PERFORMANCE REPORT

As required by

ENDANGERED SPECIES ACT, SECTION 6

TEXAS

Project E-1-3

ENDANGERED AND THREATENED SPECIES CONSERVATION

Job No. 29: Black-capped Vireo Reproduction and Dispersal

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June 25, 1991

PERFORMANCE REPORT

STATE: Texas **PROJECT NO.:** E-1-3

PROJECT TITLE: Endangered and Threatened Species Conservation.

PERIOD COVERED: September 1, 1991 - December 31, 1991

JOB NUMBER: 29

JOB TITLE: Black-capped Vireo (Vireo atricapillus) Reproduction and Dispersal

JOB OBJECTIVE: To determine reproductive success and dispersal distances for black-capped vireo populations. To develop management recommendations to provide for the establishment of new vireo populations by dispersal.

SEGMENT OBJECTIVES:

1. To complete a report on 1) the reproductive rates for black-capped vireo populations on the Kerr and Walter S. Buck Wildlife Management Areas (WMAs); 2) the effects of cowbird nest parasitism on vireo nesting success on the Kerr and Buck WMAs; and 3) vireo population turnover and dispersal at several nesting localities.

ACCOMPLISHMENTS

See attached report.

PREPARED BY: Lee Ann Linam — June 25, 1991 (Date)

Endangered Species Biologist (Title)

APPROVED BY: 7/10/91 (Date)

Larry D. McKinney, Ph.D.
Director, Resource Protection Division

REPORT

POPULATION AND NESTING ECOLOGY OF THE BLACK-CAPPED VIREO--1990

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NOVEMBER 1990

POPULATION AND NESTING ECOLOGY OF THE BLACK-CAPPED VIREO--1990.

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SUMMARY

The study was conducted at the Kerr WMA, Kerr County, properties in the vicinity of the Kerr Area, the South Fork Ranch, Kerr County, and the Walter Buck WMA, Kimble County, Texas. The primary activities involved mapping territories, locating color-banded birds, monitoring reproductive activity and pair success, trapping cowbirds, and banding additional vireos. Determining returns of birds banded in previous seasons was also pursued for the sample at the Davenport Ranch (now the City of Austin Vireo Preserve), and adjacent Wild Basin Wilderness Preserve, Travis County. Data were collected from 21 April to 28 July 1990.

Vireo numbers continued to increase on the Kerr WMA during 1990 to 120-133 adults. They were stable at the Walter Buck WMA where only 11 males and nine females were located. The eleven males and 6-7 females located in the West Frio Pasture of the South Fork Ranch represented a decline from 1988. The numbers on the Davenport Ranch site in Travis County continued to decline. Only 11 males and 4-5 females were located. In 1985, 33 males and 27 females were located here.

On properties in the vicinity of the Kerr WMA, 140 males and 38 females were located. The number of vireos estimated in these search areas was 178 males and 139 females and indicates that a significant population exists in western Kerr County.

The numbers of young produced during 1990 in the the Rock Pasture of the Kerr WMA was 96-107--the highest ever. The number of young per female, however, was 2.89, compared to 2.58 young/pair in 1988, and 3.78 young/pair (!) in 1989. This was believed due in large part to more effective removal of cowbirds enhanced, as in 1988 and 1989, by the intentional juxtaposition of cattle near these traps in the Rock Pasture during late April. A total of 294 cowbirds were removed from the Rock Pasture at a seasonal rate of 3.59/day. Production of vireo young per female at the Walter Buck WMA was 1.56. No estimate was obtained for cowbird parasitism. In 1986, the only other year when vireo production was determined at Walter Buck, no young were produced.

Fourteen males, 6 females and 74 young were banded in Texas during 1990. With the birds banded in previous years and returning, 74 males and 39 females held bands at the end of the 1990 breeding season.

The sample of returns for males and females banded in previous years was divided between those from the main colonies and those from the smaller groupings. For the main colonies, 66% of the males (130 of 197), and 49% (48 of 98) of the females returned the following year (pooling samples from 1985-1990). For the smaller groupings, however, the percentages returning were 50% for males (56 of 112) and 32% for females (8 of 25). The lower detected return for the smaller groupings may reflect the inexperience of the younger birds in these groups, and/or preferences for dispersal to areas with better potential for mating in subsequent years. Some males from the smaller groupings were detected moving more than 1 km both between years and within seasons. Females in both the core and peripheral groups also tended to have lower site fidelity than the males in the main colonies. Surprising, however, 89% (16 of 18) females with bands in 1989 returned to the Rock Pasture in 1990.

Of the 111 young banded at the Kerr WMA in 1989, 22-24 were observed in 1990, 16-18 on the Kerr area, and an additional six off the area. Mean dispersal distance of the young was 3.72 km (S.D.=4.15). The projected return of young was calculated minimally as 35%.

Overall, cowbird nest parasitism, as documented from 1983 to 1990, occurred in 72% of vireo nestings detected by this investigator in Texas where no cowbird removal occurred. Parasitism in the sample with cowbird removal occurred in 24% of vireo nestings found during this same period. Parasitism occurred in 21% of the nests in the cowbird-trapped Rock Pasture during 1990. This is higher than the 9% and 3% recorded in the two previous years, but still below the overall level of parasitism in cowbird trapped areas in Texas. The juxtaposition of cattle near the Rock Pasture colony appeared to enhance capture of cowbirds, particularly females, and is believed responsible for the enhanced production and reduced parasitism observed. Some annual variation in cowbird abundances may also have had an influence.

Concern is still high for the impact of cowbird nest parasitism on populations of Black-capped Vireos. Efforts to protect (and/or provide) areas of vireo habitat relatively near to each other are encouraged, so that dispersing young have some potential to nest in areas protected with cowbird trapping. Management of cowbirds can be very effective, as has been demonstrated on the Kerr area and elsewhere. However, the focus of this trapping is still limited relative to the overall range and populations of vireos. Some broader approach is recommended.

Furthermore, with the accumulation of data from this and other empirical work, more structured analyses couched in the framework of theoretical population models offering broader than individual-site perspectives are now needed to direct future

work. These analyses and models will likely provide perspectives not yet realized on the structure of the populations, the relative significance of the smaller and larger groupings, and on dispersal, and suggest an efficiency for monitoring and management which will not be appreciated until these analyses are performed. The analyses needed can also provide the scope and insight to assess potential of future management, and help identify critical future research needs for the Black-capped Vireo.

PROJECT OBJECTIVES

1) to enhance reproduction of Black-capped Vireos (Vireo atricapillus) by control of Brown-headed Cowbirds (Molothrus ater) on the Kerr Wildlife Management Area (WMA), Kerr County, Texas, and the Walter Buck WMA, Kimble County, Texas;

2) to obtain baseline data on vireo production (and its annual variation), and the impact of cowbirds on this production at vireo breeding sites with and without cowbird control;

3) to obtain an estimate of pair nesting success of Black-capped Vireos on the Kerr and Walter Buck WMAs during 1990;

4) to continue to evaluate the potential enhancement of cowbird trapping with rotational grazing on the Kerr WMA;

5) to obtain an estimate of population turnover at a sample of vireo nesting localities (to include the Kerr WMA, a colony on the South Fork Ranch, and the Walter Buck WMA) by estimating mortality (as determined through return of banded vireos);

6) to obtain an estimate of dispersal through search for birds banded in previous seasons on and off the Kerr WMA. Special attention will be given to attempt to locate females and young banded in 1989.

7) to continue to monitor the use of a burn-site on the Kerr WMA to study its colonization by Black-capped Vireos.

8) to provide a training session in field techniques used in studying and monitoring vireos for personnel employed by Texas Parks and Wildlife and involved in work with Black-capped Vireos.

INTRODUCTION AND BACKGROUND

The Black-capped Vireo (Vireo atricapillus) formerly nested in scrub habitats from south-central Kansas through central Oklahoma and central Texas to central Coahuila, and possibly Nuevo Leon and Tamaulipas in Mexico (Graber 1961, American

Ornithologists' Union 1983). However, it has not been reported in Kansas since 1953 (Tordoff 1956, Graber 1961), and is gravely endangered in Oklahoma (Grzybowski et al. 1986, Ratzlaff 1987, Grzybowski 1989a). Furthermore, the Black-capped Vireo appears to be disappearing in a random pattern throughout much of the northern, eastern and central portions of its range in Texas (Marshall et al. 1985, Sexton et al. MS).

A number of factors may be acting in the decline of the vireo, but one that is undoubtedly making a significant impact is nest parasitism by Brown-headed Cowbirds (Molothrus ater). Nest parasitism of vireo nests by cowbirds has been documented at greater than 80% most years in vireo breeding areas unprotected by cowbird removal (Grzybowski 1985, 1988, 1989a, 1990a, Tazik and Cornelius 1989). Because no vireos are produced from parasitized nests, this parasitism remains one of their greatest immediate threats. Production by unprotected vireos in Oklahoma from 1983-1987 was 0.43 young/pair/year, 0.66 in Texas (Grzybowski 1988), far below that necessary to maintain their populations. With cowbird removal, this production has been increased to as high as 3.95 during 1989 at the Kerr WMA (Grzybowski 1990a). Thus, some form of cowbird control is important, as well as an assessment of the success of that control. However, the values of protecting sites should to be assessed from the standpoint of relative reproductive enhancement and cost.

Currently, removal of cowbirds at selected vireo breeding sites where parasitism is a problem has been the approach employed. Within this context, a number of items which improve trapping efficiency should be considered. Observations from 1988 and 1989 imply that regular--almost daily--attention to the traps may improve their effectiveness as the season progresses.

In addition, some preliminary data suggest that cattle in proximity to the traps improves cowbird capture rates, particularly of females (Grzybowski 1989a, 1989b, 1990a). The cattle attract cowbirds, many of which pass near the traps. The cowbirds are then drawn in by the bait and decoy cowbirds already in the traps. Additional data supporting or refuting this contention could be useful, particularly for areas where cattle cannot be removed. On the Kerr area, a rotational grazing scheme has been employed around the main vireo colony in an attempt to enhance removal of female cowbirds, and was repeated in 1990.

