Section 6 (Texas Traditional) Report Review

Attachment to letter dated JAN 05 2005

Project Title: Black-capped Vireo Safe Harbor in Central Texas

Final or Interim Report? Final

Job #: WER82 **Grant #:** E-30

Reviewer Station: Arlington ESFO

Lead station was contacted and concurs with the following comments:
☐ Yes ☐ No ☒ Not applicable (reviewer is from lead station)

Interim Report (check one):

☐ is acceptable as is

☐ is acceptable as is, but comments below need to be addressed in the next report

☐ needs revision (see comments below)

Final Report (check one):

☒ is acceptable as is

☐ is acceptable, but needs minor revision (see comments below)

☐ needs major revision (see comments below)

FINAL REPORT

As Required by

THE ENDANGERED SPECIES PROGRAM

TEXAS

Grant No. E - 30
Endangered and Threatened Species Conservation

Project WER: 82

TITLE: Black-Capped Vireo Safe Harbor In Central Texas

Prepared by:

David Wolfe

TEXAS PARKS & WILDLIFE

Robert Cook
Executive Director

John Herron
Program Director, Wildlife Diversity

Mike Berger
Division Director, Wildlife

4 October 2004

FINAL REPORT

STATE: Texas **GRANT NUMBER:** E - 30

GRANT TITLE: Endangered and Threatened Species Conservation

REPORTING PERIOD: 1September 2001 to 31 August 2004

PROJECT NUMBER: WER: 82

PROJECT TITLE:

Black-Capped Vireo Safe Harbor In Central Texas

OBJECTIVE(S):

To expand the Black-capped Vireo -- Safe Harbor program currently managed by Environmental Defense in the Texas Hill Country and to establish preserve design criteria that are needed to facilitate recovery of this endangered species.

Summary Of Progress:

Please refer to Attachment A (Final Report).

Significant Deviations:

Previously enrolled Safe Harbor areas near Fort Hood, Kerr Wildlife Management Area and Kickapoo Caverns State Park were not used due to low numbers of Black-capped Vireos on those areas. Instead, sites within Fort Hood Military Reservation and on a private ranch (Quail Ridge, Somervell Co.) were selected for this study.

Preserve design criteria have not yet been established. This work was subcontracted to a graduate student (Wes Bailey, M. S. degree candidate, University of Missouri) who has not yet completed data collection and analyses. An anticipated thesis completion date of May 2005 has been indicated (see Attachment A, p. 16) which would then enable development of "statistically supportable" design criteria by August 2005 (see Attachment A, p. 3). Items 4 and 10 of the Approach section of the Project Statement were impacted by this deviation.

Data from a separate Section 6 funded project (E-15: "Census and monitoring of the Black-capped Vireo in Texas") were used in this study (see Attachment A of Attachment A, p. 2) to address population data from items 7, 8, 9 and 10 of the Approach section of the Project Statement.

Location: Fort Hood, TX; Quail Ridge Ranch, Somervell Co., TX

Cost: $41,639.30 (Federal)

Prepared by: Craig Farquhar **Date:** 4 October 2004

Approved by: Neil E. Carter **Date:** 11/16/2004

Neil (Nick) E. Carter

Section 6 Project No. E-30

Black-capped Vireo Safe Harbor in Central Texas

Attachment A

FINAL REPORT

As Required by

THE ENDANGERED SPECIES PROGRAM

TEXAS

TPWD CONTRACT NO. 102758

Endangered and Threatened Species Conservation

Black-Capped Vireo Safe Harbor In Central Texas

Principal Investigator:
Environmental Defense

FINAL REPORT

STATE: Texas **TPWD CONTRACT NO:** 102758

PROGRAM TITLE: Endangered and Threatened Species Conservation

PERIOD COVERED: August 31, 2001 - August 31, 2004

PROJECT NUMBER:

PROJECT TITLE: Black-Capped Vireo Safe Harbor In Central Texas

OBJECTIVE: To expand the Black-capped Vireo -- Safe Harbor program currently managed by Environmental Defense in the Texas Hill Country and to establish preserve design criteria that are needed to facilitate recovery of this endangered species.

PREPARED BY: David W. Wolfe 31 August 2004
Date

APPROVED BY: _____ _____
Neil (Nick) E. Carter Date
Federal Aid Coordinator

Significant Deviations

In summer 2002, during the initial phase of designing a monitoring and analysis program to generate the data necessary to develop preserve design criteria for the Black-capped Vireo (also referred to as "vireo" in this report), it appeared likely that the degree of colonization of safe harbor enrolled areas would be insufficient to support a statistically valid study within the three-year time frame of this Section 6 project. That being the case a decision was made to use surrogate sites with existing habitat areas on a private ranch – safe harbor cooperator site, as well as on well-monitored and managed sites on Fort Hood.

The data necessary for developing preserve design criteria have been collected from the aforementioned sites and final data analysis is currently underway. Despite the original expectation that seven years of data altogether would be required to develop preserve design criteria (as stated in the Project Statement) we expect to have statistically supportable criteria developed within four years of project initiation (by August 2005). This is achievable due to the collection of a large data set, in combination with recent advances in statistical modeling (see Approach section for more details). This report includes preliminary results of the data analysis.

Need and Background

Ninety-seven percent of Texas land is privately-owned. The vast majority of habitat for the endangered species in Texas is on private land. Without the cooperation of private landowners, it would be impossible to recover many of Texas' endangered species. Safe Harbor has been demonstrated to be an effective mechanism for encouraging landowners to restore and manage habitat for endangered species in Texas and elsewhere in the U.S. Expanding the use of Safe Harbor in the Hill Country for the benefit of black-capped vireos will contribute significantly to the bird's chances of recovery.

Environmental Defense received a Safe Harbor permit from the U.S. Fish and Wildlife Service in December 2000, which authorizes Environmental Defense to provide Safe Harbor protection to landowners in the rural counties of the Texas Hill Country. Safe Harbor is available to landowners that agree to restore and maintain habitat for the Black-capped Vireo and the Golden-cheeked Warbler. Environmental Defense provides technical and financial assistance to Hill Country landowners to facilitate restoration practices such as prescribed fire, brush management, and the planting of oaks. Landowners agree to carry out the provisions of a management plan and maintain restored, suitable habitat for a minimum of four breeding cycles. With additional support, Environmental Defense would be able to recruit additional landowners to the Safe Harbor program, thereby expanding the amount of suitable habitat for the species and demonstrating the power of the Safe Harbor concept.

It is critical that, as various restoration activities are undertaken for the Black-capped Vireo, those activities are designed in a way so as to maximize the benefits to the birds and facilitate their recovery. Currently there exist no scientifically supported preserve design criteria for this species. The following statement is included in the recovery plan for the vireo: "Data and analyses are needed to better refine population sizes, amount of area, and necessary configuration between specific habitat patches, including corridors, needed to meet recovery objectives with a reasonable probability of success" (USFWS 1991).

The specific questions to be addressed by the research component of this project are:

What is the minimum size habitat patch that will support a viable population? And, how is colonization of a newly available habitat patch correlated with distance from a source population?

Environmental Defense's Safe Harbor project is aimed at providing sufficient habitat to establish and maintain viable populations of the Black-capped Vireo in central Texas. These efforts would be more effective if there were scientific data that would provide guidance on habitat design criteria including size, configuration and distance to a source population.

Objective

To expand the Black-capped Vireo -- Safe Harbor program currently managed by Environmental Defense in the Texas Hill Country and to establish preserve design criteria that are needed to facilitate recovery of this endangered species.

Expected Results Or Benefits

- Over the next three years, Environmental Defense will enroll at least 12 landowners in the Safe Harbor program and will carry out restoration activities on at least 2,500 acres.
- Over the next three years, Environmental Defense will design and implement a monitoring program to generate the data necessary to develop preserve design criteria for the Black-capped Vireo. We expect that seven years of data altogether will be required to develop the preserve design criteria.
- The project will benefit the Black-capped Vireo and Golden-cheeked Warbler (also referred to as "warbler" in this report) because habitat on private lands will be restored and managed for the benefit of the birds.
- The monitoring project will benefit the vireo by providing information that will facilitate improved habitat restoration project designs.
- A host of other species that thrive in the landscape occupied by the vireo and warbler will benefit from the habitat restoration practices that private landowners will carry out.
- If the population of vireos fully recovers so that it would be appropriate to downlist or delist the species in the future, the public would benefit from reduced costs of compliance with the Endangered Species Act.

Approach

Landowner Contact and Participation

During the course of the project, Environmental Defense worked with The Nature Conservancy, Texas Parks and Wildlife Department, U.S. Fish and Wildlife Service, and other partners to identify and work with landowners that were interested in participating in the Safe Harbor program. Environmental Defense focused its efforts on behalf of the Black-capped Vireo in eight landscapes that have been identified as being important to the recovery of this species. Figure 1 shows these landscapes as well as the currently defined recovery units (identified by Roman numerals) for the vireo (USFWS 1996).

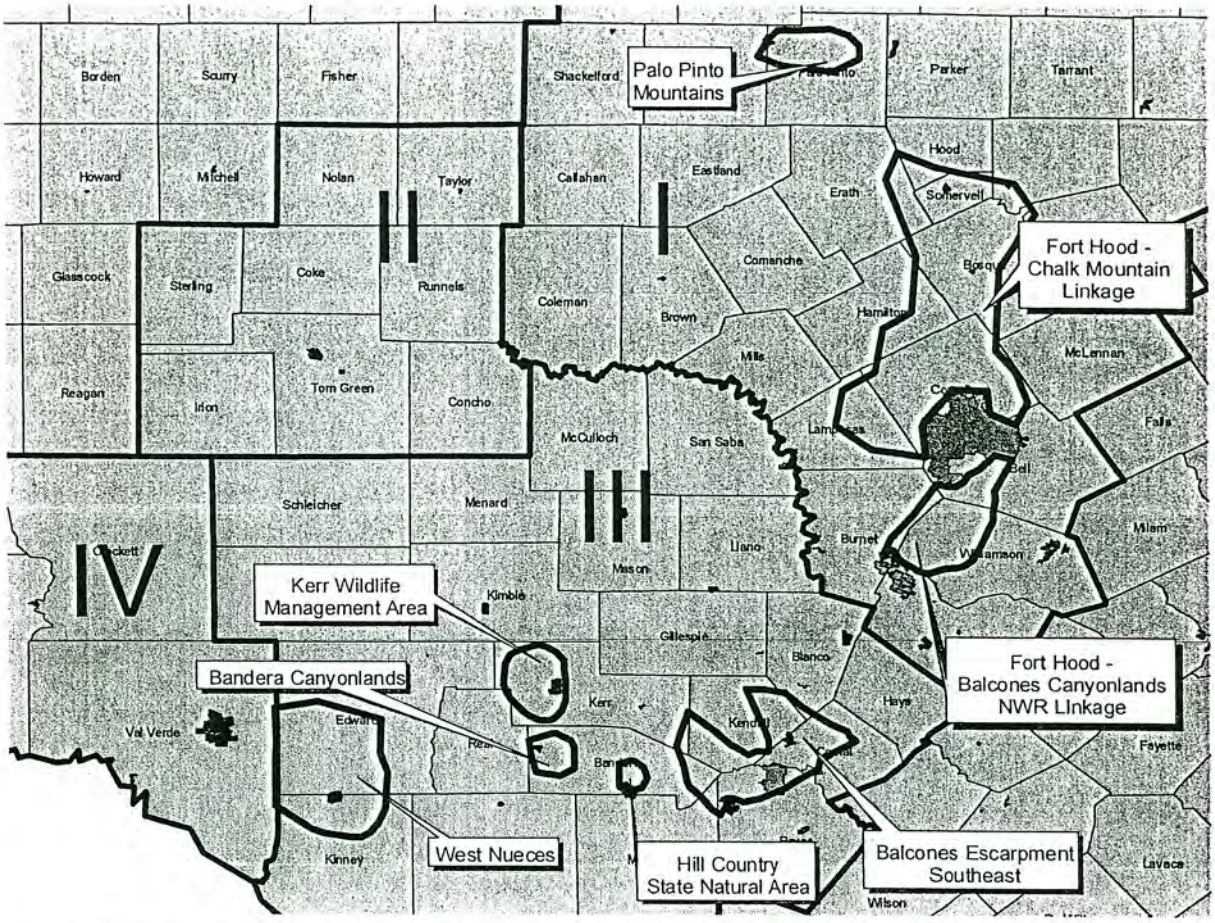

Figure 1. Eight key landscapes where Environmental Defense has focused its stewardship and safe harbor efforts.

