

## Appendix I

### Comments Concerning Federally Listed Endangered Species

The golden-cheeked warbler and black-capped vireo are Federally listed endangered species that are found in some areas of the Edwards Plateau and Cross Timbers & Prairies ecological areas.

*The following information and management guidelines are from the 130 page book "Endangered and Threatened Animals of Texas - Their Life History and Management", by Linda Campbell. Published by the Texas Parks and Wildlife Press, Austin, Texas in 1995. Distributed by the University of Texas Press, Austin, Texas, and revised in 2003 as an electronic book available on the TPWD website at [www.tpwd.state.tx.us](http://www.tpwd.state.tx.us).*

## Golden-cheeked Warbler

Scientific Name: *Dendroica chrysoparia*

Federal Status: Endangered, 5/4/90 • State Status: Endangered

### Description

The Golden-cheeked Warbler is a small, migratory songbird, 4.5 to 5 inches long, with a wingspan of about 8 inches. The male has a black back, throat, and cap; and yellow cheeks with a black stripe through the eye. Females are similar, but less colorful. The lower breast and belly of both sexes are white with black streaks on the flanks.



### Habitat

Typical nesting habitat is found in tall, dense, mature stands of Ashe juniper (blueberry cedar) mixed with trees such as Texas (Spanish) oak, Lacey oak, shin (scalybark) oak, live oak, post oak, Texas ash, cedar elm, hackberry, bigtooth maple, sycamore, Arizona walnut, escarpment cherry, and pecan. This type of woodland generally grows in relatively moist areas such as steep-sided canyons, slopes, and adjacent uplands. A mix of juniper and deciduous trees on the slopes, along drainage bottoms, and in creeks and draws provide an ideal mix of vegetation for these birds. Warblers can also be found in drier, upland juniper-oak (i.e., Texas oak, live oak, post oak, blackjack oak) woodlands over flat topography. Not all mature juniper-mixed deciduous woodlands are used by Goldencheeked Warblers. Only habitat actually used by endangered or threatened animals is subject to protection by the Endangered Species Act (ESA). (Only habitat modifications that would result in harm to the Golden-cheeked Warbler would be considered a violation by private actions under the ESA.)

Warblers need a combination of mature Ashe juniper and hardwood trees in their nesting habitat. Mature juniper trees vary in age and growth form, depending on site factors. Generally, trees required for nesting habitat are at least 15 feet tall with a trunk diameter of about five inches at four feet above the ground. The essential element is that juniper trees have shredding bark, at least near the base of the tree. Although the composition of woody vegetation varies within suitable warbler habitat, Ashe juniper is often, but not always, the dominant species. One study showed that juniper comprises anywhere from 10-90% of total trees in occupied habitat at 27 sites scattered throughout the breeding range. Golden-cheeked Warblers have been found in patches of habitat smaller than 12 acres, although populations of warblers in larger tracts of woodland habitats will persist longer than populations in small tracts of land. With increasingly fragmented habitat, smaller patches may become more important to warblers, particularly those located near areas of occupied habitat.

In general, Golden-cheeked Warblers occur in areas with a moderate to high density of older trees, and dense foliage in the upper canopy. Higher warbler densities are associated with larger contiguous patches, greater average tree height, greater variability in tree heights, and greater density of deciduous trees.

## **Life History**

The Golden-cheeked Warbler's entire nesting range is currently confined to habitat in 33 counties in central Texas. The birds are dependent on Ashe juniper (blueberry juniper or cedar) for fine bark strips used in nest construction. Although nests may be placed in various species of trees, such as juniper, Texas oak, live oak, and cedar elm, all nests contain strips of Ashe juniper bark woven together with spider webs. Warblers feed almost entirely on caterpillars, spiders, beetles, and other insects found in foliage. The birds are thought to take advantage of insect blooms associated with different plants as the growing season progresses. For example, broad-leaved trees and shrubs, especially oaks, are particularly important in providing habitat for insects during the first part of the nesting season. Later in the season, warblers are frequently seen foraging in Ashe juniper. Mesic (relatively moist) conditions, such as those found on wooded slopes, canyon bottoms, and along creeks and draws, are especially favorable for the production of insect foods.

Depending on the location and quality of habitat, Golden-cheeked Warblers forage and nest in areas of habitat ranging in size from five to 20 acres per pair. Within suitable nesting habitat, male Golden-cheeked Warblers occupy an area, called a territory, which is vigorously defended against all other male Golden-cheeked Warblers. Nesting territories range in size from three to ten acres, depending on habitat quality. Banding studies show that males often occupy the same territory in subsequent breeding seasons. Male warblers can often be located through their territorial song, described as a rather hurried, buzzy "tweah-tweah-twee-sy." Single, sharp "chipping" calls can frequently be heard as Golden-cheeks forage among the trees.

The female does most of the work of nest building and incubating the eggs. The cup-like nest is often neatly tucked into the fork of a vertical limb and camouflaged to blend with

the bark of the tree. Nests are constructed at an average height of 15 feet above ground, although they have been found as low as five feet and as high as 32 feet. The male stays close by, singing his distinctive song and defending his territory during incubation.

During April, a single clutch of three to four eggs is laid. Warblers usually nest only once per season, unless a nest is lost to accident or predation. The eggs hatch in 12 days, and both parents care for the young. After the young hatch, male singing declines, although they can still be heard into June. Nestlings fledge eight or nine days after hatching, but remain in the vicinity of the territory for at least four weeks while being cared for by both parents. Golden-cheeked Warblers migrate to their wintering grounds in the pine-oak woodlands of southern Mexico (Chiapas), Guatemala, Honduras, and Nicaragua from late June to mid August. They return to Texas in early to mid-March.

### **Threats and Reasons for Decline**

The most serious problems facing the Golden-cheeked Warbler today, as in the recent past, are habitat loss and fragmentation. Since warblers have limited and specific habitat requirements, direct habitat loss has resulted in population reduction, although precise comparisons of historic and current populations are not available. Recently, serious losses in nesting habitat have occurred in counties such as Travis, Williamson, and Bexar, where rapid urban development has spread into oak-juniper woodlands associated with canyonlands. Flood control and other impoundments have also reduced habitat for the warbler by inundating the juniper-oak woodlands existing on canyon slopes and bottoms along springs, streams, and rivers. Construction of large reservoirs has also led to loss of warbler habitat due to development of lake-side communities. Historically, some warbler habitat was lost as a result of clearing juniper/oak woodlands for increased livestock production or improved livestock handling. Stands of large juniper trees were also cut for sale as fence posts and other timber products, especially before 1940.

Over-browsing by white-tailed deer, goats, and exotic ungulates is believed to contribute to habitat degradation by reducing the survival of seedling oaks and other deciduous trees, which are a vital component of warbler habitat. Also, many of the deeper and more fertile soils in much of the Hill Country are found in small floodplains along creeks or intermittent streams associated with hillside drainage. Many of these areas, some of them supporting a variety of deciduous trees, were cleared and converted to forage crops and pasture, often resulting in a decrease in the amount of warbler habitat. Habitat loss may be obscured by the increase in juniper on rangeland throughout central Texas. The invasion of juniper on upland sites is often the result of fire suppression, overgrazing, or a combination of both. These young juniper stands invading open rangelands generally lack the kinds and numbers of hardwood trees required by warblers. Warblers are usually not found in monocultures (pure stands) where juniper comprises over 90% of the composition throughout a large area. Poor grazing management practices and fire suppression result in a decline in the diversity and productivity of rangeland. The decline in range condition associated with improper management has led to increases in juniper throughout the Hill Country.

Brood parasitism by Brownheaded Cowbirds may threaten successful reproduction of Golden-cheeked Warblers, although the degree of impact of cowbird parasitism on warbler productivity is not fully understood. Cowbirds lay their eggs in other birds' nests, leaving the host bird to raise the cowbird young. Goldencheeked Warblers apparently will either abandon parasitized nests, or raise young cowbirds in addition to or in place of their own young. Warblers that abandon parasitized nests may renest later in the season. However, abandonment of first clutches, or raising cowbird young in addition to their own, decreases the total number and survivability of Golden-cheeked warbler young produced.

