

STATUS REPORT:

VIREO ATRICAPILLUS WOODHOUSE
Black-capped Vireo

Prepared for:

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The black-capped vireo (Vireo atricapillus) is a small "greenlet" closely related to and of the same size as the Endangered least Bell's vireo (Vireo bellii pusillus) of California. Both these vireos suffer from nest parasitism by the brown-headed cowbird (Molothrus ater). This parasitism is so severe that for the past several years no young black-capped vireos have been raised at various colonies under study by local ornithologists in Oklahoma and Texas. The long-lived, highly mobile black-capped vireo occupies a successional kind of vegetation composed of short trees scattered among patches of brush. It hunts in the dense leaves for caterpillars and other insects. No surface water is required on its territory. The former breeding range was from Kansas to central Coahuila; the species has now dropped out of Kansas, most of Oklahoma, and from several parts of the Edwards Plateau of Texas. Causes in addition to cowbirds are the growth of bushy vegetation into trees, encroachment of junipers, or removal of bush foliage by goats and sheep. Some of the largest enclaves are in conservation areas in suburbs of big cities where domestic and African herbivores are not raised.

A status survey was recently completed by the Biological Survey Section under the Mexico-United States Cooperative Wildlife Agreement, administered by Region 2, covering species that have restricted distributions along the common border of the Rio Grande. A minor sampling in Coahuila during the nesting season revealed a thriving colony at the base of the Sierra Encantada, a mining area free from domestic herbivores. Other grazed desert mountain ranges of Coahuila support small enclaves. Five fall migrants were seen in northeastern Mexico, and 13 adults were found in a sample of five localities within the Sinaloa-Nayarit wintering area, reached in fall migration by circumnavigation of the Mexican Plateau in clockwise direction.

An attempt at a total count in 1985 yielded 35-39 adults in only 3 places in Oklahoma, representing about 12 actively breeding pairs. In Texas, 280 adults were counted, in 33 places, representing about 168 breeding pairs. During the same breeding season this office sponsored a pilot experiment of cowbird removal using the decoy method worked out by the Recovery Team for the Endangered Kirtland warbler (Dendroica kirtlandi) in Michigan. Reproduction in the three experimental enclaves jumped from practically nil in 1984 to phenomenal success in 1985. For instance, the largest known colony, of 33 pairs at Wild Basin, Austin, Texas, produced 24 young, up from 2 by 24 pairs in 1984.

The census revealed that populations are disappearing in a random pattern throughout the Texas hill country, but that in 1985 the species was still able to migrate in spring to its extreme outposts, such as Blaine County, Oklahoma, and Greenhills Environmental Center at Dallas, indicating a precise adaptation for scouting out the ephemeral habitat and for maintaining small enclaves over a wide area. The best chance for helping the species is by cowbird trapping in available conservation-oriented areas that have habitat adequate for large colonies black-capped vireo pairs. Trapping the feeding flocks of cowbirds at corrals will be more efficient than that practiced in 1985, which hit merely the local territorial female cowbirds on their nest-watching areas. If the colony could be built up in the potentially largest breeding area, Big Bend National Park, then those offspring in addition to those from Wild Basin, might well be capable of bolstering the remaining enclaves throughout the species range.--Joe T. Marshall, 4 September 1985.

TABLE OF CONTENTS

Introductory Page	1
I. Species Information	
Classification and Nomenclature	2
Present Legal Status	4
Description	4
Significance of Taxon	6
Current Research	7
Geographic Distribution	9
Habitat Description	15
Population Biology	18
Land Ownership and Management Responsibilities	22
Management Practices	23
Evidence of Threats to Survival	23
II. Assessment and Recommendations	
General Assessment	25
Federal Status Recommendation	25
Recommended Critical Habitat	25
Conservation/Recovery Recommendations	26
III. Information Sources	
Acknowledgments	32
Literature Cited	33
Citations for Personal Communications and List of Contacts	35

STATUS REPORT

Taxon Name: Vireo atricapillus Woodhouse

Common Name: Black-capped Vireo

Family: Vireonidae

States Where Taxon Occurs: United States of America
(North to South) Nebraska (accidental)
Kansas (former breeding range)
Oklahoma (breeding range)
Texas (breeding range)
New Mexico (accidental)
Louisiana (accidental)

United States of Mexico
Coahuila (breeding range)
Nuevo Leon (breeding range)
Tamaulipas (migration)
San Luis Potosi (migration)
Mexico (migration)
Sonora (winter range)
Durango (winter range)
Sinaloa (winter range)
Nayarit (winter range)
Jalisco (winter range)
Hidalgo (possible winter range)
Michoacan (winter range)
Guerrero (winter range)
Oaxaca (winter range)

Current Federal Status: None

Recommended Federal Status: Threatened

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I. SPECIES INFORMATION

Classification and Nomenclature

- A. Scientific Name: Vireo atricapillus Woodhouse
- B. Original Description: Woodhouse (1852).
- C. Type Specimen: San Pedro River, 10 miles from source = Devils River, near Sonora, Sutton County, Texas (Deignan 1961). Collected 26 May 1851 by S. W. Woodhouse. Deposited in the National Museum of Natural History, Division of Birds (USNM), number 15040, an adult male, examined by us.
- D. Synonyms: None
- E. Common Name: Black-capped Vireo
- F. Family: Vireonidae
- G. Subfamily: Vireoninae
- H. Taxon History: The name of the Black-capped Vireo has remained unchanged since the original description. However, the area of the type locality, which we visited in 1985, has changed and is now unsuitable for the species. Mesquites and mottes of large live oaks dominate the scene. We assume the type locality to be near either the highway 10 or the Old Spanish Trail crossing of the river "two hundred and eight miles from San Antonio, on the road leading from that place to El Paso del Norte" (Sitgreaves 1854).

Principal studies of the Black-capped Vireo are two. First, C. D. Bunker (1910) studied nesting, stomach contents (all one kind of caterpillar), and plumages of a dense population in Blaine County, Oklahoma. He discovered the sexual dimorphism in color, unique in the vireo family, that has never been embraced in the systematic literature (Ridgway 1904, Oberholser 1974). At the time of Bunker's collections, in 1901 to 1903, the United States breeding range included Kansas, Oklahoma, and Texas. Those apparently disjunct populations later decreased and the species disappeared from Kansas after 1953 (Tordoff 1956).

The second study is by Dr. Jean W. Graber (1957, 1961), on the distribution, ecology, and population biology of the Black-capped Vireo, making the species one of the best known among American birds from the scientific standpoint. Graber color-banded the birds on study areas in Oklahoma and Texas, censused them on their winter range, and linked their restricted distribution to a limited, ephemeral habitat destined to be overgrown in the course of vegetational maturing and succession. She saturated her dissertation with a mass of climatic data intended to prove that the bird is susceptible to a narrow range of extremes--an idea that to us is an anathema for a well-insulated, highly mobile, warm-blooded vertebrate. Graber also studied museum specimens and picked out the two odd-balls (as yet unknown Vireo nelsoni) as something different.

By summer of 1984 the Black-capped Vireo was found in only one Oklahoma

locality, Methodist Canyon in Canadian County. Two pairs there nested under handicap from cowbirds. Texas and Coahuila still supported substantial populations. The winter range had not been searched since Dr. Graber's study of 1955, when the bird had been easily found in tropical woodlands of Sinaloa and Nayarit.

I. Current Alternative Taxonomic Treatment:

Dr. Allan R. Phillips (1968) first pointed out the similarity between Vireo atricapillus and its Mexican neighbor to the south, Vireo nelsoni, the Dwarf Vireo. Common traits of brick red iris, blackish tertials and secondary wing coverts of adults, pure white eggs, and exceptionally complex, musical song are distinct from other members of the genus Vireo, setting off the taxa atricapillus and nelsoni by themselves. Previous to Dr. Phillips' collection and examination of unworn specimens, Vireo nelsoni had been known from the unique type specimen, a skin of such worn plumage that its affinities are not easily discerned (USNM 144890, examined by us). The first major systematic publication even to list the two species consecutively, thereby indicating a close relationship, was the sixth edition of the American Ornithologists' Union Check-list (1983). Curiously, Mayr and Short (1970) failed to recognize the evolutionary connection between these two vireos, in a paper expressly concerned with uncovering such relationships in order to define superspecies of North American birds. Probably they were influenced by Hamilton's (1962) having mistakenly separated the two species by placing atricapillus in the "arboreal group" instead of the "thicket group" of the subgenus Vireo.

It is now known that the Dwarf Vireo occurs from Jalisco and Guanajuato to Oaxaca, in habitat exactly like that of the Black-capped Vireo and indeed occupied by the latter in winter, although both species have not yet been seen together. The only obvious differences between the Dwarf Vireo and the female Black-capped Vireo are the darker, more olive green cap, duller body, and more cream-colored, less bright yellow wing bars in Vireo nelsoni. We were tempted therefore to consider Vireo nelsoni as merely a hen-feathered subspecies of Vireo atricapillus, which we attempted to prove by looking for intergrades or connecting populations in the hiatus between their breeding areas.

Where should we encounter new (to science) breeding populations of Vireo atricapillus? Graber (1961) looked in vain to the southwest, assuming from the speculations of Moore (1938) that they should occur on a line between the summering and wintering grounds, where the birds might bog down during spring migration and start a colony. Actually there is no evidence that migrants take this short-cut across the parched north end of the Mexican Plateau. On the contrary, specimens and sightings from 16 Mexican localities where the vireos occurred in migration seasons (Figure 1) are around the edge of the Plateau to the south, documenting a migratory path along or parallel to the Sierra Madre Oriental. In fall the birds would circumnavigate the Plateau in a clockwise direction and fan out both north and south upon reaching the Pacific side of the continent. Therefore the place to discover breeding populations would be southeast and south of the known breeding range. Here indeed Dirk V. Lanning (pers. comm.) found in late May a singing vireo in the Sierra San Marcos of Coahuila, southeast of the previously known southernmost nesting area; eastward, Rose Ann Rowlett (pers. comm.) located a breeding population in the Sierra Picachos of Nuevo Leon in June (where John Arvin had found them in April, pers. comm.), and farther southeast John Arvin (pers.

comm.) encountered singing males, seemingly on territories, above Ciudad Victoria, Tamaulipas, in April. This last locality is close to the site of F. B. Armstrong's specimen of 12 April 1908 (J. C. Phillips 1911). Therefore Arvin thought that the Black-capped Vireo may be scattered southward along the east flank of the Sierra Madre Oriental, whereas to us, these findings indicated that we should look for intermediate or intergrading populations along the Sierra that would connect up Vireo atricapillus with Vireo nelsoni. The northern known limits of nelsoni are in Guanajuato. Finding intermediate specimens would enable us to adopt an alternative taxonomic treatment of two subspecies: Vireo atricapillus atricapillus and Vireo atricapillus nelsoni.

These expectations went unfulfilled in spring 1985. We searched prime habitat at Cienaga, above Cola de Caballo, in Nuevo Leon; Arvin's locality at Alta Cumbre, above Ciudad Victoria, Tamaulipas (however the lush ground vegetation of the previous fall had been destroyed by goats); southwest of Palmilla on highway 101 southwest of Jaumave, Tamaulipas; 28 miles northeast of Doctor Arroyo near La Lagunita, Nuevo Leon; and 14 kilometers southeast of Galeana, Nuevo Leon (figure 1). The only vireos we found were the White-eyed Vireo (Vireo griseus) and numerous Hutton's Vireo (Vireo huttoni). Even with the help of Dr. Phillips, we still failed to find any Black-capped Vireos at Rowlett's locality in the Sierra Picachos. Thus we must reluctantly shrink from merging Vireo nelsoni as a subspecies into V. atricapillus.

Present Legal Status

A. International:	None
B. National:	
United States of America	None
United States of Mexico	None
C. States:	
Kansas	None
Oklahoma	None
Texas	None (The Golden-cheeked Warbler, <u>Dendroica chrysoparia</u> , of smaller area than the vireo yet more numerous, is listed as Endangered.)

Description

A. Plumage and Morphology:

The adult male Vireo atricapillus is olive green on the upper surface, white beneath with flanks faintly yellowish green. The crown and upper half of the head is black, sharply demarcated. Such a pattern is of course unique in the family Vireonidae. Dr. Graber's (1957) dissertation provides a photograph of specimens showing that the black extends farther posteriorly on the crown and nape on males more than one year old than it does for males in their first year.

The large, angular, white patch along the side of the head includes the lores and an interrupted eye-ring. It is broader than are the similar though smaller markings of vireos such as the Solitary (Vireo solitarius) and Gray (V. vicinior) vireos. This white area is entirely surrounded by black. The white patches from the two sides converge and become pointed anteriorly above the bill, where they are separated by only a speck of black. Black also encroaches across the superciliary to the middle of the upper eyelid. The

iris is brownish red, the bill black, the feet plumbeous. Wing and tail feathers are dark olive, becoming blackish on the tertials and secondary coverts; all are conspicuously rimmed with cream or lemon yellow. These rims broaden terminally on the coverts as conspicuous wing bars. The adult female is colored the same except that the crown is slate gray instead of black and the underparts are washed with greenish yellow. Her eggs are pure, unpatterned white, unique in the genus (except for nelsoni). Immature specimens in fall plumage (National Museum of Natural History) differ from adults by greener general coloration, a peculiar burnt umber wash along the flanks, and no head pattern, although the olive cap is grayer than the back.

Having noticed in her individually marked study populations that all breeding males have a black cap, even though the prebasic molt produces a gray cap for first year males, Graber (1957) went on to discover a mid-winter capital molt that blackens the crown of all males. Such a molt is also unique among vireos, apparently. Wing measurements of Vireo atricapillus tend around 55 to 56 millimeters. It and the other members of the brush-inhabiting group of closely related species are all about the same size, smallest of the subgenus Vireo: Vireo atricapillus, Vireo nelsoni, Vireo belli, and southern races of Vireo griseus.

B. Vocalizations:

The audio disc (Barlow 1981) serves to introduce the song and to describe it better than words can. It is a complicated song of phrases containing rapidly uttered notes that range widely in pitch. The most rapid of these sound actually thrush-like. Bunker (1910) describes such songs as like a miniature Wood Thrush, a well deserved compliment. Thus the Black-capped Vireo's song is more musical and varied than those of other vireos. Our tape recordings of Black-capped Vireo and Dwarf Vireo vocalizations are filed at the Bioacoustic Archive, Florida State Museum, University of Florida, Gainesville. Some sequences of the announcement song repeat phrases such as A, B, A, B, etc. for several minutes or up to a half hour, then shift to C, D, C, D, and so on. There are of course many more phrases available in a male's repertoire. At times the bird will shift to a monotonous repetition of a single phrase, such as A, A, A, A, usually with a wooden or rattling quality. At the opposite extreme of its repertoire, the male can utter a varied, run-on song rather like that of the Blue-gray Gnatcatcher (Poliophtila caerulea).

Graber (1957) learned that individual males are recognizable by their announcement songs. Both W. M. Meriwether (pers. comm.) and Marshall discern local dialects as well as individual differences in songs of Black-capped Vireos from listening to birds in the field as well as to their tape recordings. A unique note or even a whole phrase may characterize a local group of males. For instance, males at S-Ranch, Tom Green County, Texas, include in their songs canary-like notes similar to those of the Lesser Goldfinch (Spinus psaltria); a rising note like that of a House Finch (Carpodacus mexicanus) is heard at the northeast corner of Kerr Wildlife Management Area, Texas; a longer trill is heard at Greenhills Environmental Center at Dallas, Texas; and at least one male in southwestern Somervell County, Texas, appropriates an entire song from the White-eyed Vireo, click and all. Spectrographic analysis to demonstrate this versatility is beyond the scope of this report.

