known distances from each point should not require any more effort than setting up a SMM grid.

The VCPM has the same advantage over the SMM as Emlen's (1971) line transect method, that of being applicable for year-round studies. It has the added advantage of eliminating the bias involved in estimating the sighting angles needed for line transect density estimates (Burnham et al., Wildl. Monogr. 72:2–202, 1980). Moreover, the VCPM combines the usefulness of point counts in small habitats while defining the area censused.

We thank Bertin Anderson, Rudy King, Ralph Raitt, Richard Reynolds, Jared Verner, and Robert Whitmore for comments on this note.—ROBERT C. SZARO AND MARTIN D. JAKLE, *U.S.D.A. Forest Service, Rocky Mountain Forest and Range Experiment Station. Arizona State Univ., Tempe, Arizona 85287.* *Accepted 16 June 1982.*

*Wilson Bull.*, 94(4), 1982, pp. 550–554

**Use of prairie wetlands by selected bird species in South Dakota.**—Most studies of prairie wetlands have concentrated on waterfowl; however, wetland habitat in the prairies is also important to other kinds of birds. Our purpose is to report use of natural and man-made wetlands by 13 selected bird species other than waterfowl to provide information useful for management of these wetland birds, as well as for management of prairie wetlands. Quantification of the use of wetlands by all avian species will allow managers a more comprehensive view of the importance of such areas.

*Study area and methods.*—We surveyed sample wetlands within 476 legal quarter-sections (0.65 $km^2$) chosen by a combination of stratified random and two-stage cluster sampling (Steel and Torrie, Principles and Procedures of Statistics, McGraw-Hill Co., Inc., New York, New York, 1960). Study plots and wetlands were representative of South Dakota, exclusive of the Black Hills region. A detailed description of the study area and sampling scheme was presented in Brewster et al. (J. Wildl. Manage. 40:50–59, 1976).

Wetland birds were censused from 12–24 May and 10–21 June 1975 and from 10–23 May and 7–12 June 1976. Censuses were conducted by three two-person teams equipped with binoculars and waders. Counts were made from 30 min after sunrise until 30 min before sunset.

Selection of target species for inclusion in the study was based on anticipated abundance of a species on the study areas and the ease with which species could be observed and censused. Species selected for study included Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*), Red-winged Blackbird (*Agelaius phoeniceus*), Lesser Yellowlegs (*Tringa flavipes*), Marbled Godwit (*Limosa fedoa*), Willet (*Catoptrophorus semipalmatus*), American Avocet (*Recurvirostra americana*), American Bittern (*Botaurus lentiginosus*), Black Tern (*Chlidonias niger*), Great Blue Heron (*Ardea herodias*), Black-crowned Night-Heron (*Nycticorax nycticorax*), Green-backed Heron (*Butorides striatus*), Wilson's Phalarope (*Phalaropus tricolor*), and Sora (*Porzana carolina*).

The total number of individuals seen of each species was recorded for each wetland visited. Only territorial male Yellow-headed and Red-winged blackbirds were counted because of the inconspicuousness of the females of these species. Of the target species, the Sora was the most difficult to census. Based on densities of Soras observed in other studies (Pospichal and Marshall, Flicker 26:2–32, 1954; Griese et al., Wilson Bull. 92:96–102, 1980), we believe our counts recorded only a small percentage of those present. Use of taped calls to census rails was not feasible due to the extensive area covered in our survey, the necessity of simultaneously censusing waterfowl, and limited manpower.

Natural wetlands were classified using the method of Stewart and Kantrud (U.S. Fish Wildl. Serv. Resour. Publ. 92:1–57, 1971). Fluviatile wetlands were categorized as intermittent or permanent streams. Intermittent streams were defined as stream channels with intermittent pools of water but without continuous flowing water during censusing. Man-made wetlands were classified as stock ponds (ponds formed by construction of earthen dams across natural waterways), and dugouts (excavated ponds about 0.1 ha in size). Wetlands with tilled soil bottoms or wetlands in pastures and without aquatic vegetation were classified as tillage and pasture ponds, respectively. In the absence of tillage or grazing, most such wetlands would have been classed as ephemeral or temporary ponds.