Habitat fragmentation reduces the quality and quantity of warbler habitat. In small woodland patches, the increased proportion of habitat edge to interior area may increase rates of brood parasitism and predation, so that the surviving populations cannot maintain themselves. Also, increased distances between patches may make recolonization of vacated habitat more difficult. In Texas, Mexico and Central America, habitat management and protection, responsible land stewardship, and incentives for landowners to maintain and develop habitat, are keys to the survival and recovery of the Golden-cheeked Warbler. The diverse mix of hardwoods and junipers in canyons, and on slopes and adjacent hilltops, provide ideal habitat for the warbler. Numerous beautiful and interesting native plants and animals are also found in these canyons.

### **Recovery Efforts**

Research is underway to better understand the life history, habitat requirements, limiting factors, and land management practices affecting the Golden-cheeked Warbler. Population surveys during the breeding season are being conducted in known and potential habitat areas. Efforts to provide information and educational opportunities to landowners and the public regarding life history and habitat requirements of the warbler are also a vital part of the recovery effort. Major recovery efforts are being conducted on Department of Defense's Fort Hood and Camp Bullis, Travis County and the City of Austin's Balcones Canyonlands Preserve, the U.S. Fish and Wildlife Services' Balcones Canyonlands National Wildlife Refuge, and many properties owned and/or managed by the Nature Conservancy. Additionally, Environmental Defense through their Safe Harbor Agreement with the U.S. Fish and Wildlife Service is assisting many landowners to manage and/or create habitat for the benefit of the warbler. Voluntary cowbird trapping is being conducted by more than 400 landowners in counties throughout the range of the warbler. Recently, a consortium of researchers in governmental and nongovernmental agencies has proposed a multinational effort to better understand and coordinate approaches to managing and recovering the Goldencheeked Warbler. Additional research in Mexico and Central America is planned to gather information concerning life history and habitat requirements on the wintering range. Studies are needed to assess the potential for income generating activities, such as selective harvest of juniper, which may be compatible with habitat protection.

### **Where To See the Golden-cheeked Warbler**

A number of state lands, including Colorado Bend State Park (SP), Dinosaur Valley SP, Garner SP, Guadalupe River SP, Honey Creek State Natural Area (SNA), Hill Country

SNA, Kerr Wildlife Management Area, Longhorn Cavern SP, Lost Maples SNA, Meridian SP, Pedernales Falls SP, and Possum Kingdom SP offer opportunities for people to see Golden-cheeked Warblers and their habitat. Other locations include the Balcones Canyonlands National Wildlife Refuge, Travis Audubon Sanctuary, Wild Basin Preserve, and Emma Long City Park in the Austin area; and Friedrich Wilderness Park near San Antonio. Once open to the public, Government Canyon State Natural Area, located northwest of San Antonio, will offer additional opportunities to see Golden-cheeked Warblers. Because the Golden-cheeked Warbler is an endangered species, birders and other observers should carefully follow certain viewing ethics. Recorded calls of the Goldencheeked Warbler or Screech Owl should not be used to attract birds and observers should be careful not to disturb or stress birds.

### **How You Can Help**

You can help by providing encouragement and support for private landowners who are managing their land to protect natural diversity and endangered species habitat. Landowners are encouraged to learn the facts about the Golden-cheeked Warbler and its habitat needs, and to protect areas of habitat found on their property. The Golden-cheeked Warbler is a beautiful songbird, and is much sought after among people who enjoy birdwatching and nature study. Possibilities exist for landowners to take advantage of the growing demand for natural history tours and vacations. Landowners interested in more information concerning nature tourism opportunities should contact the Nature Tourism Coordinator, Texas Parks and Wildlife Department, Austin (512) 389-4396; Environmental Defense, Austin (512) 478-5161; or the Nature Conservancy, San Antonio (210) 224-8774. Finally, you can be involved in the conservation of Texas' nongame wildlife resources by supporting the Special Nongame and Endangered Species Conservation Fund. Special nongame stamps and decals are available at Texas Parks and Wildlife Department (TPWD) field offices, most state parks, and the License Branch of TPWD headquarters in Austin. Conservation organizations in Texas also welcome your participation and support.

### **For More Information Contact**

Texas Parks and Wildlife Department  
Wildlife Diversity Branch  
4200 Smith School Road  
Austin, Texas 78744  
(512) 912-7011 or (800) 792-1112

or

U.S. Fish and Wildlife Service  
Ecological Services Field Office  
10711 Burnet Road, Suite 200  
Austin, Texas 78758  
(512) 490-0057

Management guidelines are available from the Texas Parks and Wildlife Department and U.S. Fish and Wildlife Service for landowners and managers wishing to maintain and improve habitat for the Goldencheeked Warbler.

## References

- Arnold, K.A., C.L. Coldren, and M.L. Fink. 1996. *The interactions between avian predators and golden-cheeked warblers in Travis County, Texas*. Research report 1983-2 for Texas Department of Transportation.
- Coldren, C.L. 1998. *The effects of habitat fragmentation on the golden-cheeked warbler*. Ph.D. Dissertation, Texas A&M University, College Station, Texas.
- Engels, T.M. 1995. *Conservation biology of the golden-cheeked warbler*. Ph.D. Dissertation, University of Texas, Austin, Texas
- Fink, M.L. 1996. *Factors contributing to nest predation within habitat of the golden-cheeked warbler, Travis County, Texas*. M.S. Thesis, Texas A&M University, College Station, Texas.
- Huss, D.L. 1954. *Factors influencing plant succession following fire in ashe juniper woodland types in Real County, Texas*. MS Thesis, Texas A&M University, College Station, Texas. 77pp.
- Ladd, C. and L. Gass. 1999. "Golden-cheeked warbler (*Dendroica chrysoparia*).” In *The Birds of North America*, No. 420. (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.
- Mass, D.S. and G.D. Schnell. 1998. "Effects of habitat fragmentation on demographics of golden-cheeked warblers (*Dendroica chrysoparia*).” Masters Thesis, Part 1 of 2, University of Oklahoma, Norman, Oklahoma.
- Oberholser, H.C. 1974. *The bird life of Texas*. University of Texas Press, Austin, Texas.
- Pulich, W. 1976. *The golden-cheeked warbler, a bioecological study*. Texas Parks and Wildlife Department, Austin, Texas. 172pp.
- U.S. Fish and Wildlife Service (USFWS). 1992. *Golden-cheeked warbler recovery plan*. USFWS, Endangered Species Office, Albuquerque, NM. 88pp.
- U.S. Fish and Wildlife Service (USFWS). 1996. *Golden-cheeked warbler population and habitat viability assessment report*. Compiled and edited by Carol Beardmore, Jeff Hatfield, and Jim Lewis in conjunction with workshop participants.
- Report of an August 21-24, 1995 workshop arranged by the U.S. Fish and Wildlife Service in partial fulfillment of U.S. National Biological Service Grant No. 80333-1423. Austin, Texas. xii+48pp.+Appendix.
- Wahl, R., D.D. Diamond, and D. Shaw. 1990. *The golden-cheeked warbler: a status review*. U.S. Fish and Wildlife Service, Ecological Services Office, Austin, Texas.

## Management Guidelines for the Golden-cheeked Warbler in Rural Landscapes

The descriptions presented in this document are intended to help landowners determine if they have Golden-cheeked Warbler habitat on their property. Not all sites within the habitat types described will be used by Golden-cheeked Warblers. It is only where individuals of this species occupy the identified habitat types during the breeding season that special management considerations such as those provided in these guidelines need to be considered. Private landowners have a tremendous opportunity to conserve and manage the fish and wildlife resources of Texas.

The objective of these guidelines is to provide landowners with recommendations about how typically-used agricultural land management practices could be conducted so that it would be unlikely that Golden-cheeked Warblers would be adversely impacted. The guidelines will be updated periodically to make them more practical and useful to rural landowners. The guidelines are based on the best available information and current understanding about the biology of the warbler, but may be refined as more complete biological data are collected. TPWD biologists have prepared these guidelines in consultation with USFWS biologists to assure landowners who carry out agricultural land management practices within the guidelines that they would know, with the greatest certainty possible, that they would not be in violation of the Endangered Species Act.