Is the Dwarf Vireo's song any different? Or is it commensurate with the slight local differences mentioned above? We have only two localities represented: Tamazulapan, Oaxaca on the disc (Barlow 1981) and Presa Esperanza, Guanajuato (Marshall stereo cassette 5LAB, Marshall and Clapp 52A). These individuals sound identical among themselves and differ only slightly from the Black-capped Vireo in even greater variety and animation, if that is possible. A consistent difference is the absence, from the Dwarf Vireo's song, of the mandatory short trill of the Black-cap, which rounds off each phrase at pitch lower than the main portion of the song. As for the call notes, they are identical between the two species. These alarms and conversation notes between the members of the pair consist of a low, harsh buzz (called shrad by Graber and Grzybowski); di-di-di-di that may precede the buzz; various faint lisping notes and peeps; and a dividing of the buzz into a series of equal, short segments to make a grating sound exactly like that of the Ruby-crowned Kinglet (Regulus calendula), a bird that because of its abundance on the wintering ground causes confusion when you are looking for Vireo nelsoni and V. atricapillus.

C. Local Field Characters:

No other vireo or plain greenish bird that forages for insects in foliage possesses the striking head pattern of the Black-capped Vireo. The only approach to it is by the Solitary (Blue-headed) Vireo (Vireo solitarius) with its narrower white "spectacles," and its bluish gray cap that contrasts with the greenish back of all but the plumbeous races. The Solitary Vireo is much larger than the Black-capped and nests in a different habitat and area. Its white eye-ring cum lores is shaped like a candycane, without the black interruption above the eye.

Significance of Taxon

A. Natural:

The Black-capped Vireo has been locally common and an important ecologic component in the very particular oak brush habitat of its limited breeding range. It is the outstanding specific indicator for the vegetational configuration that it occupies because it is more narrowly limited in habitat than are species associated with it such as the Yellow-breasted Chat (Icteria virens), Rufous-crowned Sparrow (Aimophila ruficeps), Painted Bunting (Passerina ciris), Black-crested Titmouse (Parus atricristatus), and others. The vireo is a more competent habitat indicator even than the dominant plants inasmuch as these drop out and are replaced by ecologic equivalent species in an irregular sequence from west to east and north to south (tables 1, 2, 3, and 4). The Black-capped Vireo and the Golden-cheeked Warbler (Dendroica chrysoparia) are two of the few species that nest on the steep rims of the dry arroyos they inhabit, although the warbler, limited to an even smaller geographic range than the vireo, utilizes cedars (Juniperus ashei) in denser, taller stands than are suitable for the Black-cap. As will become painfully clear, this little vireo is heavily parasitized by the Brown-headed Cowbird (Molothrus ater) even though it is unsuccessful in rearing Cowbirds (Graber 1957).

B. Human:

The Black-capped Vireo, because of its striking color pattern, confiding ways, and gorgeous song, is especially attractive to ornithologists and amateur bird students, many of whom rely upon their colleagues in Texas to introduce the bird. Ornithologists, both amateur and professional, in various cities of Oklahoma and Texas, keep track of particular pairs and nesting territories year after year, in order to take visitors to them as well as to study and photograph the birds and their nests. Aside from its aesthetic value the vireo continues to provoke scientific interest, first for an explanation of its small area of distribution, already addressed by Dr. Graber; second, for an elucidation of its relationship to Vireo nelsoni; and third, for an understanding of why only this one taxon among vireos should depart from other vireos in its white eggs, sexual dimorphism, winter molt of the male's crown, and striking face pattern.

The Colima Warbler (Vermivora crissalis), Golden-cheeked Warbler, and Black-capped Vireo are the most famous birds of Texas to bird students. Travels and tours by the bus load to see these birds support a massive tourist industry, the magnitude of which is unappreciated save by the park custodians who handle the multitudes. A recent economic prospectus in the Washington Post stated that "birding" and nature photography are the fastest growing leisure industry in terms of monetary outlay for equipment, field guide-books, transport and lodging. Texas is hit by a tidal wave of these enthusiasts. We noticed that campgrounds in Texas State Parks on the Edwards Plateau were filled nightly and that campsites, motels, and lodges at Big Bend National Park constantly overflowed. We were repeatedly asked "What are all these people doing here in the non-vacation season (April and May)?" The answer is easy to see; everyone has binoculars, cameras, or bird books; discussion groups form nightly as birders compare notes ("Today the Painted Bunting became a trash species!") and compile lists. Many chartered tours prove to be from the principle bird tour agencies in Austin, such as Victor Emmanuel Native Tours and Field Guides Inc. Furthermore these visitors and tour leaders (such as John Arvin) make a bee-line to the spots listed in their Texas guide books as favorable for observing various species important to them, foremost of which is the Black-capped Vireo. While we were censusing this species, we repeatedly encountered amateur ornithologist drawn to the same spots by means of their published guides (Kutac 1982, Lane 1983). No economic detriments to humans in the United States of America are known. No economic benefits or detriments to humans in the United States of Mexico are known.

Current Research

The objectives of this study were to find out as much as possible about contemporary distribution and numbers of the Black-capped Vireo in order to compare the present with the past, as summarized by Marshall et al. (1984).

In 1983 Grzybowski began studying Black-capped Vireo populations in Oklahoma because they appeared to be dropping out of areas formerly inhabited. Using several decades of records kindly provided by John G. Newell, specimen localities, and other sites identified in Dr. Graber's study, Grzybowski embarked upon systematic visits to the known sites of previous occurrence. In 1984 he visited all of Dr. Graber's study sites in Oklahoma and looked for evidence of nesting success and interference by parasitic cowbirds.

Meanwhile in 1983 Marshall and Dirk V. Lanning observed vireos in Coahuila while Marshall was assisting Lanning in a status survey of the Colima Warbler (Lanning 1983). The following year Marshall and Roger Clapp began a study of the Black-capped Vireo along with the Texas Botteri Sparrow, because both birds have a restricted distribution as summer residents in the area of Texas and adjacent Mexico. Clapp quickly learned of Grzybowski's work and linked up with him and other local ornithologists in Oklahoma and Texas. He compiled records of former and present occurrences of the vireo both from the literature and from the local birders. He took a color photograph of the habitat of every site he visited that was the former or present home of a Black-capped Vireo. Marshall was in Mexico with Dr. Allan R. Phillips and Betsy Webb both of the Denver Museum of Natural History and Robert Phillips from the University of Nuevo Leon. This party sought in vain for the Tamaulipan population reported by John Arvin. Later Marshall and Phillips pere visited the Sierra la Encantada in Coahuila in order to secure a base-line profile of the vireo's abundance in its optimum habitat and greatest density of pairs. (This Eden is a mining area without livestock, fences, flies, or ticks; it has wildflowers, grasses, and bush foliage at ground level, necessary for shielding the nest.) From September to November 1984 Marshall surveyed Black-capped and Dwarf Vireos on their wintering areas in Mexico.

The following year, from 1 April through 6 June 1985, Clapp and Marshall attempted to visit all sites of recent vireo occurrence in Texas. From May through July Grzybowski (1985a) "resurrected" populations thought to be long gone from Oklahoma by making a more intensive search on the Wichita Mountains National Wildlife Refuge and by painstakingly pinpointing the area of Bunker's (1910) study in Blaine County. The pairs he had banded at Methodist Canyon, Canadian County, were not the ones that showed up on the same territories there in 1985. Assisted by Dr. Stephen W. Eaton in Kerr County and with the collaboration of Jim O'Donnell at Austin, Grzybowski (1985b) instituted cowbird trapping at those two sites and at Methodist Canyon and made a population study of the Black-capped Vireos at Kerr Wildlife Management Area, Kerr County, Texas.

The method used for all these surveys depends on the conspicuousness of the Black-capped Vireo in its particular summering habitat. If you drive up to a nesting area, you will hear the vireos within a half minute of rolling down the window, because their loud, distinctive song is uttered at most times of day, rain or shine. If they are not singing, you can start them up by playing a couple of their songs on a tape recorder. In Mexico, Lanning and Marshall also learned that this vireo makes a loud, harsh outcry when owls call or fly in the daytime, or when owl notes are played or imitated. Among aggregations of birds mobbing the Great Horned Owl (Bubo virginianus) and the Mountain Pygmy Owl (Glaucidium gnoma) the Black-capped Vireo stood out both from its short, buzzing alarm note and from its conspicuous coloration. Mr. Arvin mentions in addition to its coming up to owl calls and taped songs that the vireo is readily attracted by squeaking the lips, as observers do to simulate the distress signal of a young bird. Therefore negative evidence is much more trustworthy for the Black-capped Vireo than for other, less conspicuous species of birds. Until later in summer only a few minutes of hiking around and listening in the proper habitat need be spent to establish that the bird is really not there.

In Texas, 1985, we plotted upon county maps the spots of present and former occurrence of breeding Black-capped Vireos as determined from the literature and from local bird students. Within State Parks and National Wildlife Refuges we hiked in the morning in routes that covered as many vireo territories as possible. Outside the parks and refuges we drove to the spots checked on the maps, waited ten minutes at each stop after playing the tape or squeaking, and took a photograph of the habitat. Each time we saw a Black-capped Vireo we collected data on its activity, distance from the observer, position in the habitat, and geographic location. We measured the characteristics of the vegetation in a circle of two-meter radius beneath the nest or the perch of the bird where first seen, recorded the date and time of observation, enumerated and collected the plants, and listed the associated birds. We paid particular attention to cowbirds in the vicinity and to numbers of Brown-headed Cowbird eggs in the nests of the vireo.

In 1985 we found Black-capped Vireos in most of the contemporary known Texan sites that we visited but we deemed they were absent at Glass Mountains, Brewster County; Fort Hood, Bell County; and Meridian State Park, Bosque County. We discovered previously unknown groups of breeding birds in Coke, Erath, and Taylor Counties. Our Texan colleagues likewise verified other colonies and found a few new ones around Kerrville and Austin. Based on our impressions, photographs, and measurements of occupied habitat, we are prepared to recommend means of preserving this ephemeral vegetation in particular parks and refuges, on behalf of the vireo. These measures turn out to be the same as those already in use for enhancing deer forage.

Geographic Distribution

A. Geographic Range:

The Black-capped Vireo formerly bred from Kansas through Oklahoma and Texas to central Coahuila, with an outlying or temporary colony in Nuevo Leon, and summer records of accidentals in Nebraska, New Mexico, Louisiana, and the base of Cerro Potosi, southern Nuevo Leon. Migrants have been found around the perimeter of the Mexican plateau, winter residents from Sonora to Oaxaca but mostly in Sinaloa and Nayarit. The presently known breeding range is from Blaine County in Central Oklahoma south through Dallas, Edwards Plateau, Concho Valley, Callahan Divide and Big Bend National Park in Texas to at least the Sierra Madera in central Coahuila, Mexico.

B. Precise Occurrence:

By going back to original sources documenting former distribution we can modify the details without changing the overall picture presented by Graber (1957). Grzybowski (1985a) found that some of the errors for Oklahoma, such as proliferation of several records in different years from a single original observation, start with Margaret Morse Nice's book (1931) because she was denied the opportunity to proof-read it. Similarly, Roger Clapp's access to Harry C. Oberholser's original, 11000-page "Bird-life of Texas" (ms--Smithsonian microfilm copy of 1963) prompted an overhaul of the Graberian records for Texas. Apparently Dr. Graber had been furnished only scraps of information by Oberholser, who probably had not organized the data at the time of Graber's need for it. These corrections will be reported in the scientific literature in due course but they need not detract from our interim report

(Marshall et al. 1984) as a foundation for the following comparisons of 1985. These will be the findings of Grzybowski (1985a) for Oklahoma, 1985 observations of Marshall, Clapp, and colleagues in Texas, and sightings in Mexico by Marshall in 1983 and 1984.

OKLAHOMA

In 1985 only 28-32 males, 7 females, and 10-11 young were found for a total known Oklahoma population of 45-50 birds limited to three small areas (Figure 2). However, the known effective population of actively breeding birds may be 12 or fewer pairs. This and the following data are from Grzybowski (1985a).

BLAINE COUNTY. Salt Creek: 3-4 males found 10 May, none 20 June.

CADDO COUNTY. Scott: 2 males observed 10 May, part of the Canadian County enclave. None found on 20 June.

CANADIAN COUNTY. Niles, Methodist Canyon Camp, and County Line: 7 males, 4 females. These are all different birds from the two pairs and one male that were banded at Methodist Camp in 1984, when all nests were parasitized by Brown-headed Cowbirds. In 1985 decoy trapping for cowbirds enabled the vireos at Methodist Canyon to fledge 10-11 young.

COMANCHE COUNTY. Wichita Mountains National Wildlife Refuge: Hobbs Canyon, Cedar Mountain, Panther Creek, lower Greenleaf Canyon, Section 14, Elk Mountain, and Charons Garden: 15-17 males and 3 females. Fort Sill: Eagle Camp: 1-2 males on 2 June.

TEXAS

Figure 3 shows the places where we found Black-capped Vireos in Texas during the period 1 April to 7 June 1985. Although most sightings were of singing males, we presume they represent breeding colonies, especially if several are heard simultaneously. Included in the figure and following list are sightings by colleagues, if not for 1985, then for recent years in places that we did not reach where the birds probably persist. Numbers of birds found represent not the maximum but merely a sampling, because you cannot cross fences in Texas.

Marshall and Clapp found 160 adults representing about 78 breeding pairs, whereas their colleagues located 121 adults representing about 90 pairs. The totals are 280 adults in 33 places representing about 168 pairs.

BANDERA COUNTY. Lost Maples State Park: On 27 April we found two enclaves, a male singing high above the main campground, and four territories including a pair with a nest full of newly hatched, naked vireos, on the brushy slope opposite the Maple Trailhead parking lot. At this second spot, two singing males had been seen by Greg Lasley (pers. comm.) on 24 March. Somehow we all missed the much larger colony of five to six territories, probably many more, found by W. M. Meriwether (pers. comm.) in 1984 on the right side of the East Trail up Can Creek one-fourth to one-half miles from the primitive campground. The three spots are similarly situated on steep, south facing slopes, where adequate patches of brush occur among rocks and scattered trees.

BELL COUNTY. Fort Hood: John Cornelius (pers. comm.) saw a singing male and heard another in perfect habitat on 2-3 April. They were gone at the time of our visits in April and May. Apparently they left after failing to find mates.

BEXAR COUNTY. Friedrich Park: Tyrell D. Harvey took us to see three singing males on 21 April. He said that another pair had left after harassment by tape recordings. A pair and two other birds were found on 27 April (Celeste Newton pers. comm.).

BLANCO COUNTY. East of Blanco on road 2325 just east of the junction with road 165: Two singing males were heard on 8 June and there are probably more (W. M. Meriwether pers. comm.).

BREWSTER COUNTY. Big Bend National Park: We found six males singing on territories in lower Juniper Canyon on 4-5 May, at least one in lower Pine Canyon on 6 May, and two territorial males in lower Blue Spring Canyon on 9 May. Sightings of single birds were reported from half-way down the Window Trail on 13 May, the head of that trail near the treatment ponds on 28 July, and a singing male in Panther Canyon on 15 June (fide Bonnie McKinney). These may be wanderers as they were in places we had thoroughly searched in May. The Park sustains an abundance of Brown-headed Cowbirds and consequent dearth of small songbirds other than cavity nesters.

BURNETT COUNTY. Marble Falls: One was reported this year to Jennifer Terry (pers. comm.).

COKE COUNTY. Canyon and valley on north escarpment of Callahan Divide: On 14 May we found three occupied territories including three singing males, a female, and a juvenile at the edge of a probably large population in a valley that crosses highway 208 1.9 miles into Coke County from the south. At the head of a canyon on highway 2034 southwest of Robert Lee we found four territories or pairs, including three singing males.

CROCKETT COUNTY. Fort Lancaster Ruins: East of the Fort, on the highway that descends a steep, brushy north slope, we heard at least three males singing simultaneously with Gray Vireos (Vireo vicinior).

