



Restoration of Black-capped Vireo (*Vireo atricapilla*) Habitat on the Balcones Canyonlands Preserve, Travis County, Texas

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INTRODUCTION

The federally endangered Black-capped vireo (*Vireo atricapilla*) is a migratory passerine that breeds in Texas, Oklahoma, and north-central Mexico (Grzybowski 1995). Ideal breeding habitat is a mid-successional, deciduous shrubland interspersed with open areas usually containing grasses and forbs (**Figure 1**). Although there is considerable variation in the landscape physiognomy and plant species composition of occupied vireo habitats, a critical characteristic of the shrub architecture is dense foliage from ground-level to approximately 6 feet (2 m) high, the zone in which vireos build their nests (Grzybowski 1995).

Habitat loss and nest parasitism by Brown-headed cowbirds (*Molothrus ater*) are the greatest threats to Black-capped vireo populations. Habitat loss results from urban development, overgrazing by wildlife and livestock, and fire suppression (Campbell 1995). Fire suppression permits open shrubland to grow into dense shrubland or woodland that eventually contains no foliage in the critical zone below 6 feet (2 m).

Several studies have investigated the benefits of fire as a habitat restoration tool for the Black-capped vireo (Koloszar and Horne 2000; Nelka 1999). Grzybowski et al. (1994) posited that hot fires would best mimic the natural disturbances that historically maintained vireo habitat in parts of its range. However, selective brush management techniques – handcutting, chaining, rollerchopping, shredding, or bulldozing – can also be utilized to restore, maintain, or enhance Black-capped vireo habitat (Campbell 1995).

The Jollyville Unit is part of the 26,672 acre (10,793 ha) Balcones Canyonlands Preserve located in western Travis County, Texas, and contains the largest colony of Black-capped vireos on public land in the county (**Figure 2**). The Balcones Canyonlands Preserve was created to meet the terms and conditions of a permit issued by the U.S. Fish and Wildlife Service under Section 10(a)1(b) of the Endangered Species Act, and is managed to facilitate the local recovery of eight endangered species: the Black-capped vireo, Golden-cheeked warbler (*Dendroica chrysoparia*), and six species of karst invertebrates (U. S. Department of the Interior, Fish and Wildlife Service, 1996). The Jollyville Unit consists of multiple tracts owned or managed by Travis County and comprises 1658 acres (671 ha) of predominantly oak-juniper (*Quercus-Juniperus*) woodlands and forests.

Much of the habitat on the Jollyville Unit is rapidly becoming, or has already become, unsuitable for Black-capped vireos through plant community succession. Many areas have been encroached by Ashe juniper (*Juniperus Ashei*) and lack deciduous cover below 6 feet (2 m) (**Figure 3**). The goal of Travis County Natural Resources is to maintain and enhance vireo habitat to stabilize or increase the colony population. Because the Jollyville Unit is situated at a wildland-urban interface, prescribed burning was deemed impractical as a restoration method.

Travis County initiated a habitat restoration program based on mechanical methods, including shredding and handcutting. Two techniques were employed: 1) large areas of unoccupied, potential habitat were selectively cleared, leaving islands of deciduous woody species favored as nesting substrates by vireos, and 2) narrow lanes were cut through occupied, yet marginal, vireo habitat in order to create edge and promote growth of deciduous shrubs.

METHODS

SITE SELECTION

Potential areas for habitat restoration were identified by

- site visits (2001, 2002 and 2003) to assess habitat
- Black-capped vireo breeding territory surveys (2001 and 2002)

Selected restoration areas represented potential, excellent vireo habitat. Sites that were not currently occupied by vireos were chosen for selective clearing. Thirty-nine acres (16 ha) were cleared in winter 2001-02, and 15 acres (6 ha) were cleared the following winter. Cut lanes were planned for habitat occupied by vireos in the previous breeding season. A total of 23,000 ft (7,010 m) of lanes were cut in winters 2001-02 and 2002-03 (see **figure 4**).