Banding a sample of adults and as many young as possible should continue to generate an empirical data base for developing estimates of various population parameters concerning survival, dispersal, local movement (both within and between seasons) and population structure. Vireo returns in subsequent years will help to anticipate population changes and to evaluate production levels necessary to maintain vireo populations. Beyond 1990 (the

fifth year of significant banding effort), simple monitoring of the rate of return will need to continue for the life span of the surviving banded birds.

Many young vireos tend to disperse from their birthplace. However, dispersal information is still lacking, particularly for the young and females. Most of the young fledged (111 of 126-128) during 1989 on the Kerr WMA were banded. This provides an excellent opportunity to obtain these data (important for various population models).

Monitoring of nesting activity and productivity should also help assess the effectiveness of cowbird removal, and develop estimates of potential productivity and its variance at various levels. One of these levels is between years. Another is between larger and smaller groupings of vireos. The smaller groupings appear to make a disproportionately lesser contribution to productivity than the larger groupings. This becomes interesting if one considers that vireo habitat is successional, and that colonization of these changing and developing habitats begins with these smaller and less productive groupings. Movements of birds between groups also deserves further attention.

METHODS

The study was conducted at the Kerr WMA, Kerr County, properties in the vicinity of the Kerr Area, the South Fork Ranch, Kerr County, and the Walter Buck WMA, Kimble County, Texas. The primary activities involved mapping territories, locating color-banded birds, monitoring reproductive activity and pair success, trapping cowbirds, and banding additional vireos. Determining returns of birds banded in previous seasons was also pursued for the sample at the Davenport Ranch (now the City of Austin Vireo Preserve), and adjacent Wild Basin Wilderness Preserve, Travis County. Other data collected at the Davenport Ranch site can be found in DLS Associates report (MS).

Cowbird decoy traps (USDI 1973) were assembled and/or maintained at the Kerr WMA (one mobile and four stationary traps), and the Walter Buck WMA (two stationary traps). At the Kerr WMA, the three cowbird traps operated in the Rock Pasture were slightly less than one kilometer apart. One trap was maintained in the Buck Pasture, and one was moved from location to location (Figure 1). At the Walter Buck WMA, traps were placed in the north-facing draws (Figure 2). Decoy cowbirds for the traps were initially obtained from traps operated in the Austin area under the auspices of the Texas Nature Conservancy. Trapping began in mid-April and continued into July at the Kerr WMA, and from 30 April to 14 June 1990 at the Walter Buck WMA.

Cattle were placed around (but not in) the main vireo colony on the Kerr WMA at the beginning of the breeding season in late April by personnel of the Kerr WMA. After that time, the cattle were moved to other portions of the Area.

Locations of male Black-capped Vireos were plotted on maps, and used to establish the number of male birds at each locality. Because most male Black-capped Vireos are normally very vocal, they could be located and followed as they traveled around their respective territories. Turning points and territorial dispute boundaries were noted. Males were followed to determine mated status, and help locate females. A number of birds were color-banded (see below). This marking was useful in distinguishing between birds at various sites. Some males had distinctive notes in their songs which further aided in individual recognition. Plumage characteristics were used to age males in their first breeding season (SY), or older (ASY; see Grzybowski 1988). However, because some movements of vireos into and off the study sites occurred as the season progressed, the estimates of the numbers of vireos included only those established on territory during April and May.

Territory mapping was a season-long and thorough process at the Kerr WMA. At the Walter Buck WMA, mapping of territories, and monitoring of males and their mates was accomplished through a series of visits at intervals of two to three weeks. At the South Fork Ranch and other properties in the vicinity of the Kerr WMA, only one, sometimes two visits were made to any locality. The primary objective of these visits was to locate banded birds which dispersed from the Kerr WMA. Nonetheless, the locations of these birds was plotted on maps. However, to maintain confidentiality with landowners, these will not be provided here.

Initial mapping of the Kerr area was conducted with the same effort as for off-site locations. The difference in the number of birds found in this initial mapping effort on Kerr area and the final number determined after thorough mapping was used in projecting an estimate of the total number of birds in areas searched off the Kerr area.

Sampling of reproductive activity involved the discoveries of nestings. "Nestings" refer to the location of actual nests or of fledglings already out of the nests. The males were followed to help locate females and nests. Male vireos are involved in every step of the nesting process. They help in nest building. They are often in close association with the female during the egg-laying period and will attempt copulation, or be near the nest. Males also help in incubation and feed nestlings and fledglings (Graber 1961, pers. obs.).

A sample of nestings was obtained from the Kerr and Walter Buck areas. While attempts were made to discover as many nests as possible at the Kerr area, efforts at the Walter Buck area were directed only at assessing pair success. Sampling was conducted from 21 April through 28 July 1990. Nestings of other species were recorded when observed. Only territory mapping, assessment of mated status and presence of bands was accomplished at the West Frio pasture of the South Fork Ranch.

Pair success was determined by monitoring adult vireos at intervals throughout the nesting season. Again, the male is involved with the fledglings for up to 40+ days after the young leave the nest (Graber 1961, Grzybowski unpubl. data). Thus, it was possible to establish whether or not each pair fledged young, even if every nesting attempt was not discovered, by simply locating and observing the males. All vireo territories used in this part of the sampling procedure were visited at least once in mid-June and late July to confirm if any vireo young were fledged.

An effort was made to locate banded birds, to recapture any generically banded young from previous seasons, and to band additional adult and young vireos at the Kerr WMA during 1990. Attempts were made to capture most of the unbanded adult Black-capped Vireos located on the Kerr area. Mist nets in conjunction with tape recordings of vireo songs and wooden decoy models of male Black-capped Vireos were used to enhance the capture of males. Attempts at capturing females focused on placing mist nets in lanes of travel near active nests. However, caution was used in all cases to be sure that the nets were placed at least 15-20 m from known nest locations, and that the nests were known to be at a point at least four-five days into incubation or beyond, at stages where abandonment was not a concern. Banding of young was accomplished on the tenth or eleventh day after hatching, or after fledging. Young banded from the nest were fledged by the researchers.

Observations of birds banded and returning in subsequent years provided some estimate of turnover, and thus of maximum mortality and/or dispersal. Because these data are still incomplete (as the life spans of many individuals have still not expired) and are part of a longer term study, a summary approach was used to estimate minimal survival at this time.

RESULTS AND DISCUSSION

POPULATIONS

During 1990, between 120-133 adult Black-capped Vireos were located on the Kerr WMA. This was an increase from 1989 when 99-109 adults were found, and is part of a trend in increasing

numbers since 1986 when 47-48 adults were located (Table 1). The Rock Pasture colony numbered 36-38 males, up from 27 the previous season. The number of females in the Rock Pasture increased ever more dramatically form 22-25 in 1989 to 35-39 in 1990.

Numbers of vireos in two other areas of the Kerr WMA are also increasing (Table 1, Fig. 3). One of these is the Bobcat Pasture, most of which incurred a hot burn in 1984. Several territories were present outside of the burn area in 1985, 1986 and 1987. In 1988, three males established territories in the burn area, but no females were found (Grzybowski 1990a). One of the males had previously been banded as a young in 1987. During 1989, four males and two females were present in the burn area, including the 1987 fledgling, a female banded as a fledgling in 1988, and an SY male. One additional male arrived late in the season. In 1990, 7-8 males and 6-8 females were located, including the two previously banded fledglings mentioned above, four additional 1989 banded fledglings, and a pair that had occupied adjacent areas since at least 1987. One pair with three young was only noted late in the season, and may have originated in the Buck Pasture and been simply traveling through. Only 2-3 young were produced in 1989. However, at least 11-12 young (14-15 with the late season pair noted above) were produced in 1990.

The other area showing improvement is the Doe-Owl pasture area. In 1986, only one male was detected. During 1987, four males were found, three of them SY, but only one mated. In 1988, five males (two of them SY) and four females were present. By 1990, 8-9 males and 8-9 females were present and produced 13-15 young (Table 1, Fig. 3).

The Buck Pasture has shown somewhat of an erratic pattern in occupancy. Nine to ten males were present in 1985, five of them mated. In 1986, 2-3 males sequentially occupied a single territory. No females were found. This decline followed a disturbance in which junipers were mechanically removed near the beginning of the breeding season. From 1987 to 1990, 2-5 males, and 2-4 females have been present. However, no young have been produced here, with the possible exception of 1990. The pasture was not monitored in 1990, but the three young which were first detected late in the season in the adjacent Bobcat Pasture may have been produced by one of the pairs in the Buck Pasture. The male with the young and the unbanded male in the Buck Pasture were both half-gray naped.

The primary improvement in numbers at the Kerr WMA began to appear in 1989. This coincides with increased success of cowbird trapping in 1988 (Grzybowski 1990a), and a consequent increase in the number of young vireos produced. In 1985 and 1986, cowbird removal was not conducted in the main colony to collect data on

normal parasitism levels and vireo production. A single trap was placed in the Rock Pasture in 1987, which doubled production per female. In 1988, three traps were operated. In 1989 and 1990, this trapping effort was supplemented by a mobile trap placed among cattle intentionally grazed in the adjacent pasture. A substantial improvement in production and occupancy have been noted in the Rock Pasture colony from 1988 through 1990.

Unfortunately, the number of birds at the Davenport Ranch site in Travis County has steadily declined since 1985 to only 15-16 adults (only four to five females) in 1990 (Table 2). This site has been uniformly searched each year. It has, however, become increasingly isolated from other groupings of vireos in the Austin area, and influx of new birds may have become a rare event (DLS Associates 1989, MS).

The numbers at the Walter Buck WMA were about the same between years (Table 2, Fig. 2). Some fluctuation in the numbers of females is in part, the result of variation in effort and some observer bias. The constancy in the number of males is somewhat surprising given the ephemeral use of portions of the Walter Buck Area, and implicates the presence of additional birds off the Area.