DALLAS COUNTY. Greenhills Environmental Center: We located on 18-19 May three males at least one of which was paired. We were about to look for two more contiguous males reported by a local birder when our search was interrupted.

EDWARDS COUNTY. Frances Williams' breeding bird census route along highway 674: On 29 April we began our search at the first good habitat 13 miles southwest of Rocksprings and proceeding southward found no vireos for the first 3.9 miles of good, unoccupied habitat. Then suddenly we had 7 territories including pairs and a nest with 3 vireo eggs in .5 miles just on the east side of the river. We heard no more from the southern territory, where we ended our sampling. A singing male had been found farther south on the same road near the south boundary of the county on 24 March (Greg Lasley pers. comm.). Two territorial males were active on the Nueces River bank 3 miles north of Barksdale on 2 June 1985 (Jean Evans pers. comm.).

ERATH COUNTY. Bluff Dale: We found a singing male on 16 May in an valley full of suitable brush where intensive juniper eradication had just been accomplished.

[IRION COUNTY. Three separate stations towards the center of the county: These birds were discovered in 1977 by C. C. Wiedenfeld, but nesting was unconfirmed (Maxwell 1979 mapped on his figure 1). We regret that we did not search for these sites when driving through the lush, agricultural Concho Valley. These colonies could still be there; nobody has looked.]

KERR COUNTY. West Spicer Drive 5 miles southwest of Kerrville: We found 18 territories of singing males, several of them obviously paired, on 22-24 April, 26 April, and 1 May. This ridgeline area is known in the birding guidebooks as Dewberry Hollow. Clapp finds from turn-of-the-Century records of nests, eggs, and study skins in the Biological Survey Collection (National Museum of Natural History) that this site, formerly called Lacey's Ranch, has been preeminent in observations of the Black-capped Vireo ever since the 1890's. Most of the Texan nests and eggs and half the study skins in vertebrate museums of the United States were taken here (Lacey 1911).

Reservation Road southwest of Harper: We found two singing males in 1.5 miles of scattered patches of habitat in this angle with route 479 on 25 April; Judy H. and Robert F. Mason (pers. comm.) found two breeding pairs on 4 May. Further sightings by the Masons (pers. comm.) are Lazy Creek Road: a male singing on 15 April, not there the next day; Elm Pass Road: males and females heard and seen on 12 April; hillside near river off highway 39: species present 21 April, 3 and 7 May--a new site not utilized previously. YO Ranch west of Mountain Home: We found at least four territories with singing males and one nearly independent juvenile 30-31 May.

Kerr Wildlife Management Area: Clapp and Marshall saw numerous singing males, pairs, and nests in two enclaves during periods of assisting Dr. Steve Eaton and Grzybowski in April, May, and June. On 2 June we found some fledged juveniles at the northeastern part of the Rock Pasture colony; we were never sure that we had found the northeastern limit of the enclave. Grzybowski (1985b) shows at Buck Pasture: 15 territories four of which had unmated males; Rock Pasture: 19 territories, unmated males on two of them; there were 24 nestings, the success rates of which with and without cowbird trapping are presented (Grzybowski 1985b).

KIMBLE COUNTY. South Llano River Wildlife Management Area and Lovers' Leap: We found 8 territorial males several of which were paired, on 1-2 May but we failed to find the vireos along an entrance road where Debbie Jackson (pers. comm.) had found nests in 1984.

[PECOS COUNTY. Roadside Park (the only one) on highway 285 between Sanderson and Fort Stockton: found in 1974 (Frances Williams pers. comm.). We have no reason to doubt that the vireo still occurs here and possibly in the Glass Mountains along the east side of highway 385. Neither we nor Bonnie McKinney found them in Gilliland Canyon of the Glass Mountains, Brewster County, in 1985.]

SOMERVELL COUNTY. Picnic Area on highway 67 near Chalk Mountain: One male was singing on 16 May where at least two pairs had been found, apparently in

1984 by Charles Easley (fide Greg Lasley). Dinosaur Valley State Park: On 17 May we found three singing males in two separated areas.

TAYLOR COUNTY. Highway 277 northwest of Abilene State Park: On 15 May we found four singing males, at least one of them paired, at the edge of what appeared to be an extensive habitat.

TERRELL COUNTY. Mouth of Independence Creek: On 22-23 June about 7 adults were seen by G. Warren and R. M. Stortz (fide Frances Williams), who had also observed them here in 1984.

TOM GREEN COUNTY. S Ranch: Two separated males singing sparingly on 13-14 May were probably paired and nesting.

TRAVIS COUNTY. Wild Basin: On 6 April we noticed three males singing in the low portion. Farther up the ridge to the north and over the north slope of it are the 33 pairs on 100 hectares that produced 24 offspring owing to cowbird trapping, whereas in 1984, 25 pairs produced only two. Nameless Valley Ranch and Nameless Valley Road: Several pairs were found in 1984 by Charles Easley (fide Greg Lasley) and doubtless returned in 1985. South and west of Four Points: Chuck Sexton (1985) located 12 territories at least four of which were occupied by pairs, from 7 April to 18 May. Knoll on Bull Creek north side of highway 360: Three territorial males were found in a small area surrounded by mature cedar brakes on 9 May (Sexton 1985). City Park Road: A pair was observed on 12 and 21 April 1985 (Rose Ann Rowlett pers. comm.).

UVALDE COUNTY. Neal's Lodge: Greg Lasley (pers. comm.) observed a male singing on 24 March in this private area where vireos have been seen in previous years on eight territories. He observed a pair southeast of the Lodge, along Highway 127 1.0 mile northwest of its intersection with 2690 on 15 April and 1 May 1985.

BLACK-CAPPED VIREOS OBSERVED IN MEXICO 1983-1984
(from north to south, see figures 1 and 4)
BREEDING AREA

COAHUILA. Serranias del Burro: 29°00'N 102°00'W, 1300 m, 7 June 1983, J. T. Marshall and D. Lanning, 4 singing males.

N base Sierra la Encantada, 29 kilometers west of La Babia, canyon below tunnel, 28°39'N, 102°19'-20'W, 1050 to 1250 m altitude, 13-14 June 1984, J. T. Marshall and A. R. Phillips, 15 territories; 5-7 October 1984, Marshall observed the adult male of the uppermost, greenest and shadiest territory on 5 and 6 October; it left during the evening of the 6th. On 7 October an adult female and an immature were in the same spot, evidently migrating. The birds seen in summer had all left the lower territories.

North base of Sierra Madera in main canyon at 1500 meters: 27°06'N 102°26'W, 24 May 1953, J. T. Marshall, one male seen in a valley that could support many.

Sierra San Marcos: north slope, 14 km. NE of summit at 2000 meters, 26°27'N 101°34'W, 20 May 1983, D. Lanning, one male singing in brush oak area just below the pine-oak zone occupied by Colima Warblers. The proper, lower

altitude zone at the north base of the mountain was ravaged by goats.

MIGRANTS

NUEVO LEON. east slope of Sierra Picachos, Cañon del Gallo, $26^{\circ}02'N$ $99^{\circ}45'W$, 15 kilometers WSW of Cerralvo: Alarm notes of one individual heard in response to tape by Marshall and Robert Phillips on 2 October 1984.

TAMAULIPAS. Alta Cumbre, Highway 101, 15.7 kilometers airline SSW of Ciudad Victoria, 1200 m altitude, $23^{\circ}36'N$ $99^{\circ}13'W$: One female seen on 13 October 1984, not certain identification.

HIDALGO. Jacala: One uttered alarm notes in response to the taped song on 15 October 1984.

WINTER RANGE

SINALOA. Concordia: Marshall found two females (possibly only one) 7-8 November 1984.

NAYARIT. El Pescadero: One attracted to tape recording, silent, on 6 November 1984 (Marshall).

Jumatan to El Espino (northwest of Tepic): Three males that answered tapes by singing, and three individuals that responded only with alarm notes and therefore considered to be females, including a pair (the rest being far separated) were found by Marshall on 4 and 6 November 1984. All hid immediately after sounding off.

5 miles northwest of Tepic: One male was seen and one individual's alarm notes were heard by Marshall on 3 November 1984.

Las Varas: One male and one female, in the same territory, were seen on 29 October 1984 (Marshall). They appeared separately and briefly and then hid, in response to tape recordings.

DWARF VIREOS OBSERVED BY MARSHALL IN 1984 AND BY MARSHALL AND CLAPP IN 1985

GUANAJUATO. Presa Esperanza, Guanajuato, 2200 m: Two together, plus a male that sang were studied 18-20 October; this male and two additional males were found there 14-15 April 1985. Uriangato: One male that sang and uttered alarm notes and hid in response to tape recordings was found on 23 October 1984.

MICHOACAN. Querendaro, the type locality: One silent individual came close to Professor Francisco Mendez and Marshall in response to tape recordings and proved to be an adult male (JTM 7274). Apparently the only reason that the state of Queretaro is listed as part of the range of the species (AOU 1983) is that the august committee, that has never studied elementary geography, mistook the name for that of the type locality. Note also that the committee allows only northernmost Coahuila to the Black-capped Vireo, whereas it actually extends to the center of that state. Zacapu: One individual was seen on 26 October when it twice came to a tape recording and then hid.

TOTAL BLACK-CAPPED AND DWARF VIREOS FOUND IN MEXICO

In summary, Black-capped Vireos seen or heard in Mexico total about 6 migrating individuals, 13 wintering, and 24 adults in breeding areas (probably representing 19 pairs). Of Dwarf Vireos, 8 individuals were observed in fall and in the dry spring season before commencement of nesting.

Habitat Description

A. General: The habitat of the Black-capped Vireo is a beautiful, green flower-garden during the nesting period from April to June. It is distinctive, easily recognized, of limited occurrence, and ephemeral. It consists of a few small trees scattered among separated clumps of many bushes. The bushes are in the open and their foliage reaches the ground. Imagine an average territory of 3 hectares (Jim O'Donnell, pers. comm.) or of 1.5 hectares (Graber 1961:323) that we might plant and landscape according to our impression of the requirements. Tree canopy of junipers or oaks will shade from 5 to 50 percent of the territory; less than that would be unrelieved chaparral, whereas more would begin to eclipse the required brush, to which nevertheless a colony of vireos may cling even up to 75 percent tree canopy. (Trees are defined as upright plants 4 or more meters tall with a developed crown and single main trunk at least 7.5 cm in diameter at breast height--Little 1981.) Oak or sumac bushes one to two meters tall with foliage extending densely to the ground are the main ingredient. They cover 50 percent or more of the ground that is out from under the trees and they occur in clumps separated from each other by alleyways of bare ground, rocks, grasses, or wildflowers through which you can walk. Litter under the bushes of around 25 percent and grasses and forbs also of 25 percent or more indicate a healthy, suitable environment whether or not they are necessary for survival of the vireos.

This bush-and-tree habitat of the Black-capped Vireo is of limited extent because it occurs on grazing land where the lower foliage of bushes is removed by domestic animals, chiefly sheep and goats. Brush control to enhance grass on this agricultural land involves uprooting of junipers, which is compatible with vireo occupancy (as at Kerr Wildlife Management Area, Texas), whereas removal of broadleaved, low bushes is disastrous for the bird. As a transitory stage in ecological succession, the habitat is ephemeral and is constantly being overlaid by crowding together of the junipers (called cedars), oaks, and deciduous trees that grow into a closed woodland canopy as they mature. Fire sets back the ecologic clock; the best vireo habitats we found and those supporting the largest or most dense populations had been burned in hot fires that killed the junipers ten to fifteen years ago. Succession is halted in other good areas (Kerr County) by deer browsing that keeps the shinnery oaks low, and by management to favor deer. Otherwise, the only unchanging, perennial habitat is on steep, rocky slopes where erosion and interspersions of boulders thwarts achievement of a closed canopy. Examples of such steep or exposed, perennial habitats are Bunker's gypsum canyons in Blaine County, Oklahoma, rediscovered by Grzybowski (1985a); the ridge top 5 miles southwest of Kerrville, Texas (=Spicer Ranch, West Spicer Drive, Dewberry Hollow, Lacey's Ranch); Wild Basin at Austin, Texas (but burned 15 years ago, fide Dr. David H. Riskind); southeast entrance road to Fort Lancaster, Crockett County; and the north escarpment of the Callahan Divide in Coke County, Texas.

The above characterization hints at the factors limiting vireo distribution and those lines of arguments that we shall develop in recommendations for land use as well as the more objective description of the habitat to follow.

B. Specific Vegetation Characteristics: Because the Colima Warbler survey was the model for our habitat analysis, except for the definition of a tree, let us begin this description with a comparison between results for the two species. The Colima Warbler is represented by 180 vegetation plots, with numbers in parentheses (Lanning 1983, his table 5), following the averages for 82 plots within the nesting range of the Black-capped Vireo: The cover of the litter layer of dead leaves and twigs for these plots 4 meters in diameter centered under the perch where the bird was first sighted was 69% (60%); cover of ground layer 41% (51%), height .3 m (.7 m); cover of shrub canopy 60% (42%), its height 2.2 m (2.3 m); cover of tree canopy 43% (70%), height 5.6 m (8.0 m). From Big Bend National Park, Texas, to central Coahuila, the Colima Warbler occupies the same desert mountain ranges as does the Black-capped Vireo (figure 4) and the above comparisons show similarity. The differences--heavy on the brush and disregard for slope exposure and angle (table 6) for the vireo, taller vegetation for the Colima Warbler--are due to the warbler's restriction to higher north slopes just beneath coniferous forest. Both birds occur within the same broad vegetation zone of mixed conifer-broadleaf-tree-bush-grass between forest above and desert below; both forage and sing in bushes as well as trees; both require dense cover at ground level to shield the nest (bunch grass for the warbler, a bush for the vireo); neither has any surface water on its territory; and both sequester themselves in a remarkably narrow altitudinal-ecologic span, the warbler at the top of the mixed vegetation zone, the vireo at the very bottom. We find that the mountains tall enough for Colima Warblers are the best for Black-capped Vireos because of a richer flora at the base of their north slopes; accordingly we shall use the map of Colima Warbler distribution for estimating vireo populations in Coahuila (figure 4) in the section on demography.

Tables 1, 2, 3, and 4 present a qualitative, floral diagnosis of Black-capped Vireo habitat, specifying which plants are trees and which are bushes, unlike previous literature, which fails to make the distinction. Although we recorded and collected monocots and succulents on the first-sighting vegetation plots, we purposely omit them from tables for the simple reason that the strictly arboreal vireo would no more perch on a cactus, agave, palm, yucca, or grass than it would walk on the ground. Only once, we observed a singing male Black-cap perch momentarily on the gorgeous inflorescence of a yucca on its way between two juniper song perches (at Fort Lancaster, Crockett County, Texas). That Black-capped Vireos thrive in a two-species vegetation of just shin oak (Quercus durandii breviloba) and Ashe juniper (Juniperus ashei) at Kerrville, Texas, proves their independence of and disregard for monocots and cacti. Although fine grass must be plucked for nest-building, doubtless from a firm perch on a woody plant, we wonder at this assertion: "In Mexico, the dried, paper-like leaves of yucca were used" (Graber 1961 page 325). A yucca leaf is, after all, the formidable Spanish bayonet.