Monitoring Program and Habitat Design Criteria

Baseline vegetation data was gathered for each safe harbor restoration area using relevé samples (Mueller-Dombois and Ellenberg 1974). In this method the surveyor visually assesses the species composition and cover within circular plots located so as to capture the extent of variation within each vegetation community, as well as the transition between community types.

The number of plots used to adequately characterize a particular vegetation type is dependent on the plant diversity and the degree of heterogeneity within each type. Plot sizes range from ten meters in diameter for forests to one meter for grasslands. This information has been submitted to the Austin Ecological Services Office as part of the review process for each Safe Harbor Cooperative Agreement, as well as in each yearly safe harbor report.

In order to accomplish the monitoring and analysis necessary to establish habitat design criteria Environmental Defense funded a research assistantship position at the University of Missouri. Wes Bailey filled this position in fall 2002 and shortly thereafter completed the details of a research program entitled "A Multi-scaled Approach to Examine Nest Site Selection and the Effects of Habitat Characteristics on Black-capped Vireo Nest Success" (also referred to as "habitat characteristics study" in this report) under the direction and guidance of Environmental Defense (David Wolfe), Texas Parks and Wildlife Department (John Maresh), Jeff Hatfield (USGS – BRD) and Dr. Frank Thompson III (University of Missouri).

The Fort Hood study sites are located in training areas on the southwest and west sides of the installation primarily within the Coryell County portion of Fort Hood (Fig. 2). Specific training areas included in this study were as follows: 72, 53, 52, 51, 48, 45, 44, 42, 35, and 33. Study sites were defined as the delineated Black-capped Vireo habitat patches derived by The Nature Conservancy and included three of the established vireo intensive monitoring study areas. These sites are located in Training Area's 44, 24, and 2 and have been monitored each breeding season since 1997 .For a detailed description of these study areas see Cimprich (2002). See Weinberg et al. (1998) for a more complete description of the installation. A total of 31 habitat patches were selected for the study within the training areas. Patch-sizes ranged from 6.8-802.4 ha (mean 116.3 ha).

The private lands site is a 1,600-acre ranch (Quail Ridge Ranch) in Somervell County in the northern portion of the Fort Hood - Chalk Mountain Linkage. Quail Ridge Ranch is participating in the Landowner Conservation Assistance Program and the bulk of this ranch is enrolled in safe harbor (1,433 acres for the vireo). Quail Ridge Ranch and the surrounding Chalk Mountain landscape was selected as a focus area for this project for several reasons: (a) Quail Ridge Ranch has 56 acres of densely occupied Black-capped Vireo habitat that has been intensively monitored since 2001, (b) nearly 2,000 acres are being managed to create vireo habitat in close proximity to the existing habitat and (c) four landowners are currently enrolled in safe harbor in the Chalk Mountain landscape and several more landowners have expressed an interest in program participation. The monitoring program at Quail Ridge Ranch has included color banding, productivity monitoring, and vegetation characterization.

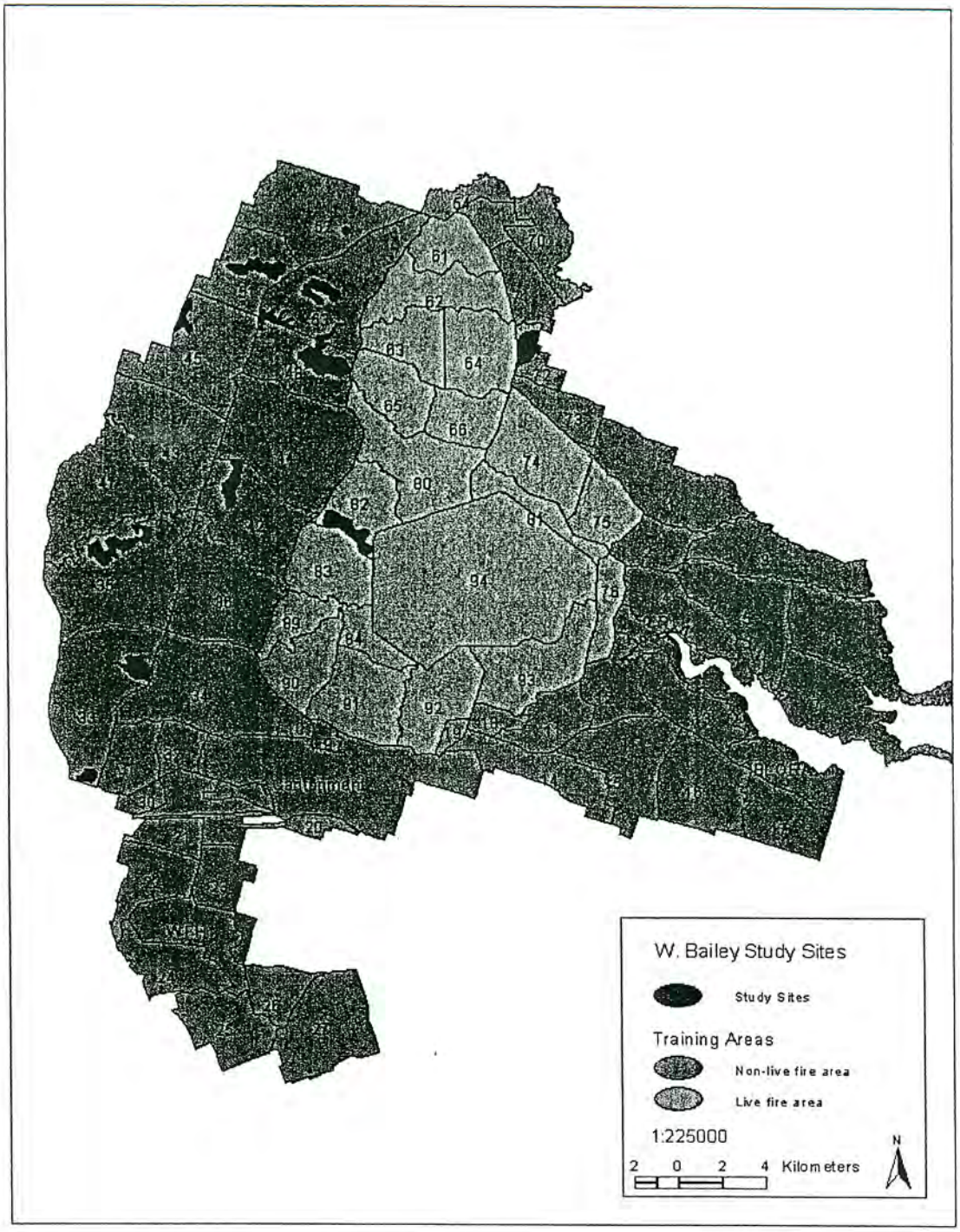

Figure 2. Study sites for the investigation of Black-capped Vireo nest success on Fort Hood Military Reservation.

Habitat characteristics were measured at three spatial scales: habitat/landscape, nest-patch, and nest-site. The three sets of spatial characteristics are described below.

The habitat patch containing the nest was classified as originating from fire or mechanical disturbance, either less than or greater than or equal to 10-years ago. Percent deciduous and evergreen shrub cover was determined within 100m and 1 Km radius of each nest (Fig. 3). Shrub cover will be classified from aerial photography using a supervised classification in a GIS.

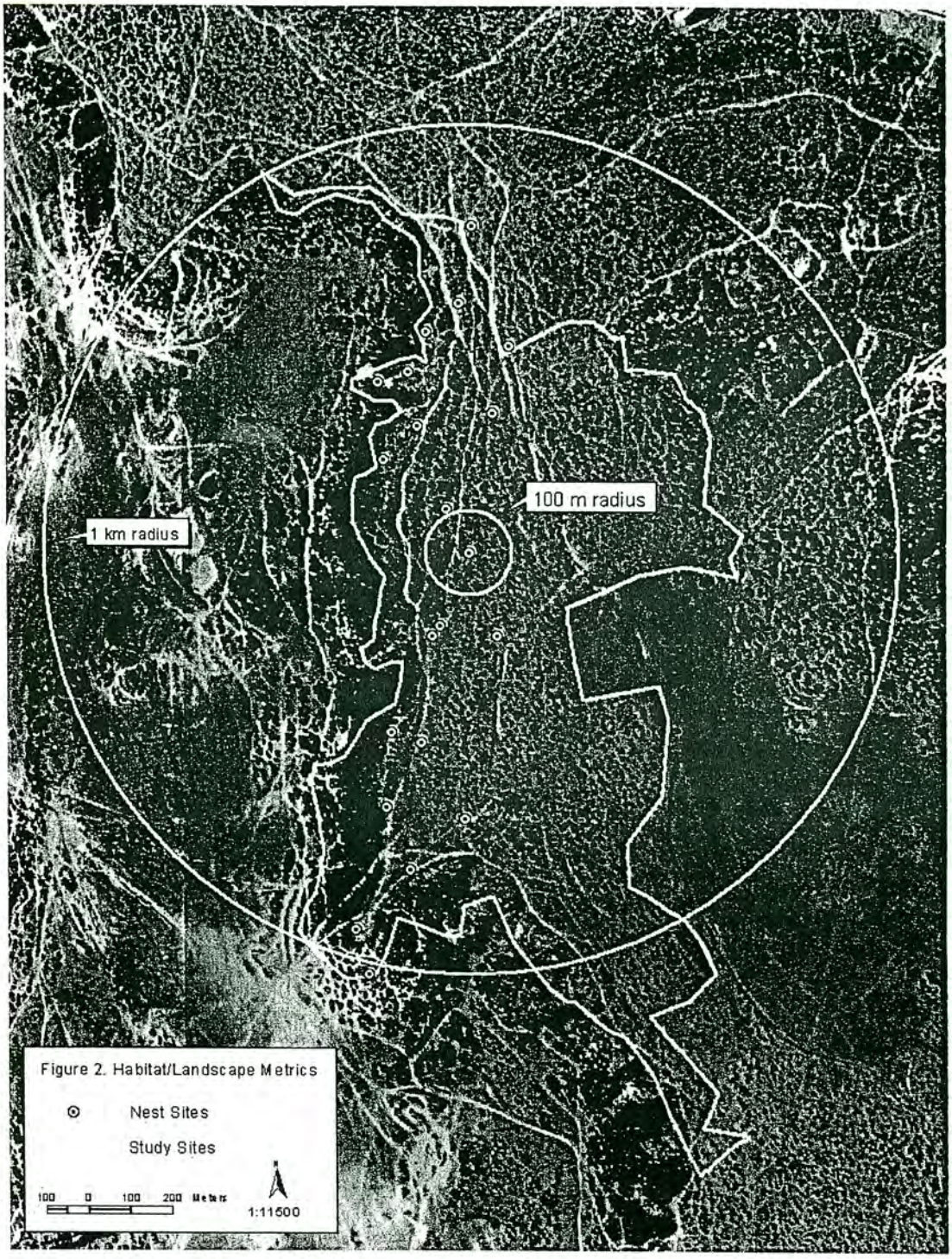

Figure 3. Habitat/landscape-scale metrics within spatially explicit radii to investigate high-scale effects of habitat on Black-capped Vireo nest success.

