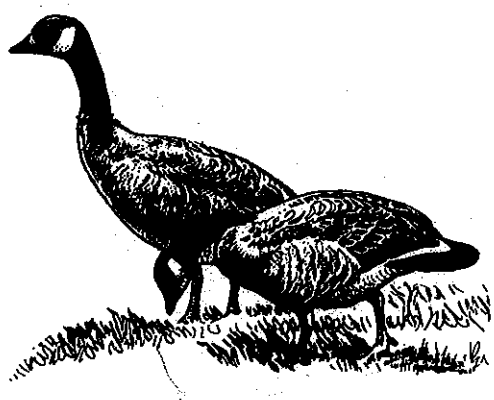
MIGRATORY BIRD POPULATIONS AND HABITAT RELATIONSHIPS IN MALHEUR-HARNEY LAKES BASIN OREGON



FINAL REPORT

DEPARTMENT OF THE INTERIOR
U.S. Fish and Wildlife Service

1983

MIGRATORY BIRD POPULATIONS AND HABITAT RELATIONSHIPS IN MALHEUR-HARNEY LAKES BASIN, OREGON

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ACKNOWLEDGEMENTS

Personnel at Malheur National Wildlife Refuge provided valuable assistance throughout the course of the study. Steve Thompson and Brad Ehlers were particularly helpful in assisting in aerial surveys in 1978, and in providing census data for some refuge areas which could not be surveyed from the air.

Significant review contributions were made by Eldon McLaury, Harold Duebbert, Dick Bauer, Dick Giger, and Marge Kolar.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF PHOTOS

LIST OF FIGURES

LIST OF PLATES

PREFACE

This biological study is one of four study elements outlined in the Fish and Wildlife Service's plan of study for the Malheur-Harney Lakes Basin, Oregon (July 1972, Revised December 1974). The other elements of the proposed study were: 1) land and water resources availability; 2) current land and water resource use and management; and 3) socioeconomics.

The basin study proposal was initiated at the request of the Oregon Water Resources Board in 1971 as a result of conflicting demands and opinions between water development and wildlife interests. The request was in accord with the Columbia-North Pacific Comprehensive Study which recommended that detailed studies be conducted before water and land management plans are developed for the basin.

Information collected has been used in the development of a County land use plan (State compliance); review of public notices and environmental impact statements; preparation of a reconnaissance report on an emergency flood control project (Corps of Engineers); routing of a transmission line; responding to a variety of requests from agencies and groups including the Bureau of Land Management, U.S. Air Force, and Nature Conservancy; and development of management decisions by Malheur National Wildlife Refuge personnel. Similar uses will continue with a possible application to water resource development if the Silvies River Project is reevaluated in the future.

The biological study was initiated in December of 1974 when the Division of River Basin Studies (now Ecological Services) opened an office in Burns, Oregon staffed by two biologists. Hydrologic data were collected by the U.S. Geological Survey (USGS) with funds provided by the Fish and Wildlife Service.

SUMMARY

SUMMARY

The Malheur-Harney Lakes Basin Study covered a 4-year period in which considerable variation occurred in weather, hydrology, and wildlife uses, distribution, and abundance. The first 2 years (1975 and 1976) were characterized by extensive runoff and flooding although timing and distribution changed from year to year. These 2 years were also different in that they were the end of a 3-year "wet" cycle which began in 1974. The third year of the study (1977) was a drought during which much of the migratory bird habitat in the basin never flooded or, if so, dried earlier than usual. The last year (1978) was another "wet" year but differed from 1975 and 1976 in that it followed a drought year and a carp control program in Malheur Lake. The low water levels and the carp control program resulted in a major change in habitat in the lake in 1978 which affected the distribution and production of some species substantially.

The reduction of the carp population, aeration of bottom sediments, and fertilization provided by decaying carp along with the return of high water levels in 1978 produced excellent growth of sago pondweed (Potamogeton pectinatus) and significantly increased use of Malheur Lake by migratory birds. Migratory bird use of Malheur Lake in the spring of 1978 was nearly identical to the low use recorded in 1977. However, by fall the growth of sago pondweed provided excellent feeding conditions, and migratory bird use (all species) increased to the highest level recorded during the study. In fact, the fall use on Malheur Lake in 1978 nearly equalled the total fall use for the first 3 years of the study (Table 1).

During the fall of 1978 duck use on Malheur Lake reached 8.5 million use-days, nearly twice the use recorded in 1975, the previous fall of highest use (Table 2). Similarly, goose, coot, and marshbird use were higher for this period than for any other comparable period.

Table 1. Total Migratory Bird Use in Malheur-Harney Lakes Basin, 1975 to 1978

LOCATION	1975	1976	1977	1978
	SPRING USE			
MALHEUR REFUGE				
Double-O	3,049,900	2,266,000	1,704,000	2,577,300
Malheur Lake	3,945,000	4,660,400	3,762,500	3,718,600
Blitzen Valley	2,094,500	2,269,500	1,741,500	1,671,700
TOTAL	9,089,400	9,195,900	7,208,000	7,967,600
OFF REFUGE				
Silvies River F. P.	7,557,300	8,735,200	1,740,600	5,841,400
Other Private Lands	3,543,200	3,440,100	941,200	2,452,000
TOTAL	11,100,500	12,175,300	2,681,800	8,293,400
BASIN TOTAL	**20,189,900**	**21,371,200**	**9,889,800**	**16,261,000**
	FALL USE			
MALHEUR REFUGE				
Double-O	3,467,900	3,568,700	1,827,700	1,523,100
Malheur Lake	7,403,600	5,928,200	2,216,500	13,907,300
Blitzen Valley	3,855,800	2,195,800	1,547,900	1,402,700
TOTAL	14,727,300	11,692,700	5,592,100	16,833,100
OFF REFUGE				
Silvies River F. P.	2,612,300	1,561,200	239,400	1,233,500
Other Private Lands	1,314,200	954,300	89,200	835,800
TOTAL	3,926,500	2,515,500	328,600	2,069,300
BASIN TOTAL	**18,653,800**	**14,208,200**	**5,920,700**	**18,902,400**
	TOTAL ANNUAL USE			
MALHEUR REFUGE				
Double-O	6,517,800	5,834,700	3,531,700	4,100,400
Malheur Lake	11,348,600	10,588,600	5,979,000	17,625,900
Blitzen Valley	5,950,300	4,465,300	3,289,400	3,074,400
TOTAL	23,816,700	20,888,600	12,800,100	24,800,700
OFF REFUGE				
Silvies River F. P.	10,169,600	10,296,400	1,980,000	7,074,900
Other Private Lands	4,857,400	4,394,400	1,030,400	3,287,800
Total	15,027,000	14,690,800	3,010,400	10,362,700
BASIN TOTAL	**38,843,700**	**35,579,400**	**15,810,500**	**35,163,400**

Table 2. Total Migratory Bird Use-Days on Malheur Lake, 1975 to 1978

LOCATION	1975	1976	1977	1978
		SPRING USE		
Waterfowl				
Ducks	2,202,400	2,052,200	1,120,000	2,077,200
Geese	460,300	696,700	414,000	402,400
Swans	458,300	292,900	218,700	64,800
Total	3,121,000	3,041,800	1,752,700	2,544,400
Shorebirds	29,600	47,900	86,200	58,200
Coot	469,300	1,163,700	1,607,700	671,200
Marshbirds	325,100	407,000	315,800	444,800
TOTAL SPRING USE	**3,945,000**	**4,660,400**	**3,762,400**	**3,718,600**
		FALL USE		
Waterfowl				
Ducks	4,870,000	4,102,400	966,100	8,501,500
Geese	88,100	80,000	53,300	144,100
Swans	225,500	74,000	2,700	48,600
Total	5,183,600	4,256,400	1,022,100	8,694,200
Shorebirds	479,700	165,800	518,800	249,900
Coot	1,314,400	1,067,000	210,600	4,482,100
Marshbirds	425,900	439,000	465,000	481,100
TOTAL FALL USE	**7,403,600**	**5,928,200**	**2,216,500**	**13,907,300**
		ANNUAL USE		
Waterfowl				
Ducks	7,072,400	6,154,600	2,086,100	10,578,700
Geese	548,400	776,700	467,300	546,500
Swans	683,800	366,900	221,400	113,400
Total	8,304,600	7,298,200	2,774,800	11,238,600
Shorebirds	509,300	213,700	605,000	308,100
Coot	1,783,700	2,230,700	1,818,300	5,153,300
Marshbirds	751,000	846,000	780,800	925,900
TOTAL ANNUAL USE	**11,348,600**	**10,588,600**	**5,978,900**	**17,625,900**

The study identified several heretofore poorly documented wildlife use areas of the basin, especially outside the boundaries of Malheur National Wildlife Refuge. Of these areas, the Silvies River Flood Plain was found to be of major importance to many species during the spring migration and nesting seasons of the so-called "wet" years. However, the drought of 1977 showed the susceptibility of this area to reduced water supply and a corresponding drastic decline in value to migratory birds. On the other hand, Malheur National Wildlife Refuge with its more reliable water supply in the Blitzen Valley and springs in the Double-O area (Units 1 to 3), showed itself to be of major importance during all years. Malheur Lake, however, did not show an increase in use corresponding to the loss of habitat in the Silvies River Flood Plain and other off-refuge areas. This illustrates the poor condition of the lake caused by excessive numbers of carp and several years of relatively stable water levels which limited the germination and growth of sago pondweed.

The drought of 1977 resulted in low lake levels by late summer. During this period the refuge conducted a control program to reduce the carp population. This, followed by an excellent water supply in 1978, resulted in an improvement in water quality, sago pondweed production, and a major increase in waterfowl use and production on Malheur Lake. At the same time, wildlife habitat and use on the Silvies River Flood Plain and other private lands returned to predrought levels. This indicates the potential of Malheur Lake to substantially increase the overall contribution of the basin to migratory bird resources.

In addition to the Silvies River Flood Plain, other important off refuge wetlands were Warm Springs Valley, Malheur-Ninemile Slough, upper Silver Creek Valley, and the small drainages east of Burns and west of Buchanan, Oregon. Of lesser importance were the Bear, Silvies, Happy, and Diamond Valleys; Dry Lake, and the small drainages north of Crane and south of Buchanan.

Basin-wide data pertaining to spring and fall waterfowl migration, shorebird use, coot use, and marshbird use are provided in Figures 1, 2, 3, 4, and 5 respectively. These figures are located at the end of this section. Individual discussions of these categories and waterfowl production, breeding bird surveys, and raptors are provided in the sections that follow. A general analysis of potential impacts of water development on the Silvies River Flood Plain and Malheur Lake is also provided.

1975 AND 1976 PREDROUGHT YEARS

The Silvies River Flood Plain (Unit 22) was found to be of major importance to many species of migratory birds during the spring migration and nesting seasons of the "wet" years 1975 and 1976. During these years many species of migratory birds spread throughout the flood plain attracted by the large expanse of shallow flooded areas. On an annual basis about 60 percent of total migratory bird use on the flood plain was by ducks, 14 percent by coot, 10 percent by geese, 9 percent by shorebirds, and 7 percent by marshbirds. Over 80 percent of the total annual migratory bird use of the flood plain occurred in the spring.

As the flood plain became drier in late spring and summer its value to migratory birds diminished. Most fall use took place on Malheur Refuge where water supplies were more permanent. In spring an average of 39 percent of the total basin migratory bird use took place on the flood plain. However, in the fall migratory bird use-days on the flood plain were reduced to an average of less than 12 percent of the basin total (Table 3). By contrast, migratory bird use-days on Malheur Refuge averaged 44 percent of the basin total in the spring, but increased to an average of 81 percent in the fall of 1975 and 1976.

Although the Silvies River Flood Plain provides excellent waterfowl nesting habitat in good water years, brood water is not always available through the nesting season. Movement of broods

toward Malheur Lake was observed as the flood plain dried. The only permanent brood water on the flood plain was provided by the Burns sewage lagoon and a pond near the Hines Lumber Company mill.

Malheur Lake levels peaked earlier in 1976 than in 1975. As a result extensive areas of alkali bulrush in Unit 6 east of Pelican Island were

Table 3. Comparison of Spring and Fall Migratory Bird Use in the Malheur-Harney Lakes Basin as a Percentage of Total Basin Use, 1975 to 1978 [1/]

PERCENTAGE OF BASIN USE

SPECIES/ LOCATION	SPRING				FALL			
	1975	1976	1977	1978	1975	1976	1977	1978
WATERFOWL								
Malheur NWR	45 (21)	40 (20)	68 (29)	47 (21)	79 (45)	84 (46)	93 (34)	90 (74)
Silvies River F.P.	35	41	20	35	13	10	5	6
Other Private Land	20	19	12	18	8	6	2	4
SHOREBIRDS								
Malheur NWR	33 (3)	34 (4)	53 (14)	26 (5)	84 (19)	74 (12)	96 (34)	63 (24)
Silvies River F.P.	47	43	32	53	10	19	2	25
Other Private Lands	20	23	15	21	6	7	2	12
AMERICAN COOT								
Malheur NWR	46 (14)	54 (35)	94 (72)	66 (40)	75 (39)	85 (45)	96 (49)	93 (87)
Silvies River F.P.	43	41	4	32	16	6	4	2
Other Private Lands	11	5	2	2	9	9	0	5
MARSHBIRDS								
Malheur NWR	53 (30)	56 (27)	66 (34)	61 (33)	78 (37)	77 (37)	96 (46)	82 (49)
Silvies River F.P.	40	38	27	31	18	17	3	13
Other Private Lands	7	6	7	8	4	6	1	5
TOTAL								
Malheur NWR	45 (20)	43 (22)	73 (38)	49 (23)	79 (40)	82 (42)	94 (7)	89 (74)
Silvies River F.P.	37	41	18	36	14	11	4	7
Other Private Lands	18	16	10	15	7	7	2	4

1/ Percentages have been rounded to the nearest whole percent. The percentage of total basin use on Malheur Lake is shown in parentheses.

flooded and attracted thousands of snow geese to one of their preferred food plants. Increased snow goose use in Unit 2 (Harney Lake) was also attributable to excellent stands of alkali bulrush at the inlet of Silver Creek. The attractiveness of Units 2 and 6 was the probable reason that use by snow geese declined 65 percent in Units 1 and 22 in 1976.

1977 DROUGHT

Migratory bird use on the Silvies River Flood Plain declined in the spring of 1977 because of reduced flooding and the consequent loss of habitat. Some migrants were observed passing through the basin without stopping. Total spring migratory bird use on the flood plain declined 79 percent from the 1975-1976 average. The flood plain supported only 20 percent of the total spring basin waterfowl use in 1977, compared to between 35 and 41 percent during the other 3 years of study.

Waterfowl unable to find suitable habitat on the Silvies River Flood Plain in the spring of 1977 did not move onto Malheur Lake in any appreciable numbers because of low water levels and virtually no sago pondweed growth. The result was that Malheur Lake suffered declines in total waterfowl use similar to the decline in use throughout the basin.

Other migratory birds were not affected as much as waterfowl. Although spring shorebird use declined throughout the basin, most losses were on the flood plain and other off-refuge areas. Spring use on Malheur Refuge was virtually identical to the 1975-1976 average because losses in the Double-O area and Blitzen Valley were more than made up by an increase in use of the large shoreline habitat created on Malheur Lake by the receding lake level.

This same pattern of use continued through the fall when 96 percent of basin shorebird use took place on the refuge. Most use was in the Double-O area (Units 1 to 3), but 34 percent of

fall basin use was on Malheur Lake. In all, total basin migratory bird use declined 52 percent in the spring and 64 percent in the fall from the 1975-1976 average.

1978

Migratory bird use increased in most areas in the basin in the spring of 1978 in comparison to the previous drought year. Increased use was notable on private lands, especially on the Silvies River Flood Plain. Waterfowl use increased from 1.21 million use-days in 1977 to 4.29 million use-days in 1978. Shorebird and coot use was the highest of the entire 4-year study. Marshbird use also increased. Total spring basin use for all migratory birds increased from 9.89 million use-days in 1977 to 16.3 million use-days in 1978.

Although most areas showed increased migratory bird use in the spring of 1978, the largest percentage increases were on private land.

Total migratory bird use on Malheur Lake actually declined slightly from the spring of 1977 because aquatic vegetation had not yet recovered from the drought conditions. Total waterfowl use on the lake increased slightly from 1977 levels because of the large numbers of ducks that were attracted by high water levels. Goose and swan use remained low. Shorebird use declined from 1977 levels as birds returned to off-refuge lands, attracted by large areas of shallow floodwaters. Marshbird use increased on the lake as well as on every other area in the basin.

Water conditions remained good on Malheur Lake through the spring and summer of 1978, and sago pondweed production increased tremendously. This was reflected by a major increase in waterfowl production (up 243 percent over 1977), and fall migration use (up 880 percent over 1977). Coot and marshbird use was higher than for any other year, with only shorebird use declining.

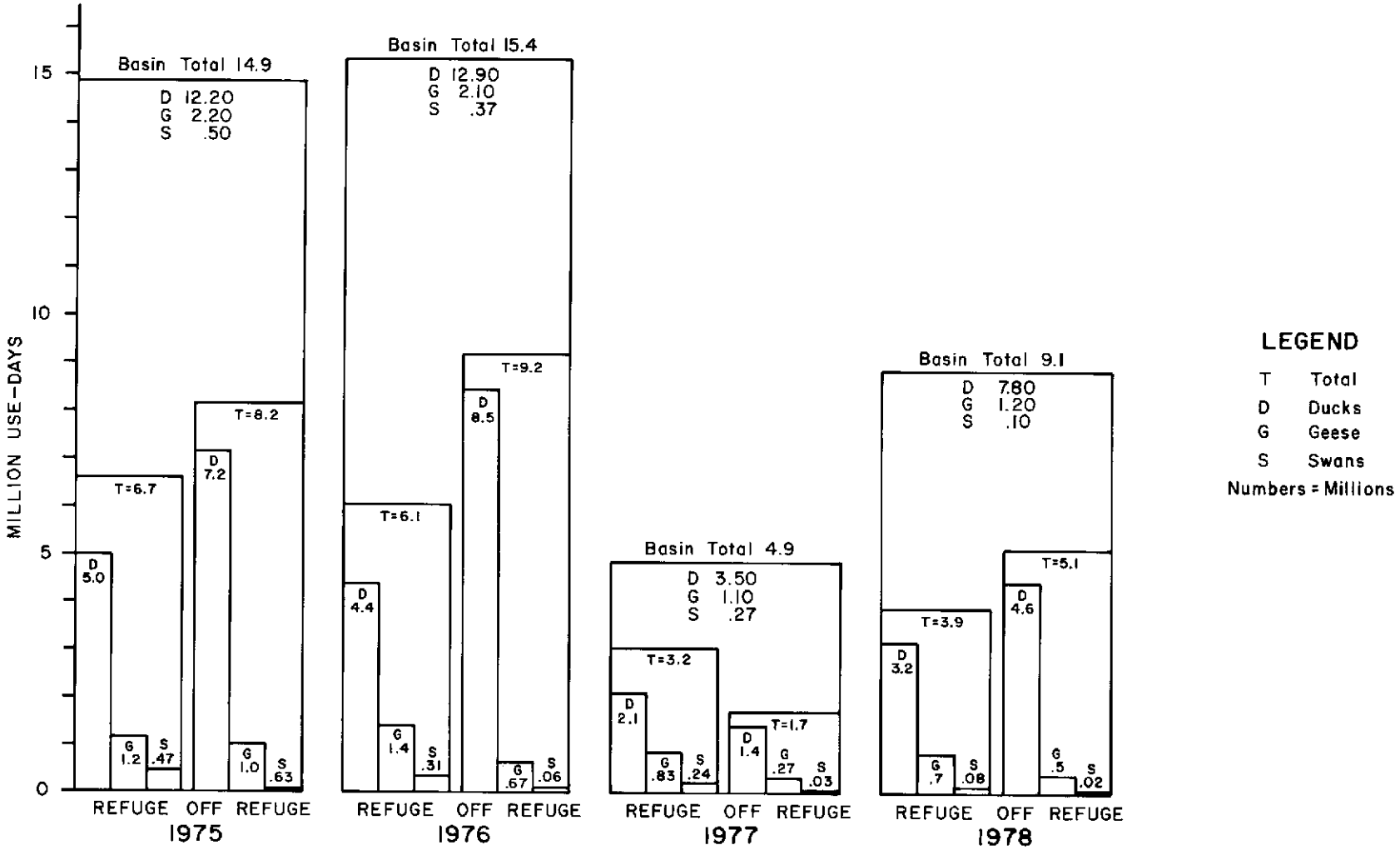


Figure 1. Spring Waterfowl Use

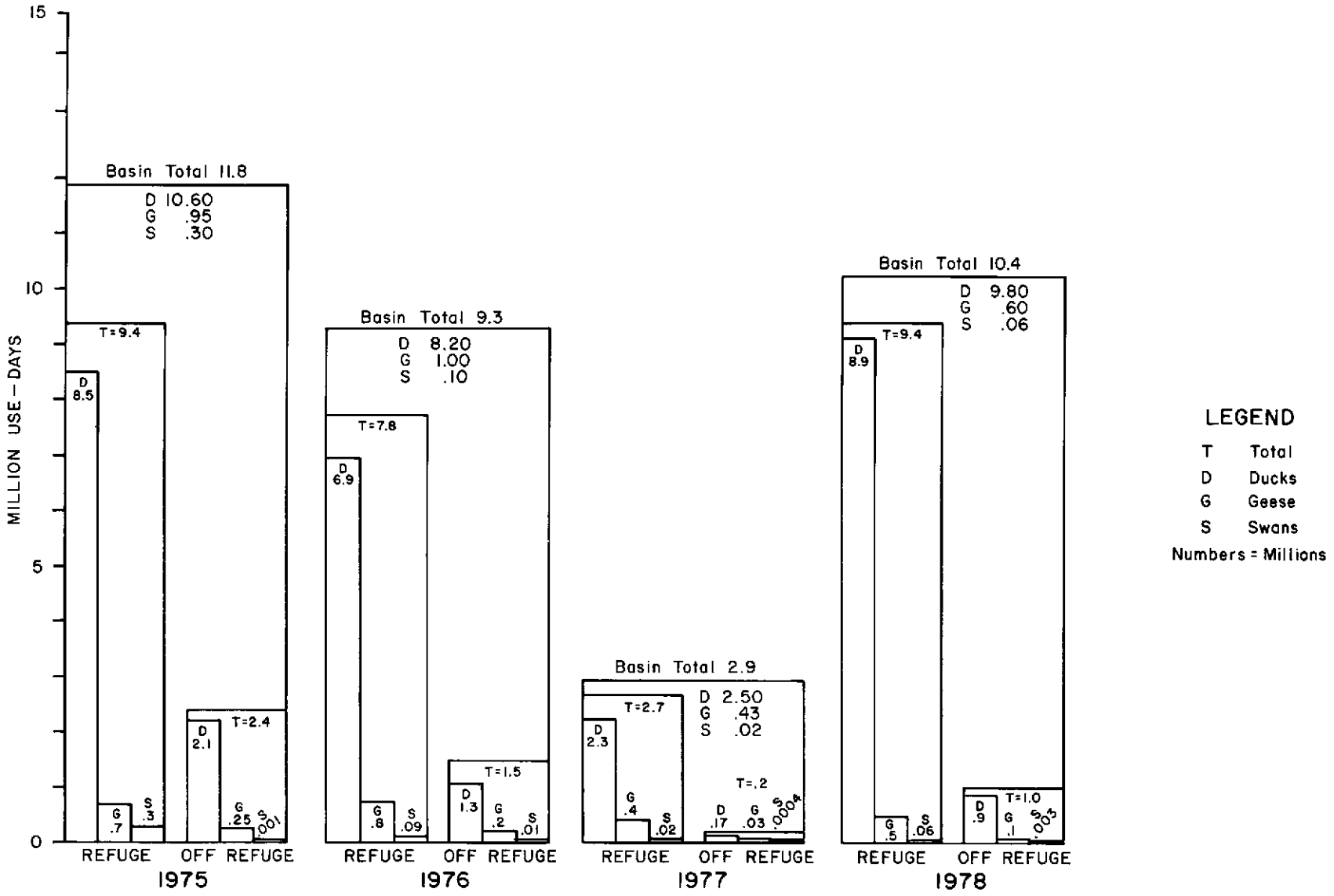


Figure 2. Fall Waterfowl Use

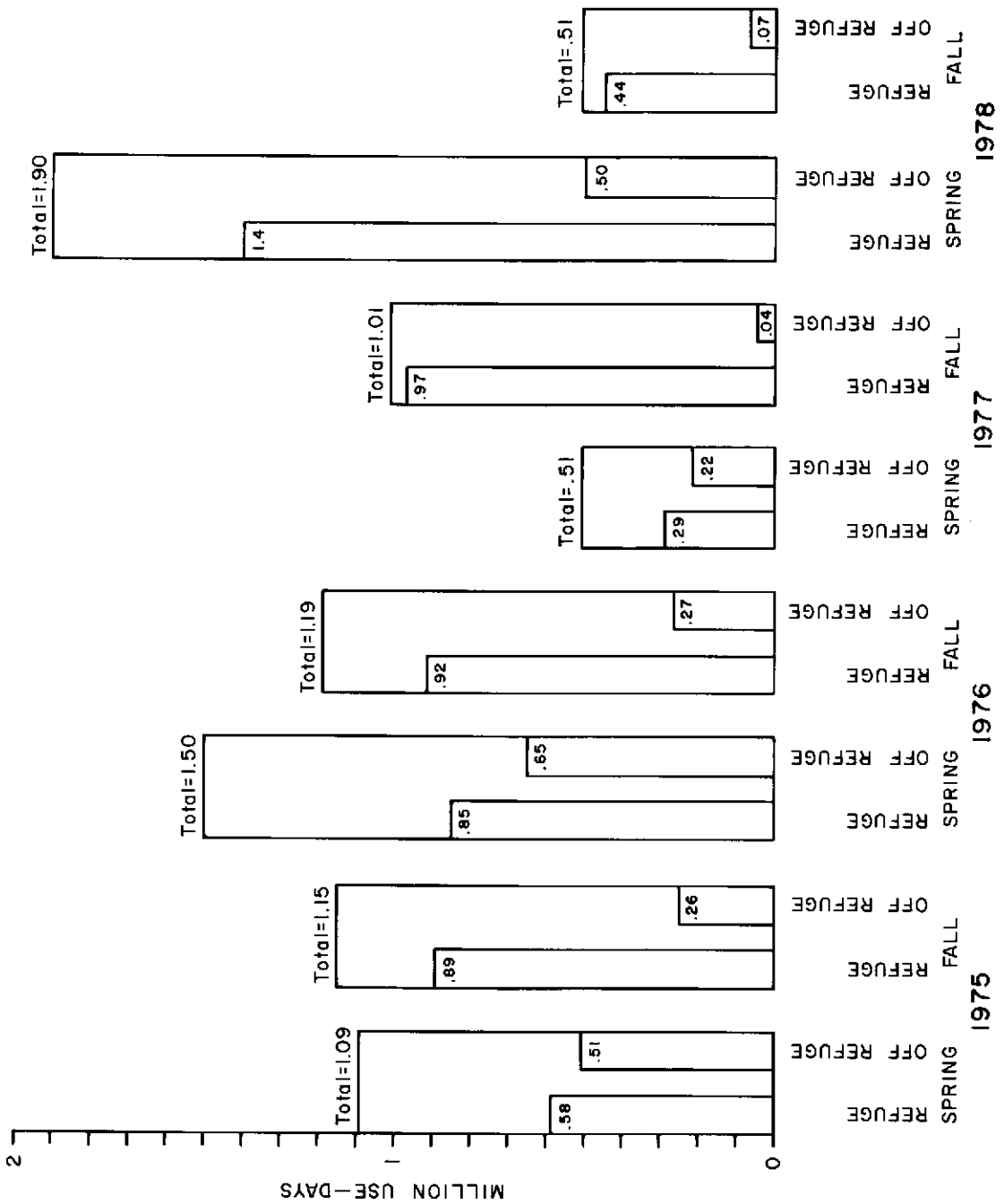


Figure 3. Spring and Fall Shorebird Use

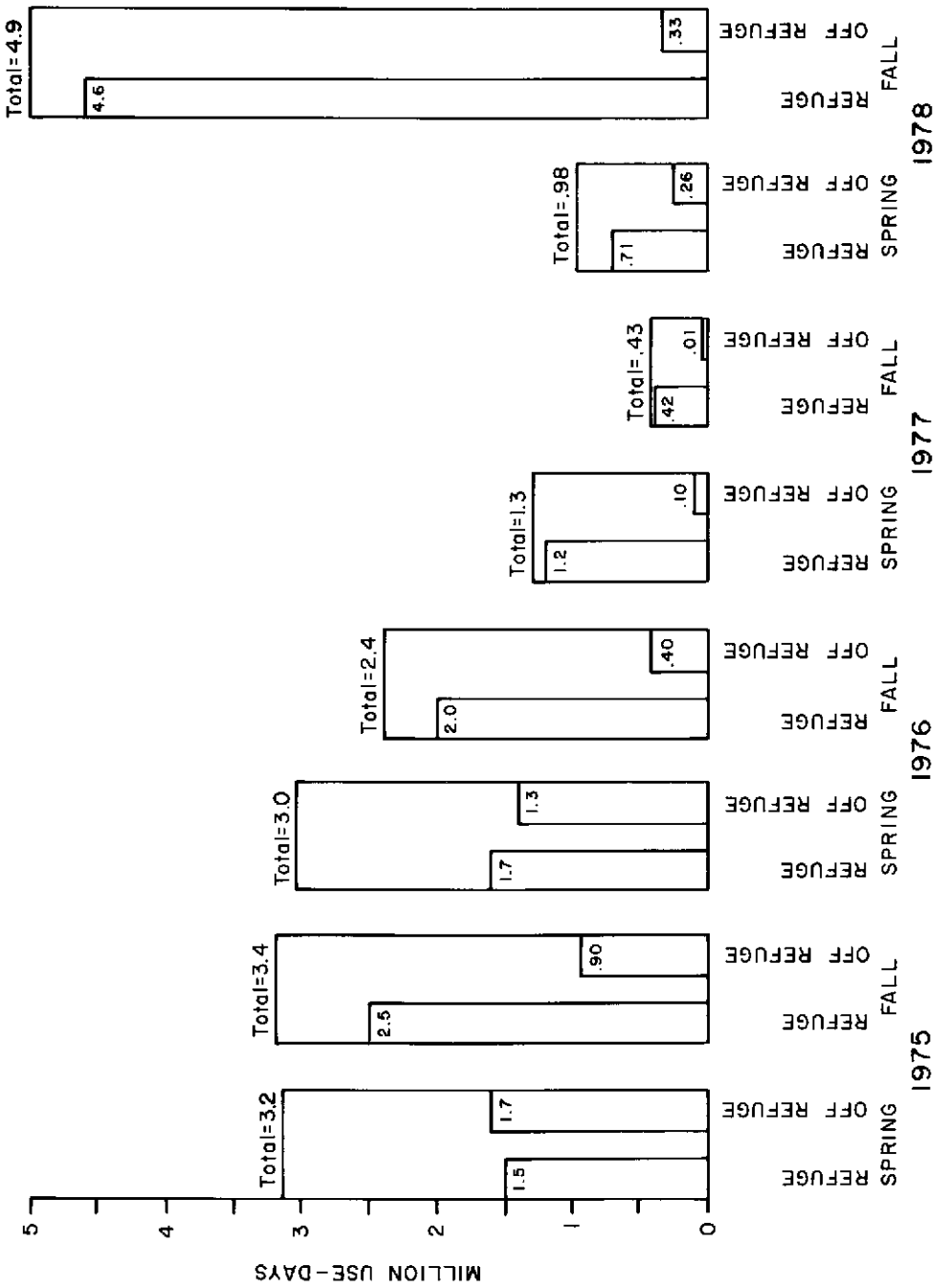


Figure 4. Spring and Fall Coot Use

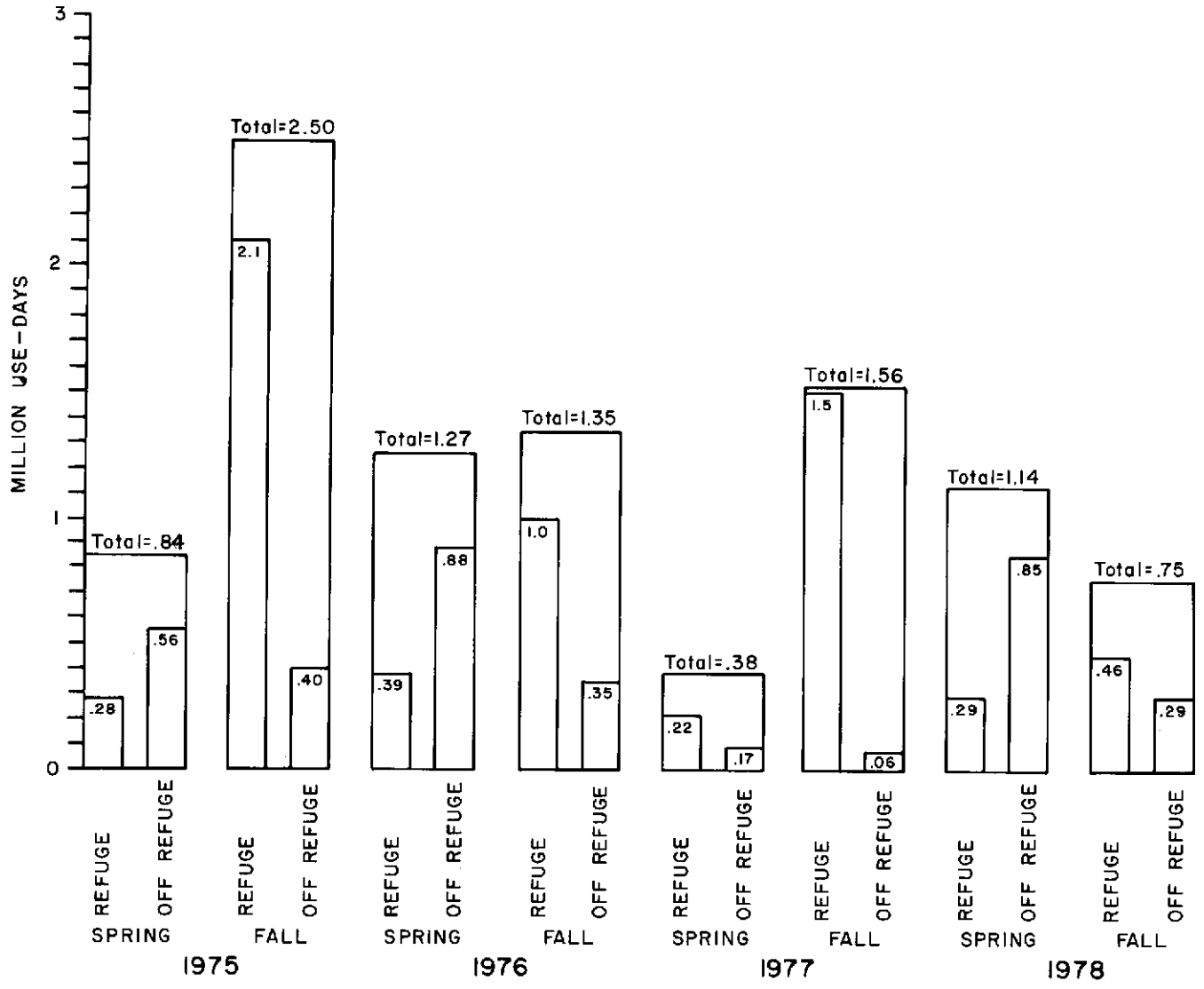
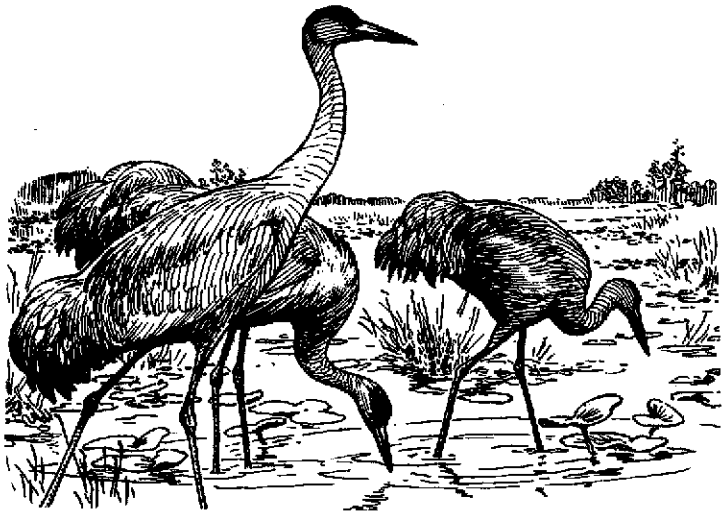


Figure 5. Spring and Fall Marshbird Use (Excluding Coot)

INTRODUCTION



INTRODUCTION

Data collected during the biological study identify the major migratory bird use areas in the basin by species, time of year, water distribution, habitat, and duration of use. These data are summarized and presented under major groupings, i.e. waterfowl, shorebirds, and marshbirds. Waterfowl are further separated into ducks, geese, and swans; and coot are treated separately from other marshbirds. Examples of data collection forms for each major group, showing each species for which data were collected are presented in Appendix A. Two basic unisort cards were also used (Figures 6 and 7), one for nesting data and one for habitat data. Information presented in tables and graphs in this report for each major group can be isolated and presented for each species if a need arises.