*Results and discussion.*—Glacial ponds and fluviatile wetlands constituted 49% of the wetlands surveyed (excluding dry basins) and 67% of the total surface water area. Man-made wetlands represented 47% of the wetlands surveyed and 25% of the total surface water area. Stock ponds and dugouts were the predominant man-made wetlands encountered in the survey.

Each of the target species occurred most frequently on one of the natural wetland types. Five target species were most frequently recorded on semipermanent ponds, three on permanent streams, two each on temporary ponds and ephemeral ponds, and one on seasonal ponds (Table 1). Overall, 78% of the semipermanent ponds surveyed had one or more of the target species present, the highest count of all wetland types surveyed (Table 2). Red-winged and Yellow-headed blackbirds, Soras, American Bitterns, and Black Terns all had their highest frequency of occurrence on semipermanent ponds. In northern Iowa, greatest density and diversity of marsh birds were associated with an interspersion of half emergent vegetation and half open water on marshes (Weller and Fredrickson, Living Bird 12:269–291, 1973). Among the wetland types we observed, semipermanent wetlands best exemplified the combination of open water and emergent vegetation described by Weller and Fredrickson (1973).

One or more of the target species occurred on 65% of the permanent streams and on 61% of the intermittent streams (Table 2). The Black Tern was the only species not observed on either permanent or intermittent streams. Great Blue, Black-crowned Night, and Green-backed herons occurred most frequently on permanent streams. Frequencies of Great Blue Herons on permanent streams greatly exceeded those on intermittent streams. Black-crowned Night-Herons were not found on intermittent streams. Yellow-headed Blackbirds, Wilson's Phalaropes, Marbled Godwits, and Willets were recorded on intermittent streams but not on permanent streams. Wilson's Phalaropes have been observed along the Big Sioux River, a permanent stream, during spring flooding in April.

With the exception of Great Blue and Green-backed herons all of the target species observed on semipermanent ponds also occurred on seasonal ponds (Table 1). Wilson's Phalaropes occurred most frequently on seasonal ponds. The frequency of Sora and Yellow-headed Blackbird occurrence on these ponds was exceeded only by that on semipermanent ponds.

All of the target species, with the exception of Green-backed Herons, used stock ponds (Table 1); and nearly half of the stock ponds had one or more target species present (Table 2). Marbled Godwit, Wilson's Phalarope, Black Tern, and Great Blue Heron frequencies on stock ponds were second only to one other wetland type. With the exception of the Green-backed Heron, all target species observed on semipermanent ponds were also observed on stock ponds. Habitat variation was minimal because stock ponds were generally deeper than natural wetlands, and emergent vegetation was either limited to littoral zones or absent. Some silted-in stock ponds with extensive shallow water (<1 m in depth) combined areas of emergent vegetation interspersed with open water as was characteristic of many semipermanent ponds.

TABLE 1

FREQUENCY OF OCCURRENCE[a] BY WETLAND CLASSIFICATION OF SELECTED BIRD SPECIES RECORDED DURING MAY AND JUNE SURVEYS IN SOUTH DAKOTA, 1975–1976

| Species | Wetland class[b] and no. wetlands sampled | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Semi-permanent ponds (256) | Stock ponds (378) | Intermittent streams (334) | Seasonal ponds (266) | Dugouts (452) | Permanent streams (91) | Temporary ponds (73) | Tillage and pasture ponds (91) | Ephemeral ponds (20) |
| Red-winged Blackbird | 74.2 | 38.9 | 59.3 | 51.9 | 19.9 | 52.7 | 37.0 | 6.6 | — |
| Yellow-headed Blackbird | 37.5 | 5.6 | 2.4 | 6.8 | 0.7 | — | 2.7 | 1.1 | — |
| Wilson's Phalarope | 7.4 | 8.7 | 3.0 | 9.8 | 1.8 | — | 8.2 | 2.2 | 5.0 |
| Lesser Yellowlegs | 1.6 | 2.1 | 0.9 | 1.9 | 0.9 | 2.2 | 2.7 | — | — |
| Marbled Godwit | 2.3 | 2.4 | 1.5 | 1.5 | 1.5 | — | 4.1 | 1.1 | — |
| Willet | 4.7 | 2.6 | 1.2 | 3.4 | 1.1 | — | 4.1 | — | 5.0 |
| Sora | 5.5 | 0.8 | 2.1 | 3.4 | 0.2 | 2.2 | — | — | — |
| American Bittern | 6.3 | 0.5 | 1.2 | 0.8 | 0.2 | 1.1 | — | — | — |
| American Avocet | — | 0.8 | 0.3 | 0.4 | 0.2 | 1.1 | 1.4 | 6.6 | 10.0 |
| Black Tern | 6.3 | 3.2 | — | 1.1 | 0.2 | — | — | — | — |
| Great Blue Heron | 1.2 | 2.1 | 0.3 | — | — | 12.1 | — | — | — |
| Black-crowned Night-Heron | 1.2 | 0.8 | — | 0.4 | — | 3.3 | — | — | — |
| Green-backed Heron | 0.4 | — | 0.3 | — | — | 5.5 | — | — | — |