Nest –patch

Burhans and Thompson's (1999) definition of nest patch as "interlocking leafy shrub or tree vegetation at nest height within which the nest plant is situated" was used. Shape metrics of each nest patch were recorded by measuring length, width, and perimeter. Using the nest-site as the center point, the percent vertical cover of each nest-patch was estimated by using a density board (Nudds 1977). From a distance of 15 m in each cardinal direction, percent cover was estimated for zones at 0-l m, l-2 m, and 2-3 m on the board. The mean of these four percentages will be calculated to obtain one estimate for analysis.

Nest-site

Nest-site characteristics were measured within 5 days after nest completion and nest substrate was recorded. Nest height was measured from the ground to the bottom of the nest cup. Percent side cover was estimated as the percentage of the nest cup concealed by vegetation (to the nearest 5%) at nest height, 1m from the nest in each cardinal direction. The mean of these four percentages was calculated to obtain one estimate for analysis. Percent overhead cover was estimated as a percentage of the nest that is concealed by vegetation from 15 cm above the nest. The distance from the nest to the nearest leafy edge of the nest-patch was measured.

Logistic regression will be used to model the effects of explanatory variables on the probability a nest survived the interval between nest checks (Peak et al. 2002). This method uses the interval between nest checks as the experimental unit, so explanatory variables that change between intervals, such as nest stage and date, can be considered in the models. This method is comparative to the counting process approach in survival analyses (Hosmer and Lemeshow 2000).

An information-theoretic approach (Burnham and Anderson 2002) will be used to evaluate hypotheses concerning the effects of nest site, nest-patch, habitat-patch, and temporal variables (Table 1) on the nest success of Black-capped Vireos. A set of a priori models that are composed of different groups of variables from Table 1 (see next page) are provided below:

1. Null: No effect or constant nest success
2. Nest-site
3. Nest-patch
4. Habitat/Landscape
5. Temporal
6. Nest-site + Nest-patch + Habitat/Landscape + Temporal
7. Nest-site + Nest-patch + Temporal
8. Nest-patch + Habitat/Landscape + Temporal
9. Habitat/Landscape + Temporal
10. Global: Nest-site + Nest-patch + Habitat/Landscape + Temporal

Table 1. Scale and variables measured in the investigation of nest success in black-capped vireos on Fort Hood Military Reservation.

Scale	Variable	Measurement
Habitat/Landscape	Site	Training Area
	Habitat	Burned, Mechanical
	Habitat Age	(≤ 10 years, ≥ 10 years)
	Shrub Cover (Habitat)	Measured within 100m radius as a percent
	Shrub Cover (Landscape)	Measured within 1km radius as a percent
Nest-patch	Vertical Cover	At 15m facing nest, 4 cardinal directions using cover board
	Shape Index	Edge to area ratio
	Patch Metrics	Area and perimeter
Nest-site	Nest height	Measured from bottom nest cup to ground
	Nest concealment	Horizontal and vertical
	Distance to edge of nest-patch	Distance from nest to closest leafy edge of nest -patch
Temporal	Year	2003, 2004
	Julian date	Date of event (fledged, depredated)
	Nest stage	Laying, incubation, nestling stage

Akaike's Information Criterion (AIC) will be used to rank models from the most- to least-supported model given the data (Burnham and Anderson 2002). The goodness-of-fit of the global model will be evaluated with Hosmer and Lemeshow (2000) goodness-of-fit tests. Model-selection uncertainty will be considered by using the entire set of candidate models to calculate odds-ratios based on model-averaged coefficients and 95% confidence intervals (CI) based on unconditional standard errors (Burnham and Anderson 2002). Model-averaged coefficients will be calculated as the sum of coefficients multiplied by AIC weights (w_i) from their respective model (Burnham and Anderson 2002). A zero (0) will be used for a coefficient when a model does not contain an explanatory variable. By doing so, odds ratios will represent the contribution of the explanatory variable across the entire set of candidate models (Burnham and Anderson 2002).

Daily nest success will be estimated by using models that show the most support. The link function for logistic regression will be modified to account for length of each nest interval, thus the predicted probabilities represent the probability of a nest surviving one day and are comparable to daily survival estimates of other methods (i.e. Mayfield 1961, 1975; Johnson 1979).

Nest success will be analyzed at several scales by examining competing models. If more than three variables are present for each scale, a two-step model will be used to select the best variable under each category. Alternative models will be used to compare the most important scale variables to one another.

Results and Discussion

Landowner Contact and Participation

Environmental Defense directly contacted a total of 25 landowners to discuss Safe Harbor and explore the suitability of restoration practices on their land. As of August 2004 seven Safe Harbor Cooperative Agreements have been signed, two were in draft form, and one was under development. A summary of the contacts made, and Safe Harbors completed (or underway) is provided in the following table.

Publicly owned land or other priority habitat area	**Safe Harbor contacts through August 2004**	**Safe Harbors completed.**	**Safe Harbors in progress.**
Balcones Escarpment Southeast	2 landowners	1 (197 acres for the vireo)	
Bandera Canyonlands	3 landowners		
Fort Hood - Balcones Canyonlands NWR Linkage	4 landowners	1 (20 acres for the vireo)	1
Fort Hood - Chalk Mountain Linkage	10 landowners	4 (a total of 1,676 acres for the vireo and 76 acres for the warbler)	
Hill Country State Natural Area	1 landowner		1 (draft – 3,978 acres for the vireo)
Kerr Wildlife Management Area	1 landowner	1 (40 acres for the vireo)	
Palo Pinto Mountains	1 landowner		1 (draft – 105 acres for the vireo)
West Nueces	3 landowners		
Total	**25 landowners**	**7 completed**	**3 in progress**

The seven completed agreements represent 1,933 acres of new habitat for the Black-capped Vireo and 76 acres of new habitat for the Golden-cheeked Warbler. The two in-progress agreements that have been drafted represent an additional 4,083 acres of habitat for the vireo.

Land management plans have been completed for 14 of the landowners listed in the table. The agreed-upon restoration measures have been implemented, or are in progress, for all of these landowners. An example management plan, which is incorporated into a Safe Harbor Cooperative Agreement, is included with this report as part of Appendix A.

Monitoring Program and Habitat Design Criteria

An example of baseline data collected as part of the establishment of each Safe Harbor Cooperative Agreement is included with this report as part of Appendix A.

In spring 2004 habitat restoration – safe harbor enrolled areas were deemed to be nearly suitable for Black-capped Vireo colonization on four participating properties: one in the Fort Hood - Balcones Canyonlands NWR Linkage, two in the Fort Hood - Chalk Mountain Linkage, and one in the Balcones Escarpment Southeast landscape. These four areas were surveyed during spring 2004 for the presence of vireos. No vireos were detected on newly restored safe harbor areas at the first three sites. Two vireos were detected on one occasion at the Balcones Escarpment Southeast site, most likely in response to call station stimulation, but these birds did not establish territories.

Color-banding has been conducted on Quail Ridge Ranch, in the Fort Hood - Chalk Mountain Linkage, for the purposes of monitoring site return rates, as well as dispersal/population expansion to newly restored safe harbor areas in the nearby landscape. Results of the color-banding effort are presented in Appendix B. Results of return rates are presented in Maresh 2004.

As part of the habitat characteristics study, Wes Bailey gathered productivity and habitat data during both the 2003 and 2004 field seasons on the Fort Hood study sites and a summary of this data is presented below (Table 2). Environmental Defense and TPWD collected similar productivity and habitat data from the participating private land site (Quail Ridge Ranch) every field season since 2001. Summary results are provided below in Table 3.

Table 2. Fort Hood Study Area Productivity Data

	2003	2004
Total nests found	131	170
Total nest to be used in analyses	126	163
Parasitism Rate	8.40%	12.27%
Percentage of Depredated Nests	50.40%	48.47%
Percentage of Successful Nests	42.00%	45.40%
Percentage of Abandoned Nests	6.70%	0.08%
Percentage of Failures due to Weather	3.40%	
Percentage of Failures cause Unknown	3.40%	

Table 3. Quail Ridge Ranch Productivity Data

	2001	2002	2003	2004
Total nests found	22	26	20	23
Total nest to be used in analyses	22	26	20	22
Parasitism Rate	86.36%	34.62%	55.00%	63.64%
Percentage of Depredated Nests	40.91%	34.62%	40.00%	36.36%
Percentage of Successful Nests	9.09%	46.15%	30.00%	18.18%
Percentage of Abandoned Nests	31.82%	7.69%	20.00%	22.73%

Table 3. Quail Ridge Ranch Productivity Data	2001	2002	2003	2004
Percentage of Failures due to Weather	0.00%	0.00%	0.00%	0.00%
Percentage of Failures cause Unknown	31.82%	11.54%	20.00%	22.73%

Preliminary analysis of the data gathered as part of the habitat characteristics study have provided a number of insights concerning the design of habitat restoration projects for the Black-capped Vireo:

- Beginning in 1988, cowbird control was implemented on Fort Hood to reduce brood parasitism on Black-capped Vireos (Summers and Norman 2003). With such a substantial reduction in parasitism (see Summers and Norman 2003), factors that influence cowbird parasitism on vireo nest success were not examined. However, in an environment without cowbird control the negative impacts of parasitism are likely to swamp the effects of nest-site characteristics on vireo nest success.
- Both temporal and landscape factors appear to have a much greater impact on vireo nest success than nest site or nest patch factors. Several nesting studies found that nest site characteristics are not important to nest success (Zannette and Jenkins 2000, Rodewald and Yahner 2001, Budnik et al. 2002, Chalfoun et al. 2002, Peak et al. 2002, Thompson et al. 2002).
- Temporal factors evaluated include: nest stage (incubation, hatching, nestling), age of the nest (number of days the nest survives), and weather. The longer the nest is exposed, the higher the probability of being located by predators. The age of the nest may influence whether or not a nest in depredated. For example, during incubation the adults quietly sit for long periods of time, reducing cues predators might key on. During the nestling stage, activity at the nest increases (e.g., begging increases, adults fly to and from the nest regularly) which might cue in predators. Results of studies examining the relationship between temporal factors and nest success suggest that variation in predator type, activity, abundance, and prey selection throughout the breeding season may be more important than nest-site factors in explaining nest success (Peak et al. 2004). Some studies have found that nests are more successful during the early part of the season, which is true for the Black-capped Vireo in some locations (John Maresh pers. comm.), however vireos are also known to do well towards the end of the season after cowbird activity decreases (Wes Bailey pers. comm.).
- Landscape factors are the characteristics of the matrix surrounding the habitat patch. For example, is the surrounding matrix vegetated or un-vegetated (e.g. urban development)? If vegetated, is the surrounding matrix grassland, shrubland, mature oak – juniper forest, or some other type? All these variables influence the predator community. Landscape factors are likely to enhance or limit movement across the landscape, thereby affecting predator abundance.

