Volume 24 1996 Number 3

THE NEW MEXICO ORNITHOLOGICAL SOCIEIY, INC.
P.O. Box 3068, Albuquerque, NM 87190-3068

OFFICERS FOR 1996-98

President: James Travis, 9420 Avenida de la Luna NE, Albuquerque, NM 87111; 821-0517
Vice-President: Bill Howe, Post Office Box 461, Albuquerque, New Mexico 87103; 899-3042
Secretary: Bill Willard, 3005 La Mancha NW, Albuquerque, New Mexico 87104; 246-9429
Treasurer: Jerry Oldenettel, 3904 Anderson SE, Albuquerque, New Mexico 87108; 255-9282
Director: Nancy Cox, 4426 San Isidro NW, Albuquerque, New Mexico 87107; 345-2385
Director: Mary Alice Root, 1108 Columbia Drive NE, Albuquerque, New Mexico 87106; 266-0561
Director: Rustay, Christopher, 221 1/2 Spruce Street, Santa Fe, NM 87501

Appointees: James Karo, Burt Lewis, and Jackie McConachie

Editors: FIELD NOTES: William H. Howe, Patricia R. Snider, and Sartor O. Williams III

Editors: NMOS BULLETIN: Mary Alice Root and Paul Steel

BIRD SPECIES DETECTION ON TRANSECTS IN LINEAR RIPARIAN HABITATS OF RIO GRANDE VALLEY AGRICULTURAL DRAINAGE CHANNELS

RAYMOND A. MEYER[1] AND BRUCE C. THOMPSON[2] [1]Department of Fishery and Wildlife Sciences and [2]U.S. National Biological Service [1,2]New Mexico Cooperative Fish and Wildlife Research Unit, New Mexico State University, P.O. Box 30003 Dept. 4901, Las Cruces, New Mexico 88003

Species composition and richness of avian communities are estimated to compile inventories, assess habitat use, compare relative habitat value (Conine et al. 1978, Verner 1985, Hanowski et al. 1990), and explore questions in biogeography (Connor and McCoy 1979, MacArthur and Wilson 1967, Simberloff 1974). Researchers must consider sample size and survey site dimensions to detect species accurately with reasonable survey effort (Morrison 1988, Buckland et al. 1993). Efficiency and effectiveness in detecting species have been studied with attention focused on effort, sample size, and repetitions necessary to estimate populations accurately (Anderson and Ohmart 1981, Dawson 1981, Verner and Ritter 1985, Gaud et al. 1986).

Strategic rather than arbitrary lengths of transects for detecting species should be considered in evaluating avian community composition and species richness. Influence of transect length has been investigated regarding estimation of bird density and richness (Engel-Wilson et al. 1981, Gates 1981) and comparison of avian communities in altered versus unaltered habitats (Connor and Dickson 1980, Hanowski et al. 1990). Sampling transects of insufficient length may bias results and conclusions (Wiens 1981). Conversely, transects surveyed beyond a certain length may provide little additional information and thus unnecessarily inflate research costs. We investigated the relationship between transect length and cumulative species detection in linear riparian habitat during breeding and migration seasons to explore potential research implications.

STUDY AREA

We selected study sites in the Rio Grande floodplain in Dona Ana County, southern New Mexico. Intensively used agricultural land dominates the landscape in this portion of the valley. Drainage channels (drains) and irrigation canals form riparian networks throughout the floodplain and are used by various types of birds, especially in relatively undisturbed areas. Rink and Ohmart (1984) found bird species richness in drainage channels adjacent to riparian woodlands was comparable to natural waterways habitat of central New Mexico.

