Vegetative characteristics of two water areas in Teton County, Montana, in relation to waterfowl usage by Richard R Knight

A THESIS Submitted to the Graduate Faculty in partial fulfillment Of the Requirements for the degree of Master of Science in Fish and Wildlife Management at Montana State College
Montana State University

Abstract:
During the summers of 1956 and 1959, information was gathered on the' vegetative characteristics and waterfowl usage of two water areas in Teton County, Montana. Maps of vegetative types were drawn and described. Data relating to occurrence of individual species were obtained from transects extending across the areas. The sum of occurrences for any plant was expressed as a percentage of the total of all occurrences.

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RICHARD R. KNIGHT

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Chairman, Examining Committee

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TABLE OF CONTENTS

ABSTRACT

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INTRODUCTION

Freezeout Lake in Teton County, Montana, is a natural sump supplied by waste water from adjacent irrigated farmland. For many years, this lake has furnished good duck hunting. From 1941 to 1952, due to unusual moisture conditions, the water area increased from 1,900 to 4,100 acres. Drainage of the area was proposed by local groups. Ellig (1955), in cooperation with the Montana Fish and Game Department, studied waterfowl relationships of the area in 1951 and 1952. In 1953, the Montana Fish and Game Department began to develope this region into a waterfowl management area. A drainage system was constructed and dikes with water control structures were planned to divide the area into several water units for management purposes.

In 1956, two water areas on the northern edge of the lake were chosen by the writer for study to determine vegetational characteristics and waterfowl usage. Information was gathered from June 15 to October 15, 1956, and from June 10 to September 24, 1959.

The writer wishes to express appreciation to the following: Dr. Don C. Quimby, for direction of the study and aid in preparation of the manuscript; Dr. W. E. Booth, for verification of plant identification; Mr. Gerald Salinas, for aid in planning the study and for assistance in the field; Mr. Robert Eastwood, Mr. Dale Witt and Mr. Robert Rothweiler, for assistance in the field; to my wife, Celia, for assistance in the field and aid in the processing of data. During the course of the investigation, the writer was employed by the Montana Fish and Game Department

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DESCRIPTION OF THE AREA

Freezeout Lake lies at the western edge of the Fairfield Bench. It occupies part of a glacial lake basin, surrounded by rolling uplands. The climate of this general area is semi-arid. Upland native vegetation is mainly grassland. Soils in the area are cloddy stratified silty clays and clays with subsoils impregnated with alkali (Geiseker, 1937).

Study Area No. 1 lies north of the main body of Freezeout Lake and is connected to it by a drainage canal 0.5 mile long and a seepage region. Ellig (op. cit.) described this area as it appeared in 1952, as a 400 acre cattail marsh. In 1953, rising water expanded this pond until it was directly connected to the main lake (Fig. 1). The rise in water levels was accompanied by elimination of much of the emergent vegetation. Drainage of Freezeout Lake, beginning in 1954, reduced the area to the size shown in figure 2 by 1956. Figure 3 shows Study Area No. 1 in 1952, supporting an extensive emergent growth. Figure 4 shows this area as it was in 1959, after drainage had reduced the area to its present size (about 296 acres) and without the extensive emergent vegetation present in 1952. This area is fed by three supply ditches entering the northern edge. All receive waste water from adjacent irrigated farmland. Maximum water depth found was 25 inches but most depths varied from six to 15 inches. Water fluctuations up to four inches were common.

Study Area No. 2 lies north of Freezeout Lake and west of Study Area No. 1. In 1952, this was a pond of about 40 acres separated from Freeze-

Fig. 1. Freezeout Lake area in 1953. The numerals 1 and 2 designate the locations of the respective study areas.

Fig. 2. Freezeout Lake area in 1959 with numerals indicating study areas. Dotted line indicates water level on Study Area No. 2 in 1956.