In terms of habitat restoration project design these preliminary results indicate that cowbird control, followed by an evaluation of the landscape context should be the first considerations

when evaluating the viability and value of a particular restoration project to the vireo. This assumes, of course, that one is already within an area known to have the potential for creating suitable and usable habitat. Habitat characteristics at the scale of the nest site and nest patch are still important, but less so, and will be determined in large degree by the environmental conditions (e.g., soils, rainfall, etc.) at each particular site. Temporal factors are essentially out of our control.

Cowbird trapping is an integral component of each safe harbor project. This practice continues to be considered essential to vireo nest success within most individual populations, as well as for overall recovery. Most landowners who are willing to participate in endangered species habitat restoration are also willing to participate in cowbird control. However, the traps are relatively expensive and running the traps requires a considerable investment of time.

Environmental Defense is increasingly focusing its efforts on vireo recovery within specific high-priority landscapes. As part of this approach we will be testing the feasibility of having one, or a few individuals running a circuit of traps on participating landowner properties. This approach has the potential to increase efficiency, not only in terms of labor investment, but also in terms of trap effectiveness. In other words, in a landscape of cooperating landowners it will be possible to establish traps at locations where they will be most effective in terms of overall, landscape level cowbird control. Using this strategy it will likely not be necessary to place a trap on each individual landowner property. This process may also be enhanced by shooting at selected times and locations.

As is generally true for most songbirds the larger the expanse of vireo habitat the better in terms of nest success and population growth (assuming all other factors are equal). While the preliminary results from the habitat characterization study are insufficient to make any statements concerning minimum viable[1] patch size for restoration a qualitative assessment is possible as a result of population monitoring at five private ranches (one of which is a safe harbor participant), as well as Camp Barkeley, a Texas Army National Guard Training site in Taylor County and Big Bend National Park (John Maresh pers. comm.). The populations on the private ranches have been monitored for four years and Camp Barkeley has been monitored yearly since 1994. Results of this monitoring indicate that the minimum viable size for a relatively isolated potential restoration area (defined as being at least 30 km from an area of equal or greater size with an existing population) should probably be on the order of 50 acres. A potential restoration area as small as 20 acres appears likely to create a net benefit to the vireo if it is embedded within a landscape matrix (within 30km) of existing, occupied habitat patches, even if all of the patches are relatively small. Projects of 10 acres or less should probably be given very low priority unless the area under consideration would expand an existing, occupied area of habitat.

The data analysis currently being conducted as part of the project entitled "A Multi-scaled Approach to Examine Nest Site Selection and the Effects of Habitat Characteristics on Black-capped Vireo Nest Success" (anticipated publication date of May 2005) will provide additional detail on the impact of spatial scale on population-level nest success and thereby provide

[1] Defined as being the minimum size that will facilitate net population growth over a four year period (the term required by Safe Harbor Cooperative Agreements for maintenance of a restored habitat area).

additional guidance on the appropriate scale of habitat restoration projects given a particular landscape setting.

Suggestions for Future Management, Conservation and Recovery

In terms of landowner interest and participation the Black-capped Vireo Safe Harbor Section 6 project achieved a level of success well beyond initial expectations. During the course of the project a total of 25 landowners were contacted regarding safe harbor and seven cooperative agreements were completed. Three more cooperative agreements are currently in progress (two in draft form as of August 2004). Landowner interest in habitat restoration projects and safe harbor participation remains high; the number of agreements would have been higher if additional staff resources had been available during the course of the project.

During the three-year term of the project, Environmental Defense and its partners have gained considerable knowledge about the abundance and distribution of vireos, the design and implementation of restoration techniques, and the best approaches for encouraging landowner participation in endangered species recovery efforts. We share the most relevant and applicable portions of this increased knowledge below and relate it to future Black-capped Vireo management, conservation and recovery efforts.

Environmental Defense and TPWD staff are currently collaborating on the development of a comprehensive status update for the vireo. We anticipate that an initial draft of this document will be circulated for review on, or before January 15, 2005. Using data available since 1998 Environmental Defense and TPWD staff summarized Black-capped Vireo abundance and distribution as shown in the following table.

Recovery Region	Known Population	Comments
I	2,015 males	1,847 males on Fort Hood alone
II	32 males	All from private lands
III	1,084 males	Approximately half of this number comes from birds on Kerr WMA and Kickapoo Caverns SP. The balance is from private lands and right-of-ways.
IV	265 males	78 males on Devils River State Natural Area, 16 from Big Bend NP, the balance on private lands.

In terms of making progress toward vireo recovery the numbers in the table above point toward the following next logical steps:

1. Additional inventory work on private lands is needed throughout the range, but especially in regions II and IV.
2. The fact that so few vireos are known to occur in regions II and IV is attributable in large part to the historic lack of access to private lands, however the relatively low values may also reflect less overall habitat or degraded habitat conditions in these regions as compared to regions I and III.

3. Recovery goals for the vireo (i.e., minimum population sizes and distribution) and associated recovery regions should be updated based on current population viability analysis (PVA) work in combination with an updated assessment of potential habitat across the breeding range.
4. In the near term efforts to restore and conserve vireo habitat on private lands should be focused on the following areas: region II (Concho Valley), lands adjacent or near to Kerr Wildlife Management Area and lands in the Balcones Escarpment Southeast landscape.
5. Once step 3 is achieved then a working group of local and national land trusts, scientists, and other stakeholders should be convened to develop a priority list of recovery sites and to design and implement a strategy for perpetual conservation of these sites. This working group should meet two to three times per year to assess progress toward recovery goals.

Pending funding support, Environmental Defense intends to make substantial progress on step 4 beginning in early 2005. We are preparing for this effort by adding additional staff resources and creating new, as well as building upon existing partnerships.

Partners have been vital to our success at encouraging landowner participation and enrolling them in safe harbor cooperative agreements. Another effective strategy that evolved during the course of this project is the "key landowner" concept. A key landowner is one that owns an important property for habitat restoration and is well-established, well-connected, outgoing and highly regarded in his or her community. Once a positive relationship is established with a key landowner, it is then possible to have this landowner serve as both an example and emissary for the safe harbor program. As a rule we now seek out, identify and approach potential key landowners in every landscape where we work.

Another lesson we learned during the course of this project is the high degree of interest in the wildlife property tax valuation. Many landowners in central Texas run livestock merely to take advantage of the agricultural property tax valuation; in fact many willingly lose money on the livestock simply because the financial savings from the reduced property taxes more than make up for this loss. When these landowners are made aware of the fact that participation in endangered species habitat restoration and monitoring will help them qualify for the wildlife valuation they are generally eager to participate, especially with the added regulatory reassurances of safe harbor.

In terms of actual restoration techniques we still rely primarily on the use of hydraulic shears to remove second-growth Ashe juniper and "top" or prune spindly oaks so as to encourage resprouting. However, we have also supported mechanical manipulation with chainsaws (where the labor was available and where the landowner wished to avoid all soil disturbance) and by bulldozer (generally limited to shallow or no soil areas). While prescribed fire is typically identified as a follow up maintenance treatment we increasingly seek opportunities to use fire initially as it is relatively inexpensive compared to mechanical treatments. Prescribed fire can often be "pushed" into a cedar brake over a series of years thereby reducing cedar cover and encouraging the restoration of fire adapted deciduous species such as shin oak.

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Appendix A

Baseline Vegetation Analysis
And
Habitat Restoration Plan
For
Safe Harbor

Quail Ridge Ranch
Somervell County

Introduction

The 1600-acre Quail Ridge Ranch is located in the Cross Timbers and Prairies Ecological Region at the interface between the Western Cross Timbers and the Grand Prairie (see Map 1). The eastern two-thirds of the ranch consists of gently rolling topography with elevations ranging from 1080 to 1200 feet. The western third of the ranch consists of the southern extension of Chalk Mountain. This approximately mile-long extension runs generally from the northwest to the southeast and has a maximum elevation of approximately 1270 feet. The ranch is bisected by Rough Creek which runs generally parallel to and about a half mile to the east of the Chalk Mountain extension. This creek runs during all but the driest of years.

The Brackett and Tarrant – Purves Association soils on Chalk Mountain support vegetation more characteristic of the Edwards Plateau than of the Cross Timbers and Prairies. The vegetation on the top, mostly flat ridge consists of a mix of shrublands and woodlands with grass dominated openings scattered throughout. The northern quarter is dominated by a woodland of stunted plateau live oak (*Quercus fusiformis*) as well as Ashe juniper (*Juniperus ashei*). The southern three-quarters is dominated by an oak shinnery of varying height (generally from 2 to 8 feet) and density. Shin oak (*Quercus sinuata* var. *breviloba*) is the primary constituent of this community, however a variety of other shrubs and small trees including elbowbush (*Forestiera pubescens*), Mexican buckeye (*Ungnadia speciosa*), redbud (*Cercis texensis*), and Ashe juniper are also present. In addition, openings dominated by sideoats grama (*Bouteloua curtipendula*), as well as other native grasses and forbs are present in a matrix with the shinnery and are somewhat more expansive in the southernmost quarter of the mountain. Surveys conducted in May and June 2000 by staff of Environmental Defense and Texas Parks and Wildlife Department documented the presence of a minimum of three Black-capped Vireo (*Vireo atricapilla*) territories in the oak shinnery habitat.

The eastern two-thirds of the ranch consists of a matrix of forests, woodlands, savannas, and grasslands. Historically, much of the woody vegetation had been cleared to accommodate grazing. The area between Rough Creek and FM2013 (see Map 2) to the east and between Rough Creek and Chalk Mountain to the west consists primarily of broad, gently undulating rangeland. These rangeland soils are mapped as Maloterre gravelly clay loam (low range potential) and a variety of soils in the Tarrant-Purves association (medium range potential). The dominance and frequency of individual

species varies from one rangeland site to the next. Savannas are characterized by scattered, relatively large individuals of plateau live oak with the occasional presence of other trees and shrubs. Grasslands are primarily composed of native grasses and forbs with little bluestem (*Schizachyrium scoparium*) and sideoats grama (*Bouteloua curtipendula*) exhibiting dominance in most of the grassland areas. Scattered woodlands are composed of plateau live oak, shin oak, Texas oak, ashe juniper, redbud, elbowbush, and flameleaf sumac (*Rhus lanceolata*).

Mature riparian forest can be found along much of Rough Creek and contributing drainages. This forest has a canopy of Pecan (*Carya illinoensis*), Sugarberry (*Celtis laevigata*), and American Elm (*Ulmus americana*). The understory is composed primarily of flowering dogwood (*Cornus florida*), rusty blackhaw (*Viburnum rufidulum)*, and deciduous holly (*Ilex decidua*). Soils on the geologic terraces along the creek and on the adjacent floodplain are Venus loam. This loam is high in organic matter and has a deep root zone. Several small pastures (mostly 6 to 10 acres) in the floodplain east of Rough Creek had historically been planted in coastal bermudagrass (*Cynodon dactylon*). Immediately upslope of, and contiguous to the western side of the riparian zone can be found small patches (2 to 7 acres) of mid to late successional oak – juniper woodland. The primary dominants in this community are Texas oak (*Quercus buckleyi*) and Ashe juniper. Young Ashe junipers dominate the understory. Soils are Sunev clay loam, a productive, high organic matter soil.