[a] Percentage of the total number of wet basins surveyed in each wetland class with a particular bird species present.
[b] Definition of glacial pond types according to Stewart and Kantrud (1971).

TABLE 2
PERCENTILE DISTRIBUTION OF EACH WETLAND CATEGORY BASED ON NUMBERS OF WETLAND BIRD SPECIES (TARGET SPECIES) RECORDED

| | Wetland categories | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Number of species recorded | Stock ponds (378)[a] | Semi-permanent ponds (256) | Seasonal ponds (266) | Inter-mittent streams (334) | Permanent streams (91) | Temporary ponds (73) | Dugouts (452) | Ephemeral ponds (20) | Tillage and pasture ponds (91) |
| 1 | 29.1[b] | 31.3 | 36.5 | 51.2 | 42.9 | 30.1 | 23.2 | 10.0 | 13.2 |
| 2 | 12.7 | 25.0 | 13.5 | 6.6 | 16.5 | 6.8 | 2.2 | 15.0 | 2.2 |
| 3 | 2.6 | 14.1 | 3.4 | 1.8 | 4.4 | 6.8 | 0.4 | — | — |
| 4 | 1.1 | 6.3 | 1.5 | 0.6 | 1.1 | — | — | — | — |
| 5 | 0.8 | 1.2 | 0.4 | 0.6 | — | — | — | — | — |
| 6 | 0.8 | — | — | — | — | — | — | — | — |
| 7 | — | — | — | — | — | — | — | — | — |
| 8 | — | — | — | — | — | — | — | — | — |
| 9 | — | — | — | — | — | — | — | — | — |
| 10 | 0.3 | — | — | — | — | — | — | — | — |
| Total | 47.4 | 77.9 | 54.8 | 60.8 | 64.9 | 43.7 | 25.8 | 25.0 | 15.4 |

[a] The total number of wet basins surveyed in each category.
[b] The percentage of the total number of wet basins.

Only 26% of the dugouts had one or more target species present. However, all of the target species with the exception of the three heron species occurred on dugouts. We observed some Great Blue Heron use of dugouts outside of the study plots. The small size ($\bar{x}$ = 0.10 ha), depth ($\bar{x} < 2$ m), and steep shoreline slope of most dugouts precluded extensive growth of emergent vegetation. Also, many dugouts were completely devoid of emergent vegetation due to intensive use by cattle. Steep shoreline slopes may discourage use by wading birds.

Temporary and ephemeral ponds persisted only a short time following cessation of snowmelt and spring rains. This fact, coupled with the drought conditions that prevailed during the study, reduced the availability of these wetland types. Under more typical conditions, however, the periodic drying and flooding regime of such ponds favors high populations of aquatic invertebrates (Krapu, Auk 91:278–290, 1974) which may account for the peak frequency of occurrence of Lesser Yellowlegs and Marbled Godwit on temporary ponds and of Willet and American Avocet on ephemeral ponds.

Tillage and pasture ponds were typically small in size with little or no emergent vegetation and were the least likely of all wetland types to have a target species present (Table 2). However, the frequency of occurrence of American Avocet on tillage and pasture ponds was only exceeded by its occurrence on ephemeral ponds (Table 1). Disturbance of shallow wetlands by intensive grazing or tillage appears to discourage use by most wetland birds.