Further remarks on critical species composition of vegetation will be found in our recommendations for particular parks. We now turn to a quantitative evaluation of Black-capped Vireo habitat (tables 5 and 6). This

is based on measurements made at and beneath the perch at which each bird was first sighted, as explained by Lanning (1983), where also the rationale and references are found. Most measurements are self-explanatory; the cover over the bird is foliage in an imaginary circle of 1 meter diameter over the perch, whereas the percent of litter, ground, and bush cover beneath the perch is within a circle of 4 m diameter. Tree cover is estimated in a 90° cone over the plot. Ground layer is that vegetation < 1 m tall, the woody bush layer is > 1 m, tree > 4 m tall and 7.5 cm diameter at breast height. The statistics emphasize that the habitat is young, low, and brushy; that the bush foliage extends down to the ground, as necessary for shielding the nest from view (usually at a height of 1.5 m); and that the migrant and wintering birds can get under some big trees--usually when they work along through dense bushes and vines that continue under the trees from a nearby opening. Marshall did not see wintering Black-capped Vireos in the continuous, shady, tropical woodland in Nayarit where the Grabers (1961) found them, this being the prime winter habitat of the Pacific coast vocal form of the Western Flycatcher (Empidonax difficilis difficilis), a truly shade-loving bird. Instead he had to climb hot slopes above those woods to get to bushes, vines, and various species of acacias (including Acacia hindsii with ants in its thorns) in order to find the vireo. His limited findings during the October-November period when the bird is so secretive as to border on the mythical are perhaps not comparable to those of the Grabers made in December, when the birds were more forthright.

The tabulations clearly show that Nelson's Vireo occupies the same habitat, though filled with Mexican species of plants, as does the Black-capped Vireo, although Vireo nelsoni can retreat into riparian vegetation in April, when its nesting habitat dries up. This vireo habitat is common in Mexico because it grows on disturbed hillsides, and road cuts. Many species of bushy composites are included. In it one can look for and find wintering Black-capped, if not Dwarf Vireos.

C. Associated Bird Species: As with the Colima Warbler, the narrow ecologic span occupied by the Black-capped Vireo precludes its having any community of associated bird species. All bird species found with it extend far beyond both the ecologic and geographic limits of this vireo. In one place or another they are the Common Screech Owl (Otus asio), Chuck-will's Widow (Caprimulgus carolinensis), Poorwill (Phalaenoptilus nuttallii), Ladder-backed Woodpecker (Dendrocopos scalaris), Ash-throated Flycatcher (Myiarchus cinerascens), Beardless Flycatcher (Camptostoma imberbe), Scrub Jay (Aphelocoma caerulescens), Black-crested Titmouse (Parus atricristatus), Bewick's Wren (Thryomanes bewickii), Blue-gray Gnatcatcher (Polioptila caerulea), Mockingbird (Mimus polyglottos), White-eyed Vireo (Vireo griseus), Bell's Vireo (Vireo bellii), Gray Vireo (Vireo vicinior), Golden-cheeked Warbler (Dendroica chrysoparia), Yellow-breasted Chat (Icteria virens), Scott's Oriole (Icterus parisorum), Brown-headed Cowbird (Molothrus ater), Lesser Goldfinch (Spinus psaltria), Cardinal (Cardinalis cardinalis), Painted Bunting (Passerina ciris), Brown Towhee (Pipilo fuscus), Black-throated Sparrow (Amphispiza bilineata), Rufous-crowned Sparrow (Aimophila ruficeps), Field Sparrow (Spizella pusilla), and Black chinned Sparrow (Spizella atrogularis). The most constant companions of the vireo are the titmouse, wren, chat, and Rufous-crowned Sparrow.

Population Biology

A. Demography: Here we offer our estimate of numbers of Black-capped Vireos living on the breeding area in 1985. Those actually observed are already listed on pages 11 to 14. For some areas they are only samples, so that we must now give an upper estimate that includes those pairs filling out the rest of each suitable place. Although we attempted to visit all known Texan localities, we found this impossible, and we must further estimate upper limits for birds supposedly occurring in suitable-appearing areas in which we did not have time to stop. The species is definitely colonial, so the problem is what to do with observations of a single, singing male? Is he the edge of a breeding colony (high estimate) or a solitary bird unable to find a mate (low estimate)? We shall give two or more singing males in hearing distance of each other the benefit of the doubt.

What constitutes a large enough cluster of pairs to breed successfully? Graber (1961 page 316), correctly noting that the species is not solitary, offered only negative evidence: that she had found no breeding colony smaller than 5 males plus 3 females, requiring 4 to 5 hectares. This concept was by no means overturned by Barlow's (1967) finding one exception, a lone, silent, successfully nesting pair at Big Bend, because Grzybowski (1985b) now has positive evidence that reproductive activity and mutual stimulation by song collapses in small enclaves, which simply abandon their territories and wander off in May after a couple of nesting attempts.

OKLAHOMA

"A reasonable projection estimate from [the sightings listed on page 11 for the three enclaves] places the Oklahoma population at fewer than 120 adults, with an effective breeding population of probably fewer than 20 breeding pairs" (Grzybowski 1985a).

TEXAS

These are mostly small enclaves, separated even in areas of abundance such as Coke County. Estimates here are in number of pairs: total from 188 to 374

	PAIRS
BANDERA COUNTY. Lost Maples State Park: Three known clusters.	14 to 17
BELL COUNTY. Fort Hood: Two good areas, the birds might return.	0 to 5
BEXAR COUNTY. Friedrich Park and vicinity: One continuous enclave.	4 to 6
BLANCO COUNTY. East of Blanco: One area.	3 to 5
BREWSTER COUNTY. Big Bend National Park: Lower part of 5 canyons.	8 to 18
BURNETT COUNTY. Marble Falls: Probably a wanderer.	0 to 3
COKE COUNTY. Callahan Divide: There should be a colony in every canyon along the north escarpment (Dr. Terry Maxwell pers. comm.). These canyons are several miles apart. We saw three	

good ones: highway 208 1.9 miles from Tom Green County line,
highway 2034 10.8 miles southwest of its junction with 158,
and the next canyon to the east. 10 to 20

CROCKETT COUNTY. Fort Lancaster Ruin: The habitat ends very
sharply half-way along the grade. 3 to 5

DALLAS COUNTY. Greenhills Environmental Center: Getting tall. 5 to 7

EDWARDS COUNTY. Highway 674 along the West Nueces River: There
could be a string of colonies at 7 territories per .5 mile on
each side of the riverbed in the 20 miles from where we found
the first (northernmost) vireo at 16.4 miles southwest of
Rocksprings to about five miles into Kinney County, at which
point the highway drops down into mesquite desert. The two
parallel strips of proper vegetation are 300 to 400 meters wide
at the base of the two bluffs that define the river bottomland;
they are separated by several hundred meters width of monotonous
mesquite and little walnut on the floodplain, occupied by Bell's
Vireos that keep getting chased by Black-capped Vireos when they
enter territories of Black-caps farther from the wash. 10 to 30

The two fighting males three miles north of Barksdale probably
represent a colony: 3 to 5

ERATH COUNTY. South of Bluff Dale: Single male. 0 to 3

GILLESPIE COUNTY. A patch of habitat west of Harper and three
more along highway 783 northeast of that town toward Doss. 0 to 12

IRION COUNTY. Three places not checked since 1977. 0 to 15

KERR COUNTY. Dewberry Hollow: One continuous population. 18 to 20

Kerr Wildlife Management Area: Buck Pasture: 11 to 15
Rock Pasture: 17 to 19

YO Ranch with three patches of habitat along Live Oak Road;
Lazy Creek Road, Elm Pass Road, Reservation Road off 479, and
Highway 39 hillside. 11 to 20

Stretches of good habitat were seen along highway 41 west of
Mountain Home on the YO Ranch and Priour Ranch, on the east
side of 1340 near its junction with 41, and along the south
side of highway 10 north of Mountain Home. 0 to 16

KIMBLE COUNTY. South Llano River Wildlife Management Area: This
is possibly a single population, including Lovers' Leap, but it
is very strung out and some pairs have dropped out since 1984. 8 to 12

From Junction to Roosevelt are 14 miles of good habitat on both
the north and south escarpments of the North Llano River. 0 to 12

PECOS COUNTY. Roadside Park on highway 285 and part of Glass

Mountains.	0 to 5
SOMERVELL COUNTY. Picnic Area on highway 67.	0 to 3
Dinosaur State Park: Overgrown.	3 to 5
TAYLOR COUNTY. Highway 277:	3 to 10
TERRELL COUNTY. Mouth of Independence Creek:	3 to 6
TOM GREEN COUNTY. S Ranch: Bushes mostly trampled.	2 to 3
TRAVIS COUNTY. Wild Basin:	33 to 34
Four Points:	6 to 12
Small clusters Nameless, Bull Creek, and City Park Road:	6 to 12
UVALDE COUNTY. Neal's Lodge:	4 to 8
Good habitats southeast of Neal's Lodge on highway 127:	3 to 8
South-facing hillside on highway 1050 west of Utopia:	0 to 3

UNITED STATES OF MEXICO: COAHUILA

These are figured by assuming a small colony in each of two or three canyons at the north base of each of the major desert mountain ranges shown in figure 4 taken from the Colima Warbler status report (Lanning 1983). Estimate for Coahuila in pairs, considering grazing and dessication is 48 to 131

Sierra del Carmen: We saw no suitable habitat on the west base.	5 to 15
Serranias del Burro:	4 to 16
Mountains south of Serranias del Burro:	0 to 8
Sierra la Encantada: Ideal habitat in the non-grazed portion.	20 to 30
Sierra Santa Fe del Pino: We did not hear the bird as we travelled up the long, central canyon.	3 to 12
Sierra Padilla: The species was found here by Graber (1957).	10 to 20
Sierra de la Madera: Only the one male found in excellent habitat, but we did not examine the west end of the range where Graber (1957) had studied the species.	6 to 12
Sierra San Marcos:	0 to 3

B. Reproductive Biology: The male reoccupies his territory in April and is rejoined by the later-arriving female. Banding shows that up to half the adults show up at the same territory the following year. The nest is built with dispatch, mostly by the female, near last year's nest. (Graber 1961).

The active first nest we found at Lost Maples Park was 45 cm from the 1984 nest hanging by half its rim in the same mesquite. These and further details of nesting are amplified in Graber (1961), including the fact that the female starts a new cycle while the male feeds the fledgelings. The reproductive cycle of the Black-capped Vireo is remarkably efficient, designed by evolution to compensate for an insecure, transitory habitat that is scattered in small parcels over a wide area.

C. Population Ecology: Black-capped Vireos have to reproduce in enclaves where individuals reinforce each others' singing and other reproductive behavior. An efficient, overlapping nesting schedule achieved by the long-lived adults is designed to produce a large fledgeling increment from the normal clutch of four eggs. Thus magnified, enough of the population can survive the two migrations each year to really scout out all available old and newly-burned or juniper-controlled habitats. Therefore we believe, to offer a concrete example, that the largest known continuous population, at Austin, that in 1985 for the first time in a decade has reproduced on account of cowbird trapping, will provide those pioneers programmed genetically to retake empty habitats throughout the range, including Fort Hood and Meridian State Park. They should be able to replenish precariously understaffed enclaves elsewhere, perhaps even into Oklahoma.

Rationale for this seemingly overoptimistic scenario of adaptation to small, transitory populations comes from these lines of evidence:

1) In spite of its small total population the Black-capped Vireo has a large proportion of sightings outside proven breeding areas during the breeding season, perhaps the largest proportion of any North American perching bird. Consider the records in Nebraska, New Mexico, and Louisiana; in Texas at Midland, Davis Mountains, Glass Mountains, and Lower Rio Grande Valley; in Nuevo Leon at Sierra Picachos and Cerro Potosi; Sierra San Marcos, Coahuila; Alta Cumbre and Santa Leonore in Tamaulipas (Marshall et al. 1984).

2) Banding studies show that between 50% and 60% of the breeding birds were new to the Oklahoma study site each breeding season (Graber 1961 page 335), and that all the birds returning to Methodist Canyon, Oklahoma, in 1985 were new (Grzybowski 1985a).

3) Even under a regime of depressed population levels in 1985, numerous wanderings were recorded such as singing males turning up briefly in canyons of the Chisos Mountains that apparently lacked breeding colonies (Panther, Window, Pine), and birds moving off good habitats in spring where they encountered no mate or too few pairs for mutual enhancement of breeding activity as at Fort Hood and Buck Pasture in Texas (Grzybowski 1985b).

4) Contrary to all the literature, the species is not differentially reduced in Texas west of the Edwards Plateau. Thriving colonies are in Coke and Taylor counties in the west, as well as in other peripheral areas such as Edwards, Uvalde, and Travis counties. There is no doubt that this vireo is declining, as is its Endangered relative, Vireo bellii pusillus of California. But the expectation for a declining species is that it loses its peripheral populations, becoming more and more confined toward the center of its breeding distribution, a fact due in most perching birds to unwavering adherence to the site of hatching. Exactly the reverse is true of the Black-capped Vireo,

which is dropping out of various central areas. Despite its adherence to the site of previous nesting it is able to move on if things are not right, and to reach in 1985 the remotest outposts north to Blaine County, Oklahoma, west to Big Bend, and east to Dallas and Travis counties. This means that a thorough mixing and canvassing of available colony sites was accomplished even in 1985.

The main flaw in the efficient system of nesting and habitat (or colony) search evolved by the Black-capped Vireo is the introduction by civilization of a new ingredient, the Brown-headed Cowbird, against which vireos have evolved no suitable defense, as they lack evolutionary experience with this parasite. Before arrival of domestic herds to North America the Brown-headed Cowbird was attached to the buffalo of the Great Plains, whereas all members of the vireo family were sequestered in forests, woodlands, and brushlands entirely out of contact with the plains, which lacked even riparian timber (Fowler 1898).

Land Ownership and Management Responsibilities

Our Texan colleagues warned of difficulty of access to the huge private ranches; therefore, they said, we would never know what hundreds of Black-capped Vireos might exist behind those fences and beyond inspection from the highway. Accordingly we were delighted at arrangements made by Dr. Terry Maxwell for us to look inside the S-Ranch north of San Antonio, and we accepted a generous invitation from the YO Ranch west of Kerrville, at the kind instigation of Kay Mueller. We conclude that a given ranch is a microcosm of the whole over-utilized state, in which areas here and there, representing perhaps 5% of the ranch, are spared from domestic or exotic herbivores due to inertia or desire to retain shinnery for deer browse. On the outside, by driving along highways and back roads, we have seen all we need to see of Texas to realize that privately-owned, good vireo habitat is left there purely by caprice, inertia, or absenteeism. Nobody could tell why several arroyo Edens in Coke County are garden spots, full of vireos cheek-by-jowl against decrepit territory of the Angora goat. Frances Williams (pers. comm. quoted in Marshall et al. 1984) claims that her breeding bird census route along highway 674 in Edwards County is too steep and rugged to plow, drag for brush control, or develop. Too easily convinced, we set out to count vireos along the closest roads to each side of 674, namely 55, 2523, and 377. True enough, on similar terrain there were no condominiums or cotton fields; neither were there any vireos or habitat remotely suitable. All had been sacrificed for goats and sheep and nothing remains but junipers and bleached limestone. The supposed ruggedness of 674 is no insurance.

The only vireo habitat in Texas that is under any sort of rational control belongs to National Parks and military reservations, the State of Texas Parks and Wildlife Department, or privately owned or endowed conservation areas. Most are pitifully small, but the fact that Wild Basin at Austin in 1985 supported 33 pairs on 101 hectares that required no manipulation except purchase (Jim O'Donnell pers. comm.) demonstrates a potentially decisive role for the small parks.

We feel that the management responsibilities for supervisors of these reserves, state parks, and private conservation areas is to prevent their land from growing up to solid Ashe juniper, not merely in behalf of the vireo but as a means of sustaining a varied, beautiful, and unique Edwardian flora and

fauna. The responsibility of Big Bend National Park is to forestall the eradication of vireos and most other open-nesting songbirds by an incredibly bloated and disgusting population of Brown-headed Cowbirds. On the other hand, the responsibility of the Fish and Wildlife Branch of Fort Hood is to hope and pray that the vireos return to this potentially largest breeding area in existence, and if they do, to shoot or trap cowbirds with zeal.