Through a cooperative project with the U.S. Fish and Wildlife Service (Partners for Wildlife) a total of 48 acres of wetlands and wetland affected areas have been created in the south-central portion of the ranch. These wetlands are valuable habitat for a variety of waterfowl and other wildlife.

Overall Habitat Restoration and Management Strategy

Landowner is in the process of shifting from extensive brush manipulation via mechanical means to reduce invasive juniper density to using prescribed fire to create and maintain desired habitat characteristics. The overall goal is to develop a mosaic of habitats that benefit a variety of native animals including endangered species (specifically Black-capped Vireos and Golden-cheeked Warblers) and game species (e.g., Bobwhite quail, white-tailed deer, and wild turkey).

Black-capped Vireo Monitoring Program

Since the discovery of Black-capped Vireos on the ranch in June of 2000 Environmental Defense has worked in cooperation with Texas Parks and Wildlife Department to intensively monitor this population as part of a Section 6 project entitled "Census and Monitoring of the Black-capped Vireo in Texas". A summary of the results of this monitoring effort is provided in Attachment B and Map 2 shows the existing occupied habitat.

Delineation of Management Zones

Maps 3 and 4 use a 1996 leaf off color-infrared image as a base layer for the Ranch. Map 3 shows the ten management units that have been recently manipulated with a goal of restoring a shrubland/grassland matrix suitable for use by Black-capped Vireos. Beginning in October 2003 management will shift to the use of prescribed fire in three large management areas on a rotating basis as indicated on Map 4. A description of the vegetation and a discussion of the proposed management within each unit are provided below.

Baseline Conditions – Overview

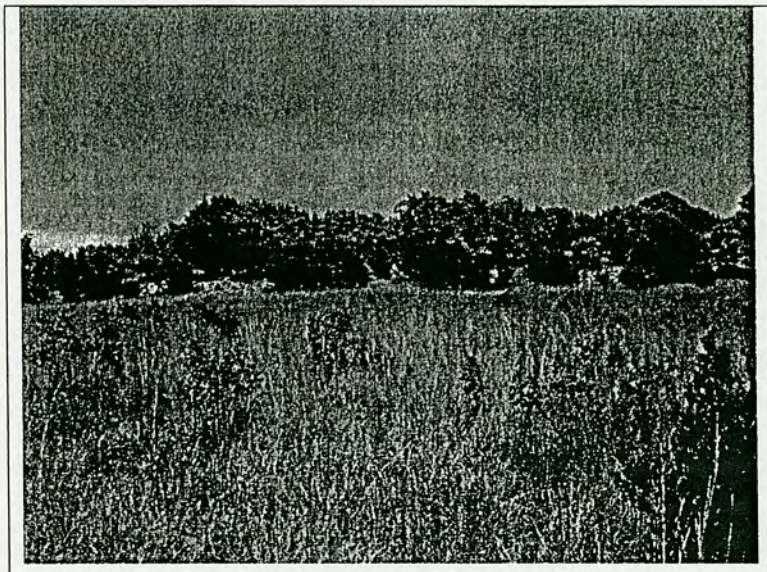
Baseline conditions shall be considered effective as of September 30, 2002. This date immediately precedes the initial use of prescribed fire as a habitat restoration tool on the ranch. Baseline vegetation conditions were documented, described and photographed within all management units through a series of surveys beginning in October 2001 and proceeding through October 2003. These conditions are described in detail below. Occupied Black-capped Vireo habitat is as delineated on Map 2.

Baseline Conditions – Vireo Management Areas 1-3 (VMA1 through VMA3)

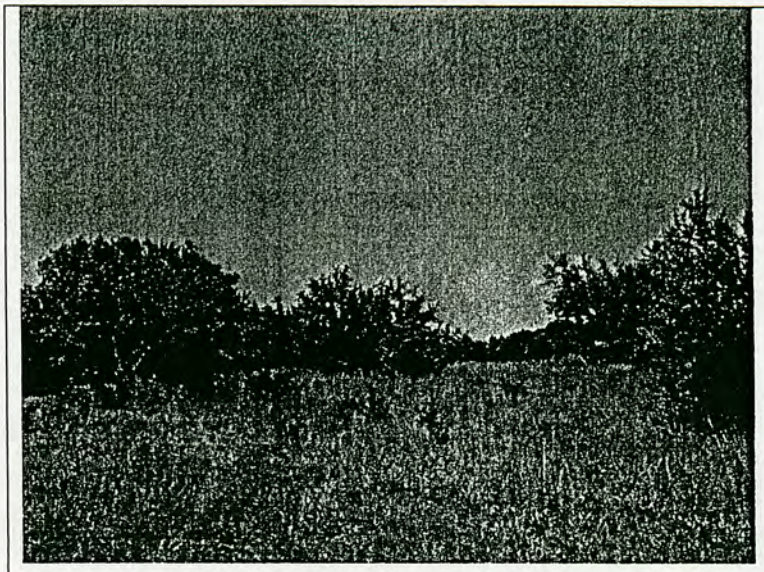
Baseline Conditions VMA 1

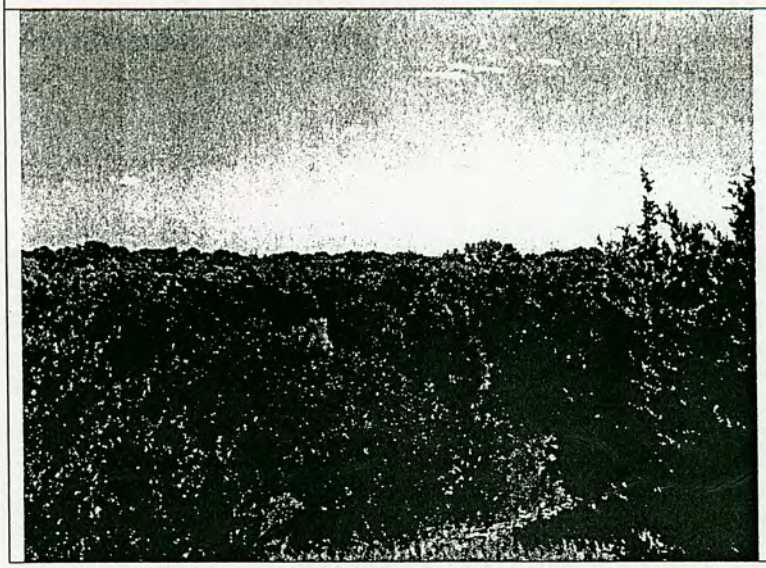
VMA 1 covers 453 acres. Since the establishment of baseline conditions (September 30, 2002) prescribed fire has been implemented on four units (VMA1.F1 through F4) and brush management has been implemented on one unit (VMA1.B1).

This area is a matrix of grasslands, cedar-invaded woodlands, riparian forests, and wetlands. Topography is generally flat to gently sloping. The portion of VMA1 north of the drainage identified as Tributary 1 on Map 4 tends toward more woodland conditions with a substantial component of Ashe, and to a lesser degree redberry juniper. Ashe juniper cover averages 40% in this area and heights are generally in the range of 8 to 12 feet. Widely scattered individuals of live and Spanish oak are present throughout with heights reaching 28 feet for the former and 25 feet for the latter. Patches of open grassland are scattered throughout with little bluestem as the predominant species. Other common components of the grasslands include KR bluestem (*Bothriochloa ischaemum* var. *songarica*), indiangrass, sideoats grama, and a variety of forbs. Flameleaf sumac is a common invader of grassland patches. Widely scattered individual shin oaks are also present. Total deciduous shrub cover averages 20 to 25%. The portion of VMA1 south of the drainage identified as Tributary 1 tends toward more grassland conditions with little and KR bluestem sharing dominance depending on the particular location. Widely scattered individual live oaks with heights generally in the range of 12 to 25 feet are present, mostly in the southern and eastern portions of this area. Small junipers (heights generally 3 to 6 feet) are present in low densities in various portions of the grasslands.

	Northern portion of VMA1. Grasslands in foreground are dominated by little bluestem with numerous individuals of flameleaf sumac (a common invader). Ashe juniper dominated woodland in background on gentle slope. Photo taken on June 3, 2003 at UTM northing 605141 and easting 3558213 facing northeast. Photo number 1 on Map 4.
	Northern portion of VMA1. Photo location is same as previous photo but facing southeast. Photo number 2 on Map 4.

The next four photos were taken in prescribed burn unit VMA1.F1 (see Map 3). This unit covers 168 acres and was burned in September 2003.

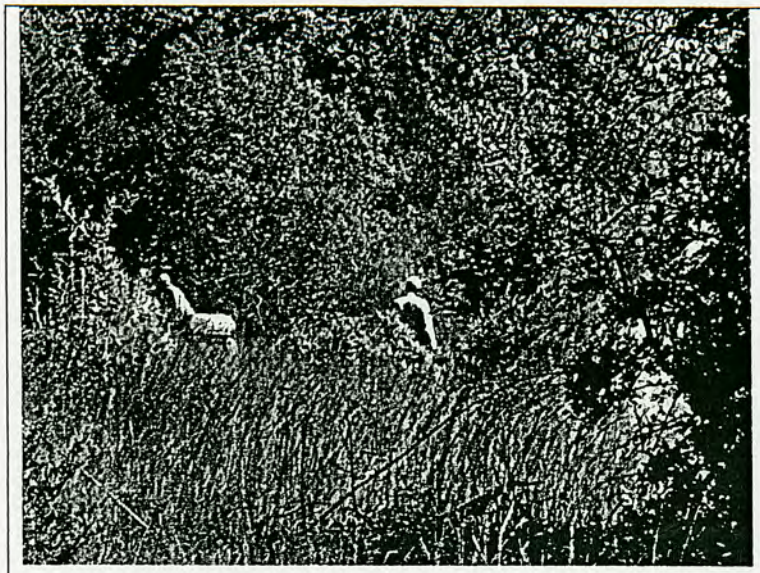
	Northern portion of VMA1.F1. Grassland dominated by little bluestem with scattered second growth Ashe juniper. Photo taken on June 3, 2003 (pre-burn) at UTM northing 605478 and easting 3557848 facing north. Photo number 3 on Map 4.
	Northern portion of VMA1.F1. Photo location and date are same as previous photo, but facing east. Note scattered individual live oak trees in foreground left and background right. Photo number 4 on Map 4.
	Southern portion of VMA1.F1. Second growth Ashe juniper accounts for approximately 40% cover and heights are generally in the range of 8 – 12 feet. Widely scattered individuals of live oak (to 26 feet) and Spanish oak (to 16 feet) are also present. Photo taken on June 3, 2003. Photo location is UTM northing 606300 and easting 3557064. Photo faces south. Photo number 5 on Map 4.

	Southeastern portion of VMA1.F1. Second growth Ashe juniper accounts for approximately 50% cover and heights are generally in the range of 8 to 12 feet. Photo taken on June 3, 2003. Photo location is UTM northing 606378 and easting 3557166. Photo faces south. Photo number 6 on Map 4.