STUDY AREA

The study area (Plate 1) includes the entire Malheur-Harney Lakes drainage system. The basin, sometimes referred to as the Oregon Closed Basin, is an area of diverse habitat types encompassing over 3 million acres and has three major surface water sources. The Silvies River, with headwaters in the Blue Mountains, drains about 1,350 square miles and flows into Malheur Lake from the north. The Donner und Blitzen River heads on Steens Mountain in the southeastern portion of the study area. It drains a 1,000-square-mile watershed and flows into Malheur Lake from the south. Silver Creek drains a 900-square-mile area and flows directly into the west side of Harney Lake. Harney Lake also receives water on the east from Malheur Lake in high water years.

Malheur and Harney Lakes are mostly within the boundaries of Malheur National Wildlife Refuge. Malheur Lake is the largest freshwater marsh in

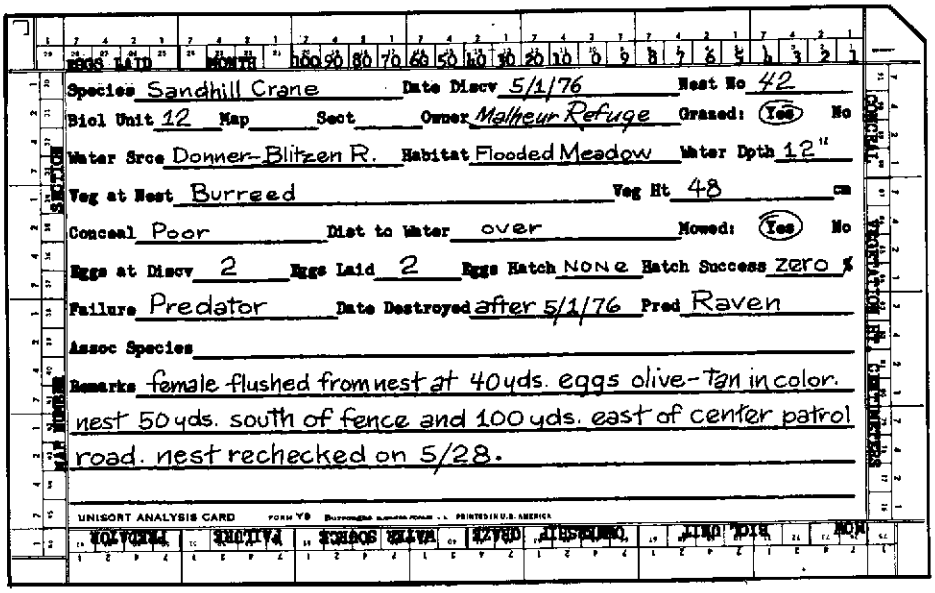


Figure 6. Example of Unisort Card and Data Recorded for Individual Nest Observations

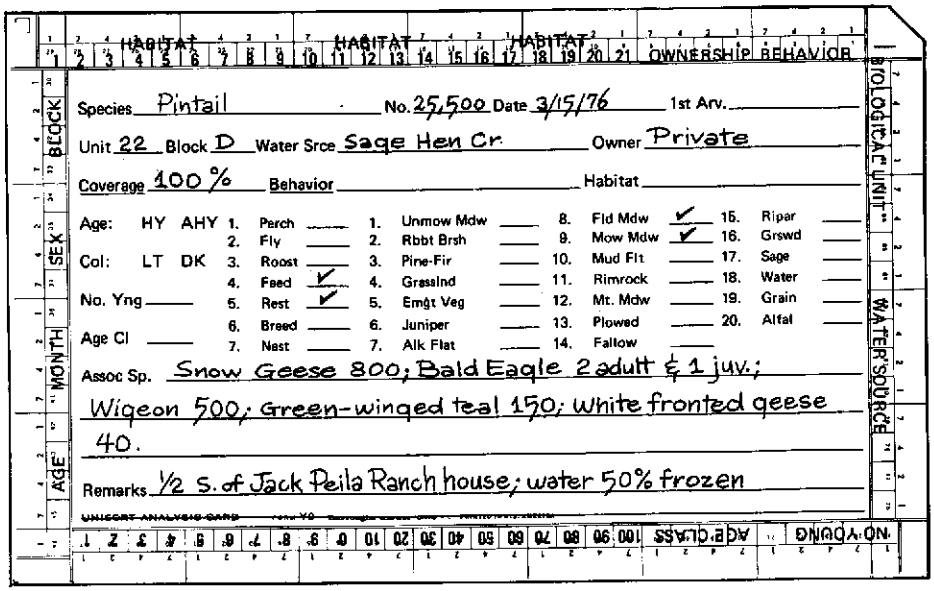


Figure 7. Example of Unisort Card and Data Recorded for Habitat and Related Observations

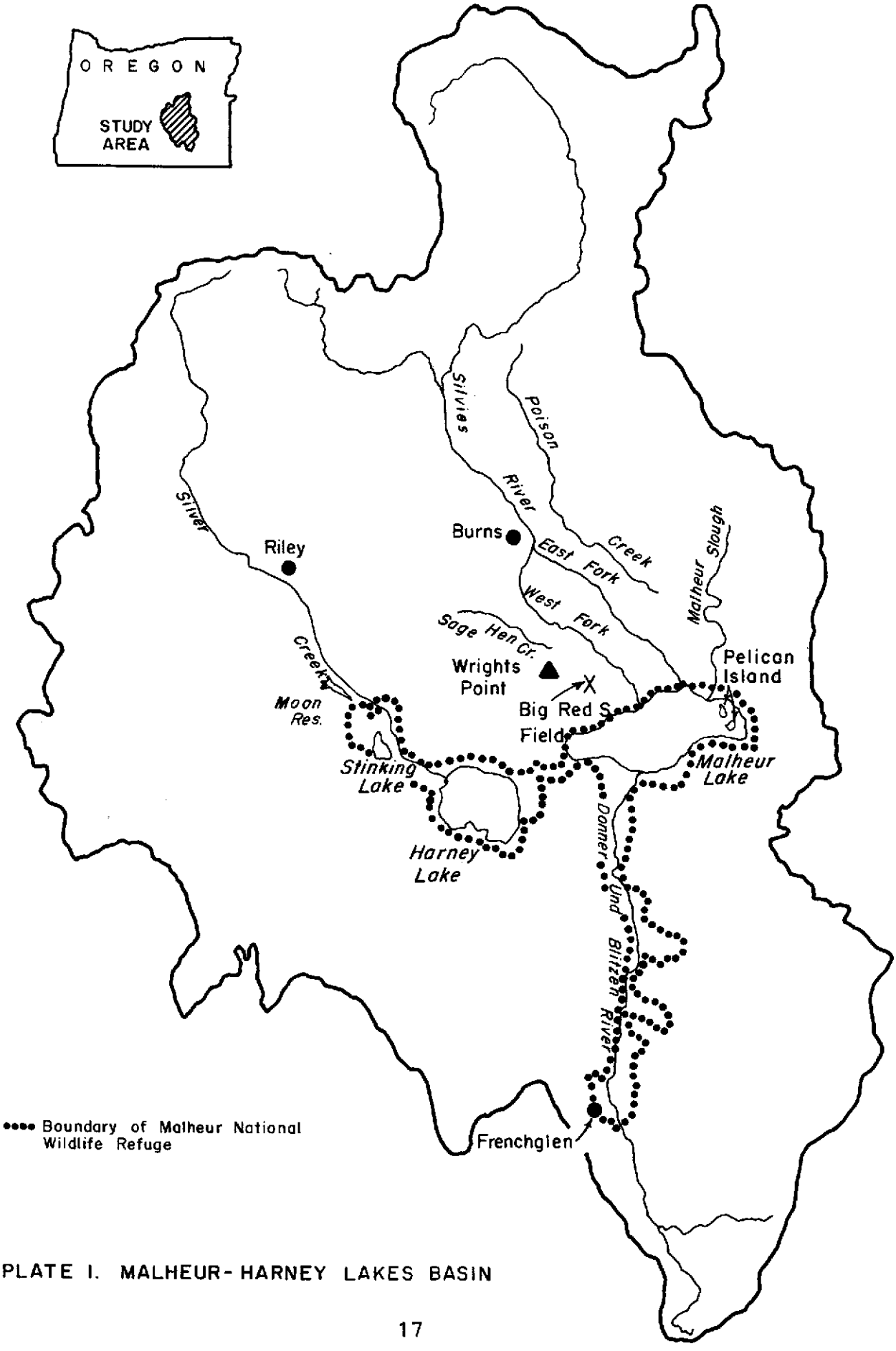


PLATE I. MALHEUR-HARNEY LAKES BASIN

the western United States and is a very important nesting, resting, and feeding area for birds, especially waterfowl, shorebirds, and marshbirds. Harney Lake is the lowest point in the basin and is a natural alkaline sump.

The Silvies River Flood Plain, comprised of over 100,000 acres of irrigated and naturally flooded meadows east and south of Burns is one of the most important spring resting areas on the Pacific Flyway for migrating waterfowl, lesser sandhill cranes, and shorebirds.

STUDY GOAL AND OBJECTIVES

The goal of the biological study was to assess the basin-wide relationships between wildlife and water. This included not only the obvious association of wildlife to water supply, distribution, and season of availability, but also to habitat conditions, species competition, changes in habitat, and a variety of other factors.

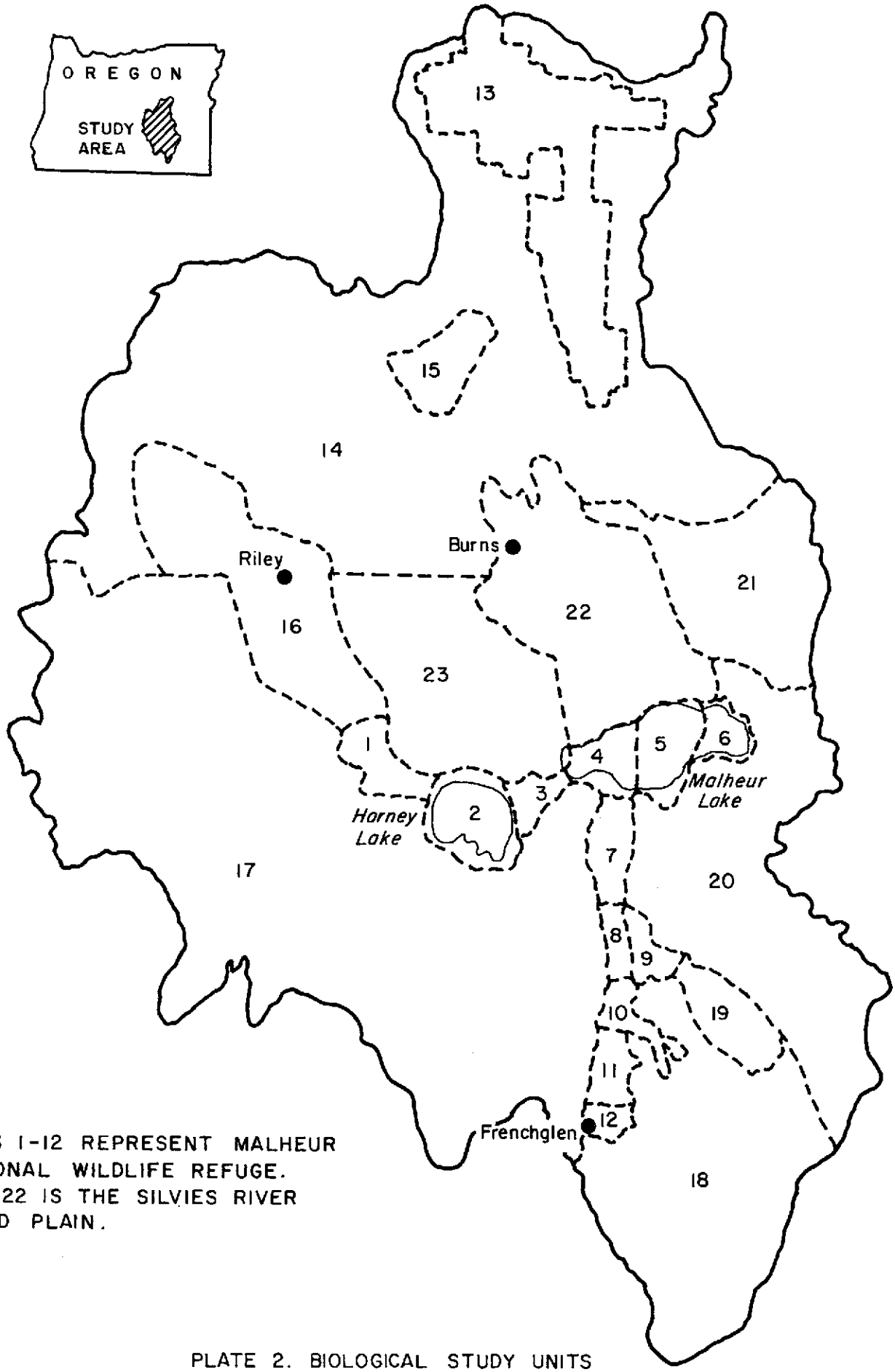
Data collection was directed primarily to the Silvies River Flood Plain and Malheur National Wildlife Refuge with special emphasis on Malheur Lake. However, the migratory habits of the Basin's wildlife required some study effort in the Silver Creek and Donner und Blitzen Valleys, and other nearby areas. Principal wildlife species studied were migratory birds that are dependent upon aquatic habitat. These included waterfowl, shorebirds, wadingbirds, and marshbirds. Since the study involved a large amount of field work, it was possible to obtain some data on other species without a major additional investment of time or funds. Some data were collected on raptors, threatened and endangered species, and passerine birds. Observations were generally made while conducting the principal study program.

To relate wildlife observations to specific areas and water sources, the basin was divided into 23 study units (Plate 2). Land ownership or administration, water sources, habitat types, and geographical features were the major criteria used in determining these units. Data in this report are generally presented as on-refuge or off-refuge. Malheur Refuge was broken into three areas by unit 1) Double-O (Units 1 to 3), 2) Malheur Lake (Units 4 to 6), and 3) Blitzen Valley (Units 7 to 12). Off-refuge was broken into two areas 1) Other Private Lands (Units 13 to 21 and 23), and 2) Silvies River Flood Plain (Unit 22).

Unit 22 (Silvies River Flood Plain) was divided into 11 subunits (A-K) (Plate 3) in 1976 since it represents some of the most valuable wildlife habitat in the basin. It also is the area with the greatest susceptibility to alteration by agricultural and water development. The subunits made it possible to relate field observations to specific areas within the flood plain, thus making these observations more meaningful when discussing land ownership, water chronology, and wildlife use.

Specific methodologies for the major study components (such as spring migration) are provided in the appropriate report sections. Some of the more general methods are explained below. Estimates of the duration of migratory bird use for individual areas of the basin are presented in use-days. If an area (unit) had a population of 100 pintail, and counts were made on a weekly basis then 700 use-days would be accumulated during that week. It was assumed that populations were stable between counts and that errors accumulating during periods of increasing population were offset during periods of decreasing population.

Figures showing migration chronology were calculated using the actual date of the count when possible. Otherwise, the midpoint between counts was used. Thus, dates indicated may be later than actual population peaks.



UNITS 1-12 REPRESENT MALHEUR NATIONAL WILDLIFE REFUGE. UNIT 22 IS THE SILVIES RIVER FLOOD PLAIN.

PLATE 2. BIOLOGICAL STUDY UNITS

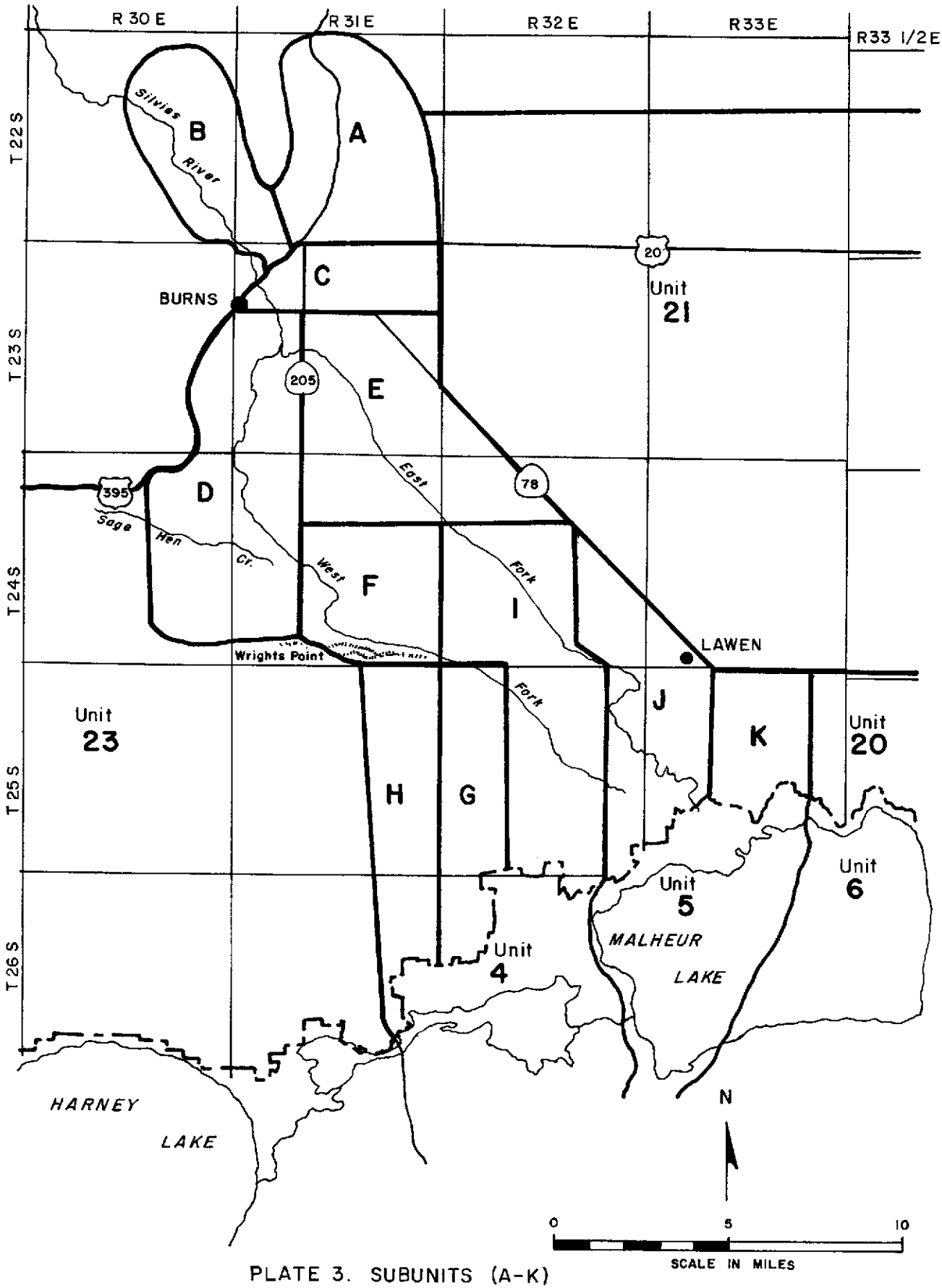


PLATE 3. SUBUNITS (A-K) IN UNIT 22

Data collection involved about 800 miles of transects. Wildlife observations were made from aircraft, auto, foot, and airboat.

Habitat typing was contracted to the Environmental Remote Sensing Laboratory (ERSAL) at Oregon State University, which provided mapping and measurements by means of remote sensing and/or photo interpretation.

The primary purpose of this special study was to identify surface water and different types of vegetative cover on the Silvies River Flood Plain and around Malheur Lake. Emphasis was placed on wetland habitats, but all upland vegetation was also classified, including acreage summaries for each habitat type. The study area encompassed sites of intensive migratory bird use, including nesting activities of many species. A major objective was to compare a year of normal precipitation with a severe drought year in terms of changes in water distribution and effects on vegetation.

The study was an analysis of the satellite data by the Environmental Remote Sensing Applications Laboratory at Oregon State University, using the "PIXSYS"[1]/ program. Initial data and subsequent combined data were displayed in the form of computer generated digitial maps.[2]/ These maps are at scales of 1:62,500 and 1:24,000. They can

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1/ PIXSYS is a Fortran-based software package for computer-assisted analysis of Landsat data which has been developed at Oregon State University for use on Control Data Corporation Computers.

2/ These consist of various symbols or patterns representing the different ground classes. Each symbol is equivalent to 1 pixel in size, or approximately 1.125 acres.

thus be used as overlays for 15 minute and 7.5 minute Geological Survey topographic maps and 7.5 minute orthophotographs of the project area. The primary source of information was Landsat multispectral scanner (MSS) data from scenes of four dates: May 26 and August 27, 1976 (a relatively normal precipitation year) and June 2, and July 26, 1977 (a year of severe drought). Supplementary data consisted of: color infrared aerial photographs (approximate scale of 1:60,000 and 1:30,000); low flight stereographic color infrared coverage at 1:7,000 of most of the flood plain; and a variety of photographs (ground and aerial) taken at various intervals during the study period.

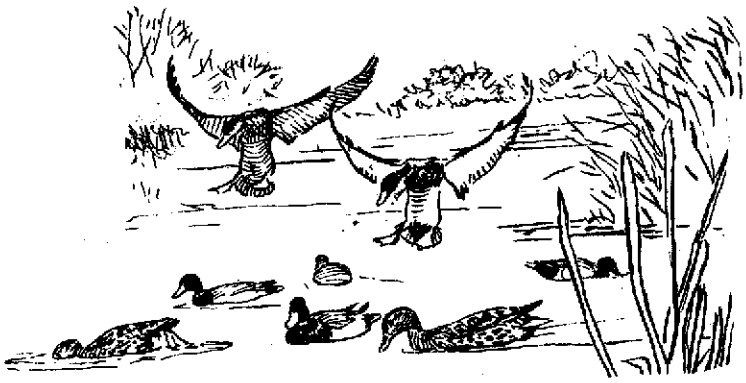
Results of the May 26, 1976 flood plain data analyses were the best indicator and measure of ground cover classes. The computer-generated digital maps for this date provided a basis for comparison of spring migratory bird use areas. It was especially indicative of the seasonally flooded agricultural lands preferred by shorebirds and marshbirds on the Silvies River Flood Plain. A cursory comparison of the bird species distribution maps prepared by staff biologists, and the digital vegetative maps showed a high correlation between the two.

The August 27, 1976, and June 2, and July 26, 1977 scenes were less than optimum because of cloud cover, heavy rainfall, sheet water, and turbidity. Numerous problems interfered with interpretation, and the time span of the 1977 drought was not enough to have a major impact on vegetation. Accordingly there were no obvious values obtained by making a cursory review of the digital maps for above dates.

In summary, the use of satellite imagery has the potential to provide a basis for determining distribution and preferred use areas for some migratory bird species. Also, methodologies used in the study have the capability of being applied to past and future scenes to generate long-term comparisons of major vegetative types

in the basin. This could be of great value if a major development (such as the Silvies River Project), with a potential to make extensive changes in the flood plain is undertaken in the future.

WEATHER & WATER CHRONOLOGY



WEATHER AND WATER CHRONOLOGY

Weather conditions influenced the arrival and departure of migratory birds each year. However, the pattern and duration of migratory bird use throughout the basin was largely determined by the amount and the timing of the stream runoff from the surrounding mountains.

Under contract with the Fish and Wildlife Service, the U.S. Geological Survey (USGS) conducted streamflow measurements and water budget studies throughout the 4-year study period. Included was the installation and monitoring of a total of seven gaging stations and velocity deflection recorders on Silver Creek, the Donner und Blitzen and Silvies Rivers, and Malheur Lake. Measurements were also made at numerous bypasses where Silvies River water reached Malheur Lake outside of the defined East and West Fork channels. Combined, these efforts identified the major timing, volume, and source of inflow to Malheur Lake. Other information collected included lake levels, and volume and sources of outflow. Data collected were published in the USGS annual water records for the State of Oregon.(1975, 1976, 1977, and 1978).

The hydrology study verified several earlier understandings about the contribution of the Silvies and Donner und Blitzen Rivers to Malheur Lake. Among these is that the major source of inflow is the Donner und Blitzen River. Also, that in spite of a major withdrawal and consumption upstream from the lake, the Silvies River provides enough inflow during "wet years" to make a major contribution to lake depth and surface area. A general summary of the hydrological data is provided in Table 4.

Flooding in the Silvies River Flood Plain and Malheur Lake area varied considerably during the 4-year study period. Photos (satellite imagery) 1 through 4 illustrate maximum spring flooding

Table 4. Comparison of Watershed Yield to In-Flow to Malheur Lake

LOCATION	1975 Acre-Ft	1976 Acre-Ft	1977 Acre-Ft	1978 Acre-Ft
Silvies River				
Volume at Burns	152,200	114,300	19,260	146,500
Lake In-Flow	32,660	14,340	560	38,700
DIFFERENCE 1/	119,540	99,960	18,700	107,800
Donner und Blitzen River				
Volume at Frenchglen	116,700	89,750	48,300	116,100
Lake In-Flow	30,270	20,240	25,670	---2/
DIFFERENCE 3/	86,430	69,510	22,630	---

1/ Difference represents loss primarily to irrigation diversion and related absorption, transpiration, and evaporation.

2/ Gage not in operation.

3/ Difference represents diversions in the Blitzen Valley to maintain ponds and wet meadow breeding habitat, absorption, transpiration, evaporation, etc.

conditions each year. Photos 5 through 8 illustrate water conditions in the fall. These photos are provided at the end of this section (Pages 34 through 37).

USGS hydrologic data for the 4-year study period are presented graphically in Figures 8 (Silvies River), 9 and 10 (Donner und Blitzen River), 11 (Malheur Lake), and 12 (Silver Creek). Figures referenced are found at the end of this section.

A brief summary of weather and water conditions for each year follows.

1975

Weather

The spring of 1975 was characterized by unseasonably cold weather and frequent snow storms. The effect of this cold, late spring on bird migration was twofold. First, cold weather delayed spring runoff, flooding, and spring ice breakup in Harney Valley by 2 to 3 weeks. The lack of open waters forced early migrants to concentrate on limited water available in the lower Blitzen Valley, at the Double-O, and Big Red S Field (Unit 22G and H). Secondly, frequent snow storms in February, March, and April delayed the arrival of most species.

Water Chronology

In 1975, most surface water remained frozen through mid-February. Several ponds began to open by late February and the first flood irrigation was noted on February 26. By early March most ponds were open; however, the western two-thirds of Malheur Lake remained ice covered through mid-March. Most of Unit 6 was open during the first week of March, and much of Unit 1 also had open, flooded meadows by this date.

By March 20, much of Unit 22 between Burns and Malheur Lake was being flood irrigated. Peak flows of 600 cfs occurred in the Silvies River in late April (Figure 8), and by the end of the first week in May, most of the basin had water which resulted from excellent snowpack on both the Blue Mountains and Steens Mountain. Runoff from Steens Mountain in the Donner und Blitzen River peaked at about 600 cfs near Frenchglen in late May (Figure 9). The volume of water reaching Malheur Lake from the Donner und Blitzen River also peaked in May at 440 cfs (Figure 10).

Surface run-off was excellent in Unit 21 which provided ideal water conditions southwest of Buchanan and on Unit 6 in east Malheur Lake. All creeks that empty into Unit 21 had excellent flows which produced good migration and nesting habitat.

Malheur Lake peaked at 44,700 surface acres in mid-July, the latest date for the entire study period (Figure 11). In mid-October the lake had declined to 28,600 surface acres.

Unit 16 began flooding in early March. Peak flows from Silver Creek were recorded at just over 200 cfs in late May (Figure 12).

Some flooding occurred on the Silvies River Flood Plain in early December 1975, when the warmest temperature ever recorded in Burns for the month of December (61° F.) brought a rapid, though short-lived, snowmelt. This caused a significant amount of flooding south of Wright's Point but it froze shortly after the thaw and remained frozen during the remainder of the month.

1976

Weather

The winter and spring of 1976 were mild and precipitation was sufficient to provide conditions allowing migratory birds to arrive and depart the basin 2 to 3 weeks earlier than in 1975. Precipitation totalled 3.99 inches for the period January through April. This was 0.57 inches below the average for this period but snowpack in the surrounding mountains was enough to insure sufficient runoff to provide adequate migratory bird habitat. However, the differences in weather caused a significant change in the chronology of flooding and the use on those waters during spring migration.

Fall temperatures were relatively mild, with the first freezing temperature being recorded on October 7. More important was the lack of precipitation throughout the basin. For the period October through December precipitation was 3.74 inches below normal and no snowfall was recorded in Burns. These conditions continued through the spring of 1977 and resulted in drought conditions with severe adverse effects on migratory birds.

Water Chronology

Changes in the chronology and distribution of floodwaters in the basin had major impacts on migratory bird use during the spring of 1976.

The Silvies River reached a peak flow of 700 cfs in April. The Donner und Blitzen peaked at about 400 cfs near Frenchglen and 250 cfs at Voltage in April. Peak flows in Silver Creek were 250 cfs in April.

In 1976 Sage Hen Creek southwest of Burns had a large early runoff which flooded several sections of land west of Highway 205. In 1975 Sage Hen Creek had only minimal flows and flooding was of minor importance to migratory birds.

The most pronounced change in flooding occurred in Unit 21 east of Burns. In 1975 this area had several thousand acres of flooded meadows and ponds fed by numerous small drainages north of Highway 20. However, in 1976 only Soldier and Cow Creek drainages had enough runoff to support migratory bird use. By late May 1976, Malheur-Ninemile Slough was reduced to about 30 acres of water where the previous year there were about 200 acres of ponds that supported several hundred pairs of nesting birds.

Early runoff in 1976 also had an effect on Malheur Lake which reached a peak of about 46,800 surface acres on March 15 (Figure 11).

This was 16 weeks earlier than in 1975. By mid-October Malheur Lake had receded to about 29,900 surface acres.

1977

Weather

Temperatures in the spring of 1977 were generally above normal but the factor most affecting waterfowl migration was far-below-normal levels of precipitation. This low precipitation resulted in a severe shortage of water throughout the spring and caused most waterfowl to depart shortly after arrival. For the 4 months ending April 30, 1977, precipitation totaled 1.57 inches at Burns, which was 2.99 inches (66 percent) below normal. The result in 1977 was little spring flooding and very poor habitat for migratory waterfowl.

Fall weather was mild and precipitation increased so that by the end of the year total precipitation was only 1.40 inches below normal.

Water Chronology

Unlike 1975 and 1976, much of the basin received little or no water in 1977. Snow was almost nonexistent in the Blue Mountains and much below normal on Steens Mountain.

The Silvies River reached a peak flow of 70 cfs in April (compared to the 1975/76 average of 650 cfs). The Donner und Blitzen peaked at about 190 cfs near Frenchglen in June (compared to the 1975/76 average of 500 cfs). Peak flows in Silver Creek were 30 cfs in June.

Ranchers with early water rights began flooding meadows in January and February in anticipation of drought conditions. By February 18, meadows

were flooded west and southeast of Island Ranch headquarters in Unit 22F (Plate 3). By late February meadows were being flooded north, south, and southeast of Burns in small isolated areas. These were the only areas on the Silvies River Flood Plain that received water in 1977.

Unit 23 was mostly dry except for the Slash C Ranch, where considerable water was pumped onto the diked fields. The Chain Lakes, which are southeast of Palomino Buttes, remained dry throughout the 1977 migration period. In 1975 and 1976 these lakes contained water and provided resting habitat for thousands of migrating waterfowl.

Minor flooding occurred in Unit 16 in Silver Creek Valley by March 7, 1977, but most of the valley remained dry throughout the year. Similarly, Warm Springs Valley received no water, and Moon and Chickahominy Reservoirs were nearly dry by July 1.

Prater Creek in Unit 21 was flooding on April 12, but the unit was dry by April 20. Also, the small amount of water present in Unit 22 (Silvies River Flood Plain) was receding in April. By the end of spring migration and the onset of nesting, most of this unit was dry except for small areas near Potters Swamp (Unit 22D), Bell A Ranch (Unit 22E), and north of Burns (Unit 22A). Most of the Island Ranch was dry by the end of the spring migration period. The East Fork of the Silvies River never received water south of Lawen, and the West Fork was dry from Potter Swamp Road south to Malheur Lake by July 15. On September 1, the Silvies River was also dry northwest of Seneca.

The water supply for Malheur National Wildlife Refuge was generally better than for private lands. Malheur Lake had thawed by March 20, and by the end of March had peaked at 36,200 surface acres (Figure 11). By the end of June the lake had receded to 25,000 surface acres and by mid-

August lake levels became too low to measure. It is estimated that the lake level may have receded to 16,000 surface acres or less by mid-October.

Spring weather conditions delayed rapid runoff on Steens Mountain and most of the refuge wetlands in the Blitzen Valley had water by the end of May. These wetlands retained good water levels until August as a result of delayed runoff and water management by the refuge.

Most migrant ducks passed over the basin because of drought conditions and the lack of food in Malheur Lake. Except for fall migrating shorebirds, migrating and nesting birds made little use of the lake in 1977.

1978

Weather

Spring weather was generally mild in 1978. For the 4-month period of January through April temperatures averaged above normal the first 3 months, with only April slightly below the 10-year average. Precipitation was above normal each month of this same period, totaling 7.4 inches which is 2.84 inches above normal. These factors, combined with excellent snowpack in the surrounding mountains, resulted in ample spring flooding throughout the basin and excellent habitat for spring migrants.

Fall temperatures were slightly colder than normal but the fall migration appeared consistent with prior wet years.

Water Chronology

Winter weather conditions provided adequate amounts of snow in the Blue Mountains and on

Steens Mountain, and moderate weather in the spring provided some flooding in late February. The Silvies River reached a peak flow of 890 cfs in April (highest of the 4-year period). The Donner und Blitzen peaked at about 390 cfs near Frenchglen in May. Peak flows in Silver Creek were 340 cfs in March.

Subunits 22F, G, H, and I were receiving runoff on February 28, although some areas were still frozen. Unit 21 received ample floodwater in February and was heavily used by spring migrants. Ample flooding also occurred in February in Unit 16 in the Silver Creek Valley.

Almost all areas of the basin were receiving water early in March, and only the Chain Lakes in Unit 23 were still partially frozen. By late March there was extensive flooding throughout Units 16, 21, 22, and the Chain Lakes of Unit 23. On Malheur Refuge, Unit 1 received ample floodwater, and in the Blitzen Valley Units 7 to 12 were being flooded. Water conditions remained good on the flood plain through the nesting season and waterfowl had high nesting success.

Malheur Lake was receiving inflow from the Silvies River, the Donner und Blitzen River, as well as Malheur Slough, and in mid-June peaked at just over 52,000 surface acres, the highest lake level recorded during the study (Figure 11). The lake receded to 30,600 surface acres in mid-November.