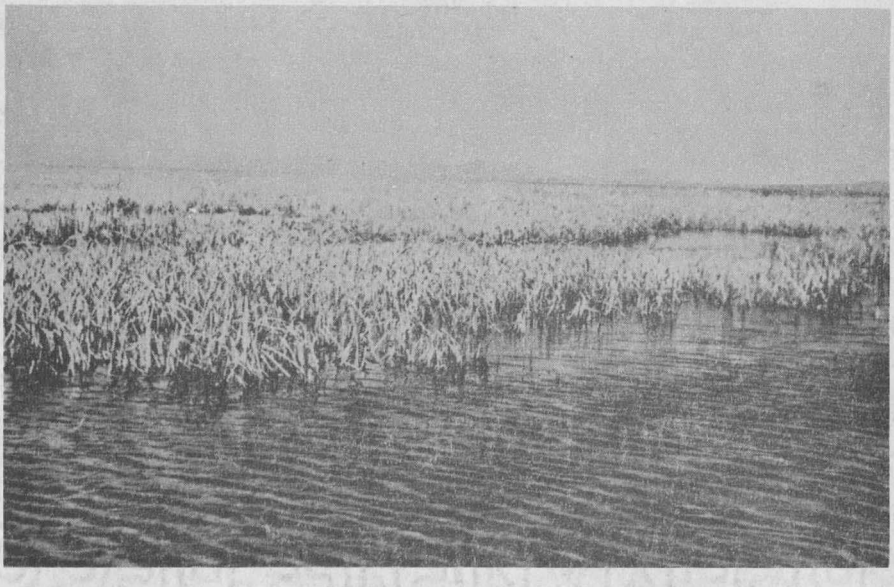

Fig. 3. Study Area No. 1 in 1952 showing extensive growth of Common Cattail (Typha latifolia).

Fig. 4. Study Area No. 1 in 1959 showing extensive open water. The dark line in the background is Great Bulrush (Scirpus validus).

out Lake by a strip of grassland approximately 0.2 of a mile wide. In 1953, this strip of grassland was flooded and Study Area No. 2 became part of Freezeout Lake (Fig. 1). By 1956, the water had receded, leaving the area approximately the same size as in 1952 but with a mud flat in place of the grassland strip. The dotted line in figure 2 indicates the approximate size and position of this area. In 1958, a dike was constructed between this pond and the main lake and small islands were built to attract nesting waterfowl. In the spring of 1959, the area inside the dike was flooded and had a surface area of 263 acres leaving a large island in addition to the artificial islands. In 1956, Study Area No. 2 was fed by two ditches: one entering from the north through a culvert under U. S. Highway 89 and one entering from the east. In 1959, all water came from a marsh area north of the highway through a culvert connecting the two areas. The maximum water depth was 14 inches in 1956 and 26 inches in 1959. Water depths throughout most of the pond varied from eight to 12 inches in 1956 and from 18 to 24 inches in 1959. Fluctuations up to six inches were common in 1959 only.

METHODS

Three methods were used to study vegetation. Cover maps were made from aerial photographs and verified in the field, pictures for comparative purposes were taken at photopoints and permanent transects extending across the study areas were established.

Steel fence posts were placed on opposite sides of the ponds on high ground to serve as end points for the transects. A 200-foot cable marked

at one foot intervals was moved between the two end points to aid the sampler. A rod with a 0.75 inch diameter wire loop at the bottom was lowered each foot along the entire length of the transect. Water depths were recorded to the nearest 0.5 inch. Anything touched by the loop was recorded as an "occurrence" of a plant or bare ground. The sum of occurrences for any plant was expressed as a percentage of the total of all occurrences. If more than one species of plant was touched, an occurrence was recorded for each of them. This method neither expressed results in amount of ground cover nor vigor of growth but it is believed to have shown vegetative composition by species. Six transects were used on Area No. 1 and two on Area No. 2. A total of 45,102 occurrences was recorded for both years.

Degrees of waterfowl usage was determined from the total number of waterfowl using the areas, the number of nests found and brood usage. In 1956, total waterfowl counts were made approximately once weekly from observation points on the ground. In 1959, poorer visibility caused by increased emergent vegetation made it necessary to make counts from an airplane. All nest searches were made between 8:00 and 10:00 A.M. Nest searches in 1956 were made by two men dragging a rope between them which had tin cans attached, similar to the method described by Sowls (1950). In 1959, nest searches were made by one man walking in zig-zag routes, spaced at 30 foot intervals. While using the latter method, hens flushed more readily if the searcher stopped for a moment every 20 or 30 feet. All broods observed in the course of normal daily activities on the area

were recorded.