The numbers of vireos present in the West Frio Pasture of the South Fork Ranch have shown a decline since 1987. Observer effort may also be affecting some of these numbers, as the survey in 1989 was not as intensive as in 1987, 1988 or 1990. Nonetheless, fewer birds were noted in 1990 (Table 2, Fig. 4). The initial observations of four males in 1986 may have been incomplete, as access was not allowed until late May, and some birds present may have avoided detection.

In searching for banded birds dispersing off the Kerr WMA (see below), a count of vireos detected was also made. A total of 140 males and 38 females were observed on properties in the vicinity of the Kerr Area. With similar survey effort on the Kerr area, about 50 of the 62-67 males (about 78%) finally noted were initially detected. Extrapolating, the estimate of males in the search area off the Kerr area is 179. Previous data from the Kerr shows approximately 163 of 213 males (76.5%) were mated (Grzybowski 1990a). Thus, about 137 females are expected. Only 38 were observed.

This analysis estimates approximately 450 adults in the areas searched in and around the Kerr WMA. Vireos are known to occur within this radius from the Kerr WMA of the sites searched (Marshall et al. 1985, Grzybowski 1988, unpubl. data) in areas which were not sampled in 1990. In addition, access was not allowed to one site with extensive habitat where vireos were heard singing from the property boundary. Thus it is likely that 1,000 or more vireos are present in this area.

RESULTS OF BANDING

A substantial effort was made to band as many vireos as possible during 1986-1990 (see Tables 3-6). In this period, between 73 (1987) and 172 birds (1989) were banded during any one year on the Texas study sites reported here (Table 6). The number of Black-capped Vireos with bands at the end of the breeding season, which includes those banded individuals surviving from previous years, has increased each year to 225 in 1989. In 1990, 187 vireos possessed bands at the end of the season.

In 1988, more young were banded than in any previous year, all but one of these at the Kerr WMA. In 1989, this was repeated with 121 young banded, 111 at the Kerr WMA. A substantial number of young were also banded in 1990--70 at the Kerr WMA, and four at the Davenport Ranch.

Five of the males returning in 1987 were banded as juveniles in 1986--four at the Kerr WMA, and one at the South Fork Ranch (Tables 3 and 5). Three of these SY males returning in 1987 returned again in 1988. One of these was detected in 1990. Two additional males banded as fledglings in 1987 were detected in 1988 and 1989. One of these also returned in 1990.

In 1989, one SY male and four SY females banded in 1988 were detected (Table 3). Only two of the females were recaptured in 1989. Both of these returned in 1990. In addition, three vireos (one male and two females) generically banded as fledglings in 1988 were discovered in 1990. Two of these were recaptured. These may have been the same three which evaded recapture in 1989. All 1986-1988 banded fledglings recaptured were located within 5 km of their natal territory.

During 1990, 22-24 vireos banded as fledglings in 1989 on the Kerr WMA were identified in the field. Since all young were generically banded, two of these could not be distinguished with certainty from birds which disappeared from other areas. Thus a range is given. Of these, 14 were recaptured, and band numbers determined.

Dispersal distances of one-year old vireos from Kerr County, Texas are shown in Figure 5. For birds not recaptured, a center-point weighted toward the Rock Pasture where most fledglings were banded was used in determining dispersal distance. The dispersal distance used here is also simplified as the distance from natal territory to the location where first detected the following year. Since not all males enter the breeding pool at this point, it is a generalized estimate of dispersal.

The mean dispersal distance is 3.72 km (S.D.=4.15). The median value is 2.6 km. However, the distribution appears to be a truncated Poisson. This is likely the result of search efforts being constrained by the property boundaries of the Kerr WMA. Observations of dispersal greater than 6 km were obtained in 1990 when adjacent properties were searched. Thus mean dispersal distance is likely greater than 3.72 km. This is also evident when extrapolating the number of banded birds undetected in off-site searches (see below).

One male banded as a fledgling in 1987, returned to the Buck Pasture in 1988, but to the Middle Trap at the other end of the Kerr WMA in 1989. Several other males in the smaller groupings appeared more than 1 km from their previous year's territory. One female banded in 1986 at the Davenport Ranch site was accidentally located in the Comanche Peak area about 10 km away during 1987 (Steed, pers. comm.). Otherwise, returns of birds banded as adults were generally to a territory substantially overlapping that in the previous year (for males) or to the same territory cluster for females. Almost all the males located during 1988, 1989 and 1990 at the Kerr WMA and Davenport Ranch carried bands at the end of the season.

Returns for the main colonies are significantly higher ($P<0.01$; 66% of 197 males) than those for the scattered groupings where only 50% (56 of 112) of the males banded were detected in the following year (Grzybowski 1990a, unpubl. data). This detected return is highest in the Rock Pasture of the Kerr WMA (70 of 100; 70%; Table 7), and may indicate higher site fidelity. The detected one-year return for females in the main groupings was only 49% (48 of 98; Table 7)--and an even lower 23% (8 of 32) in the smaller groupings (Grzybowski 1990a, unpubl. data), but this difference was not significant ($P>0.1$).

Table 7 shows year to year variation in return rates. In the Rock Pasture, return rates of males were fairly stable over a five year period for only modest sample sizes. Percent returns for females varied substantially more from 27% in 1988 to 89% in 1990. While this variance is likely related to sample size, the highest percent return of 89% (in 1990) occurred for the largest sample. The Davenport Ranch showed a pattern similar to that at the Kerr WMA between males and females, likely for similar reasons (Table 7).

Graber (1961) found one-year detected returns to be 69% (18 of 26) in males, 41% (11 of 27) in females, for a combined one-year detected return of 55%. These compare very closely with returns at the main colonies listed in Table 7. Graber, in fact, banded and worked in the larger groupings. The estimate for females may be lower because of the difficulty in locating females, and their lower site fidelity; thus, actual one-year survival may be slightly higher. Graber (1961) indicated only a

slight skew in sex ratios in one year at her Caddo County, Oklahoma study site (1.06:1::male:female), though she did record a greater difference at her Texas study site (1.31:1). One-year returns in Oklahoma were 47% for males and 15% for females (Grzybowski 1989a), and parallel results for the smaller groupings in Texas.

Studies of other passerine bird species also report lower survival of females (eg., Nice 1937, Stewart and Aldrich 1951, Nolan 1978), implying a surplus of males. This surplus is apparent in returns of banded individuals and percentages of mated males for Black-capped Vireos.

Developing a reasonable estimate for the survival of young is more difficult because the young are likely the most dispersal-prone of the age classes, and probably occur off of search areas. Of the 172 young banded on the Kerr WMA, 36 (21%) were observed in the following year. Only one of 26 young (4%) banded on the Davenport Ranch site in Travis County was subsequently detected.

In 1990, 22-24 (23 for convenience) of the 111 young (21%) banded on the Kerr area during 1989 were detected. This included 12-13 males and 10-11 females. Most banded young present were likely detected on the Kerr area itself. However, six of these birds (four males and two females) were located off of the Kerr WMA.

From the calculations above, 178 of the estimated 316 adults were observed in the searches off of the Kerr area. However, it was not determined if nine of the males and seven of the females found were banded (two of these males were aged beyond first-year by plumage, however). Thus, if six of 164 adults (3.7%) were banded as fledglings, then 3.7% of the remaining 152 adults could be projected as banded, or minimally, another 5 birds. Since substantially less than 50% of the area within a 21 km radius of the Kerr area (the furthest distance from Kerr at which a banded bird was detected), and because vireos are known to occur at a number of localities within this 21 km radius, the number of 1989 banded fledglings observed and assumed returning off the Kerr area could conservatively be doubled to 22 birds. With the Kerr birds, the minimum estimate of fledgling survival is 35% (about 39 of 111). Fledgling survival is likely higher as only about 290 km^2 of the 1635 km^2 within a 21 km radius of the Kerr WMA (but excluding Kerr) was searched or inspected.

Nolan (1978) estimated 32% survival of fledgling Prairie Warblers (Dendroica discolor) to the following breeding season. This is similar to the probably low estimate for return of Black-capped Vireos. Given the extended parental care provided the fledglings by vireos, however, one would expect a higher survival.

PRODUCTION

Production of vireos was documented at two sites where cowbirds were removed. In addition, cowbird eggs and young were removed from nests when found. In the Rock Pasture of the Kerr WMA during 1990, this production was 96-107 young, or about 2.89 young/female (Table 8). While this was the highest total number of young produced in the Rock Pasture, it was almost one young per female lower than in 1989, when 87-88 young were fledged by approximately 23 females. Nonetheless, this level of production was much higher than the 0.62 young per female documented on the Kerr Area from 1985-1988 without cowbird trapping (Grzybowski 1988, 1989b). For the third year, production in the Rock Pasture exceeded 2.5 young per female. Between 13-16 young were fledged by nine females on the Walter Buck WMA, or 1.56 young per female. This is the first estimate of production for the Walter Buck WMA since 1986 when no vireo young were produced.

A mobile cowbird trap was moved between various other locations outside the Rock Pasture on the Kerr Area. With this partial effort, 29-33 young vireos (and one young cowbird) were produced by the 16-18 females monitored in this sample, or approximately 1.82 vireo young per female. Five of these young fledged from nests where cowbird eggs were removed. An additional 12-13 young were known to be fledged on the Kerr WMA by pairs that were not monitored throughout the season. Thus, the total number of fledglings observed on the Kerr WMA during 1990 was 137-153. This is the highest annual total of fledglings observed thus far on the Kerr area. Between 126-129 young were fledged in 1989.

This success in the Rock Pasture was due, in large part, to the use of three traps which were constantly maintained during April and May, and to a fortuitous rotation of cattle on the Kerr WMA in 1988 intentionally repeated in 1989 and 1990. Cattle placed near the traps may have served as a feeding site for cowbirds, attracted more birds, particularly females (in 1988), to the traps from a broader area, and resulted in both higher initial capture (see below), and a more generalized reduction of cowbirds in the area. This reduction may have meant fewer cowbirds left to infiltrate vireo nesting areas from just outside the normal cowbird trap influence zones.