On the Silvies River Flood Plain, only Unit 22D, which also receives water from springs independent of the Silvies River, maintained water during fall migration. Most other areas were dry and fall migratory bird use patterns resembled those in 1975 and 1976, with the exception of Malheur Lake. The lake had much higher fall use than in previous years because of excellent sago pondweed production.

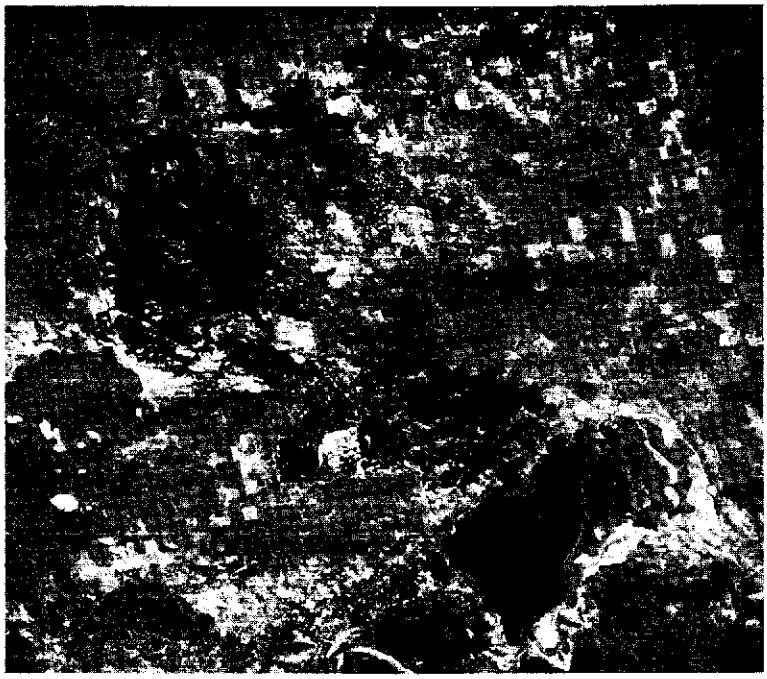


Photo 1. Spring Flooding, May 1975

Photo 2. Spring Flooding, May 1976

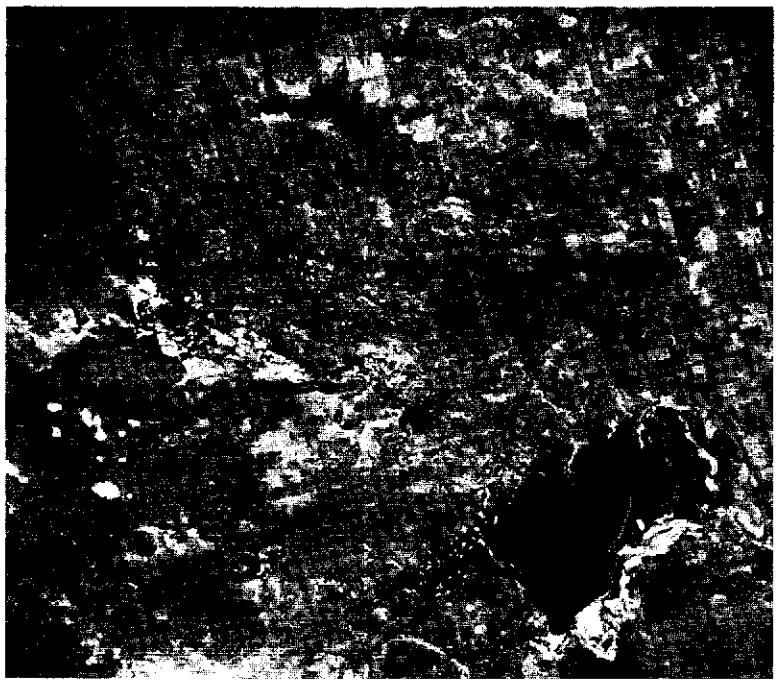


Photo 3. Spring Flooding, April 1977

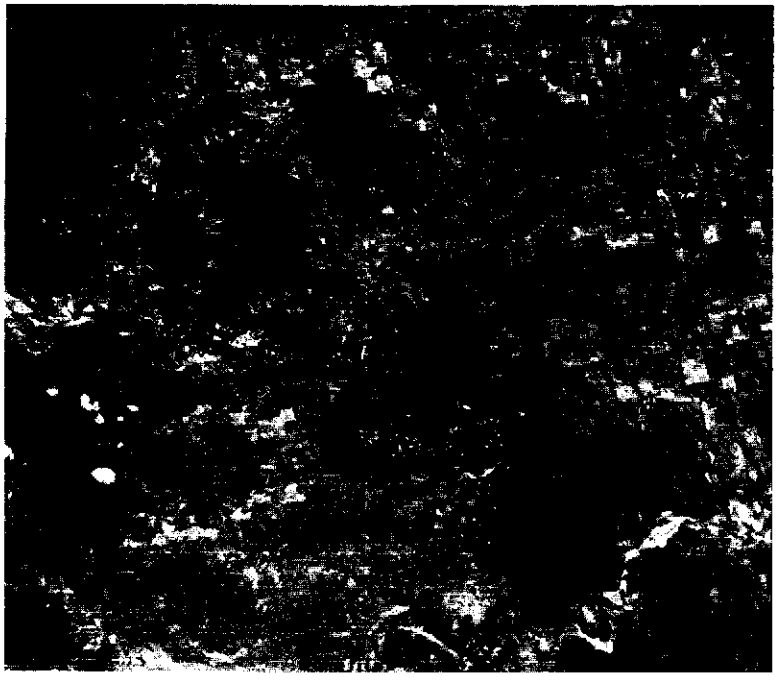


Photo 4. Spring Flooding, April 1978

Photo 5. Fall Water Distribution, September 1975

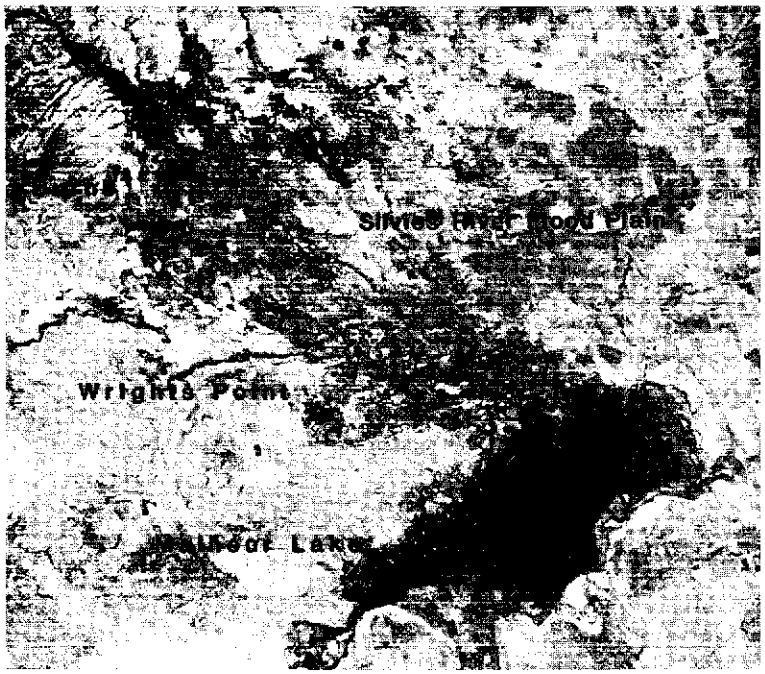


Photo 6. Fall Water Distribution, September 1976

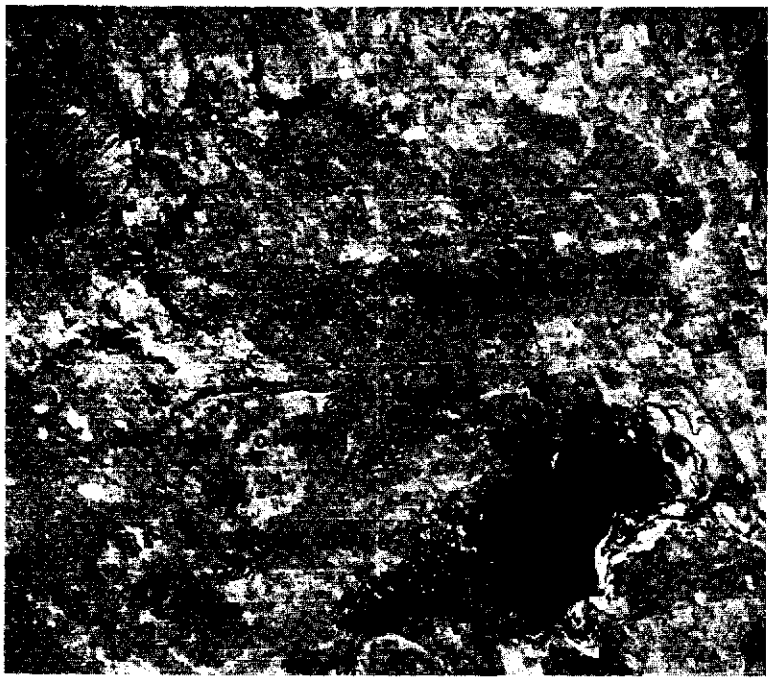


Photo 7. Fall Water Distribution, September 1977

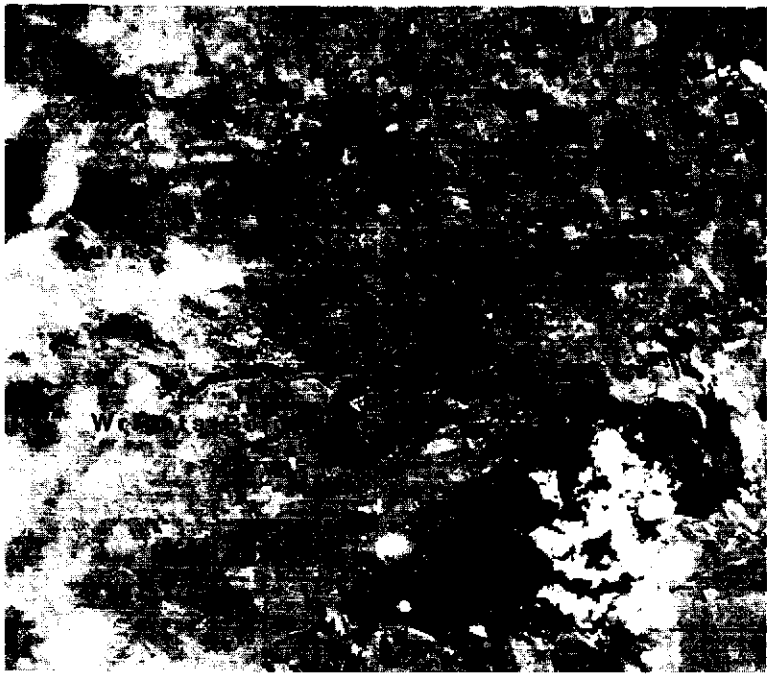


Photo 8. Fall Water Distribution, September 1978

Figure 8. Streamflow - Silvies River near Burns

Figure 9. Streamflow - Donner und Blitzen River near Frenchglen

Figure 10. Streamflow - Donner und Blitzen River near Refuge Headquarters

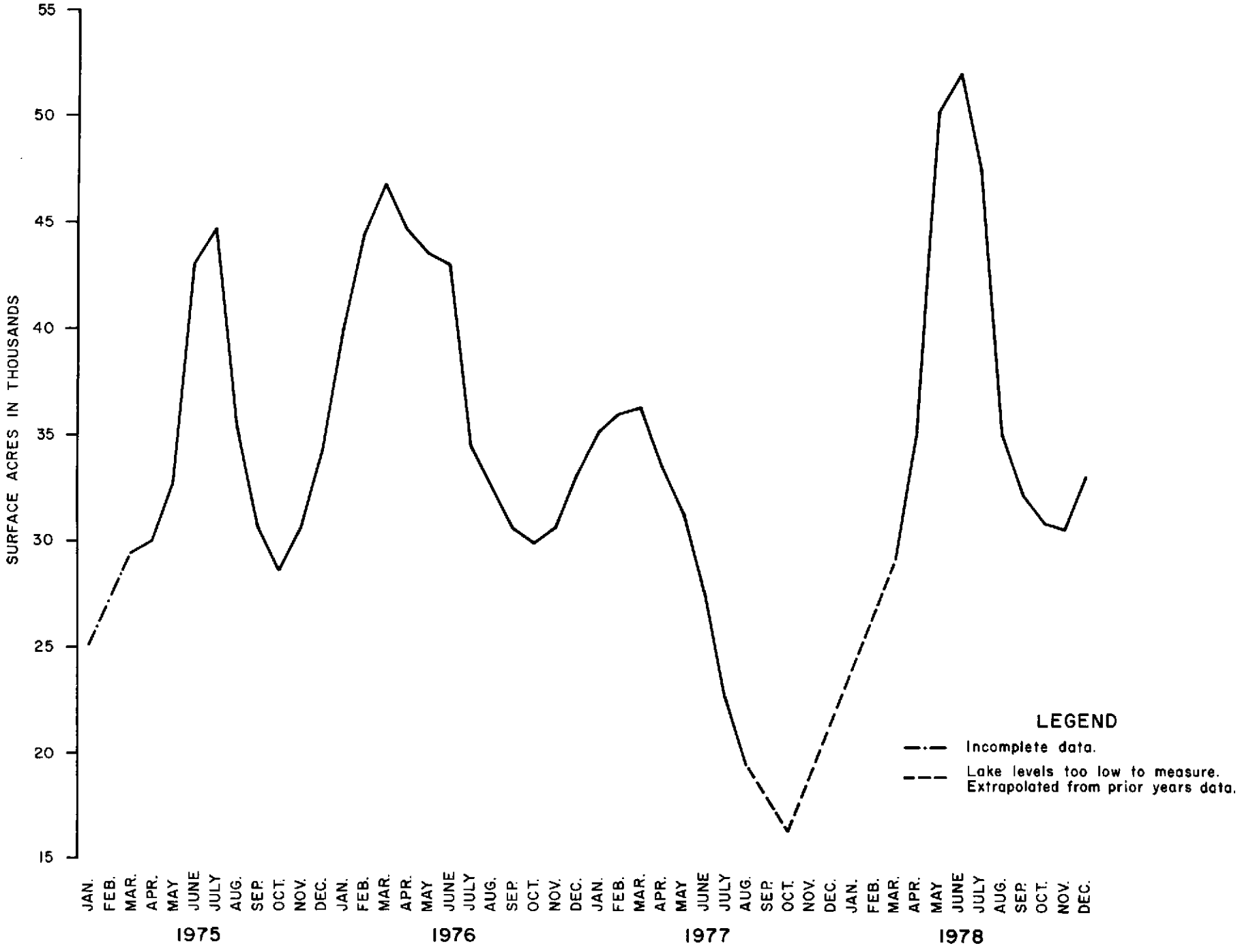
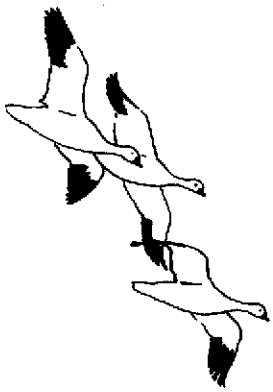


Figure 11. Surface Area of Malheur Lake

Figure 12. Streamflow - Silver Creek near Riley



SPRING
WATERFOWL MIGRATION

SPRING WATERFOWL MIGRATION

Waterfowl censuses were conducted on a weekly basis during spring migration using a modified strip count or transect method. Counts were made from fixed-wing aircraft, flying over known concentration areas at low levels (approximately 100 feet). This technique proved to be effective, economical, and in the long run the only practical method of censusing such a large area. Seventy hours were spent in the air monitoring spring migration in 1975, 60 hours in 1976 and 1977, and 70 hours in 1978.

Ground counts were found to be necessary in some geographical areas and habitat types, and where a great diversity of species was present. Unit 1 (Stinking Lake) and Unit 11 (Boca Lake) were often counted in this manner.

During the first 2 years of the study some supplemental counts were made by airboat on Malheur Lake. Airboat counts were not necessary in 1977 because low water levels simplified aerial surveys. Airboat counts were not conducted in spring 1978 because of the possible detrimental effects on colonial nesting birds.

The winter and spring of 1975 were cold and waterfowl arrived and departed 2 to 3 weeks later than in 1976. Mild weather in the spring of 1976 allowed most species to continue their northward migration without delay and therefore use patterns observed in early April 1975 did not reoccur in 1976. Based on past weather records in Burns and bird arrival records at Malheur Refuge, it appears that the 1976 bird arrivals were "normal" whereas 1975 was an unusual year with obvious delays in migration because of weather.

Spring waterfowl migration began normally in 1977 but peak numbers and waterfowl use were much lower than in 1975 or 1976 because of

drought conditions throughout the basin. Water and habitat conditions were greatly improved in 1978 and waterfowl numbers and use increased over 1977 levels.

Many changes were observed during spring migration over the 4-year study period. Most of the differences were related to availability of water and habitat, food availability, and climatic conditions. These factors contributed to some major changes in distribution of birds.

Spring waterfowl use-days are summarized in Table 5. Use-day data for individual subunits in the Silvies River Flood Plain (Unit 22) are provided in the section pertaining to the potential impacts of water development on the flood plain and Malheur Lake. Figures and plates referenced in the text are found at the end of this section.

DUCKS

Duck migration began in early February, peaked by mid-March, and usually declined to breeding numbers by mid-May each year except in 1978 when basin duck populations stabilized at about 45,000 by the last week in April (Figure 13). The pintail was the earliest migrant followed by American wigeon and green-winged teal. Later migrants included shovelers, redheads, and ruddy ducks. These same species, in order, were also the most abundant species, except in 1975 when ruddy ducks were second in abundance to the pintail.

Principal duck use areas (Plate 4) varied considerably from year to year in some portions of the study area, primarily because of differences in water supply and distribution. This was especially true in Unit 22 (Silvies River Flood Plain) where substantial variations

Table 5. Spring Waterfowl Use-Days in Malheur-Harney Lakes Basin, 1975 to 1978

LOCATION	1975	1976	1977	1978
MALHEUR REFUGE				
Double-O				
Ducks	1,606,500	984,700	713,900	1,451,200
Geese	649,800	520,900	555,200	528,700
Swans	3,100	4,600	8,200	12,900
Total	2,259,500	1,510,200	1,277,300	1,992,800
Malheur Lake				
Ducks	2,202,400	2,052,200	1,120,000	2,077,200
Geese	460,300	696,700	414,000	402,400
Swans	458,300	292,900	218,700	64,800
Total	3,121,000	3,041,800	1,752,700	2,544,400
Blitzen Valley				
Ducks	1,199,100	1,400,300	976,300	1,048,500
Geese	114,000	207,900	155,300	146,500
Swans	18,200	13,100	18,900	9,700
Total	1,331,300	1,621,300	1,150,500	1,204,700
REFUGE TOTAL				
Ducks	**5,008,100**	**4,437,200**	**2,810,200**	**4,576,900**
Geese	**1,224,100**	**1,425,500**	**1,124,500**	**1,077,600**
Swans	**479,600**	**310,600**	**245,800**	**87,400**
TOTAL	**6,711,800**	**6,173,300**	**4,180,500**	**5,741,900**
OFF REFUGE				
Silvies River F. P.				
Ducks	4,428,500	5,690,200	972,600	3,812,700
Geese	864,100	567,700	213,800	461,600
Swans	14,800	39,000	19,100	11,000
Total	5,307,400	6,296,900	1,205,500	4,285,300
Other Private Lands				
Ducks	2,776,700	2,808,700	636,200	1,890,100
Geese	141,100	107,000	78,600	173,000
Swans	17,200	18,200	6,100	11,500
Total	2,935,000	2,933,900	720,900	2,074,600
OFF REFUGE TOTAL				
Ducks	**7,205,200**	**8,498,900**	**1,608,800**	**5,702,800**
Geese	**1,005,200**	**674,700**	**292,400**	**634,600**
Swans	**32,000**	**57,200**	**25,200**	**22,500**
TOTAL	**8,242,400**	**9,230,800**	**1,926,400**	**6,359,900**
BASIN TOTAL				
DUCKS	**12,213,300**	**12,936,100**	**4,419,000**	**10,279,700**
GEESE	**2,229,300**	**2,100,200**	**1,416,900**	**1,712,200**
SWANS	**511,600**	**367,800**	**271,000**	**109,900**
GRAND TOTAL	**14,954,200**	**15,404,100**	**6,106,900**	**12,101,800**

in natural flooding occurred. The largest change was in 1977 when drought conditions severely limited distribution of ducks throughout the basin.

Total spring duck use was relatively uniform for the 3 "wet" years of 1975, 1976, and 1978 (Table 5). In 1977, however, drought conditions resulted in a substantial reduction in total use-days. A comparison of spring duck use by unit is presented in Figure 14.

GEESE

Goose migration began in early February, peaked in mid-March (except in 1975 when it peaked in mid-April), and declined to breeding numbers by early May each year (Figure 15). The delay in the 1975 migration pattern was the result of an unusually cold spring as discussed earlier. Lesser Canada geese were the earliest migrants and snow geese the most abundant. Principal use areas for Canada geese (Plate 4) were essentially the same each year since preferred habitats were not highly water-oriented. Spring use for each study unit for all species of geese is shown in Figure 16. The Double-O area of Malheur Refuge, Malheur Lake, and the Silvies River Flood Plain received the greatest spring use.

Total spring goose use was relatively equal in 1975 and 1976, but decreased about 33 percent in 1977, with a slight recovery in 1978.

SWANS

Whistling swan migration began in mid-February, peaked in late March, and ended about May 1, each year (Figure 17), leaving only the small resident population of trumpeter swans in the basin. Principal use areas (Plate 5) were the same each year, with Malheur Lake receiving from

59 to 90 percent of the total spring basin use. The Silvies River Flood Plain was generally second in use (Figure 18).

Total spring swan migration declined each year during the study, as indicated by a 79 percent reduction in total basin use-days between 1975 and 1978.