Management Practices

During Roland H. Wauer's tenure as Naturalist at Big Bend National Park in the late 1960's and early 1970's, cowbirds were regularly netted, to the tune of 100 or more each summer (Wauer pers. comm.) A management tactic under consideration at the park is controlled burning for fire protection around some heavily used campsites (Mike Fleming pers. comm.). This would reduce junipers and promote brush, and so create habitat for the Black-capped Vireo as an inadvertent benefit.

Oklahoma authorities in 1985 sponsored cowbird trapping at Methodist Canyon that resulted in successful nestings; the Office of Endangered Species at Albuquerque likewise undertook remarkably successful trapping at Wild Basin and Kerr Wildlife Management Area--all run by Grzybowski (1985b). Meanwhile Texas Parks and Wildlife authorities, in order to enhance deer forage, knocked over the Ashe junipers at Buck Pasture in Kerr WMA, just before the vireos arrived, in April 1985. The birds went ahead and nested successfully (on account of the active cowbird decoy trap) in the thriving shinnery and sang from available broad-leaved trees scattered among the fallen "cedars."

The good habitat at Fort Hood is the result of two hot fires 10 years ago, one in the northeast Golden-cheeked Warbler reserved area, the other centrally located. These were hot enough completely to eradicate junipers except that the fire jumped a nice mature stand in the northeast that is especially fine for the warbler.

Evidence of Threats to Survival

A. Present or Potential Threats to Survival: Four major threats are 1) possible real estate development of thriving vireo populations at the edge of Kerrville (West Spicer Drive) and Austin (Davenport property adjoining Wild Basin); 2) grazing by sheep, goats, and exotic herbivores over vast areas of the Edwards Plateau and westward; 3) growth of junipers into a closed canopy--a sort of monoculture resulting from human interference with ecologic processes; and 4) nest parasitism by the Brown-headed Cowbird. Concrete evidence for looming development comes from residents at West Spicer Drive who moved there to escape the city. They are now confronted with the likelihood of subdivision; we saw real estate signs there. As for Wild Basin, the best vireo habitat that contains the majority of the 33 pairs is over the boundary on the north ridge and down its further slope--an area owned by developers who may sell to the Wild Basin Committee. This is a tense and hopeful moment for the fate of the World's largest known continuous population of the Black-capped Vireo.

The importance of habitats at the edges of cities is simply that people do not tolerate domestic flocks and herds in or next to the suburbs. That is why we have active colonies of Black-capped Vireos at Dallas, Austin, San Antonio,

and Kerrville.

Evidence for heavy grazing, trampling, and browsing is rampant on the Edwards Plateau and it takes the form of a scene dominated by Ashe juniper and stark, white, sun-bleached limestone. The Plateau is the Angora goat capital of the world and it further boasts all sorts of African herbivorous game. We eschew the hackneyed term "overgrazing" here because it stands for a purely imaginary, unreal concept just like "selective logging," "tree farm," "sustained yield," and "partly pregnant." The term "overgrazing" tempts our imagination to conjure up some sort of opposing, controlled or normal grazing designed for a persistent agriculture. There is no such thing in the state of Texas, whose millionaire ranch owners are as incapable of treating the environment with moderation as are their brothers-under-the-skin, the Mexican peasants, who think they must strip the vegetation and soil in order to stay alive.

Evidence for the destructive role of the Brown-headed Cowbird is two-fold: unoccupied habitat at Fort Hood, Big Bend National Park (Campground Canyon, Window Canyon, Pine Canyon, much of Blue Spring Canyon), Meridian State Park, parts of highway 674 in Edwards County, parts of South Llano State Wildlife Management Area in Kimble County, washes crossing highways 3008 and 2523 in Kinney County and southernmost Edwards County northwest of Bracketville, and in Somervell County a spot 3 miles south of Dinosaur Valley State Park headquarters on park road 59, a half mile north of its junction with highway 67. Complementary positive evidence is the successful rearing of young at the three sites of cowbird decoy trapping (Methodist Canyon, Wild Basin, and Buck Pasture), in contrast to nearly 100% parasitism among controls (Grzybowski 1985b) and where nesting success the previous year (1984) was nil. For instance, at Wild Basin 25 pairs fledged 2 young in 1984 whereas 33 pairs successfully fledged 24 in 1985 (Jim O'Donnell pers. comm.). Another item that O'Donnell and ourselves observed was that cowbirds clue in on Black-capped Vireo songs and tapes. At Big Bend, cowbirds appeared out of nowhere when Black-caps and Gray Vireos sang.

B. Overutilization: Nests failed or were abandoned due to excessive motion picture and still photography (at Austin, O'Donnell pers. comm.) and a pair abandoned its trailside territory at Friedrich Park, San Antonio because of frequent harassment with tape-recorded songs (Terryl Harvey pers. comm.).

C. Diseases and Predation: Heretofore mortality of the long-lived adults has never been observed except as failure to return to the territory after migration (Graber 1961). O'Donnell (pers. comm.) supplied the first known instance of predation upon an adult, in 1985: A female brooding on an exceptionally low nest was eaten during the night and her feathers were found scattered over the ground the next morning, at Wild Basin.

D. Inadequacy of Existing Regulations: The Migratory Bird Treaty Act protects this species from being killed or taken captive. An official Threatened status might confer in addition relief from cowbirds, photography, tape playing, and indeed from any approach to the nest except by those officially monitoring reproductive success and cowbird activity.

II. ASSESSMENT AND RECOMMENDATIONS

General Assessment

The Black-capped Vireo is a migratory species superbly equipped to find and to persist in a transitory type of vegetation (of small total area in the summering range) that is widely scattered in small parcels over parts of Oklahoma, Texas, and Coahuila. Nest parasitism by the Brown-headed Cowbird cancels the vireo's reproductive effort, denying it the numbers necessary to search for and to colonize its habitat and to boost those enclaves too small to carry on successful nesting. Domestic herbivores, to which the cowbird is attached, bring the parasite into contact with the vireo and they eat or trample that lower level of bush foliage necessary for nesting. Reduction of the vireo population has been random, with now empty habitat scattered through the distributional area. The species was still able in 1985 to get to the the extremities of its historic distribution, except for Kansas, where suitable low vegetation no longer exists.

The Black-capped Vireo is gravely endangered in Oklahoma, where only three areas were occupied in 1985. It is reduced in Texas but it probably continues to occupy north bases of most desert mountain ranges in the northern half of Coahuila, where numbers always would have been limited because of aridity and sparseness of the vegetation. We know of no place where the vireo is secure against loss of its habitat through maturation of tree canopies, cowbird parasitism, plowing, real estate development, brush control, or grazing except in the Sierra Encantada, Coahuila, which is a mining area free from domestic herbivores. We have not ascertained why that area is not presently grazed or how long it will stay that way.

We find that the Black-capped Vireo is unlike most wildlife species, which require large, continuous areas of habitat; instead it lives in small enclaves whence individuals roam and probably effect mixing throughout the range. Therefore the small size of most of the Texas state parks is not to be sneered at; they are probably just right for perpetuating the species, with a little management. The best place to help the vireo is on the various wildlife management areas, parks, and nature reserves run by and accessible to conservation-oriented managers and public. We specify measures individually for the various parks, below, where we are certain that interest and personnel are available to carry them out. Our recommendations pertain to Texas inasmuch as Oklahoma is covered by Grzybowski (1985a).

Federal Status Recommendation

We recommend that, pursuant to the Endangered Species Act of 1973, as amended, the Black-capped Vireo (Vireo atricapillus) be accorded a U.S. Federal status of Threatened.

Recommended Critical Habitat

This is tricky. If our scenario is overoptimistic so that the Black-capped Vireo will shortly deserve Endangered Status, then we could hardly declare the agricultural goat land of Texas as a critical habitat. Nor can we designate the vireo habitat as an entity in space or time that has to be left alone. It is a transitory habitat that must be managed by burning or browsing (from the top, as by deer) in order to persist. We suggest that if it becomes necessary in future to designate a critical habitat, that we make it something over

which we have control: the mixed growth of trees and bushes dominated by oaks, evergreen sumac, or little ash that exists at Fort Hood, Big Bend National Park, Texas Parks and Wildlife Department areas on and southwest of the Edwards Plateau, and the three privately-owned conservation areas of Greenhills, Wild Basin, and Friedrich.

Conservation/Recovery Recommendations

A. General Recovery Recommendations: Each park and natural area should decide what portions of mature, healthy Ashe juniper mixed with broadleaves it wants to keep for the Golden-cheeked Warbler, of Endangered status in Texas. Then it should knock over the scrubby, runty, or pure stands of juniper elsewhere and in some cases cut back the broadleaved trees and burn the oaks so that they will sprout up again as bushes. In certain key areas where vireo populations are large, or where it will do the most good, or where they are easiest to trap, cowbirds should be removed. We recommend that cowbird control be continued indefinitely at least at Methodist Canyon in Oklahoma and Wild Basin in Texas, preferably also in Kerr County, Texas, and that it be resumed at Big Bend National Park.

B. Specific Recovery Recommendations:

TEXAS STATE PARKS

Abilene State Park, Taylor County. A thriving Black-capped Vireo colony on highway 277 just west of the Park entrance road might spread to the inside of the Park if a brush patch were created. In 1985 all was dense eastern deciduous woodland.

Cleburne Recreation Area, Johnson County. Roger Clapp searched intensively in 1984 and found the understory too open under the many junipers and few oaks. If a brush patch cleared of junipers were created, it might attract the vireo.

Dinosaur State Park, Somervell County. Clap found none on the flat portion of the Park in 1984. Black-caps were in two canyons half-way up the escarpment in 1985. They were absent from good looking brush along the firebreak on top. The habitat where they occurred, the best found in the park, is maturing so that the oak brush is growing into young trees and the oak and juniper trees are getting large enough to form a continuous canopy. We doubt that the Black-capped Vireo can persist in this overgrown habitat more than a couple more years unless the scraggly junipers in the two canyons are yanked out. The junipers in these two vireo areas are not densely foliated and healthy looking and therefore we emphasize that their removal will not jeopardize any Golden-cheeked Warblers.

Fort Lancaster Historic Site, Crockett County. This is one of those rare, self-perpetuating habitats on a steep rocky slope, with habitat ideal for both the Black-capped and Gray Vireos in spite of lacking oaks. We hope this slope along the highway descending from the east is actually within the Park. The ruins themselves are down on the mesquite floodplain.

Garner State Park, Uvalde County. In 1984 and 1985 we found the vegetation of the slopes far too tall and dense for our species of vireo. Juniper control near the top of the main ridge, on its rocky southwest face, might well

attract any extra Black-caps from the several good habitats in the county, such as Neal's Lodge.

Kerrville State Park, Kerr County. Searched by Clapp in 1984 and 1985. The Flat Rock Unit of riparian timber and the Hill Country Unit of Ashe juniper with little or no bush cover at ground level are unsuitable for the vireo and better for Golden-cheeked Warblers.

Lost Maples State Park, Bandera County. The three vireo areas on steep south-facing slopes probably need no maintenance. Junipers have been extensively cut, apparently for posts, on top of the west escarpment opposite the Maintenance Complex. But the bushes there are too tall, loose, and scraggly. Now that this relatively flat summit is opened up, it would be easy to burn or slash the bushes, allowing them to sprout up densely from the ground.

Several prominent birders, Greg Lasley, W. M. Meriwether, and Mrs. Helen Dancey (pers. comm.) agree with us that Black-capped Vireos occur in the three limited enclaves and that proliferation of supposed breeding areas in heavy forest is due simply to misidentifying the abundant Red-eyed and White-eyed Vireos there or to inadvertently chalking up all sightings of the genus Vireo as the Black-capped species. An element of exuberance sometimes enters. When we met John Arvin at Big Bend he said that Black-capped Vireos were nesting all over Lost Maples. Upon further conversation it turned out that he had seen the same birds, in the same amounts, that we had, and just in the two areas nearest the entrance. He had been directed to the nest we had earlier found.

Meridian State Park, Bosque County. Roger Clapp intensively surveyed the park in 1984 and he and Marshall checked it again in 1985. This is prime Black-capped Vireo habitat, favorably mentioned in the birding literature as the ideal place to look for the species (Kutac 1982, Lane 1983). Dr. F. R. Gehlbach found it there recently but he has not checked his notes for the actual year. Dr. Warren Pulich in a 1984 manuscript states that a few can be found but not as numerous as formerly. The only dates he mentions are extremes for arrival and departure, namely 2 April 1977 and 11 September 1970. So we are uncertain of the last sighting at Meridian. We find it most ominous that the Black-capped Vireo has lost this excellent area. This is a consideration in our recommending a Threatened status.

Mother Neff State Park, Coryell County. Clapp in 1984 saw mostly big trees and only a little brush, so that the habitat is only marginally suitable, though it might be artificially improved.

Pedernales State Park, Blanco County. Our visits in 1984 and 1985 were disappointing inasmuch as we found almost the entire terrain overgrown with Juniperus approaching a continuous canopy. Much of this is monotonous, without admixture of broadleaved trees, and on dry slopes unattractive even to the juniper-loving Golden-cheeked Warbler. The official Park bird list includes the Black-capped Vireo as a breeding species on the basis of a sighting 7 miles up the primitive trail, which we do not doubt but which nobody has verified in recent years (Chuck Sexton pers. comm.). We were misdirected to the hills at the entrance, and so wasted our time. Assuming the presence of a colony in the hinterland of the Park, we recommend that its

habitat be increased by burning or pulling the junipers in patches except from the sheltered or mixed stands suitable for the Golden-cheeked Warbler. Also we suggest increasing the low shinnery, such as can be seen across from the entrance, to the south (adjacent to the Park boundary). This would relieve the monotony of the overall vegetation and render it more attractive to deer as well as birds in general, for the juniper by itself is a most sterile habitat.

II. TEXAS STATE WILDLIFE MANAGEMENT AREAS

Kerr Wildlife Management Area, Kerr County. It is obvious from the distribution, numbers, and nesting success of Black-capped Vireos here that they benefit from cowbird trapping (Grzybowski 1985b) and from those measures taken to enhance deer habitat. Maintenance of low, dense breviloba shin oak, with cover clear to the ground, affords concealed nesting sites required by the vireo as well as ideal browse for the deer. It would seem wise to us that you take the results of Clifton Ladd's warbler study to set aside the best, mixed Ashe juniper areas for Golden-cheeked Warbler preservation and then that you go ahead with removal of the junipers elsewhere. As for continued cowbird trapping, could a feeding corral be found where they could be caught in numbers? That would protect the whole area instead of just nests near the trap when it is located in a female cowbird egg-laying territory as in 1985.

South Llano River Wildlife Management Area, Kimble County. With its varied terrain and extremely heterogeneous mix of vegetation, the Area support a significant breeding population of Black-capped Vireos that has been studied for several years by Dr. and Mrs. Nick M. Jackson. However, all may not be well, for we were unable to find the species in an area near the Agriculture Campus where Debbie Jackson had found nesting the previous year (1984). This should be a candidate area for cowbird control.

III. FEDERAL LANDS IN TEXAS

Big Bend National Park, Brewster County. The mouths of canyons around the base of the Chisos Mountains support vegetation ideal for the Black-capped Vireo and closely resembling that in neighboring desert mountain ranges of Coahuila, such as the Sierra Encantada, where the species is abundant. Nevertheless, except for a one-mile stretch of Juniper Canyon, this vireo is noticeably scarce in prime Chisos Mountain habitat. We attribute this scarcity to cowbird parasitism, noting that other species of small perching birds are likewise few in such places as Campground Canyon, Window Trail, mouth of Pine Canyon, Green Gulch, and lower reaches of Blue Spring Canyon. We think that the vireo flourishes in lower Juniper Canyon simply because that area is farthest removed, over some tall summit crags, from the source of cowbirds at the Basin saddle horse concession.