RESTORATION TECHNIQUES

Selective Clearing

Winter

- Franklin flail mower used to open up dense Ashe-juniper-choked vegetation (**Figure 5**)

- large areas were cleared to ground level, leaving islands of deciduous woody species that provide cover and nesting sites for vireos, e.g. oaks (*Quercus* spp.), sumacs (*Rhus* spp.), and redbud (*Cercis canadensis*) (**Figure 6**)
- all removed vegetation was shredded into mulch

Subsequent Fall

- remaining islands of deciduous woody species were topped with chain saws and hand tools approximately 3 feet (1 m) aboveground to encourage re-sprouting at the base
- woody debris was left where it fell to discourage deer from browsing on new woody growth

Cut Lanes

Winter

- Franklin flail mower used to clear lanes 15 ft (4.6 m) wide through dense juniper-choked habitat (**Figure 5**)
- woody vegetation was removed at ground-level and shredded into mulch

BLACK-CAPPED VIREO SURVEYS

Black-capped vireos were surveyed in the breeding season using territory mapping methods. A detailed description of methods can be found in Travis County Natural Resources (2002a).

RESULTS

RESPONSE OF VEGETATION

In areas manipulated in winter 2001-02, there has been substantial regrowth of woody and herbaceous plants (**Figure 7**; and for comparisons between years see fig. 8). Of the 32 woody species observed in the cleared areas two years after manipulation, poison ivy (*Toxicodendron radicans*), shin oak (*Quercus sinuata*), live oak (*Q. fusiformis*), flameleaf sumac (*Rhus lanceolata*), and Virginia creeper (*Parthenocissus quinquefolia*) have the greatest relative densities and are also widespread (Travis County Natural Resources 2002b, 2003). Other

common woody plants include redbud, smilax (*Smilax bona-nox*), twisted-leaf yucca (*Yucca rupicola*), Ashe juniper, evergreen sumac (*R. virens*), wild grape (*Vitis sp.*), Texas ash, elbowbush (*Forestiera pubescens*), and Texas oak (*Q. buckleyei*). There has also been a substantial increase in the abundance of grasses and forbs in the interstitial zones, suggesting that mulch, regardless of size, is not creating a barrier to germination and growth.

Response of Black-capped Vireos

The response of vireos to mechanical restoration efforts varied between years and the techniques employed. Even within the same year using the same technique, vireos responded differently on different areas of the preserve. Overall, the number of observed Black-capped vireo territories in the entire study area increased from a pre-restoration baseline of 15 territories in 2001 to 17 territories in 2003.

Selectively Cleared Areas

Vireos were observed using selectively cleared areas (e.g. foraging, tending fledglings) in every breeding season following initial restoration efforts. While there was a net increase in the number of observed territories adjacent to the 2001-02 restoration areas following habitat modification, there was a decrease in the number of observed territories adjacent to the 2002-03 restoration area following modification (**Table 1**).

Cut Lanes

An increase in vireo vocalizations and observations was apparent in areas with cut lanes during the first breeding season following habitat modification in winter 2001-02. This same response was not observed in any of the cut lane areas in the following breeding season of 2003. There was a net loss of three territories in cut lane areas from 2001 to 2003; however, the direction and magnitude of change varied between sites (**Table 1**).

Discussion

Due to the varied responses of the Jollyville Black-capped vireo population following habitat modifications and the numerous untested covariates that may influence habitat selection (Grzybowski et al. 1994; Sexton 1993; Ward and Schlossberg 2001), it is not possible to draw firm conclusions on the benefits of our method of mechanical restoration. Furthermore, only two years have passed since initiating habitat manipulation; Koloszar and Horne (2000) reported a

three year lag time before vireo habitat became suitable for occupation following fire. However, selective mechanical clearing at the Jollyville Unit appears promising based on the initial responses of both the Black-capped vireo and the vegetation. The restoration area is growing into an open, deciduous shrubland. Areas once dominated by Ashe juniper are now dominated by a diverse assemblage of deciduous woody species.

Because vireos have already been detected both adjacent to and within selectively cleared areas, it is probable that in 3-5 years these areas will become excellent habitat and perhaps support a higher territory density. However, due to the mixed response of vireos to cut lanes, we urge caution in using this method to modify horizontal structure in occupied habitat. We are considering two modifications to this restoration technique: 1) reducing the width of lanes, and 2) reducing the density of cut lanes in a given area.