COWBIRD NEST PARASITISM

Cowbird parasitism of Black-capped Vireo nests is summarized in Table 9. The Rock Pasture was part of the sample without cowbird removal in 1986, and with cowbird removal from 1987 through 1990. Cowbird trapping and removal (including removal of cowbird eggs, young and fledglings) were also used at the other sites in Texas.

Combining data for all years, 69% (138 of 199) of all nestings at sites without cowbird removal in both Oklahoma and Texas were parasitized from 1983 through 1990 (Table 9). This was more than halved for the sample with cowbird removal to 25% (97 of 395). Of 24 nestings discovered at cowbird-trapped Davenport Ranch in 1986, 14 (58%) were parasitized; 3 of 14 (21%) in 1987, 1 of 11 (9%) in 1989, but 9 of 14 (64%) in 1988. These data indicate the necessity of keeping cowbird traps functional to benefit vireo production.

Cowbird nest parasitism at the Kerr WMA with no cowbird removal was 82% (27 of 33) in 1986; 66% (4 of 6) in 1987, and 90% (9 of 10) in 1988. Combining the samples for 1985-1988, 77% of the vireo nestings discovered (53 of 69) with no cowbird removal were parasitized at the Kerr WMA. With cowbird removal, this was reduced to 15%. In both 1988 and 1989, nest parasitism at Kerr was exceptionally low in the cowbird trapped area (9 and 3%, respectively). Some areas of Kerr were partially trapped in 1989 and 1990. Parasitism was 50% (15 of 30) and 26% (7 of 27), respectively in these areas. All of these data indicate a dramatic potential impact of cowbird removal on reducing nest parasitism.

COWBIRD TRAPPING AND REMOVAL

A total of 345 Brown-headed Cowbirds were removed from the Kerr WMA during 1990 (Tables 10 and 11). Of these, 171 were adult males, 104 were adult females, and 70 were young. Fewer adults were captured in 1989 (84 males and 56 females). However, more adults were captured during 1988 in a ratio favoring females (134 males and 203 females; Grzybowski 1990a). The numbers of cowbirds removed were not apparently related to the incidence of parasitism, as parasitism in the Rock Pasture was lowest in 1989, the year of the lowest capture (Table 9; Grzybowski 1990a). Thus cowbird numbers fluctuate from year to year. It appears that in 1990, cowbirds recovered from lower population numbers in 1989.

The rate of capture for the stationary cowbird traps at the Kerr WMA varied from 0.11 to 0.87 birds per day during 1990. However 158 of the 275 adults removed (57%) on the Kerr area were captured in the Mobile Trap during a two week interval (17% of the trap operation times for all traps) when the mobile trap was in the South Rock Pasture (Table 11), only a short distance from trap 2. Cattle were moved into this pasture during this period. Cowbirds in the Rock Pasture area were likely attracted to the vicinity if this trap by the cattle, and then captured. Substantially fewer adults were captured by the three traps in the Rock Pasture, perhaps because birds in the area were being captured by the mobile trap. This was also true in 1989. In contrast, initial capture rates in the three Rock Pasture traps were much higher in 1988 when a mobile trap was not used

(Grzybowski 1990a, Table 12). Captures by the three Rock Pasture traps during 1990 appeared to be split between this same two week interval and a second period at the beginning of June (Table 10).

Examination of initial capture rates can be used to assess the effects of the presence of cattle. This manipulation helps stardardize the results for comparison, because most cowbirds are removed during an initial period. Using capture rate per day will be biased by the number of days the traps are in operation, i.e., the capture rate per day will be continue to decrease as the number of days increases simply because most of the cowbirds are already removed, and there are fewer if any left to capture. In addition, the effort expended in operating the traps (in terms of number of visits) was consistent between traps and years for this period of higher trap activity, further standardizing these data for comparisons.

The overall pattern of removal associated with the presence of cattle was high for all three years when cattle were placed near the Rock Pasture at the beginning of the vireo breeding season (Table 12). The large increase in capture of cowbirds during the interval when the cattle were present is much greater than any initial capture rates observed in any other traps operated on the Kerr area. During 1989 and 1990, however, it is clear that the presence of the mobile trap did influence capture rates in the other Rock Pasture traps, which declined. Trap 3, furthest from the mobile trap had the highest capture rate, while trap 2, closest to the mobile had a much lower capture rate--0 in 1990. Trap 2 had the highest capture rate in 1988, before the mobile trap was used. Capture rates in the Buck Pasture were low all years.

Adding to the success of the traps at Kerr in 1988, substantially more females were captured than males (203 females and 134 males). This is also unlike the ratios captured in previous years, or at other sites. While the ratios in 1989 (84 males and 56 females) and 1990 (143 males and 106 females) were not as good, a substantial number of females was still removed, and parasitism was still low, particularly for 1989. Overall, ratios of male to female captures at the Kerr WMA were 1:0.39 in areas without cattle, and 1:1.13 in areas with cattle (1:0.75 excluding 1988 data, when perhaps exceptional numbers of females were captured). Females may be susceptibly attracted to cattle, thus increasing their numbers in cowbird traps placed nearby.

In the Wichita Mountains, the patterns were similar. Initial captures of cowbirds in traps near cattle or buffalo were 4.49 birds/day; away from cattle they were 1.41 ($P<.05$; Grzybowski 1990b). Capture rates of females were almost five times greater near cattle or buffalo than away. (2.14 and 0.46 per day, respectively; $P<.05$).

While it may appear counter-productive in reducing cowbird parasitism to place cattle near vireo nesting areas, the results here make it clear that cattle can be used as a constructive tool in management in conjunction with cowbird trapping. Parasitism rates were 9%, 3% and 21% during 1988, 1989, and 1990 (Table 12), respectively at the Kerr WMA, the lowest recorded here, and generally lower than for any other site (Table 9). Nonetheless, caution should be applied when considering this approach to enhancing cowbird removal, as the situation at Kerr is a special case of rotational grazing which may require the presence of cattle near vireo nesting areas for relatively short periods of time, and in a relatively small area.

The cowbird traps continued to decrease in effectiveness through the season. Initially, captures rates are often good, but are followed by periods when fewer cowbirds are removed. Daily attention was given the traps in 1988 and 1989 at the Kerr area. This attention included clearing the floors of the traps of weeds, and cleaning water dishes. Part of the strategy employed in 1988 and 1989, but not in 1987 or 1990 was also to periodically replace birds in traps with new birds so that birds in the traps would not develop behavior which would repel new potential captures. This was believed useful as the season progressed to keep the traps functional in capturing newly dispersing cowbirds.

However, post-initial capture rates of females were 0.18 and 0.22 per day in the well attended Rock Pasture traps in 1988 and 1989, respectively, but a similar 0.20 in 1990. These capture rates for single traps in the Buck Pasture were 0 and 0.14 females per day, and 0.11 in the Rock during 1987. All Rock Pasture traps combined captured only 49 males and 32 males during the 162 days of post-initial periods in 1988 and 1989. Thirty-eight males and 14 females were captured during a 68-day post-initial period in 1990. Thus, the very attentive management of traps beyond the initial period did not appear to play a very large role in reducing cowbird numbers at the Kerr WMA. Although parasitism was higher in 1990 than 1988 and 1989, nests were parasitized during the initial as well as the post-initial periods. However, cattle accented capture during the initial period from 1988-1990 at Kerr. Thus, attention may be more worthwhile where cattle are not present.

RECOMMENDATIONS

1.) Cowbird parasitism is clearly a factor negatively impacting Black-capped Vireos. Trapping should continue at prime vireo nesting localities.

2.) Given that site-specific trapping is the only technique being used at this time to control cowbird numbers, work at improving effectiveness and efficiency of the traps should be considered. Regular--almost daily--attention to the traps may be necessary to improve their effectiveness. It also appears that cattle, under certain conditions, can be used as a tool enhancing capture of cowbirds, particularly females. The general problems with predators and maintaining decoy birds also need to be considered in any trap designs. However, it should also be recognized that trapping is still a technique with very limited coverage relative to the range of the vireo and the vireo numbers that can economically be protected.

3.) Some grander approach to reducing cowbird numbers at a regional level needs to be developed, perhaps even at the scale of eliminating a billion (!) or more cowbirds. Efforts to model cowbird populations, examine the spatial heterogeneity of their distribution, and determine wintering areas of cowbirds summering on the Edwards Plateau may prove useful. This could help to gain a better understanding of cowbird population dynamics and movements, and could elucidate the usefulness of alternative and more encompassing methods of cowbird control protecting a broad array of species.

4.) It appears that the most important vireo breeding areas are the larger groupings. Attention should be focused on locating and protecting (through cowbird removal) these larger pockets, and in enhancing habitat around these groups.

5.) Because many young vireos tend to disperse from their birthplace, searching for large pockets near those already identified would be most useful as a general approach. Clusters of vireo breeding localities can then be protected from cowbird nest parasitism. This may be necessary to maintain production of vireos that can disperse back into the primary areas currently being protected. However, because many land holdings on the Edwards Plateau are large and access limited, some broader approaches such as inspections of aerial photography, or geologic and soil maps may still prove useful to help identify those areas most worthy of attention.

6.) A series of sites should be monitored annually to log the history of use by vireos at these areas. All vireos should be counted and females located. Plumage of the males should also be determined. These data can be used to establish norms for various population parameters, and to determine whether vireo populations are changing and what dimensions of the populations are changing. Sites should include the major colonies as well as a series of smaller groupings.

7.) A large sample of young were again banded in 1990 at the Kerr WMA, as well as most of the breeding males and females. Additional dispersal data, an important parameter in modeling populations for management, is still needed, particularly for young. A zone around the Kerr area should be searched again for banded birds returning in 1991 to enhance this data base.