DESCRIPTION OF VEGETATIVE TYPES

Distribution of vegetative types on Area One in 1956 and 1959 are shown in figures 5 and 6 respectively. A description of vegetative types delineated on the maps, follows:

Scpa. This type, covered 15 acres and was characterized by dominance of Alkali Bulrush (Scirpus paludosus). It was situated above the water line in 1956 (Fig. 5) but was exposed to fluctuating water levels. Other species, mainly Spike-sedge (Eleocharis macrostachya), Great Bulrush (Scirpus validus), Common Cattail (Typha latifolia) and Nuttall Alkali-grass (Puccinellia nuttalliana) were present. By 1959, total area covered by Alkali Bulrush was 54 acres. Most of this increase was around the perimeter of open water at the east end of the area. Much of the area covered in 1959 was occupied by Kochia/Chenopodium in 1956 (Figs. 5, 6). The Alkali Bulrush type shown inside the water line in figure 6 occurred as an almost pure stand with only occasional culms of Common Cattail. This water type of Alkali Bulrush normally occurred in water depths up to six inches.

Tyla. Common Cattail was the dominant plant in this vegetative type. In 1956, Rabbitfoot Polypogon (Polypogon monolepiensis) was common, but in 1959 this grass was not as prevalent in this type. Total areas covered by Tyla did not change appreciably during the study period. Water levels averaged higher in 1959. Most of this type occurred as a large stand in the northeast portion of the area. A smaller stand was situated south of