Agricultural waterways and associated vegetation form narrow corridors approximately 15-40 m wide. Typically, vegetated borders are sharply defined by adjacent two-track pathways the length of the channels. Most pathways are not heavily traveled by vehicle. Vegetation structure in these areas can be relatively complex with trees growing to $\geq$ 10 m and a dense shrub understory. Drainage channels are dominated by coyote willow *(Salix exigua),* Siberian elm *(Ulmus pumila),* salt cedar *(Tamarix chinensis),* mesquite *(Prosopis* spp), four-wing saltbush *(Atriplex canescens),* wolfberry *(Lycium pallidum),* seep willow *(Baccharis* spp.), and other plants associated with wetland habitats in this region (Minckley and Brown 1982, Dick-Peddie 1993). Native cottonwoods *(Populus fremontii)* are scattered along the channel system. Homogeneity of vegetation varies. Portions of drainage systems are almost exclusively composed of coyote willow and seep willow while vegetation elsewhere consists of scattered salt cedar with saltbush, wolfberry, and arrowweed *(Tessaria sericea).* Channels are periodically dredged to promote water flow, thus setting back succession of vegetation. Agricultural crop fields, pecan orchards, scattered residences, or combinations of these features surround most drains.

METHODS

We established a 1,500-m transect at each of five locations randomly selected from a set of 33 potential agricultural drainage channels. Transects were measured and marked every 100 m on one of the adjacent pathways depending on which side provided better visibility. The strip (fixed width) transect technique (Seber 1982) was used for sampling because habitat was linear and narrow.

During the breeding season (22 May-28 July 1993); four transects were sampled three times and one was sampled twice. Each transect was surveyed once during fall migration (8-19 September 1993). All sampling began at least 30 minutes after sunrise and was completed before 0930 MDT. During each survey one observer slowly walked the transect and recorded all detections of birds (visual and auditory) in each 100 m interval. Only birds directly using the habitat were recorded; birds flying through or over the drains in transit were not included. Differences in cumulative species detection among transects were assessed with the Kolmogorov-Smirnov goodness of fit test (Zar 1984).

RESULTS AND DISCUSSION

We detected 52 bird species in drainage channel habitat during the breeding season. These species are 80% of the 65 species detected during all 1993 sampling in the Rio Grande corridor of Dona Ana County and believed to breed there (Meyer 1995). Ten species were encountered on all transects; four of these species (Black-chinned Hummingbird *Archilochus alexandri,* Barn Swallow *Hirundo rustica,* Blue Grosbeak *Guiraca caerulea,* and Red-winged Blackbird *Agelaius phoeniceus)* were detected during all surveys. Twenty-one species were detected on some surveys of 2-4 transects. Twenty-one species were detected only on one transect. Sixteen of these species were detected on just one survey. Birds not expected to occur in this habitat (e.g., Killdeer *Charadrius vociferus* and Western Meadowlark *Sturnella neglecta),* or during the breeding season in the area (e.g., White-throated Swift *Aeronautes saxatalis* and Orange-crowned Warbler *Vermivora celata),* accounted for more than half of the rare detections (species detected during one survey only).

Mean number of species detected during the breeding season varied among transects, with the greatest difference being 9.7 between transects 3 and 5 (Table 1). Cumulative species counts on individual transects (Table 1) represented 36.5-69.2% of 52 species detected among all transects. Ten species were found only on surveys of transect 5. Transects 1 and 2 yielded four unique species while surveys of transects 3 and 4 detected two and one unique species, respectively.

Table 1. Number of species detected during 3 breeding season surveys on five transects in Rio Grande Valley, New Mexico in 1993.

Table 1. Number of species detected during 3 breeding season surveys on five transects in Rio Grande Valley, New Mexico in 1993.

	No. species per survey[a]				
Transect	1	2	3	Mean	Total Species
1	18	14(2)	-	16.0	20
2	20	20(6)	18(2)	19.3	28
3	13	14(5)	13(4)	13.3	22
4	18	16(3)	12(1)	15.3	22
5	27	25(6)	17(3)	23.0	36
Mean	19.2	17.8(4.4)	15(2.5)	17.4	25.6

[a] Numbers in parentheses indicate previously undetected species.