8.) Monitoring of the rate of return will need to continue for the life span of the surviving banded birds to complete this segment of the data for establishing various population parameters of the vireo. Banding a sample of additional adults young during this monitoring could supplement these data useful in assessing turnover, dispersal, and local movement (both within and between seasons), though the results of current work may need to be analyzed in broader contexts (see below).

9.) One of the basic goals of work at the Kerr WMA was to collect baseline data which could establish estimates of various population parameters and could be broadly applied to determining target management goals for vireo productivity, assessing where and when management is needed, and assessing the success of management in maintaining populations. With the accumulation of survivorship, spatial distribution and dispersal data from this and other empirical work, these more structured population analyses couched in the framework of theoretical models offering broader than individual-site perspectives are now needed. These analyses and models will likely provide perspectives not yet realized on the structure of the populations, the relative significance of the smaller and larger groupings, and on dispersal. These perspectives should result in an efficiency of developing future monitoring, research and management strategy important in recovery which cannot be appreciated until these analyses are performed.

ACKNOWLEDGMENTS

Financial support for this study was received from the Resource Protection Division of the Texas Parks and Wildlife Department (TPWD) with funds from the Endangered Species Act. Administrative assistance and guidance was given by Robert Short, Joe Johnson, and Alisa Shull of the U.S. Fish and Wildlife Service and by Larry McKinney, Robert Murphy and Lee Ann Linam of TPWD. Personnel support was also received from the Wildlife Division and Parks Division of TPWD. George Litton, David Riskind, Laurel Wiley and Kelly Bryan were extremely cooperative and helpful in accessing this assistance.

TPWD also allowed use of the Kerr WMA as a study site, and provided quarters and a vehicle. They also provided personnel support in helping to monitor the cowbird traps from time to time, as well as other logistic support during the course of the

investigation. George Litton, Donnie Harmel, Bill Armstrong, Tim Schumann, Mark Edinburgh, and Joe Johnson of TPWD were particularly helpful, friendly and courteous, and made our stays at Kerr most pleasant. In addition, George Litton provided administrative support. David King, Paul Rodewald, Wendy Strader, Susan Rust, Max Traweek, and Wayne Haley provided field assistance for various dimensions of the study.

Administrative support was also provided by Central State University. Instrumental in this support were Joyce Mounce, Clyde Jacob, David Koehn, Tammy Schuler and Nic Widener.

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FIGURE CAPTIONS

FIGURE 1. Kerr Wildlife Management Area, Kerr County, Texas showing locations of the fixed cowbird traps, and the mobile cowbird trap. See Table 11 for sequence of locations and dates for the mobile trap.

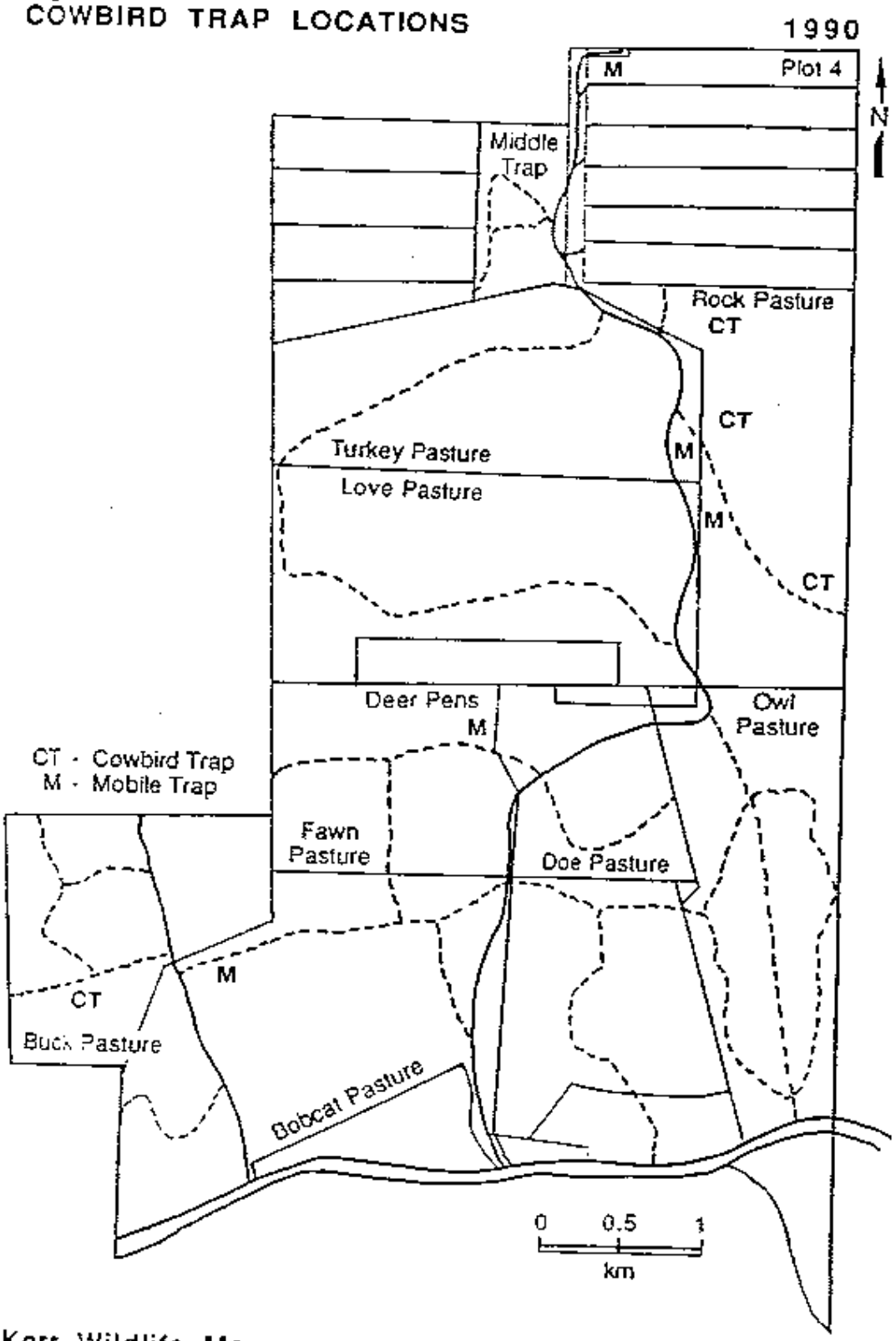
FIGURE 2. Locations of cowbird traps and Black-capped Vireo territories at Walter Buck WMA, Kimble County, Texas during 1990. Each circled area represents a territory. Circles enclosed by dashed lines indicate a temporary territory.

FIGURE 3. Locations of Black-capped Vireo territories at Kerr WMA, Kerr County, Texas during 1990. Each circled area represents a territory. Circles enclosed by dashed lines indicate a temporary territory.

FIGURE 4. Locations of Black-capped Vireo territories at West Frio Pasture of the South Fork Ranch, Kerr County, Texas during 1990. Each circled area represents a territory.

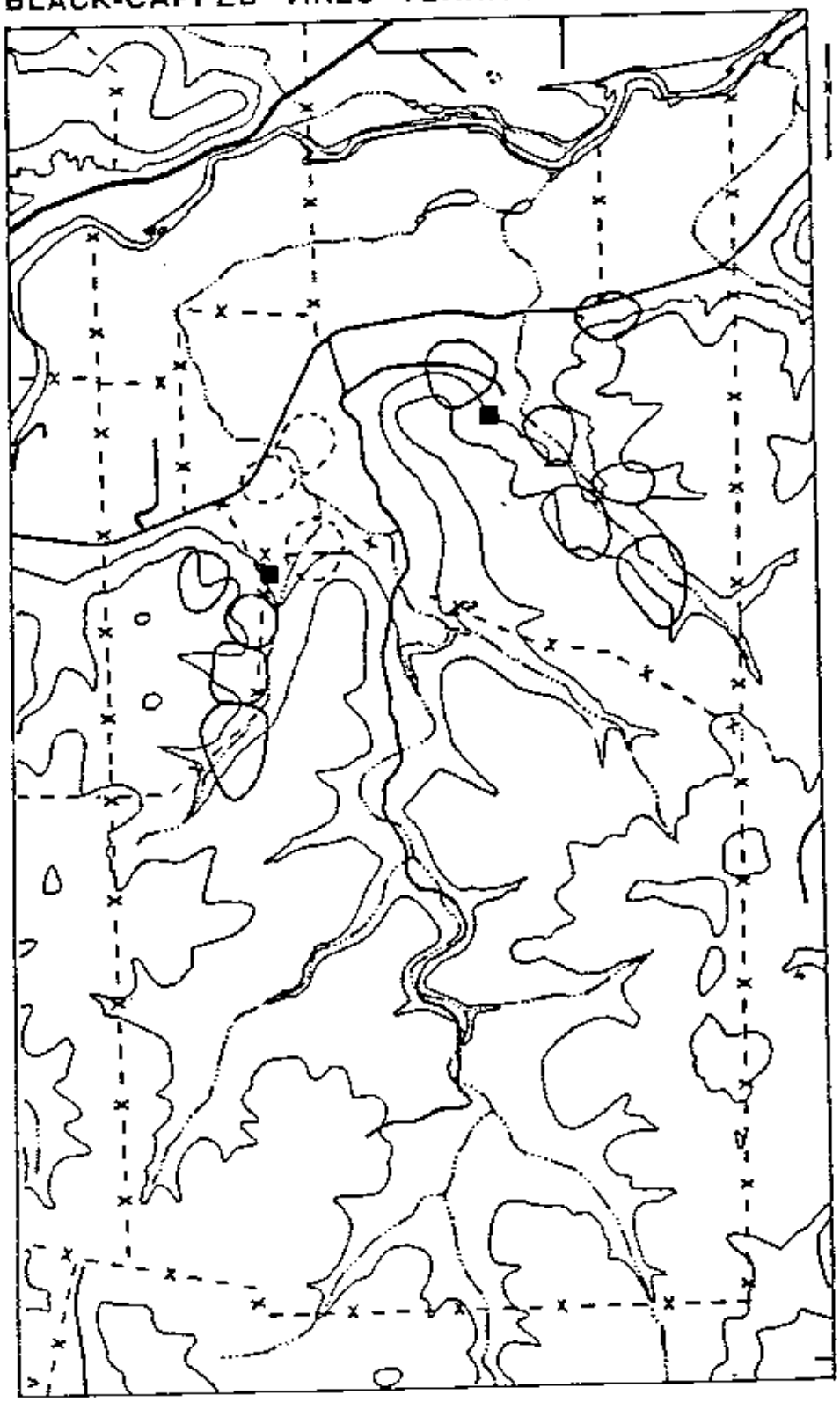
FIGURE 5. Dispersal distances of one-year old Black-capped Vireos in Kerr County, Texas.