Units VMA1.F2, VMA1.F3, and VMA1.F4 Baseline Conditions

These three units are a mix of grasslands and savannas with patches of small, second-growth Ashe juniper. In general, little bluestem grasslands dominate the western and southern portions of these units and live oak savannas dominate the eastern and northern portions. In addition to little bluestem, other common grasses include KR bluestem, indiangrass, side oats grama, and switchgrass (*Panicum virgatum* - common in low, moist areas). Unit VMA1.F2 covers 65 acres, Unit VMA1.F3 covers 34 acres, and Unit VMA1.F4 covers 43 acres.

	Southern portion of VMA1.F2. Grassland dominated by little bluestem. Photo taken on October 15, 2002 at UTM northing 606423 and easting 3555994 facing northwest. Photo number 7 on Map 4.

	Northern portion of VMA1.F4. Little bluestem dominated grassland in foreground and riparian forest (Tributary 2) in background. Photo taken on October 15, 2002 at UTM northing 607096 and easting 3556458 facing north. Photo number 8 on Map 4.
	Central portion of VMA1.F4. Second growth Ashe juniper under live oaks. Photo taken on October 15, 2002 at UTM northing 607199 and easting 3556203 facing northeast. Photo number 9 on Map 4.

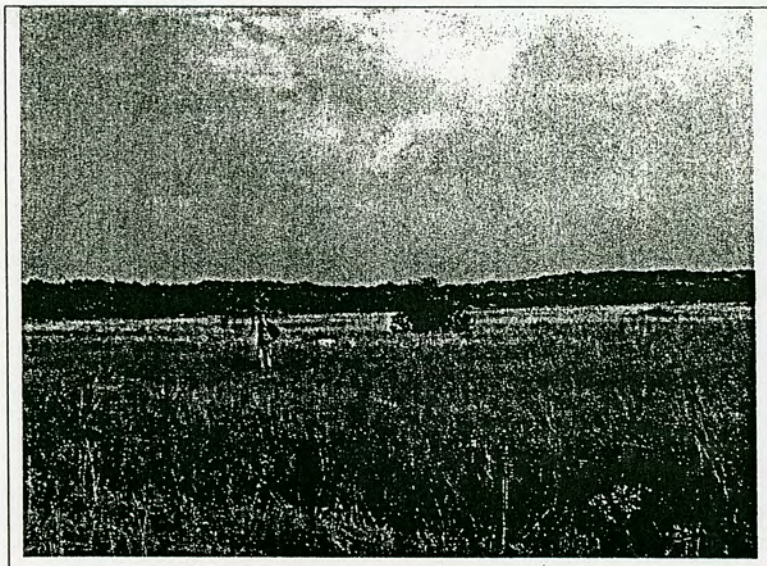
Baseline Conditions VMA 2

VMA 2 covers 629 acres. Since the establishment of baseline conditions (September 30, 2002) prescribed fire has been implemented on two units (VMA2.F1 and F2) and brush management has been implemented on two units (VMA2.B1 and B2).

The extreme northern and southern ends of VMA2 are grasslands dominated by little bluestem. Immediately south of the northernmost grassland (to the northwest and west of the lake in the northern portion of VMA2) is an area of savanna, over-mature shinnery, and (immediately west of the lake) dense second-growth juniper. The savanna is composed primarily of mixed age live, and to a lesser degree Spanish oaks with a total canopy cover of approximately 25% and heights generally ranging from 8 to 22 feet, although a few larger individuals are present. The second growth juniper to the west of the lake accounts for 50 to 60% cover and heights are generally in the range of 6 to 12

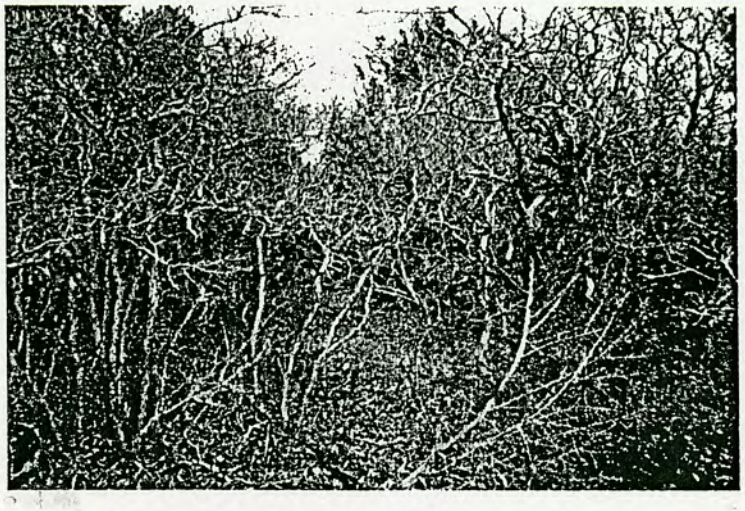
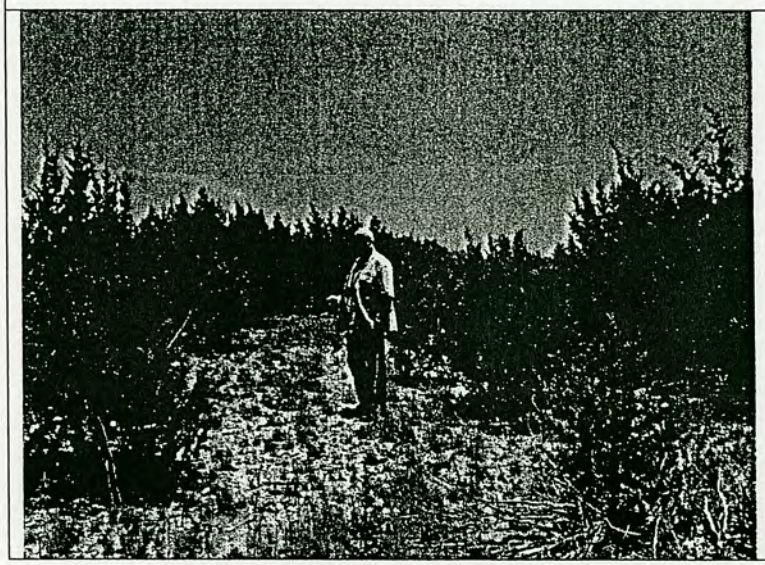
feet. Scattered individuals of live oak are also present and range from 18 to 24 feet. The central portion of VMA2 is defined as the area from south of the lake to Tributary 3, the area between Tributaries 3 and 4, and the area between Tributaries 4 and 5. These areas are a matrix of woodlands and grasslands invaded by both Ashe juniper and flameleaf sumac in a patchy manner. Flameleaf sumac typically accounts for 25% cover and has an average height of 4 feet in open grasslands. Total cover of Ashe juniper across the central portion of VMA2 is estimated to be 20% although the distribution is quite patchy and some patches reach nearly 100% cover. Heights are generally in the range of 4 to 12 feet.

The three tributaries in VMA2 drain from west to east into Rough Creek. Riparian vegetation (as described in the introduction) is present along the banks of each of these tributaries.

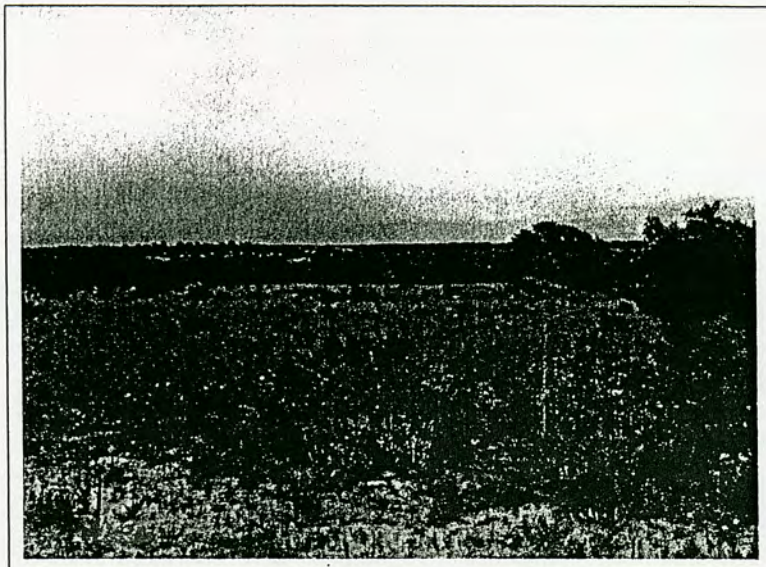


Northern portion of VMA2. Open grassland dominated by little bluestem. Photo taken on October 25, 2001 at UTM northing 604353 and easting 3558685 facing north. Photo number 10 on Map 4.

Immediately south of this grassland is a savanna intermixed with over mature shinnery.

	"Leggy" shin oaks are scattered in mottes throughout VMA2.B1. Photo taken on March 14, 2002 at UTM northing 604326 and easting 3558615 facing east. Photo number 11 on Map 4.
	Immediately west of the lake; second growth Ashe juniper accounts for approximately 50% cover and heights are generally in the range of 8 to 12 feet. Widely scattered individuals of live oak are also present (reaching heights of 18 feet). Photo taken on June 3, 2003 at UTM northing 604625 and easting 3558059 facing northeast. Photo number 12 on Map 4.

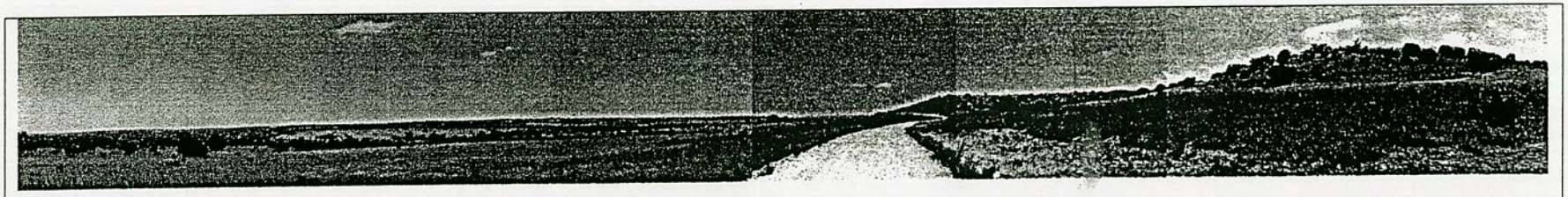
Prescribed fire unit VMA2.F1 is immediately south of the lake. This unit covers 60 acres. Small second-growth Ashe junipers account for 5 to 10% cover with heights generally in the range of 2 to 4 feet. Flameleaf sumac accounts for 5% cover and most individuals are around 4 feet high. Widely scattered individual live oak and Spanish oak trees (with heights generally in the range of 8 to 12 feet) are also present.

	Roadside at western edge of VMA2.F1. Small second-growth Ashe juniper invaded grassland. Photo taken on May 12, 2003 (pre fire) at UTM northing 604644 and easting 3557665 facing east. Photo number 13 on Map 4.
	Roadside between the two existing burn units (F1 and F2) in VMA2. Flameleaf sumac (25% cover and 4 feet tall) and scattered live oak trees (to 18 feet) within little bluestem grassland. Photo taken on May 12, 2003 at UTM northing 604810 and easting 3557176 facing east. Photo number 14 on Map 4.