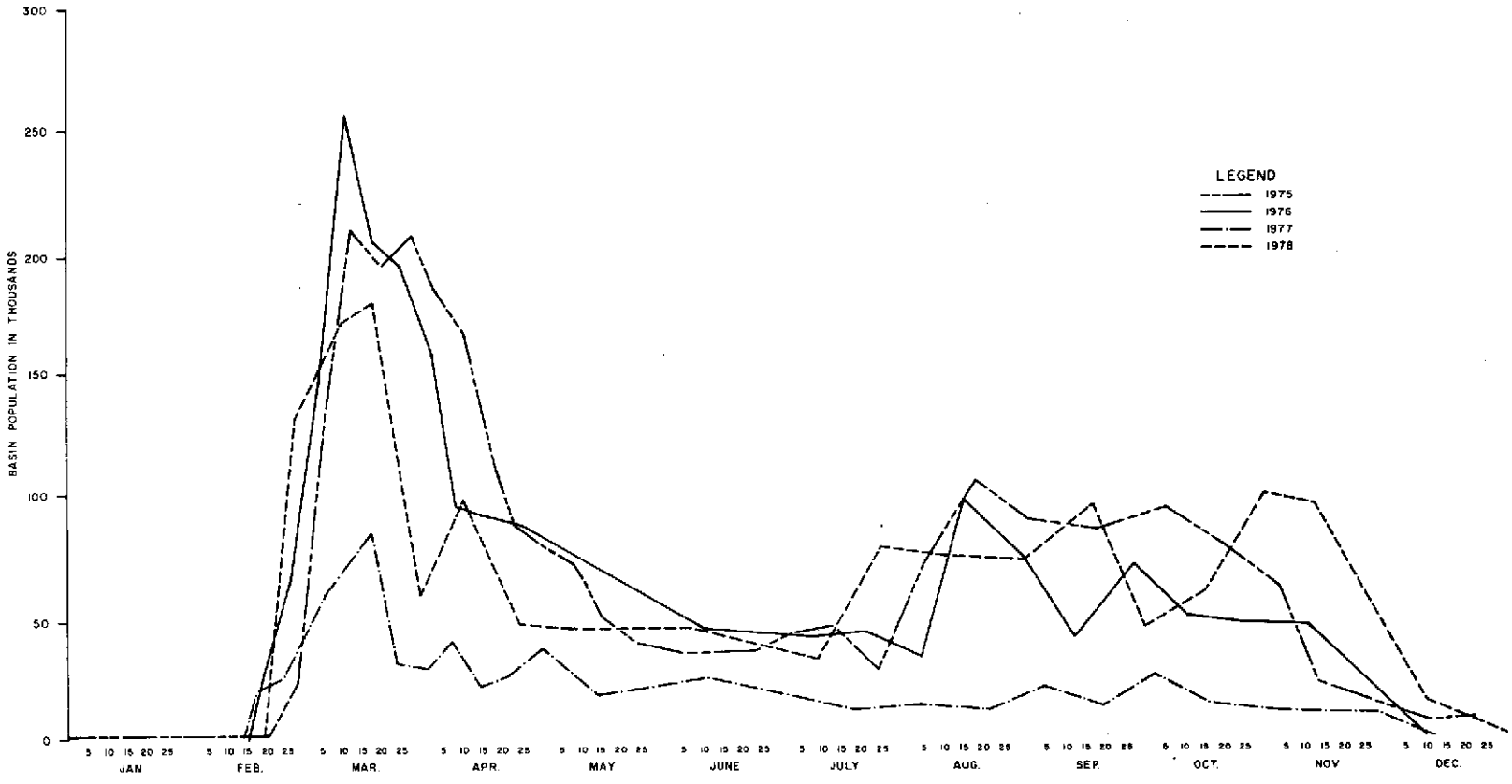


Figure 13. Duck Migration Chronology 1975-1978

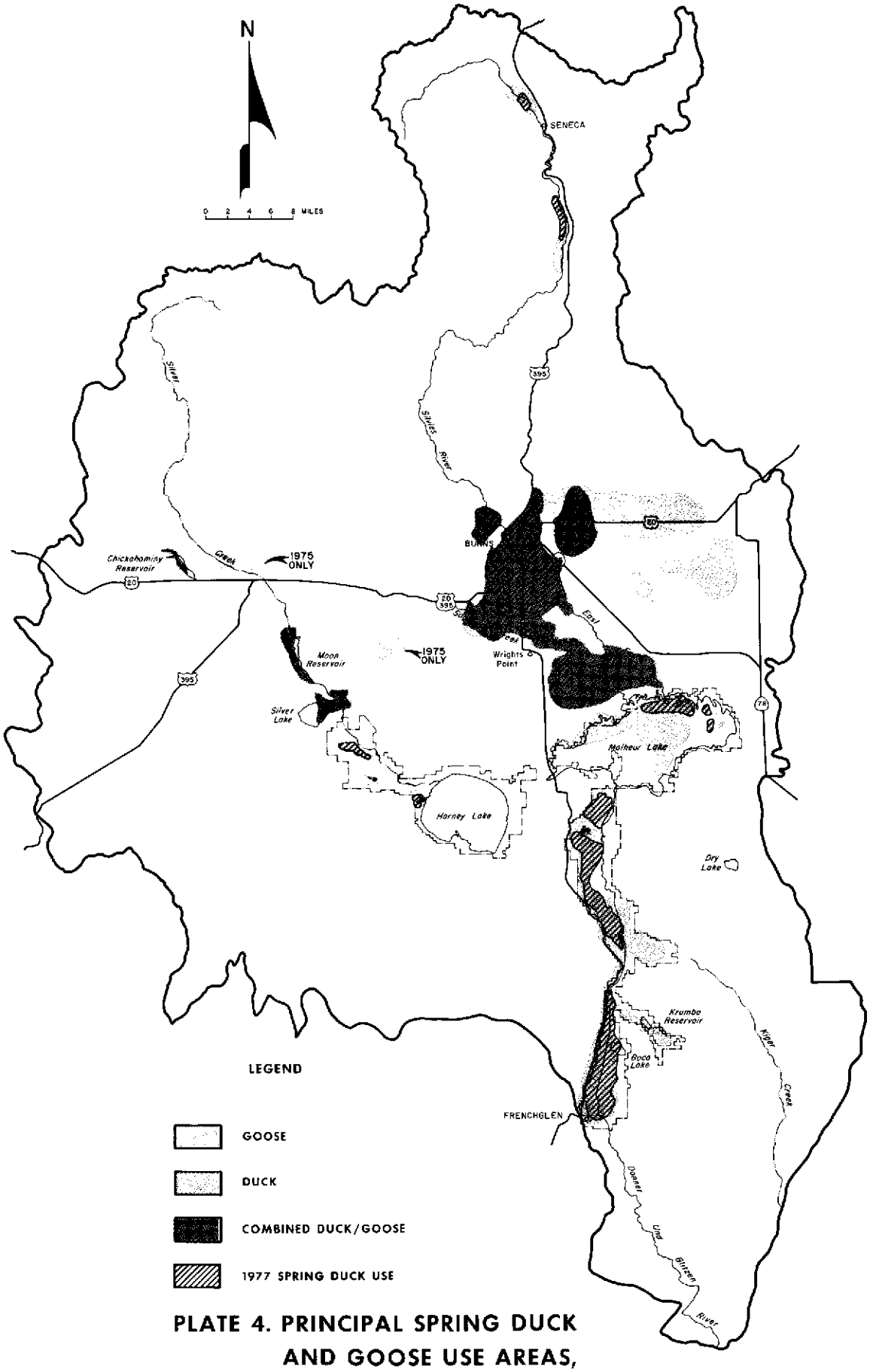


PLATE 4. PRINCIPAL SPRING DUCK AND GOOSE USE AREAS, 1975-1978

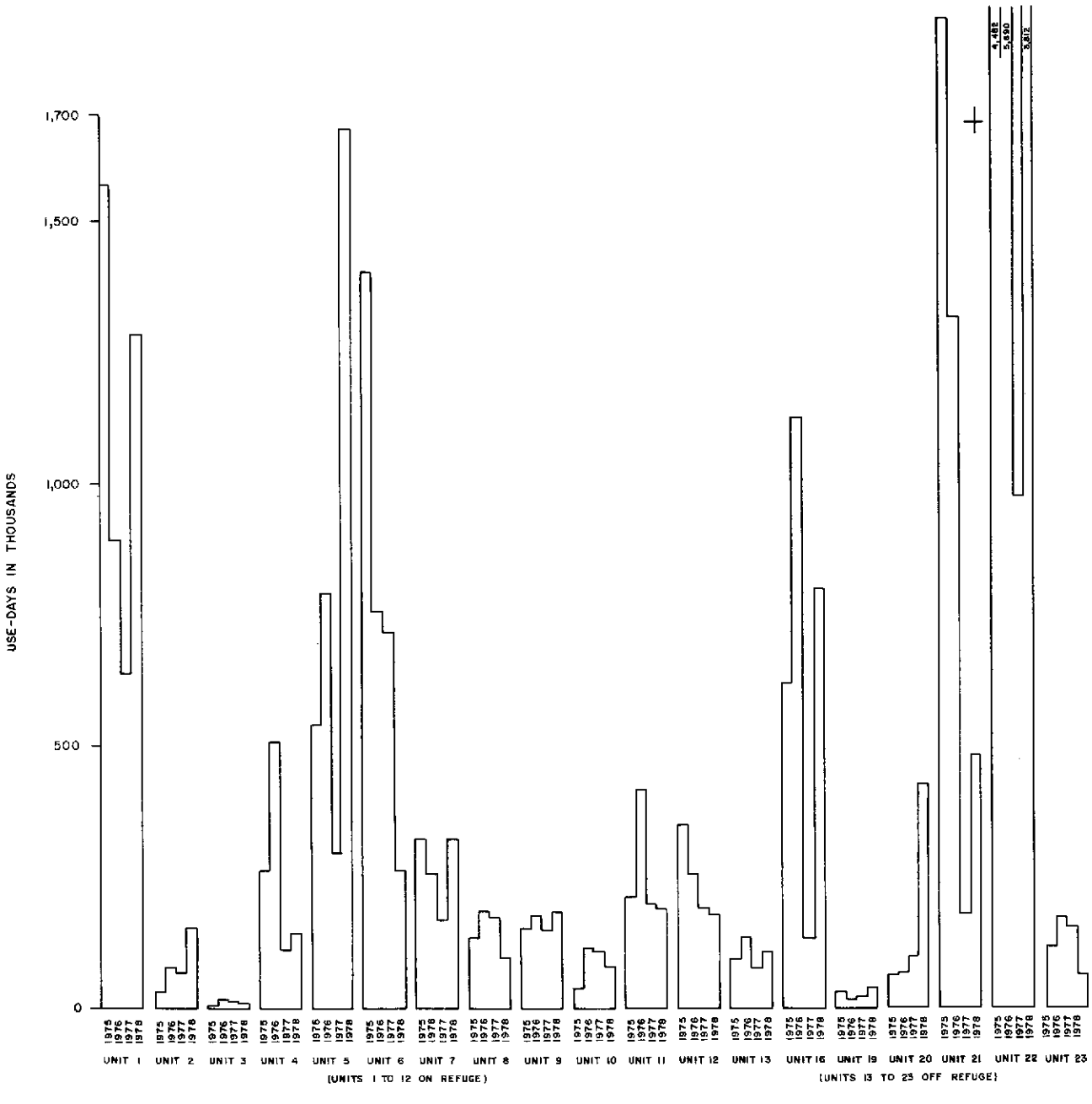


Figure 14. Spring Duck Use

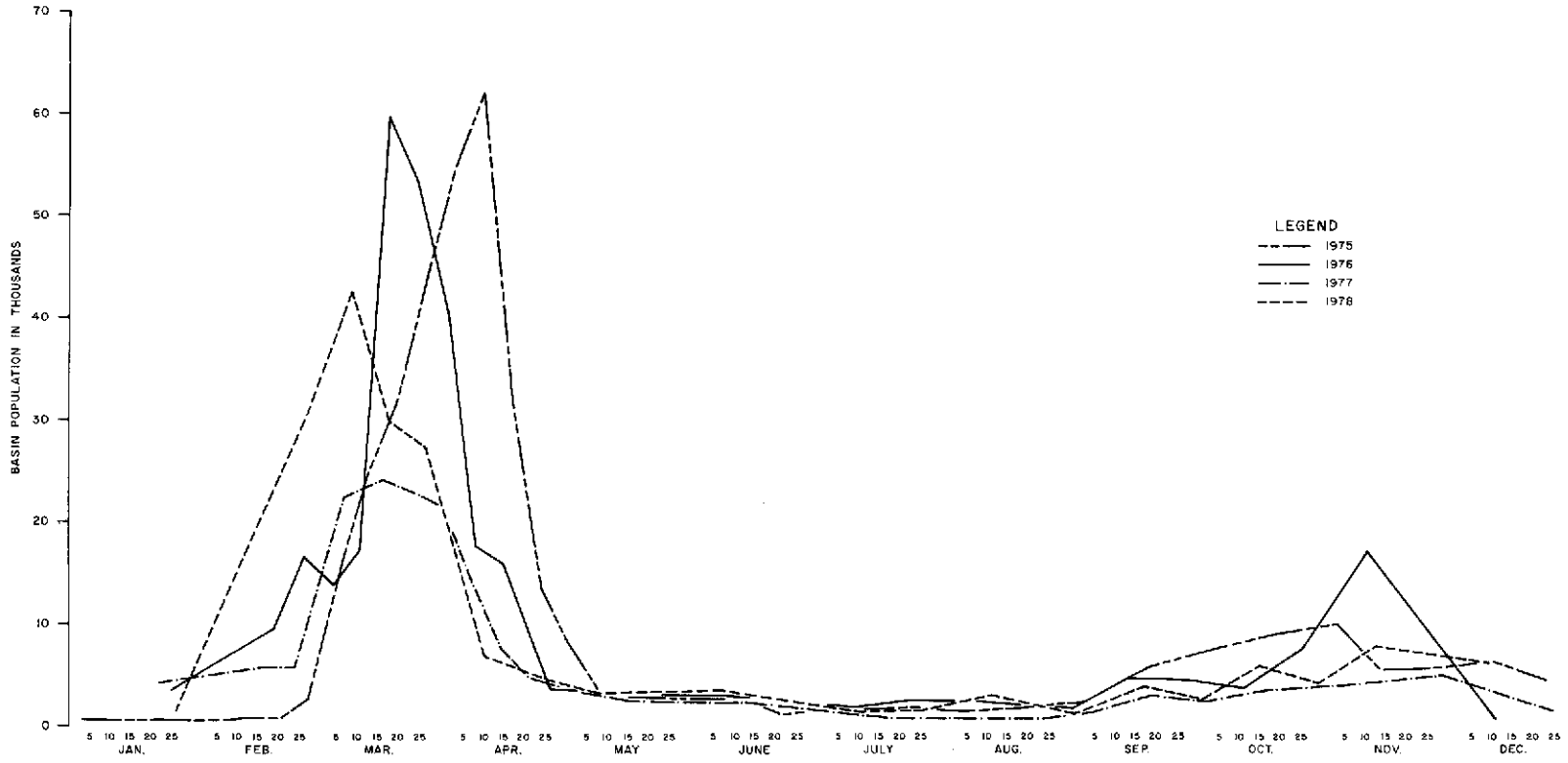


Figure 15. Goose Migration Chronology 1975-1978

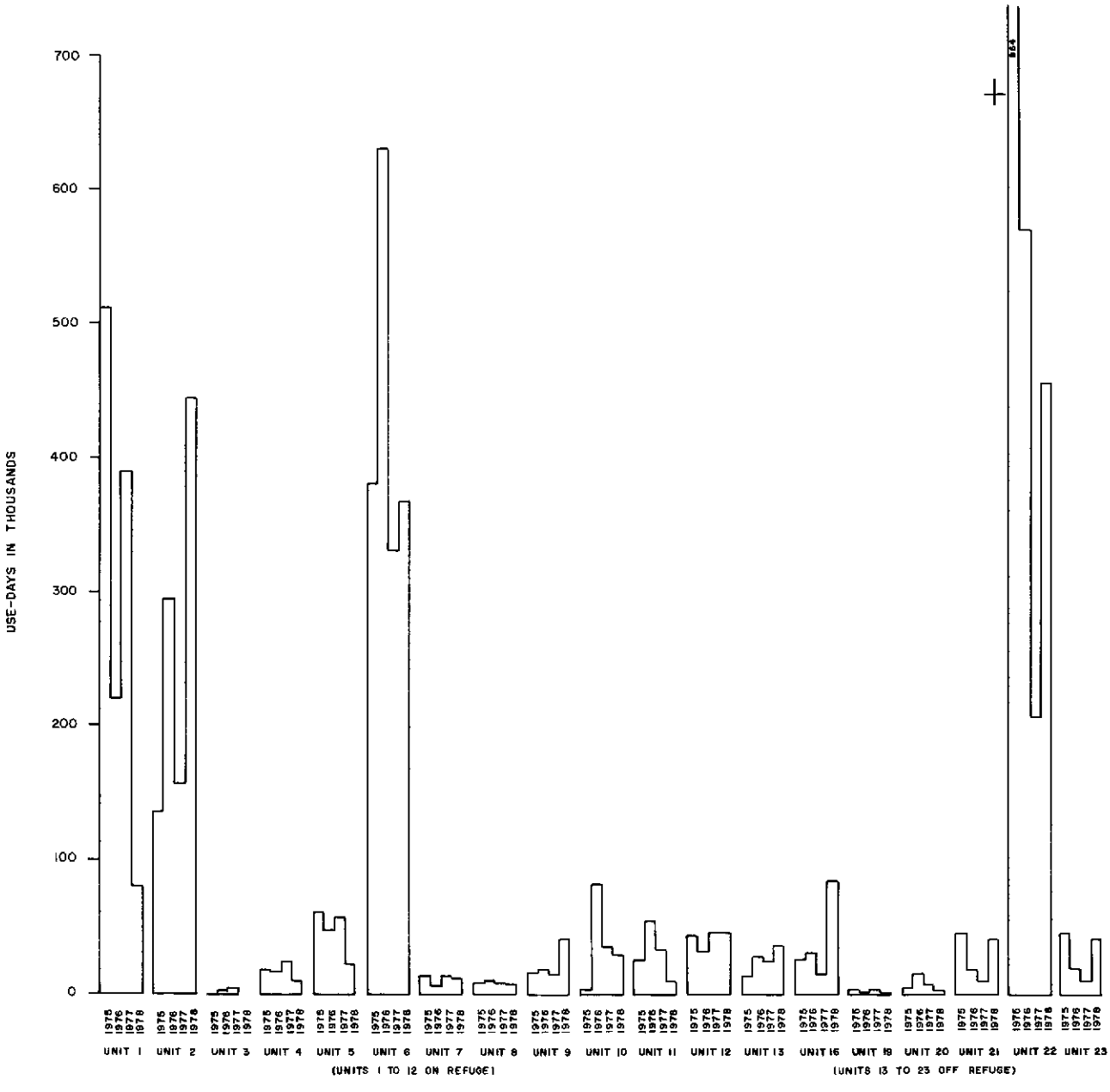


Figure 16. Spring Goose Use

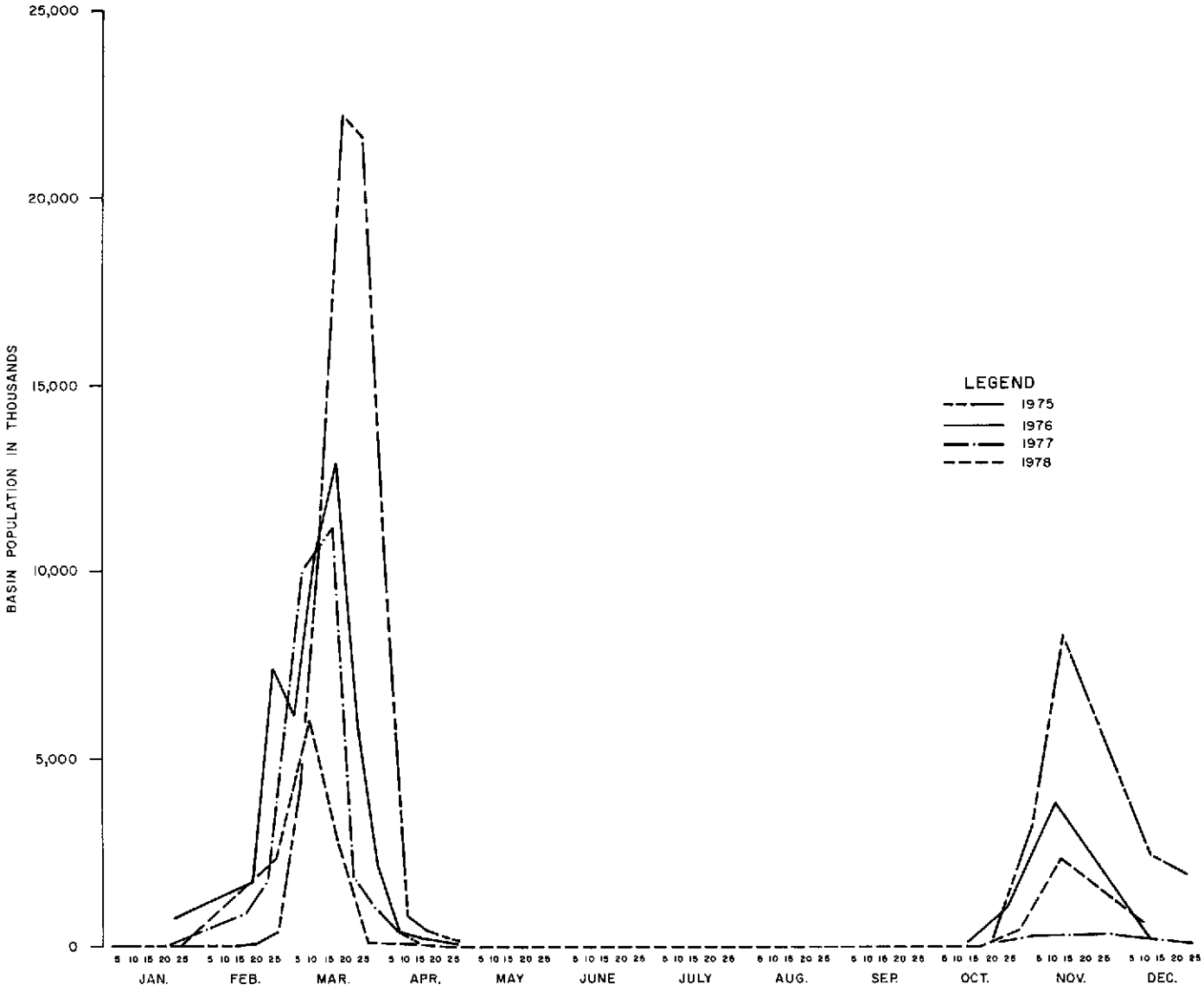


Figure 17. Swan Migration Chronology 1975-1978

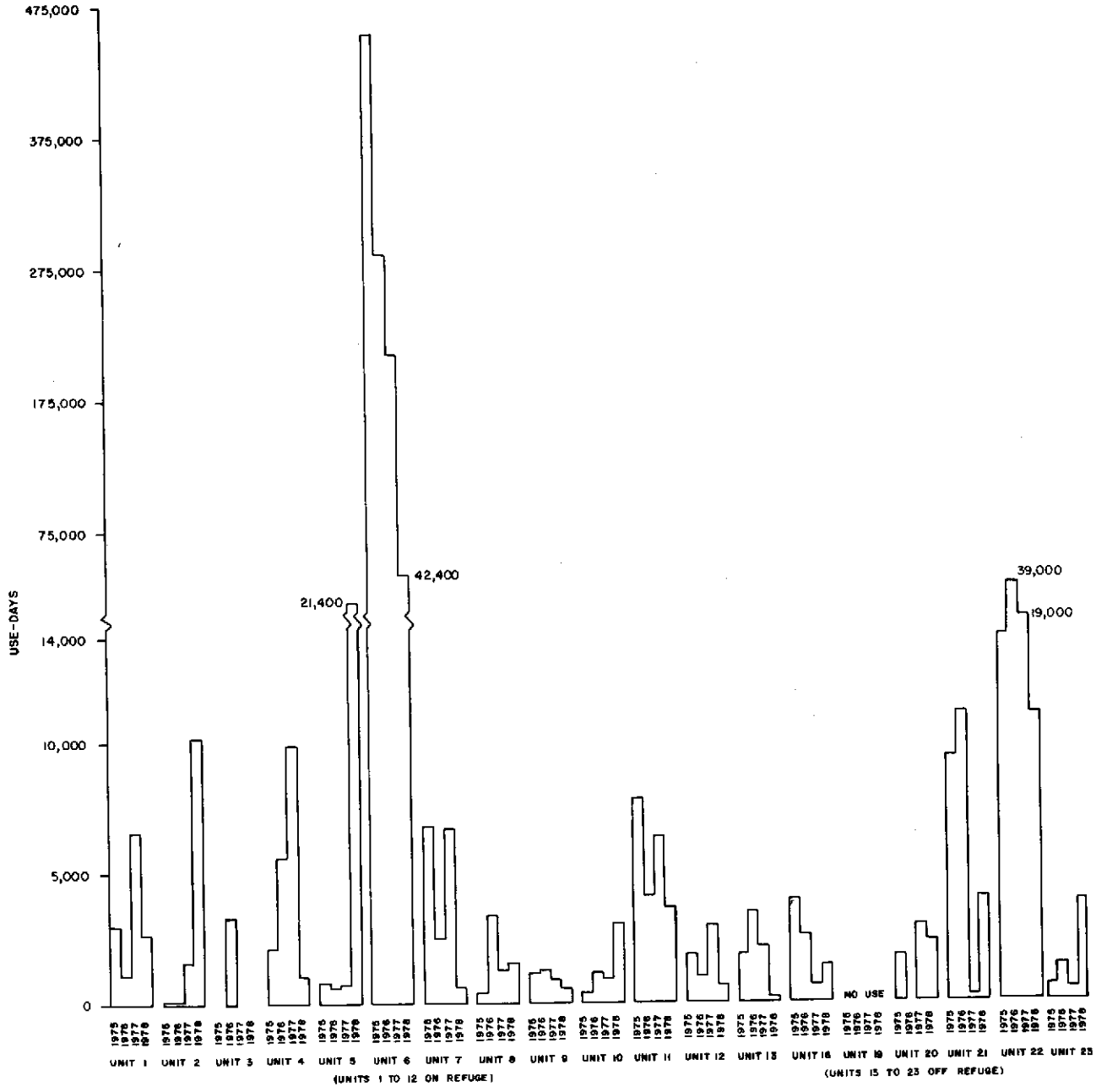


Figure 18. Spring Swan Use

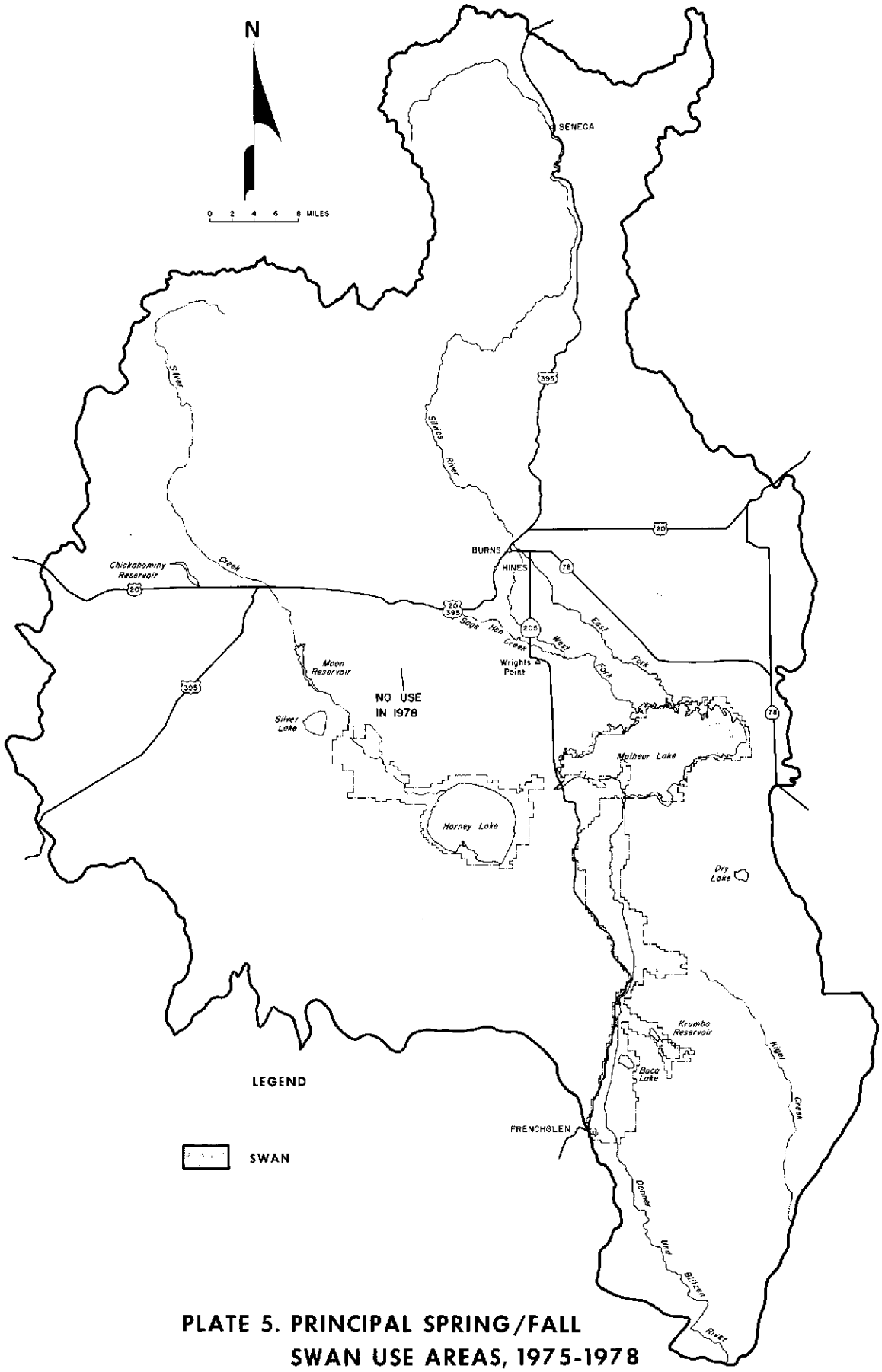
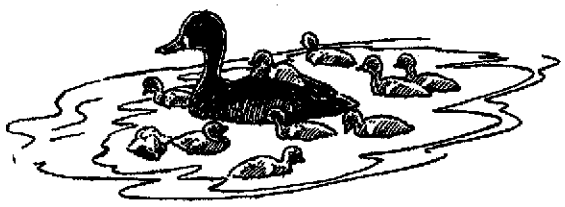


PLATE 5. PRINCIPAL SPRING/FALL SWAN USE AREAS, 1975-1978

WATERFOWL PRODUCTION



WATERFOWL PRODUCTION

Waterfowl pair counts were conducted during May of each year both aerially and on the ground. Total breeding population was determined by air-ground correlation figures (Martinson and Koczynski, 1967) and expanded by the percentage of habitat not covered.

Duck and goose brood counts were made on the ground between 5:30 and 10:30 a.m. in late July. Each year a percentage of the total brood habitat was surveyed and the number, species, and age class of each brood was recorded. The off-refuge habitat surveyed each year is shown in Table 6. Correction factors suggested by Hammond (1970) and the percentage of habitat surveyed were used to determine total production. Production data for Malheur National Wildlife Refuge were supplied by refuge personnel. The principal duck and goose nesting areas in the basin are shown in Plate 6 at the end of this section.

Nesting conditions were generally good throughout the basin in 1975, 1976, and 1978, but were poor in 1977 because of drought conditions. The

Table 6. Off-refuge Habitat Surveyed During Waterfowl Brood Counts

Area	1975	1976	1977[1]/	1978
River (miles)	17.1	13.9	4.0	5.4
Ditches (miles)	17.2	12.8	0	14.3
Marsh (miles)	2.0[2]/	0	0	0
Ponds (acres)	145.0	130.0	105.0	135.0

1/ Drought year.
2/ A straight line transect was used in 1975, but marsh area was included in ponds (acres) on subsequent years.

number of breeding pairs for each year is shown in Table 7. Waterfowl production is shown in Table 8. A summary of waterfowl production for each of the 4 years follows.

1975

Water supplies and distribution provided good nesting habitat throughout the basin for the entire nesting period.

Malheur Refuge

Water supplies were generally excellent for most species and provided good brood habitat well into August. Total duck production was 18,061 (Table 8). Production of diving ducks declined 51 percent from 1974 figures provided by the refuge. Production of redheads (a representative species) was 2,330, down 54 percent from 1974. Data on redheads are included because declining Flyway populations in recent years have led to a special emphasis on gathering data and to a commitment to improving habitat. The reason for the decline in redhead production in 1975 is not completely clear but is thought to be attributable to low water levels on Malheur Lake early in the nesting season (Figure 11).

Canada goose production on-refuge totalled 810 in 1975. This was 74 percent of total basin goose production. Trumpeter swans produced 7 young in 1975.

Off-refuge

Water conditions were excellent except for some shortages for late season broods, especially in the northern portion of Unit 22. This was accompanied by a conspicuous movement of duck broods southward toward Malheur Lake as the flood plain became drier.

Table 7. Breeding Pairs[1]/ of Waterfowl Using Malheur-Harney Lakes Basin, 1975 to 1978

SPECIES	1975 REFUGE	1975 OFF-REFUGE	1975 TOTAL	1976 REFUGE	1976 OFF-REFUGE	1976 TOTAL	1977 REFUGE	1977 OFF-REFUGE	1977 TOTAL	1978 REFUGE	1978 OFF-REFUGE	1978 TOTAL
Trumpeter Swan	10	---	10	11	---	11	12	---	12	22	---	22
Canada Goose	720	290	1,010	790	600	1,390	650	410	1,060	540	620	1,160
Mallard	1,730	1,180	2,910	2,100	1,620	3,720	2,280	410	2,690	1,980	810	2,790
Gadwall	1,650	1,400	3,050	1,650	1,200	2,850	2,180	490	2,670	1,470	1,000	2,470
Pintail	140	510	650	420	560	980	230	90	320	1,120	1,510	2,630
Green-winged Teal	190	130	320	120	430	550	180	20	200	550	340	890
Cinnamon/Blue-winged Teal	3,300	1,630	4,930	4,370	2,690	7,060	3,310	510	3,820	2,650	1,920	4,570
American Wigeon	300	200	500	340	280	620	230	30	260	130	140	270
Northern Shoveler	250	520	770	390	650	1,040	410	80	490	770	740	1,510
Wood Duck	13	---	13	11	30	41	---	---	---	---	---	---
Dabbler Duck Total	**7,573**	**5,570**	**13,143**	**9,401**	**7,460**	**16,861**	**8,820**	**1,630**	**10,450**	**8,670**	**6,460**	**15,130**
Redhead	1,960	1,050	3,010	1,780	1,140	2,920	1,100	70	1,170	3,790	620	4,410
Canvasback	120	140	260	120	150	270	30	20	50	160	190	350
Lesser Scaup	50	20	70	40	50	90	6	13	19	190	140	330
Ring-necked Duck	---	---	---	---	---	---	10	1	11	---	---	---
Ruddy Duck	340	550	890	1,540	250	1,790	470	9	479	2,280	210	2,490
Common Merganser	10	6	16	14	10	24	9	3	12	16	5	21
Diver Duck Total	**2,480**	**1,766**	**4,246**	**3,494**	**1,600**	**5,094**	**1,625**	**116**	**1,741**	**6,436**	**1,165**	**7,601**
DUCK TOTAL	**10,053**	**7,336**	**17,389**	**12,895**	**9,060**	**21,955**	**10,445**	**1,746**	**12,191**	**15,106**	**7,625**	**22,731**
BASIN WATERFOWL TOTAL	**10,783**	**7,626**	**18,409**	**13,696**	**9,660**	**23,356**	**11,107**	**2,156**	**13,263**	**15,668**	**8,245**	**23,913**

1/ All counts of 20 or less have not been rounded. All other figures are rounded to the nearest 10.

Table 8. Waterfowl Production[1/] in the Malheur-Harney Lakes Basin, 1975 to 1978

SPECIES	1975 REFUGE	1975 OFF-REFUGE	1975 TOTAL	1976 REFUGE	1976 OFF-REFUGE	1976 TOTAL	1977 REFUGE	1977 OFF-REFUGE	1977 TOTAL	1978 REFUGE	1978 OFF-REFUGE	1978 TOTAL
Trumpeter Swan	7	---	7	11	---	11	---	---	---	14	---	14
Canada Goose	810	290	1,100	1,600	1,500	3,100	1,170	630	1,800	930	1,060	1,990
Mallard	2,900	2,145	5,045	6,580	1,100	7,680	3,230	430	3,660	5,840	1,310	7,150
Gadwall	4,010	3,040	7,050	3,270	3,700	6,970	5,050	690	5,740	4,700	4,140	8,840
Pintail	220	665	885	1,160	1,520	2,680	370	---	370	2,740	990	3,730
Green-winged Teal	370	210	580	340	460	800	280	160	440	1,330	420	1,750
Cinnamon/Blue-winged Teal	6,830	4,495	11,325	9,800	7,260	17,060	2,450	180	2,630	7,010	4,460	11,470
American Wigeon	460	108	568	1,080	210	1,290	420	60	480	350	110	460
Northern Shoveler	350	1,100	1,450	1,050	690	1,740	650	20	670	1,850	1,820	3,670
Wood Duck	19	---	19	30	50	80	---	---	---	---	---	---
Dabbler Duck Total	**15,159**	**11,763**	**26,922**	**23,310**	**14,990**	**38,300**	**12,450**	**1,540**	**13,990**	**23,820**	**13,250**	**37,070**
Redhead	2,330	2,180	4,510	5,130	2,060	7,190	2,530	---	2,530	10,180	290	10,470
Canvasback	110	230	340	260	330	590	50	---	50	310	750	1,060
Lesser Scaup	60	55	115	100	40	140	11	---	11	450	120	570
Ring-necked Duck	---	---	---	---	---	---	20	---	20	---	---	---
Ruddy Duck	390	1,500	1,890	2,990	230	3,220	730	---	730	4,120	630	4,750
Hooded Merganser	---	2	2	---	---	---	---	---	---	---	---	---
Common Merganser	12	6	18	40	30	70	20	---	20	50	16	66
Diver Duck Total	**2,902**	**3,973**	**6,875**	**8,520**	**2,690**	**11,210**	**3,361**		**3,361**	**15,110**	**1,806**	**16,916**
DUCK TOTAL	**18,061**	**15,736**	**33,797**	**31,830**	**17,680**	**49,510**	**15,811**	**1,540**	**17,351**	**38,930**	**15,056**	**53,986**
BASIN WATERFOWL TOTAL	**18,878**	**16,026**	**34,904**	**33,441**	**19,180**	**52,621**	**16,981**	**2,170**	**19,151**	**39,874**	**16,116**	**55,990**

1/ All counts of 20 or less have not been rounded. All other figures are rounded to the nearest 10.

Duck production was 15,736, which was 47 percent of the total basin duck production.

Canada goose production was 290, only 26 percent of the total basin goose production. There was no trumpeter swan production off-refuge throughout the course of the study.

1976

Water conditions and nesting habitat were excellent again in 1976. However, late in the season there were shortages of broodwater in Units 16, 21, and the northern part of Unit 22.

Malheur Refuge

Malheur Lake reached nearly 47,000 surface-acres during March, and provided excellent pothole habitat in Unit 4 (western part of Malheur Lake). Higher lake levels provided better habitat and greater nesting success for diving ducks. This was reflected by increased production, especially by the redhead which produced 5,130 young, a 121 percent increase over 1975. Malheur Refuge accounted for 64 percent of the 49,510 ducks produced throughout the basin.

Canada goose production was 1,600 birds in 1976. This was 52 percent of the basin total. Most nesting was in Units 1, 12, and on Malheur Lake. Trumpeter swan production was 11 birds in 1976.

Off-refuge

Most duck nesting occurred in Units 16 and 22. Unit 22 produced 14,300 ducks, which was 81 percent of the ducks produced off-refuge. In that part of Unit 16 south of Moon Reservoir, early

irrigation releases from the reservoir provided widespread but shallow flooding. This early release of brood water was extremely detrimental to nesting ducks as it attracted 2,000 breeding pairs, but the area dried rapidly before nesting was complete. This led to increased nest desertion, brood mortality, and predation and resulted in a nest success of only 4 percent. Further, because of the timing, most hens were probably unable to renest.

Throughout the basin overall duck nesting success increased from 32 percent in 1975 to 38 percent in 1976. This occurred in spite of the lack of late season brood water in Unit 22 and the low nesting success in Unit 16.

Canada goose production increased from 290 in 1975 to 1,500 in 1976, probably a result of the better weather and water distribution early in the year.

1977

Drought conditions prevailed throughout the basin but were worse off-refuge than on the refuge. The average peak streamflow for the Silvies River during the 3 "wet" years of 1975, 1976, and 1978 was 730 cubic feet per second (cfs). However, in 1977 the Silvies River peaked at only about 70 cfs, and by July, flow was less than 5 cfs. Many of the most commonly flooded areas of the flood plain did not receive water in 1977 and some areas that did were dry by the third week in March. The Donner und Blitzen River peaked at 190 cfs compared to the 3 "wet" year average of nearly 470 cfs. In Unit 16, Silver Creek had a peak streamflow of about 30 cfs. The average peak for the 3 "wet" years was about 270 cfs.

Malheur Refuge

Less water was available than in the previous 2 years, but conditions were better than on

private land. The number of breeding pairs of ducks was roughly comparable to those in 1975, although down 19 percent from 1976 (Table 7). Duck production dropped from 31,830 in 1976 to 15,811, about 50 percent, although this was only down 12 percent from 1975 (Table 8). In all, diving duck production declined by 61 percent from 1976, and dabbler duck production declined by 47 percent. Redhead production declined to 2,530, about the same as in 1975. A good indicator of the severity of the drought on privately owned lands was the fact that 91 percent of the total basin duck production was on Malheur Refuge, compared to 53 percent in 1975, 64 percent in 1976, and 72 percent in 1978.

Canada goose production declined to 1,170 young, a decline of 27 percent from 1976. Sixty-five percent of the Canada geese produced in the basin in 1977 were produced on Malheur Refuge. There was no trumpeter swan production in 1977, probably a result of drought conditions.

Off-refuge

Only 1,746 breeding pairs of ducks were counted on private land in the basin in 1977, a decline of 81 percent from 1976. There was little brood water available in July when brood counts were made and the total duck production on private land was only 1,540 birds. This was a decline of 91 percent from 1976.

Canada goose production declined by 58 percent from 1976, to a total of 630 young.

1978

Excellent nesting habitat was provided by abundant spring flooding throughout the basin in 1978. Unit 22 began flooding in February and retained ample water through the nesting season. Unit 16 also had ample water, although

channelization of portions of Silver Creek upstream from Riley reduced the normal pattern of spring flooding.

Malheur Refuge

Waterfowl production on the refuge increased substantially in 1978. Several factors contributed to this increase. Excellent water conditions provided good habitat for breeding pairs, nesting, and broods. Also, an increase in areas deferred from grazing resulted in improved upland nesting habitat. The application of rotenone on Malheur Lake in the fall of 1977 led to improved production of sago pondweed in the lake which corresponded with increased duck production.

Duck production totalled 38,930 in 1978, a figure which has been exceeded only twice since 1960. Redheads had the highest production--10,180 young, 70 percent of which was on Malheur Lake. This figure represents the highest production for any species of duck on the refuge during the entire 4-year study and was an increase of 98 percent over 1976 production.

Canada goose production was 930 on the refuge. This was 20 percent below 1977 production and 42 percent less than in 1976. A part of this decline in production resulted from a flash flood in the Blitzen Valley on April 27, which destroyed at least 14 goose nests on that portion of the refuge. Trumpeter swan production increased to 14 in 1978.

Off-refuge

Duck production totalled 15,056 in 1978, compared to 1,540 in 1977, an increase of 880 percent. This production compares favorably with the 15,736 produced in 1975, and 17,680 in 1976. However, off-refuge areas provided only

28 percent of the total basin duck production in 1978 compared to the 47 and 36 percent, respectively, in 1975 and 1976. This is a reflection of the major increase in production on Malheur Refuge.

Canada geese produced 1,060 young, second only to the 1,500 young produced in 1976.

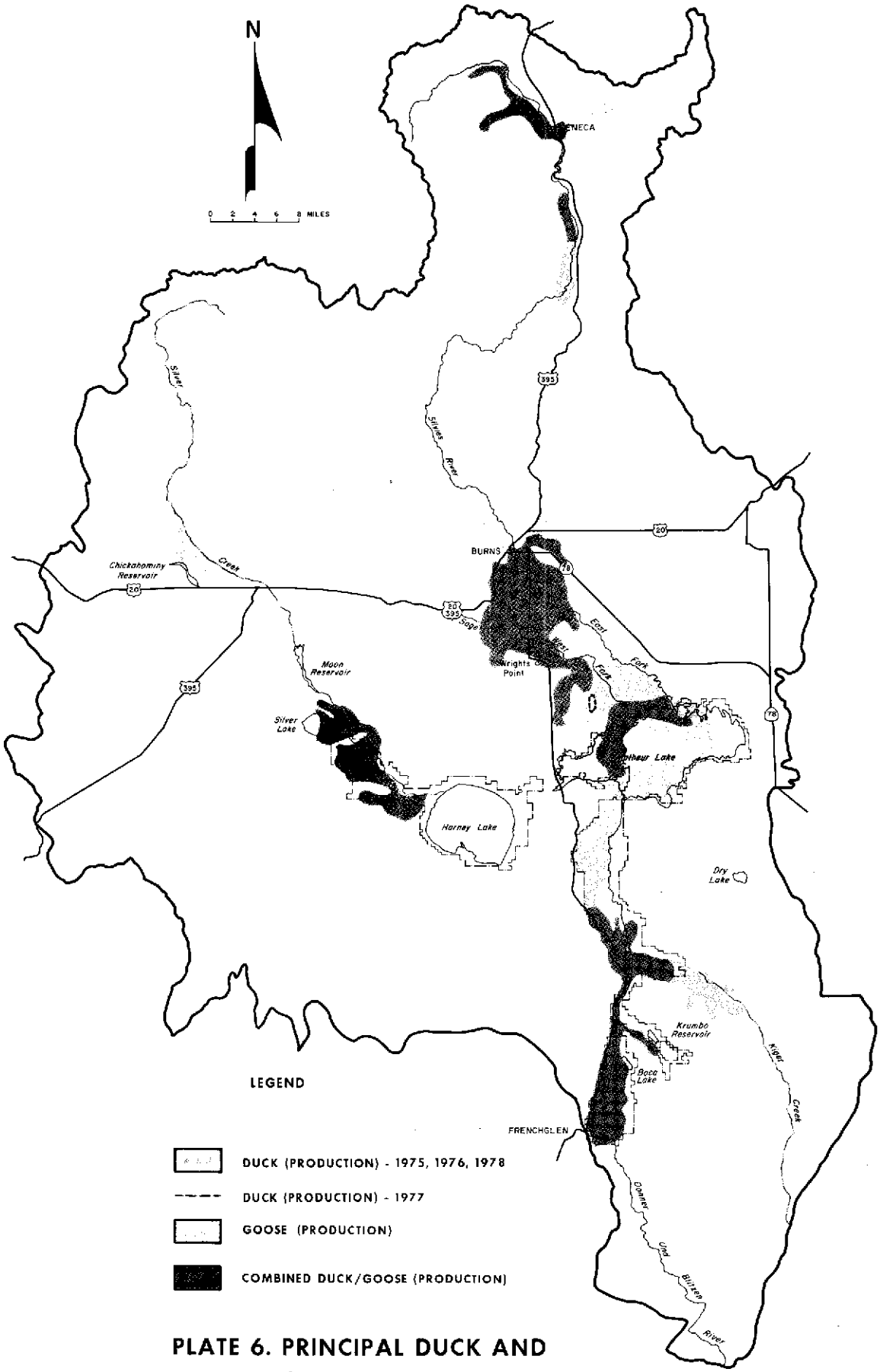
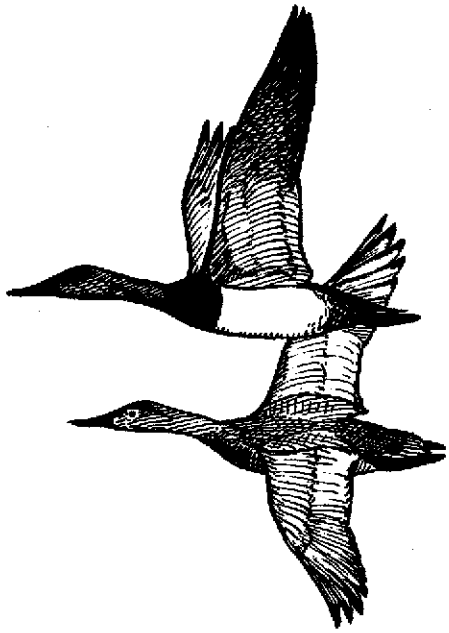


PLATE 6. PRINCIPAL DUCK AND GOOSE NESTING AREAS, 1975-1978



FALL WATERFOWL MIGRATION

FALL WATERFOWL MIGRATION

Fall waterfowl censuses were conducted on a biweekly basis during migration using a modified strip count or transect method. Counts were made from fixed-wing aircraft, as described under spring waterfowl migration. A total of 49 hours were spent in the air monitoring fall migration in 1975, 39 hours in 1976 and 1977, and 35 hours in 1978.

No major changes in preferred use areas for ducks and geese were observed during fall migration over the 4-year study period. This can be explained by the general lack of water in the basin by fall and the field-feeding habits of geese. However, swans, did show a major shift away from Malheur Lake in 1977.

An interesting difference between duck and goose/swan use-days was noted. All declined drastically during the 1977 drought, but only the ducks returned to 1975 and 1976 use levels when water conditions returned to "normal" in 1978. This was the result of the increased productivity of Malheur Lake following the carp control program in the fall of 1977. The reason for the failure of geese and swans to respond to increased water levels and lake productivity in 1978 is not known. Although geese do not feed heavily on sago pondweed they have used the lake extensively in the past for resting during the fall migration. Sago pondweed is a preferred food of swans and it was expected that they would return to the lake in 1978 in large numbers.