Figure 1
COWBIRD TRAP LOCATIONS



Kerr Wildlife Management Area
Kerr County, Texas

Figure 2
BLACK-CAPPED VIREO TERRITORIES 1990

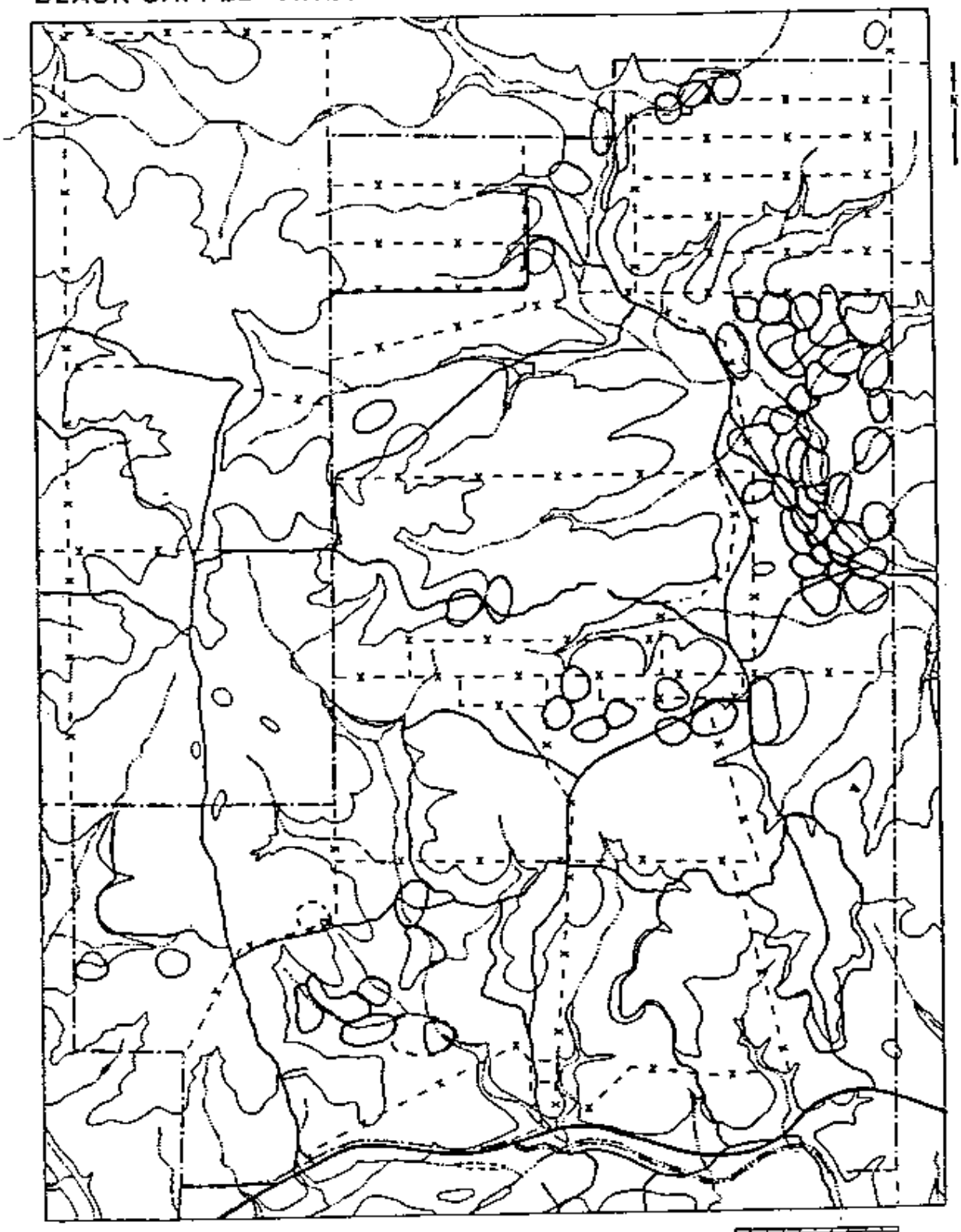


Walter Buck Wildlife Management Area
Kimble County, Texas

■ Cowbird Trap

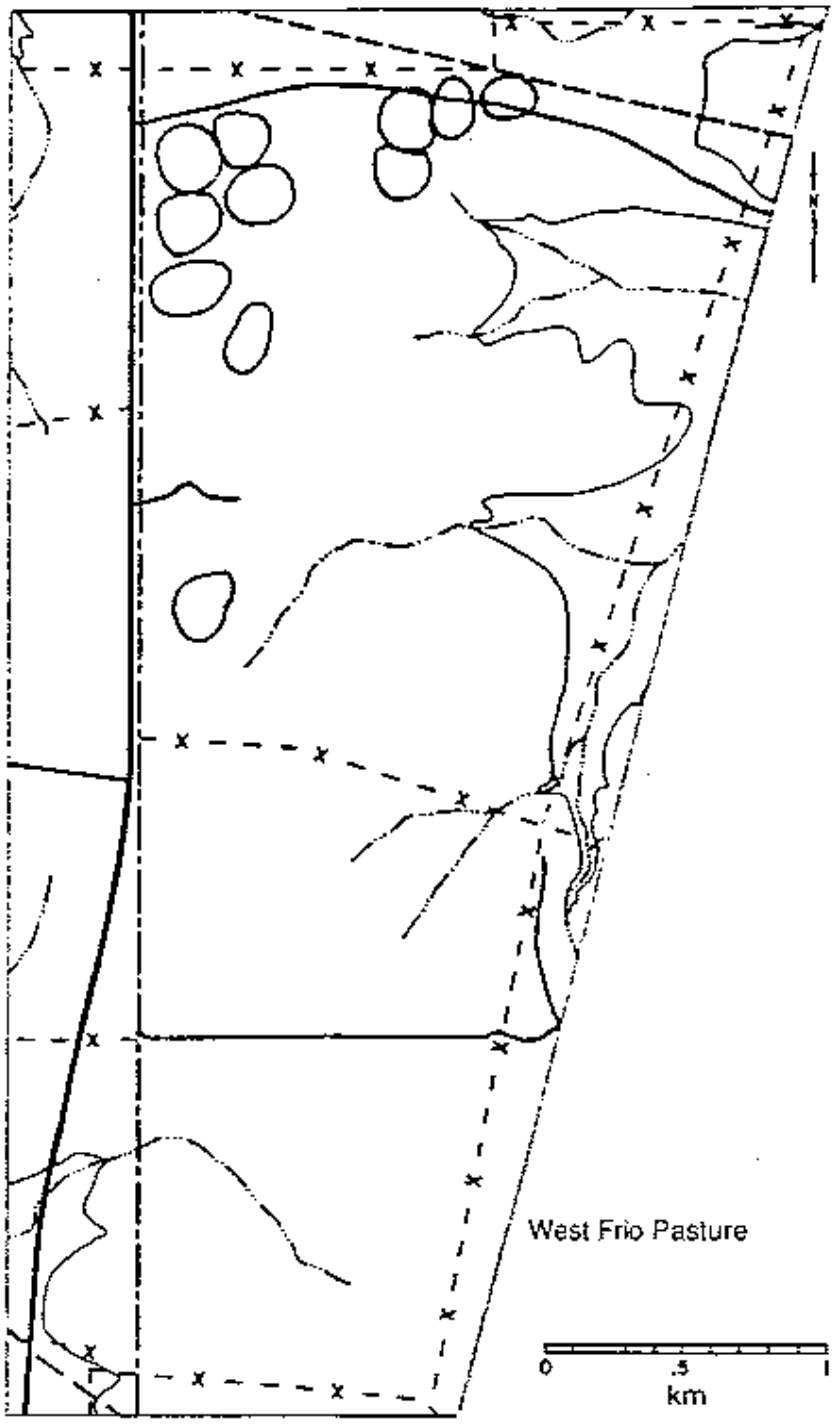
0 .5 1
km

Figure 3
BLACK-CAPPED VIREO TERRITORIES 1990



Kerr Wildlife Management Area
Kerr County, Texas

Figure 4
BLACK-CAPPED VIREO TERRITORIES 1990



South Fork Ranch
Kerr County, Texas

Figure 5

BETWEEN SEASON DISPERSAL DISTANCES OF ONE-YEAR OLD BLACK-CAPPED VIREOS
Kerr County, Texas

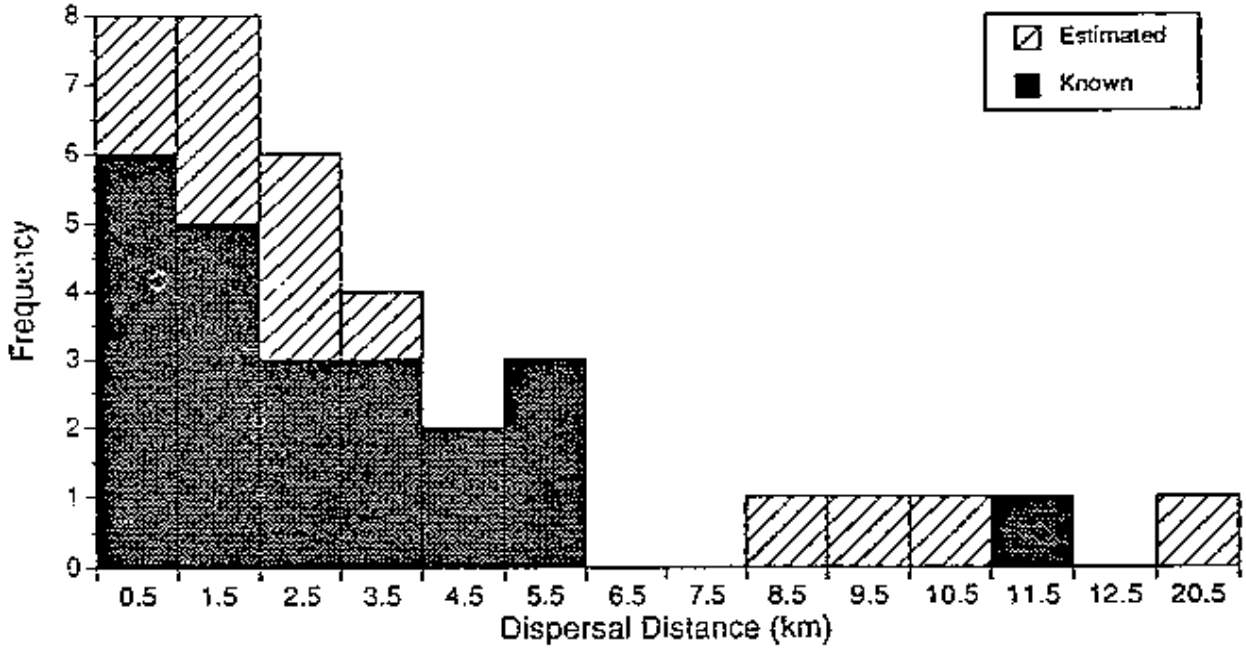


TABLE 1. Numbers of Black-capped Vireos found on the Kerr Wildlife Management Area, Kerr County, Texas from 1985 through 1990, and numbers of young produced.

Pasture(s)	Sex or age	1985	1986	1987	1988	1989	1990
Bobcat	Males	3	4	2	5	4	7-8
	Females	-	3	2	1	2	6-8
	Young	-	0	3	0	2-3	14-15[a]
Buck	Males	9-10	2-3	4	5	3-4	2-3
	Females	5	0	2	4	3	2
	Young	0	0	0	0	0	0
Doe and Owl	Males	2-3	1	4	5	7	8-9
	Females	-	0	1	4	5	8-9
	Young	-	0	0	3	14-15	13-15
Fawn	Males	1	0	-	0	0	0
	Females	-	0	-	0	0	0
	Young	-	0	-	0	0	0
Love	Males	0	1	4	2	5	2
	Females	0	0	2	1	3-4	2
	Young	0	0	2	2	7	2-3
Middle Trap	Males	-	-	-	-	4	3
	Females	-	-	-	-	3-4	3
	Young	-	-	-	-	10	7
North plots	Males	-	-	5	3	5	3
	Females	-	-	3	2	4-5	2-3
	Young	-	-	0	0	6	5-6
Rock (colony)[b]	Males	19	20	21-22	22-25	27	36-38
	Females	16	16	19	16-18	22-25	35-39
	Young	20	13	15-22	48-50	87-88	96-107
Turkey	Males	1	-	2	0	1-2	1
	Females	-	-	0	0	1-2	0
	Young	-	-	0	0	0	0
TOTALS	Males	35-37	28-29	40-41	42-45	56-58	62-67
	Female	21	19	29	28-30	43-50	58-66
	Young	20	13	20-27	53-55	126-129	137-153

[a] - includes three young which appeared with a previously undetected male; Male with cap color similar to that of unmonitored bird in Buck Pasture.
[b] - includes contiguous territories which could overlap into adjacent pastures and plots.

TABLE 2. Numbers of Black-capped Vireos found at various localities in Texas from 1985 through 1990, and numbers of young produced.

Site	Sex or age	1985	1986	1987	1988	1989	1990
Davenport Ranch, Austin, Travis Co.	Males	33	32-33	28	16	13-14	11
	Females	27	26-27	22	13-14	7	4-5
	Young	22	14-17	18-21	12-13	14	8
West Frio Pasture, South Fork Ranch, Kerr Co.	Males	-	4	21	16-18	11-12	11
	Females	-	2	15	16	-	6-7
	Young	-	0	3-5	6-7	-	-
Walter Buck WMA, Kimble Co.	Males	-	12	10-11	12	11	11
	Females	-	4-10	7	8	5+	9
	Young	-	0	-	-	-	-

TABLE 3. Numbers of Black-capped Vireos banded at the Kerr Wildlife Management Area, Kerr County, Texas from 1985 through 1990, and numbers returning and detected in subsequent years.

Locality	Sex or age	Year 1st banded	Number banded and returning[a]					
			1985	1986	1987	1988	1989	1990
Rock Pasture colony	Male		5	3	3	2	1	1
	Female	1985	3	2	2	1	1	0
	Young		0	-	-	-	-	-
	Male			16	11	9	7	4
	Female	1986		14	7	1	0	-
	Young			12(5[b])	(4[c])	(3[c])	(2[c])	(1[c])
	Male				4	2	1	0
	Female	1987			2	1	1	0
	Young				11	(1[c])	(1[c])	(1[c])
	Male					8	4	3
	Female	1988				5	2	2
	Young					32	(5[d])	(5[d])
	Male						12	10
	Female	1989					10	10
	Young						73	(9[e])
								(10[e])
	Male							9
	Female	1990						1
	Young							54
Peripheral birds	Male		1	0	-	-	-	-
	Female	1985	0	-	-	-	-	-
	Young		0	-	-	-	-	-