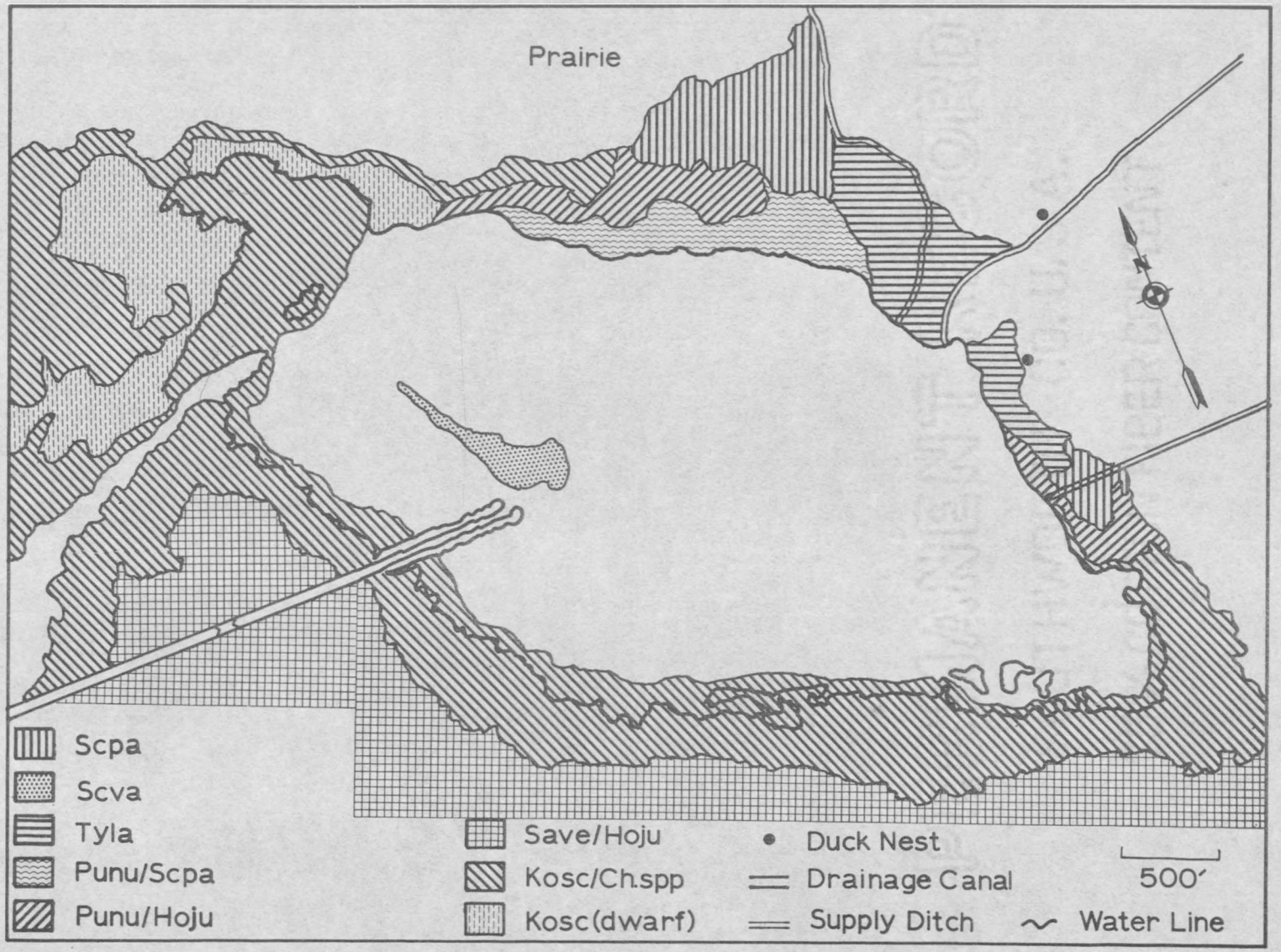

Fig. 5. Distribution of vegetative types and location of nests on Area No. 1 in 1956.