Within season variation of detectability and habitat use of birds is well recognized (Morrison 1988, various authors in Ralph and Scott 1981). Surveys of the same drainage channel at various times during the breeding season yielded varied species detections (Table 1). Number of species found on transect 3 differed by only one on surveys while the first and third surveys of transect 5 differed by 10 species. Excluding species detected one time on one transect, an average of 81 % of species detected for each transect was recorded on the first survey. Second and third surveys averaged 4.4 and 2.5 new species, respectively, per transect but only 3.4 and 1.4 if rare detections were not considered. Our sampling period spanned more than two months allowing for potential variation in species presence.

Despite variation in number of species detected, especially between transects, cumulative species detection curves for the breeding season were similar among transects (Fig. 1). Species accumulation curves began to

level off after the first 4-7 segments. Surveys in the fall showed rapid species accumulation in the first 600 m of transects and a more moderate rate in the remaining intervals (Fig. 2). However, there was no difference in distribution of mean species accumulation between fall and first surveys in the breeding season (D=0.112, n=15, P>0.20) or between fall and all breeding season surveys (D=0.102, n=15, P>0.20).

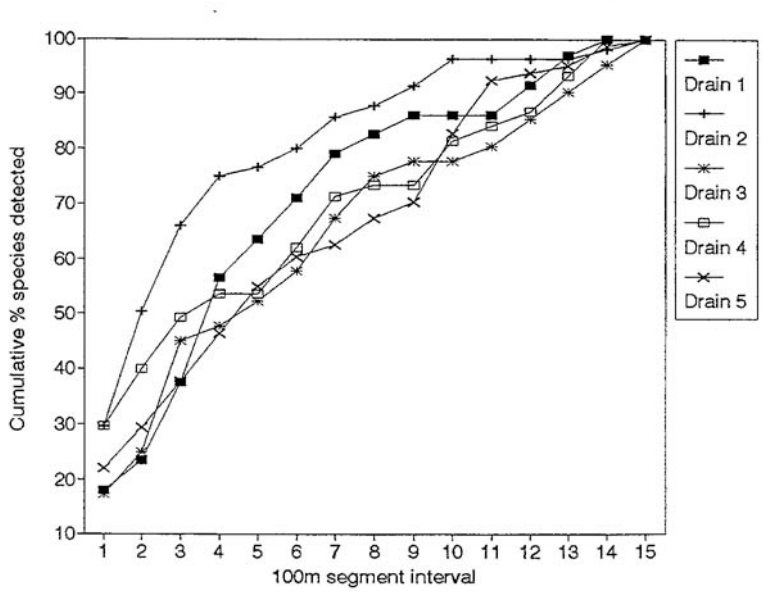


Figure 1. Cumulative percent of the mean number of bird species detected in 100 m intervals for five riparian transects surveyed during the 1993 breeding season in the Rio Grande Valley in southern New Mexico.

Variation in numbers and composition of species detected among transects and surveys was possibly due to several factors. Despite the fact that we surveyed narrow strips of habitat, detectability may have varied among species as reported by others (Yui 1977, discussion of K. Franzreb in Ralph and Scott 1981:164-169). Species such as Greater Roadrunner *(Geococcyx californianus)* and Common Moorhen *(Gallinula chloropus)* were difficult to detect in areas of dense vegetation. Also, our observations indicated that some species (e.g., Yellow-billed Cuckoo *Coccyzus americanus* and Summer Tanager *Piranga rubra)* were using drainage channel habitat for foraging and perching, thus making detection more variable than in habitat where breeding territories were maintained. Physical features of drainage channels, such as habitat width, appeared to influence species presence as reported by Stauffer and Best (1980). Conine et al. (1978) found relationships of species richness in agricultural lands with field type and proximity of other habitats.

