Justice." Environmental justice issues encompass a broad range of impacts covered by NEPA, including impacts on the natural or physical environment and interrelated social, cultural, and economic effects. Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," provides that "each Federal agency shall make achieving Environmental Justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations."

Minority Populations

According to the Census 2000, approximately 21.1 percent of the Hays County population is of a non-white race (20,575 of 97,589 people) and approximately 29.6 percent of the population is Hispanic or Latino of any race (28,859 of 97,589 people) (these categories may overlap). Therefore, between 20 and 30 percent of the population of Hays County could be considered an ethnic minority. Within Hays County, in Census Tracts generally west of Interstate Highway 35 that contain potential habitat for the covered species (i.e., Census Tracts 10600, 10700, 10801, 10802, 10901, 10902, and 10904) have a non-white population of approximately 12.6 percent (7,555 of 59,754 people) and a Hispanic or Latino population of approximately 19.2 percent (11,490 of 59,754 people).

The populations living in Census Tracts that occur within areas of potential habitat for the covered species would be more likely to be affected by the authorized take and potential mitigation provided under the regional HCP action alternatives. As described above, these populations also have a much lower percentage of minorities than Hays County overall. Therefore, none of the alternatives considered in this EIS are expected to disproportionately affect minority populations.

Poverty Populations

The median household income in Hays County (per Census 2000 data) was $45,006 and approximately 14.3 percent of the county population for which poverty status was determined was living below the poverty line (13,039 of 91,446 people). Within Hays County Census Tracts that contain potential habitat for the covered species, the median household income was $56,342

and approximately 8.0 percent of the population was living below the poverty line (4,680 of 58,555 people for which poverty status was determined).

The populations living in Census Tracts that occur within areas of potential habitat for the covered species would be more likely to be affected by the authorized take and potential mitigation provided under the regional HCP action alternatives. As described above, these populations also have a higher median household income than for Hays County overall and a much lower poverty rate than for the county overall. Therefore, none of the alternatives considered in this EIS are expected to disproportionately affect low-income populations.

While minority and low income populations exist in Hays County, the EIS alternataive are not expected to disproportionately affect these at-risk populations and Environmental Justice is dismissed from further analysis.

As participation in the action alternatives would be completely voluntary, the implementation of a regional HCP alternative is not expected to introduce "Conflicts with Land Use Plans, Policies, or Control." The action alternatives would neither require, nor be enforced by, municipal or county land use ordinances, and they are consistent with Texas state law regarding regional HCPs (Texas Parks and Wildlife Code Chapter 83).

4.2 General Description of Hays County

The Plan Area for the alternatives described in this EIS is Hays County, which comprises approximately 434,335 acres. The western three-quarters of Hays County (generally west of Interstate Highway 35) are within the Balcones Canyonlands portion of the Edwards Plateau ecoregion (Griffith et al. 2004). Potential habitat and known locations for the species covered by the action alternatives (i.e., the golden-cheeked warbler and black-capped vireo), as well as the anticipated incidental take and mitigation described in the alternatives, would occur within this region of the county.

Elevations within Hays County range from approximately 600 feet above mean sea level to over 1,400 feet above mean sea level, and gradually increase from east to west. The county is located on the border of the Edwards Plateau and Blackland Prairie ecoregions. The Balcones Escarpment forms the divide between these two ecoregions. Topography west of the escarpment is typically gently rolling to hilly, with steep slopes present along some streams. Topography east of the escarpment is typically flat to gently rolling (Barkley 1970, Dobie 1948).

Hays County occurs within a temperate, humid subtropical region. Winters tend to be mild, with an average minimum temperature in January of approximately 40°F. Summers tend to be hot, with an average maximum temperature in July of approximately 96°F. Average annual rainfall in Hays County is approximately 33.75 inches. Major weather threats include extended dry periods, flash flooding, severe thunderstorms, and tornados (Barkley 1970, Dobie 1948).

According to 2005 Hays County Central Appraisal District data, land uses in Hays County are primarily agricultural (71 percent of the area of the county), with single-family residential use (14 percent of the county) as the next most abundant land use classification. Vacant land is also common in the county, comprising approximately eight percent of the acreage. Other land use categories (including multi-family residential, commercial or industrial, and utility uses) each represent less than one percent of the acreage of the county.

Hays County is situated along the Interstate Highway 35 corridor between the major population centers of Austin and San Antonio. Hays County is included in the Austin-Round Rock Metropolitan Statistical Area (MSA), and was the second fastest growing county in the MSA (which also includes Bastrop, Caldwell, Travis, and Williamson counties) with an estimated 64.7 percent population growth between 1997 and 2007 (RECenter 2008a).

4.3 Water Resources

4.3.1 Groundwater Resources

Two aquifers underlie parts of Hays County: the Edwards Aquifer and the Trinity Aquifer. The Edwards Aquifer (the Balcones Fault Zone region) extends across portions of 13 Texas counties from Bell County to Kinney County. The Trinity Aquifer extends across a wide band including 55 counties in the central part of Texas (Figure 4-1).

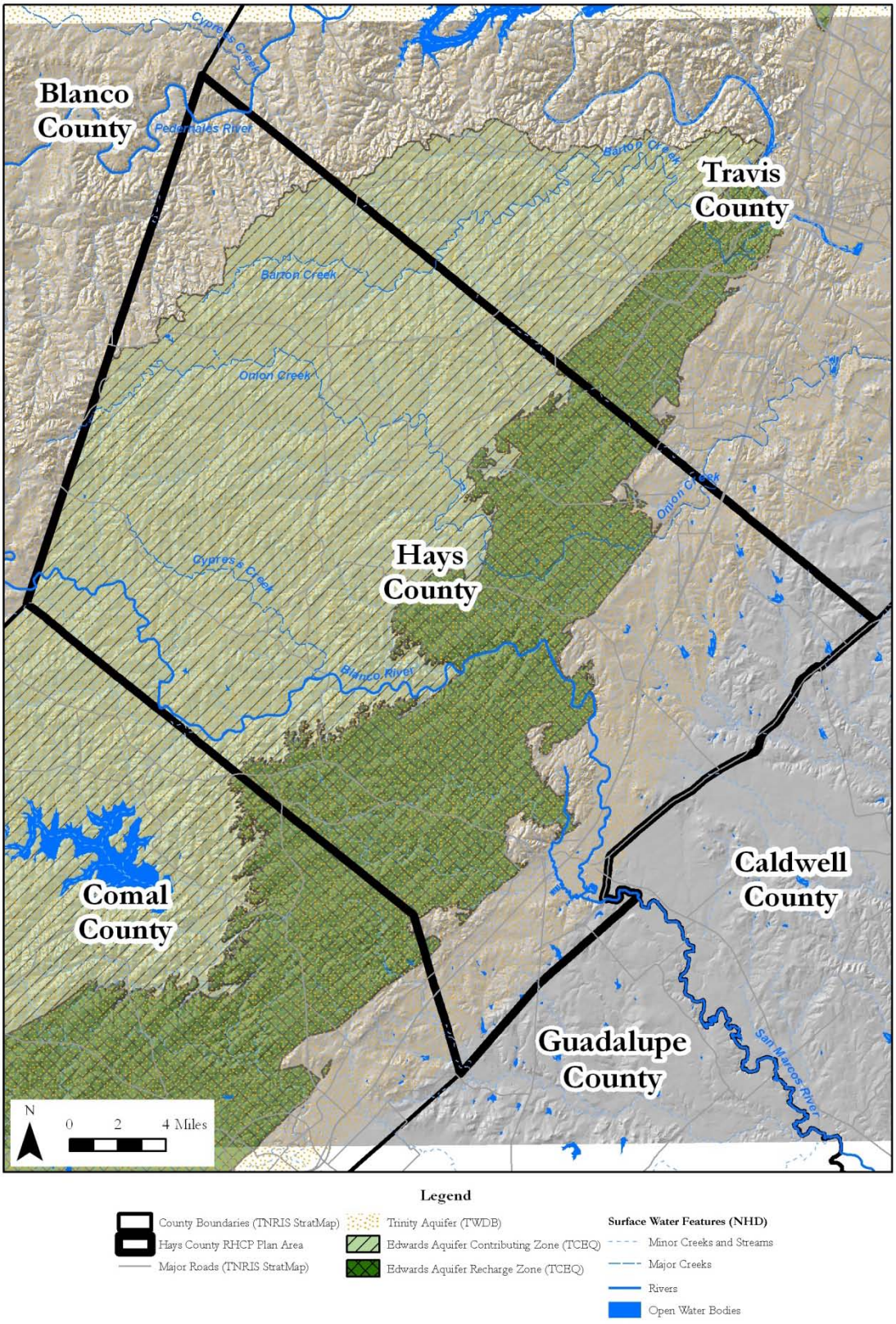
4.3.1.1 Edwards Aquifer

The Edwards Aquifer (the Balcones Fault Zone region) occurs in the porous limestones of the Edwards Group, Georgetown Limestone, and Comanche Peak Limestone formations (Ashworth and Hopkins 1995). It is confined by Glen Rose Limestone below and, in various locations across the state, by Del Rio Clay, Buda Limestone, and the Eagle Ford, Austin, and Taylor and Navarro Groups above (Blome et al. 2005). A series of faults and fractures have tilted these geologic layers, causing portions of the Edwards Group to outcrop at the surface. In Hays County, most of the Edwards Group is unconfined and this outcropping lays generally parallel to and west of Interstate 35 (Figure 4-1).

The Edwards Aquifer includes three distinct units, two of which (the San Antonio segment and the Barton Springs segment) occur in Hays County. The groundwater divide between the San Antonio and Barton Springs segments of the Edwards Aquifer generally occurs between the cities of Buda and Kyle. Groundwater within the San Antonio segment of the Edwards Aquifer generally travels from recharge areas in the southwest portion of the segment to discharge points along the northeastern edge of the segment. San Marcos Springs in Hays County is one of the primary outlets for groundwater from the San Antonio segment of the Edwards Aquifer (72 FR 39247). The Barton Springs segment of the Edwards Aquifer extends from just north of the City of Kyle into south Austin in Travis County. Groundwater from Hays County in this segment of the aquifer generally flows northeast. Barton Springs in the City

of Austin is the primary discharge point for this segment of the aquifer (Barton Springs Edwards Aquifer Conservation District 2008).

Figure 4-1 Major Water Features and Aquifers in Hays County.



The drainage basin (also known as the contributing zone) of the San Antonio and Barton Springs segments of the Edwards Aquifer covers approximately 5,400 square miles over portions of 13 counties on the Edwards Plateau. Surface water collected in the contributing zone flows south and east to the recharge zone of the aquifer, where the water-bearing limestones of the aquifer are exposed at the surface (Eckhardt 2008).

The Edwards Aquifer recharge zone is an area of porous limestone bedrock with numerous underground cavities and passages (i.e., karst terrain). Recharge features, such as caves and sinkholes, allow water from the contributing zone to infiltrate the underground passages of the aquifer. The recharge zone of the San Antonio and Barton Springs segments covers approximately 1,250 square miles over six counties on the southern and eastern edge of the aquifer system (Eckhardt 2008).

Water is stored within the aquifer's artesian zone, where impermeable overlaying and underlying geologic formations trap the groundwater within the aquifer. The artesian zone covers approximately 2,100 square miles and underlies all or a portion of ten counties. Groundwater within the artesian zone flows along the Balcones Fault Zone on the eastern edge of the aquifer where it is discharged under pressure at spring outlets, including San Marcos Springs (USFWS 1995, Edwards Aquifer Authority 2006).

4.3.1.2 Trinity Aquifer

The Trinity Aquifer is composed of Trinity Group geologic formations, which include upper and lower members of the Glen Rose formation in Hays County, and extends across a wide band including 55 counties in the central part of Texas. The Glen Rose formation outcrops at the surface in portions of Hays County west of the Edwards Aquifer recharge zone (Ashworth and Hopkins 1995, Hays Trinity Groundwater Conservation District 2005).

The primary source of water entering the Trinity Aquifer is from rainfall on the outcropping Glen Rose limestone formations. Caverns and other passages formed by the dissolution of limestone can function as groundwater conduits or create sinkholes that provide recharge substantial recharge to the aquifer. Regional groundwater flow within the Trinity Aquifer is typically to the south and southeast (Hays Trinity Groundwater Conservation District 2005). Major springs in Hays County discharging water from the Trinity Aquifer include Jacob's Well, located near Wimberley.

4.3.1.3 Aquifer Recharge

Recharge to the Edwards and Trinity aquifers is primarily derived from rainfall in their contributing zones, which flows overland and via streams until seeping into fissures, caves, and other karst features in the bedrock. For the Edwards Aquifer, a well defined recharge zone contains highly faulted and fractured outcrops of Edwards limestones at the surface that allow large quantities of surface water to flow into the aquifer. Unlike the Edwards Aquifer, the Trinity Aquifer recharges very slowly. Only four to five percent of the rainwater water that falls

over the Trinity Aquifer's drainage basin recharges the aquifer. Water also moves through the Trinity Aquifer more slowly than through the Edwards Aquifer (Eckhardt 2008, Blome et al. 2005).

Significant Recharge Features

A "significant recharge feature" is defined by the Texas Commission on Environmental Quality (TCEQ) as a karst feature with a well-defined surface opening (such as a cave) or a sinkhole (without a surface opening) that has a catchment area greater than 1.6 acres (0.6 hectare) (TCEQ 2004).

The total number of these features that may occur in Hays County is not known. However, the Texas Speleological Survey database includes 157 records of cave features and 142 records of karst features in Hays County (Texas Speleological Survey 2008).

Factors Influencing the Amount of Aquifer Recharge

There are numerous ways to decrease or degrade water that enters (or recharges) aquifers. One way is to cover, cap, or fill recharge features, thereby preventing water from entering them and recharging the aquifer. Similarly, impervious cover (such as from pavement and buildings) may decrease aquifer recharge by reducing the area of soil into which rainfall can infiltrate. While much of the water flowing off impervious surfaces is directed to nearby streams, storm water runoff often occurs in short bursts of high volume flows that provide few opportunities for runoff to infiltrate recharge features before it leaves the recharge zone.

Large stands of woody vegetation may reduce the amount of precipitation reaching groundwater. Dense canopy cover intercepts rainwater, may inhibit infiltration into the soil by dropping leaf litter, and may draw off soil moisture through transpiration (Owens 2006). On the other hand, this retained rainwater moisture may result in decreased transpiration rates and lesser needs for soil moisture (Owens 2006).

4.3.1.4 Groundwater Quality

The chemical quality of the water in the Edwards Aquifer is typically fresh, but hard, with dissolved solids concentrations averaging less than 500 milligrams/liter (Ashworth and Hopkins 1995). Water quality from the Trinity Aquifer is acceptable for most municipal and industrial purposes; however, concentrations of certain constituents in some areas exceed drinking water standards (Brazos G Regional Water Planning Group 2006). Bush et al. (2000) detected numerous organic chemicals in the Edwards Aquifer, fewer in the Trinity Aquifer, but most concentrations were very low relative to drinking-water standards and guidelines.

The State of Texas has not developed specific standards for pollutant discharge to groundwater; however, state policy requires that "…groundwater be kept reasonably free of contaminants that interfere with present and potential uses of groundwater… [and that] discharges of pollutants,…be conducted in a manner that will maintain present uses and not

impair potential uses of groundwater or pose a public health hazard" (Texas Water Code § 26.401). Groundwater contamination, as defined by the Texas Groundwater Protection Committee, is "…the detrimental alteration of the naturally occurring physical, thermal, chemical, or biological quality of groundwater reasonably suspected of having been caused by the activities of entities under the jurisdiction of the various state agencies" (Texas Groundwater Protection Committee 2006). The state agencies of the Committee systematically monitor groundwater quality at selected sites (e.g., underground storage tanks and landfills) throughout the state to determine if levels of specific contaminants vary from baseline conditions for that site. The Texas Groundwater Protection Committee (2006) reported that 6,132 groundwater contamination cases were documented or under enforcement across the state during the 2005 calendar year.

Groundwater quality protection in western Hays County is largely governed by the Edwards Aquifer Rules (30 Texas Administrative Code, Chapter 213), which regulate activities having the potential for polluting the Edwards Aquifer and associated surface waters. The TCEQ guidance for complying with the Edwards Aquifer Rules (Barrett 2005) recommends the use of setbacks (natural buffers) to prevent groundwater degradation associated with sensitive karst features.

The September 2007 "Optional Enhanced Measures for the Protection of Water Quality in the Edwards Aquifer" and "Optional Enhanced Measures for the Protection of Water Quality in the Edwards Aquifer and Related Karst Features that May Be Habitat for Karst Dwelling Invertebrates" are appendices to the TCEQ technical guidance document detailing best management practices for compliance with the Edwards Aquifer Rules (Title 30, Texas Administrative Code, Chapter 213). The Service concurred that implementation of these voluntary water quality measures "will protect endangered and candidate species from impacts due to water quality degradation". The voluntary measures, if fully implemented by a project proponent, will result in "no take" of the species addressed by the measures due to water quality impacts.

Hays County has limited authority to regulate the management stormwater under Chapter 725 of its Development Regulations (adopted August 18, 2009), mostly with respect to flood control issues. However, the County's Development Regulations do provide economic incentives for voluntary implementation of water quality protection measures, including stream buffers, control of the hydrologic regime, and structural and non-structural best management practices consistent with the water quality protection criteria of the Lower Colorado River Authority, the City of Austin, TCEQ, and other local jurisdictions. In addition to Hays County and TCEQ, local jurisdictions in Hays County (including the cities of Austin, Buda, Kyle, Dripping Springs, and San Marcos) each have regulations concerning water quality protections for projects over the Edwards Aquifer recharge zone (including the Barton Springs segment of the aquifer).

4.3.2 Surface Water

4.3.2.1 Water Features

Hays County lies within the Colorado and Guadalupe river basins, and is crossed by several rivers and major creeks, including the Blanco River, San Marcos River, Pedernales River, Cypress Creek, Onion Creek, and Barton Creek (Figure 4-1). These major waterways, and the numerous minor streams and creeks that feed them, are valuable surface water resources for the County and support wildlife, riparian habitat, recreational uses, and scenic vistas.

Hays County falls within Region K (Lower Colorado) and Region L (South Central Texas) Water Planning Areas, two of the 16 planning regions established by the Texas Water Development Board (TWDB). The Region K and Region L Water Planning Areas have classified portions of Barton Creek, Cypress Creek, and the San Marcos River as "ecologically significant," in accordance with TWDB rules (31 Texas Administrative, Chapter 357.8). TPWD described the features of these ecologically significant stream segments, as reported below (TPWD 2007):

- Barton Creek – from the confluence with Town Lake in Austin in Travis County upstream to Ranch Road 12 in Hays County. This segment contains high water quality, exceptional aquatic life, and high aesthetic value. It is described as an ecoregion stream with a diverse benthic macroinvertebrate community. In addition, this segment is classified as containing threatened or endangered species/unique communities with the only known location of the Barton Springs salamander.
- Cypress Creek – from the confluence with the Blanco River in Hays County upstream to a point four miles upstream of the most upstream named county road crossing in Hays County. This ecologically significant portion of Cypress Creek serves an important hydrological function within the Edwards Aquifer recharge zone and contains high water quality, exceptional aquatic life, and high aesthetic value.
- San Marcos River – from a point 0.7 mile downstream of Interstate Highway 35 in Hays County to a point 0.4 mile upstream of Loop 82 in San Marcos; and from the confluence with the Guadalupe River in Gonzales County upstream to a point 0.7 mile downstream of Interstate Highway 35 in Hays County. This portion of the San Marcos River displays significant overall habitat value considering degree of biodiversity and uniqueness observed in aquatic habitat. It serves a valuable hydrologic function relating to groundwater discharge of the Edwards Aquifer and is within a riparian conservation area that contains several city and university parks. This portion of the San Marcos River also contains high water quality, exceptional aquatic life, high aesthetic value, and exceptional aquatic life use. In addition, it is known to contain threatened or endangered species/unique communities including the fountain darter and the Comal Springs riffle beetle, and is the only known location of Texas wild rice and the San Marcos salamander.

Several notable spring systems occur in Hays County, including San Marcos Springs, Fern Bank Springs, and Jacob's Well. Many other minor springs also occur across the county, discharging water from the Edwards Aquifer, Trinity Aquifer, and local groundwater sources. The Texas Speleological Survey database includes records of 52 springs in Hays County (Texas Speleological Survey 2008). These springs, and the karst features that often connect them to the aquifers, provide habitat for several rare species, including karst invertebrates and salamanders. San Marcos Springs and Fern Bank Springs have been identified as critical habitat for several federally listed species (USFWS 2007a).

4.3.2.2 Surface Water Quality

Under the Clean Water Act, the State of Texas (through the TCEQ) has developed and enforces a comprehensive set of surface water quality standards that include chemical, physical, and biological criteria. The Texas Surface Water Quality Standards are found in the Texas Administrative Code under Title 30, Chapter 307 and establish explicit water quality goals throughout the state for all types of surface water sources.

The state standards, which are set in an effort to maintain the quality of water in the state consistent with public health and enjoyment, protection of aquatic life, and the operation of existing industries and economic development, are evaluated via the following five categories: aquatic life, contact recreation, public water supply, fish consumption, and general uses. Standards related to drinking water also apply to groundwater that is used as a public water supply.

Every two years, the TCEQ assesses water quality and submits a report to the U.S. Environmental Protection Agency (EPA) regarding how each body of water meets the state water quality standards. This water quality inventory is the basis of the Clean Water Act 303(d) list, which identifies all "impaired" water bodies that do not meet the water quality criteria established to support designated uses.

According to the 2008 Texas Water Quality Inventory and 303(d) List, portions of one waterway within Hays County is impaired (TCEQ 2008a). Plum Creek (Segment 1810), from the confluence with the San Marcos River in Caldwell County to FM 2770 in Hays County, was identified as impaired for recreational use due to elevated bacteria counts (TCEQ 2008a).

The Texas Pollutant Discharge Elimination System (TPDES) program gives the TCEQ Federal regulatory authority over discharges of pollutants to Texas surface waters, with exception to discharges associated with oil, gas, and geothermal exploration and development activities that are regulated by the Railroad Commission of Texas. The TPDES permitting program is designed to minimize sedimentation and contamination in surface waters by regulating point source pollution to surface water in Texas.

Both the Texas Water Code and Texas Local Government Code allow municipalities to create and enforce ordinances to protect water quality that can be applied to all developments

within municipal jurisdictions. Hays County has subdivision regulations that require stormwater runoff from new developments to be detained on-site, such that the peak discharge rate is equal to or less than the rate when the property was in its natural state. The cities of Austin, San Marcos, Kyle, Buda, and Dripping Springs each have water quality protection ordinances related to land development projects that may be applicable to projects in Hays County.

Hays County coordinates with a variety of local and regional organizations to further enable water quality protection, including the Guadalupe Blanco River Authority, the Barton Springs/Edwards Aquifer Conservation District, and both the Lower Colorado and the South Central Texas Regional Water Planning Groups. These associations promote land development with minimal impacts and require varying levels of water quality protection, permitting, and management. Hays County and several cities within the county also participate in the Regional Water Quality Plan for the Barton Springs Segment of the Edwards Aquifer and Its Contributing Zone.

4.3.3 Water Use

Communities in Hays County, including Buda, Dripping Springs, Kyle, San Marcos, and Wimberley, use groundwater for municipal, industrial, agricultural, and other non-consumptive uses. Canyon Regional Water Authority and the Guadalupe-Blanco River Authority are two of the primary wholesale water providers operating in the county.

4.4 Vegetation

Hays County lies on the edge of the Edwards Plateau and Texas Blackland Prairie ecoregions, as described by the U.S. Environmental Protection Agency (EPA) (Griffith et al. 2004). The western three-quarters of Hays County (generally west of Interstate Highway 35) are within the Balcones Canyonlands portion of the Edwards Plateau ecoregion. The Area of Potential Effect for this EIS includes only the Balcones Canyonlands ecoregion.

According to TPWD (McMahan et al. 1984), three general vegetation communities are present within the Area of Potential Effect in Hays County: Live Oak-Ashe Juniper Parks, Live Oak-Mesquite-Ashe Juniper Parks, and Live Oak – Ashe Juniper Woods.

The Live Oak-Ashe Juniper Parks and Live Oak-Mesquite-Ashe Juniper Parks vegetation communities primarily exist on level to gently rolling uplands and ridge tops within the Edwards Plateau. The dominant trees in these vegetation communities include plateau live oak (*Quercus fusiformis*), Ashe juniper (*Juniperus ashei*), and honey mesquite (*Prosopis glandulosa*). Commonly associated vegetation includes Spanish oak (*Q. buckleyi*), shin oak (*Q. sinuata* var. *breviloba*), cedar elm (*Ulmus crassifolia*), netleaf hackberry (*Celtis reticulata*), flameleaf sumac (*Rhus lanceolata*), agarito (*Berberis trifoliolata*), Texas persimmon (*Diospyros texana*), Texas pricklypear (*Opuntia engelmannii*), kidneywood (*Eysenhardtia texana*), saw greenbriar (*Smilax bona-nox*), Texas wintergrass (*Stipa leucotricha*), little bluestem (*Schizachyrium scoparium*), curly mesquite (*Hilaria belangeri*), Texas grama (*Bouteloua rigidiseta*), Hall's panicum (*Panicum hallii*), purple three-awn

(*Aristida purpurea*), hairy tridens (*Tridens pilosum*), cedar sedge (*Carex planostachys*), two-leaved senna (*Cassia roemeriana*), mat euphorbia (*Euphorbia serpens*), and rabbit tobacco (*Evax prolifera*) (McMahan et al. 1984).

The Live Oak – Ashe Juniper Woods vegetation community primarily exists on shallow limestone soils on the hills and escarpment of the Edwards Plateau. In addition to the dominant plateau live oak and Ashe juniper trees, commonly associated vegetation includes Spanish oak, shin oak, cedar elm, evergreen sumac (*Rhus virens*), escarpment cherry, saw greenbriar, Texas mountain laurel (*Sophora secundiflora*), poison ivy (*Toxicodendron radicans*), twistleaf yucca (*Yucca rupicola*), elbowbush (*Forestiera pubescens*), cedar sedge, little bluestem, Texas grama (*Bouteloua rigidiseta*), meadow dropseed (*Sporobolus asper* var. *hookeri*), Texas wintergrass, curly mesquite, pellitory (*Parietaria pensylvanica*), noseburn (*Tragia ramosa*), spreading sida (*Sida filicaulis*), woodsorrel (*Oxalis* spp.), mat euphorbia (McMahan et al. 1984).

Along perennial watercourses within Hays County, bald cypress (*Taxodium disticum*), sycamore (*Platanus occidentalis*), and (to a lesser extent) black willow (*Salix nigra*) are dominant. Buttonbush (*Cephalanthus occidentalis*) is typically prominent in the riparian shrub stratum. Intermittent streams and creeks may support sycamore woodlands or (in the case of drier sites) cedar elm may dominate. Floodplains within the Balcones Canyonlands ecoregion are typically dominated by a combination of oak-elm-hackberry gallery forests with varying woodland species such as box elder (*Acer negundo*), soapberry (*Sapindus* sp.), Ashe juniper, pecan (*Carya illinoensis*), eastern cottonwood (*Populus deltoides*), plateau live oak, Spanish oak, green ash (*Franixus pennsylvanica*), cedar elm, red mulberry (*Morus rubra*), and occasionally basswood (*Tilia caroliniana*) (Riskind and Diamond 1986).

In addition, the 2001 National Land Cover Dataset identifies 15 different land cover types in Hays County, of which forests, shrubland, and grasslands or crop fields are dominant (Table 4-1 and Figure 4-2).

Forested areas cover approximately 42 percent of the county, shrubland vegetation covers approximately 30 percent, and grasslands and crop fields cover approximately 21 percent. The dataset identifies only slightly more than five percent of the county as developed land, primarily associated with the cities of San Marcos, Kyle, Buda, Wimberley, and Dripping Springs, and the Interstate Highway 35 and U.S. Highway 290 corridors.

Figure 4-2. National Land Cover Dataset 2001 Land Use/Land Cover Classifications for Hays County.

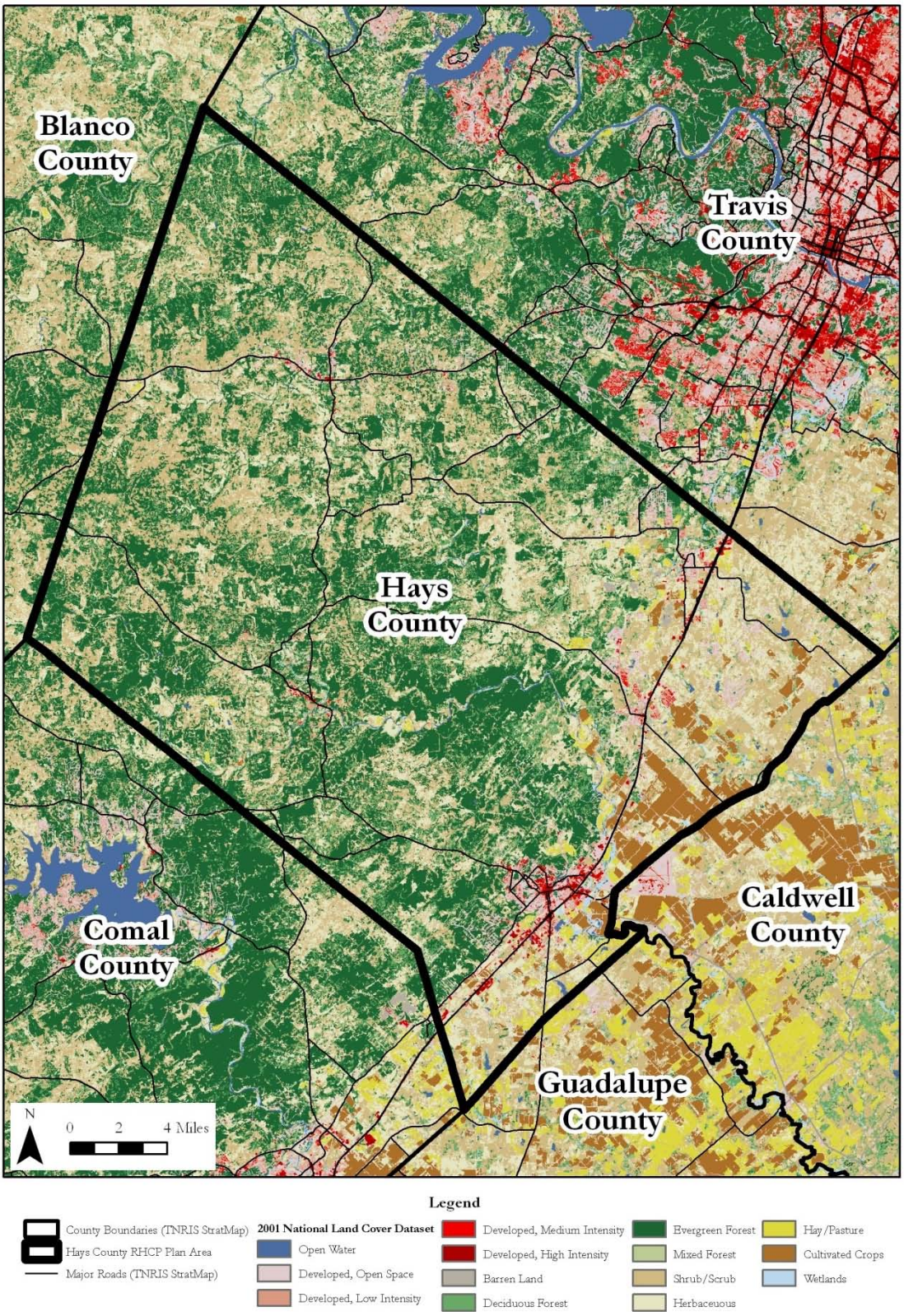


Table 4-1. 2001 National Land Cover Dataset Land Use/Land Cover Classifications for Hays County.

Category	Approx. Area (acres)	Percent of County
Open Water	1,901	0.4%
Developed, Open Space	15,139	3.5%
Developed, Low Intensity	4,877	1.1%
Developed, Medium Intensity	2,358	0.5%
Developed, High Intensity	1,144	0.3%
Barren Land	486	0.1%
Deciduous Forest	51,339	11.8%
Evergreen Forest	132,510	30.5%
Mixed Forest	156	0.0%
Shrub/Scrub	130,693	30.1%
Herbaceous	75,983	17.5%
Hay/Pasture	5,131	1.2%
Cultivated Crops	10,512	2.4%
Woody Wetlands	2,086	0.5%
Emergent Herbaceous Wetlands	3	0.0%

The U.S. Geological Survey identified land use/land cover changes between the 1992 and 2001 versions of the National Land Cover Dataset (USGS 2003). Table 4-2 identifies the changes to major land cover classes in Hays County between 1992 and 2001.

Between 1992 and 2001, Hays County lost approximately 14 percent of its forest cover, with approximately 81 percent of the lost forest cover converted to grassland/shrub cover and approximately 10 percent converted to urban cover.

Table 4-2. Land use/land cover changes between the 1992 and 2001 versions of the National Land Cover Dataset[1].

Land Cover Category	Gain (ac)	Loss (ac)	Net Change (ac)	% Change from 1992
Open Water	343	2	341	22%
Urban	4,450	27	4,423	23%
Barren	282	11	271	126%
Forest	2,573	33,684	(31,111)	-14%
Grassland/Shrub	28,822	4,334	24,488	13%
Agriculture	2,649	1,752	897	6%
Wetlands	691	0	691	48%

[1] U.S. Geological Survey. 2003. National Land Cover Database NLCD 1992/2001 Change (edition 1.0). U.S. Geological Survey, Sioux Falls, SD. www.mrlc.gov/multizone.php.

4.5 General Wildlife

Inhabiting the vegetation types described above are various wildlife species commonly observed within Hays County and the eastern edge of the Edwards Plateau (Schmidly 2004, Lockwood 2001, Dixon 2000). Table 4-3 provides a list of representative species.

Table 4-3. Common Wildlife Species of Hays County.

Common Name	Scientific Name	Common Name	Scientific Name
Mammals (based on Schmidly 2004)			
Virginia opossum	*Didelphis virginiana*	Hispid pocket mouse	*Chaetopidus hispidus*
Nine-banded armadillo	*Dasypus novemcinctus*		
Cave myotis	*Myotis velifer*	Fulvous harvest mouse	*Reithrodontomys fulvescens*
Eastern red bat	*Lasiurus borealis*	White-footed mouse	*Peromyscus leucopus*
Brazilian free-tailed bat	*Tadarida brasiliensis*	Deer mouse	*Peromyscus maniculatus*
Coyote	*Canis latrans*	Northern pygmy mouse	*Baiomys taylori*
Common gray fox	*Urocyon cinereoargenteus*	Hispid cotton rat	*Sigmodon hispidus*
Ringtail	*Bassariscus astutus*	Southern plains woodrat	*Neotoma micropus*
Northern raccoon	*Procyon lotor*	Norway rat	*Rattus norvegicus*
Striped skunk	*Mephitis mephitis*	Roof rat	*Rattus rattus*
Feral Pig	*Sus scrofa*	House mouse	*Mus musculus*
White-tailed deer	*Odocoileus virginianus*	Eastern cottontail	*Sylvilagus floridanus*
Eastern fox squirrel	*Sciurus niger*	Black-tailed jackrabbit	*Lepus californicus*
Birds (based on Lockwood 2001)			
Gadwall	*Anas strepera*	White-eyed Vireo	*Vireo griseus*
Northern Shoveler	*Anas clypeata*	Blue Jay	*Cyanocitta cristata*
Green-winged Teal	*Anas crecca*	Western Scrub-Jay	*Aphelocoma californica*
Mallard	*Anas platyrhynchos*	Purple Martin	*Progne subis*
Lesser Scaup	*Aythya affinis*	Cliff Swallow	*Petrochelidon pyrrhonota*
Bufflehead	*Bucephala albeola*	Barn Swallow	*Hirundo rustica*
Wild Turkey	*Meleagris gallopavo*	Carolina Chickadee	*Poecile carolinensis*
Northern Bobwhite	*Colinus virginianus*	Black-crested Titmouse	*Baeolophus atricristatus*
Pied-billed Grebe	*Podilymbus podiceps*	Carolina Wren	*Thryothorus ludovicianus*
Double-crested Cormorant	*Phalacrocorax auritus*	Bewick's Wren	*Thryomanes bewickii*
Great Blue Heron	*Ardea herodias*	Ruby-crowned Kinglet	*Regulus calendula*
Cattle Egret	*Bubulcus ibis*	Blue-gray Gnatcatcher	*Polioptila caerulea*
Black Vulture	*Coragyps atratus*	Hermit Thrush	*Catharus guttatus*
Turkey Vulture	*Cathartes aura*	American Robin	*Turdus migratorius*
Northern Harrier	*Circus cyaneus*	Northern Mockingbird	*Mimus polyglottos*
Red-tailed Hawk	*Buteo jamaicensis*	European Starling	*Sturnus vulgaris*
Crested Caracara	*Caracara cheriway*	Cedar Waxwing	*Bombycilla cedrorum*

Table 4-3. Common Wildlife Species of Hays County.

Common Name	Scientific Name	Common Name	Scientific Name
American Kestrel	*Falco sparverius*	Orange-crowned Warbler	*Vermivora celata*
American Coot	*Fulica americana*	Yellow-rumped Warbler	*Dendroica coronata*
Killdeer	*Charadrius vociferus*	Summer Tanager	*Piranga rubra*
Least Sandpiper	*Calidris minutilla*	Spotted Towhee	*Pipilo maculatus*
Ring-billed Gull	*Larus delawarensis*	Rufous-crowned Sparrow	*Aimophila ruficeps*
Rock Pigeon	*Columba livia*	Chipping Sparrow	*Spizella passerina*
White-winged Dove	*Zenaida asiatica*	Field Sparrow	*Spizella pusilla*
Mourning Dove	*Zenaida macroura*	Vesper Sparrow	*Pooecetes gramineus*
Yellow-billed Cuckoo	*Coccyzus americanus*	Lark Sparrow	*Chondestes grammacus*
Eastern screech-owl	*Otis asio*	Savannah Sparrow	*Passerculus sandwichensis*
Common Nighthawk	*Chordeiles minor*	White-crowned Sparrow	*Zonotrichia leucophrys*
Chuck-will's-widow	*Caprimulgus carolinensis*	Dark-eyed Junco	*Junco hyemalis*
Chimney Swift	*Chaetura pelagica*	Northern Cardinal	*Cardinalis cardinalis*
Black-chinned Hummingbird	*Archilochus alexandri*	Painted Bunting	*Passerina ciris*
Red-bellied woodpecker	*Melanerpes carolinus*	Red-winged Blackbird	*Agelaius phoeniceus*
Ladder-backed Woodpecker	*Picoides scalaris*	Eastern Meadowlark	*Sturnella magna*
Northern Flicker	*Colaptes auratus*	Great-tailed Grackle	*Quiscalus mexicanus*
Eastern Phoebe	*Sayornis phoebe*	Brown-headed Cowbird	*Molothrus ater*
Ash-throated Flycatcher	*Myiarchus cinerascens*	House Finch	*Carpodacus mexicanus*
Western Kingbird	*Tyrannus verticalis*	Lesser Goldfinch	*Carduelis psaltria*
Scissor-tailed Flycatcher	*Tyrannus forficatus*	House Sparrow	*Passer domesticus*
Loggerhead Shrike	*Lanius ludovicianus*		

Reptiles and Amphibians
(based on Dixon 2000)

Smallmouth salamander	*Ambystoma texanum*	Eastern collared lizard	*Crotaphytus collaris collaris*
Texas salamander	*Eurycea neotenes*	Texas earless lizard	*Cophosaurus texanus texanus*
Western slimy salamander	*Plethodon albagula*	Texas spiny lizard	*Sceloporus olivaceus*
Couch's spadefoot	*Scaphiopus couchi*	Southern prairie lizard	*Sceloporus undulates consobrinus*
Blanchard's cricket frog	*Acris crepitans blanchardi*	Green anole	*Anolis carolinensis*
Cope's gray tree frog	*Hyla chrysoscelis*	Ground skink	*Scincella lateralis*
Strecker's chorus frog	*Pseudacris streckeri*	Texas spotted whiptail	*Cnemidophorus gularis gularis*
Eastern green toad	*Bufo debilis debilis*	Six-lined race runner	*Cnemidophorus sexlineatus sexlineatus*
Red-spotted toad	*Bufo punctatus*	Plains blind snake	*Leptotyphlops dulcis dulcis*
Texas toad	*Bufo speciosus*	Eastern yellow-bellied racer	*Coluber constrictor flaviventris*
Gulf coast toad	*Bufo valliceps valliceps*	Texas rat snake	*Elaphe obsolete lindheimeri*
Rio Grande leopard frog	*Rana berlandieri*	Eastern hog-nosed snake	*Heterodon platirhinos*

Table 4-3. Common Wildlife Species of Hays County.

Common Name	Scientific Name	Common Name	Scientific Name
Bullfrog	*Rana catesbeiana*	Western coachwhip	*Masticophis flagellum testaceus*
Great plains narrowmouth toad	*Gastrophryne olivacea*	Diamondback water snake	*Nerodia rhombifer rhombifer*
Common snapping turtle	*Chelydra serpentina serpentina*	Rough green snake	*Opheodrys aestivus*
Yellow mud turtle	*Kinosternon flavescens flavescens*	Bullsnake	*Pituophis catenifer sayi*
Common musk turtle	*Sternotherus odoratus*	Texas brown snake	*Storeria dekayi texana*
Ornate box turtle	*Terrapene ornata ornata*	Checkered garter snake	*Thamnophis marcianus marcianus*
Red-eared slider	*Trachemys scripta elegans*	Rough earth snake	*Virginia striatula*
Guadalupe spiny soft-shelled turtle	*Trionyx spiniferus guadalupensis*	Texas coral snake	*Micrurus fulvius tenere*
		Western diamondback rattlesnake	*Crotalus atrox*

While many wildlife species are common occurrences in Hays County, several rare species are also known to occur in Hays County. TPWD maintains a list of rare or imperiled wildlife and plants for each Texas county. The TPWD annotated list of rare species for Hays County includes the following wildlife species, as listed in Table 4-4.

Table 4-4. TPWD Annotated List of Rare Species for Hays County (TPWD 2008a).