	Male			7	3	2	0	-
	Female	1986		1	0	-	-	-
	Young			0	-	-	-	-
	Male				13	6	4	2
	Female	1987			2	1	1	1
	Young				2(2[b])	(1[c])	(1[c])	0
	Male					8	3	3
	Female	1988				3	1	0
	Young					4	0	0
	Male						15	8
	Female	1989					10	4
	Young						38	(5[f])

TABLE 3 (cont.)

Locality	Sex or age	Year 1st banded	Number banded and returning[a] 1985	1986	1987	1988	1989	1990
Pericneral birds	Male							3
	Female	1990						4
	Young							16
TOTAL WITH BANDS/YEAR	Male		6	26	38	42	52	59
	Female		3	17	13	12	30	37
	Young		0	12(5[b])	13(2[b])	36	111	70
	Total		9	55(5[b])	64(2[b])	90	193	166

[a] - second and subsequent column values indicate numbers of individuals from preceding column value surviving.
[b] - additional nestlings banded that did not fledge.
[c] - all males and now adults.
[d] - one male and four females; 2 females recaptured originated in Rock Pasture; the others were not recaptured.
[e] - five males and four females recaptured. An additional 10 birds not captured were composed of four males and six females.
[f] - four males and one female.

TABLE 4. Numbers of Black-capped Vireos banded at Davenport Ranch and adjacent Wild Basin Wilderness Preserve, Travis County, Texas from 1984 through 1990, and numbers returning and detected in subsequent years.

	Sex or age	Year 1st banded	Number banded and returning[a] 1984	1985	1986	1987	1988	1989	1990
	Male		2[b]	2	2	1	0	–	–
	Female	1984	1[b]	0	–	–	–	–	–
	Young		0	–	–	–	–	–	–
	Male			15	8	6	3	2	2
	Female	1985		9	3	2	0	–	–
	Young			4	0	–	–	–	–
	Male				10	9	3	1	0
	Female	1986			11	6	2	0	–
	Young				6	0	–	–	–
	Male					13	7	5	3
	Female	1987				6	2	0	–
	Young					5	0	–	–
	Male						4	4	3
	Female	1988					2	1	1
	Young						1	0	–
	Male							0	–
	Female	1989						0	–
	Young							10	(1c)
	Male								1
	Female	1990							1
	Young								4
TOTAL WITH BANDS/	Male		2	17	20	29	17	12	10
	Female		1	9	14	14	6	1	2
	Young		0	4	6	5	1	10	4
	Total		3	30	40	48	24	23	16

[a] – second and subsequent column values indicate numbers of individuals from preceding column value surviving.
[b] – banded by Greg Lasley.
[c] – male, now an adult.

TABLE 5. Numbers of Black-capped Vireos banded at miscellaneous localities in Texas during 1986 through 1990, and numbers returning and detected in subsequent years.

Locality	Sex or age	Year 1st banded	Number banded and returning[a] 1986	1987	1988	1989	1990
Lost Maples SNA, Bandera Co.	Male		2	2	2	0	–
	Female	1986	2	0	–	–	–
	Young		1	0	–	–	–
South Fork Ranch, Kerr Co.	Male		8	3	2	0	–
	Female	1986	2	0	–	–	–
	Young		3(2[b])	(1[c])	0	–	–
	Male			6	1	0	–
	Female	1987		1	0	–	–
	Young			1	0	–	–
	Male				12	2	1
	Female	1988			4	0	–
	Male					1	1
	Female	1989				0	–
	Male						1
	Female	1990					0
Walter Buck WMA, Kimble Co.	Male		7	6	4	0	–
	Female	1986	1	0	–	–	–
	Male			5	1	1	0
	Female	1987		0	–	–	–
	Male				4	2	1
	Female	1988			1	0	
	Male					3	1
	Female	1989				0	–
TOTAL WITH BANDS/YEAR	Male		17	23	26	9	5
	Female		5	1	5	0	0
	Young		4(2[b])	1	0	0	0
	Total		26(2[b])	25	31	9	5

[a] – second and subsequent column values indicate numbers of individuals from preceding column value surviving.
[b] – nestlings banded that did not fledge.
[c] – male, now an adult.

TABLE 6. Summary of Black-capped Vireos banded each year per site in Texas.