VMA2.F2 is immediately south of the riparian zone along Tributary 3. VMA2.F2 covers 33 acres and has vegetation similar to that found in VMA2.F1. Between Tributaries 4 and 5 the vegetation grades from live oak savanna in the north to juniper invaded grassland in the south. Live oak accounts for 15% cover and reaches heights of 22 feet in the savanna. Ashe juniper accounts for 20% cover and heights average 6 feet in the grassland. The juniper invaded grassland is identified as VMA2.B2 and covers 23 acres (see Map 3).

	Unit VMA2.B2 in the southern portion of VMA2. This area is a little bluestem dominated grassland invaded by second-growth Ashe juniper. Cover of juniper is approximately 20% and heights are generally in the range of 4 to 8 feet. Photo taken on June 3, 2003 at UTM northing 605860 and easting 3556290 facing south. Photo number 15 on Map 4.
	Southern portion of VMA2. Same location and date as previous photo but facing east. Photo number 16 on Map 4.

The southern end of VMA 2 is primarily a little bluestem grassland with scattered second growth Ashe juniper and clumps of flameleaf sumac.

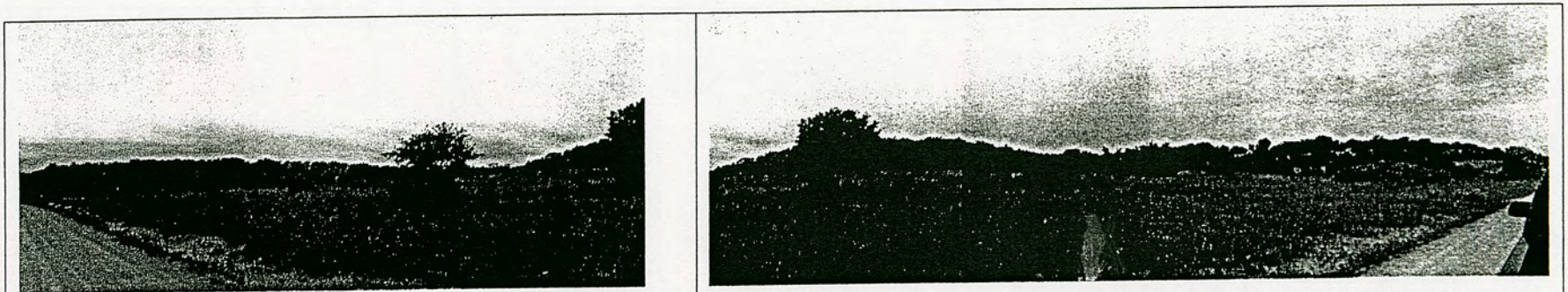


This panoramic view was taken from the road that separates the southern portion of VMA2 from VMA3. The photo was taken on June 3, 2003 at UTM northing 605751 and easting 3555615. Road direction is southeast. The left-most photo faces north into VMA2 while the right-most photo faces southwest into VMA3. Vegetation is characterized as a little bluestem grassland with widely scattered Ashe juniper to 8 feet in height. Low hills in the southern portion of VMA3 (as seen in the right side of the photo) contain approximately 10% cover of Ashe juniper with heights generally ranging from 6 to 10 feet. Flameleaf sumac is also present as widely scattered individuals. Photo number 17 on Map 4.

Baseline Conditions VMA 3

VMA 3 covers 425 acres (this acreage does not include the 42 acres that constitute WMA1). Since the establishment of baseline conditions (September 30, 2002) brush management has been implemented on one unit (VMA3.B1).

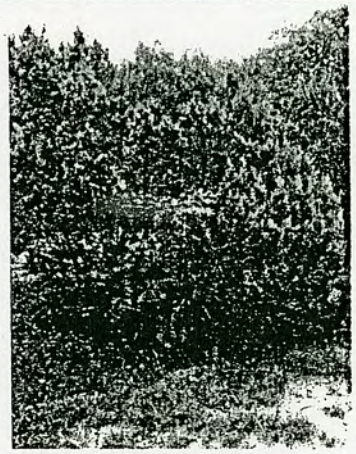
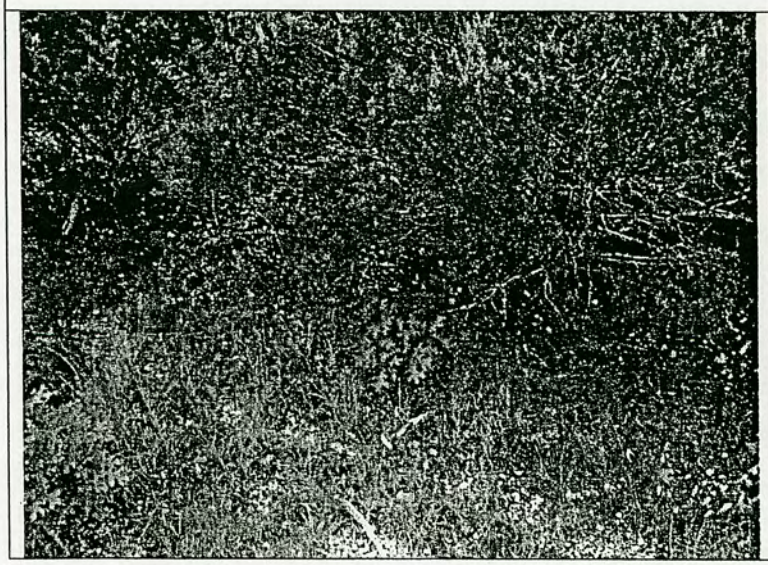
The ridgeline of Chalk Mountain runs generally northwest to southeast through the center of VMA3. Lower elevation slopes and adjacent flat areas on the north, east, and west sides of the Chalk Mountain ridge generally consist of Ashe juniper invaded grasslands. Ashe juniper cover ranges from 40 to 70% and heights are generally in the range of 8 to 12 feet. Widely scattered individual live oak (to 14 feet height) and Spanish oak (to 16 feet height) are also present. Vegetation on the ridgetop itself is a mostly deciduous shrubland dominated by shin oak. Other common species include elbowbush, redbud, and Mexican plum (*Prunus mexicana*). Total shrub cover is approximately 70% and heights are generally in the range of 4 to 12 feet. The southernmost portion of VMA3 is a little bluestem dominated grassland.

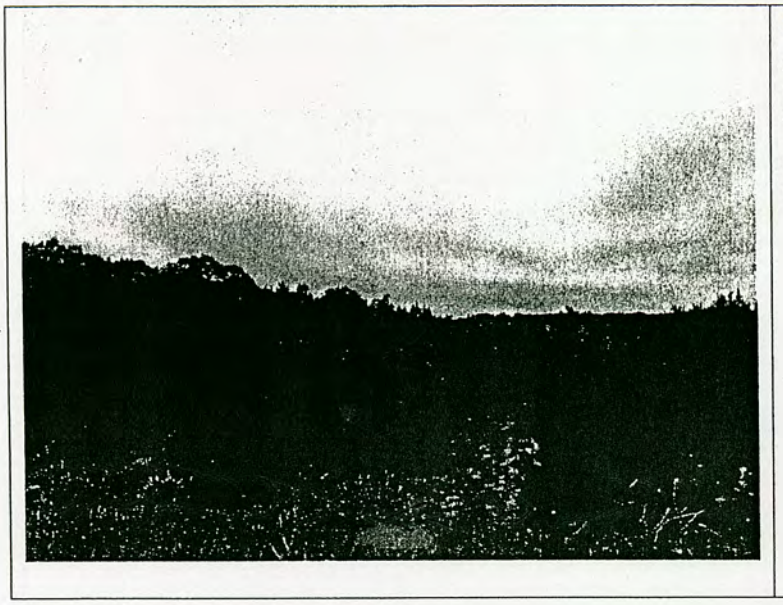


A split panorama in the northern portion of VMA3. This photo was taken on May 12, 2003 at UTM northing 604689 and easting 3557481. Center of photo mosaic on the left faces south (road faces southeast). Center of photo mosaic on the right faces northwest. Grasslands in this area are dominated by little bluestem. Ashe juniper cover on the hillsides ranges from 30 to 60% in this area with heights generally in the range of 8 to 12 feet. Scattered individual live and Spanish oaks are also present. Photo number 19 on Map 4.

Baseline Conditions WMA1

WMA1 covers 42 acres and is currently dominated by Ashe juniper on moderate slopes that vary in aspect, but are primarily north and east. Ashe juniper accounts for approximately 80% cover and heights are generally in the range of 10 to 14 feet. Scattered Spanish oaks are present and account for approximately 5% cover with heights reaching 12 feet. Of perhaps greater interest is the presence of numerous seedling Spanish oaks beneath the junipers.

	Typical vegetation conditions in WMA1. Photo taken on May 12, 2003 at UTM northing 604591 and 3557767 easting. Photo faces south. Photo number 20 on Map 4.
	Small Spanish oaks growing underneath Ashe junipers in WMA1. Photo taken on May 12, 2003 at UTM northing 604587 and easting 3557773. Photo number 21 on Map 4.



Gentle east facing slope in northern portion of WMA1. Photo taken on May 12, 2003 at UTM northing 604644 and easting 3557807 facing west. Photo number 18 on Map 4.

Habitat Restoration and Maintenance - VMAs

The general plan for long-term habitat maintenance and enhancement will be to apply prescribed fire on a three year rotation among the three VMAs. The goal of this approach is to establish and maintain a grassland – shrubland matrix across the majority of each VMA that is suitable as habitat for Black-capped Vireos. Supplemental brush manipulation may be necessary to control invading juniper on a limited basis if fires are delayed due to weather, burn bans, or other limitations.

The landowner is considering rotational grazing as a future land use/land management tool. If landowner decides to move forward with a grazing program he agrees to work with Environmental Defense, the Service and other partners to design a fencing arrangement and rotational scheme that complies with the provisions of this Safe Harbor Agreement and is compatible with the implementation of prescribed fire, and the maintenance and enhancement of Black-capped Vireo habitat. Cowbird control will be a requisite component of the grazing program. Also, where appropriate, fence installation techniques will follow Texas Parks and Wildlife Management Guidelines For Golden-cheeked Warblers.

Habitat Restoration and Maintenance- VMA1

Initial management objectives for this area (excluding wetlands and riparian zones) are as follows:

- Reduce juniper cover and maintain it at 5% overall.
- Create a deciduous shrub cover of 40 to 60% of which 25 to 35% is shin oak, 10 to 15% is live oak and Spanish oak, and 5% is other species including, but not necessarily limited to, elbowbush, sumac, and redbud.

- Leave mature oaks and other desirable trees (generally those with a dbh of 8 inches or greater) intact to serve as perch trees and to achieve wildlife habitat diversity goals.

In the northern portion of VMA1 fire will be used to reduce juniper cover and to create and maintain low mottes of deciduous woody species. In the southern portion of VMA1 fire will be used to encourage the restoration of deciduous shrubs and to reduce the cover of KR bluestem in this grassland predominated zone.

The majority of VMA1 was burned between October 2002 and September 2003:

Unit	**Prescribed Fire Date**
VMA1.F1	September 2003
VMA1.F2	June 2003
VMA1.F3	October 2002
VMA1.F4	October 2002

Follow up brush manipulation to achieve the desired management objectives and facilitate use of future prescribed fire for habitat maintenance was performed in VMA1.B1 in October 2003.

Planned future management will entail the application of prescribed fire by expanding on the existing four fire units. Future proposed fire break locations are shown on Map 4. The plan is to burn these units in 2005.