Common Name	Scientific Name	Federal Status	State Status
Amphibians			
Blanco blind salamander	*Eurycea robusta*		Threatened
Blanco River springs salamander	*Eurycea pterophila*		
San Marcos salamander	*Eurycea nana*	Threatened	Threatened
Texas blind salamander	*Eurycea rathbuni*	Endangered	Endangered
Arachnids			
Bandit Cave spider	*Cicurina bandida*		
Birds			
American Peregrine Falcon	*Falco peregrinus anatum*	Delisted	Endangered
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	Delisted	Threatened
Bald Eagle	*Haliaeetus leucocephalus*	Delisted	Threatened
Black-capped Vireo	*Vireo atricapilla*	Endangered	Endangered
Golden-cheeked Warbler	*Dendroica chrysoparia*	Endangered	Endangered
Mountain Plover	*Charadrius montanus*		
Western Burrowing Owl	*Athene cunicularia hypugaea*		
Whooping Crane	*Grus americana*	Endangered	Endangered
Zone-tailed Hawk	*Buteo albonotatus*		Threatened
Crustaceans			
A cave obligate crustaean	*Monodella texana*		
Balcones Cave amphipod	*Stygobromus balconis*		
Ezell's cave amphipod	*Stygobromus flagellatus*		
Texas cave shrimp	*Palaemonetes antrorum*		

Table 4-4. TPWD Annotated List of Rare Species for Hays County (TPWD 2008a).

Common Name	Scientific Name	Federal Status	State Status
Texas troglobitic water slater	*Lirceolus smithii*		
Fishes			
Fountain darter	*Etheostoma fonticola*	Endangered	Endangered
Guadalupe bass	*Micropterus treculii*		
Guadalupe darter	*Percina sciera apristis*		
San Marcos gambusia	*Gambusia georgei*	Endangered	Endangered
Insects			
A mayfly	*Procloeon distinctum*		
Comal Springs dryopid beetle	*Stygoparnus comalensis*	Endangered	
Comal Springs riffle beetle	*Heterelmis comalensis*	Endangered	
Edwards Aquifer diving beetle	*Haideoporus texanus*		
Flint's net-spinning caddisfly	*Cheumatopsyche flinti*		
Leonora's dancer damselfly	*Argia leonorae*		
Rawson's metalmark	*Calephelis rawsoni*		
San Marcos saddle-case caddisfly	*Protoptila arca*		
Texas austrotinodes caddisfly	*Austrotinodes texensis*		
Mammals			
Cave myotis bat	*Myotis velifer*		
Plains spotted skunk	*Spilogale putorius interrupta*		
Red wolf	*Canis rufus*	Endangered	Endangered
Mollusks			
Creeper (squawfoot)	*Strophitus undulatus*		
False spike mussel	*Quincuncina mitchelli*		
Golden orb	*Quadrula aurea*		
Pistolgrip	*Tritogonia verrucosa*		
Rock pocketbook	*Arcidens confragosus*		
Texas fatmucket	*Lampsilis bracteata*		
Texas pimpleback	*Quadrula petrina*		
Reptiles			
Cagle's map turtle	*Graptemys caglei*		Threatened
Spot-tailed earless lizard	*Holbrookia lacerata*		
Texas garter snake	*Thamnophis sirtalis annectens*		
Texas horned lizard	*Phrynosoma cornutum*		Threatened

4.6 Hays County RHCP Covered Species

Two endangered bird species, the golden-cheeked warbler and the black-capped vireo are included in the proposed RHCP as "covered species"; that is, they would be covered by the requested incidental take permit. The following paragraphs summarize the covered species' status, distribution, and habitat requirements. Each species is described in greater depth in Section 3.2 of the Hays County RHCP.

4.6.1 Golden-cheeked Warbler

4.6.1.1 Description and Regulatory Status

The golden-cheeked warbler is a migratory bird and the only bird in Texas that nests exclusively within the state's boundaries (Oberholser 1974). The golden-cheeked warbler migrates between wintering grounds in southern Mexico and Central America and breeding grounds on the Edwards Plateau and adjacent areas in central Texas, including Hays County (Ladd and Gass 1999). The species arrives in central Texas in early to mid-March to breed, and migrates south in June or July, with most warblers having left central Texas by early to mid-August (Ladd and Gass 1999, Wahl et al. 1990).

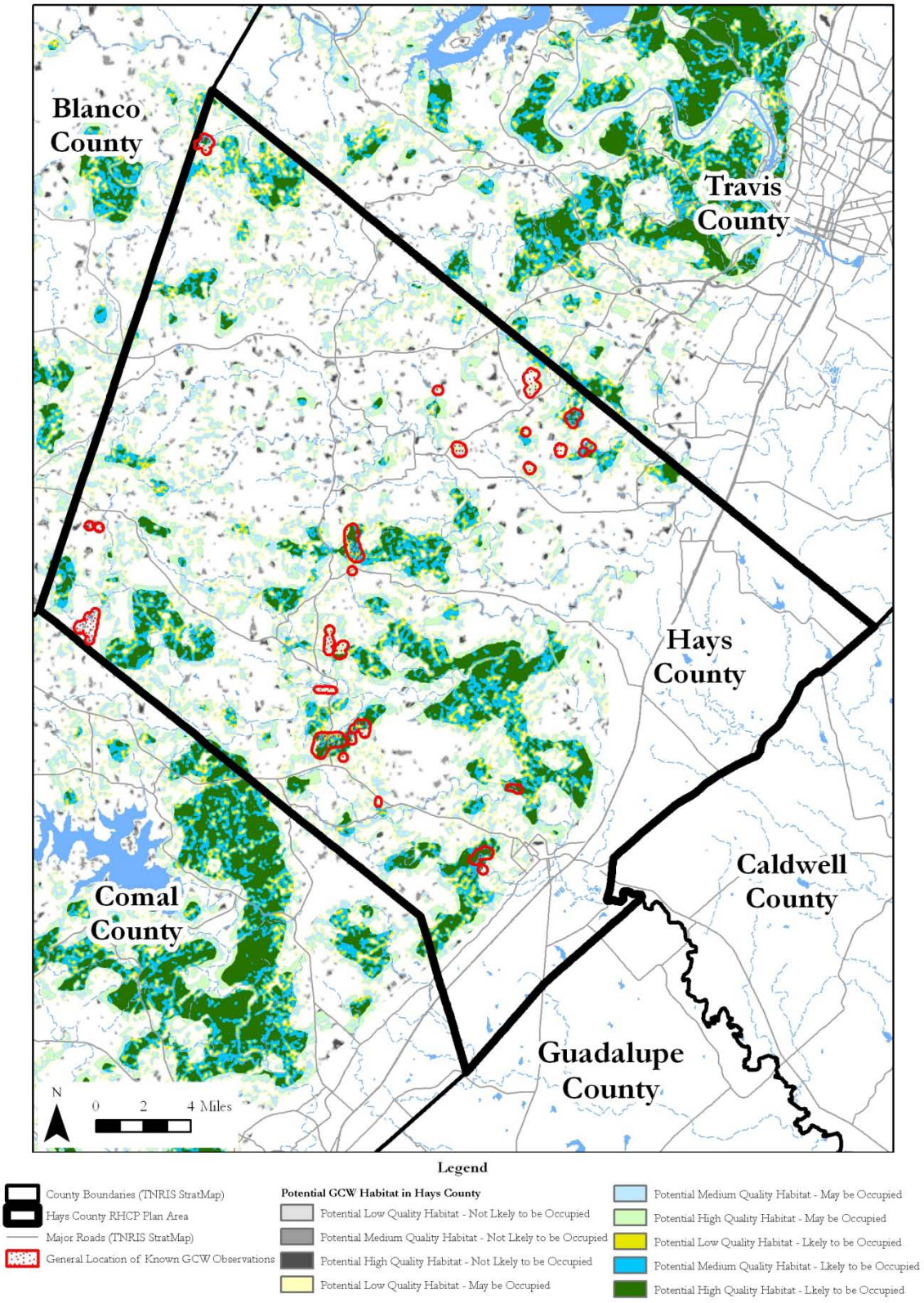
The Service published an emergency listing of the golden-cheeked warbler as endangered on May 4, 1990 (55 FR 18844). On December 27, 1990 the golden-cheeked warbler gained permanent Federal listing status as endangered (55 FR 53153). The Service has not designated critical habitat for the golden-cheeked warbler. TPWD also lists the species as endangered (TPWD 2008a).

Records of golden-cheeked warblers in Hays County are sparse, but available data shows that the species has been recently recorded from across much of the county. Several golden-cheeked warbler localities in Hays County were identified from data provided by the Service, the Texas Natural Diversity Database, and Loomis Partners, Inc. (generalized locations are shown in Figure 4-3. These localities represent golden-cheeked warbler observations recorded by various observers between 1990 and 2005.

4.6.1.2 Habitat Requirements

In Texas, the golden-cheeked warbler is an inhabitant of old-growth or mature regrowth juniper-oak woodlands in the Edwards Plateau, Lampasas Cut-Plain, and Llano Uplift (Pulich 1976, Wahl et al. 1990, USFWS 1992). Golden-cheeked warblers are typically found in areas of steep slopes, canyon heads, draws, and adjacent ridgetops (Pulich 1976, Ladd 1985). Ashe juniper and various oak species are the most common tree species throughout the golden-cheeked warbler's breeding range. The peeling bark of mature Ashe juniper trees is essential for nest building, and deciduous trees (especially deciduous oaks) are important for foraging (Wahl et al. 1990). Golden-cheeked warblers utilize moderate to dense forest or woodland habitat with a high percent canopy cover in the middle and upper layers (Ladd and Gass 1999).

Figure 4-3. Potential GCW Habitat and Reported Observations in Hays County.



The golden-cheeked warbler is a slightly forest-interior species (Coldren 1998, DeBoer and Diamond 2006) that also utilizes woodland edges, particularly after young have fledged (Kroll 1980, Coldren 1998). The golden-cheeked warbler appears to be less likely to occupy habitat adjacent to land uses with hard edges and high levels of human disturbance, particularly residential and commercial development (Engels 1995, Coldren 1998), and more likely to occupy habitat patches adjacent to soft edges associated with adjacent agricultural and grassland uses (Coldren 1998). Golden-cheeked warblers also generally placed territories farther from habitat edges with adjacent high-disturbance land uses, such as residential and transportation development (Coldren 1998).

Other habitats utilized by golden-cheeked warblers in central Texas, particularly by fledglings and family groups later in the breeding season, include woodlands and woodland edges with less species diversity, canopy cover, and canopy height. Upland oak savannas and drier, sparser juniper woodlands may also be used later in the breeding season (Ladd and Gass 1999).

4.6.1.3 Habitat Availability in Hays County

The Hays County RHCP identifies approximately 170,355 acres of potential golden-cheeked warbler habitat that may be currently available in the county (approximately 39 percent of the area of the Hays County) (see Section 3.2.1.3 and Appendix A of the RHCP). Of this acreage, approximately 34,110 acres are potential high quality habitat typified by very dense woodland canopy cover. Approximately 69,665 acres are potential medium quality habitat, and approximately 66,580 acres are potential low quality habitat with a relatively open woodland canopy. Much of this potential habitat in Hays County has a fragmented and patchy distribution, with few large blocks of high quality habitat compared with adjacent counties to the north and south.

Not all areas of potential habitat are expected to be used by the species. The Hays County RHCP estimates that approximately 148,638 acres (87 percent) of the potential habitat in Hays County (including potential high, medium, and low quality habitat) has a probability of being occupied by the species (i.e., the habitat occurs in a landscape with at least 40 percent suitable habitat). Only approximately 50,305 acres of potential golden-cheeked warbler habitat mapped in Hays County (30 percent of the total area of potential habitat) has a probability of occupancy that exceeds 50 percent (i.e., the habitat occurs in a landscape with at least 80 percent suitable habitat) (see Section 3.2.1.3 and Appendix A of the RHCP).

Figure 4-3 shows areas of potential golden-cheeked warbler habitat in Hays County, including areas with various quality habitats and probabilities of occupancy. Table 4-5 summarizes the acreage in each habitat quality and occupancy category.

Table 4-5. Potential Golden-cheeked Warbler Habitat[1] and Occupancy Probability[2] in Hays County.

Habitat Class	Total Acres of Potential Habitat	Acres of Potential Habitat Not Likely to be Occupied	Acres of Potential Habitat May be Occupied	Acres of Potential Habitat Likely to be Occupied
Potential Low Quality Habitat	66,580	13,969	42,193	10,419
Potential Medium Quality Habitat	69,665	6,736	41,389	21,540
Potential High Quality Habitat	34,110	1,013	14,751	18,346
All GCW Habitat Classes	170,355	21,718	98,333	50,305

[1]Potential habitat and relative quality classes as identified by the Loomis habitat model. See Loomis (2008) in Appendix A of the Hays County RHCP for a discussion of model methodology and results.

[2]Occupancy probabilities based on an analysis of the Loomis habitat model using the methodology described in Magness et al. (2006). See Appendix A of the Hays County RHCP for a discussion of the Magness occupancy model and the occupancy analysis of the Loomis habitat model.

4.6.1.4 Population Estimates

No recent range-wide estimates of the population size of the golden-cheeked warbler are reported in the literature. Estimates of population size in 1962 reported in Pulich (1976) vary from approximately 7,815 pairs to 18,486 pairs, based on Soil Conservation Service surveys of "cedar brakes" and "virgin Ashe juniper" and estimates of the density of golden-cheeked warblers in areas of "average" habitat. Wahl et al. (1990) estimated that the population of golden-cheeked warblers was between approximately 4,822 to 16,016 pairs, based on estimates of forest cover identified from Landsat imagery collected between 1974 and 1981 for a portion of the golden-cheeked warbler range and revised assumptions of golden-cheeked warbler density in potential habitat.

The golden-cheeked warbler was first reported to occur in Hays County in the early 1890's (Pulich 1976). However, Pulich (1976) found that records of the species in Hays County were not numerous, possibly due to a history of land-clearing activity. Current records of golden-cheeked warblers in Hays County are also sparse, but available data show that the species has been recently recorded from across much of the county.

Several golden-cheeked warbler localities in Hays County were identified from available datasets provided by the Service, the Texas Natural Diversity Database, and Loomis (generalized golden-cheeked warbler locations are shown in Figure 4-3). These localities represent golden-cheeked warbler observations recorded by various observers between 1990 and 2005. Each of these recent golden-cheeked warbler localities occur in areas identified as potential habitat by the Loomis golden-cheeked warbler habitat model, including areas identified as potential low or moderate quality habitat and areas with a less than 50 percent probability of occupancy.

Pulich (1976) estimated that the golden-cheeked warbler population in Hays County was approximately 1,500 pairs in 1962 and approximately 150 pairs in 1974. There are no recent

estimates of the total number of golden-cheeked warblers in Hays County reported in the literature.

4.6.1.5 Threats

Most recent researchers have indicated that the population decline of the golden-cheeked warbler is a result of various factors related to habitat destruction and fragmentation (Wahl et al. 1990, USFWS 1992, Ladd and Gass 1999). Oberholser (1974) discussed three main causes for the decline in the amount of suitable habitat: land clearing for agricultural use, land development, and reservoir construction. Of these, land clearing for agricultural use and land development are activities occurring in Hays County. Other factors that may be contributing to the decline of the species include the loss of deciduous oaks in nesting habitat to oak wilt, brood parasitism by brown-headed cowbirds, and predation and competition by urban-tolerant birds, such as blue jays (USFWS 1992).

4.6.1.6 Recovery Plan

The 1992 Golden-cheeked Warbler Recovery Plan (USFWS 1992) identifies the criteria to be met for the golden-cheeked warbler to be considered for downlisting from endangered to threatened status. These recovery criteria include the protection of sufficient breeding habitat to ensure the continued existence of at least one viable, self sustaining golden-cheeked warbler population in each of the eight recovery regions delineated in the recovery plan, where the potential for gene flow exists across regions to ensure long-term viability of the protected populations (USFWS 1992). Hays County lies within Recovery Region 5, which also includes all of Travis County and portions of Williamson, Blanco, and Burnet counties.

Attaining the recovery goals for the golden-cheeked warbler includes the identification of "focal areas" for protection that include a single, viable golden-cheeked warbler population or one or more smaller populations that are interconnected. Within Recovery Region 5, it appears that two focal areas have already largely been protected through the establishment of the Balcones Canyonlands Preserve and the Balcones National Wildlife Refuge in Travis and Burnet Counties.

Hays County lacks the very large, contiguous blocks of potential golden-cheeked warbler habitat that are present in some adjacent counties (i.e., Travis County and, to a lesser extent, Comal County) (Figure 4-3). The potential golden-cheeked warbler habitat in Hays County, while fairly abundant, is distributed in smaller, more isolated patches (Figure 4-3). Therefore, Hays County generally lacks an obvious "focal area" to contribute to the recovery goals for Recovery Region 5. However, achieving the recovery goals for the golden-cheeked warbler also require the protection and management of "abundant and scattered patches of habitat" outside of the focal protection areas (USFWS 1992). Protection of golden-cheeked warbler habitat across Hays County could contribute to the maintenance of adequate connectivity between existing and potential focal areas in Recovery Regions 5 and 6.

A status review of the golden-cheeked warbler is underway, but is currently unavailable.

4.6.2 Black-capped Vireo

4.6.2.1 Description and Regulatory Status

The black-capped vireo is a small, migratory, insectivorous bird and is present in Texas during the breeding season. Black-capped vireos arrive in Texas from late March to mid-April, and leave their breeding grounds in the fall, generally by mid-September (USFWS 1991). The present known breeding range of the black-capped vireo extends from central Oklahoma through Dallas, the Edwards Plateau, Concho Valley, Callahan Divide, and Big Bend National Park in Texas to the Mexican states of Nuevo Leon and Tamaulipas. The species winters entirely in Mexico along the Pacific slopes of the Sierra Madre Occidental Mountains from southern Sonora to Oaxaca (Wilkins et al. 2006).

The Service lists the black-capped vireo as endangered. It was first proposed for endangered status on December 12, 1986 (51 FR 44808) and was given endangered status on October 6, 1987, the rule becoming effective on November 5, 1987 (52 FR 37420). However, a recent status review for the black-capped vireo recommended downlisting the status of the species to threatened (USFWS 2007). The Service has not designated critical habitat for the black-capped vireo. The black-capped vireo was state-listed as threatened on March 1, 1987 and endangered on December 28, 1987.

4.6.2.2 Habitat Requirements

The black-capped vireo uses heterogeneous scrub habitat that has a patchy distribution of shrub clumps and thickets with a few scattered trees and abundant deciduous foliage to ground level (Graber 1957, 1961; USFWS 1991; Grzybowski 1995). While the habitats occupied by the black-capped vireo may differ greatly across its range, the most common and distinguishing habitat element throughout the range of the species is the presence and density of low, deciduous foliage at ground level to approximately three meters (USFWS 1991, Grzybowski et al. 1994, Maresh 2005). This low, dense, deciduous cover provides foraging and nesting sites, as well as protective cover from adverse weather and predators (Grzybowski et al. 1994).

Typical plant species in black-capped vireo habitat on the Edwards Plateau include plateau live oak, shin oak, and various sumacs. Less common species include Texas mountain laurel, agarito, and beebrush (*Aloysia gratissima*). Ashe juniper is usually not the dominant species, although it may be co-dominant with the oaks (Graber 1961, USFWS 1991, Grzybowski 1995).

Black-capped vireo habitat may also be associated with certain geologic formations (i.e., Fredericksburg limestones in Texas), poor soils, and topographic features that might create more favorable conditions for maintaining low, patchy, shrublands (USFWS 1991). However, any potential relationships between soils, geology, and black-capped vireo habitat are poorly understood.

In many parts of the black-capped vireo range (including the eastern edge of the Edwards Plateau), the shrubland vegetation used by the species is an early successional vegetation type frequently maintained by fire or moderate browsing by wildlife or livestock (heavy browsing can reduce black-capped vireo habitat). Other land management practices may also create or maintain suitable habitat conditions for the black-capped vireo. In other parts of the species' range, suitable breeding habitat is a stable vegetation type maintained by the abiotic characteristics of the area (Farquhar and Gonzalez 2005).

4.6.2.3 Habitat Availability in Hays County

Due to the importance of vertical deciduous cover as a component of black-capped vireo habitat, the extent of this habitat across the range of the species has been difficult to assess. The best available estimates of black-capped vireo habitat are presented in Wilkins et al. (2006) and are based on habitat identified during a series of county-by-county roadside surveys reported in Maresh and Rowell (2000). However, due to sampling issues associated with the original roadside surveys, the region-wide and county-wide estimates of potential black-capped vireo habitat may not be reliable and are of limited utility (Wilkins et al. 2006). Further, these estimates of available habitat do not include maps showing the distribution of the habitat across the landscape. Wilkins et al. (2006) estimates that approximately 23,855 acres of potential black-capped vireo habitat may be available in Hays County.

4.6.2.4 Population Estimates

Wilkins et al. (2006) tallied the number of known, recently observed black-capped vireo males in Texas (i.e., observations documented since 2000), by county and recovery region, and estimated a total known Texas population size of approximately 6,010 males. The recent known population of black-capped vireos in the proposed black-capped vireo Recovery Region 2 (per USFWS 1996) was 1,018 males (Wilkins et al. 2006).

Graber (1957) identified breeding populations of the black-capped vireo in Hays County in the late 1950's located at the El Rancho Cima Boy Scout Camp and at locations within a couple of miles south and east of Wimberley. Accurate locations for these three historic observations are not available. The Texas Natural Diversity Database maintained by the Texas Parks and Wildlife Department identifies three occurrences of the black-capped vireo in Hays County (one reported in 1993 and the other two reported in 1999) (TPWD 2008a). The Service has not received any records of the species in the county since 2000 (Wilkins et al. 2006).

The current population of black-capped vireos in Hays County is unknown, since a detailed population survey of the county has not been completed and only a few observations of the species have been reported in recent years. However, given the increasingly optimistic status of the black-capped vireo overall (the recent status review proposed that the species be downlisted in part due to the larger number of known populations) (USFWS 2007b), the documented presence of the species on many private lands in the region (USFWS 2007b), and

the likely abundance of potential habitat in the county (Wilkins et al. 2006), the species is still likely to occur in Hays County.

4.6.2.5 Threats

The 2007 status review for the black-capped vireo found that habitat loss and fragmentation due to the conversion of rangeland to other uses has likely decreased the amount of available habitat for the black-capped vireo across Texas, particularly on the Edwards Plateau, and remains a major threat (USFWS 2007b).

The status review found that fewer domestic livestock on the Edwards Plateau, particularly goats, may have decreased the overall threat from grazing and browsing. However, heavy grazing and browsing by domestic livestock may still have an important negative impact on localized black-capped vireo populations. While the density and abundance of domestic livestock on the Edwards Plateau may be decreasing, the populations of white-tailed deer and other exotic, browsing ungulates may have increased, which may be of concern to the species (USFWS 2007b).

Brood parasitism by brown-headed cowbirds has been identified as a major factor in the low reproductive success of some black-capped vireo populations. Cowbird abundance is correlated with the number and proximity of domestic livestock feeding areas, and the relative abundance of cowbirds in Texas has generally been decreasing over the last ten years. In addition to the general decline of the abundance of cowbirds in North America, cowbird trapping and removal efforts are likely to have reduced parasitism rates on many of the managed populations. The status review states that the overall threat to the species from brood parasitism in Texas has likely decreased since the time of listing (USFWS 2007b).

Vegetational succession, particularly the invasion and growth of Ashe juniper into formerly open rangelands, has limited black-capped vireo habitat across much of the range of the species. The status review identifies fire suppression, overgrazing, and drought as contributing factors to the increase of Ashe juniper in the landscape. The status review suggests that vegetational succession may be an increasing threat to the black-capped vireo, but little data is available to quantify the magnitude of the threat (USFWS 2007b).

In addition to the major threats to the species, the status review identifies predation from red-imported fire ants as a potentially increasing threat to the species (USFWS 2007b).

4.6.2.6 Recovery Plan and Status Review

The 1992 Black-capped vireo Recovery Plan is currently considered to be out-of-date and in need of revision (USFWS 2007b), primarily because the known black-capped vireo population is currently much larger than the known population at the time of listing and the relative magnitude of the primary threats to the species is likely to have changed since listing. However, the recovery criteria listed in the 1992 Recovery Plan included a call for the protection

of at least one viable black-capped vireo population composed of at least 500 to 1000 breeding pairs in each of six recovery regions in Texas, Oklahoma, and Mexico.

The Service includes Hays County within the black-capped vireo Recovery Region 3 (USFWS 1991). However, the Black-capped vireo Population and Habitat Viability Assessment Report (USFWS 1996) recommended that Hays County be included in a redrawn Recovery Region 2.

The 2007 status review recommends that the species be down listed from endangered to threatened status (USFWS 2007b). The recommendation for downlisting is based on observations that total known population of black-capped vireos in Texas is much larger than that known at the time of listing due to an increase in the overall population size and/or increased survey efforts that identified populations at new locations (including on private lands). Given a larger known population, the magnitude of the major threats to the species generally less than previously suspected. However, the status review cautions that threats to this species still exist and its recovery depends on the implementation of management actions to reduce these threats (USFWS 2007b).

4.7 Hays County RHCP Evaluation and Additional Species

The other special status species addressed in this EIS include the evaluation and additional species addressed in the Hays County RHCP and the other Federal or state listed species with potential occurrence in Hays County. None of these species are proposed for incidental take coverage in the RHCP, but some may benefit from the conservation measures described in the RHCP.

4.7.1 Evaluation Species

The proposed Hays County RHCP addresses 40 karst species that are included in the RHCP as "evaluation" species. The 40 evaluation species are listed in Table 1-1. These evaluation species were recommended for inclusion in the RHCP by the Hays County BAT. Each of the evaluation species is currently unlisted; however, the County recognizes that these species may be rare or sensitive and that some may have the potential to become listed species during the duration of the permit. Several of the evaluation species were included in a listing petition that was submitted to the Service in 2007 by the Forest Guardians (now WildEarth Guardians); although some of these petitioned species were recently dismissed by the Service from further review (see Table 4-6).

For the majority of these karst species, little is known of their biology, including breeding, diet, home ranges, microhabitat, demography, behavior, longevity, species associations, or life history. Only a handful of field studies on the karst invertebrates exist (Holsinger and Longley 1980). The known ranges of the evaluation species are limited and all of the species are currently known to occur only in Texas; most are known from fewer than ten localities. Several species are single site endemics that are currently known from only one location in Hays County.

Descriptions, known localities, and habitat requirements (as currently known) for the evaluation species are described in Appendix B and Appendix C of the Hays County RHCP and summarized in Table 4-6 below.

Insufficient information about these species currently exists to support the level of analysis required to meet the ESA issuance criteria for an incidental take permit. Therefore the County is not currently seeking incidental take coverage for these species through the RHCP.

Table 4-6. Evaluation Species Addressed in the Hays County RHCP[1].

Species	Hays County Occurrence	Notes
		TUBELLARIANS
Sphalloplana mohri	Artesian Well, Ezell's Cave	The known range of this aquifer flatworm is limited to two localities in Hays County and four other localities in Kendall, Travis, San Saba, and Mason counties (Kenk 1977, Texas Memorial Museum (TMM) Database 2001).
		MOLLUSKS
Phreatodrobia micra	Artesian Well, San Marcos Springs	The flattened cavesnail is an aquifer adapted species known from six localities in three Texas counties: Hays, Comal, and Kendall counties (Hershler and Longley 1986).
Phreatodrobia plana	Artesian Well, San Marcos Springs	The disc cavesnail is an aquifer adapted species known to occur at three localities in Comal and Hays counties (Hershler and Longley 1986).
Phreatodrobia punctata	San Marcos Springs	The high-hat cavesnail is known to occur at only two localities; one in Travis County (Barton Springs) and one in Hays County (San Marcos Springs) (Hershler and Longley 1986, TMM database 2001).
Phreatodrobia rotunda	Artesian Well, San Marcos Springs	The beaked cavesnail is currently known to be endemic to Hays County, with only two known localities (Hershler and Longley 1986, TMM database 2001).
		HIRUDINEA
Mooreobdella n. sp.	Artesian Well, Ezell's Cave, San Marcos Springs,	This cave-obligate leach is one of only two known aquifer-adapted leeches in the world: one is in Romania and the other is in Hays County, Texas (Culver and Sket 2000). Virtually nothing is known about this species and it has not yet been described by taxonomists. The currently known distribution in Texas includes three localities in Hays County (TMM database 2001, R. Gibson pers. comm. to Zara Environmental 2008).
		CRUSTACEANS
Tethysbaena texana	Artesian Well, Diversion Spring, Ezell's Cave	This cave-obligate crustacean is the only species from this rare order of crustaceans that is known from the continental United States. The species is known from seven localities in Bexar, Comal, Hays, and Uvalde counties (Stock and Longley 1981; R. Gibson, pers. comm. to Zara Environmental 2008).

Table 4-6. Evaluation Species Addressed in the Hays County RHCP[1].

Species	Hays County Occurrence	Notes
Allotexiweckelia hirsuta	Artesian Well	This cave-obligate amphipod is the only member of the genus *Allotexiweckelia*. It is a subterranean species known from three localities in Hays and Bexar counties (Holsinger and Longley 1980, TMM database 2001).
Artesia subterranea	Artesian Well, Ezell's Cave	There are only two species in the genus *Artesia*, and both occur only in Texas. This cave-obligate amphipod is described from a single locality in Hays County (Holsinger and Longley 1980), but has been identified at three other sites in Hays, Comal, and Val Verde counties (Gibson et al. 2008; R. Gibson pers. comm. to Zara Environmental 2008). Based on the nature of all of these localities, Gibson et al. (2008) suggests that this species primarily inhabits deeper areas of the aquifer.
Holsingerius samacos	Artesian Well	This cave-obligate amphipod is currently known from a single locality in Hays County (Holsinger and Longley 1980, TMM database 2001).
Seborgia relicta	Artesian Well, Ezell's Cave	This species is a cave-obligate amphipod known from five localities in Hays, Comal, and Medina counties (Holsinger and Longley 1980, Gibson et al. 2008, Holsinger 1992).
Stygobromus balconis	Autumn Woods Well, Boyett's Cave	The Balcones Cave amphipod is currently known from four localities, including sites in Hays and Travis counties (Gluesenkamp and Krejca 2007, Hubricht 1943, TMM database 2001, R. Gibson pers. comm. to Zara Environmental 2008).
Stygobromus flagellatus	Artesian Well, San Marcos Springs, Ezell's Cave, Rattlesnake Cave	The Ezell's Cave amphipod is currently known from six localities in Hays, Comal, and Travis counties (Holsinger 1966, Holsinger 1967, Holsinger and Longley 1980, Gibson et al. 2008).
Texiweckelia texensis	Artesian Well, Ezell's Cave, San Marcos Springs	This cave-obligate amphipod is known from three localities in Hays County (Holsinger and Longley 1980, R. Gibson pers. comm. to Zara Environmental 2008).
Texiweckeliopsis insolita	Artesian Well, San Marcos Springs	This cave-obligate amphipod is known from three localities in Hays and Bexar counties (Holsinger and Longley 1980).
Lirceolus smithii	Artesian Well, Diversion Spring	The Texas troglobitic water slater is currently known to be a Hays County endemic, and is only known from two localities in the county (Bowman and Longley 1976, Gibson et al. 2008).
Calathaemon holthuisi	Artesian Well, Ezell's Cave	This cave-obligate decapod is a Hays County endemic and is currently known only from Ezell's Cave (TMM database 2001). However, there is an unverified new locality at the Artesian Well (R. Gibson pers. comm. to Zara Environmental 2008).
Palaemonetes antrorum	Artesian Well, Ezell's Cave, Frank Johnson's Well, Wonder Cave	The Balcones cave shrimp has been recorded from eight localities in Bexar and Hays counties. However, one of the Hays County sites (Wonder Cave) is severely impacted by habitat modification and commercialization, and all recent attempts to find any aquatic fauna there have been unsuccessful. Furthermore, there are two other localities where blind shrimp have been reported but not verified, including Jacob's Well in Hays County and Carson Cave in Uvalde County (TMM database 2001).

Table 4-6. Evaluation Species Addressed in the Hays County RHCP[1].

Species	Hays County Occurrence	Notes
		ARACHNIDS
Cicurina ezelli[2]	Ezell's Cave, Grapevine Cave	This species is a cave-obligate spider and currently known to be a Hays County endemic. The spider is currently known from only two localities in the county (TMM database 2001).
Cicurina russelli[2]	Boyett's Cave	This cave-obligate spider is currently known to be a Hays County endemic that is known from only one locality in the county (TMM database 2001).
Cicurina ubicki[2]	Fern Cave, McGlothlin Sink	This species is currently known to be a Hays County endemic that is known from two localities in the county (TMM database 2001).
Eidmannella n. sp.	Ezell's Cave, McCarty Cave, McGlothlin Sink	This new species of cave-dwelling spider definitively occurs in Ezell's Cave, and possibly also occurs in McCarty Cave and McGlothlin Sink in Hays County (TMM database 2001). The species description will be the ultimate source for information on the biology, taxonomy, and distribution of the species.
Neoleptoneta n. sp. 1[3]	Burnett Ranch Cave	This new species of cave-dwelling spider is currently known to be endemic to Hays County and is only known from one locality: Burnett Ranch Cave (TMM database 2001).
Neoleptoneta n. sp. 2[3]	Boyett's Cave	This new species of cave-dwelling spider is endemic to Hays County and is currently known from only one locality in the county (TMM database 2001).
Neoleptoneta n. sp. eyeless[3]	Katy's Cave	This new species of cave-dwelling spider is endemic to Hays County and is only known from one locality (P. Paquin pers. comm. to Zara Environmental 2007).
Tartarocreagris grubbsi	Wissman's Sink	This species is a cave-obligate pseudoscorpion and is currently known to be a Hays County endemic. The species has been recorded from only one location in the county (Muchmore 2001, TMM database 2001).
Texella diplospina	Ladder Cave	This species is a cave-obligate harvestman that is currently known to be a Hays County endemic. The species has only been recorded from a single site in the county (Ubick and Briggs 2004, TMM database 2001).
Texella grubbsi	Burnett Ranch Cave, Wissman's Sink, Wissman's Sink #2	This cave-obligate harvestman is known to occur in Hays, Travis, and Burnet counties at seven underground localities and two surface localities in Burnet County (Ubick and Briggs 2004, TMM database 2001).
Texella mulaiki	Boggus Cave, Ezell's Cave, Fern Cave, Ladder Cave, McCarty Cave, McGlothlin Sink, Michaelis Cave, Tricophorous Cave	This species is a cave-obligate harvestman that occupies relatively deeper portions of the caves than other rare harvestman in Hays County (Ubick and Briggs 1992). The species is known from fifteen localities within Hays and Travis Counties (Ubick and Briggs 1992, Ubick and Briggs 2004, TMM database 2001).

Table 4-6. Evaluation Species Addressed in the Hays County RHCP[1].

Species	Hays County Occurrence	Notes
Texella renkesae	Ezell's Cave, Maggens Sink Hole	This cave-obligate harvestman is a Hays County endemic that is currently known from only two caves in the county (TMM database 2001).
		INSECTS
Arrhopalites texensis	Grapevine Cave, Wissman's Sink #2	This species is a cave-obligate springtail that is currently known from seven or eight localities in five counties, including Bandera, Bexar, Hays, Travis, and possibly Williamson counties (TMM database 2001).
Batrisodes grubbsi	Grapevine Cave	This species is a troglobitic, ant-like litter beetle currently known only from a single cave in Hays County (Muchmore 2001).
Comaldessus stygius	Fern Bank Springs	The Comal Springs diving beetle is currently known from two localities: Comal Springs (Comal County) and Fern Bank Springs (Hays County) (Gibson et al. 2008).
Haideoporus texanus	Artesian Well	The Edwards Aquifer diving beetle is known from two localities in Hays and Comal counties (Young and Longley 1976, Gibson et al. 2008).
Rhadine sp. cf. *austinica*	Dahlstrom Cave, Michaelis Cave	This new species of cave-obligate beetle is a Hays County endemic that is currently known from only two sites (J. Reddell pers. comm. to Zara Environmental 2007, TMM database 2001).
Rhadine insolita	Grapevine Cave	This cave-obligate beetle is currently known from two localities in Hays and Comal counties (TMM database 2001).
Rhadine n. sp. eyed	Boyett's Cave	This new species of cave-obligate beetle is a Hays County endemic that is currently known from only a single locality (TMM database 2001).
Rhadine n. sp. 2	Ezell's Cave, Lime Kiln Quarry Cave, McCarty Cave	This new species of cave beetle is currently known to be a Hays County endemic and definitively occurs in three caves (J. Reddell pers. comm. to Zara Environmental 2007, J. Krejca pers. coll., TMM database 2001).
		AMPHIBIANS
Eurycea pterophila	Ben McCulloch Springs, Blanco River Spring, Cypress Creek Spring, Fern Bank Springs, Grapevine Cave, Jacob's Well, Rancho Cima Dam Spring, Smith Creek Lower and Upper Springs, Spring 1 mi. SE Signal Hill, Spring 1.5 mi. E Payton	The Blanco River salamander is known to occur in at least three counties (Blanco, Hays, Kendall, and possibly Comal counties), with at least eleven known sites in Hays County (Sweet 1978, Chippindale et al. 2000, D. Hillis pers. comm. to Zara Environmental 2008, J. Krejca pers. comm. to Loomis 2008). Previously thought to be restricted to the Blanco River drainage basin, recent work by Bendick (2006) showed this species also occurs in the Guadalupe River drainage basin.

Table 4-6. Evaluation Species Addressed in the Hays County RHCP[1].

Species	Hays County Occurrence	Notes
Eurycea robusta	Underneath Blanco River at IH 35	The Blanco blind salamander is known from a single existing specimen that was collected in 1951 from groundwater in a narrow vertical fissure in the bed of the Blanco River northeast of San Marcos, in Hays County (Potter and Sweet 1981). Russell (1976) provided new information on the distribution of *E. robusta* in relation to hydrogeology, and theorized that although *E. robusta* came from a block of Austin Chalk, that unit is not particularly cavernous and the salamander may have actually come up from cave passages in the underlying Edwards Limestone. This species is state-listed by Texas as threatened.

[1]Shaded species are included in the Forest Guardians 2007 listing petition. However, *Phreatodrobia rotunda*, *Artesia subterranea*, *Cicurina ezelli*, *Cicurina russelli*, *Cicurina ubicki*, *Texella diplospina*, *Texella grubbsi*, *Texella renkesae*, *Rhadine austinica*, and *Rhadine insolita* were dismissed by the Service from further review (74 FR 419).

[2]Cave spiders, particularly in the genus *Cicurina*, are speciose in central Texas, and four *Cicurina* in Bexar County are Federally listed. In Hays County, there are eleven localities recorded for an unidentified blind *Cicurina* that may represent additional localities for one of these evaluation species, or they may represent an undescribed species. Further collection and identification efforts in the county will most likely change the known distribution of these species drastically.

[3]Cave-dwelling leptonetid spiders include two Federally listed species in the genus *Neoleptoneta*. Hays County has up to three undescribed species in this group that are each only known from a single locality.

Recently, the Service received a petition from the Forest Guardians to list all southwestern species with NatureServe global conservation rankings of G1 or G1G2 (critically imperiled or imperiled on a global scale, typically based on the number of known populations) as Federally threatened or endangered (Forest Guardians 2007). The petition names 9 of the evaluation species (*C. ezelli*, *C. russelli*, *C. ubicki*, *T. diplospina*, *T. grubbsi*, *T. renkesae*, *B. grubbsi*, *R. austinica*, and *R. insolita*); however, the Service dismissed several of these species from further review (74 FR 419). However, many of these evaluation species may still be rare (many are currently known to be endemic only to Hays County).

4.7.2 Hays County RHCP Additional Species

The proposed Hays County RHCP addresses a third category of species called "additional species", since the conservation measures described in Section 6 of the Hays County RHCP may collaterally benefit these species. The additional species, as listed in Table 1-1, were identified for inclusion in the RHCP by the Hays County BAT.

Hays County will not seek incidental take authorization for the 16 additional species because the species are either: 1) not likely to be impacted by covered activities; 2) insufficient information is available to adequately evaluate take or impacts and mitigation; and/or 3) Hays County lacks mechanisms to address important threats to the species (such as addressing the amount of water in area aquifers). However, as described for the evaluation species, conservation measures taken under the RHCP for the covered species may collaterally benefit one or more of the additional species. Species placed in this category include several of the currently listed aquatic species, as well as unlisted plants and unlisted aquatic animals.

Brief descriptions of the 16 additional species are provided below.

4.7.2.1 Hill Country Wild-mercury

Hill Country wild-mercury (*Ditaxis aphoroides*, also known as *Argythamnia aphoroides*) is an herbaceous perennial plant that is narrowly endemic to the Edwards Plateau and the southwestern portion of north-central Texas. It grows in shallow to moderately deep sandy or rocky limestone soils, including clays and clay loams over limestone. Hill Country wild-mercury is found on rolling upland terrains in grasslands mixed with live oak woodlands. The species has been historically recorded from Hays County, but Mahler (1988) did not report any currently known populations from the county (Diggs et al. 1999, TPWD 2008a). This plant has a global conservation ranking indicating that the species is imperiled across its entire range with a high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors (NatureServe 2007).

4.7.2.2 Warnock's Coral-root

Warnock's coral-root (*Hexalectris warnochii*), also known as Texas purple-spike) is a native Texas orchid found growing under juniper-oak woodlands on the Edwards Plateau. The species also occurs in the Trans-Pecos regions of Texas. On the Edwards Plateau, the orchid grows in deep leaf litter and humus over rocky limestone soils (Diggs et al. 1999, Liggio and Liggio 1999). Warnock's coral-root has been recorded in Hays County (Liggio and Liggio 1999). The species has a global conservation ranking indicating that the species is vulnerable to extirpation or extinction or may be imperiled across its entire range with a moderate to high risk of extinction due to a restricted range, few populations (often 80 or fewer), recent or widespread and possibly steep declines, or other factors (NatureServe 2007).

4.7.2.3 Canyon Mock-orange

Canyon mock-orange (*Philadelphus ernesti*) is a small, flowering shrub that grows on shaded, limestone outcrops in mesic canyons and along streams on the Edwards Plateau. The species is rare and endemic to the Texas Hill Country, including Hays County (Lynch 1981, TPWD 2008a). Canyon mock-orange has a global conservation ranking indicating that the species is imperiled across its entire range with a high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors (NatureServe 2007).