This document also provides information on land management practices that are appropriate for protection and/or enhancement of habitat. The categories were chosen to represent commonly encountered vegetation types and to address common questions regarding the effect of management practices on Golden-cheeked Warblers. In addition, suggestions are offered that promote conservation of soil, water, plant, and wildlife resources.

## **Habitat Descriptions**

### **Habitat Types Where Warblers Are Expected To Occur (Protection efforts should be focused in these habitat types)**

Woodlands with mature Ashe juniper (cedar) in a natural mix with oaks, elms, and other hardwoods, in relatively moist (mesic) areas such as steep canyons and slopes, and adjacent uplands are considered habitat types that are highly likely to be used by warblers. Mature Ashe junipers are trees that are at least 15 feet in height with a trunk diameter of about five inches at four feet above the ground (dbh). These areas generally will have a nearly continuous canopy cover of trees with 50-100% canopy closure and an overall woodland canopy height of 20 feet or more. This habitat type is also important for deer, turkey, other songbirds, and a variety of other wildlife due to the diversity of vegetation and topography and, in many cases, proximity to water. Woodlands of this description should be retained wherever they occur, especially along creeks and draws, and on steep slopes and generally rough terrain. Landowners with woodlands that fit the above description should assume that warblers may be using the area and are advised to follow the management guidelines presented here. Additional information regarding habitat types and their potential to support Golden-cheeked Warblers is presented in Table 1.

### **Habitat Types That May Be Used By Warblers**

It is relatively easy to recognize the above described high quality habitat types where Golden-cheeked Warblers are likely to occur. However, there are a number of other vegetation types that may also be used by warblers, depending on the location, size of tract, land use, adjacent landscape features, and vegetation structure. These habitat types are most often used by warblers when they are located adjacent to or near areas of high quality habitat.

The four habitat types discussed below can be associated with a variety of tree canopy covers, ranging from 35-100%. Also, all four habitat types can contain mature Ashe juniper. Although not representative of what is typically thought of as the “best” warbler habitat, these areas may support Golden-cheeked Warblers, especially fledglings (young birds that have left the nest). These habitats may be relatively more important to warblers nesting in the western and northern portions of the species’ breeding range, or in areas where optimal habitat no longer exists. Although these habitat types may occupy a large geographic area within the Hill Country, little is known about warbler occupancy when the sites are not close to the optimal habitat types. Landowners are advised to treat the following vegetation types as occupied habitat until technical assistance is obtained or a survey done to determine whether or not specific areas support warblers:

1. Stands of mature Ashe juniper (trees with shredding bark), over 15 feet in height and dbh of about 5 inches, with scattered live oaks (at least 10% total canopy cover), where the total canopy cover of trees exceeds 35% and overall woodland canopy height is at least 20 feet.
2. Bottomlands along creeks and drainages which support at least a 35% canopy of deciduous trees (average canopy height of 20 feet), with mature Ashe juniper (at least 15 feet and 5 inches dbh) growing either in the bottom or on nearby slopes.
3. Mixed stands of post oak and/or blackjack oak (10-30% canopy cover), with scattered mature Ashe juniper (15 feet in height and 5 inches dbh), where the total canopy cover of trees exceeds 35% and overall woodland canopy height is 20 feet.
4. Mixed stands of shin (scalybark) oak (10-30% canopy cover) with scattered mature Ashe juniper (15 feet in height and 5 inches dbh), where the total canopy cover of trees exceeds 35% and overall woodland canopy height is 20 feet. (See Table 1).

### **Areas Where Warblers Are Not Expected To Occur**

The following types of areas are not typical warbler habitat and are unlikely to be used by warblers unless adjacent to warbler habitat areas. This is important because areas consisting of non-typical warbler habitat that are adjacent to occupied habitat may in fact be used for foraging. This is especially true for sparsely wooded grassland or low impact agriculture, but much less so for industrial, commercial, and medium to high density residential areas (Coldren 1998). Further, although junipers occur abundantly over much of the Hill Country, a relatively small portion of them are actually a part of usable warbler habitat.

1. Stands of small Ashe juniper, averaging less than 15 feet in height and 5 inches dbh, are not habitat. This includes small juniper that invades open rangelands, previously cleared areas, or old fields. These areas are often dry and relatively flat, and lack oaks and other broad-leaved trees and shrubs. Generally, areas such as those described above that have been cleared within the last 20 years are not considered habitat.
2. Pure stands of larger (greater than 15 feet in height and 5 inches dbh) Ashe juniper, with few or no oaks or other hardwoods.

3. Open park-like woodlands or savannahs (even with old junipers) where canopy cover of trees is less than 35%. These areas often have scattered live oaks and other trees.
4. Small junipers and other trees coming up along existing fence lines.
5. Small junipers (less than 15 feet tall) coming up under larger hardwoods where junipers have been removed in the past 20 years.

<b>Table 1. Ecological site types and Range Sites with plant communities that may provide habitat for Golden-cheeked Warblers.</b> On flat or rolling uplands, warblers are most likely to occupy larger patches of woodlands adjacent to canyon systems. Most of the flat and rolling uplands within these Range Sites have other plant communities, like open savannahs, that do not support warblers. Sites that are not used by warblers are described in the Habitat Descriptions section of this leaflet.			
<b>Site Description</b>	<b>Range Site</b>	<b>Typical Plant Communities that may support Golden-cheeked Warblers</b>	<b>Potential for Golden-cheeked Warblers</b>
Slopes and canyons, and associated creek bottoms	Adobe Clay Loam 1 Loamy Bottomland1 Steep Adobe Steep Rocky	Continuous canopy woodland* of Ashe Juniper, Texas Oak, Live Oak, Lacey Oak, Chinkapin Oak, Cedar Elm, Escarpment Blackcherry, Texas Ash, Bigtooth Maple, Redbud, Hackberry, Pecan, and other deciduous trees	Highly likely to be used
Flat or rolling uplands with shallow, rocky soils of variable depth	Adobe Low Stony Hill Shallow Very Shallow	Continuous canopy woodland* of Live Oak, Blackjack Oak, Post Oak, Shin Oak, Lacey Oak, Texas Oak, Cedar Elm, Hackberry, Texas Madrone, and Ashe Juniper  Patchy woodlands + or interspersed mottes of mature Live Oak, Blackjack Oak, Post Oak, and Ashe Juniper	Highly likely to be used  May be used
Flat or rolling uplands with reddish soils	Deep Redland2 Gravelly Redland2 Redland2	Continuous canopy woodland* of Live Oak, Blackjack Oak, Post Oak, Shin Oak, Lacey Oak, Texas Oak, Cedar Elm, Hackberry, Texas Madrone, and Ashe Juniper  Patchy woodlands+ or interspersed mottes of mature Live Oak, Blackjack Oak, Post Oak, and Ashe Juniper	Highly likely to be used  May be used
Flat or rolling uplands with shallow but more continuous rocky soils over limestone 3	Low Stony Hill	Continuous canopy woodland* of Ashe Juniper, Live Oak, and Shin Oak  Patchy woodlands+ or interspersed mottes of mature Live Oak, Ashe Juniper, Hackberry, Cedar Elm, and Mesquite	May be used  May be used
<p>* Defined as 50-100% canopy cover of trees at least 15 feet in height or greater.  + Defined as 35-50% canopy cover of trees at least 15 feet in height or greater.  1 Stream bottoms in and near canyon systems.  2 Golden-cheeked Warblers may occur on Redland Range Sites adjacent to slope and canyon habitat. It is not known whether or not warblers occur on Redland Sites isolated from canyon systems.  3 Common woody plants include Hackberry, Texas Persimmon, Texas Ash, Live Oak, Texas Oak, Ashe Juniper, Evergreen Sumac, Cedar Elm, and Mesquite</p>			

Controlling juniper on these areas by prescribed burning, hand cutting, or well-planned mechanical methods is often desirable to improve range condition and plant diversity, and is compatible with protection and conservation of adjacent Golden-cheeked Warbler habitat. Maintaining a minimum 300 feet wide buffer of woodland vegetation adjacent to and around Golden-cheeked Warbler habitat is beneficial to minimize predation. This recommendation stems from studies which suggest that avian predation is greatest within 300 feet of the edge of an occupied habitat patch than farther inward (Arnold et al. 1996). However, when brush management and maintenance activities near habitat are necessary, they should not occur during the March-August nesting season to avoid adverse impacts such as disturbance of nesting and feeding birds. Since brush management activities can affect habitat for the Black-capped Vireo as well as the Golden-cheeked Warbler, landowners are encouraged to learn about the habitat requirements of both endangered songbirds (see TPWD leaflet on the Black-capped Vireo).