Considering that numbers of the vireo exist in Coahuila adjacent to Big Bend, we find it extremely unlikely that the species was ever merely a sporadic visitor that began to nest in the Park just in time to be discovered by Dr. Jon Barlow, Dr. R. Roy Johnson and Ro Wauer. We reject the notion that it recently appeared and increased despite the cowbirds from the corrals, that have been there for several decades. We hold, on the contrary, that the Black-capped Vireo has always nested at the Park and has gone unnoticed for

many periods of time between visits or residencies of those ornithologists, such as Ro Wauer, who made a special effort to find it. Judging from the amount of unoccupied habitat, and disappearance from Campground Canyon, we think the vireo is on the wane. Cowbird parasitism has already eliminated the Yellow Warbler (Dendroica petechia) from the Park (Wauer 1973).

We recommend therefore that cowbird control, which was undertaken with nets in the late 1960's and early 1970's be resumed with the more efficient decoy trap to be located at the Basin horse concession corral. The portable trap, as used in Michigan on behalf of the Kirtland Warbler, is described and figured in a U.S. Fish and Wildlife Service publication of October 1973 available at the Office of Endangered Species in Arlington, Virginia, and at the Bureau of Sport Fisheries and Wildlife, Federal Building, Fort Snelling, Twin Cities, Minnesota 55111. The trap works on a combination of decoy live Brown-headed Cowbirds, water, and sunflower seeds. The Basin at Big Bend is an ideal place to use the trap because 200 or so cowbirds visit the corral at any one time and the trap can be assembled in or behind the wooden barns, completely shielded from public view. Secrecy is important, as learned to its chagrin by the Kirtland Warbler Recovery Team.

The beauty of trapping at the Chisos Basin is that birds all around the base of the mountain would benefit, from hitting the whole cowbird flock. That is an entirely different and more efficient way from the laborious local trapping in the nest-parasitising territories of female cowbirds, which protects only a small colony, as was done in 1985.

We are alarmed at the disgusting presence of hundreds of cowbirds on a confined, isolated, small mountain like the Chisos, completely surrounded by desert, where the populations of upland species of birds, and those narrowly encircling the base, are small and vulnerable. Strictly from the standpoint of the Black-capped Vireo, the magnificent opportunity for trapping afforded by the corral, that acts like a magnet for cowbirds from all over, would enable the vireo to fill its potential distribution here in the largest area of Black-capped Vireo habitat that is within a single conservation-oriented parcel anywhere in the United States. Other species, such as the Gray and Bell's Vireos and Colima Warbler would also benefit. Notice that we are not against the horses. They are the sting that puts the cowbirds in our power.

Fort Hood, Bell County. There is an old record for the Fort (Marshall et al. 1984) as well as two individuals found by John Cornelius in 1985. The two areas burned 10 years ago are ideal habitat but livestock graze over much of the Fort, and we believe that their associated cowbirds could have eliminated a once thriving population of Black-capped Vireos. On that assumption, and the fact that vireos will probably continue to attempt setting up territories here in early spring, we recommend a careful watch for them in succeeding years and shooting of cowbirds near any pair that may form.

IV. PRIVATE CONSERVATION AREAS

Friedrich Park, San Antonio, Bexar County. Pertinent habitat is along the top of the main ridge, where we think the few vireos are too far apart. It might be well to remove a few junipers there so continuity of territories can be achieved. Tourists should be warned against playing tape recordings of the song.

Greenhills Environmental Center, Dallas, Dallas County. This is the northeasternmost, isolated stronghold of the Black-capped Vireo. The habitat appears to be maturing to near the point where brush will grow into trees or be shaded out by the merging crowns of the burgeoning woodland trees. Let us suggest that some brush patches next to the present breeding sites be hastily prepared for occupancy by yanking out junipers and burning or cutting shinnery so that it will start up again with a low growth. The shinnery now occupied is getting too tall, at head height.

Wild Basin, Austin, Travis County. We understand that although it may have burned long ago, the vireo habitat at the Basin is seemingly self-perpetuating, on account of past land use that makes it rocky and favorable for bushes. If the ridge land on the north border is successfully acquired, and if cowbird trapping is continued with the same brilliant success as in 1985, then the largest known continuous population of Black-capped Vireos will be preserved. If their reproduction continues satisfactorily, then this population may well seed other areas such as Fort Hood. The fate of the species may well hinge on the outcome of this move to acquire the northern land. Is there a local corral where cowbirds could be trapped in large numbers?

V. SELECTED PRIVATE LANDS

We think that the natural beauty and varied flora of the following sites with substantial Black-capped Vireo populations should make them candidates for special planning on behalf of the species.

Callahan Divide, Coke County. One of these canyons would make a noble addition to the splendid roster of parks and natural areas administered by the Texas Parks and Wildlife Department.

Highway 674, Edwards County. We wonder if Frances Williams or her associated birders could discretely learn by what freak of fate her famous breeding bird census route has been spared from the goats. Could we risk telling the owner of the importance of the place in the bird world, such that people from all over the country come here, attracted by directions in the guidebook (Kutac 1982)?

Neal's Lodge, Concan, Uvalde County. Personnel of this beautiful resort are aware of the vireo and they know that many of the tours and visitors that stay for the night are looking for the bird, as mentioned in the guidebooks. We suggest that someone on the staff or a local birder be encouraged to census the birds each spring and look for evidence of cowbird parasitism.

West Spicer Drive, Kerrville, Kerr County. If this oldest continuing site of the Black-capped Vireo is developed along the lines of what is already there in 1985, then we would have widely spaced houses surrounded by natural vegetation. The present residents like and encourage the natural vegetation but they know little about birds. They have a common interest in preventing a crowded suburb from sprouting up and perhaps they could be encouraged by the active group of local birders to band together and preserve this habitat with some sort of "natural vegetation zoning."

C. Monitoring: This is crucial, especially in 1986, in order to see if our

idea of reproductive capabilities of the vireo, upon which the above recommendations have been made, is too optimistic. The U.S. Park Service at Big Bend National Park should continue having Bonnie McKinney do her splendid job of monitoring both the Peregrine Falcon (Falco peregrinus) and the Black-capped Vireo at the Park. Because of her close association with the saddle horse concession and possession of Master Bird Banding status, she is also the logical person to trap the cowbirds. The amateur ornithologists of Texas should continue their fine work of recording vireo numbers in the various parks--an effort they will find more rewarding as juniper control begins to amplify the diversity of birdlife. Sightings, particularly evidence of actual nesting, should continue to funnel in to Frances Williams, Greg and Beth Lasley, Rose Ann Rowlett, and Chuck Sexton to appear in American Birds as heretofore.

III. Information Sources

Acknowledgements

Many people helped us in many ways during the course of this study. We thank Jean W. Graber without whose advice and aid this study could not have been conducted. She gave us the opportunity to study her original, fully illustrated dissertation and allowed us to quote it extensively in this report. She also made many valuable comments that made our fieldwork much easier. We should also like to thank Elizabeth Hadden and Greg and Becky Lasley who provided lodging for Clapp during the 1984 field season and for Clapp and Marshall in 1985.

Greg W. Lasley was exceptionally helpful in escorting Clapp to several vireo localities, providing information on people who would be reliable sources of information on the status of the vireo, and in his capacity as regional editor for American Birds, in soliciting unpublished information on the occurrence and status of the vireo. John Newell and Frances Williams also helpfully provided useful comments on the status of the vireo in Oklahoma and Texas and Warren M. Pulich provided summary information on the status of the vireo in northeastern Texas.

We are also much indebted to Jim O'Donnell who gave us the use of three years data on the breeding biology of the Black-capped Vireo from a valuable study being conducted at the Wild Basin Preserve and nearby Davenport Ranch in Austin, Travis County, Texas. Charles W. Sexton also provided us with preliminary information on status and habitat utilization by the vireo in other parts of Travis County.

Many members of various governmental agencies also provided information, suggestions on where to find vireos, or observations of vireos. Among the many members of the staff of the Texas Parks and Wildlife Department to whom we are indebted are William Armstrong, Donnie Harmel, Ray Ledwig, David H. Riskind, Jennifer Terry. Jack Crabtree of Wichita Mountains National Wildlife Refuge and Richard Coleman of the Division of Refuges of the U.S. Fish and Wildlife Service also provided information as did Danny Bystrak and M. Kathleen Klimkiewicz of Patuxent Wildlife Research Center. Dennis Herbert and John Cornelius of the Fish and Wildlife Branch of Fort Hood and Gene Stout and Allan R. Pfister of the Fish and Wildlife Branch of Fort Fort Sill were both courteous and helpful allowing us access to their reservations and in showing us about. We especially thank also Bonnie McKinney of Black Gap Wildlife Management Area who provided us with much data on the occurrence of the vireo in Big Bend National Park and adjacent areas. Personnel of the National Park Service who provided advice, council, and assistance include Mike Fleming and Roland H. Wauer. We thank all for their aid and counsel.

Others who were particularly helpful in providing information include John C. Arvin, Gene Blacklock, Jean Evans, Elizabeth Hadden, Tyrell D. Harvey, Nick Jackson, Clifton Ladd, Robert and Judy Mason, Terry C. Maxwell, W. M. Meriwether, James A. Middleton, Kay and Ernest Mueller, Rose Ann Rowlett, Steve R. Runnels, Gary D. Schnell, Nevenna Travis and Colonel Lloyd R. Wolfe. Addresses of these and other individuals who helped during our survey are listed in the list of contacts and citations for personal communications that follows.

A considerable number of people also helped Gryzbowski survey vireo habitat in 1985. These include Dana L. Base, William A. Carter, Debi Clark, Thomas Clark and Susan Lauzon. Several other individuals also participated in making vireo observations these including E. Grigsby, P. Lehman, C. Marantz, John G. Newell, and T. Roberts. We thank all for their enthusiasm, interest and assistance.

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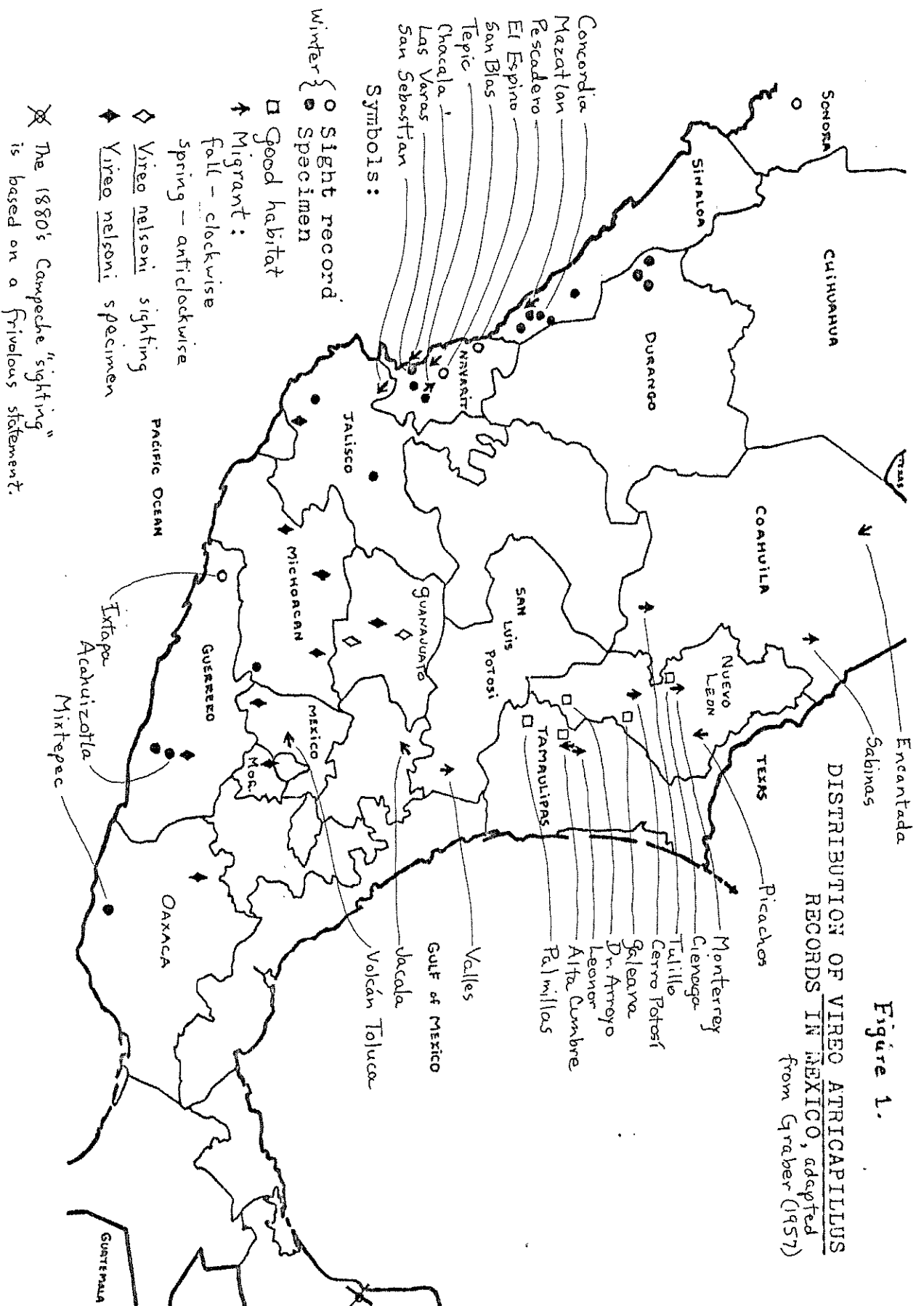
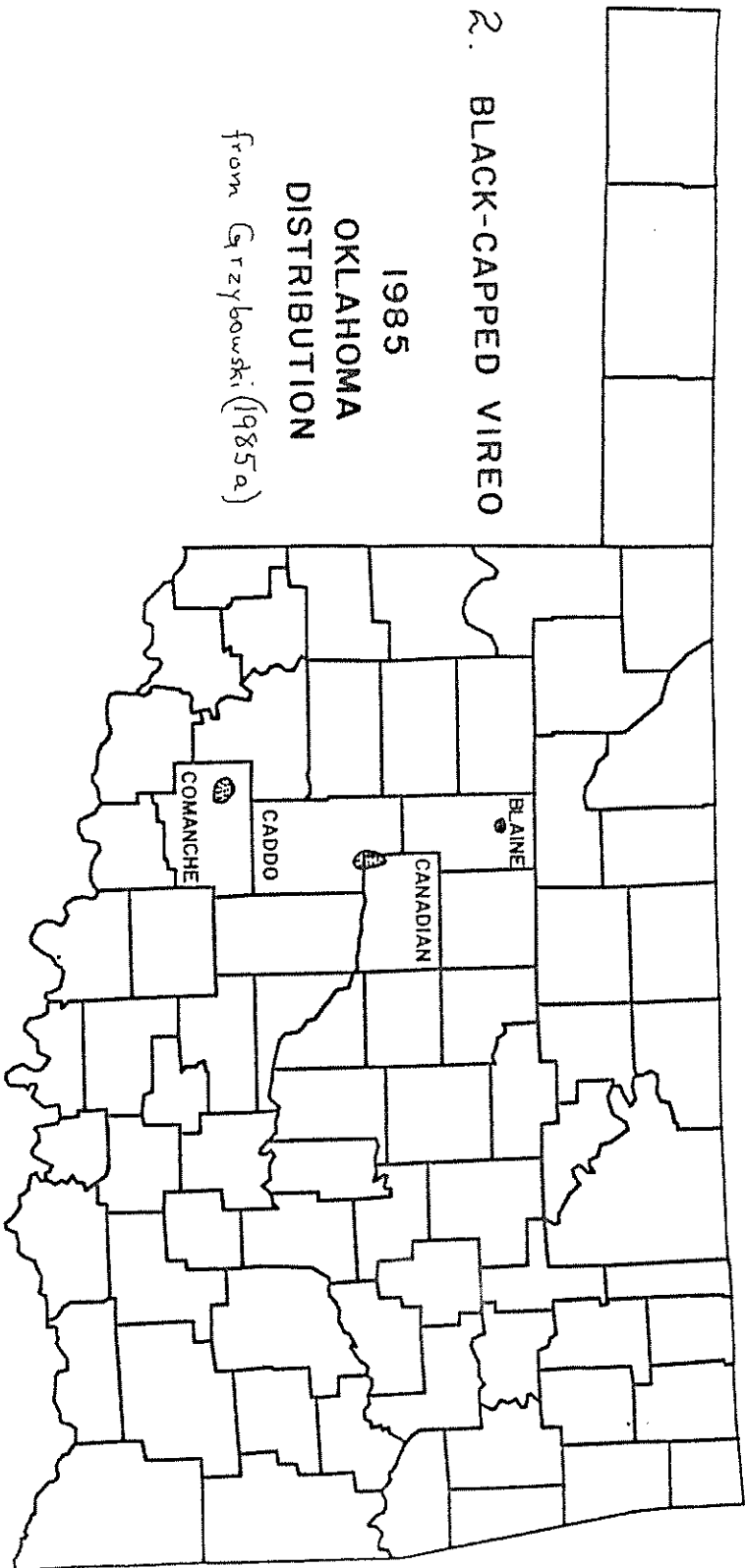