Fall waterfowl use-days are summarized in Table 9. Use-day data for individual subunits in the Silvies River Flood Plain (Unit 22) are provided in the section pertaining to the potential impacts of water development on the

Table 9. Fall Waterfowl Use-Days in Malheur-Harney Lakes Basin, 1975 to 1978

LOCATION	1975	1976	1977	1978
MALHEUR REFUGE				
Double-O				
Ducks	1,237,800	1,843,100	576,100	845,300
Geese	287,700	557,600	175,700	130,300
Swans	500	2,900	900	1,000
Total	1,526,000	2,403,600	752,700	976,600
Malheur Lake				
Ducks	4,870,000	4,102,400	966,100	8,501,500
Geese	88,100	80,000	53,300	144,100
Swans	225,500	74,000	2,700	48,600
Total	5,183,600	4,256,400	1,022,100	8,694,200
Blitzen Valley				
Ducks	2,149,600	947,600	754,100	568,900
Geese	292,100	147,300	210,400	303,200
Swans	37,600	13,100	14,200	11,300
Total	2,479,300	1,108,000	978,700	883,400
REFUGE TOTAL				
Ducks	**8,257,400**	**6,893,100**	**2,296,300**	**9,915,700**
Geese	**667,900**	**784,900**	**439,400**	**577,600**
Swans	**263,600**	**90,000**	**17,800**	**60,900**
TOTAL	**9,188,900**	**7,768,000**	**2,753,500**	**10,554,200**
OFF REFUGE				
Silvies River F. P.				
Ducks	1,427,700	836,800	132,500	606,700
Geese	170,000	119,800	27,600	114,700
Swans	600	200	---	600
Total	1,598,300	956,800	160,100	722,000
Other Private Lands				
Ducks	739,100	474,300	42,600	373,200
Geese	78,000	88,600	8,200	43,800
Swans	500	14,900	400	3,000
Total	817,600	577,800	51,200	420,000
OFF REFUGE TOTAL				
Ducks	**2,166,800**	**1,311,100**	**175,100**	**979,900**
Geese	**248,000**	**208,400**	**35,800**	**158,500**
Swans	**1,100**	**15,100**	**400**	**3,600**
TOTAL	**2,415,900**	**1,534,600**	**211,300**	**1,142,000**
BASIN TOTAL				
Ducks	**10,424,200**	**8,204,200**	**2,471,400**	**10,895,600**
Geese	**915,900**	**993,300**	**475,200**	**736,100**
Swans	**264,700**	**105,100**	**18,200**	**64,500**
GRAND TOTAL	**11,604,800**	**9,302,600**	**2,964,800**	**11,696,200**

flood plain and Malheur Lake. Figures and plates referenced in the text are found at the end of this section.

DUCKS

Fall duck migration began in early July, peaked in mid-August, and ended in mid-December each year (Figure 13). The pintail was the earliest migrant, followed by mallard, American wigeon, and gadwall. The pintail was also the most abundant species (except in 1976 when the American wigeon was the most numerous), followed by gadwall, and green-winged teal. Principal use areas (Plate 7) were generally the same during 1975, 1976, and 1978. However, drought conditions in 1977 restricted use primarily to Malheur National Wildlife Refuge and particularly to Malheur Lake.

Total fall duck migration (use-days) was relatively uniform for the 3 "wet" years of 1975, 1976, and 1978. However, in 1977 duck use dropped about 73 percent from the 1975-1976 average as the result of drought conditions throughout the basin. A comparison of total fall use-days and fall duck use by unit is presented in Table 9 and Figure 19 respectively.

The most impressive change in the pattern of fall duck use occurred in 1978 on Malheur Lake, where use increased over 1975 levels by 85 percent in Unit 4 and 276 percent in Unit 5. This increased use is attributed almost entirely to increased sago pondweed production in the lake (from 2,000 acres in 1976 to 22,000 acres in 1978--refuge staff estimate).

Increased sago production is attributable to the low lake levels in 1977 which made it possible to conduct a carp reduction program. These low lake levels also led to the exposure and oxidation of large areas of lake bottom, a condition typical of the higher sago production areas in the West. Additionally, the large numbers of

carp killed provided excellent fertilizer. The lower numbers of carp reduced water turbidity caused by feeding habits of the fish and this increased photosynthesis and sago growth. Consumption of sago by carp was also greatly reduced. The increased productivity of Malheur Lake was largely responsible for the fact that 1978 fall duck use on Malheur National Wildlife Refuge was the highest of the entire 4-year study. By comparison, other areas on the refuge had increased use from 1977 levels but still were below 1975 and 1976 use figures.

GEESE

Fall goose migration began in late August (except early August in 1978), peaked in late-October, and ended in mid-December each year (Figure 15). The reason for the early start of the 1978 migration is not known, but may not be unusual over the long-term. Great Basin Canada geese were the earliest migrants followed by snow geese and white-fronted geese each year. Canada geese were the most abundant (except in 1976), followed by snow geese and white-fronted geese. Principal use areas (Plate 7) were essentially the same each year since preferred habitats were not highly water-oriented. There was, however, increased use in Units 9 and 10 in 1978 which was likely a result of increased grain production.

Total fall goose migration (use-days) was relatively equal in 1975 and 1976, but decreased about 50 percent in 1977 and showed a moderate increase in 1978. A comparison of total fall use-days and use-days by unit are presented in Table 9 and Figures 20 respectively.

SWANS

Fall swan migration began in late October (except in 1977), peaked in mid-November, and all had left the basin by the end of December

each year (Figure 17). Migration in 1977 began about 2 weeks early as the result of drought conditions in production areas to the north. Principal use areas (Plate 5) were essentially the same in 1975, 1976, and 1978. Malheur Lake received from 71 to 85 percent of the total basin use. However, in 1977 use on Malheur Lake dropped to about 15 percent of total basin use, undoubtedly the result of low lake levels and the associated lack of sago pondweed.

Total fall swan migration (use-days) declined 94 percent between 1975 and 1977, and then increased moderately in 1978 although still below 1975 use. A comparison of total fall use-days and use-days by unit are presented in Table 9 and Figure 21 respectively.

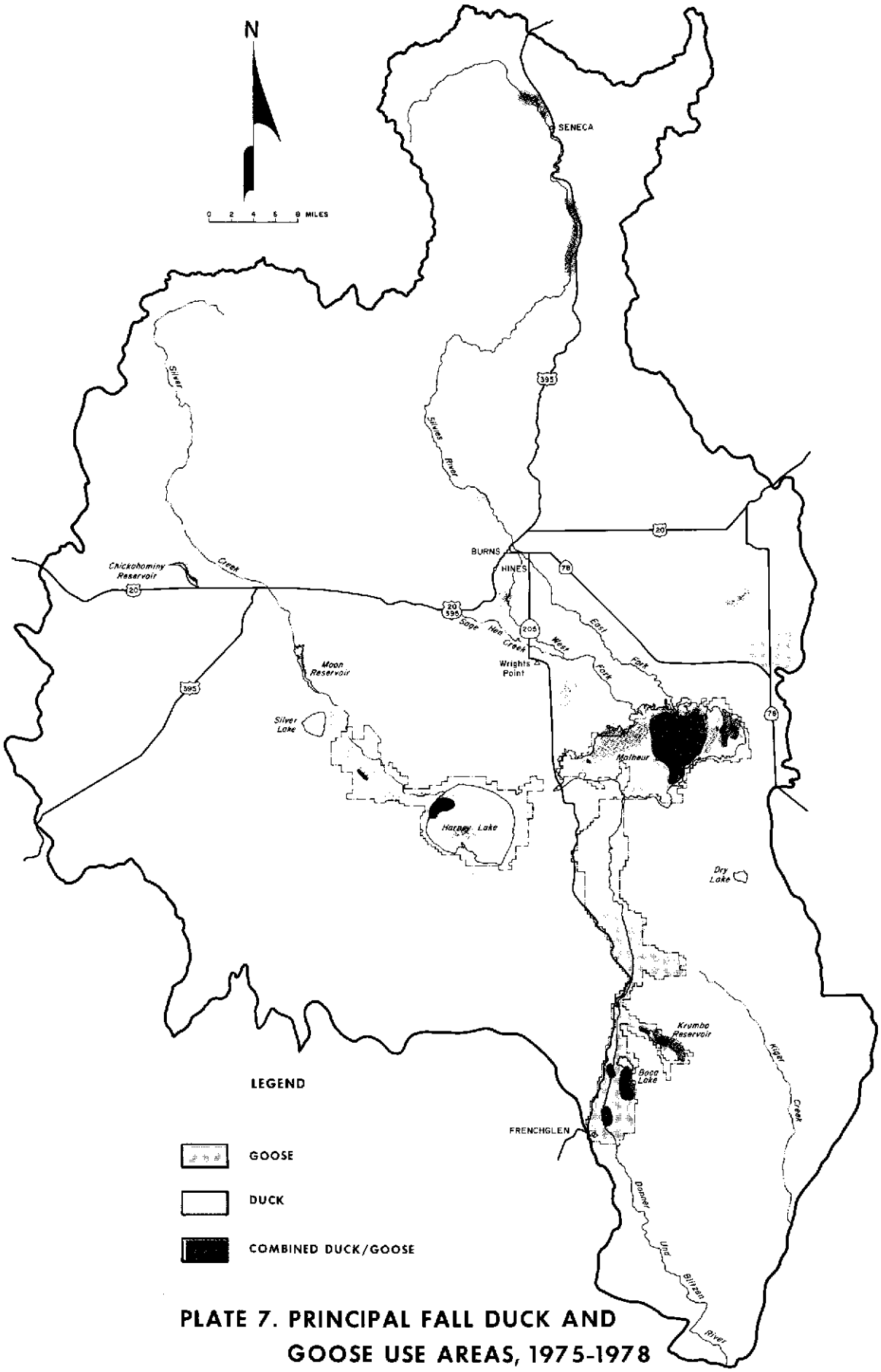


PLATE 7. PRINCIPAL FALL DUCK AND GOOSE USE AREAS, 1975-1978

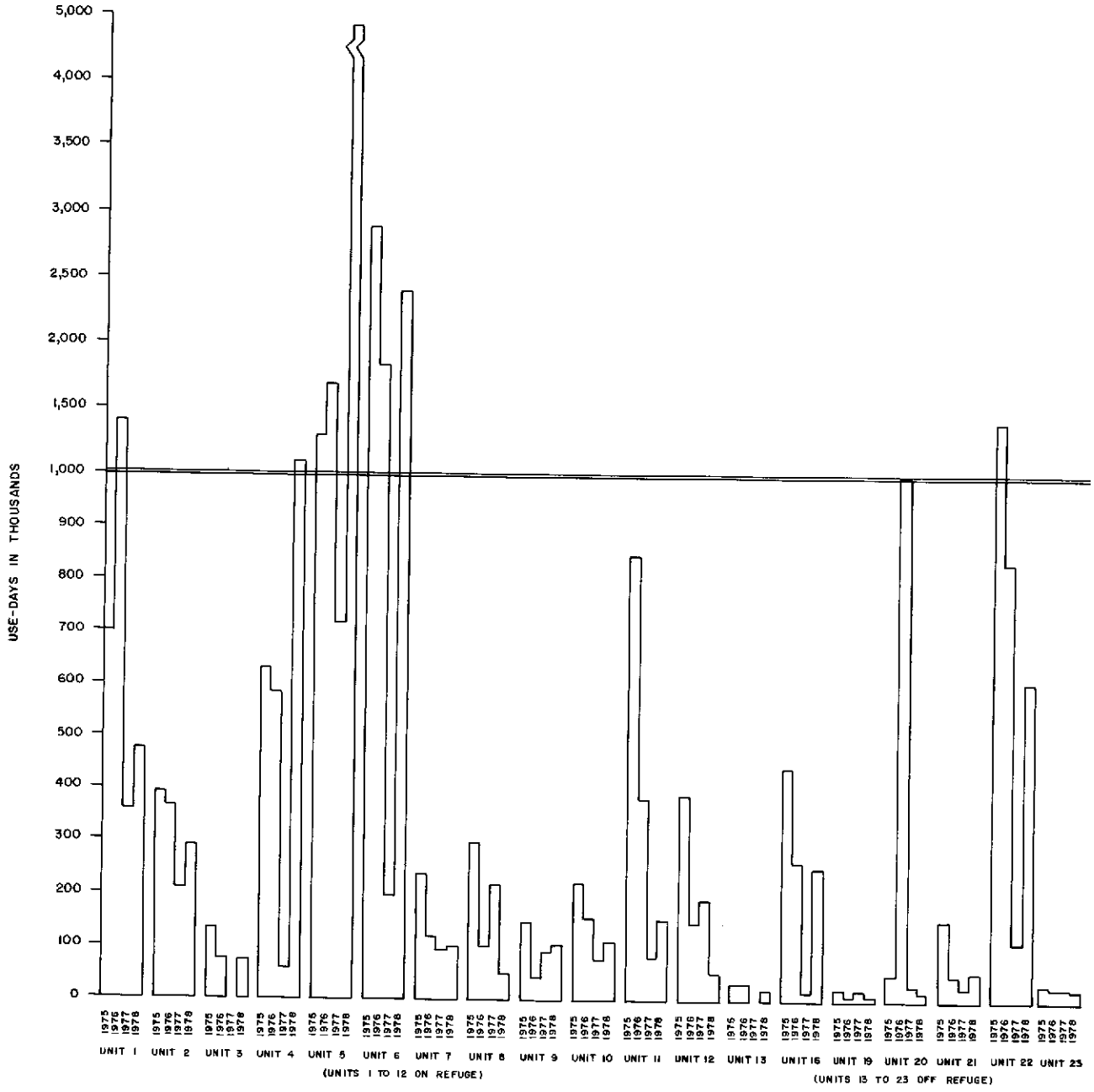


Figure 19. Fall Duck Use

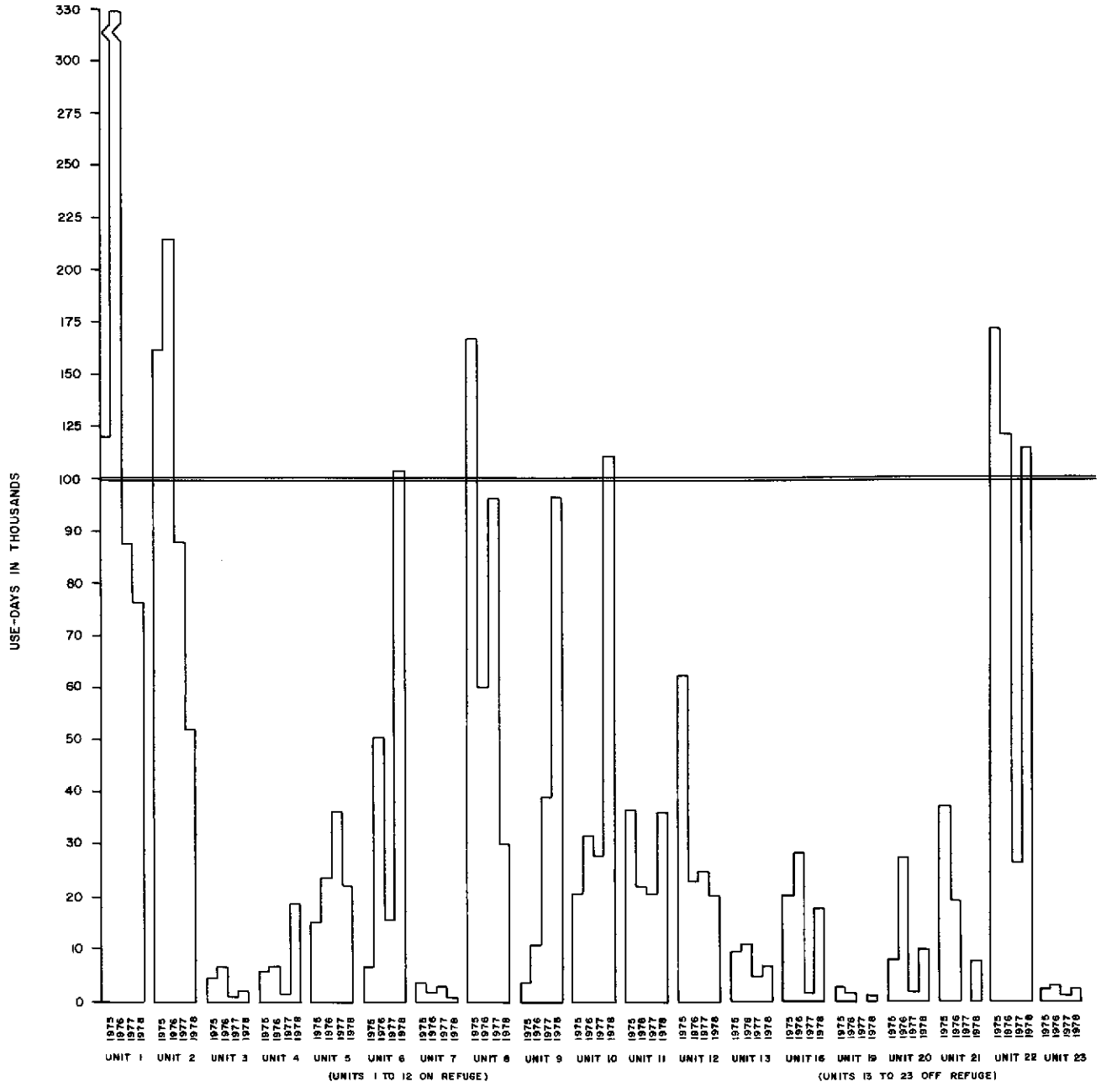


Figure 20. Fall Goose Use

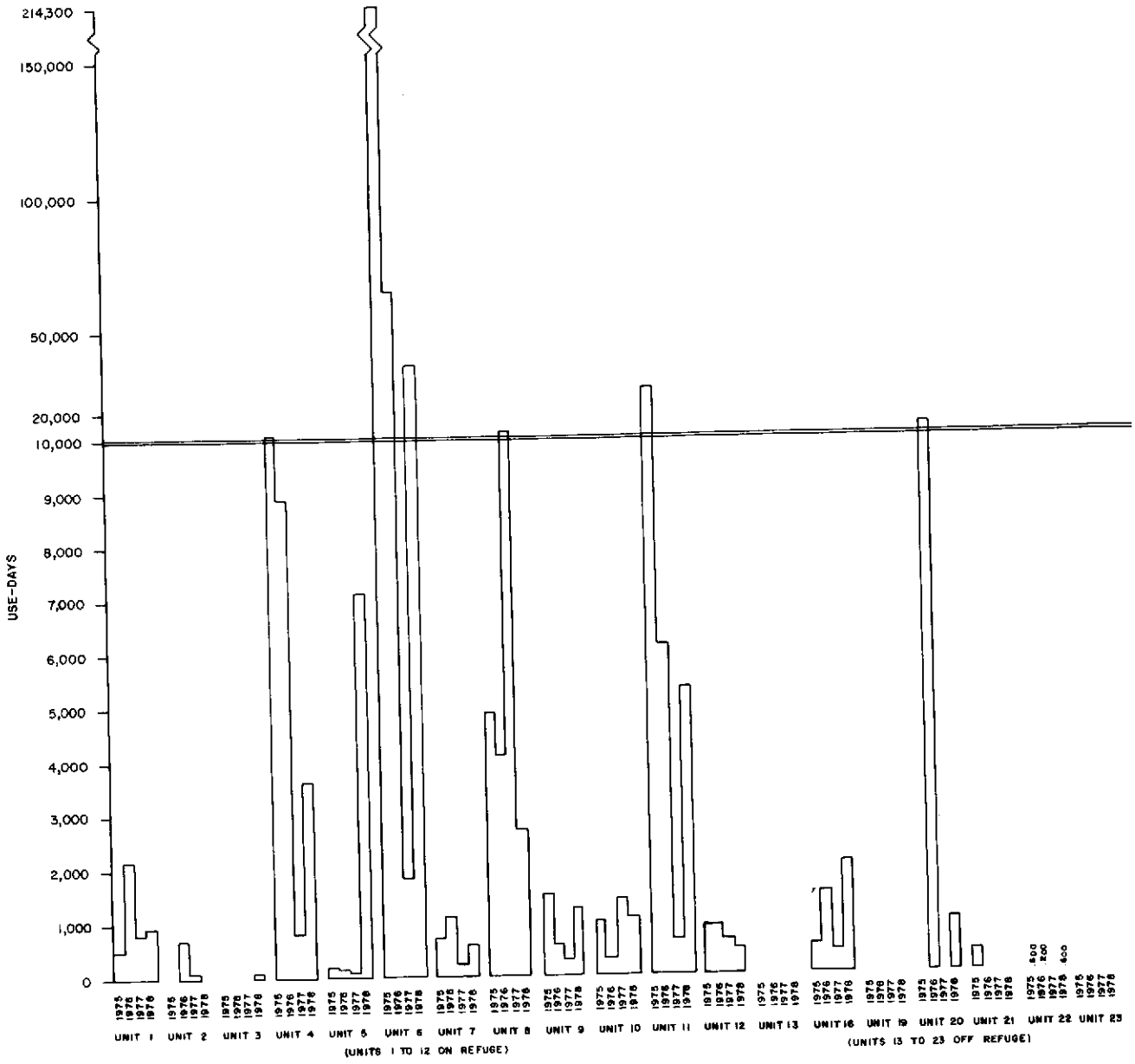


Figure 21. Fall Swan Use

SHOREBIRDS

SHOREBIRDS

Twenty species of migratory shorebirds are known to use Malheur-Harney Lakes Basin. A few killdeer and common snipe remain throughout the winter but most migrate south.

Counts were made concurrent with and by the same methods as described under Spring Waterfowl Migration.

Use-day data for individual subunits in the Silvies River Flood Plain (Unit 22) are provided in the section pertaining to the potential impacts of water development on the flood plain and Malheur Lake. Figures and plates referenced in the text are found at the end of this section.

SPRING MIGRATION

Spring migration began in mid-February (Figure 22) each year with an increase in the number of killdeer and the arrival of greater yellowlegs. Basin populations stabilized somewhat in May when nesting began, but increased again in mid-June as numbers of Wilson's phalarope, willet, and common snipe continued to arrive. Spring use is summarized in Table 10 and Figure 23.

Principal use areas during spring migration (Plate 8) include Units 22 (Silvies River Flood Plain), 1 (Double-O area of Malheur National Wildlife Refuge), and 16 (Silver Creek). Within Unit 22 the most used areas were Subunits D, E, and I, which normally receive ample shallow spring flooding from the Silvies River.

Except for the 1977 drought year, spring shorebird use patterns remained consistent for

Table 10. Spring Shorebird Use-Days in Malheur-Harney Lakes Basin, 1975 to 1978

LOCATION	1975	1976	1977	1978
MALHEUR REFUGE				
Double-O	161,700	222,600	128,900	134,200
Malheur Lake	29,600	47,900	86,200	58,200
Blitzen Valley	90,900	116,400	117,700	98,300
Total	282,200	386,900	332,800	290,700
OFF REFUGE				
Silvies River Flood Plain	397,300	492,100	200,800	596,700
Other Private Lands	167,100	255,200	98,900	248,500
Total	564,400	747,300	299,700	845,200
BASIN TOTAL	**846,600**	**1,134,200**	**632,500**	**1,135,900**

most units within the basin. On Malheur National Wildlife Refuge, Unit 1 received the greatest use each year. During the 1977 drought this unit received the highest use in the basin. The only unit which did not receive fairly uniform spring use for the 4 years studied was Unit 2 (Harney Lake), which received 70,500 use-days in 1976, compared with an average of slightly over 18,000 use-days for the other 3 years. This higher use for 1976 was the result of excellent water conditions which provided ideal shallow-water feeding habitat for American avocet. Of the 70,500 use-days received by Unit 2, 55,300, or 78 percent, were from avocets.

In spite of drought conditions in 1977, many areas on Malheur Refuge actually received increased shorebird use. Spring shorebird use on Malheur Lake was 48 percent higher in 1977 than in any other year, apparently because receding lake levels created favorable shoreline habitat which was not available in other years. There was very little change in the pattern of use in the Blitzen Valley in 1977 because water supplies were more stable than in other areas in

the basin. In contrast, spring shorebird use off-refuge, in Unit 22, declined drastically in 1977, down 59 percent from 1975. However, it increased from 200,800 use-days in 1977 to a total of 596,700 use-days in 1978: the highest spring shorebird use for any unit for the entire 4 years and an increase of 197 percent from 1977.

BREEDING POPULATIONS

Detailed studies of shorebird nesting were not possible because of staff limitations. Data collected were restricted to estimations of breeding populations (Table 11), and preliminary studies in 1976 which indicated that shorebirds, especially young of the year, were subject to high mortality during the hay mowing period on private lands.

Table 11. Estimated Shorebird Breeding Populations in Malheur-Harney Lakes Basin, 1975 to 1978

SPECIES	NUMBER OF INDIVIDUALS			
	1975	1976	1977	1978
Snowy Plover	18	184	150	110
Killdeer	1,177	1,610	740	1,445
Common Snipe	1,017	2,705	1,665	3,715
Long-billed Curlew	1,034	1,177	811	1,309
Spotted Sandpiper	271	1,848	965	1,788
Willet	1,633	1,716	1,046	2,060
American Avocet	1,696	1,863	562	2,417
Black-necked Stilt	77	87	95	35
Wilson's Phalarope	5,005	6,096	1,869	5,441
Northern Phalarope	---	---	10	15
TOTAL	**11,928**	**17,286**	**7,913**	**18,335**

The most important shorebird nesting area in the basin was the Silvies River Flood Plain (Plate 8). Wilson's phalaropes, common snipe,

and willet were the most common nesting species each year. American avocets, killdeer, long-billed curlew, and spotted sandpiper were also abundant. Long-billed curlew nesting (Plate 9) is of special significance since a considerable amount of its known nesting habitat outside the basin is being destroyed or altered by land use practices. Within the basin the current agricultural practice of installing sprinkler irrigation systems for crop production will further reduce the amount of habitat available for the long-billed curlew. Also of special significance is a snowy plover nesting area near Harney Lake.

FALL MIGRATION

Fall shorebird migration generally began in mid-June and peaked in mid-July or early August (Figure 22). In 1975 peak numbers occurred in mid-August as a result of a large influx of American avocet. In 1978 there was no peak in fall migration. Instead, numbers declined steadily from the early June peak of 18,000 until late July when they rose slightly for a period of about 3 weeks, then declined again to fewer than 5,000 birds on August 31. The average population on this date for the first 3 years was over 17,000. This decline was the result of a low fall migrating population of Wilson's phalarope, which peaked at only 6,400 birds in 1978, a decline of 52 percent from the 1977 peak. Use-days accumulated by phalaropes also declined by 42 percent in 1978 from the 1975-77 average.

The most abundant fall migrant in each of the 4 years was the Wilson's phalarope. Western sandpipers were generally second in abundance, except in 1978 when dowitchers (primarily long-billed) were second. The American avocet was third in abundance for all 4 years. Fall shorebird use is summarized in Table 12 and Figure 24.

Table 12. Fall Shorebird Use-Days in Malheur Harney Lakes Basin, 1975 to 1978

LOCATION	1975	1976	1977	1978
MALHEUR REFUGE				
Double-O	1,534,400	718,900	863,900	298,600
Malheur Lake	479,700	165,800	518,800	249,900
Blitzen Valley	96,700	115,900	75,800	111,700
Total	2,110,800	1,000,600	1,458,400	660,200
OFF REFUGE				
Silvies River F. P.	266,600	252,500	35,300	262,200
Other Private Lands	132,000	95,300	24,900	120,800
Total	398,600	347,800	60,200	383,000
BASIN TOTAL	**2,509,400**	**1,348,400**	**1,518,600**	**1,043,200**

The 1977 drought caused several changes in the distributional patterns of fall shorebird use. Fall use in Unit 1, particularly on Stinking Lake, was the highest for any year except 1975. On Malheur Lake, Units 4 and 5 received higher use than for any other year, and use on Unit 6 was second only to 1975. Even though lake levels were low in 1977, the large amount of exposed shoreline created excellent feeding conditions. In addition, habitat was not available in other areas.

Conditions off-refuge were extremely poor in 1977 and fall shorebird use declined accordingly. The Silvies River Flood Plain had little water, and fall use declined by 87 percent from 1975.

Although drought conditions resulted in drastic declines in fall use in many areas of the basin in 1977, total fall shorebird use was second

only to that in 1975 (Table 12). Much of the fall use that was lost on private lands in 1977 shifted to Malheur National Wildlife Refuge, which had an increase in use of 46 percent over 1976. This shift in use was the result of new shoreline habitat created around Malheur Lake by low water levels. In this drought year Malheur Refuge provided 96 percent of the total fall basin use.

Unit 1 (primarily Stinking Lake) received the greatest shorebird use each year of the study. Unit 6 was second in use, although Unit 2 received higher use in 1975. Unit 2 received high use only in very high water years such as 1975 and 1978. Other units of importance to fall migrating shorebirds were Units 16, and 22 D, E, and H.

In the 1977 drought year, the areas receiving the greatest use were, in order of highest use, Units 1, 6, 4, and 5, all on Malheur National Wildlife Refuge.