It is important in wildlife management in general, and in endangered species management in particular, to consider the “big picture” with regard to how land types relate to one another. For example, when brush management practices are planned in non-habitat areas, one should consider the proximity of the area to habitat used by warblers. These guidelines encourage landowners to keep natural, mature woodland sites wooded while allowing for the restoration of former savannah and grassland habitats that have been invaded by small juniper (or other invasives).

### **Agricultural Practices in Golden-cheeked Warbler Habitat**

Disruption of the tree canopy should be avoided when planning ranch improvements or maintenance work in Golden-cheeked Warbler habitat. It is recommended that new fence lines and livestock watering facilities (pipelines, storage tanks, ponds, and troughs) be planned to avoid areas of habitat whenever possible. However, narrow linear openings, such as those needed for traditional agricultural management (fence lines, ranch roads, and livestock water pipelines) will not harm Golden-cheeked Warblers if openings (spaces between trunks or stems at breast height) are no greater than 16 feet in width. This width is large enough to allow for maintenance, while permitting the hardwood tree canopy to grow over the gap. Permanent electric fencing may enable landowners to cross fence areas of rough terrain with little or no disturbance to the tree canopy. Often, these power fences are the most cost effective way to cross fence areas of steep topography and shallow soils. Fencing and other ranch improvement work in Golden-cheeked Warbler habitat should only be done during the nonnesting period (September-February).

Dozing or hand cutting in habitat with closed tree canopy and steep slopes not only destroys warbler habitat, but mechanical disturbance also can create serious soil erosion problems. In addition, clearing these areas is generally not cost effective due to higher clearing costs; lower forage production potential, and grazing distribution problems associated with steep slopes. Selective removal of small juniper less than 15 feet in height and 5 inches dbh within habitat is not a problem as long as the tree

canopy is not disturbed. Any selective removal of juniper within or adjacent to habitat should be done during the non-nesting period (September-February).

When mature juniper trees are abundant in the habitat, incidental removal of juniper for use as fence posts on the ranch will have little impact on warbler habitat. The number of trees cut depends on the density of Ashe juniper in the habitat. For example, more trees could be removed from an area with a high density of juniper compared with the density of hardwoods. The idea should always be to provide a mix of juniper and hardwoods. When posting is done, trees should be selected to avoid disturbance to the tree canopy. One way to do this is to select trees with a relatively small individual canopy and scatter your tree selections over the area. Posting should not occur in habitat during the nesting period (March-August).

In habitat areas and on rangelands immediately adjacent to habitat, it is important to manage grazing pressure by deer and livestock to prevent over browsing of broad-leaved shrubs and trees, and to maintain plant diversity and productivity. Controlling the number of browsing animals (deer, exotic animals, and livestock) is important to maintain hardwood seedlings and ensure eventual replacement of deciduous trees in the canopy.

Range condition improvement in and adjacent to habitat areas, through proper grazing management and planned deferment, will likely prove beneficial to livestock and wildlife, including the Golden-cheeked Warbler.

Landowners with questions regarding how ranch improvements and management practices will affect habitat are advised to seek technical assistance from the Texas Parks and Wildlife Department, USDA Natural Resources Conservation Service, or U.S. Fish and Wildlife Service. For activities other than those described above, land managers should seek assistance from the U.S. Fish and Wildlife Service, since permits may be needed.

## **Other Management Suggestions**

### **Reducing Impacts from Predation and Cowbird Parasitism**

Reducing the impacts of predation and brood parasitism by Brown-headed Cowbirds may be important for successful reproduction in some populations of Golden-cheeked Warblers. This is particularly true where warblers nest near grazed land or grain crops

Planned grazing systems designed to rotate livestock away from known nesting areas during the breeding season (March-August) may be desirable to reduce cowbird impacts. Periodic rest also has important benefits for improving range condition and productivity. Since cowbirds are attracted to easily available food sources, spilling or scattering grain should be avoided. Supplemental feeding areas for livestock should be moved frequently, located away from nesting habitat, and kept free from accumulations of waste grain.

Maintaining woodland vegetation adjacent to Golden-cheeked Warbler habitat is often desirable to reduce predation and brood parasitism by Brown-headed Cowbirds. Woodland strips of 300 feet or more are preferable. These strips should be composed of both the physical structure (height and canopy cover) and species composition similar to warbler habitat (Arnold, et. al. 1996).

Finally, controlling cowbirds through trapping is effective in reducing warbler brood parasitism. Mounted mobile traps, placed near watering sites as livestock are rotated through pastures, have been used successfully to reduce cowbird numbers.

Properly placed stationary traps have also proven effective in reducing cowbird numbers and parasitism in a local area. Other methods, such as shooting, can be used to supplement trapping efforts where needed. Persons trapping cowbirds need to be certified for the handling of non-target birds under the general trapping permit held by TPWD. Preventing mortality of non-target birds is of paramount concern, so traps must be carefully monitored and checked frequently.

Contact Texas Parks and Wildlife Department for information and assistance in implementing a cowbird control program.

### **Habitat Restoration**

The following suggestions are offered for landowners wishing to restore or create habitat for the Golden-cheeked Warbler in areas that currently do not support warblers. One type of restorable habitat is the relatively mesic (moist) area, with a diversity of deciduous trees, where junipers have been previously removed. Allowing the reestablishment of juniper on these sites would eventually result in the mature oak-juniper woodland preferred by Golden-cheeked Warblers.

Other situations where restoring habitat may be a possibility include relatively mesic areas dominated by juniper, where heavy browsing pressure by deer or livestock has prevented the establishment of hardwood seedlings. In these areas, control of deer numbers and planned deferment from livestock grazing would help promote reestablishment of broad-leaved shrubs and trees, eventually resulting in mature juniper-oak woodland.

In mesic areas where small junipers (15 ft. or less) are dominant, small junipers could be thinned to favor faster growth of remaining trees. Thinning would encourage hardwood regeneration, especially if some slash is left in place to provide protection for hardwood seedlings. If large junipers are dominant, several small openings per acre would encourage hardwood regeneration. These openings should be protected from browsing and left to regenerate naturally, or planted to native hardwoods.

In each of these examples, the idea is to restore areas that may once have provided habitat to the natural oak-juniper woodland capable of growing on the site.

### **Further Guidance Concerning the ESA**

Good range management practices such as proper stocking, rotational grazing, prescribed burning, periodic deferments, carefully planned brush control, and attention to plant and animal resource needs will help prevent loss of Golden-cheeked Warbler habitat. Habitat where Goldencheeked Warblers are likely to occur should be protected from activities that alter the composition or structure of trees and shrubs, except as provided for in these guidelines.