Figure 2. BLACK-CAPPED VIREO

1985

OKLAHOMA
DISTRIBUTION

from Grzybowski (1985a)



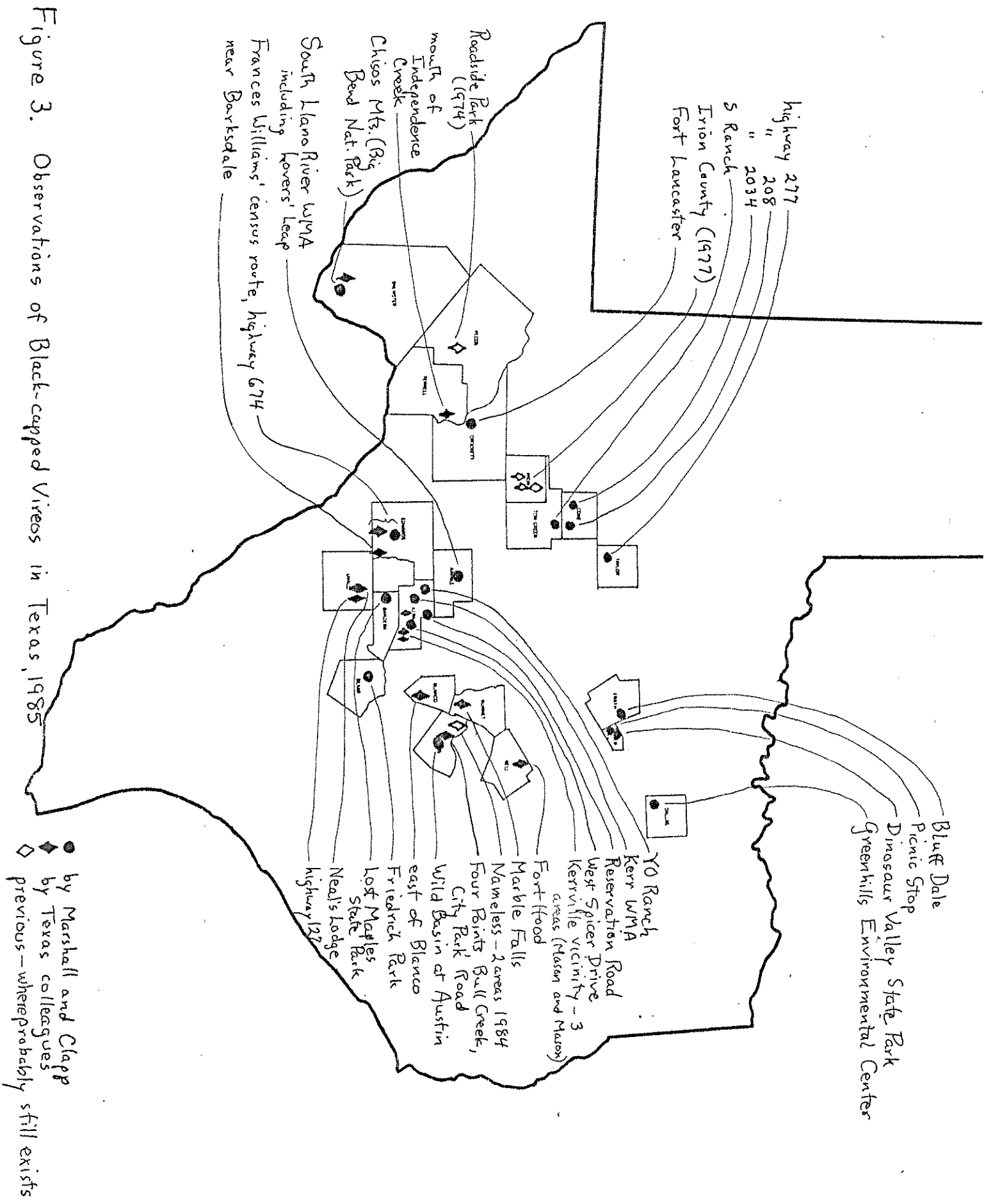


Figure 3. Observations of Black-capped Vireos in Texas, 1985

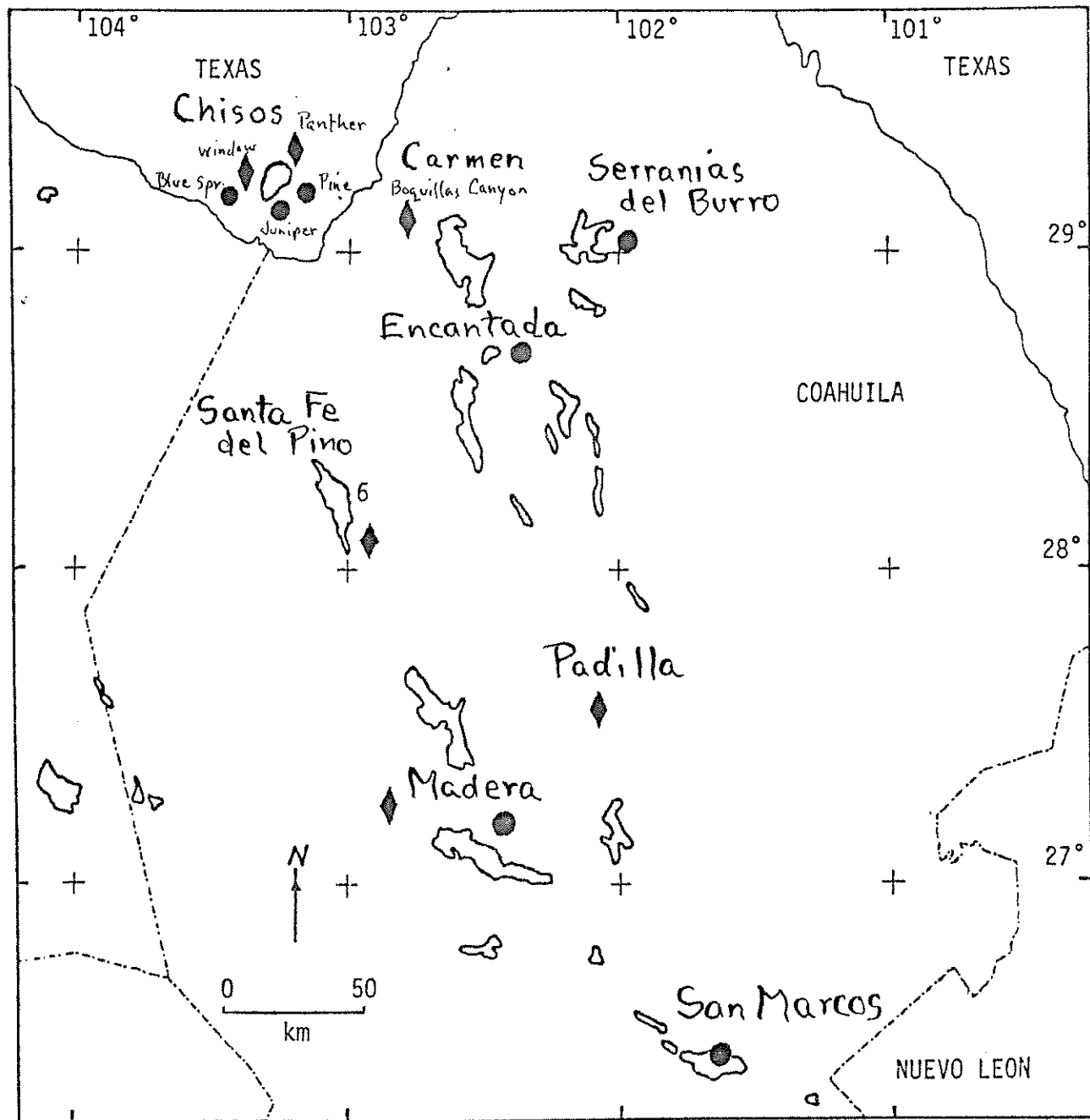


Figure 4. Northern half of Mexican state of Coahuila showing the 1800 meter level of major mountain ranges. At the north base of each mountain should be habitat for Black-capped Vireos, providing sheep and goats are absent. Adapted from Lanning (1983).

- Sighting in Coahuila by Marshall and Lanning.
- ◆ Sightings and specimens in Coahuila from the literature.

(Chisos Mts. sightings of 1985 included.)

Table 1. Trees and bushes occurring in breeding territories of Black-capped in the United States.

	KANSAS, OKLAHOMA, AND NORTHEASTERN TEXAS								
Locality:	COMANCHE Co., KS	CADDO Co., OK	HAYS & COMAL Cos.	DALLAS Co.	TRAVIS Co.	BELL Co.	SOMERVELL Co.	SOMERVELL Co.	ERATH Co.
TREES:									
<u>Bumelia lanuginosa</u>		H	X	X	X				
<u>Celtis laevigata</u>					X				
<u>Celtis reticulata</u>		H							
<u>Celtis</u> spp.			X	X	X	X		X	X
<u>Cercis canadensis</u>		H	X	X	X	X		X	
<u>Chilopsis linearis</u>			X						
<u>Fraxinus americana</u>				X	X	X	X		
<u>Fraxinus texensis</u>					X				
<u>Juglans nigra</u>	X	H							
<u>Juniperus ashei</u>			X	X	X	X		X	X
<u>Juniperus virginiana</u>	X	H		X			X	X	
<u>Morus rubra</u>		H		X		X			
<u>Prosopis juliflora glandulosa</u>									X
<u>Prunus</u> sp.	X				X	X			
<u>Quercus macrocarpa</u>	X	H		X					
<u>Quercus marilandica</u>		H							
<u>Quercus muehlenbergii</u>	X	H							
<u>Quercus shumardii texana</u>		X	X	X	X	X		X	
<u>Quercus stellata</u>	X	H		X		X	X		
<u>Quercus virginiana fusiformis</u>			X		X	X	X	X	X
<u>Ulmus americana</u>	X	H	X						
<u>Ulmus crassifolia</u>			X			X			
<u>Ungnadia speciosa</u>			X	X	X	X			

1. H indicates herbarium specimen of plant collected by Elbert D. Little, Jr. data are mostly from our 1985 survey; those for Kansas, Oklahoma, and Hays and Comal Counties, Texas are derived respectively from Graber 1961: 317, Graber 1961: 16 and Table 1 and Little 1939, and Graber 1961: 316 and Table II. Data for Travis County, Texas, is derived in part from Sexton 1985. More specific localities are listed in the text; a brief indication of where we got our data is listed here by county: DALLAS: Greenhills; BELL: Fort Hood; SOMERVELL: (1st) Dinosaur Valley SP, (2nd) roadside picnic area; ERATH: Bluff Dale; BEXAR: Friedrich Park; KERR: several localities; BANDERA: Lost Maples SNA; KIMBLE: South Llano WMA; EDWARDS: Rt. 674; TAYLOR: Rt. 277; COKE: Rts. 210 and 2034; TOM GREEN: S Ranch; CROCKETT: Fort Lancaster.

Table 1 (cont'd). Trees and bushes occurring in breeding territories of Black-capped Vireos in the United States.

	<u>KANSAS, OKLAHOMA, AND NORTHEASTERN TEXAS</u>								
Locality:	COMANCHE Co., KS	CADDO Co., OK	HAYS & COMAL Cos.	DALLAS Co.	TRAVIS Co.	BELL Co.	SOMERVELL Co.	SOMERVELL Co.	ERATH Co.
<u>Berberis trifoliata</u>			X						
<u>Celtis pallida</u>									X
<u>Cornus drummondii</u>	X	X			X				
<u>Diospyros texana</u>			X		X	X			
<u>Eysenhardtia texana</u>					X				
<u>Forestiera acuminata</u>									X
<u>Forestiera pubescens</u>		X		X	X				X
<u>Forestiera sp.</u>			X			X	X	X	
<u>Garrya lindheimeri</u>			X		X				
<u>Ilex decidua</u>					X				
<u>Melia azedarach</u>					X				
<u>Mimosa biuncifera</u>					X				
<u>Mimosa borealis</u>			X						
<u>Prunus gracilis</u>		H							
<u>Ptelea trifoliata</u>	X	X	X		X				
<u>Prosopis juliflora glandulosa</u>								X	
<u>Quercus durandii breviloba</u>			X	X	X	X			
<u>Quercus stellata</u>							X		
<u>Rhus aromatica</u>				X	X	X			
<u>Rhus lanceolata</u>			X	X	X	X		X	
<u>Rhus glabra</u>	X	X		X		X			
<u>Rhus trilobata</u>	X	X	X					X	X
<u>Rhus virens</u>			X		X	X			
<u>Sapindus drummondii</u>	X					X			
<u>Smilax sp.</u>					X				
<u>Sophora secundiflora</u>						X			
<u>Symphoricarpos orbicularis</u>		X							
<u>Zanthoxylum fagara</u>					X				
<u>Zanthoxylum hirsutum</u>					X	X			

Table 1 (cont'd). Trees and bushes occurring in breeding territories of Black-capped Vireos in the United States.

CENTRAL AND MIDWESTERN TEXAS

Locality:

BEXAR Co.
KERR Co.
BANDERA Co.
KIMBLE Co.
EDWARDS Co.
TAYLOR Co.
COKE Co.
TOM GREEN Co.
CROCKETT Co.

TREES:

<u>Bumelia lanuginosa</u>	H		X		X			
<u>Celtis spp.</u>	X		H	X	X			
<u>Cercis canadensis</u>	H				X	X		
<u>Juglans microcarpa</u>	X		H					
<u>Juglans nigra</u>	X	X	X				X	
<u>Juniperus ashei</u>	X	H	X	X	X?	X	X	X H
<u>Morus rubra</u>						X	X	X
<u>Pinus cembroides</u>					X			
<u>Prosopis juliflora glandulosa</u>			X	X		X		
<u>Prunus sp.</u>	X							
<u>Quercus glaucooides</u>	X	H		H				
<u>Quercus marilandica</u>		H		H		X		
<u>Quercus shumardii texana</u>	X	H		H		X		
<u>Quercus stellata</u>		X		X				
<u>Quercus virginiana fusiformis</u>	X	H	X	H	X		X	X
<u>Ulmus americana</u>		X		H				
<u>Ulmus crassifolia</u>		H		H				
<u>Ungnadia speciosa</u>		X		H			X	

BUSHES:

<u>Baccharis</u> sp.		X					
<u>Berberis trifoliata</u>	X	X	X	X	X		X
<u>Bumelia lanuginosa</u>	X	X					
<u>Condalia</u> sp.		X			X		
<u>Diospyros texana</u>	X	X	X	X	X		X
<u>Eysenhardtia texana</u>	X	X		X			
<u>Forestiera</u> sp.				X			
<u>Garrya lindheimeri</u>	X						
<u>Garrya</u> sp.		X		X			
<u>Juniperus ashei</u>							H
<u>Lycaeum</u>				X			X
<u>Mimosa biuncifera</u>							X

Table 1 (cont'd). Trees and bushes occurring in breeding territories of Black-capped Vireos in the United States.