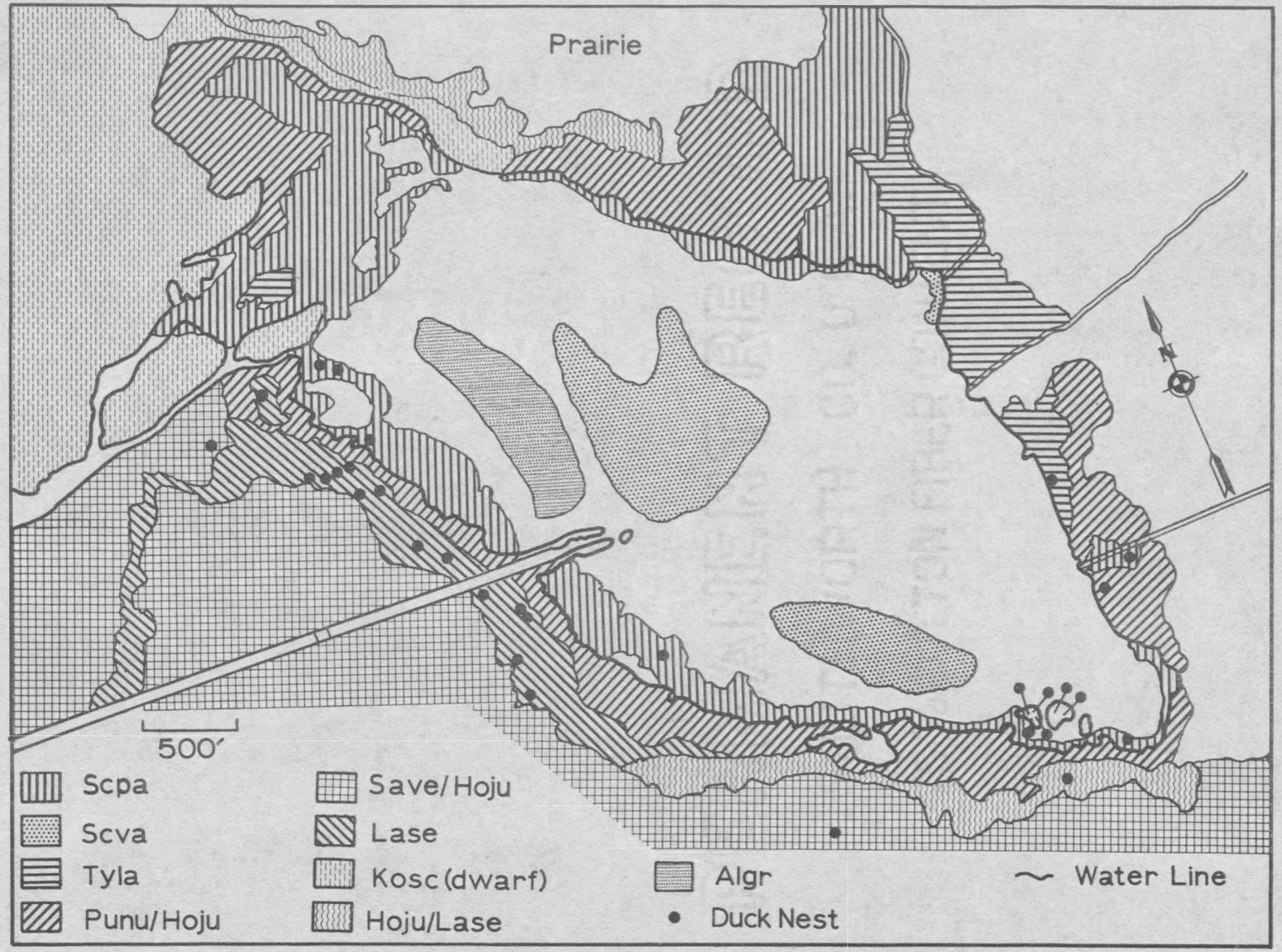

Fig. 6. Distribution of vegetative types and location of nests on Area No. 1 in 1959.

this and Common Cattail also was present at the northwestern end of the area in 1959. Water levels fluctuated from zero to three inches in the area supporting the large stand. The area occupied by the small stand was much drier. In 1959, this stand had decreased noticeably in vigor.

Scva. This type composed two acres of small clusters of Great Bulrush growing in open water, in the west central portion of the pond in 1956. In 1959, this type had expanded to 20 acres, with large vigorous clusters in the center of the pond and thinner clusters in the southeast end. No other plants were found in this type.

Punu/Hoju. This type occurred in areas with water depths up to two or three inches. Foxtail Barley (Hordeum jubatum) and Nuttall Alkali-grass were dominant with about a 30 and 60 percent occurrence respectively. In 1956, 10 acres existed and in 1959 51 acres. Most of the area taken over by this type in 1959 had been occupied by Kochia/Chenopodium in 1956 (Figs. 5, 6).

Punu/Scpa. About 8 acres of this type were present in 1956. Species composition was about 50 percent Alkali Grass and 40 percent Alkali Bulrush with some Foxtail Barley and scattered miscellaneous species. In 1959, no extensive tracts of this type were found. Sites where it had been present were occupied by pure stands of Alkali Bulrush type or Punu/Hoju type.

Algr. Only a few scattered culms of Narrow-leaved Water-plantain (Alisma gramineum) were found in 1956, but in 1959, a 7 acre stand was present near the west central edge. This plant also occurred as scattered culms throughout the pond.

Kosc/Ch. spp. This type occurred on dry or slightly damp ground. Species composition was almost equally divided between Summer Cypress (Kochia scoparia), Lamb's Quarter (Chenopodium album) and Oakleaf Goosefoot (C. glaucum). Growth was so dense (Fig. 7) that almost 100 percent occurrence was recorded. In 1956, extensive stands on the southern and western borders of the pond were flooded and killed out by August. There were 11 acres in 1956 and none in 1959.

Kosc (Dwarf). A dense growth of stunted Summer Cypress only two to three inches in height (Fig. 8) occurred on 21 and 46 acres of comparatively dry soil with numerous alkali spots at the northwestern edge of the area in 1956 and 1959 respectively (Fig. 5, 6). An expansion in 1959 covered ground formerly occupied by Kosc/Ch. spp., in 1956. Red Glasswort (Salicornia rubra) often occurred in moist areas in this type.

Lase. Prickly Lettuce (Lactuca serriola) was the dominant plant in this type, forming a very dense growth covering 25 acres between the Punu/Hoju and Save/Hoju types on the western edge of the area. Prostrate Knotweed (Polygonum aviculare), Hoary Aster (Aster canescens), Lamb's Quarter and Summer Cypress occurred commonly along the edge. This type did not occur in 1956. The area was then occupied by Kosc/Ch. spp.

Hoju/Lase. The Foxtail Barley and Prickly Lettuce type formed a strip of 8 acres on the southern edge of the area which was continuous from the Lase type to the eastern end of the area in 1959.