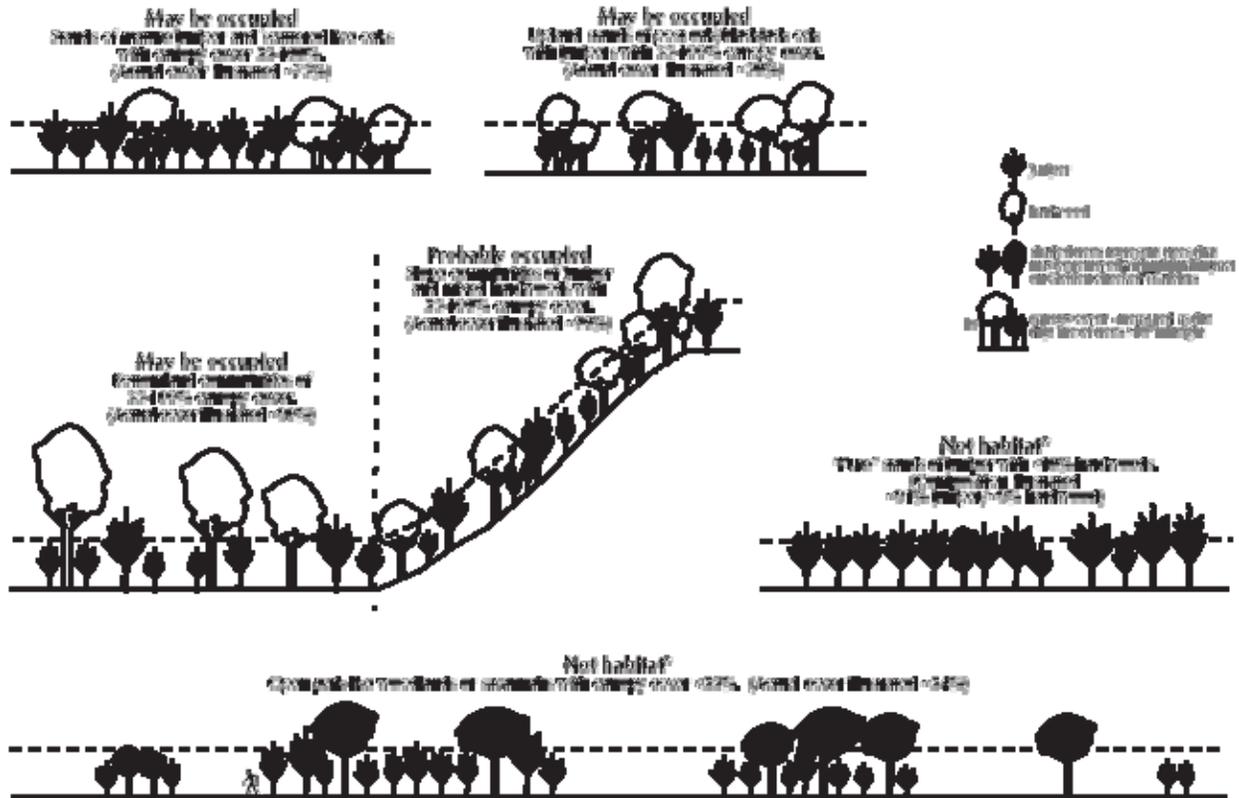
Likewise, management activities in areas that may be used by warblers should be carefully planned to avoid altering vegetation composition and structure and timed to avoid the breeding season until a survey is done to determine if warblers are using the area. Important habitat components such as the ratio of mature juniper to deciduous trees, and canopy structure and height, should be retained whenever possible to enable population recovery.

Landowners who are not sure whether or not they have suitable Golden-cheeked Warbler habitat, or whether a planned activity will affect these birds, may want to consult a biologist familiar with the species.

An on-site visit by a biologist familiar with the warbler can determine if warbler habitat is present and whether the planned activity falls under the guidelines presented here. Also, a biologist who has a scientific permit from the U.S. Fish and Wildlife Service and Texas Parks and Wildlife Department to do Goldencheeked Warbler survey work will know how to conduct a breeding season survey to determine if warblers are present in the area for which a management activity is planned.

### **Technical Assistance**

Technical assistance in range and wildlife management, including management for endangered species, is available to landowners and managers by contacting the Texas Parks and Wildlife Department, USDA Natural Resources Conservation Service, Texas Cooperative Extension, or U.S. Fish and Wildlife Service. Further guidance and specific questions concerning Golden-cheeked Warbler research, endangered species management and recovery, and landowner responsibilities under the Endangered Species Act, should be directed to the Texas Parks and Wildlife Department or U.S. Fish and Wildlife Service.



\*As long as these areas are not in close (within 300 feet) proximity to "probably occupied" or "may be occupied" habitat, neither surveys nor permits are required for activities within these areas.



## Black-capped Vireo

Scientific Name: *Vireo atricapillus*

Federal Status: Endangered, 10/6/87•

State Status: Endangered

### Description

The Black-capped Vireo is a 4.5 inch insect-eating songbird. Mature males are olive green above and white below with faint greenish-yellow flanks. The crown and back of the head is black with a partial

white eyering. The iris is brownish-red and the bill black. The plumage on the back of the female is duller than the male. Females have a medium to dark gray head with a blackish ring around the white surrounding the eye (this generally distinguishes the female from the second year male).

### Distribution and Habitat

Historical records from 1852-1956 show that the Black-capped Vireo once occurred and nested from central Kansas, Oklahoma, Texas and into northern Mexico. Today, Blackcapped Vireos are known to nest in central and southwest Texas, a few counties in central Oklahoma, and in Coahuila and Nuevo Leon, Mexico, although less is known of their status in Mexico. Black-capped Vireos winter along the western coast of Mexico.

The descriptions of habitat presented in this document are intended to help landowners determine if they have Black-capped Vireo habitat on their property. Not all sites within the habitat types described will be used by Black-capped Vireos. It is only where individuals of this species occupy the identified habitat types during the breeding season that special management considerations such as those provided in these guidelines need to be considered. In Texas, vireo habitat is found on rocky limestone soils of the Edwards Plateau, Cross Timbers and Prairies, eastern Trans-Pecos and, to a limited extent, on igneous soils in the Chisos Mountains. Although Blackcapped Vireo habitat throughout Texas is highly variable with regard to plant species, soils, temperature, and rainfall, all habitat types are similar in vegetation structure; i.e. the "overall look" is somewhat similar although the plant species vary.

Vireos require broadleaf shrub vegetation reaching to ground level for nesting cover. They typically nest in shrublands and open woodlands with a distinctive patchy structure. Typical habitat is characterized by shrub vegetation extending from the ground to about 6 feet or more and covering about 30-60% or greater of the total area. In the eastern portion of the vireo's range, the shrub layer is often combined with an open, sparse to moderate tree canopy. Patches of open grass or bare rock separate the clumps of shrubs and trees. In central Texas, this habitat is often regrowth from disturbances such as clearing, fire, and browsing. In the Edwards Plateau and Cross Timbers Regions, vireo habitat occurs where soils, topography, and land use produce scattered hardwoods with abundant low cover. Common broadleaved plants in vireo habitat in these regions include: Texas (Spanish) oak, Lacey oak, shin oak, Durand

(scalybark) oak, live oak, mountain laurel, evergreen sumac, skunkbush sumac, flameleaf sumac, redbud, Texas persimmon, Mexican buckeye, elbowbush and agarita. Although Ashe juniper is often part of the plant composition in vireo habitat, preferred areas usually have a low density and cover of juniper.

In the western Edwards Plateau and Trans-Pecos Regions, on the western edge of the vireo's range, the birds are often found in canyon bottoms and slopes where sufficient moisture is available to support diverse shrub vegetation. Dominant woody plants in this habitat type include sandpaper oak, Vasey oak, Texas kidneywood, Mexican walnut, Texas persimmon, lotebush, brasil, wafer ash, mountain laurel, cenizo, whitebrush, and guajillo. For all habitat types, the plant composition appears to be less important than the presence of adequate broad-leaved shrubs, foliage to ground level, and mixture of open grassland and woody cover. Deciduous and broad-leaved shrubs and trees throughout the vireo's range are also important in providing habitat for insects on which the vireo feeds.

### **Life History**

Black-capped Vireos arrive in Texas from mid-March to mid-April. Adult males often arrive before females and first-year males to select their territories. Vireos' territories are often clustered in patches of suitable habitat. Although territories range in size from 1 to 16 acres, most territories are 5 to 10 acres. Males sing to attract mates and defend territories. Many males can be heard singing throughout the breeding season, but singing begins to decline by July. The vireo's song is described as hurried and harsh, composed of numerous phrases separated from one another by pauses of 1 to 3 seconds. Nesting begins after the females arrive in late March to early April. Both the male and female select the nest site and build the nest, but the female often completes it. First nests are built in about 6 to 9 days, but subsequent nests can be built in one day. The cup-shaped nest is suspended from its rim in a fork of a branch about 1 to 6 feet above the ground. However, most Black-capped Vireos nest at about "door-knob" height. Nests have been found in a variety of species including shin oak, scalybark oak, Texas oak, Vasey oak, sumac, Texas persimmon, juniper, Texas redbud, Mexican buckeye and Texas mountain laurel. The vireo usually nests more than once in the same year. A new nest is constructed each time. Three to four eggs are usually laid in the first nesting attempt, but later clutches may contain only 2 to 3 eggs. The first egg is usually laid one day after completion of the nest, with one egg being laid each subsequent day. Incubation takes 14 to 17 days, and is shared by the male and female. Vireo chicks are fed insects by both adults. The young leave the nest 10 to 12 days after hatching. Fledglings are cared for by the female alone, the male alone, or by both adults. Sometimes the parents split the brood and each care for one or more young. Occasionally, males or females will leave the care of the young to their mate, and attempt another nesting effort. Vireos may live for more than five years, and usually return year after year to the same territory, or one nearby. The birds migrate to their wintering grounds on Mexico's western coast beginning in July, and are gone from Texas by mid-September.