4.7.2.4 Texas Wild-rice

Texas wild-rice (*Zizania texana*) is an aquatic, perennial grass that is generally three to seven feet long. The plant grows in the swift-moving waters of the upper San Marcos River. Texas wild-rice was federally listed as endangered on April 26, 1978 (43 FR 17910). Critical habitat for Texas wild-rice has been designated at Spring Lake and the headwaters of the San Marcos River to its confluence with the Blanco River (USFWS 1995).

4.7.2.5 Texas Fatmucket

The Texas fatmucket (*Lampsilis bracteata*) is a freshwater mussel occurring in streams and small rivers in the Colorado and Guadalupe river basins (Howells et al. 1996, NatureServe 2007). While the Texas fatmucket has not been recorded from Hays County, it has been found in several adjacent and nearby counties (Howells et al. 1996). However, only five small populations are thought to remain and the current status of three of these populations is questionable due to flood scouring or dewatering (NatureServe 2007). The species has a global conservation ranking indicating that the species is imperiled across its entire range with a high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors (NatureServe 2007).

4.7.2.6 Golden Orb

The golden orb (*Quadrula aurea*) is a freshwater mussel that appears to be restricted to flowing waters ranging from only a few centimeters to over three meters deep with sand, gravel, and cobble bottoms (NatureServe 2007). The golden orb has been recorded from the San Antonio, Guadalupe, Colorado, Brazos, Nueces, and Frio river systems. However, its current distribution is thought to only include the Guadalupe, Nueces, Frio, and San Marcos rivers (Howells et al. 1996, NatureServe 2007). The species has a global conservation ranking indicating that the species is imperiled across its entire range with a high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors (NatureServe 2007).

4.7.2.7 Texas Pimpleback

The Texas pimpleback (*Quadrula petrina*) is a freshwater mussel that utilizes mud, gravel, and sand substrates in large to medium sized rivers that have slow flow rates. The species has been found in sites with less than one meter of water. The Texas pimpleback occurs within the Guadalupe and Colorado river basins. While it has been recorded from the Llano, San Saba, Pedernales rivers, the species is currently known to occur only within the Concho River, Colorado River, and a tributary of the Colorado River in Runnels County (Howells et al. 1996, NatureServe 2007). This species has a global conservation ranking indicating that it is imperiled across its entire range with a high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors (NatureServe 2007).

4.7.2.8 Texas Austrotinodes Caddisfly

Caddisflies are slender, elongated, moth-like insects with a winged, terrestrial adult stage and an aquatic caterpillar-like larval stage. The Texas austrotinodes caddisfly (*Austrotinodes texensis*) has been observed at Fern Bank Springs in Hays County, and appears to be endemic to the karst springs and spring runs of the Edwards Plateau. This species has a global conservation ranking indicating that the species is imperiled across its entire range with a high risk of

extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors (NatureServe 2007).

4.7.2.9 Comal Springs Riffle Beetle

The Comal Springs riffle beetle (*Heterelmis comalensis*) is a very small (1.7 to 2.1 mm long) beetle, elongate with approximately parallel sides, coated with fine hairs, and reddish-brown in color (Bosse et al. 1988). Larvae are up to 10 mm long, with an elongate tubular body. Biologists find adults and larvae of this aquifer species primarily in drift nets or cotton cloth traps at spring upwellings (Gibson et al. 2008). This species is known from two localities: San Marcos Springs in Hays County and Comal Springs in Comal County.

The Comal Springs riffle beetle was Federally listed as endangered on December 18, 1997 (62 FR 66295). Critical habitat was designated at Comal Springs and San Marcos Springs on July 17, 2007 (72 FR 39247). The critical habitat designation in Hays County includes 10.5 acres associated with the surface aquatic habitat at the spring outlets and within Spring Lake (except for the slough portion of the lake that lacks spring outlets) (72 FR 39247).

4.7.2.10 *Procleon* Mayfly

Procloeon distinctum is a species of mayfly, which are small to medium-sized insects with a winged adult stage and aquatic immature stage. Larvae of *Procloeon distinctum* have been found in submergent vegetation at the lower reaches of riffles and runs. This species has a global conservation ranking indicating that the species is imperiled across its entire range with a high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors (NatureServe 2007).

4.7.2.11 San Marcos Saddle-case Caddisfly

The San Marcos saddle-case caddisfly (*Protoptila arca*) is a slender, elongated, moth-like insect with a winged, terrestrial adult stage and an aquatic caterpillar-like larval stage. The species appears to prefer swiftly moving and well oxygenated, warm water approximately one to two meters deep. While the species is known to be locally very abundant, it has only been recorded from an artesian well in Hays County (NatureServe 2007, TPWD 2008a). This caddisfly has a global conservation ranking indicating that the species is critically imperiled across its entire range with a very high risk of extinction due to extreme rarity (often five or fewer known populations), very steep population declines, or other factors. (NatureServe 2007).

4.7.2.12 Comal Springs Dryopid Beetle

The Comal Springs dryopid beetle (*Stygoparnus comalensis*) is a slender aquatic beetle, about 3 to 4 mm long, with a thin outer covering and reddish-brown color (Barr and Spangler 1992). Larvae are elongate, cylindrical and yellowish-brown. Originally described only from Comal Springs, the type locality and source of the specific name, Barr (1993) discovered them at a second locality, Fern Bank Springs in Hays County. Biologists find adults and larvae of this

aquifer species primarily in drift nets or cotton cloth traps at spring upwellings (Gibson et al. 2008).

The Comal Springs dryopid beetle was listed as Federally endangered on December 18, 1997 (62 FR 66295). The species is only known to occur at Comal Springs at the headwaters of the Comal River in Comal County and Fern Bank Springs approximately 20 miles northeast of Comal Springs in Hays County (USFWS 1995). Critical habitat was designated for the Comal Springs dryopid beetle at both locations on July 17, 2007. The Fern Bank Springs critical habitat unit includes the aquatic habitat at the spring outlet and a 50-foot wide buffer around the spring outlet that includes adjacent riparian habitat. The total size of the critical habitat area at Fern Bank Springs is 1.4 acres (72 FR 39247).

4.7.2.13 Fountain Darter

The fountain darter (*Etheostoma fonticola*) is a reddish-brown freshwater fish that is typically less than one inch long (USFWS 1995). The Service listed the fountain darter as Federally endangered on October 14, 1970 (35 FR 16047). The species is currently known to occur in Spring Lake and the headwaters of the San Marcos River downstream to approximately the confluence of the Blanco River. The fountain darter is also known to occur throughout the Comal River (USFWS 1995). Critical habitat for the fountain darter is designated at Spring Lake and the headwaters of the San Marcos River to approximately 0.5 mile below the Interstate Highway 35 bridge (USFWS 1995).

4.7.2.14 San Marcos Salamander

The San Marcos salamander (*Eurycea nana*) is a small, slender, light reddish-brown, neotenic salamander (Bishop 1941). It is approximately 4 to 6 mm long, lungless, and retains external gills throughout life. Chippindale et al. (1998) reviewed the history of taxonomic status of the species, and studied allozyme and morphological characteristics to justify the validity as a species. The San Marcos salamander can be distinguished from other central Texas *Eurycea* based on a narrower head, light reddish brown body color and dark eye ring, and allozyme characteristics. The habitat for this salamander consists of spring openings and rocky substrates at Spring Lake and below the dam where there is consistently cool, clean, clear, and flowing water. Moss and algae provide habitat for prey species, including amphipods and shrimp. Population estimates have ranged from 17,000 to 53,000 individuals (USFWS 1995).

The San Marcos salamander was listed as federally threatened on July 14, 1980 (45 FR 47355). The species is only known to occur in and just downstream of Spring Lake. Critical habitat for the San Marcos salamander is designated at Spring Lake and approximately 164 feet downstream from the Spring Lake Dam in the upper reaches of the San Marcos River (USFWS 1995).

4.7.2.15 *Eurycea* Species (Northern Hays County)

Eurycea salamanders have been found at four locations in northern Hays and southern Travis County between San Marcos Springs and Barton Springs: Blowing Sink Cave and Cold Springs in Travis County and Stuart Springs (also known as "Springs on Little Bear Creek" and as "Taylor Springs" as per Bendick [2006]) and Spillar Ranch Springs in Hays County. These populations share genetic similarity with the San Marcos salamander (*Eurycea nana*) (Bendick 2006), yet are morphologically aligned with the Barton Springs salamander (*Eurycea sosorum*). Both the San Marcos salamander and the Barton Springs salamander are federally listed species. The presence of these *E. nana* populations outside of the San Marcos Springs complex is a preliminary finding and based on a limited sample size (Bendick 2006), and this finding is not yet well documented in technical literature or addressed by regulatory entities (i.e., the Service). However, the most likely outcome of this documentation is that within the next five years biologists will describe these populations as a range extension for the federally listed San Marcos salamander or Barton Springs salamander. Estimates of the number of salamanders at these four sites are not available. Overall, the very low densities at all known localities suggest population numbers that are quite low. As with other *Eurycea* species, these populations probably rely on consistently clean flowing water and substrates that sustain prey species (crustaceans).

4.7.2.16 Texas Blind Salamander

The Texas blind salamander (*Eurycea rathbuni*) is an unpigmented, fully aquatic, large (up to 13 cm long) cave-adapted salamander distinguishable from other central Texas *Eurycea* by the lack of pigment that leaves it with a pearlescent color, extremely broad and flattened head shape, long spindly arms, deeply finned tail, and extremely reduced eyes visible as two small dark spots beneath the skin.

As the largest aquifer organism in Hays County, it is the top predator, feeding on aquifer invertebrates, including crustacea and snails (Longley 1978). A recent study summarized historic qualitative population estimates and used mark-recapture techniques to estimate current populations. At one site the population ranged from 10 to 93 individuals, and densities were recorded at two sites as 0.0026/m^2 and 2.08/m^2 (Gluesenkamp and Krejca 2007). Russell (1976) provides a summary of the distribution of the species, including a discussion of geology.

The species is a Hays County endemic, recorded from a small geographical cluster of eight sites: Diversion Spring, Ezell's Cave, Johnson's Well, Primer's Well, Rattlesnake Cave, Side seeps in Sessom's Creek, Artesian Well, and Wonder Cave. The Wonder Cave locality is severely impacted by habitat modification and commercialization and all recent attempts to find any aquatic fauna there have been unsuccessful.

The Texas blind salamander was listed as federally endangered on March 11, 1967 (32 FR 4001). No critical habitat has been designated for the Texas blind salamander (USFWS 1995).

4.8 Other Special Status Species

In addition to the Hays County RHCP covered species, evaluation species, and additional species discussed above, TPWD (2008a) identifies nine Federal or state protected wildlife species as having the potential to occur in Hays County. These "special status" species and their regulatory status are listed in Table 4-7 and discussed briefly below.

Table 4-7. Other species in Hays County with Federal or state protected status.

Species	Federal Status	Texas State Status
Birds		
American peregrine falcon (*Falco peregrinus anatum*)	Delisted	E
Arctic peregrine falcon (*Falco peregrinus tundrius*)	Delisted	T
Bald eagle (*Haliaeetus leucocephalus*)	Delisted	E
Whooping crane *(Grus americana*)	E	E
Zone-tailed hawk (*Buteo albonotatus)*		T
Reptiles		
Cagle's map turtle (*Graptemys caglei*)		T
Texas horned lizard (*Phrynosoma cornutum*)		T
Fish		
San Marcos gambusia (*Gambusia georgei*)	E	E
Mammals		
Red wolf (*Canis rufus*)	E	E

Key: E = Endangered, T = Threatened

4.8.1 American Peregrine Falcon

The American peregrine falcon (*Falco peregrinus anatum*) nests on mountain cliffs and river gorges which generally exceed 200 feet in height (Campbell 2003). The species is an uncommon to rare migrant throughout the state, and is a rare to very rare winter resident occupying primarily urban areas, inland to north-central Texas (Lockwood and Freeman 2004). The American peregrine falcon is a year-round resident in the Trans-Pecos with breeding populations confined to the Guadalupe and Chisos Mountains and the cliffs that line the Rio Grande, but may appear in Hays County as a migrant (Campbell 2003). Fall migrants are noted around the state as early as mid-July, and spring birds may linger as late as early May (Lockwood and Freeman 2004).

The species was listed as a Texas endangered species in 1974, but was removed from the Federal List of Endangered and Threatened Wildlife in August 1999 (64 FR 46541).

4.8.2 Arctic Peregrine Falcon

The Arctic peregrine falcon (*Falco peregrinus tundrius*) is slightly smaller in size and lighter in color than the American peregrine falcon (Campbell 2003). It is an uncommon to rare migrant throughout the state, and is a locally uncommon winter resident on the Coastal Prairies,

but can be common at times along the intermediate coast, particularly near bays and estuaries (Lockwood and Freeman 2004). Like the American peregrine falcon, the arctic peregrine falcon may appear in Hays County as a migrant (Campbell 2003). Fall migrants are noted as early as mid-July, and spring birds may linger as late as early May (Lockwood and Freeman 2004).

This species was listed as a Texas endangered species in May 1975, and was reclassified as a threatened species in March 1987. The falcon was removed from the Federal list of endangered and threatened wildlife in October 1994 (59 FR 50796).

4.8.3 Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) is found year-round in Texas, and the Texas population includes both breeding populations and winter residents. Breeding populations are typically found in the eastern half of the state and along the Texas Gulf Coast; however the species has been known to breed at some localized sites in central Texas. Most wintering populations have been observed in the Texas Panhandle and the central and eastern portions of the state. Spring and fall migrants are also found throughout the state (Campbell 2003). Hays County lacks large bodies of open water that would be suitable for nesting or wintering bald eagles.

The bald eagle is a Texas threatened species, but it was removed from the Federal list of endangered and threatened wildlife in July 2007 (72 FR 37346). The species will be monitored by the Service, in cooperation with the states for a minimum of five years after delisting, pursuant to the Endangered Species Act. The species is still protected by the Bald and Golden Eagle Protection Act (16 USC 668-668d), which prohibits "take" of bald and golden eagles and provides a statutory definition of "take" that includes "disturb."

4.8.4 Whooping Crane

The whooping crane (*Grus americana*) is a migratory bird that winters along the Texas coast. The coastal wintering grounds are dominated by salt grass (*Distichlis spicata*), saltwort (*Batis maritima*), smooth cordgrass (*Spartina alterniflora*), glasswort (*Salicornia* sp.), sea ox-eye (*Borrichia frutescens*), and Gulf cordgrass (*Spartina spartinae*). During migration, whooping cranes are known to utilize a variety of habitat types, including freshwater marshes, wet prairies, inland lakes, upland grain fields, and riverine systems (Campbell 2003). Migration occurs throughout the central portion of the state, to the central coast during October-November and again in April (TPWD 2008b). The portion of Hays County over the Edwards Plateau lacks extensive wetlands, major river systems, and abundant crop fields. Therefore, whooping cranes are highly unlikely to use the area during migration.

The whooping crane was Federally listed as endangered in June 1970 (35 FR 8491). Critical habitat for the species was designated in May 1978 (43 FR 20938) and includes wintering range in the Aransas National Wildlife Refuge and vicinity of the Texas Gulf coast.

4.8.5 Zone-tailed Hawk

The zone-tailed hawk (*Buteo albonotatus*) is an uncommon local summer resident in the mountains of the central Trans-Pecos, east through the southern Edwards Plateau, and a rare winter resident from Tom Green and Irion Counties southward to east-central Texas. Numerous records of occurrence exist from Bell, Bastrop, Bexar, Colorado, and Victoria counties, although there is no consistent wintering area east of the Balcones Escarpment (Lockwood and Freeman 2004). The zone-tailed hawk occupies arid open country, including open deciduous or pine-oak woodland, mesa or mountain county, often near watercourses, and wooded canyons and tree-lined rivers along middle-slopes of desert mountains. The species utilizes various habitats and sites for nesting, ranging from small trees in lower desert, giant cottonwoods in riparian areas, to mature conifers in high mountain regions (TPWD 2008b).

The species is listed as threatened by the State of Texas.

4.8.6 Cagle's Map Turtle

Cagle's map turtle (*Graptemys caglei*) is a small, emydine, aquatic turtle measuring from three to eight inches long. Cagle's map turtle only occurs within the watersheds of the Guadalupe River basin of eleven counties in Texas: Bexar, Blanco, Comal, Dewitt, Gonzales, Guadalupe, Hays, Kendall, Kerr, Lavaca, and Victoria counties (Dixon 2000). According to Vermersch (1992), it may be the most common species of aquatic turtle in Dewitt County, but may now be extirpated in the San Antonio drainage of the Guadalupe River. It is known to occur upriver to the Kerrville area in Kerr County, but its distribution across the Edwards Plateau is poorly documented (Simpson and Rose 2007). Turtles were caught on the Blanco River in Hays County in 2003. However, the density of the species in the Blanco River is thought to be low and the turtles are probably restricted to areas where deep pools provide suitable habitat during drought. Basking and nesting sites may also be limiting habitat features in the Blanco River.

Cagle's map turtle was listed in Texas as a threatened species on November 16, 2000 by the Texas Parks and Wildlife Department (Texas Register, Title 31, Chapter 65). On April 8, 1991, the Cagle's map turtle was petitioned to be listed as a federally endangered species (Killebrew 1991). The Service announced on January 22, 1993, that listing of Cagle's map turtle was warranted, but precluded (USFWS 1993). However, on September 12, 2006, the Service announced that because of stable population size, increased protection, and no foreseeable threats from reservoir construction, the listing of Cagle's map turtle was not warranted (USFWS 2006). Cagle's map turtle is currently classified by the International Union for Conservation of Nature (IUCN) Red List as "vulnerable" (Tortoise & Freshwater Turtle Specialist Group 1996).

4.8.7 Texas Horned Lizard

The Texas horned lizard (*Phrynosoma cornutum*) is a flat-bodied lizard with numerous prominent horns on its head and two rows of fringed scales along each side of the body. It

occupies habitats typically of flat open terrain with sparse plant cover; often found in areas of sandy, rocky, or loamy soils (Conant and Collins 1991). The Texas horned lizard has been reported throughout the majority of Texas, including Hays County (Dixon 2000).

The species is listed as threatened by the State of Texas.

4.8.8 San Marcos Gambusia

The San Marcos gambusia (*Gambusia georgei*) is a small, live-bearing, freshwater fish. It was endemic to Hays County, formerly known from the upper San Marcos River. The species was restricted to shallow, quiet, mud-bottomed shoreline areas without dense vegetation in a thermally constant main channel (TPWD 2008b).

The species was Federally listed as an endangered species in July 1980 (45 FR 47355-47364). Critical habitat for the species was also designated in 1980, and includes Spring Lake and its outflow, and the San Marcos River system downstream approximately 0.5 miles below the Interstate Highway 35 bridge (45 FR 47355-47364).

The San Marcos gambusia has not been observed since 1983 and after intensive surveys in 1990 failed to locate any individuals of the species, it is now thought to be extinct (USFWS 1995).

4.8.9 Red Wolf

The red wolf (*Canus rufus*) was historically known throughout the eastern half of Texas, within brushy and forested areas, as well on coastal prairies (Schmidly 2004). The species was first listed as federally threatened with extinction on March 11, 1967 (32 FR 4001) and is currently listed as federally endangered. This species has been extirpated from Texas, and is no longer known to occur in the state. The only known wild population of the species is on the Albemarle Peninsula of northeastern North Carolina (USFWS 2007c),

4.9 Socioeconomic Resources

Hays County is situated along the Interstate Highway 35 corridor between the major population centers of Austin and San Antonio. Hays County is included in the Austin-Round Rock Metropolitan Statistical Area (MSA), which also includes Bastrop, Caldwell, Travis, and Williamson counties.

4.9.1 Population Trends

The Austin-Round Rock MSA had an estimated population of nearly 1.6 million in 2007, which is an increase of approximately 44 percent since 1997. Population growth in these counties over the past decade has outpaced population growth of all other Texas MSAs and for the state overall. Comparatively, population growth in Texas was approximately 21 percent between 1997 and 2007 (RECenter 2008a).

Hays County has been the second fastest growing county in the Austin-Round Rock MSA, with an estimated 64.7 percent population growth between 1997 and 2007 (RECenter 2008a).

The 2000 Census reported a population of 97,589 in Hays County. The current population of Hays County, estimated for January 1, 2007 by the Texas State Data Center, was approximately 137,940 (Texas State Data Center 2007). This represents an estimated 41 percent increase in the population of Hays County since the 2000 census (Table 4-8).

Table 4-8. Census 2000 Population and Estimated 2007 Population in Hays County and Local Communities.

Community	Census 2000 Population	Estimated 2007 Population[1]	Percent Change
Hays County	97,589	137,940	41%
Bear Creek	360	400	11%
Buda	2,404	5,339	122%
Dripping Springs	1,548	1,962	27%
Hays	233	243	4%
Kyle	5,314	23,285	338%
Mountain City	671	745	11%
Niederwald	584	498	-15%
San Marcos	34,733	48,997	41%
Uhland	386	456	18%
Wimberley	3,797	4,386	16%
Woodcreek	1,274	1,476	16%

[1]Estimated 2007 populations reported by the Texas State Data Center (2007).

As shown in Table 4-8, San Marcos is the largest community in Hays County. However, the fastest growing communities in the county are the cities of Buda and Kyle, which are located along the Interstate Highway 35 corridor between San Marcos and Austin.

The approximate population within the portion of Hays County west of Interstate Highway 35 (i.e., the area containing potential habitat for the covered species) was approximately 59,754 in 2000 (approximately 61 percent of the Hays County population in 2000).

4.9.2 Employment and Economic Trends

Over the past decade (between 1997 and 2007), non-farm employment in the Austin-Round Rock MSA grew by approximately 191,000 jobs, a change of nearly 35 percent. State-wide, job growth was approximately 20 percent. In 2007, job growth in the Austin-Round Rock MSA outpaced growth in Texas overall, 5.2 percent compared to 3.0 percent (RECenter 2008a). Unemployment (as a percentage of the total labor force) in the Austin-Round Rock MSA was approximately 3.6 percent in 2007, which increased from an unemployment rate of approximately 3 percent in 2000 (Bureau of Labor Statistics 2008a).

The state and national economies are important drivers of the short-term economic outlook for the Austin-Round Rock MSA. According to the Biennial Revenue Estimate (2008-2009) prepared by the Texas Comptroller of Public Accounts (2007), the economic outlook for Texas is generally positive, but several national trends in interest rates, housing markets, and oil prices could lead to significantly lower state economic growth over the next several years. Despite bleak national economic trends, Texas continues to outperform the nation as a whole (and most other states) in a number of economic indicators that should provide some resistance to recessionary conditions (Texas Comptroller of Public Accounts 2008). More recent reporting by the RECenter indicated that Texas economy is "cooling" but continues to create more jobs (Anari and Dotzour 2009). Texas gained 154,600 jobs from December 2007 to December 2008, while the U.S. economy lost more than 2.8 million jobs over the same period. The state's seasonally adjusted unemployment rate rose from 4.2 percent in December 2007 to 6 percent in December 2008, while the U.S. rate rose from 4.9 percent to 7.2 percent during the same period (Anari and Dotzour 2009).

Net migration to Texas and the Austin-Round Rock MSA has also been and will likely continue to be an important factor in the economic growth of the region (Murdock et al. 2002).

The U.S. Bureau of Labor Statistics reported that the size of the average annual labor force in Hays County during 2007 was approximately 71,618 workers. Since 1997, the size of the county's labor force has increased by 23,525 workers (an approximately 49 percent increase). The average annual unemployment rate for Hays County in 2007 was approximately 3.6 percent, which is lower than the County's mean average annual unemployment rate for the period between 1997 and 2007 (approximately 4.1 percent) (Bureau of Labor Statistics 2008b). However, the unemployment rate in Hays County for September 2008 was approximately 4.7 percent (Texas Workforce Commission 2008).

Approximately 51 percent of the Hays County labor force in 2000 worked within Hays County, and approximately 40 percent of the labor force commuted to work into neighboring Travis County (Texas Workforce Commission 2008).

Hays County's local employment base included approximately 43,506 non-state government jobs in 2007, and has expanded in recent years by adding nearly 17,000 jobs since 1997 (an expansion of approximately 64 percent). The largest non-state government employment sectors in Hays County during the fourth quarter of 2007 were in the Trade, Transportation, and Utilities industry; Local Government; and the Leisure and Hospitality industry (Texas Workforce Commission 2008).

According to the Bureau of Economic Analysis, the per capita personal annual income in Hays County was $27,860 in 2006 (the most recent data available), which was lower than the 2006 per capita personal annual income for Texas (approximately $35,116) (Bureau of Economic Analysis 2008). Per capita personal income in Hays County has increased by approximately 49 percent since 1996 (Bureau of Economic Analysis 2008).

4.9.3 Housing Trends

Permits for construction projects can also demonstrate land use trends. Building permits issued for single-family residential construction in Hays County increased from approximately 157 permits issued in 1997 to approximately 1,527 permits issued in 2007. Between 1997 and 2007, approximately 12,597 building permits were issued for single-family residences in Hays County. Building permits for new multi-family residences in Hays County have authorized the construction of an average of 48 dwelling units per year for small projects (i.e., two- to four-family dwellings) and an average of 436 dwelling units per year for large projects (i.e., dwellings housing more than four families). Between 1997 and 2007, approximately 5,317 multi-family dwelling units were permitted in Hays County (RECenter 2008b).

As described in Section 4.2.2 of the Hays County RHCP, TXP and Capitol Market Research used Hays County census tract population forecasts, estimates of the projected number and average size of new residences needed to support the projected population increase, and the estimated area of other new commercial, industrial, and institutional projects to estimate the amount new land development that could be associated with projected population increases in Hays County during the duration of the plan (TXP and Capitol Market Research 2008). Based on this analysis, approximately 48,095 acres of land in Hays County may be converted from undeveloped land uses to developed land uses during the duration of the plan. As described in Section 5.2 of the Hays County RHCP, additional impacts to undeveloped lands may occur in relation to the construction or improvement of roads and other public infrastructure that support the projected increase in private-sector land development. For the purposes of this RHCP, the extent of public sector land development is assumed to add another 9,600 acres of developed land to Hays County during the term of the Permit.

The U.S. Census Bureau's 2005-2007 American Community Survey estimates that the average household size in Hays County was 2.86 people. The average value of a new single-family dwelling in Hays County during 2007 was approximately $135,700, which is an increase of approximately 90 percent from 1997 when the average value of a new single-family home was approximately $71,400 (RECenter 2008b).

4.9.4 Hays County Finances

The Fiscal Year (FY) 2009 budget adopted by Hays County identifies estimated revenues and expenditures from the County's Operating Funds, Debt Funds, and Construction Funds. Estimated revenues for all three funds in FY2009 total approximately $100,143,353 and estimated expenditures total approximately $116,545,381, with approximately $42,985,622 estimated as a beginning balance for these funds.

FY2009 General Operating Funds have an estimated beginning balance of approximately $22,200,000, with estimated FY2009 revenues of approximately $50,550,540 and expenditures of approximately $53,181,295. The FY2009 General Operating Fund budget

accounts for approximately 65 to 70 percent of the total estimated County budget. County services provided for through the General Operating Fund include operation of the County's administrative offices (such as the commissioners, auditor, treasurer, grants, probation, election administration, and tax assessor/collector offices), community services (such as indigent care, civic center operation, veterans services, and the historical commission), public health and safety services (such as operation of county departments and offices for public safety, environmental health, sheriff, fire, and animal control; operation of the County jail; and emergency medical services), judicial services (including judges, clerks, justices of the peace, attorneys, and operation of the courts), and general county operating services (such as human resources, building maintenance, and information technology services).

County revenues come primarily from ad valorem property taxes. The total Hays County ad valorem tax rate that was approved as part of the FY2009 budget is $0.4550, with an itemized tax rate of $0.3061 dedicated for generating revenue for general county maintenance and operations. Other itemized tax rates contributing to the total include a tax rate of $0.0688 for county debt service and $0.0801 for road and bridge purposes. The estimated property tax revenues for FY2009 general county maintenance and operations, as estimated by the Hays County Auditor in the September 25, 2008 Revenue Approval Worksheet accompanying the approved FY2009 budget, are approximately $29,796,509. The estimated FY2009 general county maintenance and operations property tax revenues are approximately 21 percent greater than the revenues generated during FY2006.

Hays County voters have passed two general obligation bond packages in recent years to fund conservation, recreation, and transportation projects in the county. In 2006, the voters approved the issuance of $30 million of Hays County bonds for parks, natural areas, open space, and related projects, and the preservation of water quality, aquifer recharge areas, and wildlife habitat, and the levying of a tax in payment thereof. On July 8, 2008 the Hays County Commissioners' Court voted to set aside $13 million in bond funds from the May 2006 Parks and Open Space bond program of for the acquisition of property with "recharge land, habitat for endangered species, open space and access to major waterways."

In November 2008, voters also approved a proposition for Hays County to issue $207 million in road bonds for roadway safety and mobility improvements across the County. The road bonds would be paid back by Hays County tax dollars and also by reimbursement from the State of Texas of up to $133 million available through the Texas Department of Transportation (TxDOT) Pass-Through Funding program.

4.9.5 Endangered Species Act Compliance Burden

There are a large number of federally listed endangered species that are known to occur in central Texas, especially in the counties located along the Balcones Escarpment. As such, it is relatively common for the proponents of development projects (including both public and private endeavors) to expend significant financial resources and experience substantial project

delays when seeking ESA compliance. It is not unusual for individual incidental take permits to cost tens of thousands to hundreds of thousands of dollars in legal and consultation fees to verify the presence or absence of listed species on a property, negotiate levels of take and mitigation with the Service, draft a habitat conservation plan, complete preliminary NEPA documentation on behalf of the Service, and submit a permit application to the Service. It can take up to two years to prepare and process an individual permit request and issue a permit. In addition to the costs associated with preparing the application documents and waiting for permit issuance, the project proponent must also assume the costs of implementing the agreed upon mitigation measures.

The landowner is not the only entity affected economically during the processing of incidental take permits. With each application for an incidental take permit, the Service is required to devote significant personnel time to negotiate and process individual Section 10(a)(1)(B) incidental take permits, including compliance with NEPA and by completing internal ESA Section 7 consultations. As reported in the final Environmental Impact Statement for the Williamson County Regional Habitat Conservation Plan (issued August 15, 2008), the Service estimates that it dedicates one-quarter to one-half of a full-time-equivalent staff position per year for each consultation.

5.0 ENVIRONMENTAL CONSEQUENCES

5.1 Assessment of Impact

5.1.1 Types of Impact

Each of the four alternatives identified in Section 3 of this EIS have been evaluated for potential effects on the issue topics (resources) described in Section 4. For each resource, effects are identified as being direct, indirect, beneficial, or adverse. These terms are defined below and are based on the controlling definitions for terms under CEQ's NEPA regulations (40 CFR 1508):

- Direct effect: An impact that occurs as a result of the proposed action or alternative in the same place and at the same time as the action.
- Indirect effect: Impacts that are caused by the proposed action or alternative and are later in time or farther removed in distance than the action, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.
- Beneficial effect: A positive change in the condition or appearance of the resource or change that moves the resources toward a desired condition.
- Adverse effect: A change that moves the resource away from a desired condition or detracts from its appearance or condition.

The significance of an impact, as assessed in NEPA analyses, requires consideration of both the context and intensity of the impact (40 CFR 1508.27). In this EIS, the context for the analysis is provided initially by a bulleted list of what could constitute a "significant" impact to that resource, based on the considerations identified in NEPA regulations (40 CFR 1508.27) and professional judgment. The context of the assessment is then expanded upon in the narrative. The level of intensity of an impact is expressed as negligible, minor, moderate, or major. Because the level of intensity definitions vary by impact topic, these definitions are provided separately for each topic near the beginning of the corresponding subsections.

Following the resource-by-resource analyses of direct and indirect impacts, this section presents analyses of cumulative impacts, unavoidable adverse impacts, irreversible and irretrievable commitment of resources, and short-term use of the environment vs. long-term productivity.

5.1.2 Assumptions Underlying the Impact Analysis

For the impact analysis in this EIS, the No Action alternative is defined as the conditions that can be expected if the Service does not implement the Proposed Action (issuance of an incidental take permit and approval of the proposed Hays County RHCP) or one of the other action alternatives. Consistent with the CEQ's description of the No Action alternative (46 FR 18026), under No Action the existing trends for land development activities and compliance with the ESA in Hays County are assumed to continue for the next 30 years (the duration of the plan) (i.e., there would be "no change" from the current direction or intensity of existing trends) and the proposed activity (implementation of a regional HCP in Hays County under the authority of an incidental take permit) would not take place.

A regional HCP in Hays County would not constitute a new Federal program authorizing new activities with potential impacts to the human environment. Rather, it would provide a voluntary, alternative means of compliance with the ESA for non-Federal entities in Hays County. This means that project proponents in Hays County will have the ability to develop their property and remain in compliance with the ESA through means other than a regional HCP (i.e., through avoidance, individual HCPs, or ESA Section 7 consultations). Project proponents might also determine that compliance with the ESA is not necessary for their project and develop their property without coordination with the Service (in some cases possibly risking violation of Section 9 of the ESA).

Participation in a regional HCP by the proponents of projects in Hays County might be higher or lower than is modeled in this EIS. As such, issuing the requested incidental take permit would not be an indispensable prerequisite or an essential catalyst for land development in the county. Similarly, just as implementing a regional HCP would not enable land development; failure to implement a regional HCP would not impede development because alternative means of compliance with the ESA are available. Therefore, only the most general casual relationship can be established between the issuance of an incidental take permit for a regional HCP and the potential impacts of individual land development activities.

It is important to bear in mind, however, that this EIS assesses the relevant environmental impacts for the No Action alternative at a geographic scale and over a period of time that substantially exceeds what would be compiled if the No Action alternative was actually implemented. Impacts are assessed as a collective in this EIS, rather than site-by-site with the No Action alternative. Assuming that a regional HCP had not been proposed, the environmental impact assessment associated with each development project in Hays County would have been tied to the landowner's ESA compliance actions. Further, the analysis would not have been conducted until a specific project was proposed. In most cases, the level of study associated with an individual project would be less comprehensive than in this EIS for the following reasons: 1) most small-scale HCPs are approved with an Environmental Assessment rather than an EIS; 2) Section 7 consultations do not cover the breadth of topics covered in this

EIS; 3) landowners that avoid impacts to endangered species produce no environmental impact assessments; and 4) landowners who do not comply with the ESA would not conduct any assessment under NEPA.

While other Federal regulatory programs might trigger more comprehensive environmental assessment documentation for particular development projects, it is unlikely that a county-wide EIS-level review would be compiled. By contrast, this EIS provides a detailed environmental impact assessment of relevant impacts for the No Action and the action alternatives throughout the county. This means that if the proposed RHCP or one of the other action alternatives is implemented, the relevant impacts of all ESA compliance options will have been considered in this EIS. Although this does not relieve project proponents who choose options other than participation in a regional HCP from compiling necessary environmental impact assessments at the time they commence with their projects, it does provide assurance that a regional HCP is implemented with a full understanding of the possible impact scenarios, regardless of the level of landowner participation in a regional HCP. This EIS will also serve as a valuable reference point for projects that do not use a regional HCP compliance option.

In the following analysis, it is assumed that not all of the anticipated land development projects will seek to participate in the Hays County RHCP or other action alternatives. For the non-participating projects, ESA compliance would proceed as described for the No Action alternative and will, therefore, be disregarded in the impact analysis.

5.2 Water Resources

Impacts to water resources would be considered significant if they were to result in one or more of the following types of impacts:

- Surface water and groundwater quality would be measurably altered so as to not be suitable for designated uses as defined by Texas Surface Water Quality Standards or that would not meet the state's policy of nondegradation of groundwater quality established in Section 26.401 of the Texas Water Code.
- Significant recharge features would be modified to the point where groundwater availability (volume) would be measurably altered.
- Surface water availability would be measurably altered for one or more TCEQ classified stream segments as defined in the Texas Surface Water Quality Standards.

The terms used to describe the anticipated intensity of impacts are defined below:

Negligible: Impacts to water quality and water quantity would not be detectable. Water quality parameters would be well below all water quality standards for the designated use. Water quality, recharge features, and surface water availability would be within the historical baselines and

normal variability.

Minor: Impacts to water quality and quantity would be detectable, with measurable changes from historical norms, but would be well within current standards for the designated use and would not threaten future uses.

Moderate: Impacts would be readily apparent, with measurable changes from historical norms. Water quality, the condition of recharge features, and water availability would be outside of the range of historical ambient conditions and would not consistently meet current standards. However, the degree of impact would not permanently preclude future uses of water resources, such as a permanent degradation in water quality or a complete loss of recharge or surface water features. Mitigation would be needed to offset adverse effects and would be reasonably likely to succeed.

Major: Impacts would be readily apparent, with measurable changes from historical norms. Some water quality parameters would frequently or permanently exceed standards for the designated use. The condition of recharge features and surface waters would be outside of the range of historical ambient conditions, and could include a complete loss of some features. Extensive mitigation would be needed to offset adverse effects, and success may not be achieved

5.2.1 Water Resources Impacts – Alternative A (No Action)

Under the No Action alternative, the Service would not issue an ESA Section 10(a) permit associated with a regional HCP and Hays County would not implement a regional HCP. Implementation of the No Action alternative would result in land development proceeding within Hays County as expected under current trends and under standard ESA rules and guidance. Current trends in population growth suggest natural vegetation types (i.e., forests, shrublands, and grasslands) and agricultural rangelands (i.e., mostly native and improved pastures) in Hays County will increasingly be converted to developed land uses (primarily associated with residential and commercial projects, as well as associated public and private infrastructure). The details of these development projects cannot be known at this time; however, it can be assumed that they would include activities such as vegetation clearing, re-grading soils and altering existing topography, paving surfaces, and constructing buildings and other structures. These types of activities have the potential to directly and indirectly affect water resources.

Numerous studies have shown that an increase in impervious cover generally corresponds to a decrease in water quality (Horner et al. 1996, U.S. Geological Survey 1999, Brant and Kauffman 2000). More specifically, Ging (1999) and Bush et al. (2000) found that when comparing the quality of stormwater runoff in streams draining urbanized areas and streams draining undeveloped rangeland, higher concentrations of pesticides, volatile organic compounds, nitrates, trace elements, and sediment were generally present in the urban streams. This is partially as a result of the larger number of contaminants present in an urban environment and partially as a result of replacing water resources and vegetative communities with impervious cover. Vegetation anchors soil and filters the runoff that flows across it, allowing sediment to settle out and removing some contaminants. Removing vegetation increases the probability of erosion and increased sedimentation of stormwater runoff and eliminates an important natural filtering mechanism. In contrast, paved surfaces can channel runoff directly into streams, along with pollutants present on the paved surface (e.g., oil, gasoline, and rubber). This can result in less filtering of water, higher water velocities, increased erosion, and larger sediment loads entering streams and recharge features.

In addition to increased contamination of surface water and groundwater, greater amounts of impervious cover could also cover recharge features and reduce infiltration of precipitation into the soil, thereby reducing groundwater recharge (City of Olympia 1996, Chenoweth 2004). Particularly for the Edwards Aquifer, the quality of groundwater is related to the quality of surface water recharging the aquifer. The geologic material of karst aquifers, such as the Edwards Aquifer, make them especially susceptible to contamination, as the large pore size within karst geology provides little filtration of recharging waters. According to Bush et al. (2000), water from urban groundwater wells in the Edwards Aquifer recharge zone exhibited the same frequently detected pesticides as those present in surface water at urban sites, indicating a correlation between the quality of recently recharged groundwater in an urban setting and the quality of urban surface water.

In addition, as discussed in Section 4.2, many caves, sinkholes, and other karst features are known to occur in Hays County. Potential impacts to these recharge features would continue to be minimized through the implementation of TCEQ guidelines, which could include protection by recommended setbacks. However, TCEQ would analyze these features on a project-by-project basis, which could result in closures of some karst features in an effort to protect groundwater quality.

With respect to impacts to water resources, future land uses in Hays County would be required to comply with applicable existing local, state, and Federal regulations protecting water quality on a project-by-project basis. For example, some municipalities within Hays County have impervious cover limits, erosion control standards, and requirements for water protection plans that apply to development projects within their jurisdictions. Under the Edwards Aquifer Protection Program, the TCEQ requires preparation of a Water Pollution Abatement Plan for any development on the Edwards Aquifer recharge zone (approximately 23 percent of Hays

County lies over the Edwards Aquifer recharge zone) and enforces minimum setbacks for development near recharge features. The U.S. Army Corps of Engineers regulates impacts to waters of the U.S. under Section 404 of the Clean Water Act. These measures, and many other programs, standards, and regulations that manage and oversee impacts to water quality and quantity, help to minimize the negative impacts of land development on surface waters and groundwater resources. Any necessary ESA authorizations related to these projects would also occur under existing compliance alternatives (i.e., individual ESA Section 10(a) permits or Section 7 consultations).

Even with these programs, however, an overall increase in land development and urbanization could be expected to cause direct and indirect adverse impacts on water resources, including 1) increased contamination of both surface water and groundwater, 2) reduced aquifer recharge, and 3) an overall decrease in water availability as current water resources become fully allocated. The intensity of these potentially adverse impacts over 30 years, considering the existing regulatory environment, would likely be minor to moderate under the No Action alternative.

5.2.2 Water Resources Impacts – Alternative B (Proposed Hays County RHCP)

As described in Section 4.1, the regional HCP action alternatives (including the proposed RHCP) are likely to have only minor impacts on the development trends over the next 30 years. Therefore, the adverse impacts to water resources that would be expected under the proposed RHCP alternative would be similar to those described for the No Action alternative, since implementation of the proposed RHCP would not be expected to substantially affect the amount, timing, or location of land development anticipated over the next 30 years. Future land development projects under this alternative, as with the No Action Alternative, would be expected to comply, on a case-by-case basis, with existing local, state, and Federal water quality regulations, standards, and programs.

However, compared with the No Action alternative, the proposed RHCP would be expected to result in a greater level of land conservation due to increased compliance with the ESA. It is anticipated that approximately 10,000 to 15,000 acres of undeveloped land containing habitat for the covered species would be permanently protected under this alternative. It is likely that this level of open space conservation would not occur under the No Action Alternative, since existing levels of compliance with the ESA are low and, even with increased enforcement by the Service, the lack of a streamlined alternative is somewhat of a barrier to ESA compliance. Conservation of large tracts of open space in Hays County is likely to protect natural streams and associated riparian corridors.