We observed that shin oaks cut 1 meter above ground appear to re-sprout at a faster rate than individuals mowed to the ground with the flail mower (**Figure 9**). Mowed shin oaks also appear to be more susceptible to browsing by white-tailed deer (*Odocoileus virginianus*) (**Figure 10**). In some cases browse pressure is so severe that many of these mowed shrubs may not survive. A number of other deciduous woody species favored as nesting substrates by vireos are also highly palatable to deer. Due to the overpopulation of white-tailed deer over a considerable portion of the vireo's range in Texas, any restoration plan must consider the potential impact of this species on the success of habitat restoration efforts.

Grinding mowed vegetation requires considerably more time for clearing than shredding vegetation into limb-size pieces. However, finer mulch significantly facilitates maneuverability in post-restored areas. We found that regardless of mulch size, significant regrowth of grasses and forbs in the interstitial zones occurred within one year of mulching in all restoration areas.

For managers of public lands at the wildland-urban interface, anthropogenic or cultural constraints may significantly limit the employment of various habitat restoration methods. Prescribed burning may not be a feasible restoration alternative in many cases. Restoring mid-successional shrublands via mechanical selective clearing offers a promising method when fire is not an option.

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FIGURES



Fig. 1. Optimal Black-capped vireo breeding habitat on Jollyville Unit of the BCP, Texas.

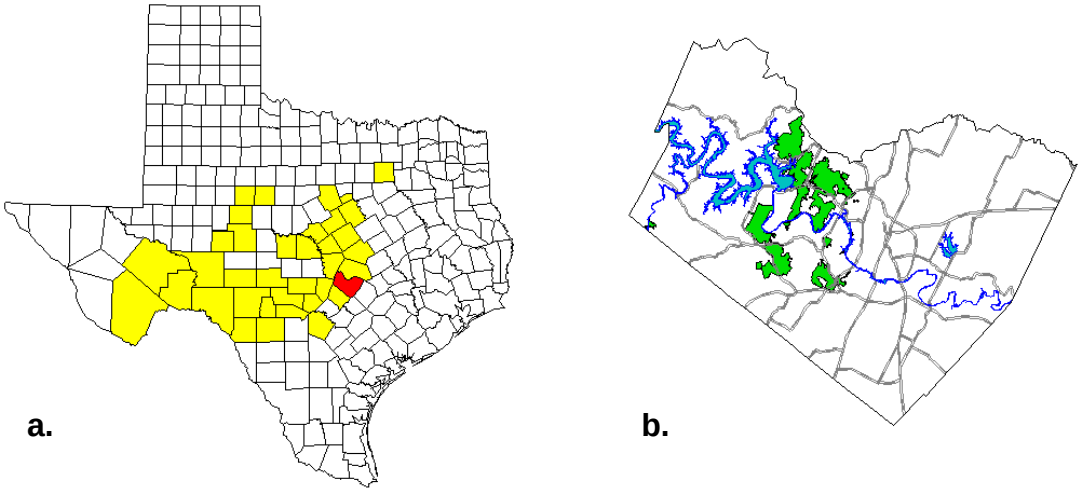

Fig. 2. A) Breeding range of Black-capped vireo in Texas (Campbell 1995) and b) location of Balcones Canyonlands Preserve in Travis county, Texas.



Fig. 3. Typical juniper-encroached habitat on Jollyville Unit of the BCP.