### **Threats and Reasons for Decline**

The Black-capped Vireo is vulnerable to changes in the abundance and quality of its habitat. Habitat may become unsuitable for vireos because of natural plant succession, sustained brood parasitism by the Brown-headed Cowbird, or because of human activities. Factors that can adversely affect vireo habitat include broad-scale or improper brush clearing, fire suppression, over browsing by deer and livestock, and urbanization. Loss of tropical wintering habitat is also a concern, but requires further study. Poorly planned brush management practices on rangeland may remove too much low growing woody cover, especially when large acreages are treated at one time. This eliminates or reduces habitat value for vireos and for other wildlife, such as White-tailed deer, quail, small mammals, and various songbirds. Over browsing of broad-leaved shrubs by goats, deer, and exotic animals reduces the vegetation in the 2- to 4-foot zone, making it unsuitable for vireo nesting. Continued overuse of these preferred browse plants over many years may eventually eliminate them from the plant community, thus permanently altering the habitat.

In the absence of natural processes, active, well-planned land management is often required to maintain good vireo habitat, especially in the eastern portion of its range. Disturbance, particularly fire, plays an important role in maintaining, improving, or creating vireo habitat. The rangelands of central Texas, and the various plant communities these lands support, evolved under the influence of periodic fires. Historically, these natural and manmade fires maintained a matrix of open grassland, shrubland and woodland. Fire stimulated shrubs to sprout multiple stems at the base, thus providing areas of dense foliage at the 2- to 4-foot level, required by vireos. In the past, fire was responsible for maintaining or periodically returning some areas to vireo habitat. Today, prescribed burning, a valuable range and wildlife management tool occurs on many ranches throughout Texas. However, the combination of overgrazing, brush clearing, and lack of fire in the recent past has reduced vireo habitat in many other areas. Natural plant succession is less of a concern in the western portion of its range where suitable habitat persists for long periods.

Human activities have provided favorable habitat for the Brownheaded Cowbird, which parasitizes vireo nests. The cowbird is usually associated with livestock, farms, dairies, and grain fields, where it benefits from waste grain and insects. They may also be attracted to backyard bird feeders, trash dumps, or other urban areas where food and water are available. Cowbirds lay their eggs in other birds' nests, leaving the host bird to raise their young. The female cowbird often removes an egg or a nestling from the host nest before she lays an egg in it. Cowbird chicks hatch earlier than most hosts's young and are thus able to out-compete the smaller vireo nestlings for food and, consequently, the young vireos typically starve. While some birds remove cowbird eggs from their nest, the vireo does not, although it is known to abandon parasitized nests. Thus parasitized nests usually fail to produce vireos. The amount of brood parasitism varies greatly from one population to another throughout the state, ranging from 10 to over 90% of the nests. Brown-headed Cowbirds are also known to remove vireo chicks from active nests. Evidence indicates that sustained parasitism pressure may lead to local extinctions of vireo populations. Direct habitat loss and fragmentation due to urban and

suburban development is a major threat in expanding urban areas of Travis, McLennan, Dallas, Bexar, and Kerr counties. Problems associated with suburban expansion, such as increases in predation by dogs, cats, raccoons, skunks, and jays, have also impacted the vireo.

### **Recovery Efforts**

Research is underway to better understand the distribution, life history, habitat requirements, and land management practices affecting the Blackcapped Vireo. Population surveys during the breeding season are being conducted in known and potential habitat areas. Efforts to provide information and educational opportunities to landowners and the public regarding life history and habitat requirements of the vireo are also a vital part of the recovery effort. Major research and/or recovery efforts are being conducted on Department of Defense's Fort Hood and Camp Bullis, Travis County and the City of Austin's Balcones Canyonlands Preserve, the U.S. Fish and Wildlife Services' Balcones Canyonlands National Wildlife Refuge, TPWD's Kerr Wildlife Management Area, properties owned and/or managed by The Nature Conservancy of Texas, and in Mexico. Additionally, Environmental Defense through their Safe Harbor Agreement with the U.S. Fish and Wildlife Service is assisting many landowners with thousands of acres to manage and/or create habitat for the benefit of the vireo. Research is ongoing regarding the impact of cowbirds on vireo populations in Texas. Research efforts in Mexico are also underway to gather information concerning life history, habitat requirements, and conservation threats on the wintering range. TPWD biologists are monitoring populations on both state and private lands, and voluntary cowbird trapping is being conducted by more than 400 landowners in counties throughout the range of the vireo. Habitat conservation planning is underway in counties such as Travis and Bexar to allow for urban expansion and development while still conserving endangered species habitat. Intensive monitoring of a large population at the U.S. Army Fort Hood Military Installation is on-going. Finally, efforts to provide information, technical assistance, and incentives for private landowners to incorporate management for Black-capped Vireos into their livestock and wildlife operations are an essential part of the recovery process.

### **Where To See the Black-capped Vireo**

A number of state lands offer opportunities to see and learn more about the Black-capped Vireo. These include Colorado Bend State Park (SP), Devils River State Natural Area (SNA), Kerr Wildlife Management Area, Kickapoo Cavern SP, Lost Maples SNA, and Hill Country SNA. Also, the Balcones Canyonlands National Wildlife Refuge near Austin offers additional opportunities to see Black-capped Vireos. Because the Black-capped Vireo is an endangered species, birders and other observers should carefully follow certain viewing ethics. Observers should be careful not to flush birds from the nest or disturb nests or young. Black-capped Vireos should be viewed only from a distance with binoculars. Do not use recorded calls of the Black-capped Vireo or the Screech Owl to attract birds, and be careful that your presence does not unduly disturb or stress the birds.

## **How You Can Help**

You can help by learning more about the habitat requirements of the Blackcapped Vireo and incorporating management practices which create or maintain habitat for these birds. You can also encourage and support private landowners who are managing their land to protect and provide habitat for endangered species. The Black-capped Vireo is a beautiful songbird and is much sought after among people who enjoy birdwatching and nature study. Possibilities exist for landowners to take advantage of the growing demand for natural history tours and vacations. Landowners interested in more information concerning nature-based tourism opportunities should contact the Wildlife Diversity Branch, Texas Parks and Wildlife Department, Austin (800) 792-1112; Environmental Defense, Austin (512) 478-5161; the Nature Conservancy, San Antonio (210) 224-8774. You can also be involved with the conservation of Texas' nongame wildlife resources by supporting the Special Nongame and Endangered Species Conservation Fund. Special nongame stamps and decals are available at Texas Parks and Wildlife Department (TPWD) field offices, most state parks, and the License Branch of TPWD headquarters in Austin. Part of the proceeds from the sale of these items is used to conserve habitat and provide information to the public concerning endangered species. Conservation organizations in Texas also welcome your participation and support.

## **For More Information Contact**

Texas Parks and Wildlife Department  
Wildlife Diversity Branch  
4200 Smith School Road  
Austin, Texas 78744  
(512) 912-7011 or (800) 792-1112

or

U.S. Fish and Wildlife Service  
Ecological Services Field Office  
10711 Burnet Road, Suite 200  
Austin, Texas 78758  
(512) 490-0057

Management guidelines are available from the Texas Parks and Wildlife Department and U.S. Fish and Wildlife Service for landowners and managers wishing to know more about rangeland management practices which improve habitat for the Black-capped Vireo.