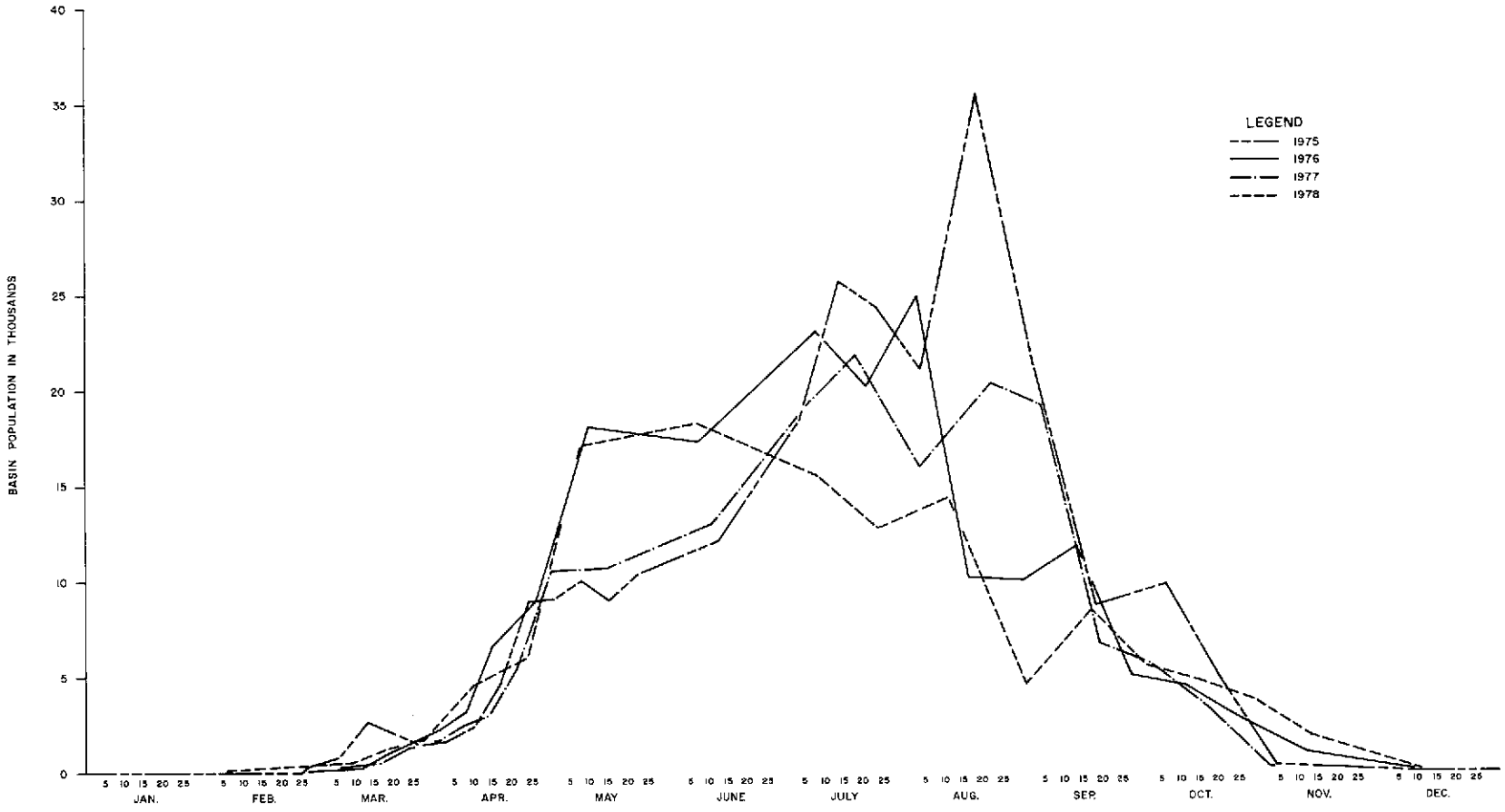


Figure 22. Shorebird Migration Chronology

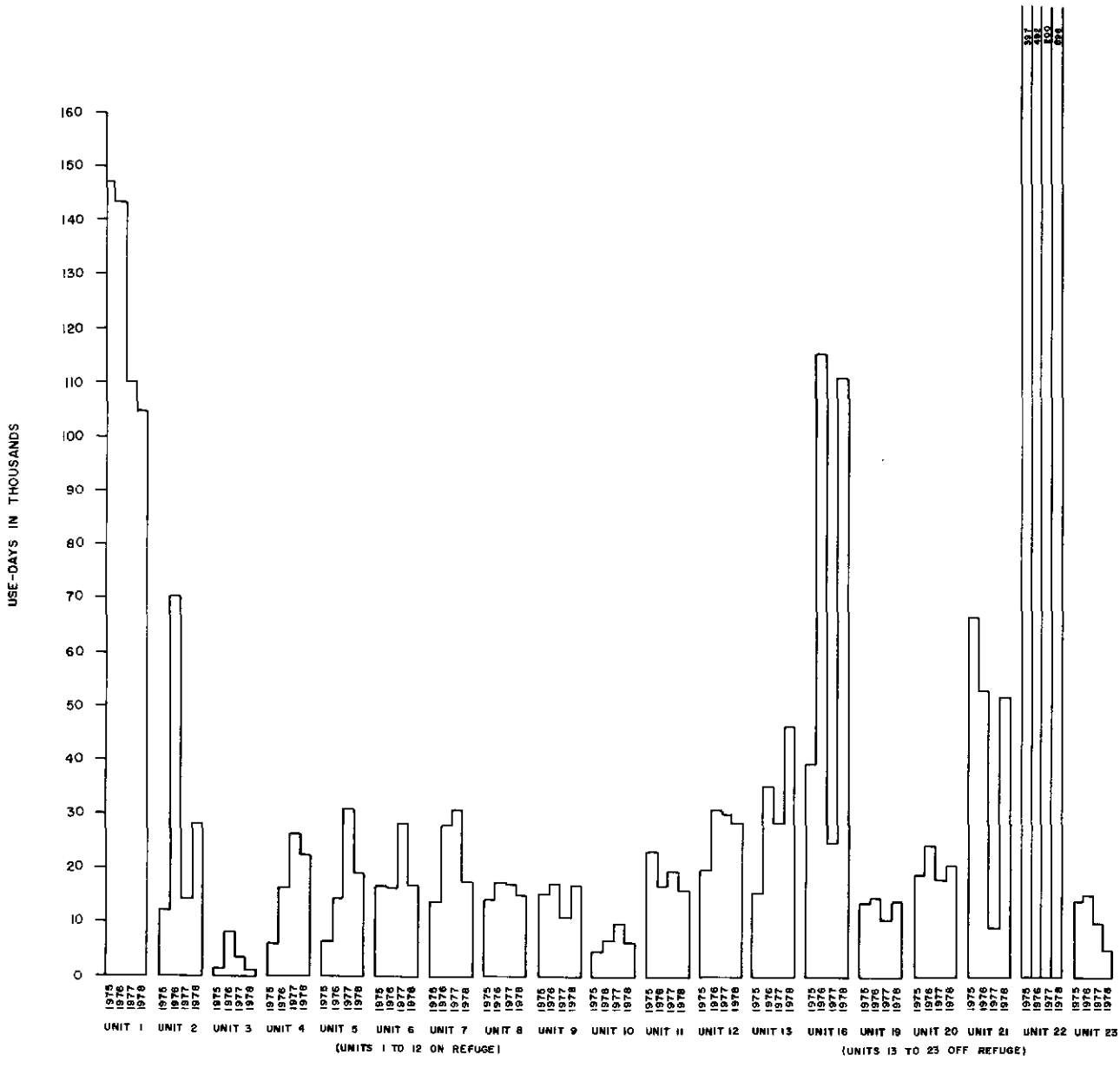


Figure 23. Spring Shorebird Use

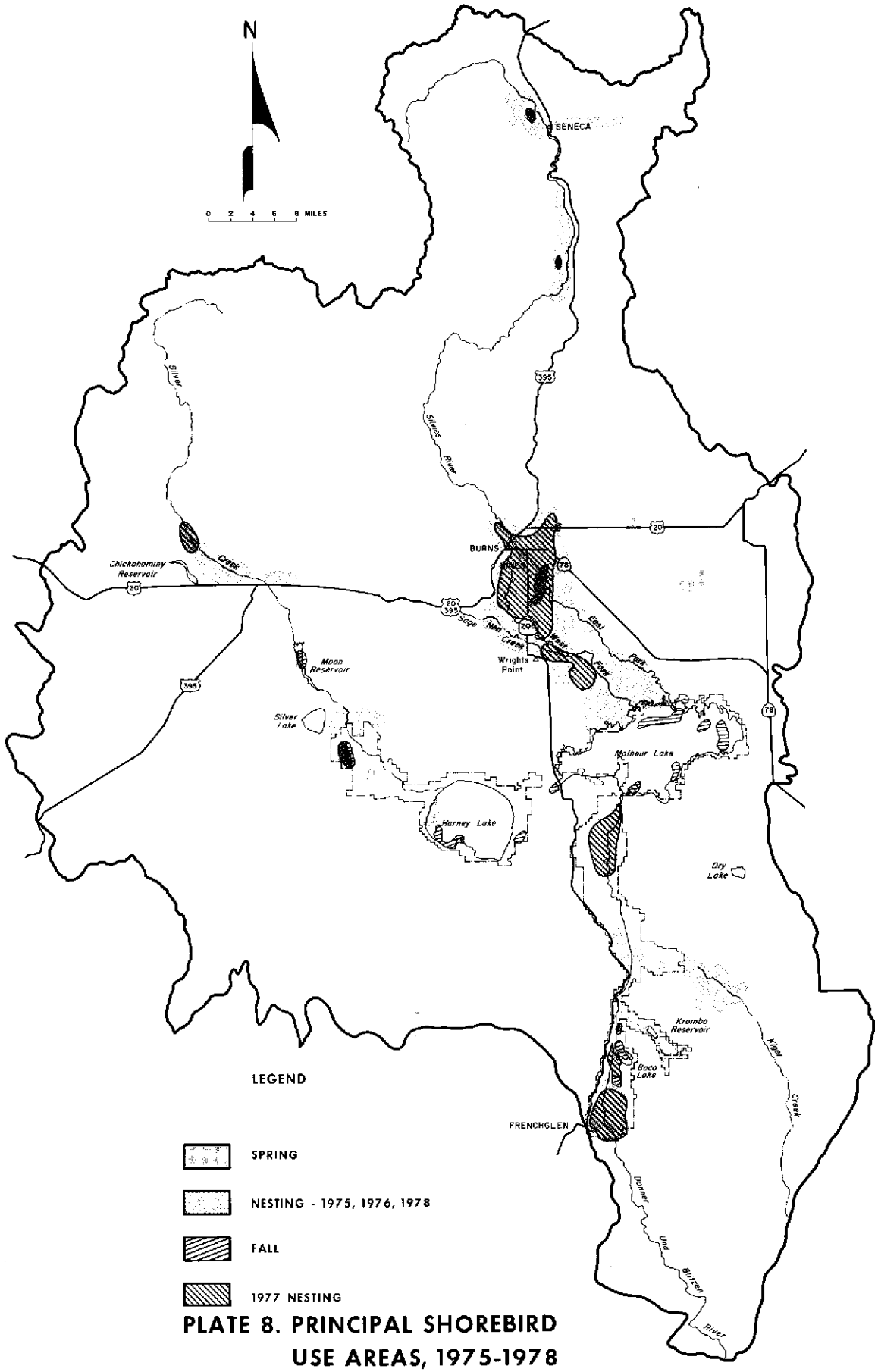


PLATE 8. PRINCIPAL SHOREBIRD USE AREAS, 1975-1978

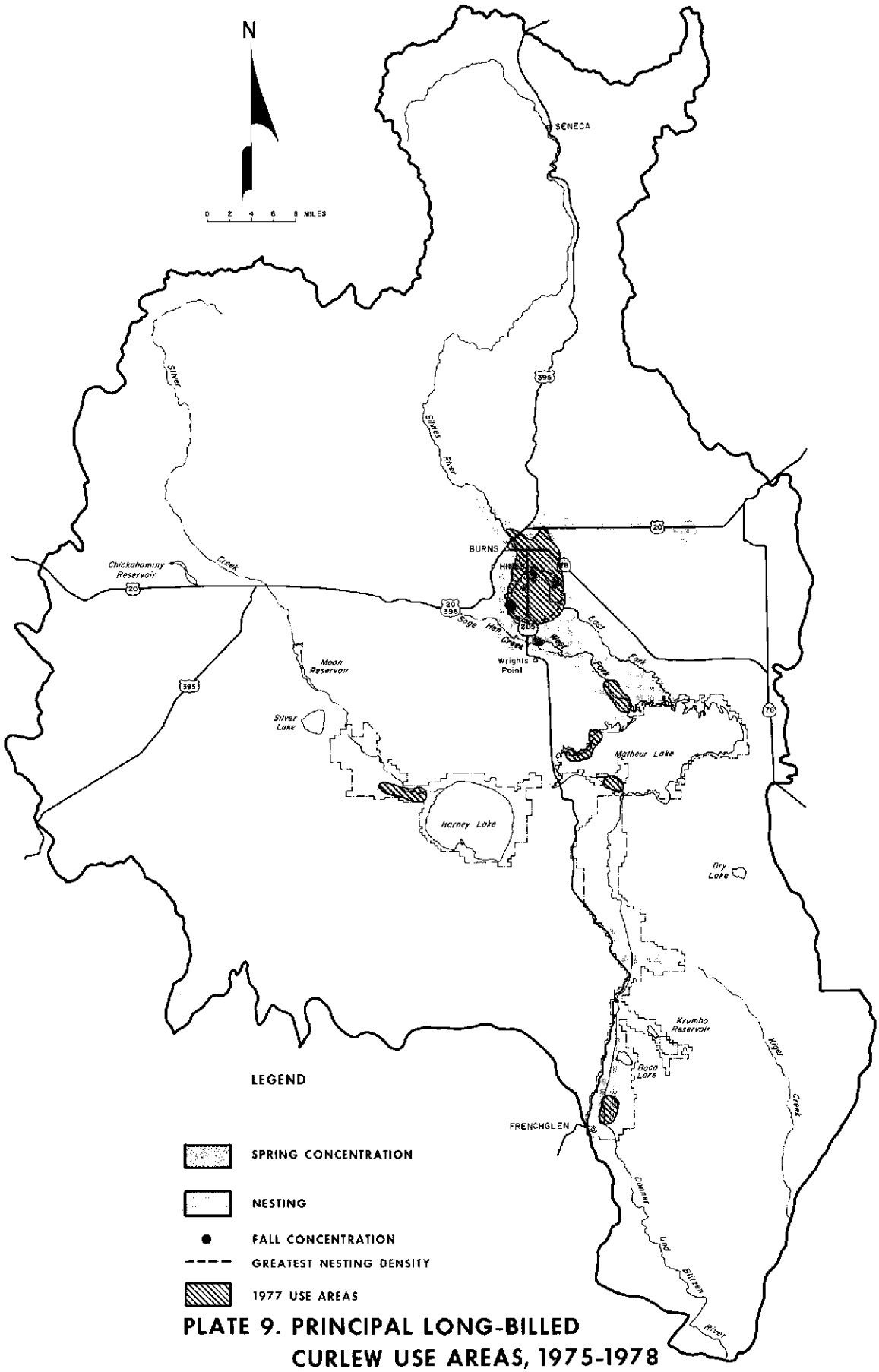


PLATE 9. PRINCIPAL LONG-BILLED CURLEW USE AREAS, 1975-1978

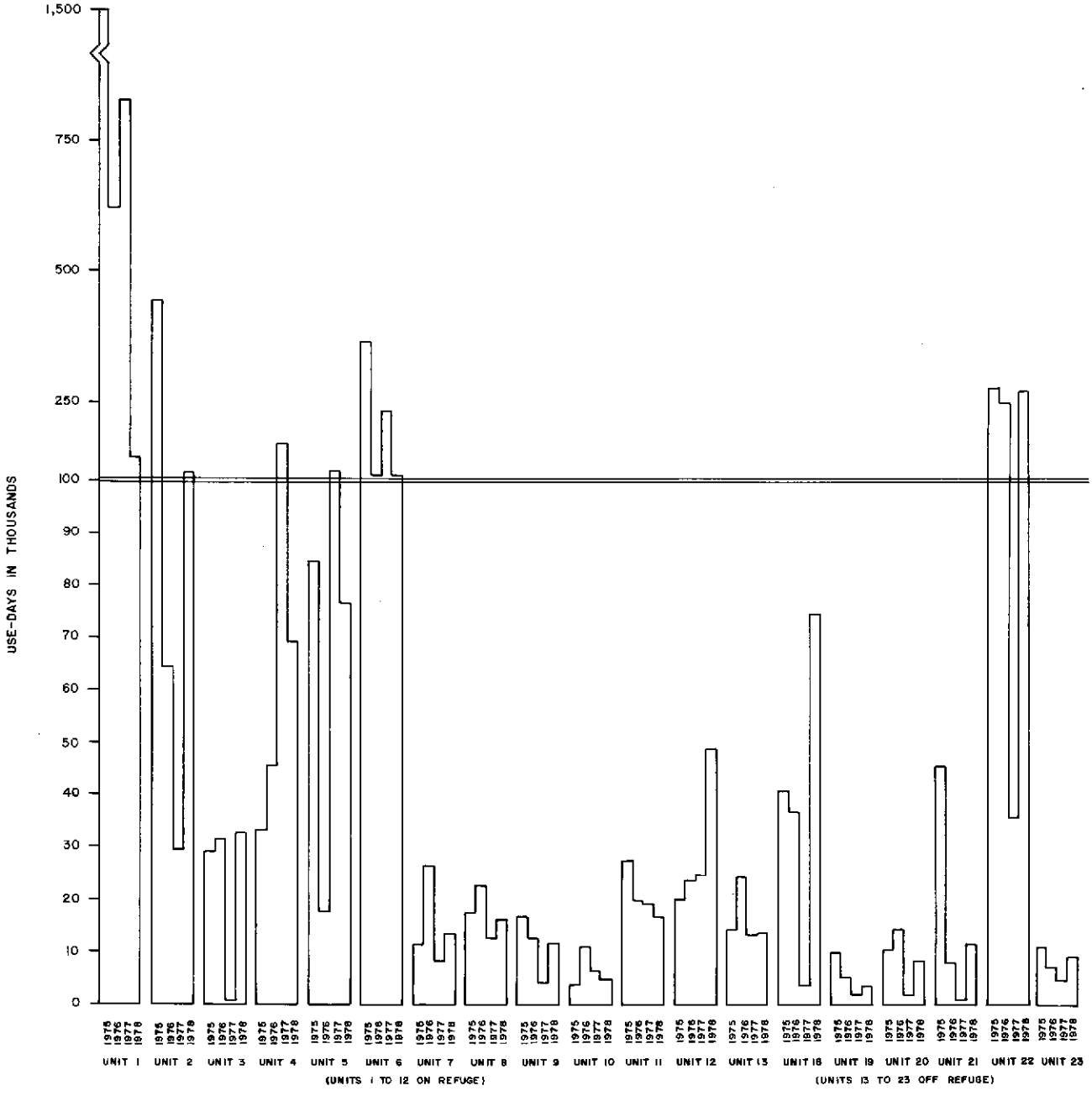
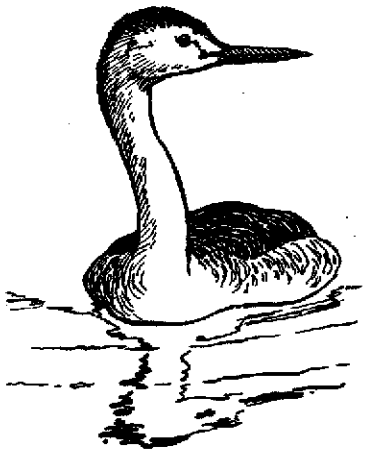


Figure 24. Fall Shorebird Use

MARSHBIRDS



MARSHBIRDS

Twenty-six species of migratory marshbirds were observed in the Malheur-Harney Lakes Basin during the study. Two species observed in 1975 (Sabine's gull and common tern) were new records for southeastern Oregon. Small numbers of great blue heron and American coot were the only marshbirds that were year-round residents.

The American coot was the most abundant marshbird in the basin but is treated separately in this report because its greater abundance tends to disguise the importance of certain wetlands to less abundant marshbird species.

Principal marshbird use areas are shown on Plates 10 and 11. Use-day data for individual subunits in the Silvies River Flood Plain (Unit 22) are provided in the section pertaining to the potential impacts of water development on the flood plain and Malheur Lake. Figures and plates referenced in the text are found at the end of this section.

COOT

Spring Migration

Spring coot migration generally began in February of each year, but in 1976, appreciable numbers did not arrive in the basin until early March (Figure 25). Spring coot population peaks declined yearly from 86,000 in 1975 to just over 30,000 in 1978. The lack of water and favorable habitat were evident in 1977 as the basin population of coot dropped from 43,000 to 1,500 birds in 15 days in late March and early April before recovering to about 22,000. In spite of adequate water distribution in 1978, coot populations were late in arriving and peaked at a lower level than in any other year.

Spring coot use within the basin varied according to water distribution and available habitat. In 1975, most use was in Unit 1, where shallow spring flooding and abundant green vegetation made habitat ideal (Figure 26). In 1976 use shifted from Unit 1 to Malheur Lake which had an increase in use of 148 percent. Changes in coot use in 1977 were a result of drought conditions. On Malheur Refuge, coot use was down 48 percent in the Double-O portion of the refuge, up 1 percent in the Blitzen Valley, and up 38 percent on Malheur Lake.

Since there was little inflow to the lake in 1977, Units 4 and 6 had a poor water supply and most use was in Unit 5, the deeper, central portion of the lake. Coot contributed over 1.5 million use-days to Unit 5, which was 94 percent of the total spring coot use on the entire lake. It also represented 73 percent of the use on the refuge, and 68 percent of the total basin use. Off-refuge spring use declined 91 percent from 1976 levels.

In 1978, spring coot use was less than 1977 levels (Table 13). Although Malheur Lake had been treated with rotenone to reduce the carp population in the fall of 1977, aquatic vegetation had not increased significantly by the spring of 1978, and the lake's value to coot and other migratory birds was still low. Use shifted to Unit 22 and Unit 1, where good habitat was available, and Malheur Lake received a smaller proportion of spring use than in 1977. In 1978, spring coot use on Malheur Lake declined to 46 percent of total refuge use and 30 percent of total basin use.

Fall Migration

Fall coot migration began in early July, peaked in August or September and declined to wintering levels by mid-December. Peak populations varied between a high of 68,500 in 1978 and a low of 8,500 in 1977 (Figure 25).

Table 13. Spring Coot Use-Days in Malheur-Harney Lakes Basin, 1975 to 1978

LOCATION	1975	1976	1977	1978
MALHEUR REFUGE				
Double-O	555,500	319,300	164,600	279,000
Malheur Lake	469,300	1,163,700	1,607,700	671,200
Blitzen Valley	488,000	304,300	307,300	172,700
Total	1,512,800	1,787,300	2,079,600	1,122,900
OFF REFUGE				
Silvies River F. P.	1,418,900	1,374,800	86,600	541,800
Other Private Lands	363,800	168,200	57,500	29,300
Total	1,782,700	1,543,000	144,100	571,100
BASIN TOTAL	**3,295,500**	**3,330,300**	**2,223,700**	**1,694,000**

Although 1976 peak populations were lower than in 1975 (by about 14,500 birds), the timing of migration was almost identical. Total use-days declined from 3,392,200 in 1975 to 2,362,300 in 1976, a decline of 30 percent (Table 14). On Malheur Refuge the pattern of fall coot use was

Table 14. Fall Coot Use-Days in Malheur-Harney Lakes Basin, 1975 to 1978

LOCATION	1975	1976	1977	1978
MALHEUR REFUGE				
Double-O	266,200	272,800	34,000	126,100
Malheur Lake	1,314,400	1,067,000	210,600	4,482,100
Blitzen Valley	955,800	661,800	169,300	204,800
Total	2,536,400	2,001,600	413,900	4,813,000
OFF REFUGE				
Silvies River F. P.	541,600	150,500	13,200	116,700
Other Private Lands	314,200	210,200	400	246,800
Total	855,800	360,700	17,600	363,500
BASIN TOTAL	**3,392,200**	**2,362,300**	**431,500**	**5,176,500**

consistent for both years. Malheur Lake received a higher proportion of fall use than did any other area, averaging 52 percent of the refuge total for 1975 and 1976.

Fall use throughout the basin in 1977 declined to 431,500 use-days, 87 percent less than in 1975. Private lands received only 4 percent of 1977 fall use, with Malheur Refuge receiving 96 percent. Most use was on Unit 5 in Malheur Lake with 197,300 use-days, representing 48 percent of refuge use (Figure 27). Unit 10, in the Blitzen Valley was second in use with 54,800 use-days.

With the increasing productivity of Malheur Lake during the summer and fall of 1978 (result of the 1977 rotenone treatment), coot found conditions ideal. They lingered on Malheur Lake until late in November and accumulated over 3 million use-days in Unit 5 alone, more than the entire basin received in 1976. Use on Malheur Lake represented 93 percent of the total refuge coot use and 87 percent of the basin total.

OTHER MARSHBIRDS

Spring Migration

Spring marshbird migration generally began in mid-February (Figure 28) as great blue heron and sandhill crane began arriving in the basin. Other species followed, and populations peaked in late May and June. The highest peak population was in June 1976 when marshbirds totalled 18,000. The lowest peak population was in early July 1977 at 12,300. Marshbird use throughout the basin was relatively stable throughout the 4 years, even during the 1977 drought. Unit 5, the central portion of Malheur Lake received the most use in each of the 4 years (Figure 29). Unit 22D, on the Silvies River Flood Plain, was second in marshbird use, followed by Unit 1.

Most areas on Malheur Refuge received fairly uniform use in 1977. Units 1 and 5 had some decline from 1976 levels, but remained the highest use areas on the refuge. Units 4 and 6 had small gains, largely a result of herons and egrets feeding in shallow water areas at the edge of Malheur Lake. In 1978, use on Malheur Refuge was 812,100 use-days, 61 percent of total basin use (Table 15). Spring marshbird use on Malheur Lake was 444,800 use-days, the highest use of the entire study, and 33 percent of the total spring basin use in 1978. This was consistent with spring use during the 1975-1977 period when Malheur Lake provided between 27 and 34 percent of the total spring basin use.

Table 15. Spring Marshbird Use-Days (Excluding Coot) in Malheur-Harney Lakes Basin, 1975 to 1978

LOCATION	1975	1976	1977	1978
MALHEUR REFUGE				
Double-O	73,200	213,900	133,200	171,300
Malheur Lake	325,100	407,000	315,900	444,800
Blitzen Valley	184,300	227,500	166,000	196,000
Total	582,600	848,400	615,100	812,100
OFF REFUGE				
Silvies River F. P.	433,700	571,400	247,700	417,600
Other Private Lands	77,300	82,800	63,900	99,600
Total	511,000	654,200	311,600	517,200
BASIN TOTAL	**1,093,600**	**1,502,600**	**926,700**	**1,329,200**

Off-refuge areas also received relatively consistent use throughout the study except in 1977 when water was not available on some areas. The greatest declines occurred on Unit 22E and 22I respectively. Unit 22D had only a slight decline from 1976 largely because of springs that provided water independent of

the Silvies River. This attracted and concentrated large numbers of lesser sandhill crane, and California and ring-billed gulls from adjacent water deficient areas.

Production

Eighteen marshbird species (excluding coot) were known to nest in the basin. The most important nesting area was Unit 5 in Malheur Lake, where colonies of cormorants, herons, egrets, gulls, and ibis nested.

Most species of marshbirds nesting on Malheur Lake were not greatly affected by the 1977 drought (Table 16) because low lake levels provided an abundance of food, including carp. However, the rotenone treatment of Malheur Lake in 1977 reduced the carp population and thereby the marshbird food supply in 1978. This may have caused the reduction in nesting pairs and production of western grebe, double-crested

Table 16. Estimated Marshbird Production on Malheur Lake, 1975 to 1978

	1975		1976		1977		1978	
SPECIES	BREEDING PAIRS	YOUNG	BREEDING PAIRS	YOUNG	BREEDING PAIRS	YOUNG	BREEDING PAIRS	YOUNG
Western Grebe	630	945	700	1,300	655	982	275	440
Double Crested Cormorant	60	85	40	100	70	182	20	52
Great Blue Heron	210	340	190	480	200	560	30	84
Great Egret	100	240	200	350	125	225	401	772
Snowy Egret	55	130	80	140	50	90	137	248
Black-crowned Night Heron	360	775	400	865	375	825	526	1,158
White-faced Ibis	40	100	25	60	110	264	190	456
Franklin's Gull	---	---	200	320	250	25	519	1,038
TOTAL	**1,455**	**2,615**	**1,835**	**3,615**	**1,835**	**3,153**	**2,098**	**3,148**

cormorant, and great blue heron. The low nesting success of Franklin's gulls in 1977 may have been the result of low food supply (invertebrates) because of turbid water and lack of submergent vegetation. Airboat disturbance prior to the rotenone treatment may have been a contributing factor also. Conversely, the increased nesting success of Franklin's gulls in 1978 may have been the result of a larger population of invertebrates associated with increased sago production and lower carp numbers.

A colony of 16 pairs of black-crowned night herons was located near Silver Lake in Unit 16 in 1976 but not in 1975, 1977, and 1978. A colony of 31 pairs of great blue herons nested in a cottonwood tree in Subunit 22I, just north of Malheur Lake in 1975 and 1976. This colony was not active in 1977 for unknown reasons, or in 1978 when a golden eagle nested in one of the abandoned heron nests.

Fall Migration

Fall migration began in early July each year (Figure 28) and most birds were gone by early December.

Unit 5 was the area most heavily used each year by fall migrating marshbirds (Figure 30). Units 1 and 8 on Malheur Refuge also received high use. Fish-eating birds predominated in Units 1 and 5. Most use in Unit 8 was by greater sandhill cranes which were attracted by planted grain.

Throughout the 4 years of the study, Malheur Lake received the highest fall marshbird use of any area in the basin (Table 17). The lake received 37 percent of the total fall basin use in 1975 and 1976, 46 percent in 1977, and 49 percent in 1978. The increased use in 1977 was believed to be the result of increased

Table 17. Fall Marshbird Use-Days (Excluding Coot) in Malheur-Harney Lakes Basin, 1975 to 1978

LOCATION	1975	1976	1977	1978
MALHEUR REFUGE				
Double-O	141,300	173,400	177,200	121,800
Malheur Lake	425,900	439,000	465,000	481,100
Blitzen Valley	324,100	310,100	324,100	202,800
Total	891,300	922,500	966,300	805,700
OFF REFUGE				
Silvies River F. P.	205,800	201,400	26,800	132,600
Other Private Lands	50,300	71,000	12,700	48,200
Total	256,100	272,400	39,500	180,800
BASIN TOTAL	**1,147,400**	**1,194,900**	**1,005,800**	**986,500**

shallow water areas in Malheur Lake, and an overall reduction in habitat elsewhere in the basin because of drought conditions. The high proportion of use in 1978 may indicate an increasing juvenile population of carp. Part of this increased marshbird use may be attributed to an increased population of invertebrates which occurred because of an abundant growth of aquatic vegetation in the lake.

Fall marshbird use off-refuge occurred mostly on Unit 22, the Silvies River Flood Plain, and varied considerably, depending on the availability of water. For example, fall use was 201,400 days in 1976 but declined to 26,800 days in 1977--an 87 percent reduction. Use increased to 132,600 days in 1978, but this was still 41 percent below the average fall use in 1975 and 1976.