Habitat Restoration and Maintenance – VMA2

Initial management objectives for this area (excluding wetlands and riparian zones) are as follows:

- Reduce juniper cover and maintain it at 5% overall.
- Create a deciduous shrub cover of 40 to 60% of which 25 to 35% is shin oak, 10 to 15% is live oak and Spanish oak, and 5% is other species including, but not necessarily limited to, elbowbush, sumac, and redbud.
- Leave mature oaks and other desirable trees (generally those with a dbh of 8 inches or greater) intact to serve as perch trees and to achieve wildlife habitat diversity goals.

In the central portion of VMA2 fire was initially applied as shown in the following table. Prescribed fire will continue to be used to reduce juniper cover and to create and maintain low mottes of deciduous woody species.

Unit	**Prescribed Fire Date**
VMA2.F1	June 2003
VMA2.F2	October 2002

Follow up brush manipulation to achieve the desired management objectives and facilitate use of future prescribed fire for habitat maintenance was completed in VMA2.B1 and VMA2.B2 in October 2003.

Planned future management will entail the application of prescribed fire using the existing two fire units, as well as on three additional units as delineated by the proposed fire breaks shown on Map 4. The plan is to burn these units in 2004.

Habitat Restoration and Maintenance – VMA3

Initial management objectives for this area are as follows:

- Maintain the suitability of the existing vireo habitat for ongoing vireo use. Current total shrub cover within this area is appoximately 70% and the objective is to enhance habitat suitability by reducing this cover to 40 – 60%.
- Expand the existing habitat by reducing cover of second growth juniper and creating a deciduous shrub cover of 40 to 60% of which 25 to 35% is shin oak, 10 to 15% is live oak and Spanish oak, and 5% is other species including, but not necessarily limited to, elbowbush, sumac, and redbud.

Achievement of these objectives will entail the application of prescribed fire using three fire units as delineated by the proposed fire breaks shown on Map 4. The plan is to apply a relatively cool fire during winter 2003 to the three units. The burn plan will be designed to meet the objectives listed above. Future prescribed fire will be used to maintain the desired habitat characteristics. It is currently planned to use a three year return interval so the next scheduled burn would be fall/winter 2006.

Habitat Restoration and Maintenance – WMA1

The primary goal in WMA1 is to create a mature oak – juniper forest that has the characteristics necessary to serve as Golden-cheeked Warbler breeding habitat. Though relatively small in size, this patch of habitat will serve to expand a neighboring block of habitat that adjoins Quail Ridge Ranch. The ten year objectives (by 2013) for WMA1 are to have mature individuals of Ashe juniper compose 10 to 20% of the canopy and for mature Spanish oaks to compose 60 to 80% of the canopy. It is expected that Ashe juniper heights will be in the range of 15 to 22 feet and Spanish oak heights will be in the range of 15 to 30 feet. The understory will be composed of seedling and sapling Spanish oaks and other deciduous shrubs and trees such as redbud and elbowbush.

The primary strategy for restoring warbler habitat in WMA1 will be to allow the existing sub-mature juniper woodland to succeed to an oak-juniper forest. To facilitate this process two specific management activities will be implemented.

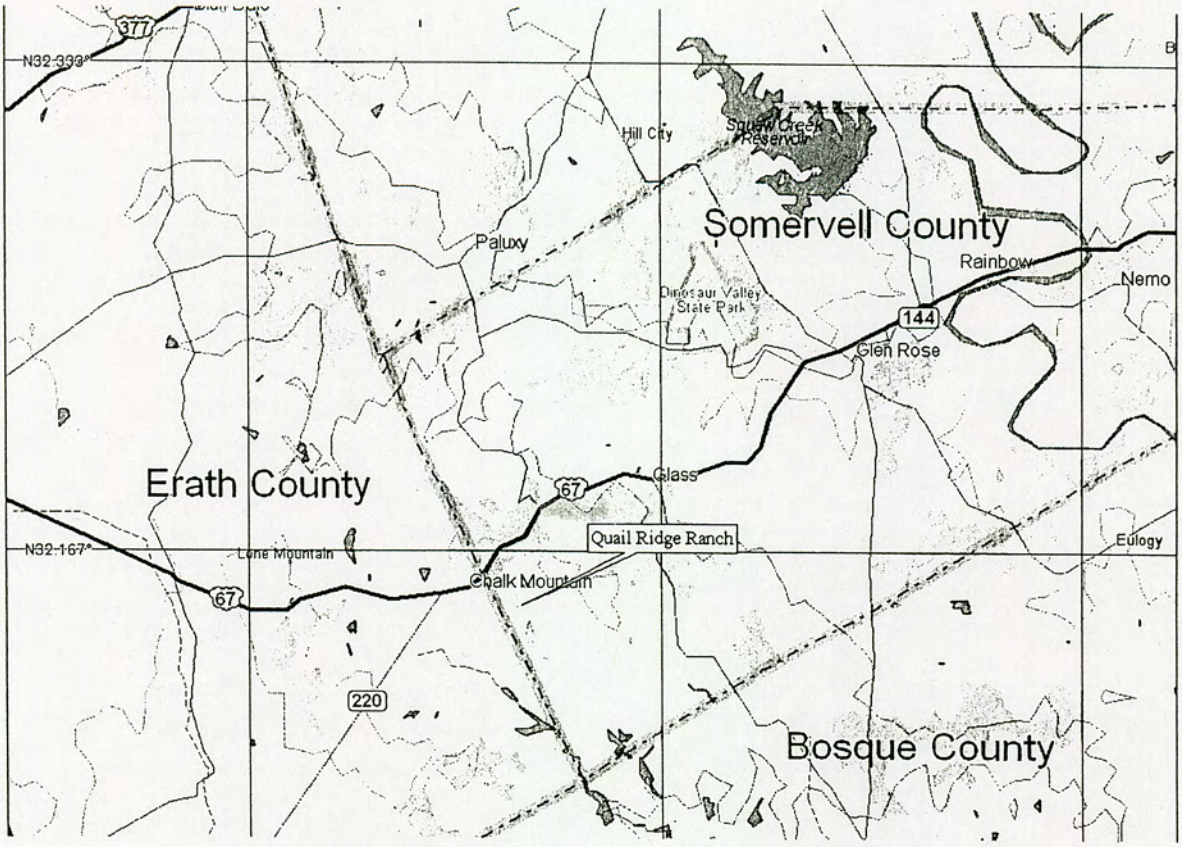
- Junipers less than 4 feet in height will be thinned to facilitate additional oak regeneration.

- Seedling and sapling oaks will be protected from browsing by piling juniper slash around them and/or by installing wire cages.

This work is scheduled to take place in winter 2004/2005.

Cowbird Control

Cowbird control has been accomplished by shooting female Brown-headed cowbirds in the vicinity of the existing vireo habitat. This program was initiated in spring 2002 and continued in spring 2003 and has had a direct and positive impact on vireo reproductive success. Plans are to continue cowbird control either through continued shooting or trapping.



Map 1. Approximate location of Quail Ridge Ranch Ranch.

Appendix B

Monitoring and Productivity Data from Existing Black-Capped Vireo Habitat on Quail Ridge Ranch

Quail Ridge Ranch- Somervell County – Banding Data

QRR number	Location	Date	Band size	Band number	Color combination	Combo #	Species	Age
2001								
1	FAIN	11-Apr-01	0	2100-45417	DkB/Y//R/S	486	BCVI	ATY-P
2	>	>	>	1770-34939	G/S//Bk/G	487	>	SY-P
3	>	>	>	1770-34940	M/Y//Bl/S	525	>	TY-P
4	FAIN	13-Apr-01	0	1770-34942	Y/S//W/R	491	BCVI	AHY-P
5	FAIN	01-May-01	0	1770-34944	W/DkG//G/S	538	BCVI	ATY-P
6	>	>	>	1770-34945	DkG/S//M/G	531	>	AHY-P
7	FAIN	04-Jun-01	0	1770-34957	O/S//Y/G	528	BCVI	ATY-P
8	FAIN	09-Jun-01	0	1770-34958	Bl/S//DkB/G	549	BCVI	ATY-P
9	>	>	>	1770-34960	Bl/P//Y/S	481	>	ATY-P
10	FAIN	01-Jul-01	0	1770-34959	G/P//Bl/S	1093	BCVI	ASY-P
2002								
11	FAIN	24-Apr-02	0	1770-34983	Bl/S//O/W	1231	BCVI	ASY-P
12	FAIN	14-May-02	0	1770-34992	Y/Y//P/S	1234	BCVI	ASY-P
18	FAIN	16-May-02	0	1770-34993	G/M//Bk/S	1241	BCVI	AHY-P
13	FAIN	11-Jun-02	0	1760-75151	W/S//M/W	1264	BCVI	ASY-P
14	FAIN	13-Jun-02	0	1760-75152	R/S//M/DkB	1253	BCVI	SY-P
15	FAIN	19-Jun-02	0	1760-75153	DkG/S//O/P	1272	BCVI	ASY-P
16	FAIN	20-Jun-02	0	1760-75148	W/S//M/Bk	1275	BCVI	SY-P
17	FAIN	11-Jul-02	0	1760-75163	DkB/S//Y/R	1265	BCVI	ASY-P
19	FAIN	19-Jul-02	0	1760-75149	P/S//Bl/DkB	1270	BCVI	ASY-P
20	>	>	>	1760-75150	W/S//W/R	1271	>	ASY-P
2003								
21	FAIN	17-Apr-03	0	1760-75173	M/R//O/S	1583	BCVI	SY-P
22	>	>	>	1760-75174	R/S//P/R	1588	>	SY-P
23	>	>	>	1760-75175	Bl/DkB//-/S	1593	>	AHY-P

Quail Ridge Ranch- Somervell County – Banding Data

QRR number	Location	Date	Band size	Band number	Color combination	Combo #	Species	Age
2004								
24	FAIN	01-Apr-04	0	2280-85913	M/S//Bk/DkB	1206	BCVI	ASY-P
25	FAIN	02-Apr-04	0	2280-85914	P/DkB//DkG/S	1205	BCVI	ASY-P
26	>	>	>	2280-85915	Bk/S//Bk/DkG	1204	>	>
27	>	>	>	2280-85916	M/S//G/M	1209	>	AHY-P
28	FAIN	28-Apr-04	0	2280-85925	M/Bk//M/S	1226	BCVI	ASY-P

Quail Ridge Ranch- Somervell County – Banding Data (continued)

QRR number	Sex	CP	BP	Fat	Wing	Wt. (g)	Comments	Bander
2001								
1	M-P	2	0	2	55			JPM
2	M-CP	2	0	2	56			>
3	M-CP	2	0	1	54			>
4	F-P	0	0	2	56		body molt = 0; ff molt = 0; ff wear = 3	JPM
5	M-P	2	0	4	55			JPM
6	F-P	0	4	3	55		w/egg	>
7	M-P	2	5		56		ff wear = 3	JPM
8	M-P	0	5	3	56			JPM/JP
9	M-P	2	0	3	55			JPM/JP
10	M-P	0	0	4	56			JPM/JP
2002								
11	M-P	2	0		56			JPM
12	M-CP	2	0		55			JPM
18	F-PB	0	4	0	55			JPM
13	M-P	2	4		56			JPM/WB
14	M-P	3	4		55			JPM/WB
15	F-P		4		55			JPM/WB
16	M-P	1	0					JPM/WB