As described above, natural buffers along creeks and streams filter pollutants and absorb flood waters. These vegetated areas would slow down water and allow for pollutants to drop out of the storm water before they reach surface waters and groundwater. The protection of thousands of acres of natural vegetation in Hays County under the proposed RHCP would

protect surface and groundwater resources by preserving the natural ecological processes that filter stormwater runoff and absorb flood waters for aquifer recharge. Although tracts that provide benefits to multiple species may rank higher during the County's evaluation of potential preserve lands

Therefore, the protection of natural vegetation in the RHCP preserve system would likely yield some indirect beneficial impacts to water resources, compared to the No Action alternative. These potentially beneficial effects could, in association with other applicable water resource regulations, further mitigate some of the generally adverse effects of land development on the quality and availability of water resources in Hays County. The preserve lands established under the proposed RHCP would likely be composed of large parcels of land, compared to the typically smaller, fragmented preserves that would be expected as the result of numerous, uncoordinated, project-by-project mitigation efforts. The RHCP preserve system would also be assembled in addition to any on-site setbacks or buffers for streams, springs, and recharge features that would otherwise be required by applicable federal, state, and local water-related regulations.

Therefore, the large preserve blocks created by implementation of the RHCP would likely result in more assured protection for any water resources contained within the preserves over the long term than would be the case under the No Action alternative. The impact of these large preserve blocks would be relatively small, however, as the total area that would be preserved under this alternative would be small compared to the total size of the area of potential effect. Thus, it is likely that the proposed RHCP would be expected to have negligible to minor beneficial effects on water resources in Hays County, compared to the No Action alternative.

5.2.3 Water Resources Impacts – Alternative C (Moderate Preserve/Limited Take)

As for the proposed alternative, the Moderate Preserve/Limited Take alternative would also not have a significant influence on the amount, timing, or location of land development anticipated over the next 30 years. Therefore, the potentially adverse impacts to water resources resulting from anticipated land development (whether authorized through a regional HCP, an individual ESA authorization, or without specific ESA compliance) would be similar to the impacts described for the No Action alternative. Future land development projects under this alternative, as with the No Build Alternative, would be expected to comply, on a case-by-case basis, with existing local, state, and Federal water quality regulations, standards, and programs.

The primary difference between the Moderate Preserve/Limited Take alternative and the No Action alternative is the establishment and long-term management of a pre-determined 3,000-acre preserve system. Creating these large preserves and restricting public access would protect natural landscapes along creeks and streams, thus filtering pollutants and absorbing flood waters. These vegetated areas would slow down water and allow for pollutants to drop out of the storm water before they reach surface waters and groundwater.

While some habitat conservation would occur under the No Action alternative as the result of individual ESA compliance actions, the extent of these individual preserves would likely be less than the assured protection of 3,000 acres under Alternative C and the distribution of preserved lands under the No Action alternative would likely be more scattered. The creation of a larger block of preserve land with more assured protection and guided management is likely to create a more effective buffer for streams contained within the 3,000-acre preserve system than would be achieved with fewer, smaller, and more scattered protected areas under the No Action alternative.

Thus, these larger blocks of preserved native vegetation protected from development by Hays County would be more likely to yield benefits to water resources than the mitigation measures that would result from project-by-project authorizations with the Service. The differential would be small, however, as the total area that would be preserved under this alternative would be small compared to the total size of the area of potential effect. Therefore, the beneficial impacts of the Moderate Preserve/Limited Take alternative on water resources would likely be negligible.

5.2.4 Water Resources Impacts – Alternative D (Large-scale Preserve System)

The 163,000 acres of authorized incidental take of habitats for the golden-cheeked warbler and black-capped vireo under the Large-scale Preserve System alternative may adversely affect both surface water and groundwater, as described for the No Action alternative. However, potential adverse impacts on water resources as a result of anticipated land development over the next 30 years would be minimized, as under the No Action alternative, by compliance with existing local, state, and Federal water quality regulations, standards, and programs. Therefore, the potential adverse impacts of the Large-scale Preserve alternative would be similar to those expected under the No Action alternative.

The establishment and long-term management of a 30,000-acre preserve system, as proposed under this alternative, would yield beneficial impacts to water resources in Hays County. This large preserve system would contain larger areas of contiguous, undeveloped land throughout Hays County than the No Action alternative. Protecting such large, contiguous areas and tightly controlling public access would result in the protection of water recharge areas and the buffering of streams to help preserve water quality. In addition, as discussed previously, these buffers would slow down stormwater runoff and decrease flooding. As a result, the Large-scale Preserve System alternative could have a minor to moderate benefit to water resources in Hays County, compared to the No Action alternative.

5.3 Vegetation

Vegetation would be affected within the Hays County, as take of the covered species would be expressed as a specified number of acres of potentially suitable habitat lost or

modified, and mitigation for that take would be the preservation and management in perpetuity of an equivalent amount of suitable habitat for the covered species.

Impacts to vegetation that would result from implementation of the various alternatives would be considered significant if they were to result in the following:

- The existing levels of native vegetation would increase (a beneficial impact) or decrease (an adverse impact) on a landscape scale
- Non-native plants replaced substantial or important components of native vegetation communities (an adverse impact) or non-native plants were removed from native vegetation communities (a beneficial impact).

The intensity of potential impacts to vegetation is defined as follows:

Negligible: Individual native plants may occasionally be affected (i.e., displaced or out competed), but measurable or perceptible changes in plant community size, integrity, or continuity would not occur.

Minor: Effects to native plants would be measurable or perceptible, but localized within a small proportion of the native plant community. The viability of the plant community would not be affected and the community, if left alone, would recover.

Moderate: A change would occur over a relatively large portion of the native plant community that would be readily measurable in terms of species composition, vegetation structure, or habitat quality for native wildlife. Mitigation measures would likely be necessary to offset adverse effects and would likely be successful.

Major: Effects to native plant communities would be readily apparent and substantially change native vegetation communities over a large portion of the community. Extensive mitigation would be needed to offset adverse effects and its success would not be assured.

5.3.1 Vegetation Impacts – Alternative A (No Action)

As previously described, it is anticipated that approximately 57,700 acres of new land development will occur in Hays County over the next 30 years. While the location, magnitude, and nature of specific activities associated with future commercial, residential, and other types of development cannot be predicted at this time, it can be assumed that the predicted extent of new development would include clearing and altering of vegetation prior to construction. This expected increase in development and urbanization would result in moderate adverse impacts on vegetation, including the local removal of entire patches of native vegetation communities.

Under the No Action Alternative, the natural vegetation within the existing undeveloped areas of Hays County (which consists of native and/or introduced grasses; crops; live oak-Ashe juniper parks; live oak-mesquite-Ashe juniper parks; and live oak – Ashe juniper woods) is expected to significantly decrease over the next 30 years. With new land development, areas of native vegetation would be replaced with impervious cover and landscaping that is frequently composed of non-native vegetation, such as turfgrass and ornamental plants. As indicated in Table 4-2, forested landscapes may be heavily affected if current trends continue.

The fragmentation of native vegetation communities by land development can also facilitate the invasion and establishment of non-native plants in adjacent native vegetation communities. Many of the common plants used in residential landscaping are not native to Central Texas or even North America. All too often, these non-native landscaping plants are able to escape cultivation and thrive outside of our yards and gardens. While many non-native, ornamental plants do offer food and shelter to some wildlife species, they often degrade the quality of habitat available to native wildlife when they escape into natural areas. Since these plants are not in their natural environment, many are able to flourish unchecked by their natural competitors, forming dense stands of vegetation that often outcompete native plants for light, water, and nutrients. As a result, the diversity of native trees, shrubs, vines, grasses, and forbs is reduced, and the native wildlife species that depend on this diversity of native plants must look elsewhere for the habitat they require. Non-native plants are a common problem in Central Texas parks and natural areas, particularly along streams, creeks, and roads – areas where soils are frequently disturbed and the potential for seed movement is high. Once non-natives are established, they are almost impossible to eradicate (generally requiring the use of herbicides).

Under the No Action Alternative, the impacts of development to some vegetation communities, particularly those that provide habitat for endangered species, would be mitigated on a case-by case basis when landowners individually comply with the ESA. Other natural vegetation communities, such as riparian plant communities along water ways, could also be protected through compliance with other local, state, and Federal regulations. As a result, some parcels containing natural vegetation communities would be preserved on a case-by-case basis and result in negligible beneficial impacts to vegetation in Hays County.

In addition to conservation areas set aside to avoid or mitigate impacts to regulated resources, it is likely that other areas of natural vegetation would be protected by through efforts to create parks and other types of publicly accessible open spaces. Hays County includes several community or regional parks, greenbelts/greenspaces, preserves, academic research tracts, and privately owned conservation easements that total approximately 23,739 acres. These open spaces protect a variety of natural vegetation communities from intensive development.

There are no county-wide vegetation protection regulations within Hays County. However, under the No Action alternative, future development would be subject to any tree

preservation and landscape ordinances established by the municipalities within Hays County. To minimize adverse impacts, development activities within these communities would be expected to comply, on a case-by-case basis, with the appropriate ordinances per each municipality's development codes. These ordinances are intended, in part, to preserve native vegetation and require protection or replacement of trees of a certain size, as well as revegetation of areas not fully occupied by buildings, parking areas, or other impervious surfaces.

Overall, the No Action alternative could have moderate adverse impacts on native vegetation communities in Hays County.

5.3.2 Vegetation Impacts – Alternative B (Proposed Hays County RHCP)

Compared to the No Action alternative, the proposed RHCP would have similarly moderate adverse impacts resulting from the anticipated extent of new land development, since the regional HCP alternatives are not expected to significantly affect the extent, timing, or location of land development activities in Hays County over the next 30 years (see Section 4.1). As for the No Action alternative, these anticipated adverse impacts would be moderated by the existing inventory of protected open spaces in Hays County and a variety of open space protection measures related to regulatory compliance and parks initiatives.

Under the proposed RHCP, additional mitigation for vegetation impacts would be accomplished through increased ESA compliance. Approximately 10,000 to 15,000 acres of native vegetation communities (primarily forest and shrubland vegetation used by the golden-cheeked warbler and black-capped vireo) would be protected under this alternative. The extent of protection for forest and shrubland communities under the proposed RHCP is several thousand acres more than would likely be protected under the No Action alternative, since the level of ESA compliance under the No Action alternative is likely to be lower than under the proposed RHCP with its streamlined compliance alternative. The protection and management of relatively large blocks of native vegetation under the proposed RHCP will also help prevent the invasion and establishment of non-native plants, since large preserve blocks have fewer edges and less exposure to adjacent land uses (compared to the overall size of the tract) than do smaller parcels.

The RHCP preserve system would also target forest vegetation for protection, which is the vegetation type that appears to be most vulnerable to loss, based on recent trends, and is a mature vegetation community that takes decades to form. The conservation program included in the RHCP requires management and monitoring of protected lands in perpetuity to minimize the impacts of adjacent land uses on the preserve system. The proposed RHCP also requires that plan participants take precautions against the spread of oak wilt when conducting vegetation clearing and construction activities on individual project areas. Therefore, the mitigation provided by the proposed RHCP would result in a minor to moderately beneficial impact to vegetation communities in Hays County, compared to the No Action alternative.

5.3.3 Vegetation Impacts – Alternative C (Moderate Preserve/Limited Take)

As previously stated, the Moderate Preserve/Limited Take alternative would consist of the development of a regional HCP with a 3,000-acre preserve system in return for incidental take authorization on 3,600 acres of golden-cheeked warbler or black-capped vireo habitat. The authorized take of 3,600 acres of golden-cheeked warbler and black-capped vireo habitat under this alternative would be a part of the total anticipated amount of new land development that is projected to occur regardless of the availability of a regional HCP. Therefore, the potential adverse effects of land development activities, including those authorized under this alternative, would be similar to the effects of No Action alternative since the availability of a regional HCP is not expected to significantly affect the extent, timing, or location of land development in Hays County over the next 30 years (see Section 4.1). Similar to the No Action alternative, removal or alteration of native vegetation communities by land development would be expected to be conducted in compliance with existing vegetation ordinances of the municipalities within Hays County.

The proposed 3,000-acre preserve system would protect vulnerable forest vegetation in Hays County from land development, and ensure that it was managed in perpetuity to reduce threats from adjacent land uses. This regional HCP would also require participants to implement oak wilt precautions on individual project areas. Compared to the No Action alternative, this additional mitigation would have a beneficial effect on vegetation in Hays County. However, due to the moderate size of the preserve system and limited extent of allowed participation under this alternative, these benefits would likely be minor.

5.3.4 Vegetation Impacts – Alternative D (Large-scale Preserve System)

Direct, adverse impacts under this alternative to vegetation communities in Hays County would include the authorized take of up to 163,000 acres of golden-cheeked warbler and black-capped vireo habitat during the permit term. While up to 163,000 acres of habitat for the golden-cheeked warbler and black-capped vireo would be authorized for take, only a fraction of this amount would be expected to occur during the duration of the plan (i.e., projections estimate that only approximately 57,700 acres of new land development will occur in Hays County during the term of the plan, regardless of the impact to endangered species habitat). Therefore, the potentially adverse effects of land development during the duration of the plan would be similar to that described for the No Action alternative.

The establishment of a 30,000-acre preserve system containing habitat for the golden-cheeked warbler and black-capped vireo in Hays County would have a moderately beneficial effect on vegetation communities, particularly forests. A preserve system of this size, assembled in a number of large contiguous blocks (some of which would likely be adjacent to currently protected open spaces in Hays County), would have the potential to protect large-scale ecosystem functions that would help ensure that natural processes are able to maintain vegetation communities in perpetuity. Large preserve blocks would minimize the potential for

non-native vegetation to invade and affect habitats for native wildlife and plan participants would be required to implement oak wilt precautions on individual project areas. Therefore, it is likely that implementation of the Large-scale Preserve System alternative would have a moderately beneficial effect on vegetation in Hays County.

5.4 General Wildlife

Wildlife occupying the habitats that would be lost or modified as a result of activities covered for incidental take and areas protected and managed as mitigation could potentially be affected by the action alternatives. Impacts to general wildlife populations would be considered significant if they were to result in the following:

- The presence of self-sustaining native wildlife communities (with a natural balance of species and numbers of individuals) would increase (a beneficial impact) or decrease (an adverse impact) in Hays County.

The intensity of potential impacts to wildlife populations is defined as follows:

Negligible: Self-sustaining native wildlife communities would not be affected as the effects would be at or below the level of detection and so slight that they would not be of any measurable or perceptible consequence to wildlife populations.

Minor: Effects to self-sustaining native wildlife communities would be measurable or perceptible (such as slight shifts in species composition or relative abundance of certain species), but localized within a small area. The wildlife community, if left alone, would recover.

Moderate: A change to self-sustaining native wildlife communities would occur over a relatively large area. The change would be readily measurable in terms of species composition, the relative abundance of certain species, or the distribution of a particular community as a whole. Mitigation measures would likely be necessary to offset adverse effects and would likely be successful.

Major: Effects to self-sustaining native wildlife communities would be readily apparent and would substantially change wildlife populations over a large area. Changes would be evident in species composition, the relative abundance of certain species, or the distribution of a particular community as a whole. Extensive mitigation would be needed to offset adverse effects, and success may not be achieved

5.4.1 General Wildlife Impacts – Alternative A (No Action)

As previously described, it is anticipated that approximately 57,700 acres of new land development will occur in Hays County over the next 30 years. Residential development impacts natural environments in several ways, such as replacing native vegetation with buildings, pavement, and other man-made structures (e.g., direct habitat loss) (McIntyre and Hobbs 1999), decreasing the amount of continuous open-space (e.g., fragmentation), and increasing vegetational disturbance, erosion, and soil compaction (Bradley 1995). Residential development often results in the introduction of non-native vegetation through invasion or landscaping with non-native, ornamental plants (Whitney and Adams 1980, Mills et al. 1989, Bolger et al. 1997). Urbanization also can change the abundance of predators and competitors in an area (Wilcove 1985, Engels and Sexton 1994, Jokimaki and Huhta 2000) and increase disturbance from human activity (Whitcomb et al. 1981). Physical changes to the natural landscape, as well as the possible alteration in predator or competitor interactions resulting from urbanization can have a profound impact on wildlife communities (Freisen et al. 1995). Thus, while certain species may benefit from human activities, land development typically alters the processes that maintain balance in native wildlife communities, resulting in adverse effects to self-sustaining native wildlife communities. Therefore, activities under the No Action Alternative have the potential to cause moderate, direct, and indirect adverse impacts to wildlife populations through habitat changes, introduction of non-native species, and other alterations to the natural balance of native wildlife species.

A general list of wildlife species likely to occur within Hays County is provided in Section 4.4. Impacts to these species would vary based on the type of habitat impacted by development activities and the sensitivity of each species to human-induced changes to native habitats or wildlife communities. However, in general, the natural composition and stability of native wildlife communities would decline concurrently with the expansion of the human population into their habitats. Should this projected future development incorporate areas of natural green space, this anticipated decline could be minimized.

Title 5 of the Texas Parks and Wildlife Code describes laws and matters regarding forests, water district and river authority parks, Texas trails systems, wildlife and plant conservation, hunting and fishing licenses, commercial and fish farmer's licenses, the Uniform Wildlife Regulatory Act, hunting, endangered species, crustaceans and mollusks, wildlife management areas, sanctuaries, and preserves, including Federal-state agreements. The code also establishes special standards for non-game species, such as bats (Texas Parks and Wildlife Code, Title 5, Chapter 63.101).

Most urbanized animals are not seasonally hunted or treated as game, while the hunting of game animals such as white-tailed deer are restricted to specific seasons and heavily regulated. Avian species are protected by both the provisions of the Texas Parks and Wildlife Code, and the Migratory Bird Treaty Act, which prohibits the taking, killing, or possession of all

migratory birds (with the exception of several non-native species). While these regulations protect wildlife to some degree, they provide no protection to the habitat required for wildlife survival.

Under the No Action Alternative, development on land that provides habitat for endangered species would be mitigated on a case-by-case basis, but most land development would commence without conservation of open spaces as mitigation for impacts. However, as this mitigation would be specific to the affected listed species, these lands would likely not be suitable for all wildlife species. Project-by-project mitigation is also likely to result in small and isolated patches of protected habitat with a high potential for adverse edge effects from adjacent human activities. Thus, any mitigation under the No Action Alternative would generally result in negligible beneficial impacts to native self-sustaining wildlife communities.

5.4.2 General Wildlife Impacts – Alternative B (Proposed Hays County RHCP)

Since the trends in land development would be similar under the No Action alternative and the proposed RHCP, the impacts to the general wildlife communities in Hays County would also be similar. As described above, anticipated land development over the next 30 years would convert currently undeveloped open space used by a wide variety of wildlife species to developed land uses. While some wildlife species thrive in urbanized environments, most wildlife communities currently present in Hays County would experience a decrease in habitat and likely declines in population sizes. Therefore, both alternatives would likely result in moderately adverse effects on most Hays County wildlife species, and the true impacts of the proposed RHCP on wildlife communities would be tied to the proposed conservation measures of the RHCP.

The proposed RHCP would facilitate ESA compliance for land development projects impacting potential habitat for the covered species and would result in the creation of a preserve system of approximately 10,000 to 15, 000 acres.

Protecting contiguous open space is crucial for many wildlife species as they depend on numerous habitats throughout their lives. In addition, contiguous forest habitat supports native wildlife species that require large areas to survive. Such habitat supports natural ecological processes, such as predator/prey interactions and natural disturbance. It also serves to buffer species against the negative consequences of fragmentation. In the absence of such habitat, many birds are greatly affected by increased rates of nest predation from raccoons, skunks, and squirrels, as well as nest parasitism from brown-headed cowbirds. Many of the native migratory songbird populations are now in decline due, in part, to the loss of contiguous forest habitat (Terborgh 1989, Vermont Fish and Wildlife Department 2004).

The preserve system would incidentally benefit a variety of native wildlife species in Hays County, particularly those that utilize forest habitats. However, given the mosaic of habitat types across the Hays County landscape, it is likely that the preserve system (while targeting areas

of potential habitat for the covered species) would also contain substantial native vegetation communities that would support the sheltering, nesting, and foraging requirements for many other wildlife species.

Ongoing management of the preserve system and a public education program (particularly for landowners adjacent to preserve lands) would seek to reduce adverse edge effects from adjacent land uses, such as keeping pets indoors or contained, native plant landscaping, and appropriate ways to feed backyard wildlife, which would further minimize the generally adverse effects of land development on native wildlife. This mitigation would result in a moderate beneficial impact to wildlife resources since the RHCP would focus on preserving these large, contiguous tracts in perpetuity.

5.4.3 General Wildlife Impacts – Alternative C (Moderate Preserve/Limited Take)

As described in Section 4.1 for the action alternatives, the Moderate Preserve/Limited Take alternative is not expected to influence land development trends in Hays County. Therefore, the potentially adverse impacts from land development (including the approximately 3,600 acres of impact to habitats for the covered species authorized by this alternative) on the general wildlife communities in the county would be similar to those described for the No Action alternative. The effects of the Moderate Preserve/Limited Take alternative on general wildlife communities in Hays County would be related to the conservation measures associated with this alternative.

The preserve system under this alternative would include the preservation of large (500-acre minimum) tracts of undeveloped land totaling approximately 3,000 acres. When compared to the No Action alternative, the preserves under this alternative would likely be larger and more contiguous than would be established per the mitigation requirements of individual, project-specific ESA authorizations. Protecting contiguous open space is crucial for many wildlife species as they depend on numerous habitats throughout their lives. In addition, contiguous forest habitat supports native wildlife species that require large areas to survive. Such habitat supports natural ecological processes, such as predator/prey interactions and natural disturbance. It also serves to buffer species against the negative consequences of fragmentation. In the absence of such habitat, many birds are greatly affected by increased rates of nest predation from raccoons, skunks, and squirrels, as well as nest parasitism from brown-headed cowbirds. Many of the native migratory songbird populations are now in decline due, in part, to the loss of contiguous forest habitat (Terborgh 1989, Vermont Fish and Wildlife Department 2004).

As described for the proposed RHCP, a preserve management program and public education program would accompany the creation of the preserve system and help to minimize typically adverse edge effects on native wildlife communities within the preserve system from adjacent land uses.

Therefore, given the scale of this alternative, the establishment of the 3,000-acre preserve under this alternative would likely have a minor beneficial impact on general wildlife communities when compared to the No Action alternative.

5.4.4 General Wildlife Impacts – Alternative D (Large-scale Preserve System)

As for the other alternatives, the Large-scale Preserve System alternative is not expected to influence land development trends in Hays County over the next 30 years, since participation in the regional HCP would be voluntary and other ESA compliance options are available. Therefore, even though this alternative would authorize the loss of up to approximately 163,000 acres of habitat for the golden-cheeked warbler and black-capped vireo (which is more than would be expected to occur over the next 30 years), the potentially adverse impacts to wildlife species would be similar to that described for the No Action alternative.

The preserve system under the Large-scale Preserve System alternative would include approximately 30,000 acres. Protecting contiguous open space is crucial for many wildlife species as they depend on numerous habitats throughout their lives. In addition, contiguous forest habitat supports native wildlife species that require large areas to survive. Such habitat supports natural ecological processes, such as predator/prey interactions and natural disturbance. It also serves to buffer species against the negative consequences of fragmentation. In the absence of such habitat, many birds are greatly affected by increased rates of nest predation from raccoons, skunks, and squirrels, as well as nest parasitism from brown-headed cowbirds. Many of the native migratory songbird populations are now in decline due, in part, to the loss of contiguous forest habitat (Terborgh 1989, Vermont Fish and Wildlife Department 2004).

As described for the proposed RHCP, a preserve management program and public education program would accompany the creation of the preserve system and help to minimize typically adverse edge effects on native wildlife communities within the preserve system from adjacent land uses. The amount of undeveloped land protected under this alternative would likely exceed land protected under the No Action alternative The establishment and long-term management of such a large preserve system, would yield moderate beneficial impacts to native wildlife populations as the preserves would contain numerous, sizable areas of contiguous, undeveloped land throughout Hays County.

5.5 Hays County RHCP Covered Species

Two Federally listed species (the golden-cheeked warbler and black-capped vireo) would be covered by the incidental take permit requested under the Proposed Action. Indicators of impact significance vary by species and are further described in the Section below. However, definitions of impact intensity are similar for both of these species, and are as follows:

Negligible: Covered species would not be affected or the change would be so small

as to not be of any measureable or perceptible consequence to the population in the area of potential effects. Negligible effects would equate with a "may effect, not likely to adversely affect" determination by the U.S. Fish and Wildlife Service under the ESA.

Minor: There would be a measurable effect on the covered species or their habitats, but the change would be small and relatively localized with respect to the area of potential effects. Minor effect would equate with a "may effect" determination by the U.S. Fish and Wildlife Service under the ESA and would be accompanied by a statement of either "likely" or "not likely to adversely affect" the species.

Moderate: There would be a noticeable effect to the population of the covered species. The effect would be of consequence to populations or habitats in the area of potential effects. Moderate effect would equate with a "may effect" determination by the U.S. Fish and Wildlife Service and would be accompanied by a statement of either "likely" or "not likely to adversely affect" the species.

Major: There would be a noticeable effect with severe consequences or exceptional benefit to populations or habitats of the covered species in the area of potential effects. Major effect would equate with a "may effect" determination by the U.S. Fish and Wildlife Service under the ESA and would be accompanied by a statement of either "likely" or "not likely to adversely affect" the species or habitats.

5.5.1 Golden-cheeked Warbler

Impacts to the golden-cheeked warbler would be considered significant if they were to result in one or more of the following:

- The existing primary threats to the mature, juniper-oak woodland habitat used by the species would decrease (a beneficial impact) or increase (an adverse impact) to a substantial degree.
- The size of the local golden-cheeked warbler population in Hays County would substantially increase (a beneficial impact) or substantially decrease (an adverse impact).
- The goals and objectives of the golden-cheeked warbler recovery plan were furthered or met (a beneficial impact) or were precluded from being met (an adverse impact).

5.5.1.1 Golden-cheeked Warbler Impacts – Alternative A (No Action)

Under the No Action alternative, the recent trends affecting the golden-cheeked warbler in Hays County (particularly related to the loss of potential habitat as described in Section 4.2.2 and Section 5.2 of the Hays County RHCP) would be expected to continue through the next 30 years and result in a moderate adverse impact to the species.

Under the No Action alternative, recent trends in population growth, land development, and forest cover loss are likely to continue as projected. It is likely that the construction activities required to support future population growth of the community will impact much of the potential golden-cheeked warbler habitat currently present within Hays County over the next 30 years. As reported in Section 5.2 of the Hays County RHCP, approximately 22,000 acres of potential golden-cheeked warbler habitat may be lost directly to developed land uses. The estimated habitat loss over the next 30 years represents approximately 13 percent of the total amount of potential golden-cheeked warbler habitat that may be available in Hays County (based on the Loomis estimate of the total acres of potential golden-cheeked warbler habitat shown in Table 4-5) and less than four percent of the potentially available golden-cheeked warbler habitat in Recovery Region 5. This level of anticipated habitat loss would likely result in a minor to moderate adverse impact to the species.

Under the No Action alternative, any impacts to occupied golden-cheeked warbler habitat that rose to the level of "take" would require authorization from the Service to proceed in compliance with the ESA. While the impacts and mitigation likely to occur under the No Action alternative are difficult to predict due to the lack of information regarding the precise location and nature of future land development in the County and the inability to predict the future level of compliance with the ESA, it may be assumed that some conservation efforts for the species would take place. ESA authorization would include the requirement that the effects of any incidental take of the golden-cheeked warbler be mitigated to the maximum extent practicable. Frequently, mitigation for habitat loss or degradation involves the permanent protection and management of other habitat. The overall benefit to the species from habitat protection resulting from individual ESA authorizations is likely to be minor, since compliance could be relatively low (to date there has only been one ESA incidental take permit issued for the golden-cheeked warbler in Hays County) and, even if all take was fully mitigated, the mitigation from individual projects is more likely to occur in relatively small and scattered or isolated patches of habitat with relatively low long-term conservation value.

Habitat protection completed as mitigation for individual ESA authorizations could occur either within Hays County or outside of the county. It is possible that some mitigation for impacts in Hays County would occur outside of Hays County, due to the existence of a private mitigation bank located in a nearby county. Therefore, it is possible that the level of habitat protection within Hays County would not fully balance the level of anticipated habitat loss over the next 30 years, resulting in a net loss of habitat in Hays County. Accordingly, a decline in the

Hays County golden-cheeked warbler population may be expected under the No Action alternative. However, a decline in the local Hays County golden-cheeked warbler population would not preclude meeting the recovery goals for Golden-cheeked Warbler Recovery Region 5.

The 1992 Golden-cheeked Warbler Recovery Plan (USFWS 1992) identifies the criteria to be met for the golden-cheeked warbler to be considered for downlisting from endangered to threatened status. These recovery criteria include the protection of sufficient breeding habitat to ensure the continued existence of at least one viable, self sustaining golden-cheeked warbler population in each of the eight recovery regions delineated in the recovery plan, where the potential for gene flow exists across regions to ensure long-term viability of the protected populations (USFWS 1992). Hays County lies predominantly within Recovery Region 5, which also includes all of Travis County and portions of Williamson, Blanco, and Burnet counties.

Attaining the recovery goals for the golden-cheeked warbler includes the identification of "focal areas" for protection that include a single, viable golden-cheeked warbler population or one or more smaller populations that are interconnected (USFWS 1992). Within Recovery Region 5, it appears that a focal area has already largely been protected through the establishment of the Balcones Canyonlands Preserve and the Balcones Canyonlands National Wildlife Refuge in Travis, Williamson, and Burnet counties (Figure 3-3). Currently, these areas comprise approximately 48,250 acres of permanently preserved and managed lands dedicated to the protection of endangered species. These two preserve systems contain approximately 28,440 acres of potential high quality golden-cheeked warbler habitat, based on the results of the Loomis warbler habitat model. Therefore, the No Action alternative would not be likely to preclude the attainment of recovery goals for the golden-cheeked warbler, but would also not be likely to substantially contribute to meeting these goals.

Under the No Action alternative, the recent trends affecting the golden-cheeked warbler in Hays County (particularly related to the loss of potential habitat as described in Section 4.2.2 and Section 5.2 of the Hays County RHCP) would be expected to continue through the next 30 years and result in a moderate adverse impact to the species.

5.5.1.2 Golden-cheeked Warbler Impacts – Alternative B (Proposed Hays County RHCP)

The proposed Hays County RHCP alternative is likely to result in a moderate beneficial impact to the golden-cheeked warbler, compared to the No Action alternative.

Under the proposed Hays County RHCP, the County would receive authorization to incidentally take golden-cheeked warblers related to the loss or degradation of up to 9,000 acres of potential golden-cheeked warbler habitat in Hays County. To mitigate for those impacts, Hays County will create a conservation bank containing habitat for the golden-cheeked warbler, with a target size of between 10,000 and 15,000 acres. The bank would be assembled on a phased basis, as needed over the next 30 years to provide sufficient mitigation credits to offset impacts from participating public and private projects. Under the phased conservation bank

approach, habitat protection would always occur in advance of authorized impacts through the RHCP; however, no pre-determined preserve system would be designated under the RHCP.

As explained in Section 4.1, the Hays County RHCP would be implemented in the same socioeconomic context as the No Action alternative and would experience similar levels and patterns of land development. Accordingly, anticipated land development activities in the county would be expected to have similar potentially adverse effects to the species as described for the No Action alternative. Since implementation of the proposed RHCP would not be expected to substantially influence the total amount of anticipated habitat loss in Hays County during the permit term, the impacts of the proposed RHCP on the golden-cheeked warbler would be primarily associated with the mitigation provided by the plan.

The Service would award mitigation credits to the Hays County RHCP in proportion to the acreage of potential golden-cheeked warbler habitat contained within the preserve system as parcels are acquired. It is anticipated that most preserves will generate one mitigation credit for each acre of potential habitat included within it. However, the Service may alter this ratio if conditions (such as habitat quality, parcel size, or adjacent/interior land uses) warrant such action. Therefore, the actual mitigation value of each preserve parcel in the conservation bank will be based on the specific conditions of each site.

In a similar fashion, Hays County will determine the mitigation needs for potential RHCP participants based on the specific conditions on each project site by conducting an on-site habitat assessment. The direct and indirect impacts to potential habitat would be evaluated by reviewing site plans for plan participants. Mitigation needs for plan participants would be typically determined at a ratio of one mitigation credit required for each acre of impact; although the County would have some flexibility to alter this ratio based on habitat quality, landscape context, or existing impacts in coordination with the Service. Therefore, it is anticipated that impacts to habitat authorized through the RHCP will adequately be balanced by protected habitat in the preserve.

The Service anticipates that the proposed RHCP may increase the amount of ESA compliance in Hays County, compared with the No Action alternative, since compliance will be more efficient than obtaining individual authorization through the Service. Further, the RHCP includes commitments by the County to increase awareness of endangered species issues in Hays County, which may also lead to increased ESA compliance. Increased ESA compliance would benefit the species by ensuring that a larger portion of the anticipated habitat loss over the next 30 years would be balanced with conservation actions, such as habitat protection.

The mitigation provided under the RHCP would likely result in a preserve system with greater conservation value than would likely be achieved if similar acreage was protected and managed through individual ESA Section 10(a) or Section 7 authorizations. The enhanced conservation value of the RHCP preserve system would result from the protection of larger

blocks of potential habitat than would likely be achieved for smaller, individual mitigation actions.

Overall, the proposed RHCP would protect large areas of potential habitat in the county from future land development, thereby decreasing the threat of habitat loss for many important areas of potential golden-cheeked warbler habitat in Hays County and resulting in a beneficial impact to the species. The ultimate size of the preserve system will be proportional to the amount of impact authorized through participation in the RHCP, and may ultimately include approximately 10,000 to 15,000 acres permanently protected and managed for the benefit of the golden-cheeked warbler. A preserve system of this size would be likely to have a moderate beneficial impact on the golden-cheeked warbler population in Hays County. It is difficult to predict precisely how golden-cheeked warbler populations would be affected by the protection of several thousand acres of potential golden-cheeked warbler habitat in Hays County (see Sections 6..3 and 6.4 of the RHCP for detail on the operation of the phased conservation banking approach and preserve acquisitions). It is possible that this modestly sized preserve system would have a minor beneficial impact on the size of the regional golden-cheeked warbler population. However, the Region 5 golden-cheeked warbler population is likely to be influenced more heavily by the ongoing management and possible expansion of protected areas associated: with the Balcones Canyonlands Preserve and the Balcones Canyonlands National Wildlife Refuge. The local golden-cheeked warbler population in Hays County could also experience increases in population with the protection and management of high quality habitats in the county; however, the overall effect with regard to changes in population size would probably be relatively minor.

With regard to recovery goals, the RHCP would be unlikely to protect or create a new "focal" area for golden-cheeked warbler conservation. In Recovery Unit 5, this goal is being substantially met in Travis, Williamson, and Burnet counties. However, recovery goals for the golden-cheeked warbler also include protection of interconnecting habitats between focal areas. The proposed RHCP preserve system would contribute to this facet of the golden-cheeked warbler recovery plan by providing some connectivity between large blocks of potential habitat in adjacent Travis and Comal counties. Therefore, this alternative will likely have a positive effect on the ability of recovery goals being met. The proposed Hays County RHCP alternative is likely to result in a moderate beneficial impact to the golden-cheeked warbler, compared to the No Action alternative.

5.5.1.3 Golden-cheeked Warbler Impacts – Alternative C (Moderate Preserve/Limited Take)

Overall, the Moderate Preserve/Limited Take alternative is likely to result in only minor beneficial impacts to the golden-cheeked warbler.

The Moderate Preserve/Limited Take alternative would authorize the loss or degradation of approximately 3,600 acres of potential habitat for the covered species within Hays County associated with public and private land development activities. Most of this

authorized impact would affect golden-cheeked warbler habitat. As mitigation, the County would collect mitigation fees from plan participants and acquire at least 3,000 acres of preserve system containing a large proportion of high quality golden-cheeked warbler habitat. Acquisition of the pre-determined preserve system would occur within the first four years of the plan.

The Moderate Preserve/Limited Take alternative is assumed to occur within the same socioeconomic context as described for the No Action alternative (i.e., projected population increases and associated increases in land development and forest loss). As such, the amount of authorized habitat loss or degradation would constitute a portion of the total amount of habitat loss that is projected to occur under the No Action alternative (i.e., approximately 16 percent of the 22,000 acres of total anticipated habitat loss over 30 years). The remainder of the anticipated habitat loss would either be authorized through individual ESA Section 10(a) permits or Section 7 consultations, or would occur unlawfully without ESA authorization.

It is possible that the Moderate Preserve/Limited Take alternative would increase the amount of ESA compliance in Hays County, compared with the No Action alternative, since compliance would be substantially easier than obtaining individual authorization through the Service. However, without a permit amendment, the potential benefits of increased ESA compliance would be limited by the modest level of incidental take authorization available under this alternative.

As described in Section 5.1.2 above, issuing an incidental take permit under the Moderate Preserve/Limited Take alternative is not an "indispensable prerequisite" or an "essential catalyst" for land development in Hays County, and implementing this alternative regional HCP would not enable or impede future land development because alternative means of compliance with the ESA are available. Therefore, the potentially adverse impacts of this alternative would be similar to those described for the No Action alternative (i.e., the alternative would provide ESA authorization for a portion of the total amount of anticipated habitat loss in Hays County over the next 30 years, but would not be expected to substantially increase or decrease the total amount of anticipated habitat loss during that time). The remaining impacts of this alternative on the golden-cheeked warbler would be primarily associated with the mitigation provided by the 3,000-acre preserve system.

Under the Moderate Preserve/Limited Take alternative, authorized impacts to up to 3,600 acres potential golden-cheeked warbler habitat in Hays County would be mitigated by the permanent protection of approximately 3,000 acres of high quality golden-cheeked warbler habitat. While the mitigation ratio under this alternative is slightly less than one acre of habitat protected for each acre lost or degraded, the ratio would be justified by the relatively high quality of the protected habitat likely to be included within the pre-determined preserve system compared with the typically lower quality of potential golden-cheeked warbler habitat across the remainder of Hays County (approximately 80 percent of the potential golden-cheeked warbler

habitat in Hays County is identified as "low" or moderate" quality, based on the Loomis habitat model).

Hays County would identify specific criteria for the location, size, configuration, and habitat composition of the 3,000-acre preserve system within the plan, and would commit to the acquisition of a preserve system consistent with these criteria. The preserve system would be designed and managed to maximize the conservation value of the protected lands.

The mitigation provided under the Moderate Preserve/Limited Take alternative would likely result in a preserve system with greater conservation value than would be achieved if a similar acreage was protected and managed through individual ESA Section 10(a) or Section 7 authorizations. The enhanced conservation value of the pre-determined preserve system would result from the adherence to detailed criteria regarding the size, shape, location, and composition of preserve lands in the system. These criteria would target the largest contiguous blocks of the highest quality habitats, minimize the effects of adjacent land uses, and strive for connectivity with other important habitats. In comparison, a similar acreage of protected land achieved through individual ESA authorizations would likely result in a system of small, scattered, and isolated preserves with inconsistent management and monitoring practices.

The Moderate Preserve/Limited Take alternative would protect key areas of potential habitat in the county from future land development, thereby decreasing the threat of habitat loss for the most important areas of potential golden-cheeked warbler habitat in Hays County. However, the overall size of the preserve system would be modest. Therefore, the preserve system would be likely to have a minor beneficial impact on golden-cheeked warbler habitats. While it is difficult to predict precisely how golden-cheeked warbler populations would be affected by the protection of the 3,000-acre preserve, it is unlikely that this modestly sized preserve system would have substantial influence (either beneficially or adversely) on the size of the regional or local golden-cheeked warbler populations. With regard to recovery goals, the likely beneficial aspects of the detailed preserve design criteria (particularly with respect to mainlining habitat connectivity across the landscape) would also be tempered by the relatively modest size of the preserve system. Therefore, this alternative is not likely to have substantial influence on the ability of recovery goals being met.

Overall, the Moderate Preserve/Limited Take alternative is likely to result in only minor beneficial impacts to the golden-cheeked warbler.

5.5.1.4 Golden-cheeked Warbler Impacts – Alternative D (Large-scale Preserve System)

The overall impact of the Large-scale Preserve System alternative would likely be moderately beneficial for the golden-cheeked warbler in a regional and local context.

Like Alternative C, the Large-scale Preserve system alternative would create a pre-determined preserve system for the covered species that would be would be designed and managed to maximize the conservation value of the protected lands. In accordance with state

law, this pre-determined preserve system would also have to be completed with four years of permit issuance. Under this alternative, the preserve system would include approximately 30,000 acres, and most of this acreage would be high quality golden-cheeked warbler habitat.

In return for the commitment to acquire a very large-scale, well-designed, and appropriately managed preserve system that met the identified criteria (comparable to the Balcones Canyonlands Preserve in Travis County), Hays County would be authorized to incidentally take all of the remaining areas of golden-cheeked warbler habitat outside of the target acquisition area. The County would be able to permit incidental take associated with the loss or degradation of the remaining approximately 140,000 acres of potential golden-cheeked warbler habitat in Hays County.

While the amount of potential habitat loss authorized under this alternative would far exceed the amount of habitat protected, the general quality of vulnerable habitat would likely be lower than the general quality of protected habitats. It is also likely that much of the 140,000 acres of potential golden-cheeked warbler habitat that could be subject to loss under this alternative would occur in small, fragmented patches with a low probability of occupancy, while most of the important, high quality habitats would be included in the preserve system. Therefore, the potentially adverse impact of the discrepancy between the acres of take and mitigation would likely be minor. For instance, only approximately 50,000 acres of potential golden-cheeked warbler habitat identified by the Loomis model has a probability of occupancy that exceeds 50 percent (see Section 4.5.1.3), and much of this habitat would likely be included in the preserve system. Considering that most of the potential golden-cheeked warbler habitat with a relatively high likelihood of occupancy would be protected in perpetuity, the overall impact of this alternative on the golden-cheeked warbler could be moderately beneficial, since the threats to a large portion of the important habitat in the county would be alleviated.

The Large-scale Preserve System alternative would have the potential to increase the local population of golden-cheeked warblers in Hays County, since the preserve system would include long term management that would likely increase the quality protected habitats over time. Further, a 30,000-acre, pre-determined preserve system would also likely help achieve recovery goals for the golden-cheeked warbler by preserving and/or enhancing habitat connectivity across the landscape.

The overall impact of the Large-scale Preserve System alternative would likely be moderately beneficial for the golden-cheeked warbler in a regional and local context.