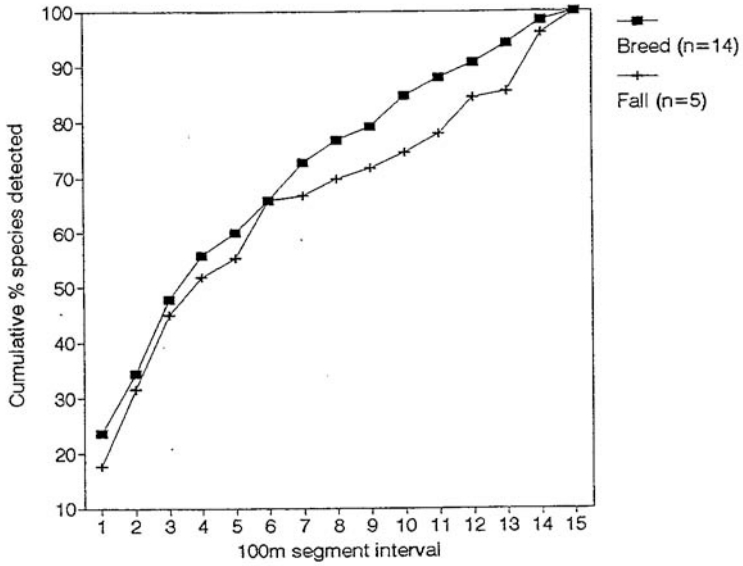


Figure 2. Cumulative percent of the mean number of bird species detected in 100 m intervals for riparian transects during the 1993 breeding and fall migration seasons in the Rio Grande Valley in southern New Mexico.

Presence of certain land types appeared to increase the species we detected in drainage channel habitat For example, transect 5 which was between the Rio Grande and an older pecan orchard had highest species richness and mean number of species detected per survey. Variability in vegetation along transects probably affected composition of the avian communities.

In a hypothetical situation where objectives require 80% species detection in linear riparian habitat, our results indicate that 1,000-m transects appeared to be sufficient. In fact, during the breeding season only 5 species of birds (9.6% of all detected) were added with the additional 500 m sampled (33% of total survey time) on each transect. Conversely, if finding rare species or compiling comprehensive species lists were necessary, transects may need to be ~ 1,500 m because detection of a few additional species was still occurring in the latter distance intervals.

Variation in number of species detected among transects was relatively high suggesting a lack of uniformity in the avian community associated with drains. Greater effectiveness in sampling species richness in habitat we surveyed could potentially be achieved by limiting transect length to approximately 1,000 m and directing the time savings to sampling a greater diversity of sites. Hanowski et al. (1990) reported similar conclusions regarding length versus number of transects to detect differences in populations of woodland birds. Repeating surveys of transects at least three times during the breeding season was productive in detecting new species (28% of total species detected in 2nd and 3rd surveys). In other situations and habitats the optimum design for sampling species composition will probably differ.

Our data indicate that length, number, and repetitions of transects should all be considered when designing studies focusing on species composition and richness of avian communities. These conclusions are consistent with transect sampling experiences summarized by Buckland et al. (1993). Limited pilot studies, strongly recommended by Buckland et al. (1993:295), of the type used in our study may prove useful in developing a strategic design and specific sampling intensity for accurate and efficient avian surveys in other riparian areas.

ACKNOWLEDGMENTS

This research was conducted in cooperation with the U.S. Fish and Wildlife Service, National Biological Survey, New Mexico Department of Game and Fish, and New Mexico State University. Financial support from the U.S. Fish and Wildlife Service made field work possible. K. (Milne) Granillo provided helpful comments during analyses and manuscript review. We thank Elephant Butte Irrigation District staff, especially M. Riley, for sample site access and map services. F.G. Cooch, C.A. Davis, and P.J. Zwank provided helpful comments on an earlier draft.

LITERATURE CITED

Anderson, B. W., and R. D. Ohmart. 1981. Comparisons of avian census results using variable distance transect and variable circular plot techniques. Pages 186-192 *in* C. J. Ralph and J. M. Scott, eds. Estimating numbers of terrestrial birds. Studies in Avian Biology. No.6. Cooper Ornith. Soc., Allen Press, Inc., Lawrence, Kansas.