Save/Hoju. Greasewood (Sarcobatus vermiculatus) and Foxtail Barley were the dominant plants in this type. Western Wheatgrass (Agropyron

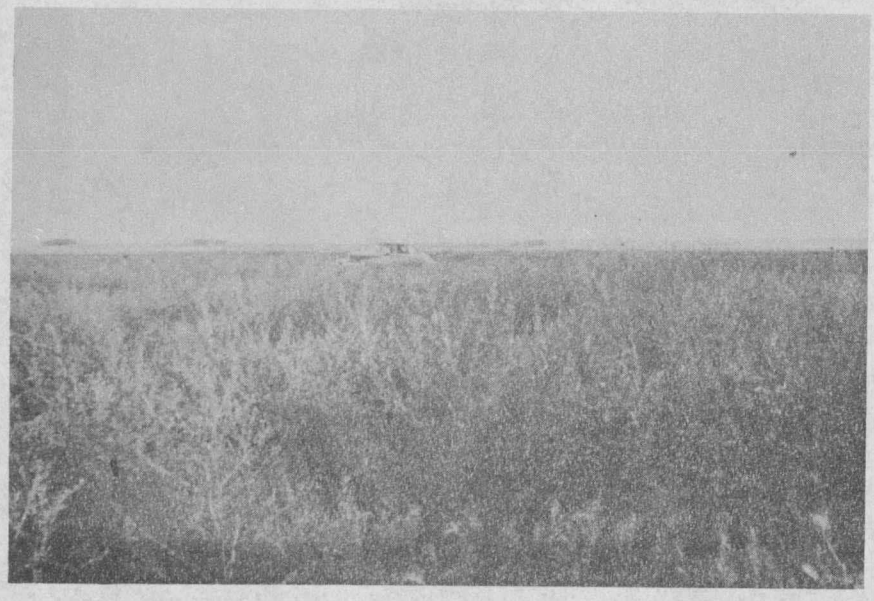

Fig. 7. Dense growth of Kosc/Ch. spp. type.

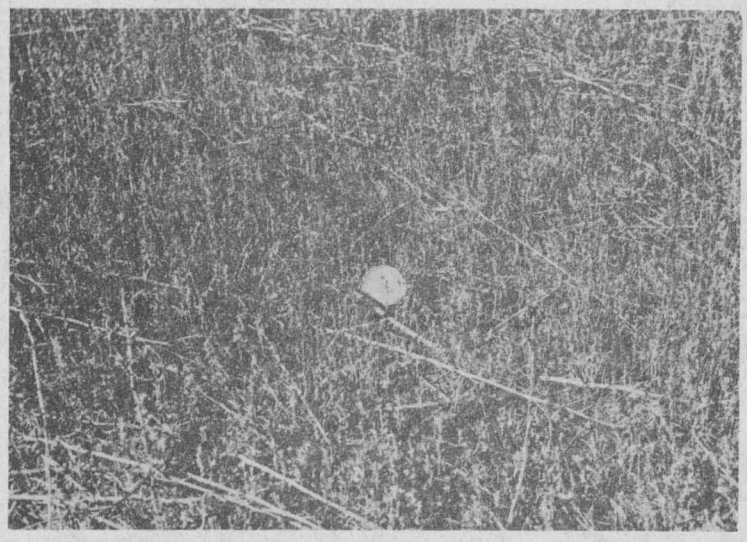

Fig. 8. Kosc (Dwarf) type.

smithii) was the only other plant of common occurrence. This type was found on high ground which had not been inundated in recent years. It extended from the southern edge of the study area, south and west to Freeze-out Lake in both years.

Prairie. Prairie bordered Area No. 1 on the entire north side. The most abundant grasses were Junegrass (Koeleria cristata), Canby Bluegrass (Poa canbyi) and Western Wheatgrass. Other prevalent plants were William's Needlegrass (Stipa williamsii), Broom Snakeweed (Gutierrezia sarothrae), Curlcup Gumweed (Grindella squarrosa), Hymenoxys richardsonii, Prairie Coneflower (Ratibida columnifera), Dotted Blazingstar (Liatris punctata), Fringed Sage (Artemisia frigida), Rubber Rabbitbrush (Chrysothamnus nauseosus), Two-grooved Milkvetch (Astragalus bisulcatus), Common Salsify (Tragopogon dubius), Aster commutatus and A. hesperius. Desert Saltgrass (Distichlis stricta), Marsh Arrowgrass (Triglochin maritima) and Foxtail Barley were locally abundant.

Figure 9 shows the distribution of vegetative types on Area No. 2 in 1959. A cover map of the entire area for 1956 is not available.