5.5.2 Black-capped Vireo

Impacts to the black-capped vireo would be considered significant if they were to result in one or more of the following:

- The existing primary threats to the shrubland habitat used by the species would decrease (a beneficial impact) or increase (an adverse impact) to a substantial degree.
- The size of the local black-capped vireo population in Hays County would substantially increase (a beneficial impact) or substantially decrease (an adverse impact).
- The goals and objectives of the black-capped vireo recovery plan were furthered or met (a beneficial impact) or were precluded from being met (an adverse impact).

5.5.2.1 Black-capped Vireo Impacts – Alternative A (No Action)

Under the No Action alternative, the recent trends affecting the black-capped vireo would be expected to continue through the next 30 years. Few records exist for the black-capped vireo in Hays County and little is known about its current status in the county. However, range-wide conditions for the species appear to be improving. The recent 5-year status review for the black-capped vireo (USFWS 2007b) suggests that even with substantial increases in urban development over portions of the species' range in Texas, the size of the known black-capped vireo population has dramatically increased since the species was listed as federally endangered in 1987.

The 2007 status review found that habitat loss and fragmentation due to the conversion of rangeland to other uses has likely decreased the amount of available habitat for the black-capped vireo across Texas. In Hays County, developed land uses are increasing across the landscape, which is likely resulting in some loss of habitat for the black-capped vireo. As described in Section 5.2 of the Hays County RHCP, the County anticipates that approximately 3,300 acres of potential black-capped vireo habitat could be impacted by new land development activities in Hays County during the term of the Permit. However, land cover changes tracked by the USGS suggest that large areas of forest cover are also being converted to more open grassland or shrubland habitats, which over time could create more habitat for the species. Therefore, given the lack of specific information regarding the status of the black-capped vireo in Hays County, it is uncertain the extent to which land use changes and other regional trends would be expected to adversely or beneficially affect the species (both in terms of habitat availability and population size) under the No Action alternative.

Regardless of the overall impacts of land use changes in Hays County, any loss or degradation of occupied black-capped vireo habitat in the county would require authorization from the Service to proceed in compliance with the ESA. While the impacts and mitigation likely to occur under the No Action alternative are difficult to predict due to the lack of information regarding the precise location and nature of future land development in the County, the lack of reliable information regarding the status of the species in Hays County, and the

inability to predict the level of compliance with the ESA, it may be assumed that some conservation efforts for the species would take place. ESA authorization would include the requirement that any occupied black-capped vireo habitat that was disturbed or removed be mitigated for by some form of compensation. Frequently, mitigation for habitat loss or degradation involves the permanent protection and management of habitat. The benefit to the species from habitat protection resulting from individual ESA authorizations under the No Action alternative is likely to be negligible to minor, since compliance would likely be relatively low (there have been no ESA Section 10(a) permits issued for the black-capped vireo in Hays County) and mitigation from individual projects is likely to protect relatively small and scattered or isolated patches of habitat.

The recovery criteria listed in the 1991 Recovery Plan for the black-capped vireo included a call for the protection of at least one viable black-capped vireo population composed of at least 500 to 1000 breeding pairs in each of six recovery regions in Texas, Oklahoma, and Mexico. It is not clear whether a viable black-capped vireo population is currently protected in the recovery region that includes Hays County, although the 2006 status review by Wilkins et al. (2006) identified 1,018 recent black-capped vireo observations in the Edwards Plateau recovery region. Most of these records were from protected lands, such as state parks and wildlife management areas. Since the true status of the black-capped vireo in Hays County and the recovery region is unknown, it is uncertain whether the No Action alternative would promote or prohibit the attainment of recovery goals for the species.

5.5.2.2 Black-capped Vireo Impacts – Alternative B (Proposed Hays County RHCP)

The proposed Hays County RHCP is likely to result in a minor to moderate beneficial impact to the black-capped vireo, compared to the No Action alternative.

Under the proposed RHCP, the County would receive authorization to incidentally take black-capped vireos related to the loss or degradation of up to 1,300 acres of potential black-capped vireo habitat in Hays County over 30 years. To mitigate for those impacts, the County would create a preserve system under a phased conservation bank approach, with a target size of approximately 10,000 to 15,000 acres. The bank would be assembled on a phased basis as needed over the next 30 years to provide sufficient mitigation credits to offset impacts from participating public and private projects. Under the phased conservation bank approach, habitat protection would always occur in advance of authorized impacts through the RHCP; however, no pre-determined preserve system would be designated under the RHCP. The County estimates that by the end of the 30-year permit term, approximately 1,300 acres would be managed in perpetuity for the benefit of the black-capped vireo.

As explained in Section 4.1, the Hays County RHCP would be implemented in the same socioeconomic context as the No Action alternative and would experience similar levels and patterns of land development. Accordingly, anticipated land development activities in the county would be expected to have similar potentially adverse effects to the species as described

for the No Action alternative. Since implementation of the proposed RHCP would not be expected to substantially influence the total amount of anticipated habitat loss in Hays County during the permit term, the impacts of the proposed RHCP on the black-capped vireo would be primarily associated with the mitigation provided by the plan.

Black-capped vireo mitigation credits under the proposed RHCP would be awarded to the County by the Service based on the number of acres dedicated to perpetual black-capped vireo habitat management within the preserve system. The mitigation needs of projects seeking to authorize impacts to the covered species through the RHCP would be determined by the County based on an on-site assessment of habitat conditions and site-specific development plans. Typically one acre of impact to potential black-capped vireo habitat within a participating project area would require the use of one mitigation credit from the RHCP conservation bank. Therefore, it is anticipated that impacts to habitat authorized through the RHCP will be adequately balanced by perpetually managed black-capped vireo habitat within the preserve system.

Areas protected and managed for the benefit of the black-capped vireo under the proposed RHCP would be would likely be larger than the mitigation typically needed to offset impacts associated with individual projects, these areas would be regularly managed and monitored in accordance with a Service-approved plan that addresses the maintenance of appropriate vegetative structure for the black-capped vireo and reduces threats from nest parasites and browsing wildlife, and the black-capped vireo management areas would be buffered from the effects of adjacent land uses by being located within a larger system of preserve lands.

Therefore, the mitigation provided under the proposed RHCP would be expected to alleviate some of the major threats to the species for up to 1,300 acres of black-capped vireo habitat in Hays County, thereby providing a moderate benefit to the species in Hays County, compared to the No Action alternative. However, these expected benefits could be minor on a regional scale due to the somewhat limited scope of this alternative and the presence of several other protected areas with recently observed black-capped vireo populations elsewhere within the recovery region (i.e., state parks and wildlife management areas within the Edwards Plateau recovery region). Similarly, the proposed RHCP in Hays County would be expected to have only minor beneficial effects on the prospect for attaining recovery goals for the black-capped vireo.

Overall, the proposed Hays County RHCP is likely to result in a minor to moderate beneficial impact to the black-capped vireo, compared to the No Action alternative

5.5.2.3 Black-capped Vireo Impacts – Alternative C (Moderate Preserve/Limited Take)

The Moderate Preserve/Limited Take alternative would authorize the loss or degradation of approximately 3,600 acres of potential habitat for the covered species (both the golden-cheeked warbler and the black-capped vireo) within Hays County associated with public and private land development activities. For the purpose of this EIS, it is assumed that a small

portion of this authorized impact (perhaps 5 to 10 percent) could be expected to affect the black-capped vireo. As mitigation, the County would collect mitigation fees from plan participants and acquire at least 3,000 acres of preserve system that would likely contain between 100 and 300 acres of shrubland to be managed in perpetuity as black-capped vireo habitat.

It is possible that the Moderate Preserve/Limited Take alternative would increase the amount of ESA compliance in Hays County, compared with the No Action alternative, since compliance may be more efficient than obtaining individual authorization through the Service. This may be particularly true with regard to the black-capped vireo, since individual ESA permittees could be required to engage in long-term obligations for regular black-capped vireo habitat management activities that could make a one-time payment to a regional plan an attractive alternative to an individual permit. However, the potential benefits of increased ESA compliance would be limited by the modest level of incidental take authorization available under this alternative.

As described above, issuing an incidental take permit under the Moderate Preserve/Limited Take alternative is not an "indispensable prerequisite" or an "essential catalyst" for land development in Hays County, and implementing this alternative regional HCP would not enable or impede future land development because alternative means of compliance with the ESA are available. Therefore, the potentially adverse impacts of this alternative would be similar to those described for the No Action alternative. The remaining impacts of this alternative on the black-capped vireo would be primarily associated with the 100 to 300 acres of black-capped vireo management area designated within the 3,000-acre preserve system.

Impacts to potential black-capped vireo habitat (as identified through on-site habitat assessments) would typically be mitigated at a ratio of one acre of mitigation for each acre of impact. The mitigation provided under the Moderate Preserve/Limited Take alternative would be provided in relatively large blocks of at least 50 acres within portions of the preserve system that are not managed as golden-cheeked warbler habitat. This alternative would create black-capped vireo management areas that would be larger than the mitigation typically needed to offset impacts associated with individual projects. Black-capped vireo habitat within the preserve system would also be regularly managed and monitored in accordance with a Service-approved plan that addresses the maintenance of appropriate vegetative structure for the black-capped vireo and reduces threats from nest parasites and browsing wildlife. Further, the black-capped vireo management areas under this alternative would be buffered from the effects of adjacent land uses by being located within a larger system of preserve lands (typically in blocks of at least 500 acres).

Therefore, the mitigation provided under the Moderate Preserve/Limited Take alternative would be expected to alleviate some of the major threats to the species for a moderately sized area of black-capped vireo habitat, thereby providing a minor benefit to the species in Hays County, compared to the No Action alternative. Although, these expected

benefits could be negligible on a regional scale due to the limited scope of this alternative and the presence of much larger protected areas with recently observed black-capped vireo populations elsewhere within the recovery region (i.e., state parks and wildlife management areas within the Edwards Plateau recovery region). Similarly, the Moderate Preserve/Limited Take alternative in Hays County would be expected to have only negligible effects (beneficial or adverse) on the prospect for attaining recovery goals for the black-capped vireo.

5.5.2.4 Black-capped Vireo Impacts – Alternative D (Large-scale Preserve System)

The overall impact of the Large-scale Preserve System would likely be moderately beneficial for the black-capped vireo in a regional and local context.

The Large-scale Preserve System alternative uses a pre-determined preserve system that would be designed to include approximately 30,000 acres of high quality habitats for the covered species in Hays County. It is likely that some of these preserve lands would include tracts with the occupied black-capped vireo habitat and/or areas with the promise for developing into high quality black-capped vireo habitat with proper management. Assuming that approximately 5 to 15 percent of the preserve system would be dedicated to black-capped vireo habitat management, approximately 1,500 acres to 4,500 acres in Hays County could be perpetually managed as high quality black-capped vireo habitat. Under this alternative, the remaining acres of potential black-capped vireo habitat in Hays County (approximately 19,000 to 22,000 acres) could be incidentally taken.

While the amount of potential habitat loss authorized under this alternative would far exceed the amount of habitat protected, the general quality of vulnerable habitat would likely be much lower than the general quality of protected habitats, and most vulnerable habitats would lack appropriate management activities to maintain suitable habitat conditions over time. Therefore, the potentially adverse impact of the authorized take would be balanced by a perpetual commitment to manage thousands of acres for the benefit of the black-capped vireo.

It is likely that the Large-scale Preserve System alternative would increase the amount of compliance with the ESA with regard to the covered species, including the black-capped vireo, since the time and cost of compliance would be reduced for project proponents compared to individual ESA authorizations through the Service and the alternative would include education and outreach programs to increase awareness of endangered species issues in the county. As a result, more of the anticipated habitat loss would likely be mitigated for than under the No Action alternative.

The Large-scale Preserve System alternative would have the potential to increase the local and regional populations of black-capped vireos in Hays County, since the preserve system would include regular habitat management activities that would likely increase the quality protected habitats, increase the likelihood that these managed habitats would be occupied by the species, and increase the abundance of the black-capped vireo in Hays County over time. Further, a 30,000-acre, pre-determined preserve system containing 1,500 to 4,500 acres of high

quality black-capped vireo habitat would also likely help achieve recovery goals for the black-capped vireo by contributing to a viable and self-sustaining population of approximately 500 to 1,000 breeding pairs.

The overall impact of the Large-scale Preserve System would likely be moderately beneficial for the black-capped vireo in a regional and local context.

5.6 Hays County RHCP Evaluation and Additional Species

In addition to the covered species, for which the County would obtain incidental take authorization, the proposed Hays County RHCP addresses two other categories of rare and/or sensitive species termed "evaluation" or "additional" species.

The set of evaluation species includes 40 karst species, including a variety of cave-adapted snails, crustaceans, arachnids, beetles, salamanders, a flatworm, a springtail, and a leech. None of the evaluation species are listed as federally threatened or endangered; nor have they been officially identified as candidates for such listing. However, several of the evaluation species have been petitioned for listing (see Table 4-6) and one or more of these species could become federally listed during the term of the permit. Hays County is not currently seeking ESA incidental take authorization for any of the evaluation species; nevertheless, the evaluation species may benefit from the conservation measures identified in the proposed RHCP.

The additional species addressed in the RHCP include a group of 16 plants, mollusks, insects, amphibians, and a fish. Most of these species utilize surface aquatic habitats, but some are adapted to aquatic karst habitats (such as spring outlets and underground aquifers) and others utilize upland habitats. Some of the additional species are currently listed as Federally threatened or endangered, including Texas wild-rice, the Comal Springs riffle beetle, the Comal Springs dryopid beetle, the fountain darter, the San Marcos Springs salamander, and the Texas blind salamander. Although not yet determined, the unidentified *Eurycea* salamander found in northern Hays County could also be a member of a listed species. All of the federally listed additional species are associated with aquatic habitats that are highly dependent on spring flow from the Edwards Aquifer at the San Marcos Springs. Hays County is not currently seeking ESA incidental take authorization for any of the additional species; nevertheless, the additional species may benefit from the conservation measures identified in the proposed RHCP.

The indicators of impact significance differ for different groups of these 56 evaluation and additional species and will be discussed in the appropriate sections below. The definitions of impact intensity, however, are similar for these two groups of species and are as follows:

Negligible: Changes to the existing primary threats to the evaluation or additional species, their habitats, or the natural processes sustaining them would be at the lowest levels of detection. Changes in distribution would be minimal and well within the range of natural variation. For listed species, negligible effects would equate with a "may effect, not likely to

adversely affect" determination by the U.S. Fish and Wildlife Service under the ESA.

Minor: Changes to the existing primary threats to the evaluation or additional species, their habitats, or the natural processes sustaining them would be detectable, but short-term and/or spatially limited in scope. Changes in distribution would not be expected to greatly exceed the range of natural variability. For listed species, minor effect would equate with a "may effect, not likely to adversely affect" determination by the U.S. Fish and Wildlife Service under the ESA.

Moderate: Changes to the existing primary threats to the evaluation or additional species, their habitats, or the natural processes sustaining them would be readily detectable over relatively wide areas of the county. Impacts could result in direct mortality and/or interference with activities necessary for survival, but would not be expected to threaten the continued existence or distribution of the species in the County. For listed species, moderate effect would equate with a "may effect, likely to adversely affect" determination by the U.S. Fish and Wildlife Service.

Major: Changes to the existing primary threats to the evaluation or additional; species, their habitats, or the natural processes that sustain them would be readily detectable over most areas of the county and would be outside of the range of natural variability for long periods of time or be permanent. For listed species, major effect would equate with a "may effect, likely to adversely affect" or a jeopardy determination by the U.S. Fish and Wildlife Service under the ESA.

5.6.1 Unlisted Evaluation Species Utilizing Terrestrial Karst Habitats

The species included in this group utilize terrestrial (or dry) underground habitats, and include the following evaluation species:

Common Name	Scientific Name	Taxa
a cave-obligate spider	*Cicurina ezelli*	Arachnids
a cave-obligate spider	*Cicurina russelli*	Arachnids
a cave-obligate spider	*Cicurina ubicki*	Arachnids
undescribed cave-obligate spider	*Eidmannella* n. sp.	Arachnids
undescribed cave-obligate spider	*Neoleptoneta* n. sp. 1	Arachnids
undescribed cave-obligate spider	*Neoleptoneta* n. sp. 2	Arachnids
undescribed cave-obligate spider	*Neoleptoneta* n. sp. eyeless	Arachnids
a pseudoscorpion	*Tartarocreagris grubbsi*	Arachnids
a cave-obligate harvestman	*Texella diplospina*	Arachnids

Common Name	Scientific Name	Taxa
a cave-obligate harvestman	*Texella grubbsi*	Arachnids
a cave-obligate harvestman	*Texella mulaiki*	Arachnids
a cave-obligate harvestman	*Texella renkesae*	Arachnids
a cave-obligate springtail	*Arrhopalites texensis*	Hexapods
an ant-like litter beetle	*Batrisodes grubbsi*	Insects
a cave-obligate beetle	*Rhadine austinica*	Insects
a cave-obligate beetle	*Rhadine insolita*	Insects
undescribed beetle	*Rhadine* n. sp. (*subterranea* group)	Insects
undescribed beetle	*Rhadine* n. sp. 2 (*subterranea* group)	Insects

Impacts to the terrestrial karst evaluation species would be considered significant if they were to result in the following:

- The existing primary threats to these species would decrease (a beneficial impact) or increase (an adverse impact) to a substantial degree.
- An increase in the distribution of these species indicated sufficient resource conservation (a beneficial impact) or a decline in distribution indicated insufficient resource conservation (an adverse impact).

5.6.1.1 Unlisted Terrestrial Karst Evaluation Species Impacts – Alternative A (No Action)

Approximately 139,870 acres of Hays County are underlain by geologic formations that are known to develop karst features. One or more of the unlisted terrestrial karst evaluation species have been observed in 18 of the approximately 301 caves, sinkholes, springs, and other karst features are currently known to occur in Hays County. Approximately two of these "occupied" karst features occur on currently protected lands in the county, while the remaining locations are located on unprotected private lands. However, few systematic karst surveys have been completed in Hays County, and given the extent of karst geology in Hays County it is likely that many more karst features (including features that could contain one or more of the evaluation species) are present across the landscape than are currently known.

Karst habitats are extremely sensitive to degradation from human activities. As described in Section 4.6.1, most of the terrestrial karst evaluation species have a limited known distribution, and their primary threat is destruction or degradation of habitat. Impacts to terrestrial karst species resulting from land development activities could be associated with actions such as filling and collapsing caves, alteration of surface drainage patterns and groundwater flow, alteration of surface plant and animal communities, contamination from pollutants, human visitation and vandalism, and activities associated with mining and quarrying. Non-native, invasive species, such as red imported fire ants, also enter caves, eat native arthropods, and could compete indirectly with foraging cave crickets (USFWS 2008).

Over the next 30 years, projected population increases and associated increases in developed land uses would be expected to affect thousands of acres of currently undisturbed portions of Hays County that could contain potential karst habitats. While it is impossible to predict the number of caves and karst features that would be adversely affected by future development activities, it is not unreasonable to assume that known and unknown karst features would be destroyed or substantially degraded by encroaching development. Even if many more caves and other karst features are discovered across the landscape, the destruction or degradation of karst habitats could result in adverse impacts to the one or more of the terrestrial karst evaluation species.

Currently, none of the terrestrial karst evaluation species are protected by the ESA and, therefore, there are no protective mechanisms specific to these species. The TCEQ enforces the Edwards Aquifer Rules, which address water quality protection and apply to certain types of development projects over the Edwards Aquifer contributing, recharge, and transition zones (i.e., all of the area of potential effect considered in this EIS). Some provisions of the Edwards Aquifer Rules require the creation of buffer zones around karst features. However, this regulatory program does not alleviate most of the threats contributing to the loss or degradation of terrestrial karst habitats. Due to the general sensitivity of karst habitats (as described above) and the limited known distribution of many of these species (several are known from only a single location), increases in land development across the county could ultimately cause a decline in the numbers and range of one or more of these potentially rare species.

Overall, the Service generally lacks sufficient information on the distribution, abundance, life history, and specific habitat requirements of these unlisted terrestrial karst species to make a determination of likely impacts under the No Action alternative.

5.6.1.2 Unlisted Terrestrial Karst Evaluation Species Impacts – Alternative B (Proposed Hays County RHCP)

As for the No Action alternative, terrestrial karst evaluation species in Hays County would likely suffer adverse impacts from habitat loss or degradation resulting from expected increases in developed land uses over the next 30 years; however, the extent or significance of these potential adverse effects is uncertain due to the scarcity of information pertaining to these species.

While the proposed Hays County RHCP would not cover the terrestrial karst evaluation species for incidental take under the ESA (and such coverage is not currently needed for these unlisted species), the RHCP conservation program would be likely to incidentally protect habitats for one or more of these species within the preserve system. The proposed RHCP would also promote the voluntary conservation of the terrestrial karst evaluation species through education and outreach programs and would fund research to increase the body of knowledge regarding their biology and conservation.

The potentially beneficial effects of incidental habitat protection for the terrestrial karst evaluation species under the proposed RHCP could vary from negligible to major. For example, if the preserve system contained few or no karst habitats known to be occupied by the evaluation species, then the benefits of the preserve system on these species would be negligible. On the other end of the scale, the benefits could be major if the preserve system included (and permanently protected) the only known localities for one or more of these potentially rare species. Since the RHCP preserve system would be assembled on a rolling basis, it is not possible to determine the true level of benefit that these species would receive.

Therefore, the preserve system, education and outreach program, and research funding proposed as part of the Hays County RHCP would likely have minor to major beneficial effects on the unlisted, terrestrial karst evaluation species, compared with the effects of the No Action alternative. The magnitude of this potentially beneficial effect could vary from minor to major, depending on the how many karst features were incidentally protected within the preserve system over time and the particular species occupying those features.

5.6.1.3 Unlisted Terrestrial Karst Evaluation Species Impacts – Alternative C (Moderate Preserve/Limited Take)

Under the Moderate Preserve/Limited Take alternative, the current trends regarding land development and possible impacts to karst habitats described for the No Action alternative would be expected to continue, and it is likely that adverse impacts to one or more of the terrestrial karst evaluation species would occur (primarily through loss or degradation of habitat). This alternative would not cover the terrestrial karst evaluation species for incidental take under the ESA; indeed, no such coverage is needed since none of these species are federally listed. The alternative could, however, incidentally benefit one or more of these species by protecting approximately 3,000 acres in Hays County from future land development. While the preserve system under the Moderate Preserve/Limited Take alternative would be designed to include high quality habitats for the covered species, these habitats can occur in areas that are likely to contain karst features as well. By protecting large blocks of undeveloped land, it is likely that the preserve system would also protect caves or other karst features that are occupied by one or more of the terrestrial karst evaluation species.

The effect of this incidental conservation would likely be negligible to minor for most of the terrestrial karst evaluation species, since the overall scale of the preserve system is relatively modest and the protection of these species would not be a primary consideration in the design of the preserve system. However, if the preserve system did contain occupied habitat for one or more of the species currently known from only a single site in Hays County, the effects of protecting that habitat could be significant for that species.

In addition to the possible incidental protection of terrestrial karst habitats within the 3,000-acre preserve system, the conservation program under the Moderate Preserve/Limited Take alternative would also include education and outreach programs to increase awareness of

endangered species issues in Hays County. These programs would also address issues related to the conservation of karst habitats and promote the use of voluntary measures to conserve karst habitats.

Therefore, while it is difficult to predict the true impact of this alternative on these species, it is likely that implementation of the Moderate Preserve/Limited Take alternative would have a beneficial effect on the unlisted, terrestrial karst evaluation species, compared to the No Action alternative. The magnitude of this potentially beneficial effect could vary from minor to major, depending on the how many karst features were incidentally protected and the particular species occupying those features.

5.6.1.4 Unlisted Terrestrial Karst Evaluation Species Impacts – Alternative D (Large-scale Preserve)

As described for the No Action alternative, anticipated new land development in Hays County could result in the loss or degradation of karst habitats and could adversely affect one or more of the terrestrial karst evaluation species. However, under the Large-scale Preserve System, approximately 30,000 acres of habitat for the golden-cheeked warbler or black-capped vireo would be protected within a pre-determined preserve system within the first several years of the plan. Even though this alternative would also not seek to cover the terrestrial karst evaluation species for incidental take, there would be a high likelihood that some karst habitats and some of the currently known karst features occupied by one or more of the evaluation species could be included in this preserve system. The preserve system could also include some currently unknown karst features that provide habitat for one or more of the terrestrial karst evaluation species. Therefore, given the size of the proposed preserve system, it is likely that the Large-scale Preserve System alternative would incidentally result in a minor to major beneficial impact for one or more of the terrestrial karst evaluation species, compared to the No Action alternative.

5.6.2 Unlisted Evaluation Species Utilizing Aquatic Karst Habitats

The species included in this group utilize aquatic underground habitats (such as aquifers and spring outlets), and include the following evaluation species:

Common Name	Scientific Name	Taxa
Aquifer flatworm	*Sphalloplana mohri*	Turbellarians
Flattened cavesnail	*Phreatodrobia micra*	Mollusks
Disc cavesnail	*Phreatodrobia plana*	Mollusks
High-hat cavesnail	*Phreatodrobia punctata*	Mollusks
Beaked cavesnail	*Phreatodrobia rotunda*	Mollusks
a cave-obligate leech	*Mooreobdella* n. sp.	Hirudinea
a cave-obligate crustacean	*Tethysbaena texana*	Crustaceans
a cave-obligate amphipod	*Allotexiweckelia hirsuta*	Crustaceans

a cave-obligate amphipod	*Artesia subterranea*	Crustaceans
a cave-obligate amphipod	*Holsingerius samacos*	Crustaceans
a cave-obligate amphipod	*Seborgia relicta*	Crustaceans
Balcones cave amphipod	*Stygobromus balconis*	Crustaceans
Ezell's cave amphipod	*Stygobromus flagellatus*	Crustaceans
a cave-obligate amphipod	*Texiweckelia texensis*	Crustaceans
a cave-obligate amphipod	*Texiweckeliopsis insolita*	Crustaceans
Texas troglobitic water slater	*Lirceolus smithii*	Crustaceans
a cave-obligate decapod	*Calathaemon holthuisi*	Crustaceans
Balcones cave shrimp	*Palaemonetes antrorum*	Crustaceans
Comal Springs diving beetle	*Comaldessus stygius*	Insects
Edwards Aquifer diving beetle	*Haideoporus texanus*	Insects
Blanco River Springs salamander	*Eurycea pterophila*	Amphibians
Blanco blind salamander	*Eurycea robusta*	Amphibians

Impacts to the aquatic karst evaluation species would be considered significant if they were to result in the following:

- The existing primary threats to these species would decrease (a beneficial impact) or increase (an adverse impact) to a substantial degree.
- An increase in the distribution of these species indicated sufficient resource conservation (a beneficial impact) or a decline in distribution indicated insufficient resource conservation (an adverse impact).

5.6.2.1 Unlisted Aquatic Karst Evaluation Species Impacts – Alternative A (No Action)

Most of the aquatic karst evaluation species are restricted to the Edwards Aquifer; although a few (such as *Comaldessus stygius*, *Stygoparnus comalensis*, and *Eurycea pterophila*) are known to occur in the underground, water-filled passages and spring outlets of the Trinity Aquifer. Under the No Action alternative, all or most of the unlisted, aquatic karst evaluation species could experience moderate adverse impacts related to projected increases in human population and associated land use changes in Hays County over the next 30 years.

The aquatic karst ecosystem relies on the natural quantity and quality of water flowing through the system and the energy brought in through caves and other karst features with connections to the surface environment. Aquatic karst environments are highly interconnected and heterogeneous, are characterized by rapid recharge of unfiltered surface water into the subsurface, and typically experience high flow velocities within the system. As described for the terrestrial karst evaluation species, karst terranes are extremely sensitive to degradation from human activities (Ford and Williams 1989, White 1988). In short, a healthy subsurface environment is dependent upon a healthy surface environment.

Water quality has obvious implications for aquatic species. These characteristics make aquifer-dependent species and habitats vulnerable to activities that disturb natural surface environments from both biological and hydrological perspectives (Ford and Williams 1989, White 1988). Poor water quality can mean low levels of dissolved oxygen, increased levels of sediments and/or contaminants, and/or increased levels nutrients that can cause disease, deformities, or death of aquatic organisms.

Changes in surface water flow and/or ground water pumping could alter the amount and pattern of water flow through the aquifer systems, and therefore affect the movement of energy, nutrients, and dissolved oxygen through the system that aquifer organisms rely on. For spring-dependent species, changes in water use could stop spring flows and destroy key habitats. Some spring species might survive short-term flow intermissions by burying into gravels or retreating into the aquifer, but they may not be adapted to living there for long periods.

Over the next 30 years, projected population increases and associated increases in developed land uses would be expected to affect thousands of acres of currently undisturbed portions of Hays County. This land development would replace vegetation with impervious cover associated with buildings, pavement, and similar surfaces. Impervious cover can increase contaminant loads in springs and groundwater, as well as alter local hydrologic regimes by increasing storm runoff and decreasing base flows in drainages (Arnold and Gibbons 1996). Increased stormwater runoff results in a decrease in aquifer recharge, increased variability in water availability and flow, and decreased water quality due to soil erosion and sedimentation. Contaminants carried and stored in sediments can include petroleum hydrocarbons, pesticides, and heavy metals (Hoffman et al. 1995). Decreases in base flow in streams due to land development results in reduced water availability at springs, which can be especially problematic during periods of drought (Price et al. 1995, USFWS 2004b).

While the general relationship between land development, impervious cover, and the degradation of groundwater resources is well established, the level of impact that land development activities in Hays County would have on the quality and quantity of water in the aquifer is difficult to quantify. The Edwards and Trinity aquifers have very large contributing and recharge zones spanning thousands of square miles, and the groundwater under Hays County (which provides habitat for the aquatic evaluation and additional species) is influenced by land and water use patterns across this entire area, not only in Hays County. Land development activities in Hays County (which represents only a small fraction of the total area contributing to the health of the Edwards and Trinity aquifers) could only have a very limited impact on the overall health of these aquifer systems; although more significant localized impacts are possible.

Currently, none of the aquatic karst evaluation species are protected by the ESA and, therefore, there are no protective mechanisms specific to these species. The TCEQ enforces the Edwards Aquifer Rules, which address water quality protection and apply to certain types of

development projects over the Edwards Aquifer contributing, recharge, and transition zones (i.e., all of the area of potential effect considered in this EIS). Other local water quality regulations are also enforced across portions of the area of potential effects. However, these regulatory programs are likely to provide only negligible to minor beneficial impacts to the aquatic karst evaluation species since they do not address issues pertaining to water quantity. Therefore, due to the general sensitivity of aquatic karst habitats (as described above) and the limited known distribution of many of these species (several are known from only a single location), it is expected that increases in land development across the county could ultimately cause a decline in the numbers and range of one or more of these potentially rare species.

Overall, the Service generally lacks sufficient information on the distribution, abundance, life history, and specific habitat requirements of these unlisted aquatic karst species to make a determination of likely impacts under the No Action alternative.

5.6.2.2 Unlisted Aquatic Karst Evaluation Species Impacts – Alternative B (Proposed Hays County RHCP)

The proposed Hays County RHCP could result in negligible to major beneficial impacts to the aquatic karst evaluation species.

As for the No Action alternative, the adverse impacts of anticipated land development activities in Hays County would likely be negligible to minor for most the aquatic karst species, since habitats for these species depend on land and water use patterns across a large portion of Texas, not just activities in Hays County. However, significant local impacts could also be possible if particular development projects destroyed or degraded occupied spring outlets or important recharge features.

The preserve system created under the proposed RHCP would be expected to protect approximately 10,000 to 15,000 acres in Hays County from future land development. By protecting large blocks of undeveloped land, it is possible that the preserve system would also protect springs and other karst features that are occupied by or one or more of the aquatic karst evaluation species. It is also possible that at least some of the preserve land would protect recharge features that allow surface water to replenish the aquifer. Protection of natural vegetation around recharge features contributes to maintaining water quality in the aquifers.

The effect of conservation actions under the RHCP would likely be negligible to minor for most of the aquatic karst evaluation species, since the overall scale of the preserve system is relatively modest with respect to the area of the recharge and contributing zones of the aquifers that provide habitat for these species (i.e., the overall health of the aquifer systems is dependent upon a much larger area than Hays County). However, if the preserve system included important spring outlets or recharge features that contributed directly to the known habitat of one or more of the aquatic evaluation species, then the beneficial effects of protecting that habitat could be significant for that species.

In addition to the possible protection of aquatic karst habitats (i.e., springs, caves, or similar local features) within the preserve system, the conservation program under the proposed RHCP would also include education and outreach programs to increase awareness of endangered species issues in Hays County. These programs would discuss issues related to the conservation of karst habitats and promote the use of voluntary measures to conserve karst habitats and water resources. Further, the County would voluntarily commit funds for new research to better understand the distribution, abundance, biology of one or more of the RHCP evaluation species and help develop effective management practices to conserve them.

Therefore, the preserve system, education and outreach programs, and research funds that would be implemented under the proposed RHCP would likely have beneficial effects on the aquatic karst species. Since the ultimate size and location of the preserve system is not known at this time, it is uncertain how many locally important springs or recharge features would be protected. However, it is likely that some of the aquatic karst species would benefit from the creation of the preserve system. While the overall beneficial effects of the proposed RHCP (compared to the No Action alternative) would likely be negligible to minor for most of the aquatic karst species, some species could experience moderate to major beneficial effects depending on the specific features of the preserve system.

5.6.2.3 Unlisted Aquatic Karst Evaluation Species Impacts – Alternative C (Moderate Preserve/Limited Take)

Under the Moderate Preserve/Limited Take alternative, the current trends regarding land development and possible impacts to aquatic karst habitats described for the No Action alternative would be expected to continue, and it is likely that adverse impacts to one or more of the aquatic karst evaluation species would occur (primarily through loss or degradation of habitat). This alternative would not cover the aquatic karst evaluation species for incidental take under the ESA; indeed, no such coverage is currently needed since none of these species is federally listed.

Nevertheless, the Moderate Preserve/Limited Take alternative could incidentally benefit one or more of these species with the creation of an approximately 3,000-acre preserve system in Hays County. By protecting large blocks of undeveloped land, it is possible that the preserve system would also protect springs and other karst features that are occupied by or one or more of the aquatic karst evaluation species. It is also possible that at least some of the 3,000 acres of preserve land would protect recharge features that allow surface water to replenish the aquifer. Protection of natural vegetation around recharge features contributes to maintaining water quality in the aquifers.

As described for Alternative B, the effect of this incidental conservation would likely be negligible to minor for most of the aquatic karst evaluation species. However, if the preserve system included important spring outlets or recharge features that contributed directly to the

known habitat of one or more of the aquatic evaluation species, then the effects of protecting that habitat could be significant for that species.

The Moderate Preserve/Limited Take alternative would also include education and outreach programs to increase awareness of endangered species issues in Hays County and promote the use of voluntary measures to conserve karst habitats and water resources.

Therefore, while it is difficult to predict the true impact of this alternative on the aquatic karst species, it is likely that implementation of the Moderate Preserve/Limited Take alternative would have a beneficial effect on the unlisted, aquatic karst evaluation species, compared to the No Action alternative. The magnitude of this potentially beneficial effect could vary from negligible to major, depending on the local importance of any springs and recharge features that would be incidentally protected and the particular species occupying those features.

5.6.2.4 Unlisted Aquatic Karst Evaluation Species Impacts – Alternative D (Large-scale Preserve)

Under the Large-scale Preserve System, approximately 30,000 acres of prime habitat for the golden-cheeked warbler or black-capped vireo would be protected within a pre-determined preserve system within the first several years of the plan. Even though this alternative would not seek to cover the aquatic karst evaluation species for incidental take, there would be a high likelihood that many important springs and recharge features known in Hays County would be included in this large preserve system. Therefore, given the size of the proposed preserve system, it is likely that the Large-scale Preserve System alternative would incidentally result in a minor to moderate beneficial impact for one or more of the aquatic karst evaluation species relative to the No Action alternative.

5.6.3 Additional Species

The category of additional species includes three upland plants, eight aquatic species that utilize surface water habitats, and five species that utilize aquatic karst habitats. Some of these additional species are listed as threatened or endangered, including Texas wildrice, Comal Springs riffle beetle, Comal Springs dryopid beetle, fountain darter, San Marcos salamander, Texas blind salamander, and (possibly, pending additional study) the undescribed northern Hays County Eurycea salamander. Impacts to the additional species would be considered significant if they were to result in the following:

- The existing primary threats to these species would decrease (a beneficial impact) or increase (an adverse impact) to a substantial degree.
- An increase in the distribution of these species indicated sufficient resource conservation (a beneficial impact) or a decline in distribution indicated insufficient resource conservation (an adverse impact).

5.6.3.1 Additional Species Impacts – Alternative A (No Action)

The three upland plant species included in the list of additional species are each currently considered to be rare, with relatively few known populations as described in Section 4.6.2. None of these upland plants are threatened or endangered under the ESA. Habitat loss from land development activities, overgrazing from domestic animals or wildlife, and competition from invasive and/or non-native plants may all be substantial threats to these species. Under the No Action alternative, anticipated human population increases would be expected to result in increased land development that would convert undeveloped and relatively natural upland vegetation communities to developed land uses. Increased land development could also lead to the introduction and expansion of populations of non-native plants in adjacent natural areas. While agricultural land uses in Hays County would be expected to decrease over the next 30 years, localized overgrazing and overabundant populations of deer and other wildlife could still be expected. These factors could cause a decline in the Hays County populations of the three upland plant species and/or their known distribution in Texas.

Overall, the anticipated threats to surface and sub-surface aquatic communities that provide habitat for the aquatic additional species would be expected to be similar to that described for the aquatic evaluation species in Section 5.6.2. Land development and increases in impervious cover can lead to the degradation of the quality of water in streams and rivers, as well as changes to the volume and pattern of stream flow. These changes in hydrology would negatively affect surface and subsurface aquatic communities and could cause declines in rare species; particularly when rare species (such as the aquatic additional species) are constrained by very precise habitat requirements. Any actions that would result in take of the listed additional aquatic species would require authorization under Section 10 or Section 7 of the ESA and the impacts of take would be analyzed in detail pursuant to any such authorizations.

Scattered conservation actions, such as would occur under individual ESA authorizations and other public parks or open space initiatives, would also be expected to protect some currently undeveloped areas within Hays County. For example, the City of San Marcos is currently developing a habitat conservation plan for the additional listed aquatic species that occur at San Marcos Springs, Spring Lake, and the upper reaches of the San Marcos River. However, due to the difficulty in predicting the size, number, and location of potential future conservation actions and the wide area contributing to the health of surface and sub-surface aquatic resources in Hays County, it is not possible to predict the extent to which potential future conservation actions would result in beneficial conservation of the additional species.

Overall, it is likely that the additional species would experience negligible to moderate adverse impacts under the No Action alternative.

5.6.3.2 Additional Species Impacts – Alternative B (Proposed Hays County RHCP)

The overall effects of an increasing human population in Hays County, as described for the No Action alternative, would be expected to result in similar adverse effects to the additional species under the proposed RHCP. However, the beneficial conservation actions of the proposed RHCP would likely have negligible to minor beneficial effects for one or more of these species, compared to the No Action alternative.

The proposed RHCP would create a preserve system of approximately 10,000 to 15,000 acres containing potential golden-cheeked warbler and black-capped vireo habitat in Hays County. The three terrestrial plants that are included in the group of additional species also occur in these habitat types, and it is possible that some populations of these plants would be protected by the preserve system and benefit from the management of these habitats. Therefore, the proposed RHCP could have a negligible to moderate beneficial effect on reducing threats to and maintaining the distribution of the three terrestrial plant species.

Since aquatic resources would not be the focus of the preserve system, it is uncertain how many or what types of aquatic resources would be included within the preserve system. The size of the preserve system could also limit the potential water quality benefits of large-scale watershed protection; although some more significant localized benefits could be achieved if the preserve included important riparian areas. Therefore, the eight additional species that utilize surface water habitats could be expected to experience negligible to minor beneficial effects from implementation of this alternative, compared to the No Action alternative.

Similarly, the five additional species utilizing karst aquatic habitats would also be expected to experience negligible to minor beneficial effects from the proposed RHCP. These species are all associated with two locations in Hays County: San Marcos Springs (and associated spring runs) and Fern Bank Springs. Both of these locations have been designated as critical habitat for several of the listed species that occur there. The City of San Marcos and Texas State University currently manage the impacts from developed land uses and public access at San Marcos Springs, Spring Lake, and the upper reaches of the San Marcos River. Therefore, the proposed RHCP would have little effect on the physical condition of these riparian areas. It is uncertain whether Fern Bank Springs would be included within the preserve system. However, any lawful development in the immediate vicinity of Fern Bank Springs would have to comply with the ESA, and given the critical habitat designations at this site, it is likely that the Service would require substantial protections for the springs.

Even if the physical spring localities are protected, the aquatic habitats used by the five karst aquatic additional species depend on a narrow range of water quality and spring flow parameters. As described above, the limited scale of the preserve system compared to the total area contributing to the quality and availability of water in the Edwards and Trinity aquifers would limit the water quality protection benefits of the RHCP preserve system. The RHCP would have no influence on water quality protections outside of Hays County and would have

no effect on groundwater pumping within Hays County or elsewhere across the Edwards and Trinity aquifers. Therefore, because the proposed RHCP does not seek to cover listed aquatic species and, thus, does not specifically address issues related to water quality or quantity, the proposed RHCP may only have negligible to minor beneficial impacts on the five additional species utilizing karst aquatic habitats, compared to the No Action alternative.

5.6.3.3 Additional Species Impacts – Alternative C (Moderate Preserve/Limited Take)

The Moderate Preserve/Limited Take alternative would have a negligible to minor beneficial effect on the 16 additional species, compared with the No Action alternative and with similar rationale as described for Alternative B. However, due to the more modest size of the anticipated preserve system under the Moderate Preserve/Limited Take alternative, the benefits to the additional species could be somewhat less than for the proposed RHCP.

5.6.3.4 Additional Species Impacts – Alternative D (Large-scale Preserve)

Compared to the No Action alternative, the Large-scale Preserve alternative would likely result in minor to moderate beneficial effects with regard to the 16 additional species.

While the 30,000-acre preserve system specified by this alternative would be designed to include some of the best habitats in Hays County for the covered species, the scale of the conservation effort would improve the chances that the preserve system included populations of the additional terrestrial plants and important riparian corridors, springs, and recharge features utilized by the aquatic additional species. The Large-scale preserve system could also provide more substantial benefits for to water quality through the preservation of open space in a variety of Hays County watersheds.