Buckland, S.T., D. R. Anderson, K. P. Burnham, and J. L. Laake. 1993 Distance sampling: estimating abundance of biological populations. Chapman & Hall, London, UK. 446 pp.

Conine, K. H., B. W. Anderson, R. D. Ohmart, and J. F. Drake. 1978. Responses of riparian species to agricultural habitat conversions. Pages 248-262 *in* Strategies for protection and management of floodplain wetlands and other riparian ecosystems. Gen. Tech. Rep. WO-12. U. S. Dep. Agric. For. Ser., Washington D. C.

Connor, E. F., and E. D. McCoy. 1979. The statistics and biology of the species area relationship. Am. Nat. 113: 791-873.

Connor, R. N., and J. G. Dickson. 1980. Strip transect sampling and analysis for avian habitat studies. Wildl. Soc. Bull. 8:4-10.

Dawson, D. G. 1981. Experimental design when counting birds. Pages 392-398 *in* C. J. Ralph and J. M. Scott, eds. Estimating numbers of terrestrial birds. Studies in Avian Biology. No.6. Cooper Ornith. Soc., Allen Press, Inc., Lawrence, Kansas.

Dick-Peddie, W. A. 1993. New Mexico vegetation past, present, and future. Univ. of New Mexico Press, Albuquerque. 244 pp.

Engel-Wilson, R. W., A. K. Webb, K. V. Rosenberg, R. D. Ohmart, and B. W. Anderson. 1981. Avian censusing with the strip method: a computer simulation. Pages 445-449 *in* C. J. Ralph and J. M. Scott. eds. Estimating numbers of terrestrial birds. Cooper Ornith. Soc., Studies in Avian Biology No.6.

Gates, C. E. 1981. Optimizing sampling frequency and numbers of transects and stations. Pages 399-404, *in* C. J. Ralph and J. M. Scott, eds. Estimating numbers of terrestrial birds. Cooper Ornith. Soc., Studies in Avian Biology. No.6.

Gaud, W. S., R. P. Balda, and J. D. Brown. 1986. The dilemma of plots or years. Pages 223-227 *in* J. Verner, M. L. Morrison, and C. J. Ralph, eds. Wildlife 2000. Modeling habitat relationships of terrestrial vertebrates. Univ. of Wisconsin Press, Madison.

Hanowski, J. M., G. J. Niemi, and J. G. Blake. 1990. Statistical perspectives and experimental design when counting birds on line transects. Condor 92:326-335.

Hink, V. C., and R. D. Ohmart. 1984. Middle Rio Grande biological survey. Center for Environmental Studies, Arizona State University, Tempe. 226 pp.

MacArthur, R. H., and E. O. Wilson. 1967. The theory of island biogeography. Princeton Univ., Princeton, New Jersey.

Meyer, R. A. 1995. The avian community of an agricultural environment in the Rio Grande Valley of southern New Mexico. M.S. Thesis, New Mexico State Univ., Las Cruces. 100 pp.

Minckley, W. L., and D. E. Brown. 1982. Wetlands. Desert Plants 4:223-287.

Morrison, M. L. 1988. On sample sizes and reliable information. Condor 90:275-278.

Ralph, C. J., and J. M. Scott. 1981. Estimating numbers of terrestrial birds. Cooper Ornith. Soc., Studies in Avian Biology. No.6. 630 pp.

Seber, G. A. 1982. The estimation of animal abundances. Macmillan Publishing Co., Inc., New York. 654 pp.

Simberloff, D. S. 1974. Equilibrium theory of island biogeography and ecology. Ann. Rev. Ecol. Syst. 5:161-182.

Stauffer, D. F., and L. B. Best. 1980. Habitat selection by birds of riparian communities: evaluating effects of habitat alterations. J. Wildl. Manage. 44:1-15.