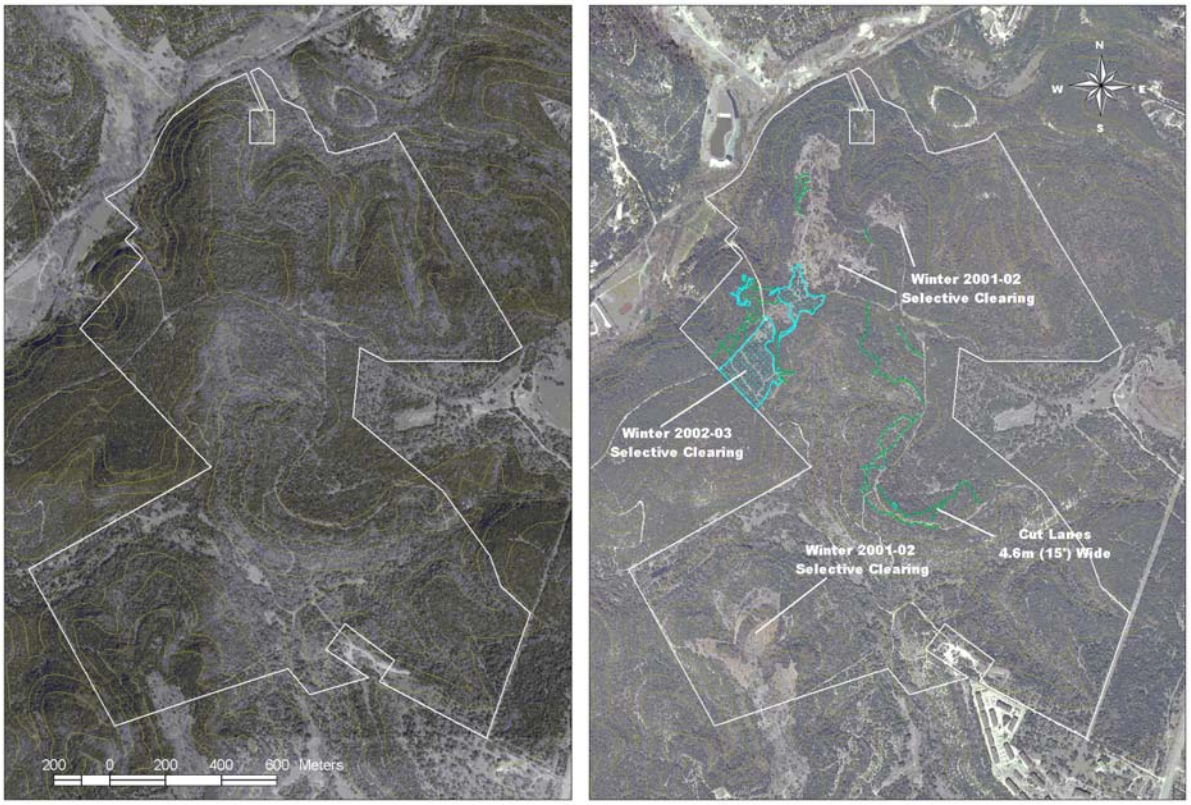

Fig. 4. Aerial imagery of long-term study site on Jollyville Unit of the BCP, a) prior to restoration (1997) and b) after winter 2001-02 restoration (2002).



Fig. 5. Franklin flail mower creating cut lane on Jollyville Unit of the BCP.



Fig. 6. Example of deciduous island created with Franklin flail mower immediately after selective clearing and prior to topping on Jollyville Unit of the BCP.



Fig. 7. Regrowth of deciduous shrubland two years after selective clearing on Jollyville Unit of the BCP.



Fig. 8. Photopoints on Jollyville Unit of the BCP. A) Pre-restoration (2001) and b) same location, 6 months after restoration (2003). C) Pre-restoration (2001) and d) same location, 2 years following restoration (2003).



Fig. 9. Island of topped shin oaks resprouting from the base two years after handcutting on Jollyville Unit of the BCP.



Fig. 10. Close-up of mowed shin oak with severe hedging, two years after mowing, on Jollyville Unit of the BCP.

TABLES

Table 1. Number of observed Black-capped vireo territories a) on long-term study site, b) in and adjacent to selectively cleared areas, and c) in cut lanes areas on Jollyville Unit of the BCP, Travis County, Texas, 2001-2003.

Area	2001	2002	2003
Long-term Study Site	15[a]	16	17
Selectively Cleared Areas			
Winter 2001-02	3[a]	4	4
Winter 2002-03		5[a]	4
Cut Lanes			
West	5[a]	5	4
East	3[a]	3	4
South		3[a]	2
Coffee Cup		2[a]	0

[a] = results of pre-restoration baseline surveys

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