## **References**

- Armstrong, W.E., M.W. Lockwood, and D.K. Stuart. 1992. *Performance report: Black-capped vireo management on Texas Parks and Wildlife Department lands*. Federal Aid Project No. E-1-4, Job No. 3.2.
- Armstrong, W.E., C. Travis, and B.G. Alexander. 1989. *Final report: Black-capped vireo management*. Federal Aid Project No. W-103-R-19, Job No. 60.
- Farquhar, C.C. and J. P. Maresh. 1998. *Population biology and habitat characterization of black-capped vireos at Dolan Falls Ranch Preserve, Val Verde County, Texas*.

- Year two final report.* Endangered Resources Branch, Texas Parks and Wildlife Department. Austin, Texas.
- Graber, J.W. 1961. *Distribution, habitat requirements, and life history of the black-capped vireo.* Ecol. Mon. 31:313-336.
- Grzybowski, J.A., R.B. Clapp, and J.T. Marshall, Jr. 1986. *History and current population status of the Black-capped vireo in Oklahoma.* American Birds 40:1151-1161.
- Grzybowski, J.A., D.J. Tazik, and G.D. Schnell. 1994. *Regional analysis of blackcapped vireo breeding habitats.* Condor 96:512-544.
- Grzybowski, J.A. 1995. "Black-capped vireo (*Vireo atricapillus*)." The birds of North America, No. 181. The Academy of Natural Sciences, Philadelphia, and The American Ornithologist Union, Washington D.C.
- Oberholser, H.C. 1974. *The bird life of Texas.* Edgar Kincaid, Ed., University of Texas Press, Austin, Texas. Vol. 2, 1069 pp.
- Robinson, S.K., S.I. Rothstein, M.C. Brittingham, L.J. Petit, and J.A. Grzybowski. 1995. "Ecology and behavior of cowbirds and their impact on host populations" (pp 428-460) in T.E. Martin and D.M. Finch, eds. *Ecology and management of neotropical migratory birds.* Oxford University Press, New York, New York.
- U.S. Fish and Wildlife Service. 1991. *Black-capped vireo recovery plan.* Endangered Species Office, Albuquerque, N.M.
- U.S. Fish and Wildlife Service. 1996. *Black-capped vireo population and habitat viability assessment report.* Compiled and edited by Carol Beardmore, Jeff Hatfield, and Jim Lewis in conjunction with workshop participants. Report of a September 18-21, 1995 workshop arranged by the U.S. fish and Wildlife Service in partial fulfillment of U.S. National Biological Service Grant No. 80333- 1423. Austin, Texas. ix + 57 pp.

## **Management Guidelines for Black-capped Vireo**

The following guidelines address land management practices that can be used to maintain, enhance, or create Black-capped Vireo habitat. They are intended primarily to serve as general guidance for rural landowners and others managing land for livestock and/or wildlife in Texas. The guidelines are based on our current understanding of the biology of this species.

Private landowners have a tremendous opportunity to conserve and manage the fish and wildlife resources of Texas. The objective of these guidelines is to provide landowners with recommendations about how typically-used land management practices could be conducted so that it would be unlikely that Black-capped Vireos would be impacted. The guidelines will be updated periodically to make them more practical and useful to rural landowners. The guidelines are based on the best available information and current understanding about the biology of the vireo, but may be refined as additional biological data are collected. TPWD biologists have prepared these guidelines in consultation with USFWS biologists to assure landowners who carry out land management practices within the guidelines that they would know, with the greatest certainty possible, that they would not be in violation of the Endangered Species Act.

This document also provides information on land management practices that are appropriate for protection and/or enhancement of habitat.

The categories were chosen to represent commonly encountered vegetation types and to address common questions regarding the effect of management practices on Black-capped Vireos. In addition, suggestions are offered that promote conservation of soil, water, plant, and wildlife resources.

### **Prescribed Burning**

Fire is a natural component of Texas rangelands, and prescribed burning has many range and wildlife management benefits. These include improved forage quality and availability for livestock and deer, and maintenance of desirable plant composition and structure. Prescribed burning in some portions of the vireos range can be an excellent tool used to maintain or create the desired vegetation structure for vireo nesting; i.e. a mosaic of shrubs and open grassland with abundant woody foliage below 10 feet. If planning these activities in Bandera, Kerr, Kimble, Real, and Uvalde counties, landowners should avoid impacts to Tobusch fishhook cactus (*Ancistrocactus tobuschii*), a federally listed endangered plant, which occurs on similar soils as the vireo. Cool season burns that are patchy and low intensity, conducted prior to March 15, are often recommended to control small juniper, thus maintaining the relatively open shrublands preferred by vireos. Care should be taken to burn under appropriate humidity and wind conditions to maintain the proper black-capped vireo vegetation profile. Prescribed burns conducted during late spring and early fall, under hotter conditions, can be used to set back plant succession to create vireo habitat; however, warm season burns should be done only in areas that do not currently support Black-capped Vireos. On grazed rangeland, prescribed burns should be coordinated with livestock rotation to allow for needed deferments. It is best to avoid burning relatively small areas within large pastures to prevent heavy grazing pressure by livestock and/or deer on burned areas.

Desirable burn intervals for cool season burns vary throughout the state, depending on rainfall and vegetation type. Field experience shows that, for much of the Hill Country, a burning interval of 5 to 7 years is considered desirable to keep Ashe juniper (cedar) invasion in check and to allow regrowth of broad-leaved shrubs. Maintaining open grassland areas between clumps of shrubs is important for good vireo habitat.

Research is needed to better understand the use of prescribed burning to maintain and create vireo habitat, and to develop guidelines on desirable burn intervals throughout the vireo's range in Texas, especially in the western Edwards Plateau and eastern Trans-Pecos. Assistance from people experienced with the use of prescribed burning is highly recommended.

Landowners are encouraged to have a complete written prescribed burn plan addressing the objectives of the burn, required weather conditions, grazing deferments, fireguard preparations, personnel and equipment needed for nest concealment. Livestock and deer management, which allows woody plants such as live oak, shin oak,

sumac, Texas persimmon, elbowbush, redbud, and hackberry to make dense growth from zero to at least 8 feet, is needed. On ranches throughout Texas, moderate stocking, rotation of livestock, controlling deer and exotic ungulate numbers and proper use of desirable browse plants will benefit deer and livestock as well as Black-capped Vireos.

To provide adequate nesting cover for vireos, woody plants should receive only limited browsing during the spring and summer. If animals (livestock, deer, and exotics) are wellmanaged and kept within recommended stocking rates, this can be achieved. Experience has shown that, in general, ranges stocked with cattle and deer tend to maintain better vireo nesting cover than ranges stocked with goats and exotic animals.

Limit browsing pressure, especially during the growing season, to no more than 50% of the total annual growth (current year twigs and leaves) within reach of animals on any given plant. This will maintain plants that are already vigorous and allow for improvement of those with less than ideal structure. As a rule of thumb, if you can “see through” a needed, a detailed map showing how the burn will be conducted, and notification and safety procedures.

Landowners are advised to contact local representatives of the Texas Parks and Wildlife Department, USDA Natural Resources Conservation Service, or Texas Cooperative Extension for help in developing and implementing a prescribed burning program designed specifically for your property and management objectives.

### **Selective Brush Management**

In some portions of the vireos range, particularly the central and eastern segment, increases in juniper (cedar) and other woody species can cause the vegetation to grow out of the patchy, low shrub cover that provides suitable habitat. In these communities, good nesting habitat generally has between 30-60% shrub canopy. Selective brush removal with herbicides or mechanical means during the non-breeding season (September-February) can be used to keep the habitat favorable for vireo nesting.