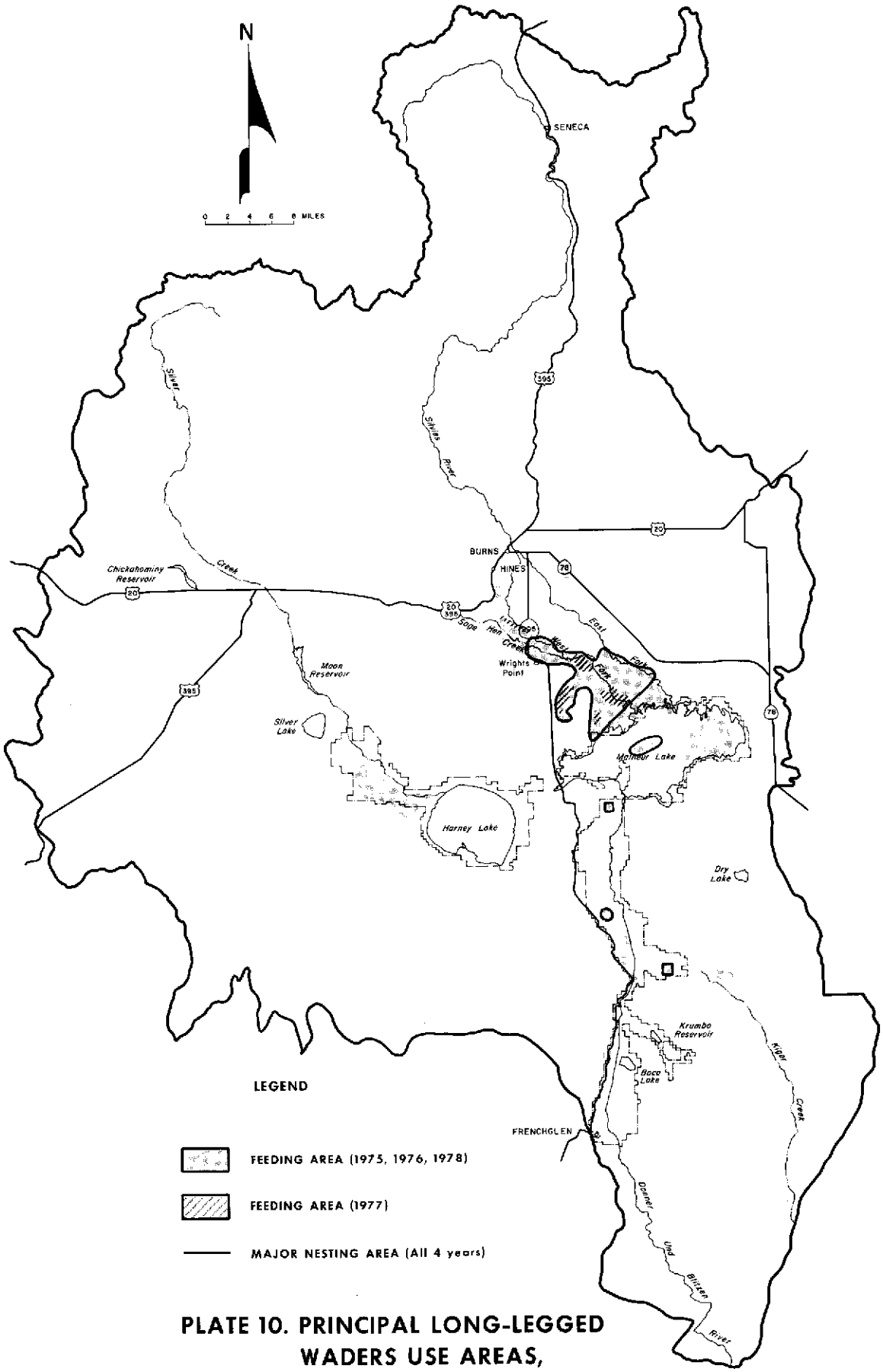


PLATE 10. PRINCIPAL LONG-LEGGED WADERS USE AREAS, 1975-1978

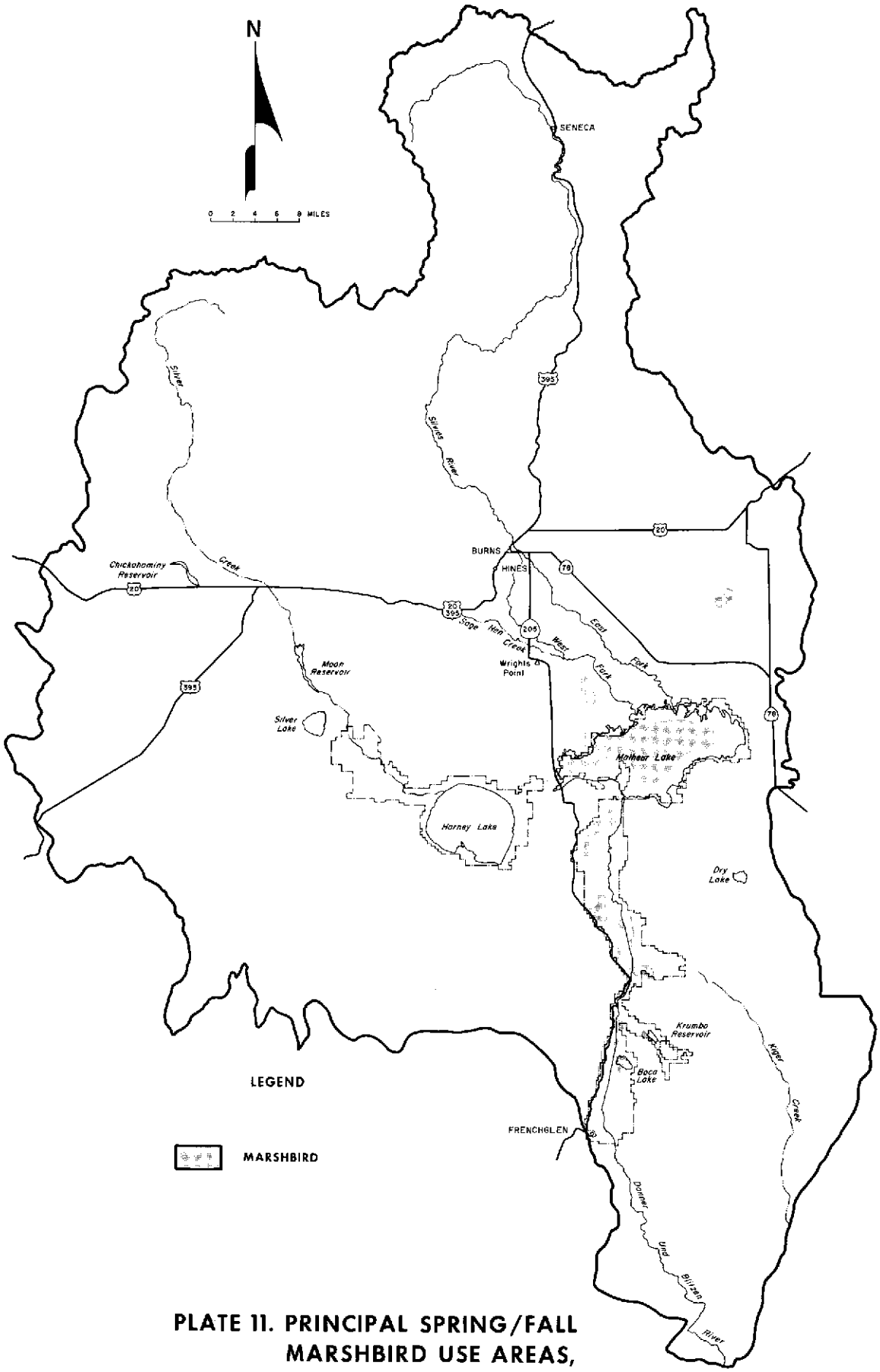


PLATE 11. PRINCIPAL SPRING/FALL MARSHBIRD USE AREAS, 1975-1978

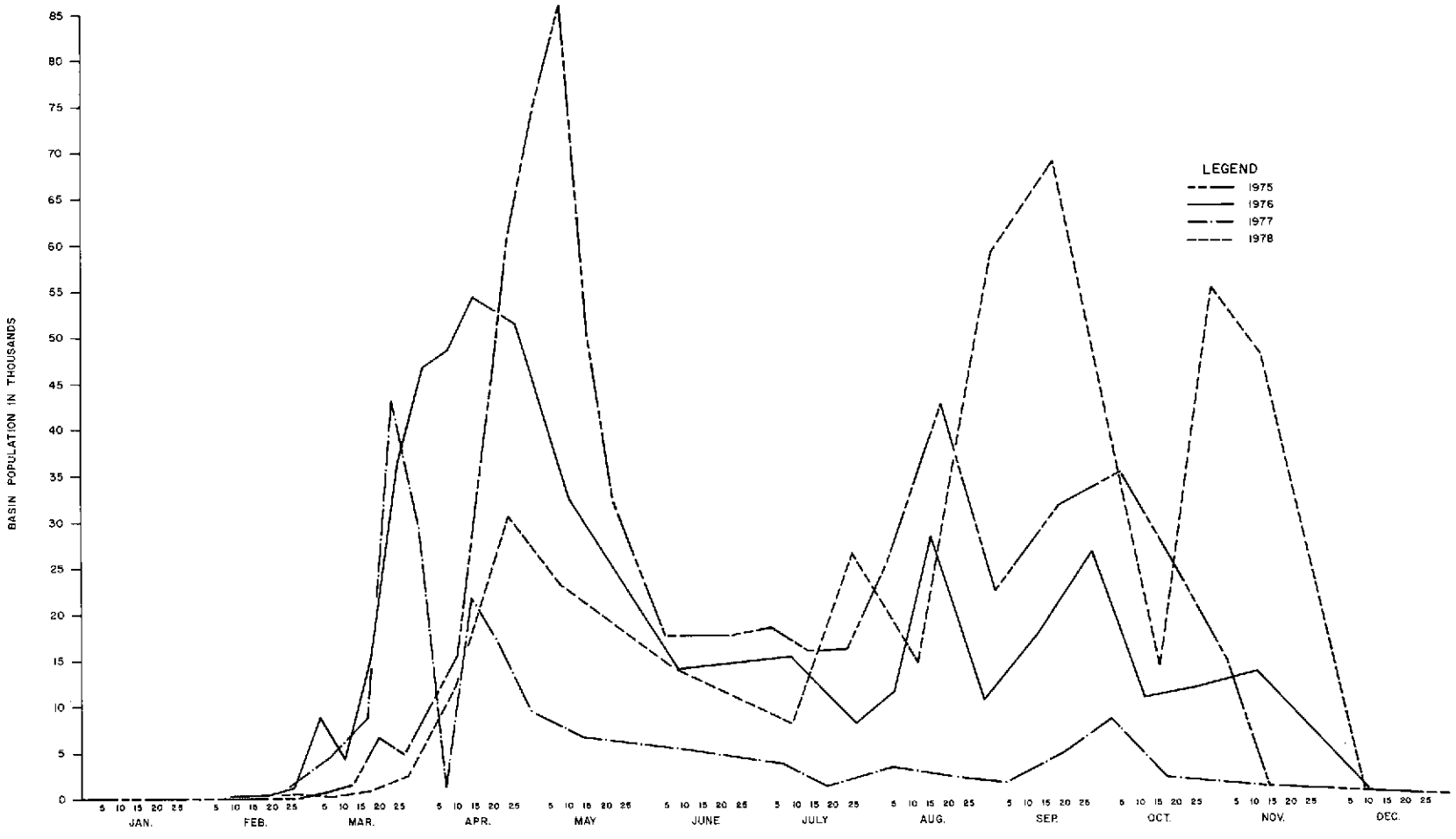


Figure 25. Coot Migration Chronology

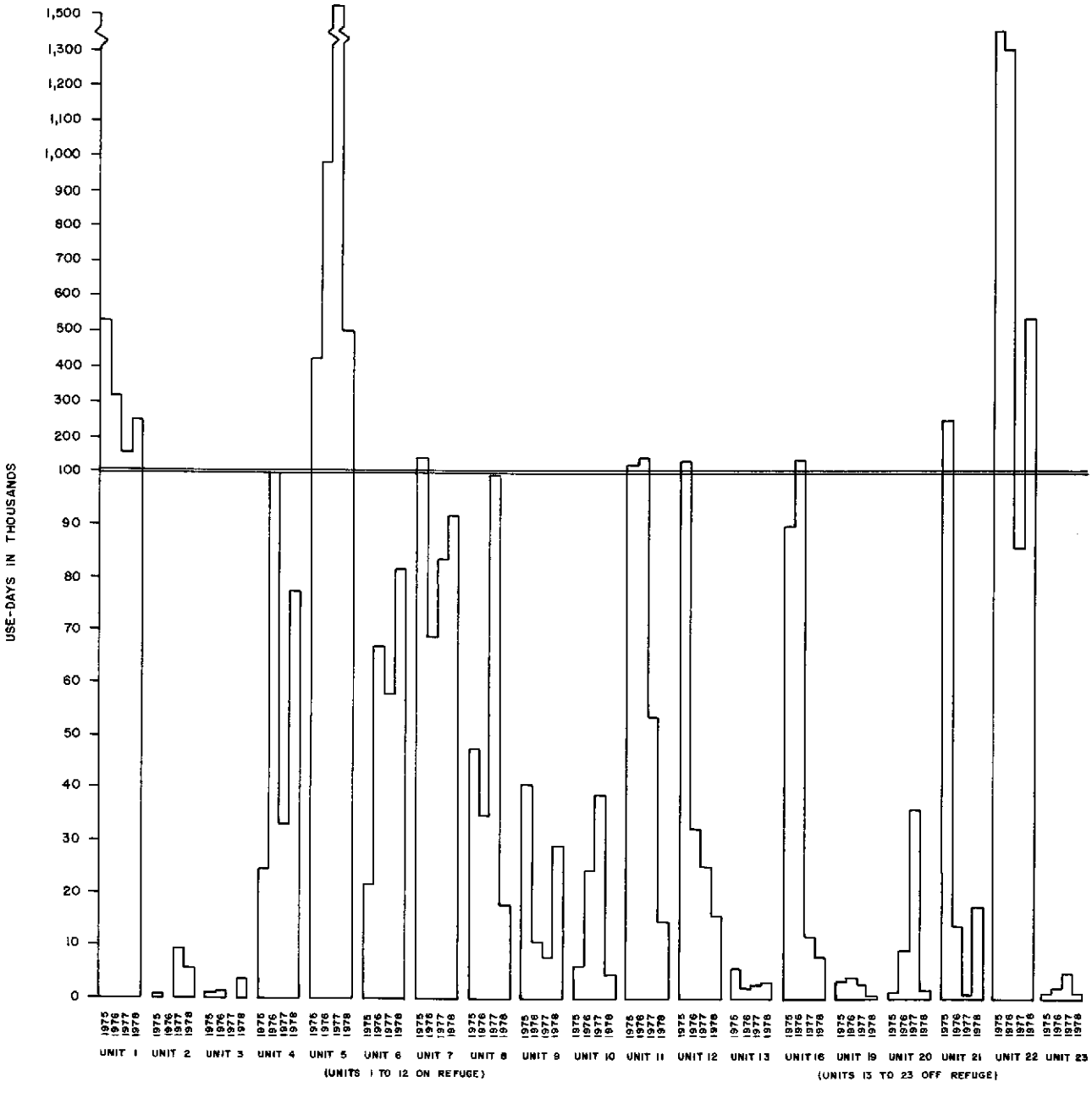


Figure 26. Spring Coot Use

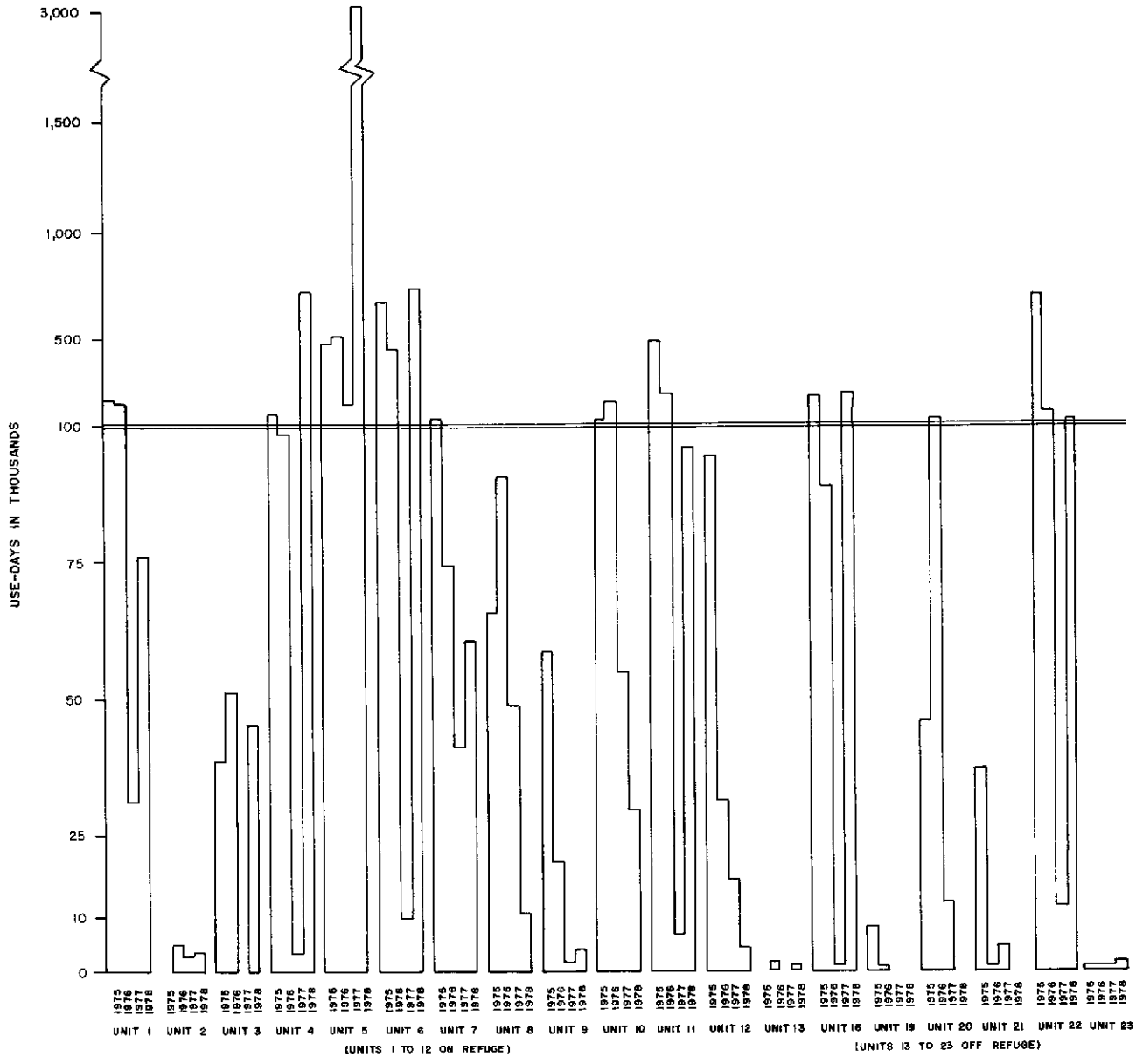


Figure 27. Fall Coot Use

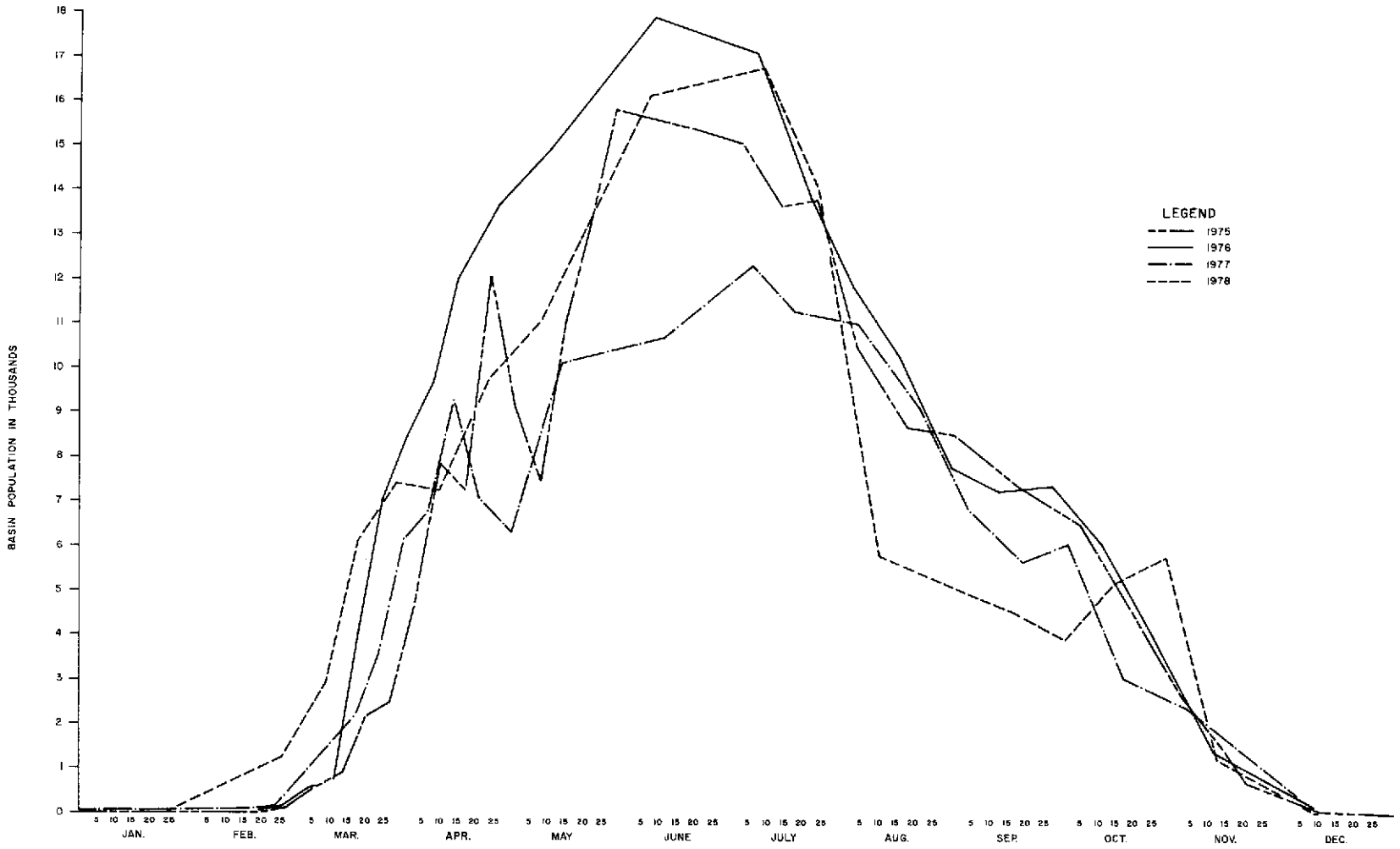


Figure 28. Marshbird Migration Chronology

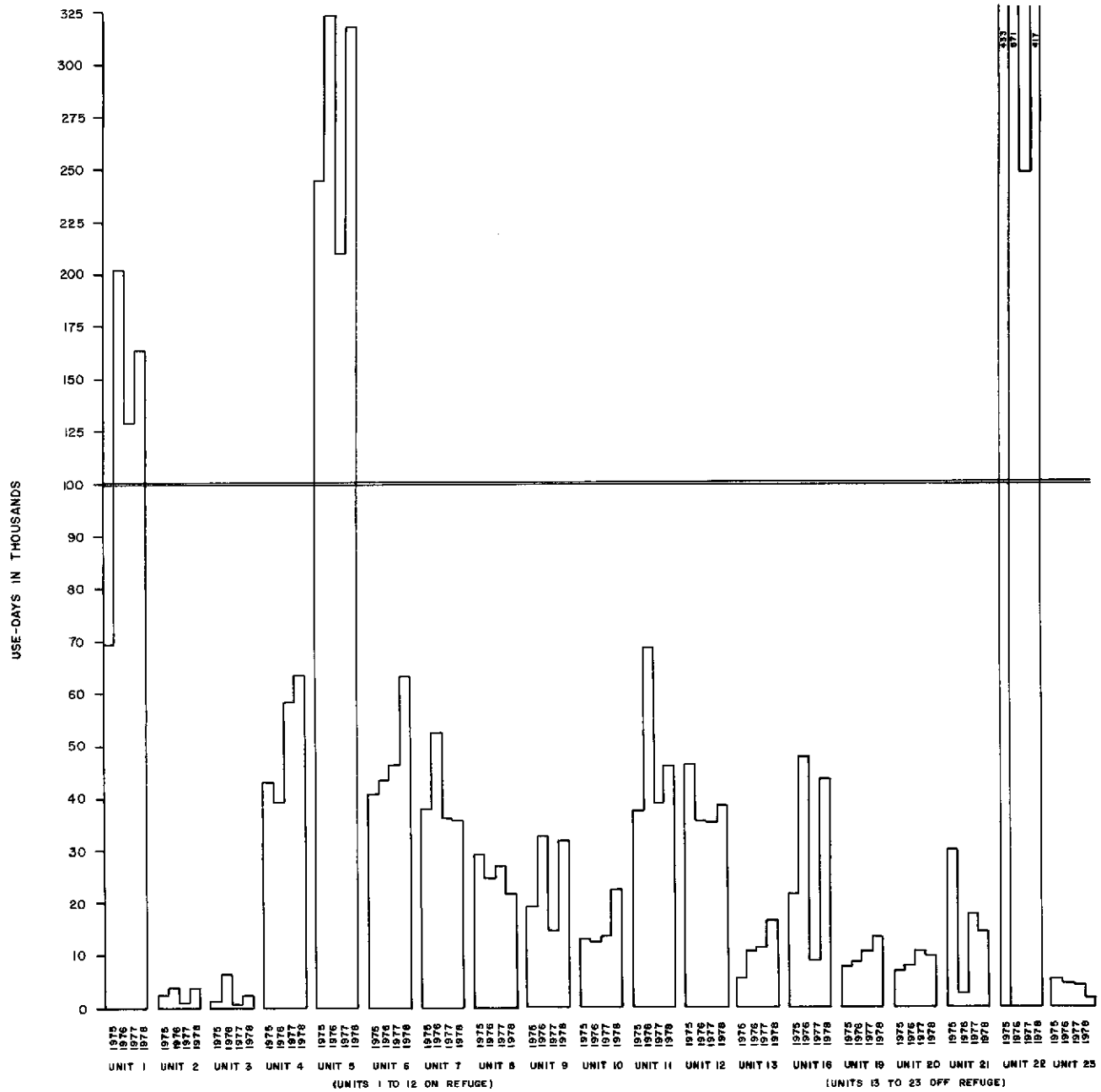


Figure 29. Spring Marshbrid Use (Excluding Coot)

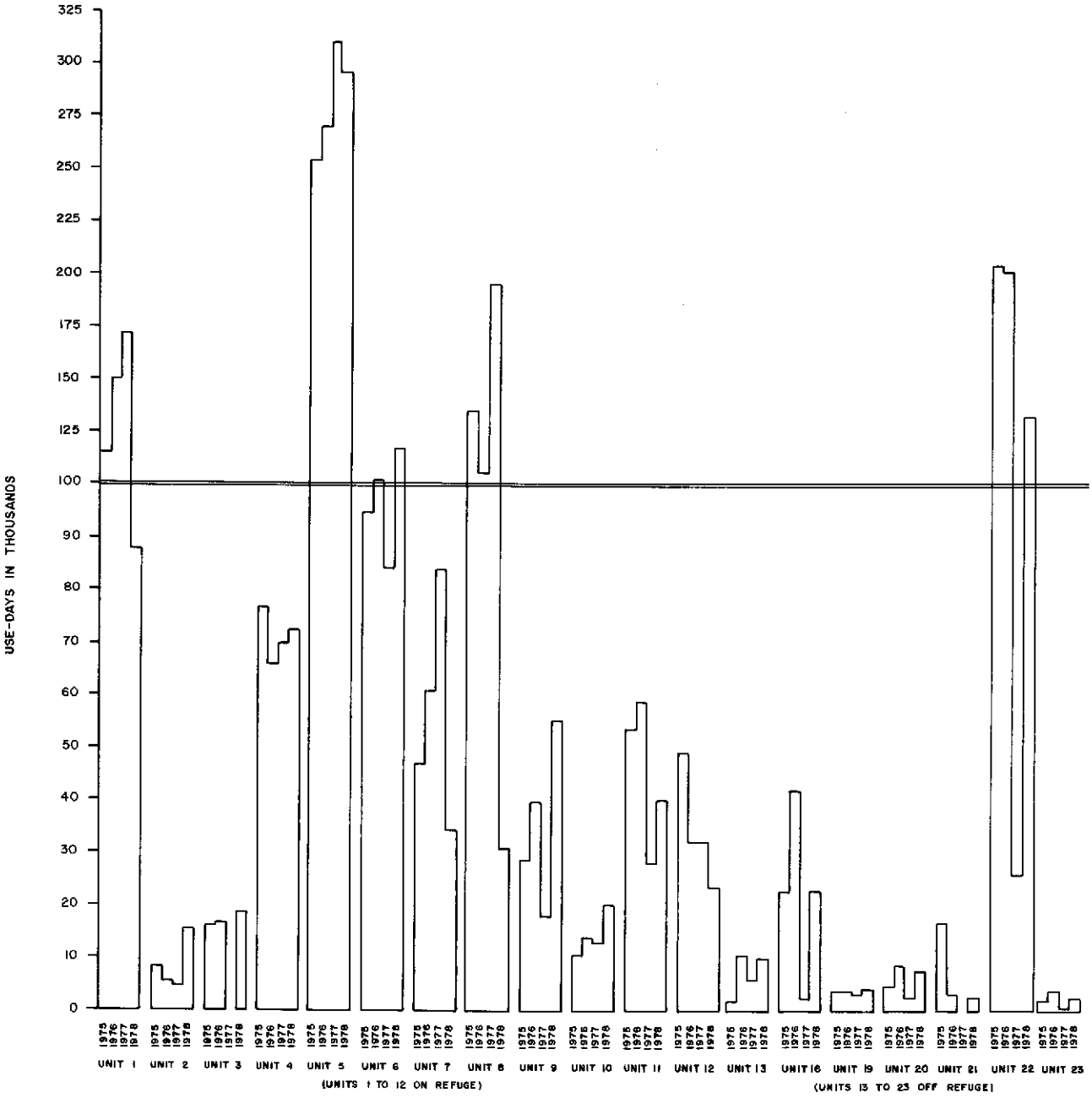
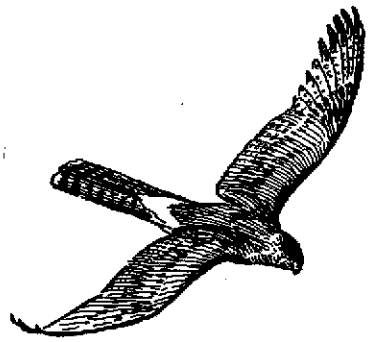


Figure 30. Fall Marshbird Use (Excluding Coot)



RAPTORS

RAPTORS

Quarterly raptor surveys were conducted in 1975 and 1977 to coincide with four major periods: 1) mid-winter (January), 2) spring migration (April), 3) nesting season (June), and 4) fall migration (August-September). The 1977 mid-winter survey was actually made in January 1978 to record possible impacts of the 1977 drought.

The 1975/77 surveys were conducted on 311 miles of transects involving 15 routes selectively chosen to sample 13 major habitat types in the basin. Eighteen species of raptors were observed during the quarterly surveys (Table 18). An additional eight species were

Table 18. Comparison of Raptor Numbers Observed on Quarterly Surveys in 1975 and 1977 in Malheur-Harney Lakes Basin

SPECIES	WINTER		SPRING		SUMMER		FALL	
	1975	1977	1975	1977	1975	1977	1975	1977
Turkey Vulture	0	0	54	36	55	134	133	181
Sharp-shinned Hawk	0	0	0	0	0	0	1	1
Cooper's Hawk	1	0	0	1	0	0	2	0
Red-tailed Hawk	3	21	40	24	39	78	44	55
Swainson's Hawk	0	0	5	32	2	23	7	16
Rough-legged Hawk	109	137	13	2	0	0	0	0
Ferruginous Hawk	0	0	0	0	2	5	1	0
Unidentified Buteo	0	0	2	8	0	14	0	2
Golden Eagle	25	31	7	16	20	17	25	26
Bald Eagle	14	4	0	1	0	0	0	0
Unidentified Eagle	4	0	0	0	0	0	0	0
Marsh Hawk	15	30	56	79	25	37	32	59
Unidentified Hawk	6	0	0	0	0	0	0	0
Osprey	0	0	0	0	0	1	0	0
Prairie Falcon	4	6	4	5	2	5	1	5
American Kestrel	0	3	52	30	13	49	35	42
Great-horned Owl	0	2	2	4	0	0	0	0
Burrowing Owl	0	0	1	1	2	1	0	0
Short-eared Owl	0	0	2	4	0	0	0	0
Northern Shrike	2	2	0	0	0	0	0	0
Loggerhead Shrike	1	0	4	4	11	15	6	13
TOTAL	**184**	**236**	**242**	**247**	**171**	**379**	**287**	**400**

known to have used the basin but were not observed during the surveys. These were the American peregrine falcon, goshawk, merlin, and five species of owls (long-eared, barn, saw-whet, screech, and flammulated), all of which are uncommon.

The 1975/77 surveys were not extensive enough to provide definitive data on any raptor in the study area. Peak populations of some species did not coincide with survey dates, and the routes did not cover major use areas (i.e. bald eagle). However, data acquired during other field investigations complemented the surveys and revealed that Malheur-Harney Lakes Basin was used extensively by raptors throughout the 4-year study period (Plate 12). Harney Valley, and particularly the Silvies River Flood Plain, is an important wintering area for rough-legged hawks and bald eagles.

The rimrocks of the basin provide nesting habitat for a variety of raptors including numerous pairs of golden eagles, prairie falcons, great-horned owls, and red-tailed hawks. One pair of peregrine falcons was known to nest in the basin in 1975.

TURKEY VULTURE

This species is common in spring, summer, and fall. The average arrival date is March 19. They become common in mid-April and leave the area in late October. Numbers were higher in 1977 than 1975 (134 and 55 respectively in the July counts). Fall counts did not show this ratio but the 1977 numbers were still substantially higher. The difference could have been the result of higher summer carryover and a corresponding reduction in fall migrants.

It is believed that three things contributed to the increase of turkey vultures in 1977:

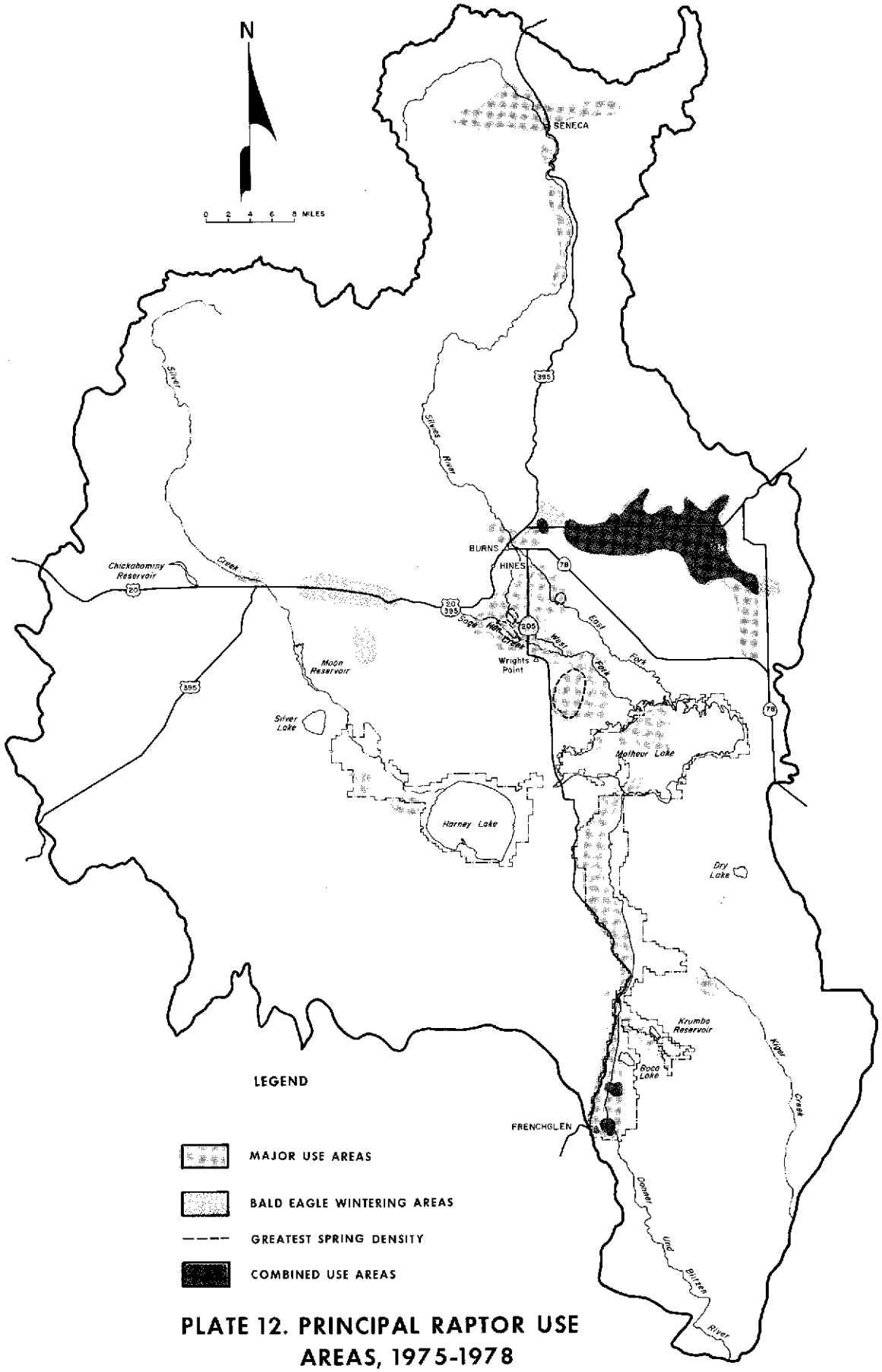


PLATE 12. PRINCIPAL RAPTOR USE AREAS, 1975-1978

1. More nesting and non-nesting birds could have remained in the basin. This was attributable to drought caused increases in food (i.e. mortality of birds and mammals) and reduction of flooded area which represented a substantial increase in feeding area.

2. Brood survival could have been higher because of more food availability.

3. Drought conditions throughout the west could have caused the birds to migrate earlier than normal.

RED-TAILED HAWK

Red-tailed hawks are common in the basin throughout the year. Most nest on rimrocks, but several pairs are known to nest in junipers, cottonwoods, and ponderosa pine trees. They were more abundant in the spring of 1975 than 1977. By August the ratio decreased considerably as drought conditions became extreme. Many of the birds were believed to have moved to the higher elevations outside of the survey routes where conditions were not as severe.

Survey data do not indicate the number of birds wintering in the basin because these hawks prefer the juniper-sagebrush slopes outside the survey routes. Winter numbers in 1977/78 were somewhat higher than in 1975. This could have been the result of higher fall populations and a mild winter.

ROUGH-LEGGED HAWK

Rough-legged hawks are a common winter species in the basin. Surveys showed most use to be on Malheur Refuge where meadows and feeding conditions were more favorable. This species

appeared to be particularly influenced by the deferred grazing program on the refuge which resulted in increased food supply in the form of meadow vole populations. Specifically, during the winter of 1977/78 surveys of hawk use in relation to management practices on Malheur Refuge showed the following results: out of 253 hawks surveyed, 129 (51 percent) were using deferred areas; 65 (26 percent) used mowed-grazed; and 59 (23 percent) were in mowed-ungrazed. Combined, the two nongrazed areas supported 178 or 74 percent of the rough-legged hawks observed.

SWAINSON'S HAWK

The Swainson's hawk is found in the basin spring through fall. Like most other raptors, it showed an increase in 1977 over 1975, especially in the spring and summer (32:5 and 23:2 respectively). The difference in fall counts was less pronounced, but still more than double (16:7). Increased food supply (rodent populations) in 1977 was believed to account for the increase.

RED-SHOULDERED HAWK

A red-shouldered hawk was observed near P Ranch on Malheur Refuge in August 1976. This represented the first record for southeast Oregon. A low pressure weather condition in northern California in late July and early August could have caused the movement of this individual into southeast Oregon.

GOLDEN EAGLE

The golden eagle is a year-round resident in the basin, and populations are not subject to significant change by in/out migration of birds. Numbers in 1977 were slightly higher than in 1975 except in the July count. The resident

nonmigratory status of the golden eagle may have been responsible for the less spectacular increase in numbers than shown by some species of raptors.

BALD EAGLE

Bald eagles are winter and spring inhabitants in the basin. In the winter they are most common in the sagebrush-juniper-agricultural areas, especially between Burns and Buchanan. They are most abundant in the spring at the peak of waterfowl migration. This occurs in March, however no raptor surveys occurred at this time. Observations during spring aerial waterfowl surveys showed that the Silvies River Flood Plain was an important feeding area for migrant bald eagles. These eagles concentrated on meadows flooded by the Silvies River where waterfowl were abundant. Bald eagles were fewer in number in the winter of 1977 than in 1975. What caused this difference was not determined, but it is possible that the lack of snow cover prevented the concentration of jackrabbits, a preferred prey species. Mild weather may have also contributed by allowing eagles to remain on summer/fall habitat later than usual.

MARSH HAWK

A year-round resident, the marsh hawk is common throughout wetland areas of the basin. Surprisingly, with the lack of water in 1977, marsh hawk numbers were up from 1975. Nesting habitat was adequate on Malheur Refuge, but was virtually absent elsewhere in the basin. Small rodent densities were greater in 1977 and this could have accounted for the marsh hawk increase.

The 1977 winter counts were double the 1975 counts probably because the mild winter in 1977 provided more favorable feeding areas with

little or no snow cover. On Malheur Refuge, 75 percent of the marsh hawks were using nongrazed habitats during winter surveys and most basin use occurred on the refuge.

PRAIRIE FALCON

Prairie falcons, although not abundant, are present all year. Surveys in 1977 showed minor increases over the 1975 counts. Several pairs were known to have fledged young in 1977. As with other species, the dry conditions provided feeding habitat which is normally inundated with water during the summer. A slight increase in numbers noted during the winter of 1977 could have been the result of the milder weather.

AMERICAN KESTREL

The American kestrel is a spring-summer-fall resident. As with other species, it generally showed increased numbers in 1977, but counts were down considerably during April and May. The July counts revealed that the highest densities were in the agricultural areas in the vicinity of Crane and Buchanan but they were also commonly observed in the sagebrush-juniper areas. A few wintered in 1977, but none were seen in 1975. The milder winter could have been responsible for this difference.

PEREGRINE FALCON

An adult was seen at Stinking Lake on July 20, 1977. This represented the only lowland record. In 1975 the only record was of a single bird that was seen repeatedly on the east side of Malheur Lake.

OSPREY

An osprey was seen in Silvies Valley in late June and in early July 1977. No nest was located and it could not be determined if this bird was a member of a nesting pair.

CONCLUSIONS

Generally, most raptors were more abundant in 1977 than in 1975. The drought seemed to benefit many species, but it is difficult to positively state that drought conditions alone were the major cause of the increase in raptor numbers. Rodent and jackrabbit numbers were higher than in 1975 and weather conditions were milder than in 1975. Increased agricultural developments in certain areas near transect routes could have also had an effect on overall numbers. Another factor was the increase of deferred cattle grazing areas on Malheur Refuge which improved habitat for prey species.

BREEDING BIRD SURVEY

BREEDING BIRD SURVEYS

Four 25-mile breeding bird survey routes were established in 1975 and 1976. Although routes were not surveyed both years, climatic conditions were similar (wet years). All four routes were surveyed in 1977 to compare breeding populations of birds in a dry year with those during years of normal or above average precipitation.

DELINTMENT LAKE ROUTE (1975 AND 1977)

This survey was made on the same date (June 24) in 1975 and 1977. The route began 27 miles southwest of Delintment Lake and followed a logging access road to a point 2 miles east of the lake. Habitat (coniferous) varied from sage-juniper at the starting point, to aspen-ponderosa at the end. Thirty-three species were recorded in 1977, compared to 30 in 1975. The three most abundant species (robin, chipping sparrow, and Cassin's finch) were the same both years, although the sequence changed. Several observations were made in 1977 including a significant increase in woodpeckers. This increase coincided with a major insect-caused tree kill in northern California and southern Oregon. The increase in dead trees and the food supply (insects) could have been reponsible for the woodpecker increase. Yellow-rumped warblers also increased as did most other insectivorous species. Conversely, seed-eating species were generally down in numbers.

MYRTLE PARK ROUTE (1976 AND 1977)

The Myrtle Park counts were made on June 25, 1976, and June 27, 1977. The route was from the Myrtle Park Road - US 395 junction north to an area west of the Silvies Valley. Most vegetation along the route consisted of ponderosa pine with a sagebrush understory. A few stops were in stands of sagebrush with no trees, or in

dense stands of Douglas and white fir. Some willow, mountain mahogany and aspen were also present along the route. A total of 50 species was recorded in 1977 compared with 45 in 1976. The American robin was the most abundant species both years.

Like the Delintment Lake route, numbers of common flickers increased, but some species of woodpeckers showed a decline in 1977. Numbers of mountain chickadees also declined on this route, but populations of all three species of nuthatches increased. Breeding populations of most seed eaters were up, but species that are dependent on coniferous cones were down in numbers.

Unlike the Delintment and Rattlesnake Creek routes yellow-rumped warblers decreased in numbers, but populations of other insectivorous species, such as flycatchers increased.

RATTLESNAKE CREEK ROUTE (1975 AND 1977)

This route was surveyed on June 27, 1975 and on June 28, 1977. The count was made from Camp Harney north and west to a point east of Silvies Valley. The count area consisted of riparian, juniper, ponderosa pine and Douglas fir. A total of 53 species was recorded in 1977, down from 55 in 1975. The most abundant species both years was the American robin. Even so it was much less abundant in 1977, declining to 69 compared to 105 in 1975. Common flickers increased from 11 in 1975 to 16 in 1977, but other species of woodpeckers declined in numbers.

Populations of flycatchers increased as did all three species of nuthatches. Yellow-rumped and yellow warblers also increased.

Coniferous cone-eating species declined, especially the red crossbill. Cassin's finches were down only slightly.

SILVIES RIVER FLOOD PLAIN ROUTE (1976 AND 1977)

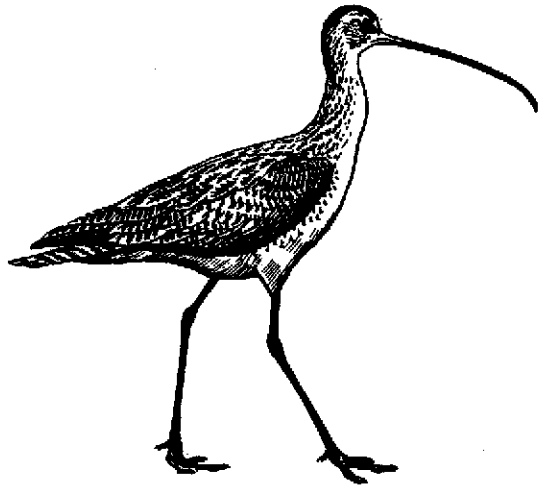
The most drastic change in breeding bird populations during the survey period occurred on this route. Counts were made on June 29, 1976 and June 30, 1977. The route extended from just south of Hines Mill through Potter Swamp, then southeast to Island Ranch and Lawen, and terminated near the Cargill Ranch north of Malheur Lake. Most of this route was through native meadow and greasewood-sagebrush uplands. In 1976 the native meadows had been flood irrigated, but in 1977 due to drought conditions only the first 2 miles of the route had received water. In 1976, 62 species were recorded (4,809 birds) compared to 45 species (1,363 birds) in 1977.