Verner, J. 1985. Assessment of counting techniques. Pages 247-302 in R.F. Johnston, ed. Current Ornithology. Vol. 2, Plenum Publishing, New York.

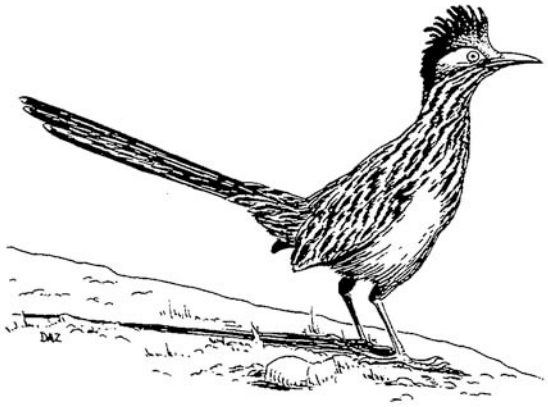
Verner, J., and L. V. Ritter. 1985. A comparison of transects and point counts in oak-pine woodlands of California. Condor 87:47-68.

Wiens, J. A. 1981. Scale problems in avian censusing. Pages 513-521 *in* C. J. Ralph and J. M. Scott, eds. Estimating numbers of terrestrial birds. Cooper Ornith. Soc., Studies in Avian Biology. No.6.

Yui, M. 1977. The census method of woodland bird populations during the breeding season. Pages 97-112 *in* M. Morisita, ed. Studies on methods of estimating population density, biomass and productivity in terrestrial animals. Japanese IBP Synthesis, Vol. 17, Univ. Tokyo Press, Japan.

Zar, J. H. 1984. Biostatistical analysis. Prentice-Hall Inc., Engelwood Cliffs, New Jersey. 718 pp.

Received 2 March 1996



Greater Roadrunner

NOTES, NOTICES, AND INFORMATION

I. A note from Dr. Robert W. Dickerman informs us that the ornithological library of his colleague, Dr. Telford Hindley Work (1921-1995), has been donated to the UNM Centennial Library of Science and Engineering by Dr. Work's wife, Dr. Martine Jozan-Work. Some 110 volumes are in the collection, each bearing a bookplate recognizing this gift.

Dr. Work's first publication was in Condor (44:149-159,1942), entitled "The nest life of the Turkey Vulture." He was a graduate of Stanford University, Stanford Medical School, and served in the US Navy during World War II. His first assignment was in San Francisco where he was able in his free time to photograph and study the 40-some free-living California Condors in the Sespe Mountains. His films are of unique historical interest.

Following the war, and after studying tropical medicine and public health, he joined the Rockefeller Foundation to set up a program to study mosquito transmitted viruses (Arboviruses). In 1962 he was appointed the head of the Virology Section of the Center for Disease Control (CDC). He recognized the role of birds in the ecology, distribution, and dispersal of several human diseases caused by arboviruses. His research travels stimulated an interest in raptors, especially of the Near and Far East.

The ornithological community of New Mexico will be able appreciate this thoughtful gift. It is hoped that a list of the volumes can be published in a future NMOS Bulletin.

II. In the December 1995 issue of the newsletter of The Biological Society of New Mexico an article by Dr. John Hubbard tells us that the bird collection of the UNM Museum of Southwestern Biology has received a historical collection of 78 skins of New Mexico birds collected by Frank Stephens in 1875-76. Dr. Robert W. Dickerman was able to arrange a trade with the San Diego Natural History Museum using surplus material from the Amadeo Rea collection, which the museum received recently through the efforts of Dr. Dickerman. These specimens provide verifiable and tangible evidence of the occurrence of these birds at given times and places, and can be used for research purposes. Candidates for DNA and other analyses are specimens of Yellow-billed Cuckoo, Buff-breasted Flycatcher, Gray and Bell's vireos, and McCown's Longspur.