Locality:	<u>CENTRAL AND MIDWESTERN TEXAS</u>							
	BEXAR Co.	KERR Co.	BANDERA Co.	KIMBLE Co.	EDWARDS Co.	TAYLOR Co.	COKE Co.	TOM GREEN Co. CROCKETT Co.
BUSHES:								
<u>Mimosa borealis</u>	X							
<u>Ptelea trifoliata</u>	X							
<u>Prosopis juliflora glandulosa</u>	X							
<u>Quercus durandii breviloba</u>	X	H				X		
<u>Quercus mohriana</u>						X	X	X
<u>Rhus aromatica</u>	X							
<u>Rhus lanceolata</u>	X	X						
<u>Rhus microphylla</u>								H
<u>Rhus trilobata</u>							H	
<u>Rhus virens</u>	X			X	X			
<u>Sapindus drummondi</u>								X
<u>Sophora affinis</u>				H				
<u>Sophora secundiflora</u>	X	X	X	H	X			H
<u>Viguiera sp.</u>								H
<u>Yucca sp.</u>								H

Table 2. Trees and bushes in breeding territories of vireos studied in Mexico and the Chisos Mountains -- 1983-1985¹.

	<u>Vireo atricapillus</u>							<u>Vireo nelsoni</u>				
Localities:	Chisos	Burro	Encantada	Madera	San Marcos	Picachos	Alta Cumbre	Jacala	Presa Esperanza	Uriangato	Querendero	Zacapu
TREES:												
<u>Acacia berlandieri</u>	H		H	x		H		x		x		
<u>Acacia farnesiana</u>	H									x		
<u>Acacia villosa</u>										x	H	
<u>Acer grandidentatum</u>				x								
<u>Alnus</u> sp.									H			
<u>Arbutus xalapensis</u>	H			x	x							
<u>Arctostaphylos</u> sp.				x								
"Bumelia" (spiny dense tree)						x			H			
<u>Ceiba</u> sp.										x		
<u>Celtis reticulata</u>	H					x						
<u>Celtis. pallida</u>						x						
<u>Celtis</u> sp.			x							x		
<u>Cercis canadensis</u>		x	H	H								
<u>Cordia boissieri</u>						H						
<u>Cupressus arizonica</u>	H			x								
<u>Forestiera angustifolia</u>									H			H
<u>Fraxinus cuspidata</u>				H								
<u>Ipomaea murucoides</u>									H	x	x	x
<u>Juniperus flaccida</u>	H				x			x				
<u>Juniperus erythrocarpa</u>	H		x									
<u>Leucaena pulverulenta</u>						H				H		
<u>Leucaena retusa</u>	H		H	H								
<u>Pinus cembroides</u>	H				x							
<u>Pinus ponderosa</u>		H		x								
<u>Pistacia mexicana</u>									H			H
<u>Pistacia texana</u>			H									
<u>Pithecellobium flexicaule</u>						x						
<u>Prosopis juliflora glandulosa</u>			x									
<u>Prunus</u> sp.			H		x		x					
<u>Quercus canbyi</u> ²	H						H					
<u>Quercus emoryi</u>	H											
<u>Quercus glaucoides</u>		x	H	H	H							
<u>Quercus gravesii</u>	H	x		x	H							

1. H indicates herbarium specimen collected. Specimens collected in the Chisos Mountains by Elbert L. Little, Jr., those from Mexico by Joe T. Marshall.

2. (= "graciliformis").

Table 2 (cont'd). Trees and bushes in breeding territories of vireos studied in Mexico and the Chisos Mountains -- 1983-1985.

	<u>Vireo atricapillus</u>							<u>Vireo nelsoni</u>				
Localities:	Chisos	Burro	Encantada	Madera	San Marcos	Picachos	Alta Cumbre	Jacala	Presa Esperanza	Uriangato	Querendero	Zacapu
TREES:												
<u>Quercus grisea</u>	H											
<u>Quercus hypoxantha</u>					H							
<u>Quercus invaginata</u>					H							
<u>Quercus mohriana</u>					H							
<u>Quercus polymorpha</u>						H	H	x				
<u>Quercus virginiana fusiformis</u>							H		H			
<u>Salix</u> sp.									x			
<u>Ungnadia speciosa</u>	H		H			x						
BUSHES:												
<u>Acacia berlandieri</u>	H	x	H	x						x		
<u>Acacia rigidula</u>	H					H						
<u>Acacia roemeriana</u>			H							x		
<u>Agaratina brevipes</u>									H		x	x
<u>Amyris madrensis</u>			H									
<u>Baccharis glutinosa</u>									x			
<u>Berberis trifoliolata</u>	x	x	x		x							
"bumelia" (spiny dense bush)									H			
<u>Ceanothus coeruleus</u>					H							
<u>Cercocarpus</u> sp.	H	x		x								
<u>Chilopsis linearis</u>	H	x										
<u>Condalia lycioides?</u>	x			x								
<u>Cowania plicata</u>	x			x								
<u>Crataegus mexicana</u>									x	x		H
<u>Diospyros texana</u>	H		H						H			
<u>Dodonea viscosa</u>												
<u>Esenbeckia</u> sp.						H						
<u>Eupatorium incarnatum</u>									H		x	x
<u>Eysenhardtia polystachya</u>									H			
<u>Eysenhardtia texana</u>	H											
<u>Fallugia paradoxa</u>	H		H									
<u>Forestiera angustifolia</u>						H						
<u>Fraxinus greggii</u>	H	H	H									
<u>Garrya wrightii</u>	H		H	H								
<u>Helietta parvifolia</u>							H					
<u>Juglans microcarpa</u>			x				x					

Table 2 (cont'd). Trees and bushes in breeding territories of vireos studied in Mexico and the Chisos Mountains -- 1983-1985.

	<u>Vireo atricapillus</u>							<u>Vireo nelsoni</u>				
Localities:	Chisos	Burro	Encantada	Madera	San Marcos	Picachos	Alta Cumbre	Jacala	Presa Esperanza	Uriangato	Querendero	Zacapu
BUSHES:												
<u>Leucophyllum frutescens</u>	x		x									
<u>Mimosa biuncifera</u>	x	x							H		x?	
<u>Montanoa leucantha</u>									H		x	
<u>Quercus durifolia</u>		H										
<u>Quercus intricata</u>				H	x							
<u>Rhus microphylla</u>	H											
<u>Rhus trilobata</u>	H								x			
<u>Rhus virens</u>	H	x	H	x			x					
<u>Sophora secundiflora</u>	x		H			H						
<u>Stevia salicifolia</u>									H		x	x
<u>Tecoma stans</u>									H		x	
<u>Verbesina sphaerocephala</u>											x	H
<u>Vitis</u> sp.	H											
<u>Zanthoxylem fagara</u>						x				H		

Table 3. List of plants in which Black-capped Vireos have been found nesting.

Plant				Per Cent (all areas)
	1 Oklahoma	2 Texas	3 Coahuila, Mexico	
<u>Quercus marilandica</u>	52	--	--	31.7 %
<u>Rhus virens</u>	--	21	--	12.8
<u>Q. shumardii texana</u>	--	17	--	10.3
<u>Quercus stellata</u>	14	--	--	8.5
<u>Garrya lindheimeri</u>	--	11	--	6.7
<u>Juniperus ashei</u>	--	11	--	6.7
<u>Juniperus virginiana</u>	4	--	--	2.4
<u>Quercus sp.</u>	--	--	4	2.4
<u>Sophora secundiflora</u>	--	4	--	2.4
<u>Q. durandii breviloba</u>	--	3	--	1.8
<u>Quercus muhlenbergii</u>	3	--	--	1.8
<u>Q. virginiana fusiformis</u>	--	3	--	1.8
<u>Rhus lanceolata</u>	--	3	--	1.8
<u>Aesculus glabra</u>	2	--	--	1.2
<u>Cercis canadensis</u>	2	--	--	1.2
<u>Rhus glabra</u>	2	--	--	1.2
<u>Ungnadia speciosa</u>	--	2	--	1.2
<u>Arbutus texana</u>	--	--	1	0.6
<u>Symphoricarpus orbiculatus</u>	1	--	--	0.6
<u>Diospyros texana</u>	--	1	--	0.6
<u>Ilex vomitoria</u>	--	1	--	0.6
<u>Pistacia texana</u>	--	--	1	0.6
<u>Rhus toxicodendron</u>	1	--	--	0.6
<u>Ulmus americana</u>	--	1	--	0.6
	80	78	6	

1. Most (71) of the nest sites from Oklahoma for which plant species are known are from Graber (1966) and most of these records (at least 66) are from a single locality in Caddo County (3 mi. SW Cogar). Other records from Oklahoma are from Nice 1931, from unpublished notes by G. M. Sutton, and from J. G. Newell (pers. comm.)

2. The bulk of the records from Texas are from two sources, Graber's (1961) study, largely conducted in Hays Co. (most of 37 nests) and from the observations (31 nests) of Jim O'Donnell (in litt.) at Wild Basin Preserve and the nearby Davenport Ranch, Austin, Travis Co. Other records are from the literature (Barlow 1967, Benner 1887, W. H. Werner in Brewster 1879), American Birds, our observations 1984-1985, and from the nest and egg records of the U.S. National Museum.

3. Nest records are from Graber (1961) and by Marshall.

Table 4. Conspicuous plants on winter territories of Black-capped Vireos in Mexico. All are trees except those indicated otherwise. H = herbarium specimen collected by J. T. Marshall.

Localities:

	<u>Nayarit</u>				<u>Sinaloa</u>
	<u>Las Varas</u>	<u>Tepic, 5.7 mi NW</u>	<u>El Espino</u>	<u>El Pescadero</u>	<u>Concordia</u>
<u>Acacia hindsii</u>	x		x		
<u>Acacia farnesiana</u>				x	
<u>Acacia</u> spp. JTM numbers 99,100,101	H	H	x		x
<u>Albizia</u>			x		
<u>Ardisia revoluta?</u> (leafless)					x
<u>Bumelia</u> sp.			x		
<u>Bursera</u> sp.					x
<u>Cercis</u>					x
<u>Coffea arabica</u>		x			
<u>Ficus</u>	x		x		
<u>Pithecellobium dulce</u>				x	
<u>Guazuma ulmifolia</u>		H			
<u>Ipomoea muricoides</u>					x
<u>Lantana horridum</u>		x			
<u>Leucaena pulverulenta</u>				x	
<u>Leucaena retusa</u>			x		x
<u>Lippia pringlei</u>		H	x		
<u>Quercus planipocula</u>		H			
tree (# 110)			H		
<u>Verbesina fastigata</u>		x			
vines: big thorny, angle-stem, probably including <u>Combretum farinosum</u>	x	x	x		x
vine: <u>Petrea volubilis</u>	x				
<u>Vitex pyramidata</u>			H		

Table 5. List of the plants in which each of 82 Black-capped Vireos was first sighted during our 1983 - 1985 study, within the spring and summer nesting area.

Plants	Number of 2 vireos	Height of trees	Height of bushes
<u>Juniperus ashei</u>	15	4-5 m	2.5-3.5 m
<u>Quercus virginiana fusiformis</u>	11	4.5-8	
<u>Quercus durandii breviloba</u>	9	4.5	1.5-3.3
<u>Quercus glaucoides</u>	6	4-6	2-3.5
<u>Pistacia texana</u>	4	4-5	
<u>Quercus shumardii texana</u>	4	5-7	1.9
<u>Fraxinus greggii</u>	3		1.5-3
<u>Quercus mohriana</u>	3		1.6-1.9
<u>Acacia berlandieri</u>	2		1.5-3
<u>Bumelia lanuginosa</u>	2	4	2
<u>Juniperus monosperma</u>	2	4	2
<u>Juniperus virginiana</u> ₃	2	4.1	3
<u>Juniperus sp. (dead)</u>	2		2.3-3.1
<u>Juglans major</u>	2	6-8	
<u>Sophora secundiflora</u>	2		1.6-3
<u>Berberis trifoliolata</u>	1		1.6
<u>Diospyros texana</u>	1		1.8
<u>Fraxinus americana</u>	1	13	
<u>Garrya spp.</u>	1		2.5
<u>Juglans microcarpa</u>	1	5	
<u>Morus microphylla</u>	1		3.5
<u>Prosopis juliflora glandulosa</u> (dead)	1		3.5
<u>Quercus durifolia</u>	1		2
<u>Quercus emoryi</u>	1	9	
<u>Quercus gravesii</u>	1		3
<u>Quercus grisea</u>	1		2.9
<u>Quercus marilandica</u>	1		2
<u>Quercus stellata</u>	1	5.5	
	82		

1. Those for which a vegetation analysis beneath the perch was completed. Plants in which 63 males were singing are not significantly taller (average 4.1 m) than those (average 4.0 m) in which 19 non-singing males and females were foraging when first seen.
2. The number given indicates how many Black-capped Vireos were first seen in each type of plant.
3. One standing, one overturned and surrounded by Forestiera and Rhus trilobata.

Table 6. Summary of vegetation plot information, Black-capped Vireo.

First sighting data	n=	Activity	Number in trees	Number in bushes	Substrate height (m)	Bird height (m)	Vegetation cover over bird (%)
Black-capped Vireo breeding areas	82	63 sing ¹ 19 forage	42	40	4.05 ± 2.00	2.46 ± 1.68	69 ± 27
Nelson's Vireo breeding areas	12	4 sing 8 forage	7	5	5.04 ± 2.73	2.41 ± 1.57	75 ± 16
Black-capped Vireo in migration	2	2 forage	2	8	8	5	85
Black-capped Vireo wintering areas	10	3 sing 7 forage	7	3	4.75 ± 1.87	2.80 ± 2.21	72 ± 27
		Litter cover (%)	Ground layer cover (%)	Ground layer height (m)	Shrub layer cover (%)	Canopy top (m)	Canopy depth (m)
Black-capped Vireo breeding areas	69 ± 27	41 ± 21	.32 ± .16	60 ± 25	2.15 ± .81	2.00 ± .78	
Nelson's Vireo breeding areas	76 ± 14	36 ± 19	.35 ± .18	50 ± 20	2.35 ± .52	2.33 ± .53	
Black-capped Vireo in migration	35	55	.4	15	1.85	1.85	
Black-capped Vireo wintering areas	76 ± 12	65 ± 17	.38 ± .19	45 ± 24	2.4 ± .87	2.24 ± .95	
	Tree cover (%)	Canopy top (m)	Canopy depth (m)	Slope exposure SE - flat	Slope Angle	Cowbirds present?	
Black-capped Vireo breeding areas	43 ± 39	5.60 ± 1.73 (n=50)	4.61 ± 1.82 (n=50)	15 - 25	12.3 ± 15.6	yes: 40 no: 41	
Nelson's Vireo breeding areas	58 ± 38	6.65 ± 2.67 (n=10)	5.19 ± 2.42 (n=10)	1 - 3	18.3 ± 17.6	no: 7	
Black-capped Vireo in migration	70	8.0	7.0	1 - 0	60	no: 2	
Black-capped Vireo wintering areas	71 ± 23	7.05 ± 4.74	5.30 ± 3.64	6 - 0	15.2 ± 14.9	no: 12	

1. Plant height and bird height almost exactly the same for 19 non-singing males and females as for 63 singing males.