Construction of dikes around Area No. 2 in 1958 resulted in increased water levels and flooding of much land in 1959 that had been dry in 1956. Data on the 82 percent of Study Area No. 2 that was dry in 1956 and inundated in 1959 are of value for describing the vegetation appearing in the summer immediately following flooding. Data on the 18 percent that was already flooded in 1956 must be interpreted as the effect of higher water levels on vegetation. The only emergent vegetation present in 1956

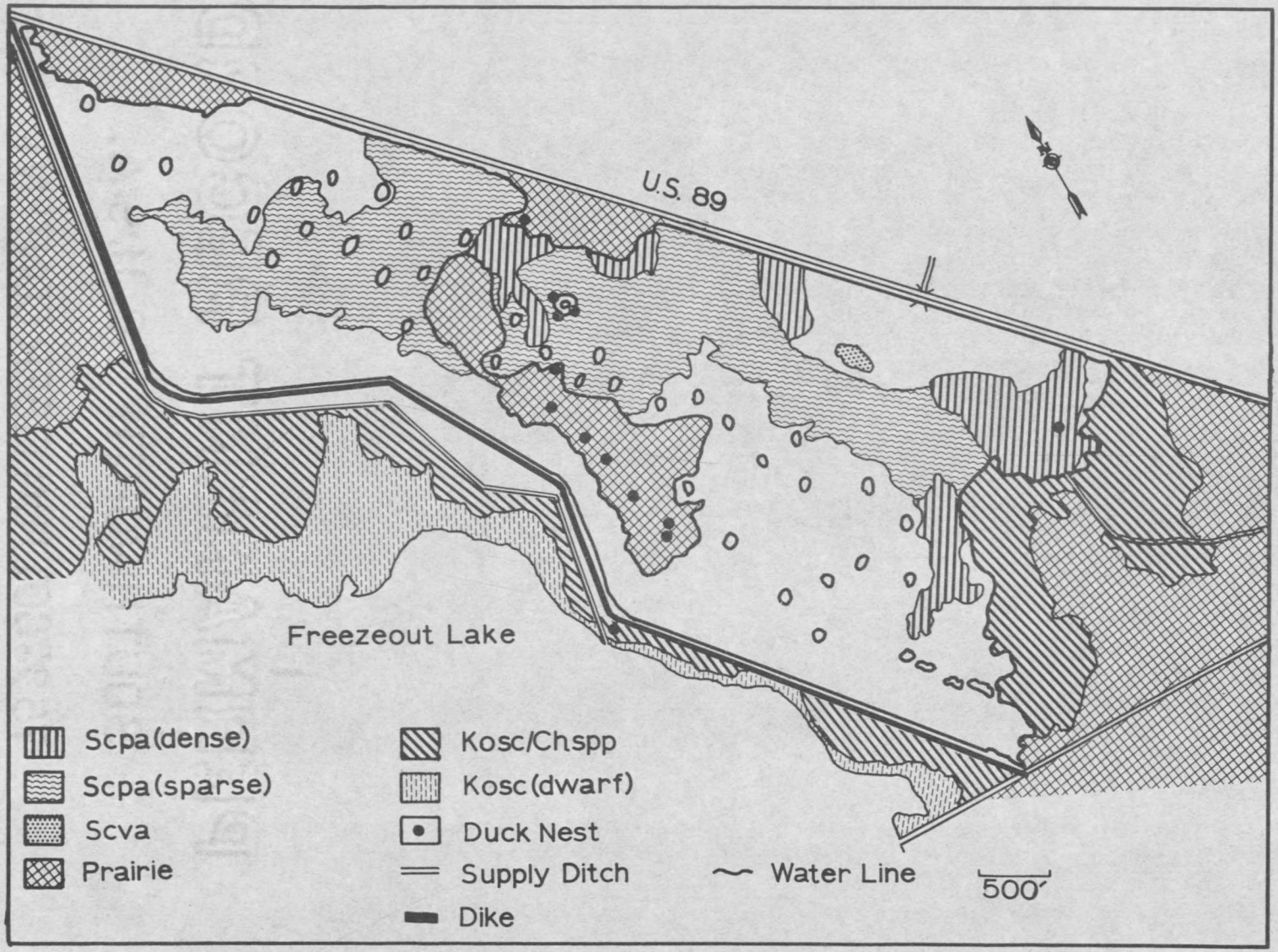

Fig. 9. Distribution of vegetative types and location of nests on Area No. 2 in 1959.

was a 2 acre stand of Alkali Bulrush at the southeast corner. The remainder of the area was occupied by the Kochia/Chenopodium type in varying densities and Prairie type at the eastern end and on the large island (Fig. 9).