5.7 Other Special Status Species

Nine other species with ranges including Hays County are listed as threatened or endangered under the ESA or by the State of Texas. These species are the American peregrine falcon, Arctic peregrine falcon, bald eagle, whooping crane, zone-tailed hawk, Cagle's map turtle, Texas horned lizard, San Marcos gambusia, and the red wolf. Impacts to these other state or federally listed species would be considered significant if they were to result in one or more of the following:

- The existing primary threats to these other species would decrease (a beneficial impact) or increase (an adverse impact) to a substantial degree.
- The long-term, local Hays County population trends of any of these other species would decrease (an adverse impact) or increase (a beneficial impact) substantially.

The intensity of potential impacts to the other special status species is defined as follows:

Negligible: The existing primary threats to the other special status species would

not be affected or the change would be so small as to not be of any measurable or perceptible consequence to the population. Negligible effects for Federally protected species would equate with a "may effect, not likely to adversely affect" determination by the U.S. Fish and Wildlife Service under the ESA.

Minor: There would be a measurable effect on the existing primary threats to the other special status species, but the change would be small and relatively localized and would not affect the long-term population trends in the County. For Federally protected species, minor effect would equate with a "may effect, not likely to adversely affect" determination by the U.S. Fish and Wildlife Service under the ESA.

Moderate: A noticeable effect to the existing primary threats to the other special status species would occur. The effect would be of consequence to the long-term population trends in the County. For Federally protected species, moderate effect would equate with a "'may effect" determination by the U.S. Fish and Wildlife Service and would be accompanied by a statement of either "likely to adversely affect" the species.

Major: Noticeable effect on the existing primary threats to the other special status species with severe consequences or exceptional benefits to the long-term population trends in the County. For Federally listed species, major effect would equate with a "may affect, likely to adversely affect" or a jeopardy determination by the U.S. Fish and Wildlife Service under the ESA.

5.7.1 Other Special Status Species Impacts – Alternative A (No Action)

Under the No Action alternative, the existing threats to the nine other state or federally protected species described in Section 4.6.3 would be likely to increase over the next 30 years. The habitats for these species include terrestrial environments and aquatic environments. Anticipated human population growth in Hays County and the associated increases in land development activities would be expected to replace and/or encroach on a broad range of natural habitat types, including those used by these special status species.

The effects of the anticipated land use changes in Hays County over the next 30 years could increase the threats to one or more of these species, resulting in negligible to moderate adverse impacts to any Hays County populations. However, the significance of these impacts is not likely to rise to the level where they would affect the range-wide populations of these species.

Five of the special status species (i.e., the American peregrine falcon, Arctic peregrine falcon, bald eagle, whooping crane, and zone-tailed hawk) are potential migrants through Hays

County and would be most likely to utilize riverine or riparian corridors in the county. While some portion of these habitat types in Hays County may be lost to or degraded by developed land uses, any decline is unlikely to be sufficient to affect the migratory patterns of these species or survival of these species during migration. Therefore, only negligible impacts would likely be expected.

Two of the nine special status species (i.e., the Cagle's map turtle and San Marcos gambusia) are aquatic and utilize surface streams in Hays County. Future land use changes are probably not likely to affect the San Marcos gambusia, because this species may already be extinct. Nevertheless, if the species is still extant, increasing land development in Hays County under the No Action alternative could adversely affect the gambusia as described for the RHCP additional aquatic species in Section 5.6.3.1. Threats to Cagle's map turtle include collections for the pet industry, intentional killings, pesticides, and loss of riverine and shoreline habitat due to impoundments and other man-made disturbances within riparian corridors. Increasing human populations and associated land development in Hays County under the No Action alternative could increase the level of threat to the turtle and result in minor to moderate adverse effects to the species.

The Texas horned lizard and the red wolf utilize upland habitats. Future land use changes under the No Action alternative are not likely to affect the red wolf, because this species has been extirpated from Texas. The Texas horned lizard is threatened by loss of rangeland habitat to land development and by predation from red imported fire ants. Increasing human populations and associated land development in Hays County under the No Action alternative could increase the level of threat to the lizard and result in minor to moderate adverse effects to the species.

5.7.2 Other Special Status Species Impacts – Alternative B (Proposed Hays County RHCP)

The potential impacts to the other special status species associated with increasing human population and associated land development would be similar to the No Action alternative. Therefore, any impacts to the other special status species related to the proposed RHCP would be associated with the potential benefits of the conservation measures included in this alternative, when compared to the No Action alternative. The potential beneficial effects of the creation of an approximately 10,000 to 15,000-acre preserve system (with a focus on protecting habitats for the covered species) on the other special status species would likely be overall beneficial, but negligible, since many of these species have rarely been observed in Hays County and/or may be extirpated or extinct. However, overall minor beneficial impacts to the Texas horned lizard and Cagle's map turtle could be possible if the RHCP preserve system included some open rangeland occupied by the lizard or riparian habitat along the Blanco River corridor used by the turtle.

5.7.3 Other Special Status Species Impacts – Alternative C (Moderate Preserve/Limited Take)

Under the Moderate Preserve/Limited Take alternative, the potentially adverse effects of increasing human population and land development in Hays County would be similar to the No Action alternative. As for the proposed RHCP, the effects of the Moderate Preserve/Limited Take alternative could yield some benefits to the other special status species that would be associated with the establishment of the 3,000-acre preserve system. However, due to the moderate size of the preserve system and the focus on protecting habitat for the covered species, it is likely that any such overall benefits to the other special status species would be negligible compared to the No Action alternative.

5.7.4 Other Special Status Species Impacts – Alternative D (Large-scale Preserve System)

The Large-scale Preserve system would create a 30,000-acre preserve system in Hays County that would be designed to protect high quality habitats for the covered species. However, the size of the preserve system could yield some benefits to the other special status species through the permanent protection of large blocks of woodland and shrubland habitats, some of which could occur along riparian corridors that could be used by one or more of the other special status species as breeding habitat (as for the Cagle's map turtle) or as migratory habitat (as for the five birds). Some open rangeland vegetation might also be included within the preserve system that could protect habitat for the Texas horned lizard. Therefore, the Large-scale Preserve System alternative could result in overall negligible to minor beneficial impacts on one or more of the other special status species, compared to the No Action alternative.

5.8 Socioeconomic Resources

Impacts to socioeconomic resources would be considered significant if they were to result in one or more of the following:

- Economic growth, including employment and per capita income, would substantially increase (a beneficial impact) or substantially decrease (an adverse impact).
- County finances, measured as accrual of annual tax base, would substantially increase (a beneficial impact) or substantially decrease (an adverse impact).
- Time and money expended on individual development projects by landowners for ESA compliance would substantially decrease (a beneficial impact) or substantially decrease (an adverse impact).
- The amount of time expended by the Service in ESA compliance for projects in Hays County would substantially decrease (a beneficial impact) or substantially increase (an adverse impact).

The intensity of potential impacts to socioeconomic resources is defined as follows:

Negligible: No change in economic or government agency activities would occur or the magnitude of the change would not be measurable.

Minor: Changes in economic or government agency activities would be measurable, but would not alter the structure, composition, or function of socioeconomic resources in Hays County and would be limited in context.

Moderate: Changes in economic or government agency activities would be measurable and may somewhat influence the structure, composition, or function of socioeconomic resources in Hays County, but would be limited in context.

Major: Changes in economic or government agency activities would be measurable, would alter the structure, composition, or function of socioeconomic resources in Hays County and may be extensive in context.

5.8.1 Population, Employment, and Economic Trends

5.8.1.1 Impacts to Population, Employment, and Economic Trends – Alternative A (No Action)

Demographic and economic growth is projected to continue in the Austin area, including Hays County, for the foreseeable future. While population growth tends to follow the local economic cycle to some degree, the longer-term outlook is for the area to remain an attractive site for relocation. Other key factors that would help shape the course of the regional economy include the integration into a wider regional economy that includes the rapidly growing San Antonio area, expanding opportunities for higher education, and enhanced transportation infrastructure (both rail and highway).

Population

Population projections for Hays County were developed for the RHCP by TXP (an Austin-based economic analysis and public policy consulting firm) and Capital Market Research (CMR, an Austin-based market research firm specializing in real estate research, land development economics and market analysis) (TXP and CMR 2008). The projections were based on an analysis of historic and recent demographic and economic data (such as population, income, employment, and economic activity). The RHCP population estimate takes into account the most recently available population estimates for Hays County (July 2007), employment data (quarterly and annual information for 2007), migration rates, and information related to land development activity within Hays County.

Based on the TXP and CMR analysis, the population of Hays County is expected to increase from 97,589 in the year 2000 to an estimated 375,873 by the year 2040 (Table 5-1), which is a projected population increase of approximately 285 percent.

Table 5-1. Projected Population Estimates for Hays County and Census Tracts by Decade (TXP and CMR 2008).

Census Tract	Census 2000 Population	Projected 2040 Population	Estimated Percent Change (2000 - 2040)
Hays County	97,589	375,873	285%
CT 010100	1,908	3,799	99%
CT 010200	5,656	10,513	86%
CT 010301	10,176	22,600	122%
CT 010302	4,326	7,646	77%
CT 010400	4,343	18,691	330%
CT 010500	2,783	7,162	157%
CT 010600	7,904	18,689	136%
CT 010700	8,113	21,050	159%
CT 010801	12,908	66,295	414%
CT 010802	10,153	27,939	175%
CT 010901	6,609	15,872	140%
CT 010902	5,512	28,237	412%
CT 010903	8,643	52,076	503%
CT 010904	8,555	75,304	780%

TXP and CMR used historic census tract population estimates and recent household and land development information to allocate the population forecast among the 14 census tracts delineated in the county.

Household and land development information used to help allocate the Hays County population forecast among census tracts included a review of building permit data and septic tank permit data provided by the cities of Buda, Kyle, and San Marcos; the Hays County Health Department; and the Capital Metropolitan Planning Organization. TXP and CMR also compiled a survey of currently approved residential subdivision lots that are available for future development (including a tally of the number of undeveloped residential lots in subdivisions approved for development or those with continued or pending sales efforts). The data provided a record of residential construction in Hays County by census tract since the year 2000.

Several census tracts in Hays County are projected to increase in population faster than the overall growth rate for the county, including the census tracts corresponding to the southern tip of Hays County (Census Tract 10400), the Dripping Springs area (Census Tract 10801), and

the Kyle-Buda area (Census Tracts 10902, 10903, and 10904). The most extreme population growth is expected in Census Tract 10904, which is associated with the city of Kyle (Table 4-2).

Projected population growth in census tracts with potential habitat for the golden-cheeked warbler and black-capped vireo (i.e., Census Tracts 10600, 10700, 10801, 10802, 10901, 10902, and 10904) is approximately 324 percent, which is a gain of approximately 193,632 people between 2000 and 2040.

Employment and Economic Trends

Over the next 30 years, county-based employment in Hays County is expected to increase as a reflection of population growth, although not at a steady rate. As in the past, employment levels are likely to fluctuate with periods of economic upturn and downturn. Long term projections are highly speculative and vary greatly. Employment forecasts adopted in 2005 by the Capital Area Metropolitan Planning Organization (CAMPO) suggest that employment in Hays County could increase from approximately 35,000 jobs in 2000 to approximately 126,000 jobs in 2030, which would represent an increase of approximately 260 percent or an average annual growth rate of approximately 4.4 percent (CAMPO 2005). At that rate of growth, the number of jobs in Hays County could reach approximately 184,000 by 2039 (the last year of the proposed permit term).

While per capita income has fluctuated in recent years, between 1996 and 2006 per capita income in Hays County increased by 49 percent or an average annual growth rate of approximately 4 percent. At that rate, the per capita income in Hays County could reach approximately $102,000 by 2039.

The current economic forecasts for Hays County and the region currently predict increases in employment and other economic indicators without the availability of a regional HCP alternative for ESA compliance. Therefore, the No Action alternative would be expected to have only negligible beneficial or adverse effects on employment and economic trends.

5.8.1.2 Impacts to Population, Employment, and Economic Trends – Alternative B (Proposed Hays County RHCP)

Under the proposed RHCP, population and economic growth (including employment and per capita income) is expected to continue in Hays County in a pattern similar to that of the No Action alternative. Population growth trends would follow the local economic cycle, and the longer term outlook for the area is that it would remain an attractive site for relocation. For those businesses requiring incidental take permits for construction and/or operation of new facilities in Hays County, the availability of a regional HCP that would streamline ESA compliance could be a positive factor in site selection for individual projects (see Section 4.1). However, this potential beneficial effect cannot be quantified at this time. Over the 30 year duration of the RHCP, the potential benefits of a streamlined ESA compliance option on population, employment, and economic trends in Hays County are likely to be negligible

compared to the effects of other regional economic drivers described for the No Action alternative.

5.8.1.3 Impacts to Population, Employment, and Economic Trends – Alternative C (Moderate Preserve/Limited Take)

The effects of the Moderate Preserve/Limited Take alternative on Hays County population, employment, and economic trends would be similar to those described for the No Action alternative. The Moderate Preserve/Limited Take alternative would provide a regional HCP that might be seen as a potential benefit for those businesses requiring incidental take permits for construction and/or operation of new facilities in Hays County. However, the scope of this potential benefit would be limited by the relatively modest amount of incidental take authorized by this alternative. In either case, the potential beneficial effect on population and other economic indicators cannot be quantified at this time and is likely to be small compared to other regional economic and social factors driving socioeconomic trends in Hays County.

5.8.1.4 Impacts to Population, Employment, and Economic Trends s – Alternative D (Large-scale Preserve System)

Even with the very high incidental take authorization included in the Large-scale Preserve System alternative (the plan could cover requested take authorizations for all participants during the term of the permit for areas outside of the pre-determined preserve system), the overall Hays County population, employment, and economic trends would be similar to those described for the No Action alternative since alternative ESA compliance options already exist (see Section 4.1). This alternative would provide a regional HCP that might be seen as a potential benefit for those businesses requiring incidental take permits for construction and/or operation of new facilities in Hays County. However, the potential beneficial effect on population and other economic indicators cannot be quantified at this time and is likely to be small compared to other regional economic and social factors driving socioeconomic trends in Hays County. Therefore, the overall impact on population and other local and regional economic indicators is likely to be negligible, compared to the No Action alternative.

5.8.2 Land Use and Housing Trends

5.8.2.1 Impacts to Land Use and Housing Trends – Alternative A (No Action)

Current land use trends, which would be expected to continue under the No Action alternative, are described in Section 4.7.3. These trends suggest a continued loss of forested land as it is converted to other uses, including urban development.

Under the No Action alternative, there would be an increase in the number of large master-planned communities and commercial developments expected over the next 30 years in response to the rapidly increasing human population. Assuming that the average household size remains constant, anticipated population increases could lead to the addition of approximately

68,000 new households to the portion of Hays County west of Interstate Highway 35 (i.e., the area of the county containing potential habitat for the covered species) over the next 30 years. The average value of a single family residence is expected to continue to rise in conjunction with overall Austin-Round Rock MSA economic activity and could double in value from approximately $135,700 in 2007 to approximately $271,400 in 2039.

The current projections for land use and housing trends in Hays County currently predict increases in urban development and housing prices without the availability of a regional HCP alternative for ESA compliance. Therefore, the No Action alternative would be expected to have only negligible impacts on land use and housing trends.

5.8.2.2 Impacts to Land Use and Housing Trends – Alternative B (Proposed Hays County RHCP)

Under the proposed RHCP, land use and housing trends would be expected to continue as described for the No Action alternative. However, the completion of participating housing or land development projects could occur faster under the proposed RHCP than would be possible under the No Action alternative. Streamlined ESA compliance could reduce the amount of permitting time needed to comply with the ESA from one or two years to a few weeks. Although, ESA permitting is only one part of the development process and it is uncertain how much of an impact streamlined compliance could have on the overall schedule of an individual project. Substantially reducing the time associated with ESA compliance for individual participating projects would not likely have a significant impact on permitting requirements through other agencies or jurisdictions. Further, potential time savings for completion of individual projects due to streamlined ESA compliance (even if individual participating projects were to be completed a year or two faster than would otherwise be possible with an individual authorization from the Service) would not be likely to substantially influence overall trends in housing or land development during the 30-year term of the permit.

Therefore, the proposed RHCP would likely have only minor beneficial impacts on housing and construction trends, compared to the No Action alternative. Potential impacts to housing prices in Hays County would likely be negligible under the proposed RHCP, compared to the No Action alternative, since the average value of a single-family residence in Hays County is expected to continue to rise in conjunction with overall Austin-Round Rock MSA economic activity.

5.8.2.3 Impacts to Land Use and Housing Trends – Alternative C (Moderate Preserve/Limited Take)

Land use and housing trends under the Moderate Preserve/Limited Take alternative would be expected to continue as described for the No Action alternative. For the limited number of development projects that would participate in this regional HCP, completion of these projects could occur faster than would be possible under the No Action alternative. Although, as described above, reducing the time associated with ESA compliance for the limited

number of participating projects would not likely have a significant impact on permitting requirements through other agencies or jurisdictions. Further, the relatively small number of participating projects would also moderate the potential beneficial impacts to the land development community. Therefore, this alternative would likely have only minor beneficial impacts on housing and construction trends, compared to the No Action alternative. Potential impacts to housing prices in Hays County would likely be negligible under the Moderate Preserve/Limited Take alternative, compared to the No Action alternative, since the average value of a single-family residence in Hays County is expected to continue to rise in conjunction with overall Austin-Round Rock MSA economic activity.

5.8.2.4 Impacts to Land Use and Housing Trends – Alternative D (Large-scale Preserve System)

Land use and housing trends under the Large-scale Preserve alternative would largely be expected to continue as described for the No Action alternative. For projects seeking incidental take authorization through this regional HCP, completion could occur faster than would be possible under the No Action alternative. However, substantially reducing the time associated with ESA compliance for the limited number of participating projects would not likely have a significant impact on permitting requirements through other agencies or jurisdictions. Therefore, this alternative would likely have only minor beneficial impacts on housing and construction trends, compared to the No Action alternative. Potential impacts to housing prices in Hays County would likely be negligible under the Large-scale Preserve alternative, compared to the No Action alternative, since the average value of a single-family residence in Hays County is expected to continue to rise in conjunction with overall Austin-Round Rock MSA economic activity.

5.8.3 Hays County Finances

5.8.3.1 Impacts to Hays County Finances – Alternative A (No Action)

County finances are primarily influenced by the assessed value of taxable property in the county (i.e., the County's tax base). The County's tax base in 2008 (i.e., the total appraised value of property and improvements in the county) was approximately $10.1 billion. Under the No Action alternative, if the tax base growth continues in a pattern similar to the past (including appreciation in the 2008 tax base and new value from residential and commercial development), the tax base for the county could reach approximately $55.5 billion by 2039 (see Appendix F of the Hays County RHCP).

Under the No Action alternative, the County would disburse funds from the recently passed 2008 Road Bond initiative to construct, improve, and expand various County roads. County road improvement efforts could result in take of the covered species and, thus, the need for individual incidental take permits or Section 7 ESA consultations for some of the proposed projects identified in the 2008 Road Bond, including improvements to Farm-to-Market Road

2325 near Wimberley, Ranch Road 1626 near Buda, and Ranch Road 12 between Wimberley and San Marcos. Therefore, Hays County would likely need to expend funds for ESA compliance for the golden-cheeked warbler and black-capped vireo related to the completion of these (and potentially other) road improvement projects. While Hays County could use the remaining 2006 Parks and Open Space bonds to acquire property with habitat for the golden-cheeked warbler and black-capped vireo, it is likely that the 2006 Parks and Open Space bond funds would be expended prior to initiation of the road improvement projects and would, therefore, be unavailable to mitigate for endangered species impacts from these projects. Under the No Action alternative, the County would need to find additional funding for ESA compliance on a case-by-case basis. The need to find additional funding for ESA compliance to support County-sponsored projects would likely create a minor adverse impact on Hays County finances under the No Action alternative.

5.8.3.2 Impacts to Hays County Finances – Alternative B (Proposed Hays County RHCP)

Implementation of the proposed RHCP would include the acquisition of preserve land, ongoing management and monitoring of the preserve system, administration of the participation process, and implementation of research and outreach programs. Funding to implement the proposed RHCP would come from at least two sources: participation fees based on impacts to potential habitat for the covered species and the County's general operations and maintenance fund. In addition, the funding plan for the proposed RHCP assumes that the County will dedicate approximately $5 million from the 2006 Parks and Open Space bond funds to acquire several hundred acres of preserve land with potential habitat for the covered species prior to the start of the RHCP.

The funding plan presented in Section 8 of the proposed RHCP shows that the costs to implement the RHCP in Year 1 of the Plan could be approximately $2,515,262. These implementation costs could rise to approximately $4,124,675 by Year 10, approximately $6,920,738 by Year 20, and approximately $10,380,202 by Year 30. The total estimated cost to implement the RHCP, as illustrated by the RHCP funding plan, could be approximately $182.6 million over 30 years.

The cost of RHCP implementation would be offset by the collection of participation fees from other public or private RHCP participants on the basis of impacts to potential habitat for the covered species. The County would also contribute approximately $5 million from the 2006 Parks and Open Space bond to acquiring RHCP preserve land. Based on the land development and participation projections presented in the RHCP, participation fees could generate approximately $98.4 million in revenue to support the RHCP. These participation fees could represent approximately 54 percent of the revenue needed to implement the RHCP. The remaining RHCP operating budget is expected to come from the County's general fund (i.e., approximately $79.2 million over 30 years).

Under the proposed RHCP, Hays County finances and services would be affected in several ways.

Existing Bond Funds

To initiate the rolling conservation bank, the County would use approximately $5 million from the remaining 2006 Parks and Open Space bond funds to purchase several hundred acres of preserve land with high quality habitat for the golden-cheeked warbler and black-capped vireo prior to RHCP approval and issuance of the incidental take permit. This preserve land would be protected and managed in accordance with the provisions of the RHCP. While this preserve land would contribute to the acquisition of general open space and habitat for endangered species, using the 2006 Parks and Open Space bond funds may or may not contribute substantially to the other identified objectives for the use of these funds, including protecting recharge land for the aquifers and providing public access to major waterways. Therefore, the use of these funds for acquiring land for the RHCP could preclude the acquisition of other types of parks and public recreation facilities in Hays County; although there may be opportunities to satisfy multiple open space objectives.

However, use of a portion of the 2006 Parks and Open Space bond funds to initiate the RHCP conservation bank could prevent the County from needing to use the 2008 road bond funds for ESA compliance associated with individual projects. It is also likely that completion of any ESA authorizations for road projects funded by the 2008 bond package through the proposed RHCP would be more cost effective (in terms of time and money) than for the No Action alternative.

The proposed RHCP would likely have a negligible to minor beneficial effect on the use of voter-approved bond funds compared to the No Action alternative, since use of the 2006 Parks and Open Space bonds for the RHCP preserve system is compatible with the objectives for this program and the ESA compliance costs associated with road projects funded by the 2008 road improvement bonds are likely to be reduced.

General Maintenance and Operations Funds

Implementation of the proposed RHCP would require the County to commit to the long-term funding of the Plan. The ESA requires that an applicant for an incidental take permit ensure that adequate funding would be available to implement the HCP. To meet this requirement, Hays County has approved the RHCP funding plan as described in Section 8 of the RHCP. Included in the funding plan is the commitment that every year during the 30-year term of the permit the County would evaluate the financial plan to ensure adequate funding to meet the goals and objectives of the RHCP. While the County may opt out of the RHCP at some point in the future, any mitigation requirements for take that has already occurred must be continued in perpetuity.

The funding plan described in the proposed RHCP would provide for the implementation of the conservation program, including the acquisition, management, and monitoring of preserves, and the implementation of other research and public outreach programs described in the conservation program. So long as the County is otherwise meeting its financial obligations under the Plan, the disposition of its financial resources remains within the sole and exclusive purview of the Commissioners' Court.

The funding plan for the proposed RHCP would annually divert up to approximately 10 percent of the property tax revenues generated by new development in Hays County after permit issuance to the RHCP for land acquisition, preserve management and monitoring, and program administration. Alternatively, this contribution would represent approximately 3 percent of the cumulative general fund revenues collected between 2010 and 2039. Since no new taxes are proposed, the diversion of these funds to the RHCP could happen at the expense of other County services and programs.

While implementation of the RHCP could divert approximately $79.2 million in general fund revenue over the 30-year life of the Plan, the impact of this diversion would be moderated by potential gains to the County tax base associated with potentially accelerated additions to the tax base from participating projects reaching completion sooner than would be possible with individual ESA authorizations and the potential for higher real estate values for properties adjacent to RHCP preserves. Therefore, the use of general operations and maintenance funds for the RHCP could have an overall minor adverse impact on County finances.

Tax Base

The time savings for permitting incidental take of the covered species through the proposed RHCP would likely result in the participating projects entering the County's tax base at residential and commercial land tax rates one to two years sooner than under the No Action alternative. The accelerated addition of value to the tax base would likely result in a minor beneficial impact on County finances; however the exact amount of this benefit is impossible to calculate due to the long-term uncertainties in the local economy.

In addition, the creation of large tracts of preserve land under the proposed RHCP would likely increase the value of adjacent property (i.e., the "proximate principle"), which would further benefit the County. It has been demonstrated in other locations that proximity to greenbelts, parks, and preserves commonly has a positive effect on the values of adjacent residential property. In one study, it was found that properties adjacent to a greenbelt were appraised at over 30 percent higher than properties that were 3,200 feet or more away from the greenbelt (Correll et al. 1978). In Dallas, homes facing parkland were found to be worth 22 percent more than homes that were more than one-half mile from such an amenity (Miller 2001). In Austin, property adjoining the Barton Creek Greenbelt was eight to 12 percent higher in value than comparable property not adjacent to the greenbelt (Nicholls 2002).

Since implementation of the RHCP is expected to increase ESA compliance and result in more conservation for the covered species than would be expected under the No Action alternative (i.e., the permanent protection of more preserve land), potential benefits to the County's tax base due to the proximate principle would likely be greater under this alternative than under the No Action alternative. Therefore, the proposed RHCP could have a minor positive impact on the County's tax base.

5.8.3.3 Impacts to Hays County Finances – Alternative C (Moderate Preserve/Limited Take)

Implementation of the Moderate Preserve/Limited Take alternative would include the acquisition of preserve land (i.e., 3,000 acres within the first four years of the plan), ongoing management and monitoring of the preserve system, administration of the participation process, and implementation of research and outreach programs. It is likely that funding to implement the regional HCP under this alternative would come from at least three sources: bonds or other debt financing to fund the upfront preserve acquisitions, participation fees based on impacts to potential habitat for the covered species, and the County's general operations and maintenance fund.

Land acquisitions for the preserve system could cost approximately $24 million within the first four years of the plan, given the same assumptions regarding per acre land costs and mix of fee simple and conservation easement acquisitions used for the proposed RHCP alternative. To achieve these early land acquisitions, which would be necessary under state law, the County would need to issue bonds or use other types of debt financing. Repaying the principal and interest on this debt would add additional cost to the budget for this plan. Assuming a repayment term of 20 years and an annual interest rate of 5.5 percent, the total cost to repay approximately $24 million in debt could be approximately $40 million.

After the initial four years of the plan, most of the costs associated with plan implementation would be associated with the ongoing management and monitoring of the preserve system and other administrative tasks associated with managing participation and implementation of associated research and public outreach programs (similar to that described for the proposed RHCP). Since the total size of the preserve system and the amount of participation in the plan is expected to be much smaller under the Moderate Preserve/Limited Take alternative than the proposed RHCP, the costs associated with these tasks would also be less. While a detailed budget for implementation of the Moderate Preserve/Limited Take alternative has not been completed, it is anticipated that the ongoing preserve management and monitoring costs and other administrative costs would be approximately one-quarter of those estimated for the proposed RHCP, based on the relative sizes of the preserve systems for these alternatives. Therefore, the County could expect to spend approximately $38 million over the next 30 years on plan costs not associated with land acquisitions.

The cost of plan implementation (which could total approximately $78 million over 30 years) would be partially offset by the collection of participation fees from other public or

private RHCP participants on the basis of impacts to potential habitat for the covered species. However, due to the limited amount of take authorization under this alternative, the amount of revenue generated from the sale of mitigation credits (estimated at approximately 3,600 credits) would also be limited. Based on the annual projections of mitigation credit need presented in Appendix E of the RHCP, participation fees under the Moderate Preserve/Limited Take alternative could generate approximately $38 million in revenue to support the RHCP.

Because participation fees could not fully fund ongoing preserve management and monitoring and other plan administration over the 30 years of the program (i.e., participation fee revenue would only be available for the first 10 to 15 years of the plan, at which point no more credits would be available for sale), the County would need to use revenue from its general operations and maintenance fund to repay the land acquisition debt and cover any cost contingencies.

Under this alternative, Hays County finances and services could be affected in several ways.

Existing Bond Funds

The Moderate Preserve/Limited Take alternative does not require an advance acquisition of preserve land to jump-start a conservation bank, since this alternative includes a defined commitment of preserve lands within a short period of time. Therefore, this alternative would have negligible impacts on the use of the remaining 2006 Parks and Open Space bond funds, unless the Count opted to use these funds for the plan.

As for the proposed RHCP, the effect of the Moderate Preserve/Limited Take alternative on the use of the 2008 road improvement bonds would likely be beneficial, since the costs of ESA compliance associated with projects funded by these bonds would be reduced with the availability of a regional HCP.

General Operations and Maintenance Funds

As for the proposed RHCP, implementation of the Moderate Preserve/Limited Take alternative would require the County to commit to the long-term funding of the conservation program. Under this alternative, the County would use general fund revenues primarily to repay the debt associated with the preserve acquisitions in the first four years of the RHCP. Assuming a repayment term of 20 years and an interest rate of 5.5 percent, the amount needed to meet this obligation could be more than $40 million over 30 years. This amount would represent approximately 1.5 percent of the cumulative general fund revenues estimated under the No Action alternative between 2010 and 2039. The County would also need to use general fund revenue if participation fees did not generate sufficient funds in any given year to meet annual management, monitoring, and administrative needs. Since no new taxes are proposed, the diversion of these funds to the plan could happen at the expense of other County services and programs.

Compared to the No Action alternative, the implementation of the Moderate Preserve/Limited Take alternative would likely have a minor adverse impact on County finances since the County would need to use a portion of its general funds to repay the debt needed to purchase the preserve system and no new taxes are proposed.

Tax Base

Potential impacts of the Moderate Preserve/Limited Take alternative on the County's tax base would be similar to those described for the proposed RHCP (i.e., a minor beneficial impact compared to the No Action alternative). However, any benefits would likely be less significant for this alternative than for the proposed RHCP since the overall size of the preserve system would be less and would lead to fewer opportunities for adjacent properties to experience value increases due to the proximate principle.

5.8.3.4 Impacts to Hays County Finances – Alternative D (Large-scale Preserve System)

Implementation of the Large-scale Preserve System alternative would include the acquisition of preserve land (i.e., 30,000 acres within the first four years of the plan), ongoing management and monitoring of the preserve system, administration of the participation process, and implementation of research and outreach programs. Funding to implement this alternative would come from at least three sources: bonds or other debt financing to fund the upfront preserve acquisitions, participation fees based on impacts to potential habitat for the covered species, and the County's general maintenance and operations fund.

Land acquisition for the preserve system could cost approximately $243 million within the first four years of the plan, given the same assumptions regarding per acre land costs and mix of fee simple and conservation easement acquisitions used for the proposed RHCP. To achieve these early land acquisitions, which would be necessary under state law, the County would need to issue bonds or use other types of debt financing. Repaying the principal and interest on this debt would add additional cost to the budget for this plan. Assuming a repayment term of 20 years and an annual interest rate of 5.5 percent, the total cost to repay approximately $243 million in debt could be approximately $408 million.

After the initial four years of the plan, most of the costs associated with plan implementation would be associated with the ongoing management and monitoring of the preserve system and other administrative tasks associated with managing participation and implementation of associated research and public outreach programs (similar to that described for the proposed RHCP). Since the total size of the preserve system is expected to be much larger under the Large-scale Preserve System alternative than the proposed RHCP, the costs associated with these tasks would also be more. While a detailed budget for implementation of the Large-scale Preserve System alternative has not been completed, it is anticipated that the ongoing preserve management and monitoring costs and other administrative costs would be approximately 2.6 times larger than those estimated for this alternative, based on the relative

sizes of the preserve systems for these alternatives. Therefore, the County could expect to spend approximately $98 million over the next 30 years on plan costs not associated with land acquisitions.

The cost of plan implementation (which could total approximately $506 million over 30 years) would be partially offset by the collection of participation fees from other public or private RHCP participants on the basis of impacts to potential habitat for the covered species. However, due to the amount of participation anticipated under this alternative, the amount of revenue generated from the sale of mitigation credits could be limited. Assuming that participation in the Large-scale Preserve System alternative is similar to participation rates estimated for the proposed RHCP, approximately 10,300 mitigation credits would be sold to participants. Accordingly, the amount of revenue generated from participation fees under the Large-scale Preserve System alternative would be similar to the revenue generated by participation fees under the proposed RHCP (i.e., approximately $98.4 million over 30 years).

Since participation fees would only partially fund the costs of implementing the Large-scale Preserve System alternative (i.e., participation fees would cover approximately 19 percent of the total costs), the County would need to use revenue from its general operations and maintenance fund to repay the land acquisition debt and cover any cost contingencies.

Under the Large-scale Preserve System alternative, Hays County finances and services would be affected in several ways.

Existing Bond Funds

The Large-scale Preserve System alternative does not require an advance acquisition of preserve land to jump-start a conservation bank, since this alternative includes a defined commitment of previously identified preserve lands within a short period of time (i.e., as specified by Chapter 83 of the Texas Parks and Wildlife Code, four years after the issuance of the federal permit or six years after the initial application for the permit, whichever is later). Therefore, this alternative would have negligible impacts on the use of the remaining 2006 Parks and Open Space bond funds, unless the County opted to use these funds for the plan.

As for the proposed RHCP, the effect of the Large-scale Preserve System alternative on the use of the 2008 road improvement bonds would likely be beneficial, since the costs of ESA compliance associated with projects funded by these bonds would be reduced with the availability of a regional HCP.

General Operations and Maintenance Funds

As for the proposed RHCP, implementation of the Large-scale Preserve System alternative would require the County to commit to the long-term funding of the conservation program. Under this alternative, the County would use general fund revenues to repay the debt associated with the preserve acquisitions in the first four years of the RHCP and to cover any

other implementation costs not covered by participation fee revenue. The amount needed to meet this obligation could be more than $401 million over 30 years. This amount would represent approximately 15 percent of the anticipated cumulative value of the general fund under the No Action alternative between 2010 and 2039. Since no new taxes are proposed, the diversion of these funds to the plan would happen at the expense of other County services and programs.

Compared to the No Action alternative, the implementation of the Large-scale Preserve System alternative would likely have a moderate adverse impact on County finances since the County would need to use a relatively large portion of its general funds to fund the implementation of the plan.

Tax Base

Potential impacts of the Large-scale Preserve System alternative on the County's tax base would be similar to those described for the proposed RHCP (i.e., a minor beneficial impact compared to the No Action alternative). However, any benefits would likely be somewhat more significant for this alternative than for the proposed RHCP since the overall size of the preserve system would be greater and would lead to more opportunities for adjacent properties to experience value increases due to the proximate principle.

5.8.4 Endangered Species Act Compliance Burden

5.8.4.1 ESA Compliance Burden Impacts – Alternative A (No Action)

Under the No Action alternative, the number of ESA authorizations between landowners and the Service is expected to increase in conjunction with anticipated increases in human population and land development. Despite the low ESA compliance record in Hays County to date, the Service expects to conduct more compliance actions in the future due to increasing awareness of endangered species issues across central Texas.

It is not uncommon for individual ESA authorizations to require two years or more to complete. As reported in the Williamson County Regional Habitat Conservation Plan Final Environmental Impact Statement, the Service anticipates expending an estimated 0.25 to 0.5 of a full-time employee equivalent (FTE) for each ESA consultation per year. For an estimated 90 individual authorizations (i.e., three Section 10 permits or Section 7consultations per year for 30 years), the Service would expend the equivalent of one to two full-time staff positions for the next 30 years engaged only in negotiating and processing ESA authorizations for projects in Hays County. Project uncertainty and potential project delays would continue to occur for those projects requiring actions on behalf of the Service related to the ESA.

ESA compliance costs for project proponents in Hays County (including project delays, consultation fees, and mitigation costs) cannot be calculated due to a lack of information on the specifics of each future project, including location, species affected, amount of habitat affected,

future interest rates, debt service needs, and lack of information on the specifics of each project affected. However, the cumulative costs to landowners and project proponents related to ESA compliance under the No Action alternative could be substantial, resulting in an overall moderate adverse impact.

5.8.4.2 ESA Compliance Burden Impacts – Alternative B (Proposed Hays County RHCP)

Compared to the No Action alternative, the proposed RHCP would have a beneficial impact on a landowner's or project proponent's ESA compliance burden and the Service's ESA consultation burden. The proposed RHCP could reduce the amount of time needed to obtain incidental take authorization for the covered species by up to two years.

Following historical patterns of individual consultations between project proponents and the Service, it is expected that up to 20 percent of the 90 anticipated individual ESA consultations over the next 30 years would be avoided by participation in the proposed RHCP. Participation in the RHCP would reduce the amount of staff time the Service would need to dedicate to ESA consultations in Hays County, which would be a moderate beneficial impact for the Service.

For project proponents, participation in the proposed RHCP would also reduce the uncertainty regarding permit processing times and mitigation obligations. The cost savings to project proponents in Hays County can not be precisely determined due to a lack of information regarding project specifics such as project location, species affected, habitat impacted, future interest rates, debt service needs, and similar information. However, substantial time and cost savings would be expected for participants in the proposed RHCP and would likely represent a moderate beneficial impact.

5.8.4.3 ESA Compliance Burden Impacts – Alternative C (Moderate Preserve/Limited Take)

As for the proposed RHCP, the Moderate Preserve/Limited Take alternative would reduce the amount of time project proponents and the Service would need to spend applying for and processing individual ESA authorizations. The amount of time saved could be up to two years for regional HCP participants and would be a beneficial effect for project proponents and the Service, compared to the No Action alternative.

However, fewer projects would be able to participate in the regional HPC, due to the relatively small amount of take authorization allowed under this alternative. Therefore, the potential cumulative benefits to project proponents and the Service over the 30-year term of the permit would be less than for the proposed RHCP. The Moderate Preserve/Limited Take alternative would only be expected to have a minor beneficial effect on easing the ESA compliance burden in Hays County.

5.8.4.4 ESA Compliance Burden Impacts – Alternative D (Large-scale Preserve System)

The effects of the Large-scale Preserve System alternative on project proponents' and the Service's ESA compliance burden would be similar to that described for the proposed RHCP (Alternative B), since the plan would be designed to cover all of the anticipated need for participation. Therefore, the Large-scale Preserve System alternative would result in a moderately beneficial impact for the Service and individual project proponents in Hays County.

5.9 Cumulative Impacts

A cumulative effect is the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such actions (40 CFR 1508.7). Cumulative impacts can result from individually minor but collectively noteworthy actions taking place over a period of time. "Reasonably foreseeable future actions" are defined as actions that are not speculative. They have been approved, are included in short- to medium-term planning and budget documents prepared by government agencies or other entities, or are based on likely trends. Cumulative impacts can result from individually minor, but collectively noteworthy actions taking place over a period of time.

5.9.1 Water Resources, Vegetation, and General Wildlife

5.9.1.1 Water Resources

Chapter 307.1 of the Texas Administrative Code addresses surface water quality standards for the State. This chapter states that it is the policy of the State "to maintain the quality of water in the state consistent with public health and enjoyment, propagation and protection of terrestrial and aquatic life, operation of existing industries, and economic development of the state."

The TCEQ (formerly known as the Texas Natural Resource Conservation Commission) regularly monitors and assesses the extent to which the State's waters provide for healthy aquatic communities, water-based recreation, and safe public water supplies as part of its Texas Water Quality Inventory. The State's surface water quality standards define the goals for a body of water with respect to five general use categories for which the water body should be suitable. The five use categories are: Aquatic Life (standards that are designed to protect plant and animal species that live in and around water), Contact Recreation (standards designed to ensure that water is safe for swimming or other water sports that involve direct contact with water), Public Water Supply (standards that indicate whether water from a lake or river is suitable for use as a source for a public water supply system), Fish Consumption (standards designed to protect people from eating fish or shellfish that may be contaminated), and General Uses (standards pertaining to other basic uses such as navigation, agricultural water supply, industrial water supply, and aesthetic considerations).

For stream segments crossing Hays County that were addressed in the 2000 Texas Water Quality Inventory, one or more of the uses of surface water resources were not fully supported for six of the County's ten monitored stream segments. Water quality concerns for these impaired streams included depressed dissolved oxygen levels, elevated fecal coliform densities, elevated average sulfate levels, elevated concentrations of dissolved solids, and/or elevated nitrate levels (Texas Natural Resource Conservation Commission 2002).

The 2008 Texas Water Quality Inventory identifies only one impaired stream segment crossing Hays County that did not fully support one or more of the general use categories (although three streams were identified as "of concern" for approaching non-attainment in some criteria or for approaching additional screening levels for these criteria) (TCEQ 2008a).

TCEQ administers a number of water quality monitoring and assessment, permitting, and planning programs in coordination with other agencies, organizations, and local stakeholder groups to protect and improve the quality of the State's waters. The TCEQ reports that its pace and progress in addressing water quality impairments documented on the State's 303(d) list has risen sharply since 2000 (TCEQ 2006).

With respect to groundwater resources, Section 26.401 of the Texas Water Code establishes the State's groundwater protection policy which sets a goal of non-degradation of groundwater resources for all State groundwater quality programs. This policy provides that groundwater quality should be restored if feasible. Overall, the approach strives to protect groundwater resources for their highest quality use related to human health and the environment. Several State agencies are responsible for regulating groundwater, including the TCEQ and the Texas Water Development Board, among others. The Texas Groundwater Protection Committee was established by the State legislature in 1989 to bridge the gap between existing State groundwater programs and optimize water quality protection by increasing cooperation among these different State agencies (TCEQ 2008b).

The Texas Groundwater Protection Committee actively identifies opportunities to improve existing groundwater quality protection programs and strives to improve or identify areas where new or existing programs could be enhanced to provide additional protection (TCEQ 2008b). At the local level, four Groundwater Conservation Districts, which are local units of government charged with the management and protection of groundwater resources, cover portions of Hays County (i.e., Hays Trinity Groundwater Conservation District, Edwards Aquifer Authority, Barton Springs Edwards Aquifer Conservation District, and Plum Creek Conservation District). Groundwater Conservation Districts are required to develop groundwater management plans.