*Implications.*—The diversity of wetland types in the northern great plains is important to a variety of avian species other than waterfowl. Considerable loss of glacial wetlands has occurred in the northern prairies due to drainage (National Academy of Sciences, Special Problems of Waters and Watersheds, pp. 149–180 *in* Land Use and Wildlife Resources, National Research Council, Washington, D.C., 1970) and drainage continues at a rapid pace. Shallow ephemeral and temporary wetlands are especially vulnerable to drainage. Drainage of shallow wetlands may affect not only breeding waterfowl (Krapu, Auk 91:278–290, 1974), but other avian species such as Lesser Yellowlegs, Marbled Godwit, Willet, and American Avocet. Other less abundant or difficult to census species not included in our study may be among those most severely affected by drainage. The widespread drainage of private wetlands, including semipermanent ponds and lakes, threatens habitat important to a variety of bird species that either migrate through or nest in the northern great plains.

*Acknowledgments.*—We thank Harold F. Duebbert and Raymond L. Linder for critically reviewing this manuscript and W. Lee Tucker for providing advice on sampling design. Financial support for this study was provided by the South Dakota Agricultural Experiment Station (Project H–615) and the South Dakota Water Resources Institute (Project A–038–SDAK and B–045–SDAK). This paper was approved for publication by the Director, Agricultural Experiment Station, South Dakota State University, as Journal Series No. 1748.—MICHAEL J. WEBER, *U.S. Forest Service, P.O. Box 194, Idabel, Oklahoma 74745*; PAUL A. VOHS, JR., *U.S. Fish and Wildlife Service, 18th and C Streets, N.W., Washington, D.C. 20240*; AND LESTER D. FLAKE, *Dept. Wildlife and Fisheries Sciences, P.O. Box 2207, South Dakota State Univ., Brookings, South Dakota 57007.**Accepted 15 Feb. 1982.*

*Wilson Bull.*, 94(4), 1982, pp. 554–555

**Sexing Saw-whet Owls by wing chord.**—Weir et al. (Wilson Bull. 92:475–488, 1980) present an analysis of the fall migration of Saw-whet Owls (*Aegolius acadicus*) at Prince Edward Point, Ontario. All owls with a wing chord ≤134 mm were designated males and all with wing chord ≥141 mm females. Those between 134 and 141 mm were classed as sex unknown (U). This method led to an unbelievable preponderance of identified males in the juvenile (HY) age class (Table 1). It seems grossly unlikely that juvenile males are extremely more abundant than females at Prince Edward Point because the sex ratio of identified adults (PHY) does not differ significantly from unity (Table 1). It is probable that the juveniles are not being sexed properly.

The sexing method is apparently based on the study of Earhart and Johnson (Condor 72: 251–264, 1970) who measured museum specimens and found a mean wing chord of 132.2 ± 3.83 mm for males and 139.2 ± 2.45 mm for females. The limits used by Weir et al. (1980) are approximately at the 95% confidence intervals from the means of Earhart and Johnson (1970) and thus should be a reasonable estimator of sex. However, Earhart and Johnson (1970) did not determine the age of their specimens and Mueller and Berger (Bird-Banding 38:120–125, 1967) have shown that juvenile Saw-whet Owls have significantly shorter wing chords ($\bar{x}$ = 136.5 mm) than adults ($\bar{x}$ = 138.5 mm). This age difference is 29% of the difference between means for the sexes given by Earhart and Johnson (1970) and 33% of the gap between sexes in the sexing method used by Weir et al. (1980). Mueller and Berger (Auk 85:431–436, 1968) have suggested that measurements of museum specimens may be shorter than those taken from live birds because of possible shrinkage in drying. Mueller et al. (Bird-Banding 47:310–318, 1976) have indicated that measurements probably vary with the method of measurement. Thus, it is not surprising that a further examination of the data of Mueller and Berger (1967), using the sexing method of Weir et al. (1980), yields a biased sex ratio for sexed adults but not for sexed juveniles (Table 1), the opposite of that found by Weir et al. (1980). A further caveat: an examination of the distribution of measurements used in Mueller and Berger (1967) reveals that an average difference of measurement of only 1 mm (0.8% of wing chord), due to slight, but reasonably consistent differences in measuring techniques, would change the sex identification of 11–14% of their sample from identified to unidentified or vice versa, but not from male to female. A 2-mm difference (1.5%) would similarly change the sex identification of 24–31%.