Scpa(dense). This type occupied 20 acres in 1959. The bulk of it occurred adjacent to the 2 acre stand which was present in 1956. The average density of Alkali Bulrush was 69.83 culms per square yard as determined by 18 randomly scattered square-yard quadrats. Spike-sedge also occurred in this type in the shallower areas.

Scpa(Sparse). A thin stand of Alkali Bulrush occurred over much of the area which was flooded for the first time in 1959. The average density of Alkali Bulrush was 8.73 culms per square yard as determined by 15 randomly scattered square-yard quadrats. Foxtail Barley occurred in this type in the shallower areas.

Kosc/Ch. spp. This type is essentially the same as that described for Area No. 1 in 1956, except for the added occurrence of Desert Saltgrass. In addition to the portion shown on the map, this type also occurred on all of the artificial islands in the area.

Prairie. This is similar to the type described for Area No. 1 with the exception that Western Wheatgrass was the most abundant grass with Canby Bluegrass and Junegrass occurring rarely.

OCCURRENCE OF INDIVIDUAL SPECIES

Transect data show an increase from 34.3 to 79 percent in total occurrence of aquatic species on Area No. 1 from 1956 to 1959. Table I shows

Table I. Percent occurrence of aquatic plants along transects on Area No. 1 in 1956 and 1959.

Species	Percent Occurrence 1956	1959
Sago Pondweed *Potamogeton pectinatus*	11.40	27.25
Stonewort *Chara vulgaris*	0.90	10.84
American Milfoil *Myriophyllum exalbescens*	0.04	7.95
Widgeongrass *Ruppia maritima*	0.10	2.04
Horned Poolmat *Zannichellia palustris*	---	1.51
Slender Pondweed *Potamogeton filiformis*	---	0.45
Alkali Bulrush *Scirpus paludosus*	2.70	5.58
Nuttall Alkali-grass *Puccinellia nuttalliana*	1.70	4.57
Foxtail Barley *Hordeum jubatum*	2.60	4.50
Common Cattail *Typha latifolia*	2.14	3.15
Water-plantain *Alisma gramineum*	0.07	1.08
Rabbitfoot Polypogon *Polypogon monolepiensis*	1.80	2.74
Spike-sedge *Eleocharis macrostachya*	0.06	0.59
Great Bulrush *Scirpus validus*	0.19	0.38
Common Duckweed *Lemna minor*	---	1.35

percent occurrence for the more commonly occurring individual species.

Six species of submerged plants showed gains in percent occurrence from 1956 to 1959. Extremes were 0.0 to 0.45 and 11.4 to 27.25 percent. Sago Pondweed (Potamogeton pectinatus) was the most frequently occurring plant and a more vigorous growth of individual plants was noted for 1959. Stonewort (Chara vulgaris) was localized in 1956 but occurred generally throughout the pond in 1959. American Milfoil (Myriophyllum exalbescens) was of rare occurrence in 1956, but in 1959, extensive beds occurred in the center of the pond and individual plants were scattered throughout. Widgeongrass (Ruppia maritima) was scattered both years. Horned Poolmat (Zannichellia palustris) did not occur in this pond in 1956 but was localized at the southeastern end in 1959. Slender Pondweed (Potamogeton filiformis) was found localized at the north central portion of the pond in 1959 only.

Eight emergent plants showed gains in percent occurrence from 1956 to 1959. Extremes were 0.19 to 0.38 and 2.70 to 5.58 percent. Alkali Bulrush was the most abundant emergent species on Area No. 1 for both years, and was found in water depths up to 14 inches. Common Cattail, which once occupied most of the pond (Fig. 2), was found only along the northern edge in 1956. In 1959, this plant was found scattered along the entire perimeter in water depths up to four inches. New growths of Common Cattail observed in 1959 were in areas already occupied by Alkali Bulrush (Fig. 10). Nuttall Alkali-grass occurred in shallow water around the perimeter of the pond. In 1956, this plant was most common as pure stands, but in