Cumulative impacts on water resources within the area of potential effect would result from the rapidly increasing human population, increased development, and changes in land use.

New development will likely encroach onto aquifer recharge zones and could increase the potential for contamination of water quality or recharge damage. In addition, development

activities in other Texas counties could also impact water resources within Hays County. For the No Action alternative, the continuation of land development trends has the potential of reducing or degrading available water supplies in Hays County and contributing to adverse cumulative impacts on the available water supply for humans, wildlife, and vegetation.

The implementation of a regional HCP would have the potential to create an overall cumulative, beneficial effect on water quality and quantity in Hays County and elsewhere across the region. The implementation of a regional HCP would be expected to increase compliance with the ESA and result in more conservation actions for the covered species, primarily via the protection of large blocks of native vegetation communities. In addition, these conservation actions would be more systematic than would individual, project-specific mitigation efforts for the covered species under the No Action alternative. The scale of these beneficial cumulative impacts would vary between negligible (for the Moderate Preserve/Limited Take alternative) to minor (as for the proposed RHCP or the Large-scale Preserve System alternative).

5.9.1.2 Vegetation

The impacts of prior land use activities in Hays County on vegetation communities are described in Table 4-2 (see Section 4.4). Between 1992 and 2001, the U.S. Geological Survey estimates that approximately 31,111 acres of forest cover were lost during that period. Much of this forest cover was converted to grassland or shrub vegetation (approximately 24,488 acres of these vegetation communities were created between 1992 and 2001). However, approximately 4,423 acres of new urban cover was also created during this time period, which represents a loss of undeveloped vegetation communities.

As described in Section 5.3 of the RHCP, approximately 24,500 acres of land development association with ongoing residential construction in currently platted subdivisions, new projects that are currently undergoing the subdivision approval process, and a number of road improvement projects are reasonably certain to occur in the coming years. This development would be expected to increase the amount of urban land cover in the county and decrease the amount of undeveloped vegetation communities (particularly forest cover and grassland or shrub cover). However, a detailed projection of any such land cover changes is not possible.

As for water resources, cumulative impacts to vegetation communities within the area of potential effect would result from the rapidly increasing human population, increased development, and changes in land use. The current composition, distribution, and extent of the various vegetation communities in Hays County are the result of past and present land development patterns, recreational and agricultural land uses, water availability, and climatic events (such as droughts and floods). As described in previous sections, all four alternatives evaluated in this EIS would result in moderate adverse impacts on vegetation (compared to current conditions) as land development trends would continue as described for the No Action alternative. However, compared to the No Action alternative, each of the action alternatives

would have a somewhat positive impact on regional vegetation patterns as large blocks of mitigation lands within Hays County would be acquired and managed in perpetuity as habitat for the endangered golden-cheeked warbler and black-capped black-capped vireo. Thus, the incremental impacts of each of these action alternatives would slightly offset the adverse cumulative impacts on vegetation from other regional impacts.

5.9.1.3 General Wildlife

Directly related to vegetation and water resources, wildlife populations in Hays County are also anticipated to be moderately adversely impacted as a result of the prior loss of undeveloped vegetation communities between 1992 and 2001 (see Section 5.9.1.3), the anticipated conversion of additional undeveloped vegetation to urban land cover associated with approximately 24,500 acres of ongoing or currently planned/approved development projects in Hays County, and the potential 48,095 acres of projected future land development within Hays County.

The 2005 Texas Wildlife Action Plan (formerly known as the Texas Comprehensive Wildlife Conservation Strategy) developed by TPWD identifies threats to the State's wildlife resources associated with changing demands on land resources (such as land development and fragmentation that threaten the viability of natural habitats and the sustainability of wildlife populations), introduced species (non-native plants and animals that displace native species and threaten habitat integrity for native wildlife), noxious brush and invasive plants (excessive quantities of even native plants can reduce the quality of wildlife habitat), overgrazing and fire suppression (improper application of these management tools or uses have contributed to a drastic alteration of the historic landscape), and limited understanding of complex natural systems (lack of reliable knowledge about the function of natural systems can lead to inappropriate conservation or management decisions) (TPWD 2005).

The 2005 Texas Wildlife Action Plan considers the ecoregions occurring in Hays County to be relatively high priorities for management and conservation efforts. The Blackland Prairie ecoregion is considered a high priority due largely to the drastic reduction of native prairie since European settlement and associated declines in prairie species. The Edwards Plateau ecoregion is considered a secondary priority highlighted by the high degree of biodiversity and endemism that occurs in this region (TPWD 2005). TPWD has identified 192 native wildlife species of conservation concern that occur in the Blackland Prairie ecoregion and 301 native wildlife species of conservation concern that occur in the Edwards Plateau ecoregion. These lists identify species with low or declining populations that are important to the health and diversity of the State's wildlife resources.

Cumulative impacts to wildlife depend on whether a particular wildlife species thrives or deteriorates as a result of human encroachment. Urban-adapted or tolerant wildlife species (such as raccoons, squirrels, grackles, and blue jays) could benefit from an increase in human

activity, while other species (such as cave-dependent bats, bobcats, forest dwelling birds, and many reptiles) would decrease as humans convert or encroach upon natural landscapes.

As discussed above for vegetation, the action alternatives would have a slight benefit to general wildlife populations compared to the cumulative impacts of the No Action alternative as large tracts of mitigation lands would be acquired and managed in perpetuity. These large tracts of land would provide wildlife populations with the necessities required for species survival. Thus, the incremental impacts of each of these alternatives would slightly offset adverse cumulative impacts on general wildlife populations from other regional impacts.

5.9.2 Hays County Special Status Species

5.9.2.1 Covered Species (Golden-cheeked Warbler and Black-capped Vireo)

Historic estimates of potential golden-cheeked warbler habitat in Hays County vary from approximately 75,000 acres in 1962 (Pulich 1976) to approximately 50,644 acres in 1988 (USFWS 1992). More recent estimates suggest that as much as 170,355 acres of potential habitat may be currently present in Hays County (Loomis 2008); however, only approximately 148,638 acres (87 percent) of this potential habitat has a probability of being occupied by the species (Loomis 2008). Unfortunately, direct comparison of the various historic and recent habitat estimates is complicated by different methodologies used to identify potential habitat, and it is not possible to derive reliable trends regarding past habitat conditions from these data.

There have been no historic estimates of potential black-capped vireo habitat in Hays County, but Wilkins et al. (2006) reported a recent county-wide estimate of approximately 23,855 acres of potential black-capped vireo habitat in Hays County.

While historic trends in habitat conditions for the covered species are unavailable, it is almost certain that some amount of habitat loss and/or degradation occurred in association with increasing populations and urban and suburban development in Hays County during the past 30 years.

Range-wide, previously permitted impacts to the golden-cheeked warbler and black-capped vireo were estimated based on a review of documents posted on the USFWS Southwest Region Ecological Services Electronic Library and publications in the Federal Register since 1994 (the earliest information available on the Federal Register website). According to these documents, the Service has authorized incidental take of the golden-cheeked warbler or is evaluating possible take authorization (typically measured in acres of habitat loss or degradation) for over approximately 41,000 acres of potential golden-cheeked warbler habitat across the range of the species through the issuance of ESA Section 10(a) incidental take permits and Section 7 Biological Opinions related to interagency consultations. Similarly, the Service has authorized incidental take of the black-capped vireo or is evaluating possible take authorization (typically measured in acres of habitat loss or degradation) for approximately 7,900 acres of potential black-capped vireo habitat across the range of the species.

Most of this previously authorized take is associated with the Balcones Canyonlands Conservation Plan (a regional habitat conservation plan operated by the City of Austin and Travis County), the proposed Williamson County Regional Habitat Conservation Plan, an ESA Section 7 consultation with the U. S. Department of Agriculture Natural Resources Conservation Service for land management and restoration practices related to the Leon River Restoration Project in Hamilton and Coryell counties, and another ESA Section 7 consultation with the Department of Defense regarding military training on the Fort Hood Military Reservation in Bell and Coryell counties.

The number of individual golden-cheeked warblers or black-capped vireos (or territories) affected by each of the previously authorized incidental take actions was not consistently reported in Service or Federal Register publications and is unknown.

Projections of recent population and land development trends suggest that approximately 57,700 acres of new land development activities may be reasonably certain to occur within Hays County in the next 30 years. The cumulative extent to which these activities (which include potential projects that would participate in a regional HCP to achieve ESA compliance) would negatively affect the covered species or their habitats cannot be precisely determined. However, based on general predictions regarding the location of new development and the distribution of potential habitat of the covered species across Hays County, the estimated total amount of adverse impact to potential warbler habitat projected to occur during the next 30 years is approximately 22,000 acres. For the black-capped vireo, a similar analysis suggests that 3,300 acres of potential vireo habitat could be lost or degraded during the life of the proposed RHCP or other action alternatives.

The cumulative loss or degradation of potential warbler or black-capped vireo habitat related to future land development activities is likely to affect less than 10 to 15 percent of the total amount of potential habitat currently available in Hays County for these species.

Under the No Action alternative, only a small fraction of this anticipated cumulative habitat loss would be mitigated by conservation actions, as required by the ESA. Each of the regional HCP alternatives, including the proposed RHCP, would be expected to increase ESA compliance and the amount of mitigation provided for the covered species in Hays County.

The cumulative effect of habitat protection in Hays County due to the action alternatives would vary. Golden-cheeked warbler Recovery Region 5 includes approximately 28,440 acres of protected habitat for the golden-cheeked warbler in the Balcones Canyonlands Preserve and the Balcones Canyonlands National Wildlife Refuge. Implementation of the action alternatives will result in the permanent protection of between 3,000 acres and 30,000 acres of golden-cheeked warbler habitat, depending on the alternative selected. The proposed RHCP could contribute approximately 9,000 acres of protected habitat for the golden-cheeked warbler to the system of preserves in Recovery Region 5 (approximately 32 percent of the current total).

The cumulative effect of black-capped vireo habitat protection and management in Hays County under the action alternatives is difficult to predict, since little detailed information is known about the amount or distribution of potential habitat for this species in Hays County or elsewhere across its range. The 2007 status review for the black-capped vireo recommends that the species be down listed from endangered to threatened status (USFWS 2007b), based on observations that total known population of black-capped vireos in Texas is much larger than that known at the time of listing. However, the status review cautions that threats to this species still exist and its recovery depends on the implementation of management actions to reduce these threats (USFWS 2007b). The protection and dedicated long-term management of several hundred to several thousand acres of black-capped vireo habitat in Hays County would have a beneficial cumulative effect on the species, the protection and management of this habitat would help address the remaining threats to the species. The proposed RHCP would contribute approximately 1,300 acres of protected and managed habitat to the existing system of parks and preserves that contain black-capped vireo populations in the proposed recovery region that includes Hays County (i.e., Kickapoo Caverns State Park, Kerr Wildlife Management Area, Love Creek Preserve, Hill Country State Natural Area, Camp Bullis, City of San Antonio lands, Walter Buck Wildlife Management Area, Mason Mountain Wildlife Management Area, and Colorado Bend State Park) (Wilkins et al. 2006).

5.9.2.2 Evaluation and Additional Species

Past, current, and projected local and regional increases in human population and associated land development activities and other land use changes have likely resulted in and are likely to result in the loss, fragmentation, and/or degradation of habitat for one or more of the 56 evaluation or additional species addressed in this EIS. The anticipated cumulative habitat impacts, which would be expected to occur under all four alternatives as described for general wildlife communities in Section 5.9.1.3, would likely lead to reduced populations for one or more of these species.

When compared to the No Action alternative, the cumulative effects of the action alternatives would be generally positive, since each regional HCP alternative would protect large blocks of undeveloped land in Hays County and would providing funding to expand the current body of knowledge regarding the biology, habitat, distribution, and management of these species as a group.

5.9.2.3 Other Special Status Species

As described for the No Action alternative in Section 5.7, the cumulative effects of past, current, and projected local and regional increases in human population and associated land development activities and other land use changes has likely caused and would likely continue to lead to minor to moderate adverse impacts to some of the other special status species in Hays County (i.e., Texas horned lizard and the Cagle's map turtle). However, most of the other special status species would likely remain unaffected or experience only negligible impacts from

the consequences of an expanding human population (see the discussion in Section 5.7). Any anticipated adverse impacts would be expected to occur under all four alternatives.

When compared to the No Action alternative, the cumulative effects of the action alternatives would be generally positive, since each regional HCP alternative would protect large blocks of undeveloped land in Hays County. Depending on the location of these preserves, one or more of the other special status species (particularly the Texas horned lizard and the Cagle's map turtle) could benefit from these actions.

5.9.3 Socioeconomic Resources

Recent socioeconomic trends are described in Section 4.9, which are a reflection of the social and economic impacts of population growth and land development in recent years. Generally these socioeconomic indicators (population growth, employment trends, and housing trends) are increasing or improving, resulting in a larger tax base for Hays County.

None of the action alternatives would be expected to have long-term cumulative socioeconomic impacts on the local or regional population, economic trends, County employment rates, per capita income, or real estate transactions. Participants in a regional HCP would enjoy cost and time savings as a result of simplified ESA compliance, but these savings would not be expected to rise to a level that would significantly impact local or regional economies. The Service would experience a long-term beneficial impact under the action alternatives, since each of these regional HCP alternatives would reduce the amount of time and effort the Service would spend on individual ESA consultations.

The time savings for permitting incidental take through a regional HCP would likely result in a portion of the anticipated land development occurring one to two years sooner than would be expected with an individual ESA consultation, and could accelerate the growth of the County's tax base. In addition, creation of large preserves under the action alternatives would likely increase the value of adjacent property, further increasing the County's tax base by an undetermined amount.

Each of the action alternatives requires the dedication of revenues from the County's general maintenance and operations fund, which could negatively affect the County's ability to support services currently funded with these revenues. For the proposed RHCP, the amount of general fund revenues that could be dedicated to the implementation of the plan would be approximately $79.2 million over 30 years (i.e., approximately 3 percent of the cumulative value of the County's general fund during the life of the plan). Comparatively, the Moderate Preserve/Limited Take alternative would only require approximately $40 million from the County's general fund (approximately 1.5 percent of the cumulative value of this fund over 30 years) and the Large-scale Preserve System would require approximately $401 million from the general fund over 30 years (i.e., approximately 15 percent of the fund's cumulative value).

5.9.4 Climate Change and Cumulative Impacts

In an October 8, 1997 memorandum, the CEQ issued draft guidelines on how global climate change should be treated in NEPA documents. The CEQ guidance called on Federal agencies to consider in NEPA documents how major Federal actions (such as the proposed Hays County RHCP) could affect sources and sinks of greenhouse gases and how climate change could potentially influence such actions. The CEQ bases this guidance on the NEPA regulations which mandate that all "reasonably foreseeable" environmental impacts of the proposed Federal action have to be considered in the NEPA document. The CEQ considers that there is adequate scientific evidence that indicates that climate change is a "reasonably foreseeable" impact of greenhouse gas emissions.

Furthermore, in November 2007, the Intergovernmental Panel on Climate Change (IPCC) issued its *Fourth Assessment Report*, which concluded that evidence of global warming is now "unequivocal." Some of the IPCC's findings in this report included rising temperatures, rising sea levels, and retreating arctic ice. The IPCC's conclusions have been widely accepted as representing the consensus of opinion in the scientific community. According to the EPA (1997), global mean surface temperatures have increased 0.6 to 1.2 ºF between 1890 and 1996. The nine warmest years in this century have all occurred within the last 14 years. Based on projections made by the IPCC and results from the Hadley Centre's climate model (HadCM2), by the year 2100, temperatures in Texas could increase by approximately 3ºF in spring and 4ºF in other seasons, with variant ranges of 1 to 9ºF (EPA 1997). According to the HadCM2 model, precipitation is estimated to decrease by five to 30 percent in winter and increase by about ten percent in other seasons. Increases in summer could be slightly larger (up to 30 percent) than in spring and fall. As a result, in regard to water resources in Texas, unless increased temperatures are coupled with a strong increase in rainfall, water could become scarcer. A warmer and drier climate would lead to greater evaporation and less water for recharging groundwater aquifers.

The frequency and intensity of extreme weather is of critical importance to ecological systems, and the ability of some plants and animals to migrate and adapt appears to be much slower than the predicted rate of climate change (EPA 1997). According to the Service's Southwest Region, climate change is among the greatest challenges ever faced by a conservation community in conserving fish, wildlife, and their habitats (USFWS 2008). Many avian species are considered to be particularly vulnerable to global warming and associated climate change, as habitat composition shifts (Both and Visser 2001). Global warming also influences the routes of many migratory birds and their annual migration rhythm. Many migratory species change their routes, or shorten or completely cancel their journey as a result of changing temperatures. In 2001, a study of North American warbler species (including the golden-cheeked warbler) found that the range of occurrence had shifted significantly farther north in the past 24 years, by an average of more than 65 miles (Price and Root 2001). The trend of warmer and drier conditions could reduce critical habitat and create further stress on sensitive ecological communities and species, such as the endangered golden-cheeked warbler and black-capped vireo.

Climate change could also affect the abundance and diversity of birds. Warmer winters could increase the survival of birds that live in an area year-round, which could give migratory birds more competition for resources such as food and nest sites when they return to breed in the spring. In turn, a decrease in the total number of migratory birds as well as the number of species would be anticipated (Society for Conservation Biology 2003).

At a local level, anticipated population increases are expected to drive economic growth in Hays County over the next 30 years (i.e., the duration of the RHCP and Permit), as described in Section 4.9. This increase in population will likely be accompanied by an increase in fossil fuel consumption and greenhouse gas emissions related to transportation, energy and heat production, commercial or industrial production, agriculture, and other sectors of the economy. At the same time, population increases will also drive land use changes in Hays County and likely reduce the amount of forest cover present in the county (see Section 4.4 and Section 5.3). Since mature forests can at least temporarily function as carbon sinks by converting carbon dioxide into stable plant materials (i.e., wood), reduction in forest cover can reduce the ability of the natural landscape to sequester carbon dioxide emitted from the burning of fossil fuels.

As such, the No Action alternative would be expected to contribute to the amount of greenhouse gas emissions in the atmosphere and the associated impacts of global climate change described in the paragraphs above. The magnitude of any such contribution by activities in Hays County to the adverse cumulative impacts of global climate change is likely to be so minor as to become negligible on a global scale.

Compared to the No Action alternative, the action alternatives would each protect thousands of acres of mature forest in Hays County. These mature forests are thought to function as "carbon sinks" that trap atmospheric carbon dioxide in long-lived plant materials. While these preserves would be designed to protect habitat for the covered species in perpetuity (particularly mature juniper-oak forest for the golden-cheeked warbler), there is still a possibility for occasional catastrophic events (such as wildfire, exceptional and prolonged drought, or tree diseases) to remove this mature forest cover and release the stored carbon. However, Hays County would implement management practices to replace the lost forest cover under its adaptive management process, which would reestablish the carbon sink. Therefore, each of the action alternatives would protect the ability of at least some mature forest cover in Hays County to function as a carbon sink in perpetuity (even if temporary setbacks occur) and reduce the County's contribution to global climate change. As with the No Action alternative, the magnitude of such a positive contribution would likely be very minor or negligible on a global scale under any of the action alternatives.

While future climate change in Texas may adversely affect the resources analyzed in this EIS (particularly the covered species), as described above, the action alternatives are not expected to contribute cumulatively to such effects should they occur. As a result of climate change, proposed habitat preserves under the action alternatives may increase or decrease in

value to the relevant species over the next 30 years. The Service's Southwest Region has been working with the U.S. Geological Survey, the academic community, and other natural resource management agencies and interest groups to translate available and emerging science into concrete actions that reduce the impacts of a changing climate on the diverse ecosystems in Texas (USFWS 2008). However, at present, there is insufficient knowledge upon which to design alternative or additional mitigation measures within any of the four alternatives to compensate for any adverse effects of climate change. To help deal with this uncertainty, the proposed RHCP includes adaptive management measures and procedures for dealing with changed circumstances such as climate change.

5.10 Unavoidable Adverse Impacts

Unavoidable adverse impacts are defined as those that meet the following two criteria: 1) there are no reasonably practicable mitigation measures to eliminate the impacts and 2) there are no reasonable alternatives to the proposed project that would meet the purpose and need of the action, eliminate the impact and not cause other or similar significant adverse impacts (40 CFR 1500.2(e).

It is expected that development in Hays County would continue as trends predict under the No Action alternative, regardless of the implementation of a regional HCP (see Section 4.1). Since potentially adverse impacts associated with anticipated land development would be the same for the No Action and each of the action alternatives, the effects of the action alternatives would be limited to the effects associated with the implementation of their conservation programs. Therefore, all four alternatives discussed in this EIS would result in unavoidable adverse impacts that would include loss of vegetation, native wildlife, and endangered species habitat in Hays County, as well as some adverse impacts to water resources. Mitigation measures discussed in the three action alternatives for the covered species should minimize the loss of habitat for those species (and associated vegetation communities and wildlife) and benefit their conservation.

5.11 Irreversible and Irretrievable Commitment of Resources

Under 40 CFR 1502.16, an irreversible commitment of resources is defined as the loss of future options. It primarily applies to non-renewable resources, such as minerals or cultural resources, and to those factors that are renewable only over long time spans, such as soil productivity. Irretrievable commitments represent the loss of production, harvest, or use of renewable resources. These opportunities are foregone for the period of the proposed action, during which other allocations of these resources cannot be realized. These decisions are reversible, but the utilization opportunities foregone are irretrievable.

Under all EIS alternatives, the loss of habitat for the golden-cheeked warbler and black-capped vireo in Hays County would result in irreversible habitat loss for both species. However,

the proposed preserves described for each action alternative would help preserve habitat for these species.

Under all action alternatives, the commitment and funding by Hays County for acquisition and permanent management of mitigation properties would be irreversible. The commitment and funding of mitigation and monitoring activities for the duration of the Permit would also be irretrievable.

5.12 Short-term Use of the Environment vs. Long-term Productivity

Pursuant to NEPA regulations (CFR 1502.16), an EIS must consider the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity. Short-term uses are those that determine the present quality of life for the public. The quality of life for future generations depends on long-term productivity; the capability of the environment to provide on a sustainable basis.

All four alternatives would result in a short-term loss of habitat for the golden-cheeked warbler and black-capped vireo in Hays County due to human population growth and the associated increase in land development. However, all three action alternatives, particularly the proposed RHCP, would be expected to protect more suitable habitat for these species in the long term through the acquisition and management of their preferred habitat in perpetuity.

6.0 PREPARERS AND DEIS RECIPIENTS

6.1 Preparers and Contributors

This EIS was prepared for the Service by the Hays County RHCP consultant team. Individuals involved with the preparation of this document are listed below, along with their role in this project, educational background, and experience.

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Joseph Lessard	RHCP funding plan		
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6.2 Draft Environmental Impact Statement Recipients

Copies of the dEIS and dHCP are available at the Hays County Regional Habitat Conservation Plan website at http://hayscountyhcp.com/documents. Alternatively, you may obtain compact disks with electronic copies of these documents by writing to Mr. Adam Zerrenner, Field Supervisor, U.S. Fish and Wildlife Service, 10711 Burnet Road, Suite 200, Austin, TX 78758; calling (512) 490-0057; or faxing (512) 490-0974. A limited number of printed copies of the dEIS and dHCP are also available for public inspection and review at the following locations (by appointment only at government offices):

- San Marcos Public Library (625 E. Hopkins Street, San Marcos, Texas)
- Hays County Precinct 3 Office (14306 Ranch Rd 12 , Wimberley, Texas)
- Hays County Precinct 4 Office (101 Old Fitzhugh Rd, Dripping Springs, Texas)

Persons wishing to review the application may obtain a copy by writing to the Regional Director, U.S. Fish and Wildlife Service, P.O. Box 1306, Room 4012, Albuquerque, NM 87103.

7.0 GLOSSARY OF TERMS AND ABBREVIATIONS

abiotic characteristics – Non-living chemical and physical factors in the environment such as light, temperature, water and soil.

affected environment – The current environmental conditions and resources that may be affected or impacted by the proposed RHCP alternatives.

aquifer – Rocks or sediments, such as cavernous limestone and unconsolidated sand, that store, conduct, and yield water in significant quantities for human use.

Area of Potential Effect – The focus of operation for the Hays County RHCP located west of Interstate Highway in Hays County, Texas. This is the portion of the county where authorized take of endangered species and the avoidance, minimization, and mitigation measures described by the alternative actions are expected to occur. This area closely corresponds to the Balcones Canyonlands portion of the Edwards Plateau ecoregion.

Balcones Canyonlands – The Balcones Canyonlands sub-ecoregion forms the southeastern boundary of the Edwards Plateau ecoregion. The Balcones Canyonlands are highly dissected through the erosion and solution of springs, streams, and rivers working both above and below ground; percolation through the porous limestone contributes to the recharge of the Edwards Aquifer. This Ecoregion supports a number of endemic plants and has a higher representation of deciduous woodland than elsewhere on the Edwards Plateau.

Balcones Canyonlands Conservation Plan – The regional habitat conservation plan covering western Travis County. The Balcones Canyonlands Conservation Plan calls for the creation of a preserve system to protect eight endangered species as well as 27 other species believed to be at risk. The Balcones Canyonlands Conservation Plan was approved by the Service in 1996 and has a 30-year term. It allows for incidental take outside of proposed preserve lands, and provides mitigation for new public schools, roads and infrastructure projects of the participating agencies (Travis County, the City of Austin, and the Lower Colorado River Authority). Landowners and developers may elect to participate in the Balcones Canyonlands Conservation Plan to obtain ESA take authorization rather than by seeking authorization directly from the Service.

Balcones Escarpment – The Balcones Escarpment is a geologic fault zone several miles wide consisting of several faults, most of which both dip and are downthrown to the east. It extends in a curved line across Texas from Del Rio to the Red River and is visible eastward from Del Rio, where it is about 1,000 feet high, and northeastward from San Antonio to Austin, where it is about 300 feet high. The escarpment, which appears from the plains as a range of wooded hills, separates the Edwards Plateau in the west from the Coastal Plains.

BCV – Abbreviation for the "black-capped vireo," which is one of the covered species in the RHCP.

Biological Advisory Team ("BAT") – Three or more professional biologists retained to provide guidance for the RHCP, especially with respect to the calculation of harm to the endangered species and the size and configuration of the habitat preserves. The Texas Parks and Wildlife Code § 83.015(c) requires a Biological Advisory Team for RHCPs and specifies that at least one member shall be appointed by the Texas Parks and Wildlife Commission and one by landowner members of the Citizens Advisory Committee. The members of the Biological Advisory Team for this RHCP are experts on the species covered by the RHCP.

Biological Opinion – The Service document issued at the conclusion of formal consultation pursuant to section 7(a)(2) of the ESA that generally includes: (1) the opinion of the Fish and Wildlife Service as to whether or not a Federal action is likely to jeopardize the continued existence of listed species, or result in the destruction or adverse modification of designated critical habitat; (2) a summary of the information on which the opinion is based; and (3) a detailed discussion of the effects of the action on listed species or designated critical habitat (50 CFR §§ 402.02, 402.14(h)).

Blackland Prairie Ecoregion – This ecoregion represents the southernmost extension of the North American tallgrass prairie and consists of deep, fertile black soils. Because of the fertile soils, much of the original prairie has been plowed to produce food and forage crops. Typically, soils are uniformly dark-colored alkaline clays, often referred to as "black gumbo," interspersed with some gray acidic sandy loams. The landscape is gently rolling to nearly level, and elevations range from 300 to 800 feet above sea level. The dominant vegetation includes big bluestem, little bluestem, Indiangrass, switchgrass, and gramagrass.

CAMPO – Acronym for the Capital Area Metropolitan Planning Organization**.**

candidate species - Under U.S. Fish and Wildlife's ESA regulations, "…those species for which the Service has on file sufficient information on biological vulnerability and threat(s) to support proposals to list them as endangered or threatened species. Proposal rules have not yet been issued because this action is precluded…" (see 61 FR 7598).

CEQ – Acronym for the Council on Environmental Quality. A three-member council created by Title II of NEPA in the Executive Office of the President, responsible for advisory, reporting, and policy analysis functions.

Citizens Advisory Committee ("CAC") – Texas Parks and Wildlife Code § 83.016 requires that the plan participants appoint a Citizens Advisory Committee to assist in preparing the RHCP and application for the Federal permit. The state law requires that at least 4 members, or 33 percent, of the Citizens Advisory Committee, whichever is greater, must own undeveloped land or land in agricultural use in the RHCP area. The law also specifies that a landowner member may not be an employee or elected official of a plan participant or any other governmental entity and that the Texas Parks and Wildlife Commission shall appoint one voting representative to the Citizens Advisory Committee.

CMR – Acronym for Capitol Market Research.

Code of Federal Regulations ("CFR") – A compilation of the general and permanent rules of the executive departments and agencies of the Federal Government as published in the Federal Register. The code is divided into 50 titles that represent broad areas subject to Federal regulation.

conservation bank – A conservation bank is a parcel of land containing natural resource values that are conserved and managed in perpetuity, through a conservation easement held by an entity responsible for enforcing the terms of the easement, for specified listed species and used to offset impacts occurring elsewhere to the same resource values on non-bank lands. The values of the natural resources are translated into quantified "credits." Typically, the credit price will include funding for the long-term natural resource management and protection of those values.

conservation easement – A recorded legal document established to conserve biological resources in perpetuity, and which requires certain habitat management obligations for the conservation bank lands.

covered species – Species included in the RHCP for which incidental take authorization under the ESA is sought.

critical habitat – Specific geographic areas, whether occupied by a listed species or not, that are essential for its conservation and that have been formally designated by rule published in the Federal Register.

discharge – An outflow of water from a stream, pipe, or ground water system. Includes, but is not limited to, the accidental or intentional spilling, leaking, pumping, emitting, emptying, or dumping of a substance into or on any land or water.

delisting – To remove a species from the Federal list of endangered and threatened species (50 CFR 17.11 and 17.12) because the species no longer meets any of the five listing factors provided under section 4(a)(1) of the Endangered Species Act and under which the species was originally listed (i.e., because the species has become extinct or is recovered).

downlisting – To reclassify an endangered species to a threatened species based on alleviation of any of the five listing factors provided under section 4(a)(1) of the Endangered Species Act (16 USC § 1533(a)(1)).

drainage basin – An area that is occupied by a drainage system, which consists of a surface stream or a body of impounded surface water together with all tributary surface streams and bodies of impounded surface water. The term is used synonymously with watershed, river basin, or catchment.

Edwards Aquifer – The Edwards Aquifer is an arch-shaped belt of porous, water bearing limestones that comprises one of the major groundwater systems in Texas. It extends 180 miles from Brackettville in Kinney County to Kyle in Hays County. It is the primary source of water for approximately 1.7 million people. While it is a primary source of drinking water, it is the sole-source of water for a unique system of aquatic life, including several threatened and endangered species.

Edwards Aquifer recharge zone – The area where a formation allows available water to enter the aquifer. Generally, that area where the Edwards Aquifer and associated limestones crop out in Kinney, Uvalde, Medina, Bexar, Comal, Hays, Travis, and Williamson counties and the outcrops of other formations in proximity to the Edwards limestone, where faulting and fracturing may allow recharge of the surface waters to the Edwards Aquifer.

Edwards Aquifer Recovery Implementation Program ("EARIP") – The Edwards Aquifer Recovery Implementation Program is a collaborative, consensus-based stakeholder process in Texas. Many stakeholders are working to develop a plan to protect the Federally listed species potentially affected by the management of the Edwards Aquifer and other activities.

Edwards Plateau ecoregion – This Ecoregion comprises an area of central Texas commonly known as the Texas Hill Country. The region is clearly demarcated by the Balcones Fault escarpment to the east and south, but grades into the Chihuahuan Desert to the west and the Great Plains to the north. The region is characterized by steep canyons and stony hills with shallow rocky soils dissected by several river systems. The underlying porous limestone bedrock of the Edward's Plateau is honeycombed caves and sinkhole wich allow recharge into the Edwards Aquifer which lies under the eastern edge of the Plateau. Today, the Edwards Plateau is characterized by grasslands, juniper/oak woodlands, and plateau live oak or mesquite savannah. Open grasslands and savannahs were more common in presettlement times than they are today. Ranching is the primary agricultural industry in the region.

endangered species – "Any species [including subspecies or qualifying distinct population segment] which is in danger of extinction throughout all or a significant portion of its range" (section 3(6) of the Endangered Species Act, 16 USC § 1532(6)).

Endangered Species Act ("ESA") – 16 USC §§ 1513–1543; Federal legislation that provides means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, and provides a program for the conservation of such endangered and threatened species.

endemic – Being native and restricted to a particular geographic region.

Environmental Impact Statement ("EIS") – A detailed written statement required by section 102(2)(C) of the National Environmental Policy Act containing, among other things, an analyses of environmental impacts of a proposed action and alternatives considered, adverse effects of the project that cannot be avoided, alternative courses of action, short-term uses of the environment versus the maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitment of resources (40 CFR §§ 1508.11, 1502).

Environmental Justice – The pursuit of equal justice and equal protection under the law for all environmental statutes and regulations without discrimination based on race, ethnicity, and/or socio-economic status. Presidential Executive Order No. 12898 (issued February

11, 1994) requires Federal agencies to respond to the issue of environmental justice by "identify[ing] and address[ing] disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low income populations."

EPA – Acronym for U. S. Environmental Protection Agency.

Evaluation Species of Concern – Species that are not presently listed as threatened or endangered under the ESA, but are either currently listed in petitions to the Service, or are sufficiently rare and/or endemic that there is a reasonable probability that they may be listed in the future.

extirpation – The elimination of a species or subspecies from a particular area, but not from its entire range.

extinction - The cessation of existence of a species or group of taxa.

fee simple land acquisition – The acquisition or outright purchase of the title, structure and rights associated with real property.

Federally listed – The Federal Lists of Endangered and Threatened Wildlife and Plants.

Federal Register - Daily publication of the United States government containing all proposed regulations, final regulations, and other activities of the Federal government.

FTE – Acronym for full-time employee.

geologic formation – The fundamental unit of lithostratigraphy which consists of rock strata that have comparable or similar properties. A formation can be further divided in one or more members or groups.

GCW – Abbreviation for the "golden-cheeked warbler," which is the primary covered species in the RHCP.

habitat – The location where a particular taxon of plant or animal lives and its surroundings, both living and non-living; the term includes the presence of a group of particular environmental conditions surrounding an organism including air, water, soil, mineral elements, moisture, temperature, and topography.

habitat conservation plan ("HCP") – Under section 10(a)(2)(A) of the Endangered Species Act, a planning document that is a mandatory component of an incidental take permit application, also known as a "section 10(a)" or "HCP."

habitat determination – Habitat determinations are prepared by Hays County for potential RHCP participants and document the location and extent of potential habitat within a project area, as delineated from the review of background information and the on-site assessment. The habitat determination will also include a calculation of the acreage of potential habitat on a project area.

harm – Defined in regulations promulgated by the Department of the Interior to implement the Endangered Species Act as an act "which actually kills or injures" listed wildlife. Harm may include "significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering" (50 CFR § 17.3 (2005)).

impervious cover – Land cover that prevents rain from infiltrating into soil, including roofs and pavement.

incidental take – Take of any Federally listed wildlife species that is incidental to, but not the purpose of, otherwise lawful activities (see definition for "take") (Endangered Species Act section 10(a)(1)(B)).

incidental take permit ("Permit") – A permit that exempts a permittee from the take prohibition of section 9 of the Endangered Species Act issued by the Service pursuant to section 10(a)(1)(B) of the Endangered Species Act. Also sometimes referred to as a "section 10(a)(1)(B)," "section 10 permit," or "ITP." "Permit" in this document refers to the incidental take permit associated with the RHCP.

interlocal agreement – A written formal agreement that allows governmental jurisdictions to cooperate with one another in the performance of tasks.

IPCC – Acronym for the Intergovernmental Panel on Climate Change.

issuance criteria – Before issuing an incidental take permit, the USFWS must find that a habitat conservation plan meets certain "issuance criteria" described in Section 10(a)(2)(B). The USFWS must find that the take of listed species will be incidental to an otherwise lawful activity; that the applicant will, to the maximum extent practicable, minimize and mitigate the impacts of the taking; that adequate funding sources are available and committed to long-term implementation of the plan; and that the taking covered by the permit will not jeopardize the survival and recovery of the species in the wild.

IUCN – Acronym for the International Union for Conservation of Nature.

karst – A terrain characterized by landforms and subsurface features, such as sinkholes and caves, that are produced by solution of bedrock. Karst areas commonly have few surface streams; most water moves through cavities underground.

karst features – Generally, a geologic feature formed directly or indirectly by solution, including caves; often used to describe features that are not large enough to be considered caves, but have some probable relation to subsurface drainage or groundwater movement. These features typically include but are not limited to sinkholes, enlarged fractures, noncavernous springs and seeps, soil pipes, and solution cavities in the epikarst (the highly solutioned zone in karst areas between the land surface and the predominantly unweathered bedrock).

land in lieu of fees - The donation of suitable land as an alternative to paying mitigation fees or purchasing credit from a mitigation bank.

listing - Species listed as either endangered or threatened under section 4 of the Endangered Species Act (16 USC § 1533).

mitigation – Under National Environmental Quality Act regulations, to moderate, reduce or alleviate the impacts of a proposed activity, including: (1) avoiding the impact by not taking a certain action or parts of an action; (2) minimizing impacts by limiting the degree or magnitude of the action; (3) rectifying the impact by repairing, rehabilitating or restoring the affected environment; (4) reducing or eliminating the impact over time by

preservation and maintenance operations during the life of the action; or (5) compensating for the impact by replacing or providing substitute resources or environments (40 CFR § 1508.20). Under the Endangered Species Act, the applicant must demonstrate that the applicant would, to the maximum extent practicable, undertake to minimize and mitigate the impacts of take of species. According to the HCP Handbook, typical mitigation actions under HCP and incidental take permits include the following: (1) avoiding the impact (to the extent practicable); (2) minimizing the impact; (3) rectifying the impact; (4) reducing or eliminating the impact over time; or (5) compensating for the impact.

mitigation bank – A mitigation bank is a parcel of land containing natural resource values that are conserved and managed in perpetuity, through a conservation easement held by an entity responsible for enforcing the terms of the easement, for specified listed species and used to offset impacts occurring elsewhere to the same resource values on non-bank lands. The values of the natural resources are translated into quantified "credits." Typically, the credit price will include funding for the long-term natural resource management and protection of those values.

mitigation credit – A unit of measure representing the quantification of species or habitat conservation values within a conservation bank.

MSA – Acronym for the Metropolitan Statistical Area.

National Environmental Policy Act ("NEPA") – Federal legislation establishing national policy that environmental impacts would be evaluated as an integral part of any major Federal action. Requires the preparation of an Environmental Impact Statement for all major Federal actions significantly affecting the quality of the human environment (42 USC §§ 4321–4327).

neotenic - The retention of juvenile characteristics in the adult.

NLCD – Acronym for National Land Cover Dataset.

NMFS – Acronym for the National Marine Fisheries Service.

Notice of Intent ("NOI") – Formal notice in the Federal Register to initiate the NEPA process (required for Environmental Impact Statements).

oak wilt – Oak wilt is an infectious disease caused by a fungus, which invades and disables the water-conducting system in susceptible trees. All oaks (*Quercus* spp.) are susceptible to oak wilt to some degree, but some species are more affected.

Plan Area – The area of operation for the Hays County RHCP. The Plan Area includes the extent of Hays County, Texas.

Proposed Action – Under National Environmental Policy Act regulations, a plan that has a goal which contains sufficient details about the intended actions to be taken or that would result, to allow alternatives to be developed and its environmental impacts to be analyzed (40 CFR §1508.23).

recharge – Natural or artificially-induced flow of surface water to an aquifer.

RHCP – Abbreviation for the "Hays County Regional Habitat Conservation Plan." The RHCP supports an application by Hays County for an ESA Section 10(a)1(B) incidental take permit from the USFWS. An RHCP typically covers a large geographic area, numerous landowners, and multiple species. Local or regional authorities or entities are often the applicant and permittee, and may be relied upon to implement the mitigation plan under an RHCP.

RHCP participants – Any non-Federal party desiring to undertake activities covered by the RHCP, who agrees to comply with the terms and conditions of the RHCP.

riparian – Pertaining to the banks of a river, stream, waterway, or other, typically, flowing body of water as well as to plant and animal communities along such bodies of water.

scoping – The first document in the environmental review process to receive public comment. It is usually made available just prior to the Public Scoping Meeting.

Section 7 of the ESA – The section of the Endangered Species Act that describes the responsibilities of Federal agencies in conserving threatened and endangered species. Section 7(a)(1) requires all Federal agencies "in consultation with and with the assistance of the Secretary [to] utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered species and threatened species." Section 7(a)(2) requires Federal agencies to "ensure that any action authorized, funded, or carried out by such agency ... is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of..." designated critical habitat.

Section 9 of the ESA – The section of the Endangered Species Act dealing with prohibited acts, including the take of any listed species without specific authorization of the Service.

Section 10 of the ESA – The section of the Endangered Species Act dealing with exceptions to the prohibitions of section 9 of the Endangered Species Act.

Section 10(a)(1)(B) – That portion of section 10 of the Endangered Species Act that authorizes the Service to issue permits for the incidental take of threatened or endangered species.

Service – Abbreviation for the U.S. Fish and Wildlife Service.

sinkholes – A natural depression in the ground's surface related to dissolutional processes, including features formed by concave dissolution of the bedrock, and/or by collapse or subsidence of bedrock or soil into underlying dissolutionally formed cavities.

species of concern – Other species addressed in the RHCP that would not be covered for incidental take that may be rare and or endemic to Hays County, and without adequate conservation measures, could become listed by the Service in the future.

take – Under section 3(18) of the Endangered Species Act, "…to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" with respect to Federally listed endangered species of wildlife. Federal regulations provide the same taking prohibitions for threatened wildlife species (50 CFR 17.31(a)).

Texas Open Meetings Act – Under the Texas Open Meetings Act (the Act), every regular, special, or called meeting of a governmental body, including a city council and most

boards and commissions (depending on membership and authority), must be open to the public and comply with all the requirements of the Act. The Act does not apply to purely social gatherings or conventions and workshops, as long as any discussion of city business is incidental to the purpose of the gathering.