For example, the selective removal of juniper, mesquite, or pricklypear (less desirable to the vireo and to the rancher) serves to maintain the proper shrub canopy and encourages growth of associated broad-leaved shrubs. Selective brush removal should strive to maintain the desired low shrubby structure. Radical changes in shrub canopy from one year to the next over large areas should be avoided, since this may alter vireo habitat too drastically within a short time-frame. However, moderate thinning of dense (>60%) shin oak so that the low canopy is maintained at 30-60% shrub canopy can enhance habitat. Western Edwards Plateau rangelands comprised primarily of mesquite, often referred to as mesquite flats, are not considered Black-capped Vireo habitat; therefore, mesquite control in these areas will not affect vireos. When using herbicides, careful attention to the kinds, amounts, timing, and application technique will achieve the best control of target species at minimum cost. Precise application also reduces the risk of environmental contamination and offsite effects. It is best to choose highly selective individual plant treatment methods, whenever practical, to avoid damage to desirable shrubs such as live oak, shin oak, Texas oak, hackberry, Texas

persimmon, sumac, redbud, and elm. Herbicides should always be used in strict accordance with label directions, including those for proper storage and disposal of containers and rinse water. Herbicide applications should not occur during the breeding season, except for basal applications or individual plant treatment of prickly pear pads.

Carefully planned mechanical methods of brush management such as chaining, roller chopping, shredding, hand cutting, hydraulic shearing, grubbing, and tree dozing can be used to achieve desirable shrub composition and to stimulate basal sprouting of key woody species in order to maintain, enhance, or create vireo habitat. If planning these activities in Bandera, Kerr, Kimble, Real, and Uvalde counties landowners should avoid impacts to Tobusch fishhook cactus (*Ancistrocactus tobuschii*), a federally listed endangered plant, which occurs on similar soils as the vireo. As with other habitat manipulation procedures, mechanical methods should only be used during the non-breeding season (September-February) and done in such a way as to maintain the proper black-capped vireo vegetation profile. Remember that good grazing management and moderate stocking rates can reduce woody plant invasion and therefore the need for expensive brush control practices.

Finally, although brush management practices can be used to change the structure and composition of vegetation so that vireos may occupy the habitat, landowners should seek technical assistance when planning brush management practices in habitat that is known to be occupied by Blackcapped Vireos. Since brush management activities can affect habitat for the Golden-cheeked Warbler as well as the Black-capped Vireo, landowners are encouraged to learn about the habitat requirements of both endangered songbirds (see TPWD leaflet on the Golden-cheeked Warbler).

### **Grazing and Browsing Management**

Excessive browsing by goats, exotic animals, and white-tailed deer destroys the thick woody growth browse plant at “door knob” to “eye level”, then too much stem and leaf growth has been removed. Installation of structures needed to facilitate good grazing management; i.e., fencing, pipelines, water troughs, water tanks, and ponds, need to avoid removing vireo habitat, should include only enough space to allow for proper operation and maintenance, and need to conduct activities during the non-nesting period (September-February).

Careful management of woody plants will not only provide for the habitat needs of Black-capped Vireos, but will also create high quality habitat for deer and other wildlife as well as livestock. Technical assistance in identifying browse plants and determining proper use is available from the Texas Parks and Wildlife Department and USDA Natural Resources Conservation Service.

### **Reducing Impacts From Cowbirds**

Brood parasitism by Brown-headed Cowbirds poses a serious threat to successful reproduction in some populations of Black-capped Vireos. Research is currently underway to better understand the impacts of cowbirds on vireos. Because livestock attract cowbirds, management to reduce cowbird impacts is important on grazed land.

Because cowbirds are attracted to easily available sources of food, avoid spilling or scattering grain. Supplemental feeding areas should be moved frequently and kept free from accumulations of waste grain. This would help to prevent sparsely vegetated areas of compacted soils, which also tend to attract cowbirds.

Because cowbirds can be attracted by the presence of livestock, grazing management can be used to remove grazing animals from areas where vireos nest. For example, livestock can be rotated away from prime nesting habitat during the breeding season. Another option is to graze stocker cattle during the fall and winter, resting pastures during the spring/summer nesting season. Resting pastures periodically improves range condition and may also help reduce nest parasitism.

Finally, trapping and/or shooting cowbirds can be very effective in reducing vireo brood parasitism, since a single female cowbird can parasitize hosts over a sizeable area (4-5 acres, or more). Mounted mobile traps, placed near watering sites as livestock are rotated through pastures, have been used successfully to reduce cowbird numbers. Properly placed stationary traps have also proven effective in reducing cowbird numbers and parasitism in a local area. Shooting cowbirds at places where they congregate is another option, although this method is often not selective for the cowbirds responsible for the parasitism. Shooting female cowbirds within Black-capped Vireo nesting habitat for as little as one hour a week can reduce parasitism.

Persons trapping cowbirds need to be certified for the handling of non-target birds under the general trapping permit held by TPWD. Preventing mortality of non-target birds is very important, so traps must be carefully monitored and checked frequently.

Contact Texas Parks and Wildlife Department for information and assistance in implementing a cowbird control program.

### **Habitat Restoration**

For landowners in central Texas wishing to restore or create habitat for the Black-capped Vireo in areas currently unoccupied by vireos, the following suggestions are offered.

One type of restorable habitat is an open shrubland capable of growing a diversity of woody plants, where much of the low-growing cover has been removed through overbrowsing by livestock or deer. Controlling browsing pressure by reducing animal numbers and providing pasture rest will allow the natural reestablishment of low-growing shrub cover needed by vireos. Prescribed burning and or mechanical methods described under the Selective Brush Management section may be needed to jump start the resprouting and root sprouting of trees and shrubs.

Habitat restoration may also be possible in areas where the shrub layer has become too tall or dense to provide good vireo habitat. In these areas, well-planned use of controlled fire or other brush management techniques listed above can reduce overall shrub height, stimulate basal sprouting of shrubs, and reduce shrub density to produce more favorable habitat for vireos. The goal is to maintain the critical low growing canopy cover of 30-60%.

Also, in areas where the brush has become too dense, selective thinning conducted during the nonnesting period (September through February) could be done to produce a more open habitat. Carefully planned brush management could be used to encourage regeneration and lateral branching of desirable shrubs by allowing sunlight to reach the ground. The idea is to restore areas to relatively open, low-growing shrub/grassland vegetation that may provide habitat preferred by vireos. If planning any of these activities in Bandera, Kerr, Kimble, Real, and Uvalde counties landowners should avoid impacts to Tobusch fishhook cactus (*Ancistrocactus tobuschii*), a federally listed endangered plant, which occurs on similar soils as the vireo.

Currently, there is no strong evidence to suggest that habitat manipulation will be necessary on many parts of the drier western and southwestern Texas range (western Edwards Plateau and eastern Trans-Pecos) as mature vegetation communities in these areas are used successfully by vireos. Unless browsing pressure or other catastrophic disturbances have eliminated desirable shrub land in these areas, the only requirement needed is time. Fire is of limited use in lower rainfall areas devoid of fine fuels and the plant density required for cost-effective prescribed burns.

There are a number of agencies and organizations conducting management activities benefiting the vireo that can provide useful information and/or assistance to landowners. These include Texas Parks and Wildlife Department, USFWS, The Nature Conservancy, USDA Natural Resources Conservation Service, and Environmental Defense.

### **Summary**

In the Edwards Plateau and other parts of the range supporting woodland or savanna, periodic prescribed burning and selective brush management are very effective in maintaining and creating Black-capped Vireo habitat. In all parts of the range, control of deer and exotic wildlife numbers, and good grazing management practices, including proper stocking and rotational grazing, are management options that can be used to maintain and enhance habitat for Black-capped Vireos. These same management tools will also maintain diverse and productive rangelands. In addition to providing food, fiber, and support for rural landowners, wellmanaged rangelands provide habitat for a wide variety of wildlife, and benefits such as clean water, natural diversity, and recreational opportunities for all Texans.

Technical assistance in range and wildlife management, including grazing management, determination of proper stocking rates, prescribed burning, brush management, and management for endangered species, is available to landowners and managers by contacting the Texas Parks and Wildlife Department, USDA Natural Resources Conservation Service, or Texas Cooperative Extension. Further guidance and specific questions concerning Black-capped Vireo research, endangered species management and recovery, and the Endangered Species Act, should be directed to the U.S. Fish and Wildlife Service or Texas Parks and Wildlife Department. If, after reading this leaflet, you are still unsure whether or not your management plans will adversely affect the Vireo or its habitat, please contact the U.S. Fish and Wildlife Service for assistance.