Locality	Sex or Age	Number banded							Number with bands at end of season						
		1984	1985	1986	1987	1988	1989	1990	1984	1985	1986	1987	1988	1989	1990
Lost Maples SNA, Bandera Co.	Male			2	0	0	0	0			2	2	2	0	0
	Female			2	0	0	0	0			2	0	0	0	0
	Young			1	0	0	0	0			1	0	0	0	0
Kerr WMA, Kerr Co.	Male		6	23	17	16	27	12		6	26	34+4[a]	37+5[a]	47+5[a]	43+16[a]
	Female		3	15	4	8	20	5		3	17	13	12	26+4[b]	22+15[b]
	Young		0	17	15	36	111	70		0	12[c]	13[c]	36	111	70
South Fork Ranch, Kerr Co.	Male			8	6	12	1	1			8	9+1[a]	15	3	3
	Female			2	1	4	0	0			2	1	4	0	0
	Young			5	1	0	0	0			3[c]	1	0	0	0
Walter Buck WMA, Kimble Co.	Male			7	5	4	3	0			7	11	9	6	2
	Female			1	0	1	0	0			1	0	1	0	0
	Young			0	0	0	0	0			0	0	0	0	0
Davenport Ranch, Travis, Co.	Male	2	15	10	13	4	0	1	2	17	20	29	17	12	9+1[a]
	Female	1	9	11	6	2	0	1	1	9	14	14	6	1	2
	Young	0	4	6	5	1	10	4	0	4	6	5	1	10	4
TOTALS	Male	2	21	50	41	36	31	14	2	23	63	90	85	73	74
	Female	1	12	31	11	15	20	6	1	12	36	28	23	31	39
	Young	0	4	29	21	37	121	74	0	4	22	19	37	121	74
	Total	3	37	110	73	88	172	94	3	39	121	137	145	225	187

[a] - additional birds are males banded as nestlings or fledglings in preceding years.
[b] - additional birds are females banded as nestlings or fledglings in preceding years.
[c] - does not include nestlings banded that did not fledge.

TABLE 7. Summary of percentages of Black-capped Vireos returning and detected by area and year in Texas.

Locality	Sex or age	1985-86		1986-87		1987-88		1988-89		1989-90	
		Sample	%	Sample	%	Sample	%	Sample	%	Sample	%
Rock Pasture,	Male	5	80%	19	74%	22	73%	25	64%	29	72%
Kerr WMA,	Female	3	67%	16	56%	11	27%	8	50%	18	89%
Kerr Co.	Young	-	-	12	33%	11	9%	32	16%	73	26%
Peripheral areas,	Male	1	0%	7	43%	16	50%	17	47%	23	57%
Kerr WMA,	Female	-	-	1	0%	2	50%	4	50%	12	42%
Kerr Co.	Young	-	-	-	-	2	50%	4	0%	38	13%
Walter Buck WMA,	Male	-	-	7	86%	11	45%	9	33%	6	33%
Kinble Co.	Female	-	-	1	0%	-	-	1	0%	-	-
	Young	-	-	-	-	-	-	-	-	-	-
Davenport Ranch,	Male	17	59%	20	80%	29	45%	17	71%	12	67%
Travis Co.	Female	9	33%	14	57%	14	29%	6	17%	1	100%
	Young	4	0%	6	0%	5	0%	1	0%	10	10%

TABLE 8. Pair success of Black-capped Vireos in Texas during 1990. Numbers only for those pairs of determined success.

	With partial cowbird removal			With cowbird removal		
	No. of pairs	yg.[a] produced	yg./ pair[b]	No. of pairs	yg.[a] produced	yg./ pair[b]
Texas	16-18	29-33[c]	1.82	42-46	109-123	2.64
Kerr WMA						
Rock Past.	--	--	--	33-37	96-107[c]	2.89
Other sites	16-18	29-33[c]	1.82	--	--	--
Walter Buck WMA	--	--	--	9	13-16	1.56

[a] - only Black-capped Vireo young considered.
[b] - median value or median value minus 0.5 of pairs and vireo young produced used to calculate young/pair.
[c] - five young produced from nests where cowbird eggs were removed; one cowbird was also fledged.

TABLE 9. Summary of parasitism by Brown-headed Cowbirds of Black-capped Vireo nestings in Texas and Oklahoma from 1983 through 1990 for samples with and without cowbird trapping.

Site(s)		1986 W/out	1986 With	1987 W/out	1987 With	1988 W/out	1988 With	1989 W/out	1989 With	1990 W/out	1990 With	1983-1989 combined W/out	1983-1989 combined With
	sample size	50	32	34	63	42	78	17	80	14	139	399	395
All	no. paras.	40	18	19	22	32	21	7	13	7	18	138	97
sites	% paras.	80%	56%	56%	35%	76%	27%	41%	16%	50%	15%	69%	25%
	sample size	13	4	19	27	16	41	17	33	12	58	80	166
Oklah.	no. paras.	12	2	11	13	13	10	7	11	6	7	52	43
	% paras.	92%	50%	58%	48%	81%	24%	41%	33%	50%	12%	65%	26%
	sample size	37	28	15	36	26	37	-[a]	47	2	61	119	229
Texas	no. paras.	28	16	8	9	19	11	-	2	1	11	86	54
	% paras.	76%	57%	53%	25%	73%	30%	-	4%	50%	18%	72%	24%
	sample size	-	24	-	14	-	14	-	11	-	3	19	83
Raven.	no. paras.	-	14	-	3	-	9	-	1	-	0	17	31
Ranch	% paras.	-	58%	-	21%	-	64%	-	9%	-	0%	89%	37%
	sample size	33	-	6	22	10	23	30	36	27	53	69	137
Kerr	no. paras.	27	-	4	6	9	2	15[a]	1	7[a]	11	53	21
WMA	% paras.	82%	-	66%	27%	90%	9%	50%	3%	26%	21%	77%	15%
Other	sample size	4	4	9	-	16	-	-	-	2	5	31	9
Texas	no. paras.	1	2	4	-	10	-	-	-	1	0	16	2
sites[b]	% paras.	25%	50%	44%	-	63%	-	-	-	50%	0%	52%	22%

[a] - under conditions with some cowbird trapping; thus not included with other sample of all sites during 1989 or 1990.

[b] - Lost Maples SNA, Bandera County; South Fork Ranch, Kerr County; and Walter Buck WMA, Kimble County.

TABLE 10. Results of cowbird trapping in the Rock and Buck pastures of the Kerr Wildlife Management Area, Kerr County, Texas during 1990.

	Rock Pasture									Buck Pasture		
	Trap 1			Trap 2			Trap 3					
Trapping began	21 April			22 April			23 April			26 April		
Trapping ended	12 July			12 July			12 July			12 July		
Days operational	82			81			80			77		
	Brown-headed Cowbirds captured											
Dates	M[a]	F	Y	M	F	Y	M	F	Y	M	F	Y
22 - 28 Apr	1	5	0	0	0	0	2	2	0	-	-	-
29 Apr - 5 May	7	4	0	-1	1	0	9	4	0	0	0	0
6 - 12 May	1	2	0	0	0	0	4	4	0	1	0	0
13 - 19 May	0	-1	0	0	1	0	3	1	0	-1	-2	0
20 - 26 May	2	-1	0	-3	-2	0	4	0	0	0	-1	0
27 May - 2 Jun	-1	0	1	1	0	0	5	1	0	-1	0	0
3 - 9 Jun	8	1	-1	2	1	1	3	0	0	0	0	0
10 - 16 Jun	4	1	5	-3	-2	0	7	-1	0	5	0	0
17 - 23 Jun	-3	0	9	1	0	1	2	0	0	2	-1	1
24 - 30 Jun	3	2	4	-5	0	5[b]	-1	0	1	-1	0	0
1 - 7 Jul	3	4[b]	1	3	2	4	0	-1	0	0	1	2
8 - 14 Jul	0	2	8[b]	-1[b]	-1	4	0	0	2	2	1	1
TOTALS	25	19[b]	27	-6[b]	0	15[b]	38	10	3	7	-2	4
Totals by trap	71			9			51			9		
Cowbirds/day	0.87			0.11			0.64			0.12		
Totals	294[c] cowbirds (3.59/day)[d]											

[a] - M=male; F=female; Y=young of year.
[b] - an additional Bronzed Cowbird (Molothrus aeneus) captured.
[c] - includes 131 cowbirds captured in mobile trap while in E. Turkey and S. Rock pastures; see Table 10.
[d] - base number of days used in the division is the number representing the time (in days) from the earliest starting day to the latest ending day for the area traps being combined.

TABLE 12. Initial capture rates of cowbird traps at the Kerr WMA in areas near or away from encroachment by cattle.

	Away from Cattle		Near Cattle			
Trap location and number	Buck	Rock	Rock1	Rock2	Rock3	Mobile
1985						
Initial period (days)	14					
cowbirds captured	10					
Total/day	0.71					
males/day	0.50					
females/day	0.21					
1986						
Initial period (days)	14					
cowbirds captured	26					
Total/day	1.86					
males/day	1.57					
females/day	0.29					
1987						
Initial period (days)		11				
cowbirds captured		40				
Total/day		3.64				
males/day		2.00				
females/day		1.64				
1988						
Initial period (days)			21	22	20	
cowbirds captured			75	170	53	
Total/day			3.75	7.73	2.65	
males/day			1.38	2.95	1.00	
females/day			2.19	4.77	1.90	
1989						
Initial period (days)	16		9	8	9	9
cowbirds captured	17		12	12	21	46
Total/day	1.06		1.33	1.50	2.33	5.11
males/day	1.13		1.11	1.00	1.33	3.33
females/day	-0.06		0.22	0.50	1.00	1.77
1990						
Initial period (days)	9		14	13	12	21
cowbirds captured	1		17	0	17	163
Total/day	0.11		1.21	0	1.42	7.76
males/day	0.11		0.57	0	0.75	4.09
females/day	0		0.64	0	0.50	3.67