TCEQ - Acronym for the Texas Commission on Environmental Quality.

threatened species – "Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range" (Endangered Species Act § 3 (20), 16 USC § 1532(20)].

TNRIS – Acronym for Texas Natural Resources Information Service.

Texas Pollutant Discharge Elimination System ("TPDES") – Texas Pollution Discharge Elimination System. Texas' state water quality program authorized by the EPA in September 1998; it has Federal regulatory authority over discharges of pollutants to Texas surface waters.

TPWD – Acronym for the Texas Parks and Wildlife Department.

TWDC – Acronym for the Texas Water Development Board

TXDOT – Acronym for the Texas Department of Transportation.

TXP – an Austin-based economic analysis and public policy consulting firm.

USFWS – Acronym for the U.S. Fish and Wildlife Service.

vegetational succession – Succession is the relatively gradual change in structure and composition that arises as the vegetation modifies various environmental variables over time, including light, water and nutrient levels. These modifications change the suite of species most adapted to grow, survive and reproduce in an area, causing floristic changes.

Water Pollution Abatement Plan – A water pollution abatement plan (WPAP) is required by TCEQ for any regulated activity proposed on the Edwards Aquifer recharge zone. This includes any many construction-related activities on the recharge zone, which may pose a potential for contaminating the Edwards Aquifer and hydrologically connected surface streams.

wetlands – Wetlands are those areas where water saturation is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the surrounding environment.

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DRAFT RECORD OF DECISION

Regarding the Service's Decision on the Issuance of an Incidental Take Permit for Golden-cheeked Warbler and Black-capped Vireo to Hays County, Texas

Introduction

This Record of Decision (ROD) signifies the end of the permitting process for the development of a Regional Habitat Conservation Plan (RHCP) and issuance of an Incidental Take Permit (ITP) to Hays County, Texas. Hays County has applied to the U.S. Fish and Wildlife Service (Service) for an ITP for incidental take of the endangered golden-cheeked warbler (*Dendroica chrysoparia*) and the endangered black-capped vireo (*Vireo atricapilla*) under the authority of Section 10(a)(1)(B) of the Endangered Species Act of 1973 (ESA), as amended. Hays County is seeking authorization for incidental take resulting from the proposed construction, use, or maintenance of public or private land development projects; construction, maintenance, or improvement of transportation infrastructure; installation or maintenance of utility infrastructure; construction, use, or maintenance of institutional projects or public infrastructure; and management activities within Hays County, Texas. This ROD documents the Service's decision based on information contained in the final Environmental Impact Statement (EIS). The Service's decision to issue the ITP was not made final until at least 30 days after publication of the notice for the final EIS.

The Decision

We, the Service, intend to issue an ITP allowing Hays County to implement the preferred alternative (Alternative B), as described in the final EIS. This intention is based on a thorough review of the alternatives and their environmental consequences. This alternative meets the needs of Hays County and has been determined to be economically feasible. Implementation of this decision entails the issuance of the ITP, including all terms and conditions governing the permit. Implementation of this decision requires adherence to all of the minimization and mitigation measures specified in the Hays County Regional Habitat Conservation Plan (RHCP) to offset impacts to the golden-cheeked warbler and black-capped vireo to the maximum extent practicable, as well as the described monitoring and adaptive management measures. Hays County and the RHCP meet all issuance criteria for an ITP. Since implementation of Alternative B would result in incidental take under the ESA, the Service prepared an intra-Service Biological Opinion prior to making a permit decision.

Alternatives Considered

Four alternatives, including the No Action Alternative, and their environmental consequences were evaluated in the draft EIS released November 2, 2009 for a 90-day public comment period. Several elements were common to all action alternatives and included interagency coordination, National Environmental Policy Act (NEPA)

compliance, and protection of threatened and endangered species and cultural resources. Following is a brief summary of the alternatives considered. A longer summary and complete description is included in the Final EIS.

Alternative A (No Action): The No Action alternative assumed that we would not issue a regional permit for the County. Although development could occur on lands not occupied by endangered species, development activities that would cause take of listed species would require individual authorizations through section 7 or section 10(a)(1)(B) of the ESA. Individual entities could also elect to avoid take on properties containing endangered species by avoiding direct and indirect impacts to the species (i.e., take-avoidance). Processing individual section 10(a) permits could cause delays in permit issuance, because we often take 1 to 2 years to process an individual permit.

Alternative B (Environmentally Preferable Alternative): Our selected alternative is the Proposed RHCP, the preferred alternative (Alternative B) as described in the final EIS. This alternative provides for the issuance of an ITP to the County for incidental take anticipated to occur as a result of projects described above. This alternative includes implementation of RHCP measures to minimize and mitigate for the potential incidental take of federally listed species to the maximum extent practicable. The intent of this alternative is to allow continued development in the County; to minimize the biological, environmental, and socioeconomic impacts; to satisfy the covered species needs; and meet issuance criteria of section 10 of the ESA.

For golden-cheeked warblers, the take associated with direct and indirect impacts to 9,000 acres of habitat are authorized over the 30-year life of the permit. These impacts shall be mitigated by a combination of purchasing mitigation credits in nearby conservation banks and by purchasing high quality habitat within Hays County for designated golden-cheeked warbler preserves. For black-capped vireos, the take associated with direct and indirect impacts to 1,300 acres of habitat are authorized over the life of the permit. Impacts will be mitigated primarily through habitat restoration, habitat management, enhancement of existing protected black-capped vireo habitat, or an alternate, Service-approved mitigation program.

Alternative C (Moderate Preserve System with a Take Limit): Compared to Alternative B, this alternative features the acquisition of a modestly sized, pre-determined preserve system and a proportionately smaller amount of incidental take authorized by the ITP. This alternative illustrates a conservation program that could be relatively easy for the County to afford, but (due to relatively smaller size of the preserve system compared to the proposed RHCP) might not satisfy the anticipated need for incidental take authorization over the duration of the plan.

Alternative D (Large-scale Preserve System): Compared to Alternative B, this alternative involves a conservation program that utilizes a pre-determined preserve approach. The preserve system would be large enough to authorize incidental take of any remaining golden-cheeked warbler or black-capped vireo habitat in the County, outside of the target acquisition area of the preserve system, during the duration of the plan.

Rationale for Decision

We intend to select the preferred alternative (Alternative B) for implementation based on multiple environmental and social factors, including potential impacts and benefits to covered species and their habitat, the extent and effectiveness of minimization and mitigation measures, and social and economic considerations.

In order for us to be able to issue an ITP, we must ascertain that the RHCP meets the criteria set forth in 16 U.S.C. § 1539(a)(2)(A) and (B). We have made that determination. These criteria, and how the RHCP satisfies these criteria, are summarized below:

1. The taking will be incidental.

We find that the take will be incidental to otherwise lawful activities, including the proposed construction, use, or maintenance of public or private land development projects; construction, maintenance, or improvement of transportation infrastructure; installation or maintenance of utility infrastructure; construction, use, or maintenance of institutional projects or public infrastructure; and management activities. The take of individuals of covered species will be primarily due to indirect impacts of habitat destruction and/or alteration.

2. The applicant will, to the maximum extent practicable, minimize and mitigate the impacts of such takings.

The County has committed to a wide variety of conservation measures, land acquisition, management activities, monitoring, adaptive management, and other strategies designed to avoid and minimize harm to the covered species and mitigate for any unavoidable loss. Impacts to the covered species will be minimized and mitigated as described in the environmentally preferable alternative section above (fully described in section 10 of the RHCP and section 3 of the EIS).

3. The applicant will develop an HCP and ensure that adequate funding for the HCP will be provided.

The County has developed the RHCP and committed to fully fund all of the obligations necessary for its implementation. These obligations include the cost for purchase and management of golden cheeked warbler and black capped vireo mitigation lands in perpetuity, enforcement of conservation easements, and monitoring of species populations and habitat. In addition, the County has committed to implement adaptive management measures that: identify areas of uncertainty and questions that need to be addressed to resolve such uncertainty; developing alternative management strategies and determine which experimental strategies to implement; integrate a monitoring program that is able to acquire the necessary information for effective strategy evaluation; and incorporate feedback loops that link implementation and monitoring to the decision-making process that result in appropriate changes in management. To accomplish RHCP implementation, the County estimated that costs could total up to $182.6 million. The County will fund the actual costs of implementing the RHCP by application and

mitigation fees, the County General maintenance and operations fund contributions, and the County Conservation Investments.

The Service's No Surprises Assurances are discussed in the RHCP, and measures to address changed and unforeseen circumstances have been identified. Adaptive management in the form of conservation, mitigation, or management measures and monitoring will be implemented to address changed circumstances over the life of the permit that were able to be anticipated at the time of RHCP development. Unforeseen circumstances would be addressed through the Service's close coordination with the County in the implementation of the RHCP. The County has committed to a coordination process to address such circumstances.

The No Surprises Assurances do not apply to any listed species not fully covered in the HCP. There are no measures described to address changed circumstances regarding foreseeable severe drought conditions (drought of record) or when springflows drop to critically low levels.

We have, therefore, determined that the County's financial commitment and plan, along with the County's willingness to address changed and unforeseen circumstances in a cooperative fashion, is sufficient to meet this criterion.

4. The taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild.

As the Federal action agency considering whether to issue an ITP to the County, we have reviewed the issuance of the ITP under section 7 of the ESA. Our biological opinion, dated January 31, 2011, concluded that issuance of the ITP will not jeopardize the continued existence of the golden cheeked warbler and black capped vireo in the wild. No critical habitat has been designated for either of the covered species, and thus none will be affected. The biological opinion also analyzes other listed species within the planning area and concludes that the direct and indirect effect of the issuance of the ITP will not appreciably reduce the likelihood of survival and recovery of other listed species and no adverse modification of any designated critical habitat within the permit area.

5. The applicant agrees to implement other measures that the Service requires as being necessary or appropriate for the purposes of the HCP.

We have cooperated with the County in the development of the RHCP. We commented on draft documents, participated in advisory group meetings, and worked closely with the County in every step of plan and document preparation, so that conservation of the covered species would be assured and recovery would not be precluded by the covered activities. The RHCP incorporates our recommendations for minimization and mitigation of impacts, as well as steps to monitor the effects of the RHCP and ensure success. Annual monitoring, as well as coordination and reporting mechanisms, have been designed to ensure that changes in conservation measures can be implemented if measures prove ineffective or impacts exceed estimates. It is our position that no

additional measures are required to implement the intent and purpose of the RHCP to those detailed in the RHCP and its associated ITP.

We have determined that the preferred alternative best balances the protection and management of habitat for covered species, while allowing and providing a streamlined process for ESA compliance for continued development in Hays County. Considerations used in this decision include: (1) mitigation will benefit the golden cheeked warbler and black capped vireo, mitigation lands will be managed for the species in perpetuity, and other conservation measures will protect and enhance habitat; (2) mitigation measures for the covered species will fully offset anticipated impacts of development to the species and provide recovery opportunities; and (3) the RHCP is consistent with the golden cheeked warbler and black capped vireo recovery plans.

Section 9 of the Act and its implementing regulations prohibit the "taking" of threatened or endangered species. However, under limited circumstances, we may issue permits to take listed wildlife species incidental to, and not the purpose of, otherwise lawful activities.

To minimize impacts, Hays County must:

A. The permit does not authorize take, whether direct or indirect, of any listed species other than the covered golden-cheeked warbler and black-capped vireo.

B. If conditions exist (e.g., severe drought, springflows drop to critically low levels) where actions associated with the Hays County Regional Habitat Conservation Plan (RHCP) are shown to result in incidental take of listed species not fully covered by the permit, the permit may be suspended or revoked because the taking is not otherwise lawful. The Service will notify Hays County that their permit is no longer valid if any unauthorized direct or indirect take occurs, as soon as we become aware of such take. All activities associated with the RHCP that are shown to cause take must cease until further notice.

C. For golden-cheeked warblers: the incidental take associated with direct and indirect impacts to 9,000 acres of habitat are authorized over the life of the Permit. These impacts shall be mitigated by a combination of purchasing mitigation credits in nearby conservation banks and, by purchasing high quality habitat within Hays County for golden-cheeked warbler preserves, anticipated to include 10,000 to 15,000 acres combined. Preserves for golden-cheeked warblers will be managed and monitored in perpetuity to maintain the biological value for the benefit of the species. Mitigation ratios shall be commensurate with Service mitigation policies in accordance with the Fish and Wildlife Act of 1956 (16 U.S.C. 742(a)-754), the Fish and Wildlife Coordination Act (16 U.S.C. 661-667(e)), the Watershed Protection and Flood Prevention Act (16 U.S.C. 1001-1009), and the National Environmental Policy Act (42 U.S.C. 4321-4347).

D. Clearing and construction activities on participating parcels within 300 feet of golden-cheeked warbler habitat is not authorized between February 28 and July 31 (reproductive season), with the following exceptions: 1) protocol breeding season surveys indicate golden-cheeked warblers are not present; 2) construction activities that began during the non-breeding season and are performed in a reasonably prompt and expeditious manner may continue, and; 3) construction activities that do not involve the removal of potential habitat may continue only if not adjacent (within 300 feet) to potential habitat. However, any disturbance activity with potential for direct and indirect effects to the golden-cheeked warbler, whether on or off of the project site, must be mitigated as appropriate.

E. For black-capped vireos: the incidental take associated with direct and indirect impacts to 1,300 acres of habitat are authorized over the life of the Permit. Impacts will be mitigated primarily through habitat restoration, habitat management, enhancement of existing protected black-capped vireo habitat, or an alternate, Service-approved mitigation program. Mitigation activities and acquisition are anticipated to cover approximately 1,300 acres and must be maintained in perpetuity. Mitigation ratios shall be commensurate with Service mitigation policies in accordance with the Fish and Wildlife Act of 1956 (16 U.S.C. 742(a)-754), the Fish and Wildlife Coordination Act (16 U.S.C. 661-667(e)), the Watershed Protection and Flood Prevention Act (16 U.S.C. 1001-1009), and the National Environmental Policy Act (42 U.S.C. 4321-4347).

F. Clearing and construction activities on participating parcels within 300 feet of black-capped vireo habitat is not authorized between March 15 and August 31 (reproductive season), with the following exceptions: 1) protocol breeding season surveys indicate that black-capped vireos are not present; 2) construction activities that began during the non-breeding season and are performed in a reasonably prompt and expeditious manner may continue, and; 3) construction activities that do not involve the removal of potential habitat may continue only if not adjacent (within 300 feet) to potential habitat. However, any disturbance activity with potential for direct and indirect effects to the black-capped vireo, whether on or off of the project site, must be mitigated as appropriate.

G. With regard to projects that may involve a Federal nexus, the Federal action agency may mitigate for effects to golden-cheeked warblers and/or black-capped vireos through the RHCP. However, Federal action agencies are still required to consult with the Service pursuant to section 7 of the ESA prior to arranging specific mitigation (i.e., no mitigation, in lieu fee, etc. shall be paid by the Federal action agency until conclusion of their section 7 consultation). Although voluntary mitigation through an appropriate HCP may expedite their consultation, it is no guarantee of such. If Federal projects are analyzed under the Hays County EIS, impacts and mitigation are counted as part of the authorization under the Hays County RHCP permit.

H. Clearing and construction activities covered by the RHCP and the Permit shall be consistent with the current practices recommended by the Texas Forest Service to prevent the spread of oak wilt.

I. Each preserve acquisition will be subject to Service approval and the mitigation credits will be determined based on the number of acres of potential and/or occupied habitat for the covered species. The number of mitigation credits allowed for each preserve will be based on, and commensurate with, Service policy and guidelines regarding mitigation (such as, but not limited to, the *Guidance for the Establishment, Use, and Operation of Conservation Banks*) in order to ensure that the quality of the mitigation is equal to or greater than the quality of the habitat impacted.

J. The County will ensure that mitigation assessments are performed in accordance with the methodology described in the RHCP. The County will provide the mitigation assessment for each individual participant to the Service, and the Service will notify the County when the assessment is received. Once received by the Service, the Service will strive to review the mitigation assessment within 10 Federal working days and notify the County if it has any objections. No response from the Service after 10 days is not implicit approval of the mitigation assessment.

   The Service reserves the right to review and approve all mitigation assessments by the County during a probationary period of five years from the date of issuance of the permit. Within three years after issuance, the Service will consult with the County and, if the Service is satisfied with the accuracy of the County's mitigation assessments, the Service's review of mitigation assessments may be reduced or eliminated.

Other Factors Considered – National Historic Preservation Act

Historic and archeological resources are currently protected by State and Federal laws, including the Texas Antiquities Code administered by the Texas Historical Commission and the National Historic Preservation Act. The EIS assumes that the proponents of all projects covered by a regional HCP action alternative would abide by State and Federal regulations regarding cultural resources. Entities proposing projects on property owned by the State or a subdivision of the State are required by the Texas Antiquities Code to coordinate with the Texas Historical Commission and the proponents of any project receiving Federal permits or funding (such as an incidental take permit under the ESA) are required by the National Historic Preservation Act to coordinate with the State Historic Preservation Officer to determine if the project would affect properties that are included in or that meet the criteria for listing on the National Register of Historic Places. Therefore, given the existing protections for cultural resources, the activities associated with the authorized take, proposed mitigation, or funding/administration of a regional HCP under one of the action alternatives would have only negligible impacts on archeological, historical, or other cultural resources in Hays County.

Public Comments on the EIS

The Service prepared an EIS for this ITP application. A Notice of Availability was published in the *Federal Register* notifying the public of the availability of the draft EIS and HCP from November 2, 2009, through February 1, 2010, for a 90-day period (74 FR 56655). A public hearing was held on November 18, 2009, providing the public an additional outlet in which to provide comments. Three sets of comments on the draft RHCP were received from the public. No comments on the RHCP or the DEIS were received from government agencies.

Generally, most of the comments received were supportive of the RHCP and its implementation process. Two comments indicated concern regarding 1) lack of access to preserve parcels for recreation and 2) lack of discretionary authority by Hays County to deny use of the RHCP for "bad" developments.

The Service believes these comments are addressed and reasonably accommodated in the implementation procedures.

For More Information

The Final EIS is available at the Service's Albuquerque Regional Office or Austin, Texas Field Office. A copy of this Record of Decision will be made available at ***http://www.fws.gov/southwest/es/AustinTexas*** or at the offices listed above. For additional information, call Mr. Marty Tuegel at (505) 248-6651.

_____ _____

Deputy Regional Director
U.S. Fish and Wildlife Service
Southwest Region
Albuquerque, New Mexico

Date

U.S. Fish and Wildlife Service

News Release

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Southwest Region (Arizona ● New Mexico ● Oklahoma ●Texas) http://southwest.fws.gov

For Release: May 13, 2011
Contacts: Tanya Sommer, 512-490-0057
Lesli Gray, 972-569-8588

Service Approves Hays County Regional Habitat Conservation Plan for Two Federally Listed Species

Today, the U.S. Fish and Wildlife Service (Service) announced in the *Federal Register* the availability of the final Environmental Impact Statement (EIS), the final Hays County Regional Habitat Conservation Plan (RHCP), and the Service's draft Record of Decision. The Service will issue a 30-year incidental take permit to Hays County authorizing the incidental take of the golden-cheeked warbler (*Dendroica chrysoparia*) and black-capped vireo (*Vireo atricapilla*) as a result of the Hays County RHCP.

The Hays County RHCP includes conservation measures to minimize and mitigate incidental take of the golden-cheeked warbler and black-capped vireo that would occur as a result of activities including, but not limited to, public or private land development, transportation projects, or utility projects. The Hays County RHCP conservation measures include the establishment of a preserve system of 10,000-15,000 acres to mitigate for the incidental take of golden-cheeked warblers and black-capped vireos. "The approval of the Hays County RHCP will enable Hays County to continue to develop and grow while ensuring long-term habitat protection for the golden-cheeked warbler and black-capped vireo," stated Adam Zerrenner, Austin Field Supervisor.

You may obtain copies of the EIS and RHCP online at *http://hayscountyhcp.com/documents* or *http://www.fws.gov/southwest/es/AustinTexas*. For further information on how to obtain or review copies of these documents, see the *Federal Register* notice at http://www.fws.gov/southwest/index.html.

America's fish, wildlife and plant resources belong to all of us, and ensuring the health of imperiled species is a shared responsibility. We're working to actively engage conservation partners and the public in the search for improved and innovative ways to conserve and recover imperiled species. To learn more about the Endangered Species program, go to http://www.fws.gov/endangered/.

The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect and enhance fish, wildlife, plants and their habitats for the continuing benefit of the American people. We are both a leader and trusted partner in fish and wildlife conservation, known for our scientific excellence, stewardship of lands **a**nd natural resources, dedicated professionals and commitment to public service. The U.S. Fish and Wildlife Service works cooperatively with the American public to continue the conservation legacy of America's great outdoors. For more information on our work and the people who make it happen, visit www.fws.gov.

http://www.fws.gov/southwest/

a unitization revision ($831). Respondents are also required to pay for court reporter and transcripts § 250.1304(d), if seeking compulsory unitization ($500). We have not identified any other non-hour cost burdens associated with this collection of information.

Public Disclosure Statement: The PRA (44 U.S.C. 3501, *et seq.*) provides that an agency may not conduct or sponsor a collection of information unless it displays a currently valid OMB control number. Until OMB approves a collection of information, you are not obligated to respond.

Comments: Before submitting an ICR to OMB, PRA section 3506(c)(2)(A) requires each agency "* * * to provide notice * * * and otherwise consult with members of the public and affected agencies concerning each proposed collection of information * * *". Agencies must specifically solicit comments to: (a) Evaluate whether the proposed collection of information is necessary for the agency to perform its duties, including whether the information is useful; (b) evaluate the accuracy of the agency's estimate of the burden of the proposed collection of information; (c) enhance the quality, usefulness, and clarity of the information to be collected; and (d) minimize the burden on the respondents, including the use of automated collection techniques or other forms of information technology.

Agencies must also estimate the non-hour cost burdens to respondents or recordkeepers resulting from the collection of information. Therefore, if you have costs to generate, maintain, and disclose this information, you should comment and provide your total capital and startup cost components or annual operation, maintenance, and purchase of service components. You should describe the methods you use to estimate major cost factors, including system and technology acquisition, expected useful life of capital equipment, discount rate(s), and the period over which you incur costs. Capital and startup costs include, among other items, computers and software you purchase to prepare for collecting information, monitoring, and record storage facilities. You should not include estimates for equipment or services purchased: (i) Before October 1, 1995; (ii) to comply with requirements not associated with the information collection; (iii) for reasons other than to provide information or keep records for the Government; or (iv) as part of customary and usual business or private practices.

We will summarize written responses to this notice and address them in our submission for OMB approval. As a result of your comments, we will make any necessary adjustments to the burden in our submission to OMB.

Public Comment Procedures: Before including your address, phone number, email address, or other personal identifying information in your comment, you should be aware that your entire comment–including your personal identifying information–may be made publicly available at any time. While you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

BOEMRE Information Collection Clearance Officer: Arlene Bajusz (703) 787–1025.

Dated: May 4, 2011.

Doug Slitor,

Acting Chief, Office of Offshore Regulatory Programs.

[FR Doc. 2011–11837 Filed 5–12–11; 8:45 am]

BILLING CODE 4310–MR–P

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

[FWS–R2–ES–2010–N173; 20124–1112–0000–F2]

Regional Habitat Conservation Plan, Hays County, TX

AGENCY: Fish and Wildlife Service, Department of the Interior.

ACTION: Notice of availability of final environmental impact statement, final Hays County regional habitat conservation plan, and draft record of decision.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), make available the final environmental impact statement (EIS), the final Hays County regional habitat conservation plan (RHCP) under the National Environmental Policy Act of 1969 (NEPA), and our draft record of decision (ROD). Our intended action is the issuance of a 30-year incidental take permit (ITP) for the Preferred Alternative (described below) under the Endangered Species Act of 1973, as amended (ESA), to Hays County, Texas (the County), to incidentally take golden-cheeked warbler (*Dendroica chrysoparia*) and black-capped vireo (*Vireo atricapilla*). Under the RHCP, the County will mitigate for take by establishing a preserve system of 10,000–15,000 acres to mitigate for incidental take of covered species. Each preserve acquisition will be subject to Service approval and will generate mitigation credits based on the number of acres and quality of potential occupied habitat for the covered species.

DATES: We will issue a ROD and make a final permit decision no sooner than 30 days after publication of this notice. Comments on the final EIS and RHCP will be accepted for 30 days after publication of this notice.

ADDRESSES: For where to review documents and submit comments see Reviewing Documents and Submitting Comments in **SUPPLEMENTARY INFORMATION**.

FOR FURTHER INFORMATION CONTACT: Mr. Adam Zerrenner, Field Supervisor, Austin Ecological Services Field Office, 10711 Burnet Road, Suite 200, Austin, TX 78758; telephone 512/490–0057.

SUPPLEMENTARY INFORMATION: We, the U.S. Fish and Wildlife Service (Service), announce the availability of the Hays County final environmental impact statement; final regional habitat conservation plan, which we developed in compliance with the agency decision-making requirements of the National Environmental Policy Act (NEPA) of 1969, as amended; and our record of decision. We intend to implement the preferred alternative, which is implementation of the RHCP. We have described all alternatives in detail, and evaluated and analyzed them in our May 2010 final EIS and the final RHCP.

Based on our review of the alternatives and their environmental consequences as described in our final EIS, we intend to implement the preferred alternative (the proposed action). The selected proposed action is the issuance of a section 10(a)(l)(B) incidental take permit (ITP) to Hays County, Texas (the County), for incidental take of golden-cheeked warbler (*Dendroica chrysoparia*) and black-capped vireo (*Vireo atricapilla*). We refer to both species collectively as "the covered species."

The term of the permit is 30 years (2011–2041). The County will implement mitigation and minimization measures according to the schedule in the RHCP. Under the RHCP, the County will mitigate for take by establishing a preserve system of 10,000–15,000 acres to mitigate for incidental take of covered species. Each preserve acquisition will be subject to Service approval and will generate mitigation credits based on the number of acres, and quality, of potential occupied habitat for the covered species. The number of mitigation credits allowed for each

preserve will be based on, and commensurate with, Service policy and guidelines regarding mitigation (such as, but not limited to, the Guidance for the *Establishment, Use, and Operation of Conservation Banks*) in order to ensure that the quality of the mitigation is equal to or greater than the quality of the habitat impacted.

Background

The County applied to us for an ITP. As part of the permit application, the County developed and will implement the RHCP to meet the requirements of an ITP. Our issuance of an ITP would allow the County to take the covered species resulting from proposed construction, use, or maintenance of public or private land development projects; construction, maintenance, or improvement of transportation infrastructure; installation or maintenance of utility infrastructure; construction, use, or maintenance of institutional projects or public infrastructure; and management activities within Hays County, Texas, during the 30-year ITP term.

The Secretary of the Interior has delegated the authority to the Service to approve or deny an ITP in accordance with the ESA. To act on the County's permit application, we must determine that the RHCP meets the approval criteria specified in the ESA, including our regulations in the Code of Federal Regulations (CFR) at 50 CFR 17.22 and 17.32. The issuance of an ITP is a Federal action subject to NEPA compliance, including the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of the NEPA (40 CFR 1500–1508).

On November 2, 2009, we issued a draft EIS and requested public comment on our evaluation of the potential impacts associated with issuance of an ITP for implementation of the RHCP and to evaluate alternatives, along with the draft RHCP (74 FR 56655). We included public comments and responses associated with the Draft EIS and Draft RHCP in an appendix to the final EIS.

Purpose and Need

The purpose of the section 10(a)(l)(B) permit is to authorize incidental take associated with the otherwise legal activities listed in the background section.

We identified key issues and relevant factors through public scoping and also through working with a Citizens Advisory Committee; Biological Advisory Team; and comments from the public. These issues included the need for: (1) Development to continue in the County; (2) minimization of impacts on covered species; and (3) mitigation of impacts on covered species. We thoroughly examined these issues in the draft and final EIS and RHCP. No new significant issues arose following publication of the draft documents.

Environmentally Preferable Alternative

Our selected alternative is the Proposed RHCP, the preferred alternative (Alternative B) as described in the final EIS. This alternative provides for the issuance of an ITP to the County for take that would occur as a result of projects described above. This alternative includes implementation of RHCP measures to minimize and mitigate the potential take of federally listed species to the maximum extent practicable. The intent of this alternative is to allow continued development in the County; to minimize the biological, environmental, and socioeconomic impacts; to satisfy the habitat and species needs; and meet issuance criteria of section 10 of the ESA.

For golden-cheeked warblers, the take associated with direct and indirect impacts to 9,000 acres of habitat are authorized over the life of the permit. These impacts shall be mitigated by a combination of purchasing mitigation credits in nearby conservation banks and by purchasing high quality habitat within Hays County for designated golden-cheeked warbler preserves. For black-capped vireos, the take associated with direct and indirect impacts to 1,300 acres of habitat are authorized over the life of the permit. Impacts will be mitigated primarily through habitat restoration, habitat management, enhancement of existing protected black-capped vireo habitat, or an alternate, Service-approved mitigation program.

We considered three additional alternatives in the final EIS:

Alternative A (No Action): The No Action alternative assumed that we would not issue a regional permit for the County. Although development could occur on lands not occupied by endangered species, development activities that would cause take of listed species would require individual authorizations through section 7 or section 10(a)(1)(B) of the ESA. Individual entities could also elect to avoid take on properties containing endangered species by avoiding direct and indirect impacts on the species (*i.e.,* take-avoidance). Processing individual section 10(a) permits could cause delays in permit issuance, because we often take 1 to 2 years to process an individual permit.

Alternative C (Moderate Preserve System with a Take Limit): Compared with that under Alternative B, this alternative features the acquisition of a modestly sized, pre-determined preserve system and limits the amount of incidental take that would be authorized by the ITP. This alternative illustrates a conservation program that could be relatively easy for the County to afford, but (due to relatively smaller size of the preserve system compared to the proposed RHCP) might not satisfy the anticipated need for incidental take authorization over the duration of the plan.

Alternative D (Large-scale Preserve System): Compared with that under Alternative B, this alternative involves a conservation program that utilizes a pre-determined preserve approach. Under this alternative, the preserve system would be large enough to authorize the incidental take of any remaining golden-cheeked warbler or black-capped vireo habitat in the County, outside of the target acquisition area of the preserve system, during the duration of the plan.

Decision

We intend to issue an ITP allowing the County to implement the preferred alternative (Alternative B), as it is described in the final EIS. This intention is based on a thorough review of the alternatives and their environmental consequences. Implementation of this decision entails the issuance of the ITP, including all terms and conditions governing the permit. Implementation of this decision requires adherence to all of the minimization and mitigation measures specified in the RHCP, as well as monitoring and adaptive management measures.

Rationale for Decision

We intend to select the preferred alternative (Alternative B) for implementation based on multiple environmental and social factors, including potential impacts and benefits to covered species and their habitat, the extent and effectiveness of minimization and mitigation measures, and social and economic considerations.

In order for us to be able to issue an ITP, we must ascertain that the RHCP meets the criteria set forth in 16 U.S.C. 1539(a)(2)(A) and (B). We have made that determination. These criteria, and how the RHCP satisfies these criteria, are summarized below:

1. The taking will be incidental. We find that the take will be incidental to otherwise lawful activities, including the proposed construction, use, or maintenance of public or private land

development projects; construction, maintenance, or improvement of transportation infrastructure; installation or maintenance of utility infrastructure; construction, use, or maintenance of institutional projects or public infrastructure; and management activities. The take of individuals of covered species will be primarily due to habitat destruction and/or alteration.

2. The applicant will, to the maximum extent practicable, minimize and mitigate the impacts of such takings. The County has committed to a wide variety of conservation measures, land acquisition, management activities, monitoring, adaptive management, and other strategies designed to avoid and minimize harm to the covered species and mitigate for any unavoidable loss. Impacts to the covered species will be minimized and mitigated as described in the environmentally preferable alternative section above.

3. The applicant will develop an HCP and ensure that adequate funding for the HCP will be provided. The County has developed the RHCP and committed to fully funding all of the obligations necessary for its implementation. These obligations include the cost for purchase and management of golden-cheeked warbler and black-capped vireo, mitigation lands in perpetuity, enforcement of conservation easements, and monitoring of species populations and habitat. In addition, the County has committed to implement adaptive management measures that: identify areas of uncertainty and questions that need to be addressed to resolve such uncertainty; developed alternative management strategies and determine which experimental strategies to implement; integrate a monitoring program that is able to acquire the necessary information for effective strategy evaluation; and incorporate feedback loops that link implementation and monitoring to the decision-making process that result in appropriate changes in management. To accomplish RHCP implementation, the County estimated that costs could total up to $182.6 million. The County will fund the actual costs of implementing the RHCP by application and mitigation fees, the County General maintenance and operations fund contributions, and the County Conservation Investments.

The Service's No Surprises Assurances are discussed in the RHCP, and measures to address changed and unforeseen circumstances have been identified. Adaptive management in the form of conservation, mitigation, or management measures and monitoring will be implemented to address changed circumstances over the life of the permit that were able to be anticipated at the time of RHCP development. Unforeseen circumstances would be addressed through the Service's close coordination with the County in the implementation of the RHCP. The County has committed to a coordination process to address such circumstances.

We have, therefore, determined that the County's financial commitment and plan, along with the County's willingness to address changed and unforeseen circumstances in a cooperative fashion, is sufficient to meet this criterion.

4. The taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild. As the Federal action agency considering whether to issue an ITP to the County, we have reviewed the issuance of the ITP under section 7 of the ESA. Our biological opinion concluded that issuance of the ITP will not jeopardize the continued existence of the golden cheeked warbler and black capped vireo in the wild. No critical habitat has been designated for either of the covered species, and thus none will be affected.

5. The applicant agrees to implement other measures that the Service requires as being necessary or appropriate for the purposes of the HCP. We have cooperated with the County in the development of the RHCP. We commented on draft documents, participated in advisory group meetings, and worked closely with the County in every step of plan and document preparation, so that conservation of the covered species would be assured and recovery would not be jeopardized. The RHCP incorporates our recommendations for minimization and mitigation of impacts, as well as steps to monitor the effects of the RHCP and ensure success. Annual monitoring, as well as coordination and reporting mechanisms, have been designed to ensure that changes in conservation measures can be implemented if measures prove ineffective or impacts exceed estimates. It is our position that no additional measures are required to implement the intent and purpose of the RHCP to those detailed in the RHCP and its associated ITP.

We have determined that the preferred alternative best balances the protection and management of suitable habitat for covered species, while allowing and providing a streamlined process for ESA compliance for continued development in Hays County. Considerations used in this decision include: (1) Mitigation will benefit the golden cheeked warbler and black capped vireo, mitigation lands will be managed for the species in perpetuity, and other conservation measures will protect and enhance habitat; (2) mitigation measures for the covered species will fully offset anticipated impacts of development to the species and provide recovery opportunities; and (3) the RHCP is consistent with the golden cheeked warbler and black capped vireo recovery plans.

Section 9 of the Act and its implementing regulations prohibit the "taking" of threatened or endangered species. However, under limited circumstances, we may issue permits to take listed wildlife species incidental to, and not the purpose of, otherwise lawful activities.

Reviewing Documents and Submitting Comments

Please refer to TE–220793–0 when requesting documents or submitting comments. You may obtain copies of the final EIS and final RHCP by going to the Hays County Regional Habitat Conservation Plan Web site at *http://hayscountyhcp.com/documents*. Alternatively, you may obtain compact disks with electronic copies of these documents, as well as the draft ROD, by writing to Mr. Adam Zerrenner, Field Supervisor, 10711 Burnet Road, Suite 200, Austin, TX 78758; telephone 512–490–0057; facsimile 512–490–0974. The application, final RHCP, final EIS, and draft ROD will also be available for public inspection, by appointment, during normal business hours (8 a.m. to 4:30 p.m.) at the Austin office. During the public comment period (see **DATES**), submit your written comments or data to the Field Supervisor at the Austin address.

Public comments submitted are available for public review at the Austin address listed above. This generally means that any personal information you provide us will be available to anyone reviewing the public comments (see the Public Availability of Comments section below for more information).

A limited number of printed copies of the final EIS and final RHCP are also available for public inspection and review at the following locations (by appointment only at government offices):

- Department of the Interior, Natural Resources Library, 1849 C. St., NW., Washington, DC 20240;
- U.S. Fish and Wildlife Service, 500 Gold Avenue, SW., Room 4012, Albuquerque, NM 87102;
- San Marcos Public Library, 625 E. Hopkins Street, San Marcos, TX, 78666–6313;

• Hays County Precinct 3 Office, 14306 Ranch Rd 12, Wimberley, TX; 78676, and

• Hays County Precinct 4 Office, 101 Old Fitzhugh Rd, Dripping Springs, TX, 78620.

Persons wishing to review the application or draft ROD may obtain a copy by writing to the Regional Director, U.S. Fish and Wildlife Service, P.O. Box 1306, Room 4012, Albuquerque, NM 87103.

Public Availability of Comments

Written comments we receive become part of the public record associated with this action. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, you should be aware that the entire comment—including your personal identifying information—may be made publicly available at any time. While you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

Authority

We provide this notice under section 10(c) of the Act (16 U.S.C. 1531 *et seq.*) and its implementing regulations (50 CFR 17.22) and NEPA (42 U.S.C. 4371 *et seq.*) and its implementing regulations (40 CFR 1506.6).

December 7, 2010.

Joy E. Nicholopoulos,

Acting Regional Director, Region 2, Albuquerque, New Mexico.

[FR Doc. 2011–11761 Filed 5–12–11; 8:45 am]

BILLING CODE 4310–55–P

DEPARTMENT OF THE INTERIOR

Bureau of Land Management

[LLWY922000–L13200000–EL0000; WYW161248]

Notice of Competitive Coal Lease Sale, Wyoming

AGENCY: Bureau of Land Management, Interior.

ACTION: Notice.

SUMMARY: Notice is hereby given that certain coal resources in the Belle Ayr North Coal Tract described below in Campbell County, Wyoming, will be offered for competitive lease by sealed bid in accordance with the provisions of the Mineral Leasing Act of 1920, as amended.

DATES: The lease sale will be held at 10 a.m., on Wednesday, July 13, 2011. Sealed bids must be submitted on or before 4 p.m., on Tuesday, July 12, 2011.

ADDRESSES: The lease sale will be held in the First Floor Conference Room (Room 107), of the Bureau of Land Management (BLM) Wyoming State Office, 5353 Yellowstone Road, P.O. Box 1828, Cheyenne, Wyoming 82003. Sealed bids must be submitted to the Cashier, BLM Wyoming State Office, at the address given above.

FOR FURTHER INFORMATION CONTACT: Mavis Love, Land Law Examiner, or Tyson Sackett, Acting Coal Coordinator, at 307–775–6258, and 307–775–6487, respectively.

SUPPLEMENTARY INFORMATION: This coal lease sale is being held in response to a lease by application (LBA) filed by Alpha Coal West, Inc. (formerly RAG Coal West, Inc.), Gillette, Wyoming. The coal resource to be offered consists of all reserves recoverable by surface mining methods in the following described lands located approximately 10 miles south-southeast of Gillette, Wyoming and east of State Highway 59.

T. 48 N., R. 71 W., 6th Principal Meridian

Sec. 17, lots 13 and 14;
Sec. 18, lots 17 through 19 inclusive;
Sec. 19, lots 5 through 19 inclusive;
Sec. 20, lots 3 through 7 inclusive and lots 9 through 16 inclusive;
Sec. 21, lots 13 and 14;
Sec. 28, lots 3 through 6 inclusive; and
Sec. 29, lots 1 and 6.

Containing 1,671.03 acres, more or less, in Campbell County, Wyoming.

The tract is adjacent to Federal and private leases along the northern lease boundary of the Belle Ayr mine, and to Federal leases along the southwestern lease boundary of the Caballo mine, and to the Caballo West LBA along the north. It is also adjacent to additional unleased Federal coal to the west and north. The tract is crossed by Bishop Road along its northeastern boundary.

All of the acreage offered has been determined to be suitable for mining. Features such as Bishop Road, utilities, and pipelines can be moved to permit coal recovery. In addition, numerous producing coal bed natural gas wells have been drilled on the tract. The estimate of the bonus value of the coal lease will include consideration of the future production from these wells. An economic analysis of the future income stream from the coal lease will consider reasonable compensation to the gas lessee for lost production of natural gas when the wells are bought out but by the coal lessee. The surface estate of the tract is owned by Alpha Coal West, Inc.

The tract contains surface mineable coal reserves in the Wyodak-Anderson coal zone currently being recovered in the adjacent, existing mines. On the LBA tract, there is one recoverable seam, the Wyodak, which ranges from about 72 to 78 feet thick. The Wyodak seam is continuous over the entire tract with no outcrops or subcrops. Overburden depths to this seam range from 278 to 317 feet thick on the LBA tract. The tract contains an estimated 221,734,800 tons of mineable coal. This estimate of mineable reserves includes the main seam mentioned above but does not include any tonnage from localized seams or splits containing coal less than 5 feet thick. Also, it does not include the adjacent private leases although these are expected to be mined in conjunction with the LBA tract. The total mineable stripping ratio of the coal in bank cubic yards per ton is about 4.2:1. Potential bidders for the LBA tract should consider the recovery rate expected from thick seam mining.

The Belle Ayr North LBA coal is ranked as subbituminous C. The overall average quality on an as-received basis is 8,542 British Thermal Units per pound containing about 0.34 percent sulfur. These quality averages place the coal reserves in the lower part of the range of coal quality currently being mined in the Wyoming portion of the Powder River Basin.

The tract will be leased to the qualified bidder of the highest cash amount provided that the high bid meets or exceeds the BLM's estimate of the fair market value of the tract. The minimum bid for the tract is $100 per acre or fraction thereof. No bid that is less than $100 per acre, or fraction thereof, will be considered. The bids should be sent by certified mail, return receipt requested, or be hand delivered. The BLM Wyoming State Office Cashier will issue a receipt for each hand-delivered bid. Bids received after 4 p.m. local time, on Tuesday, July 12, 2011, will not be considered. The minimum bid is not intended to represent fair market value. The fair market value of the tract will be determined by the Authorized Officer after the sale. The lease that may be issued as a result of this coal lease sale will provide for payment of an annual rental of $3 per acre, or fraction thereof, and a royalty payment to the United States of 12.5 percent of the value of coal produced by surface mining methods and 8 percent of the value of the coal produced by underground mining methods. The value of the coal will be determined in accordance with 30 CFR 206.250.

Bidding instructions for the tract offered and the terms and conditions of the proposed coal lease are available from the BLM Wyoming State Office at