Shorebirds and waterfowl were most affected by the drought. Marshbirds which normally nest on the flood plain probably moved south onto the refuge. Greater sandhill cranes wandered throughout the flood plain and little nesting occurred.

Unlike the mountainous routes, mourning doves showed an increase on the flood plain. An increase in numbers of short-eared owls probably reflected better feeding conditions, because fewer areas held water. Virtually the entire flood plain was dry and small rodents were apparently dispersed throughout.

The Swainson's hawk was seen in 1977 but not in 1976 and an increase was apparent throughout the basin. Other raptor observations were essentially unchanged along the route except for the marsh hawk which showed a decline.

POTENTIAL IMPACTS OF A MAJOR WATER STORAGE PROJECT ON THE SILVIES RIVER FLOOD PLAIN AND MALHEUR LAKE



POTENTIAL IMPACTS OF A MAJOR WATER STORAGE PROJECT ON THE SILVIES RIVER FLOOD PLAIN AND MALHEUR LAKE

The 1977 drought provided the basic data needed to prepare a general analysis of the impacts a major water storage project on the Silvies River could have on the Silvies River Flood Plain (Unit 22) and Malheur Lake. Extensive diking and drainage on the flood plain or small impoundments upstream could produce similar impacts on a lesser scale. Since Unit 22 was divided into 11 subunits (A to K), impact assessment could be made for specific areas of relatively small size if future development warrants it. Figures 31 through 42 at the end of this section illustrate the importance of individual subunits to the major migratory bird groups.

Migratory bird use of the Silvies River Flood Plain is dependent almost entirely upon spring flooding. Any reduction in flooded area would be detrimental. Of equal importance is the timing of flooding in the unit. In the 3 "wet" years of 1975, 1976, and 1978 the arrival of spring migrants was closely associated with climatic conditions and the beginning of spring flooding. For example, the relatively cold spring of 1975 resulted in a delay in flooding paralleled by a delay in the arrival of spring migrants of up to 2 weeks. Conversely, a similar delay of flooding because of reservoir storage would result in a major loss of early spring migrant habitat. However, it would not be accompanied by a delayed arrival of spring migrants. Early spring migrants, such as the pintail, American wigeon, Canada goose, and sandhill crane, which enter the basin as early as mid-February, would be most severely affected by the loss of feeding and resting areas. Early nesting species such as the Canada goose, pintail, mallard, cinnamon teal, sandhill crane, and most shorebird species could also be deprived of nesting habitat. Any nests completed would be subject to destruction by rising water levels during May and June if reservoir

releases were large or used for flood irrigation. Based on 1977 observations (late flooding), such releases would cause a large portion of the spring migrant birds to leave the basin without nesting. Since the amount of breeding habitat would be declining in other areas, this could result in almost an entire loss in production of those birds affected.

The only area of the flood plain that would not be seriously affected by a water storage project would be a portion of Subunit 22D just south of the City of Hines where springs provide water independent of the Silvies River. However, this is only a small portion of the flood plain, covering only a few hundred acres in wet years.

Migratory bird use of Malheur Lake during the spring is affected by a variety of factors including holdover of water from the prior year, volume and timing of inflow, and total surface area. Silvies River inflow, although not as large as once believed, provides an important contribution of water to Malheur Lake. The significance of this inflow is largely in the "topping off" aspect when added to other water sources and carryover from the prior year. Malheur Lake normally includes several thousand acres of shallow area each spring. This area produces the major portion of sago pondweed and invertebrates in the lake which are the primary food source for many species of migratory birds. The shallowness also meets the feeding requirements of nondiving species of waterfowl, wading birds, and shorebirds.

Based upon data provided by the U.S. Geological Survey's hydrological study, the Silvies River inflow in 1975, 1976, and 1978 represented enough water to create much of the shallow water area. This flooded area formed by Silvies River inflow and the depth thereof not only increased the total production of food but also served to extend the period of availability before dryup occurred. The loss of Silvies River inflow could contribute to several significant losses; most notably food production, feeding, and

nesting area. Delayed inflow could, in addition to the above, result in flooding of nests and creation of stable water conditions that are not compatible with 1) species needing receding levels to expose food sources, or 2) optimum production of sago pondweed which also provides much of the most productive invertebrate habitat in the lake.

Fall use by water-dependent species in the basin is limited to areas with firm water supply, most of which is on Malheur National Wildlife Refuge. The Silvies River Flood Plain is usually "dry" by fall so upstream storage would have much less impact on Unit 22 in the fall than in the spring. However, any reduction in late summer water area on the flood plain could significantly reduce the survival of waterfowl produced there.

It is not possible to assess the specific impacts a water project would have on migratory birds without detailed information concerning the project and updating of information about migratory birds in the areas that would be affected. However, the drought-caused changes in use and production on the Silvies River Flood Plain and Malheur Lake are an example of the potential changes which could result from a major loss of spring flooding and reduced lake levels. The overall impact of the drought on migratory bird use was a decline of about 6.4 million spring and 1.5 million fall use-days on the Silvies River Flood Plain, and .45 million spring and 4.45 million fall use-days on Malheur Lake. Duck and goose production also declined substantially; 91 and 58 percent respectively on the flood plain, and 50 and 34 percent respectively on Malheur Lake. It should be noted that these impacts resulted from a temporary change in habitat conditions and therefore were probably less severe than those that could occur with long-term changes in water surface area, flooding, land use, and project operation.

As indicated above, the specific impacts of a project cannot be determined without additional data, but the potential for loss is great. Accordingly, any project development would undoubtedly have to include a major compensation program. A detailed analysis of a specific project could also identify means to enhance some species.

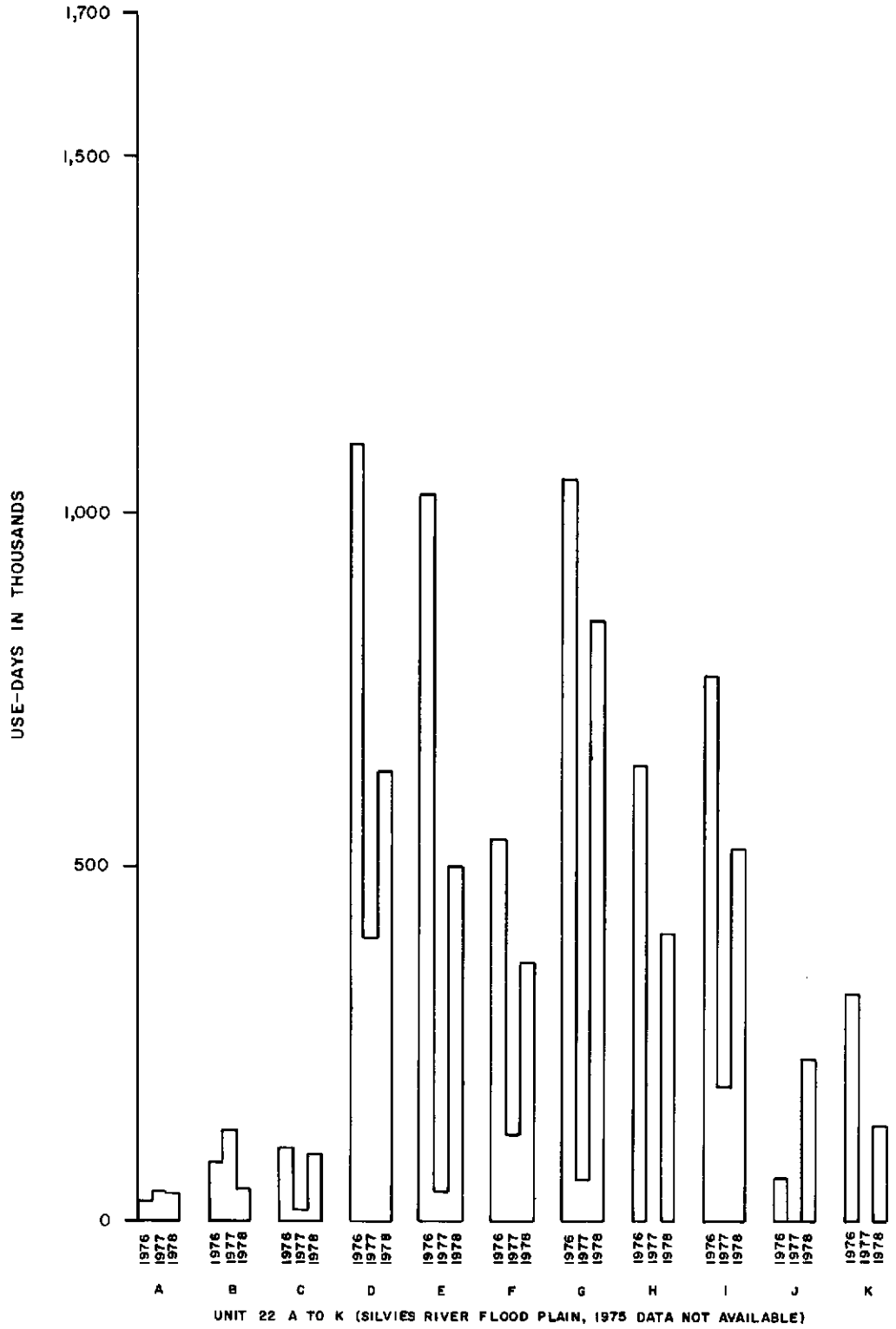


Figure 31. Spring Duck Migration

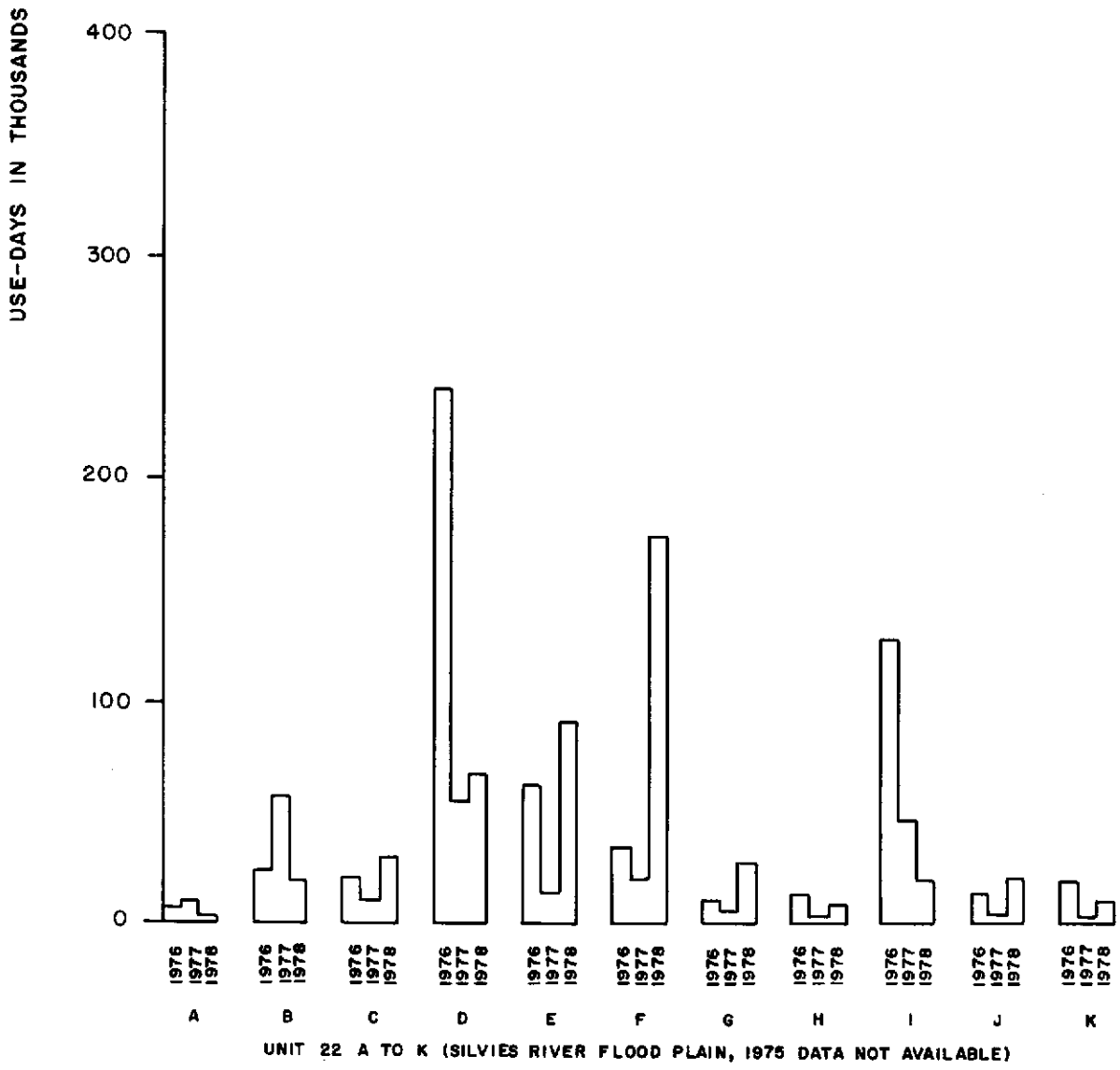


Figure 32. Spring Goose Migration

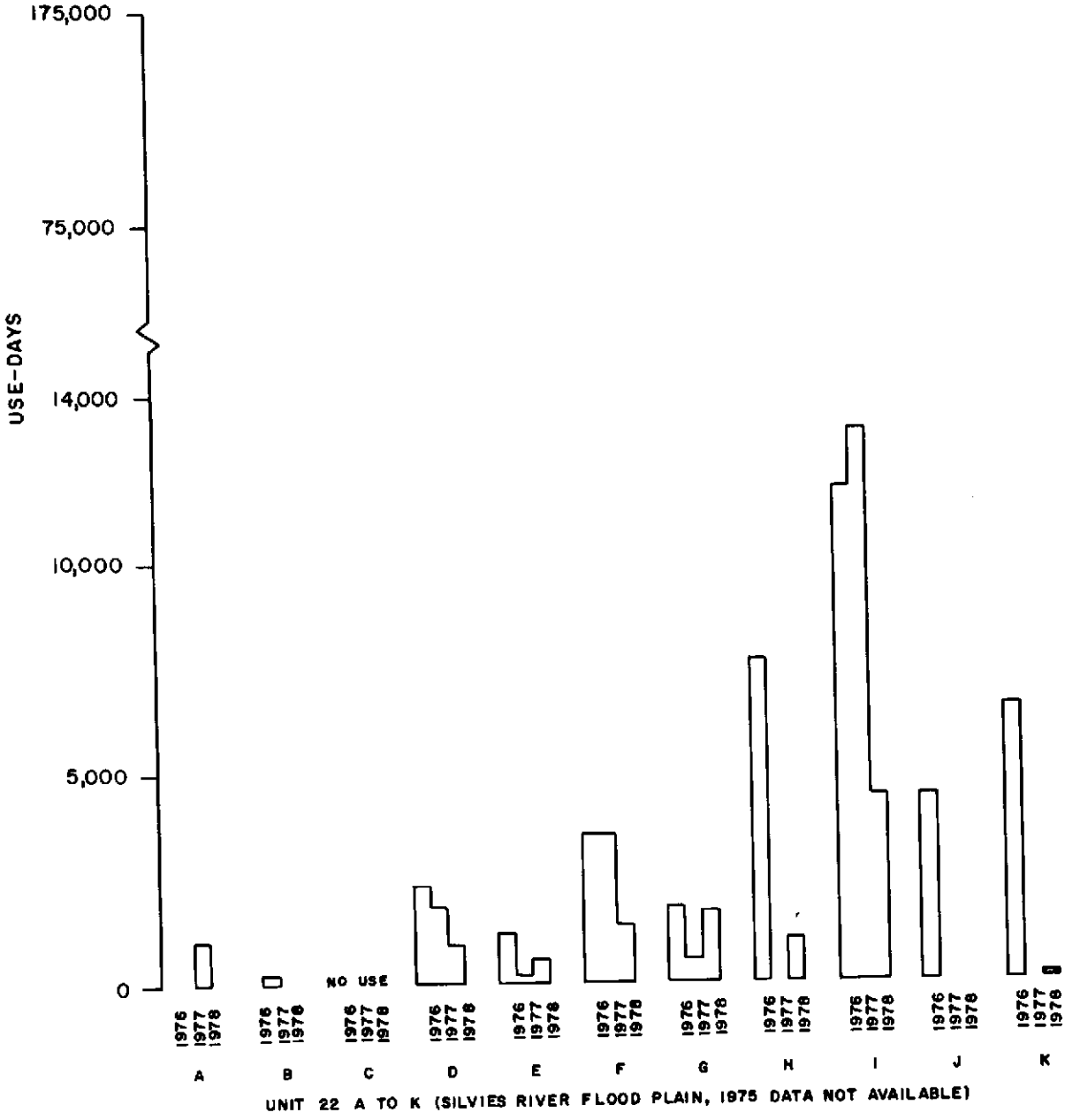


Figure 33. Spring Swan Migration

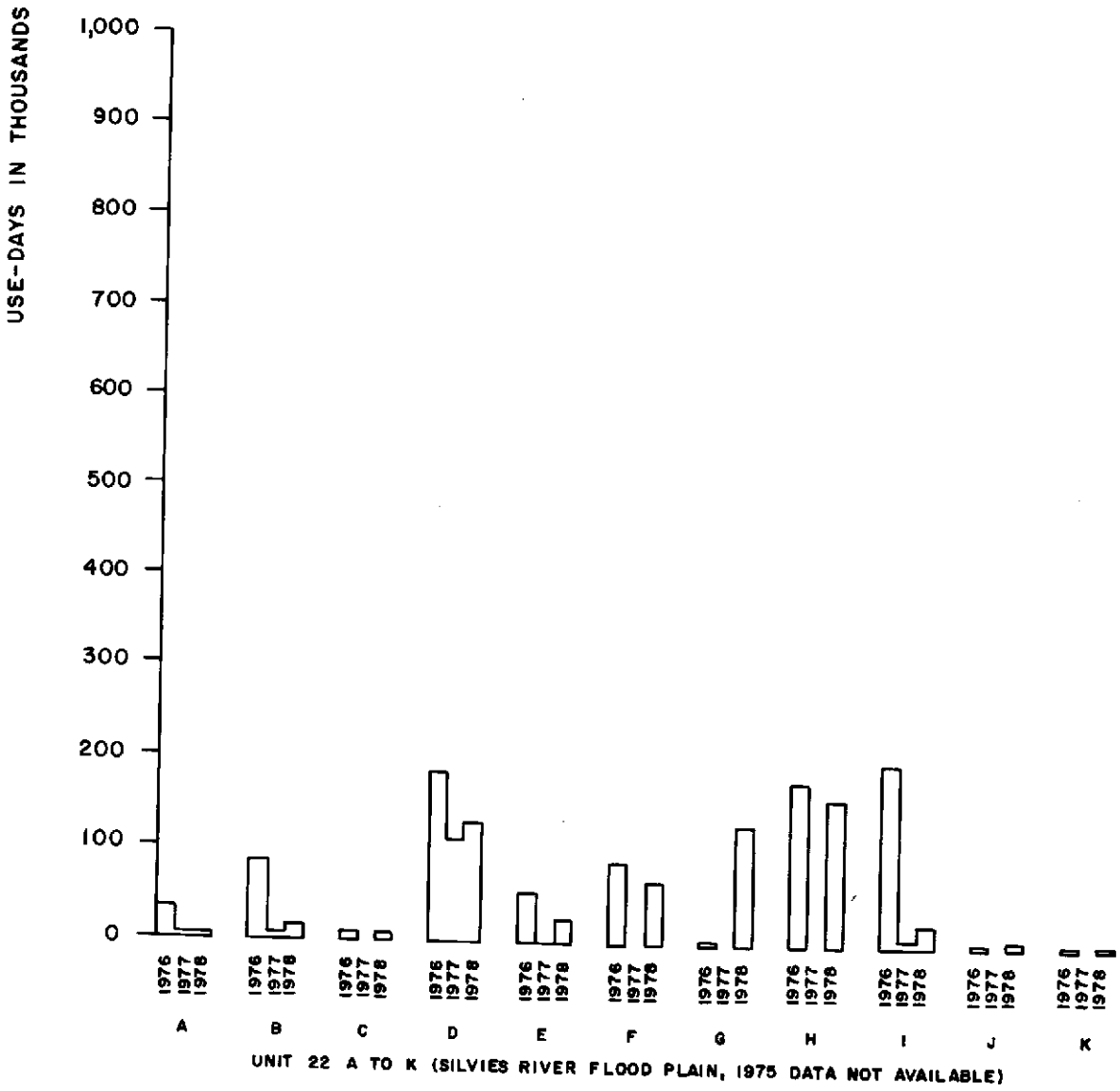


Figure 34. Fall Duck Use

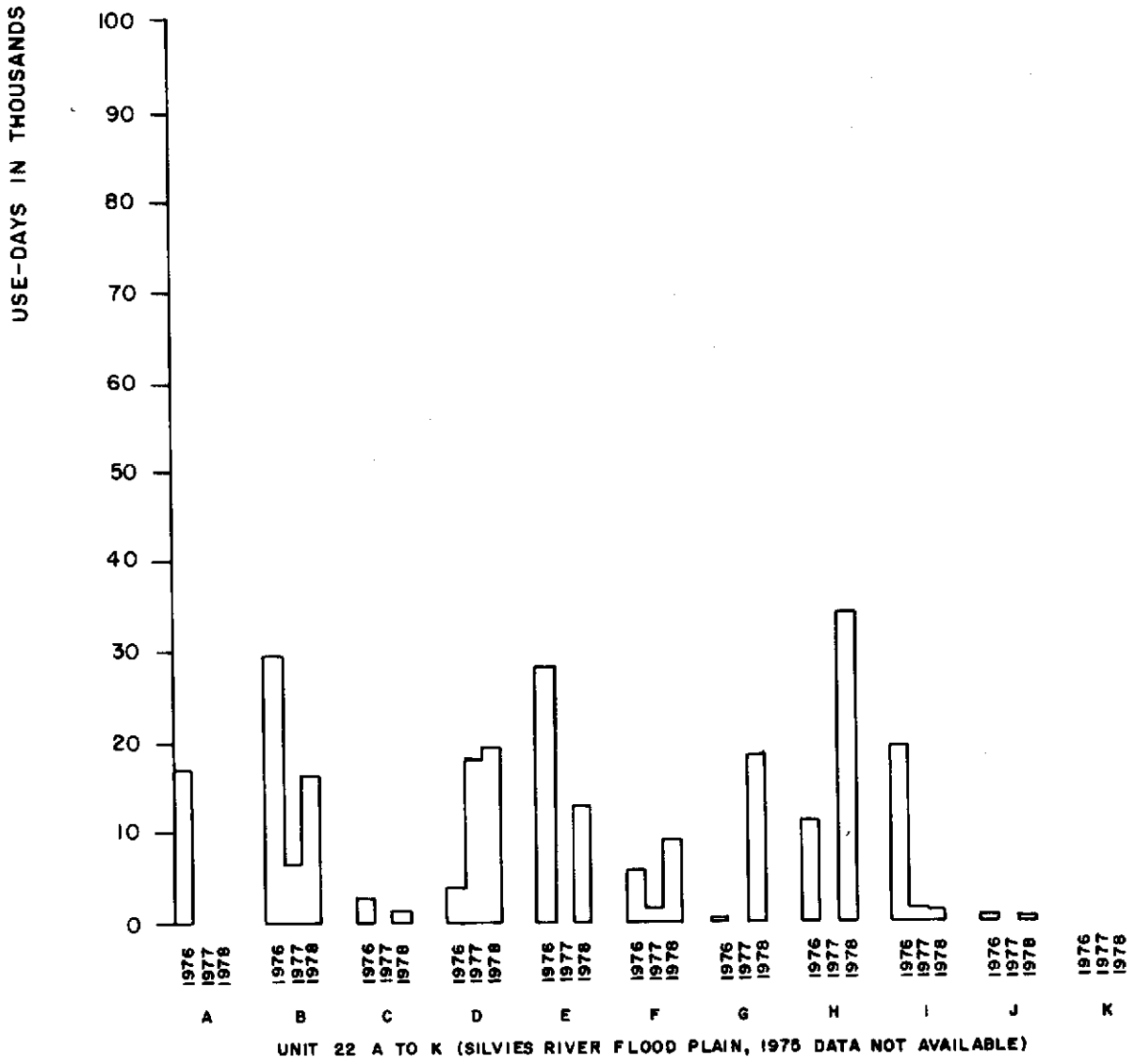


Figure 35. Fall Goose Use

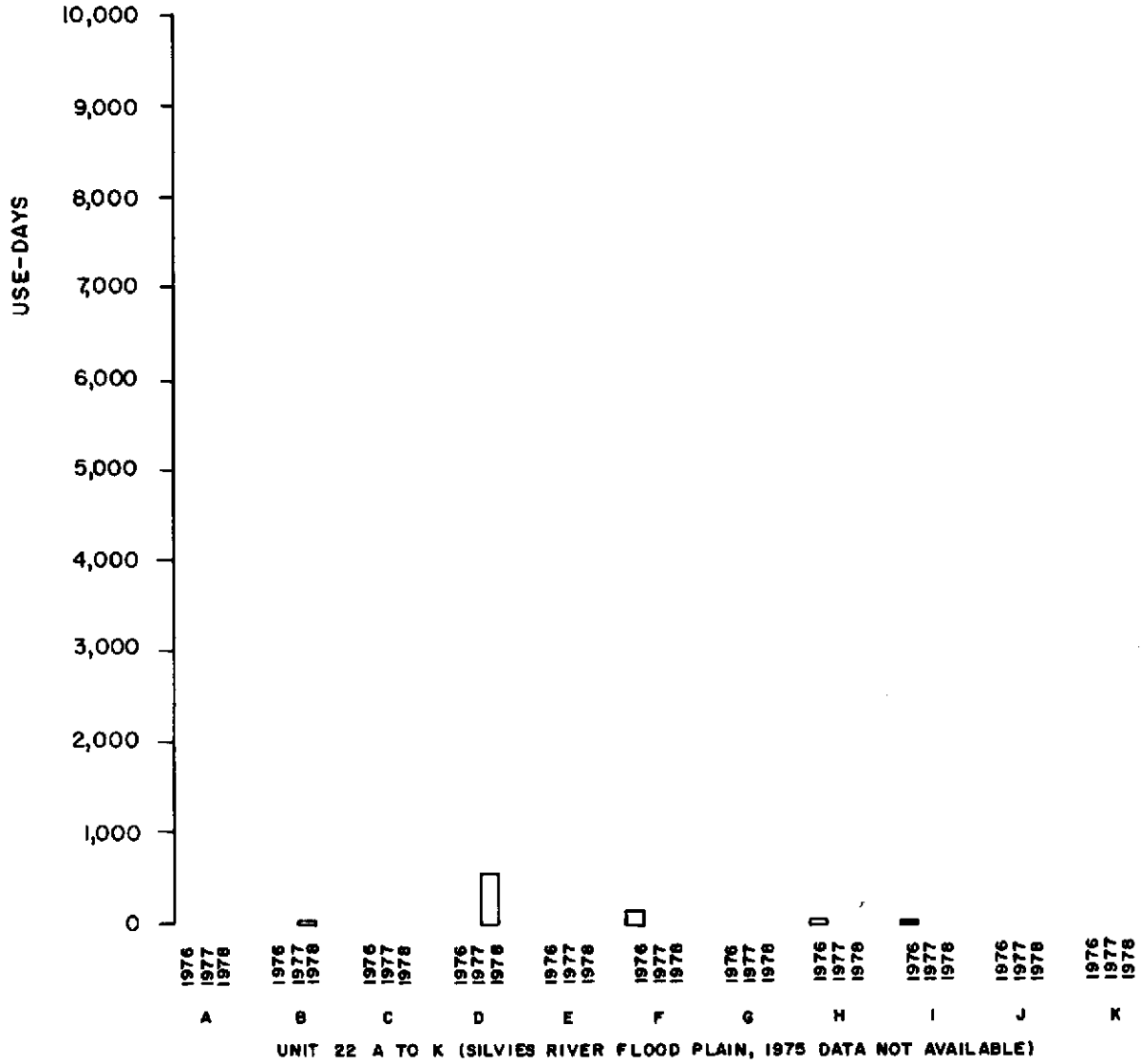


Figure 36. Fall Swan Use

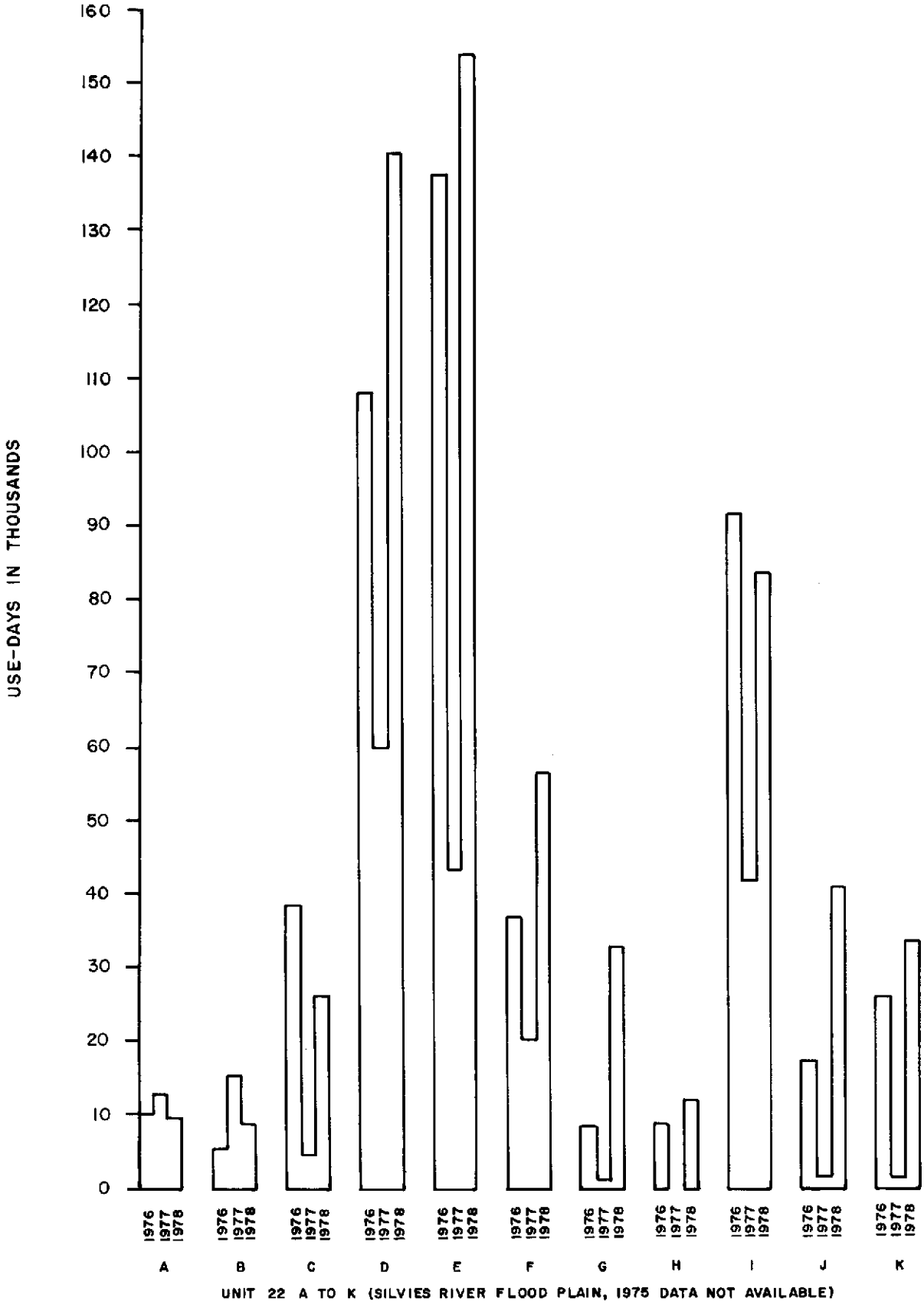


Figure 37. Spring Shorebird Use

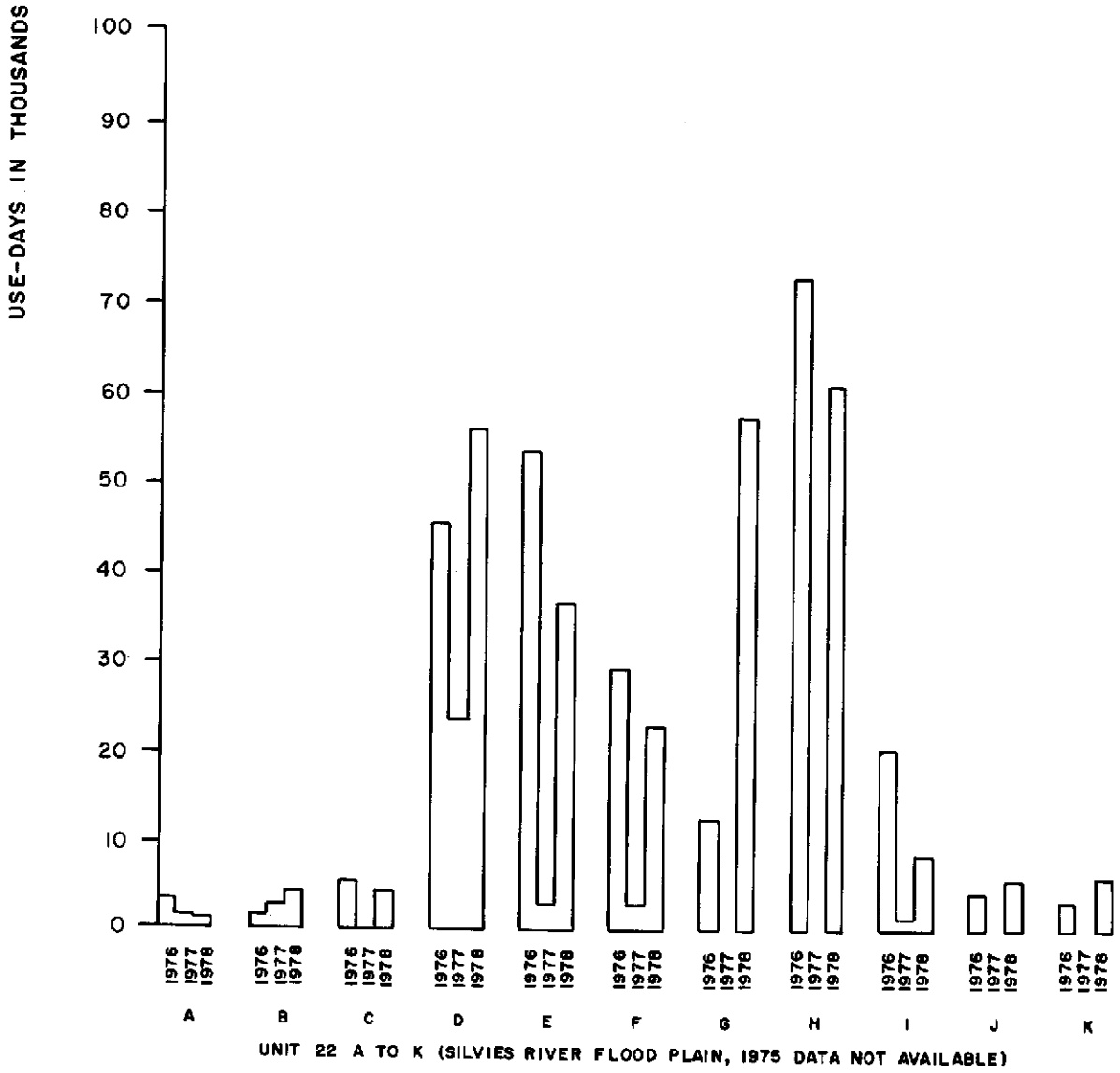


Figure 38. Fall Shorebird Use

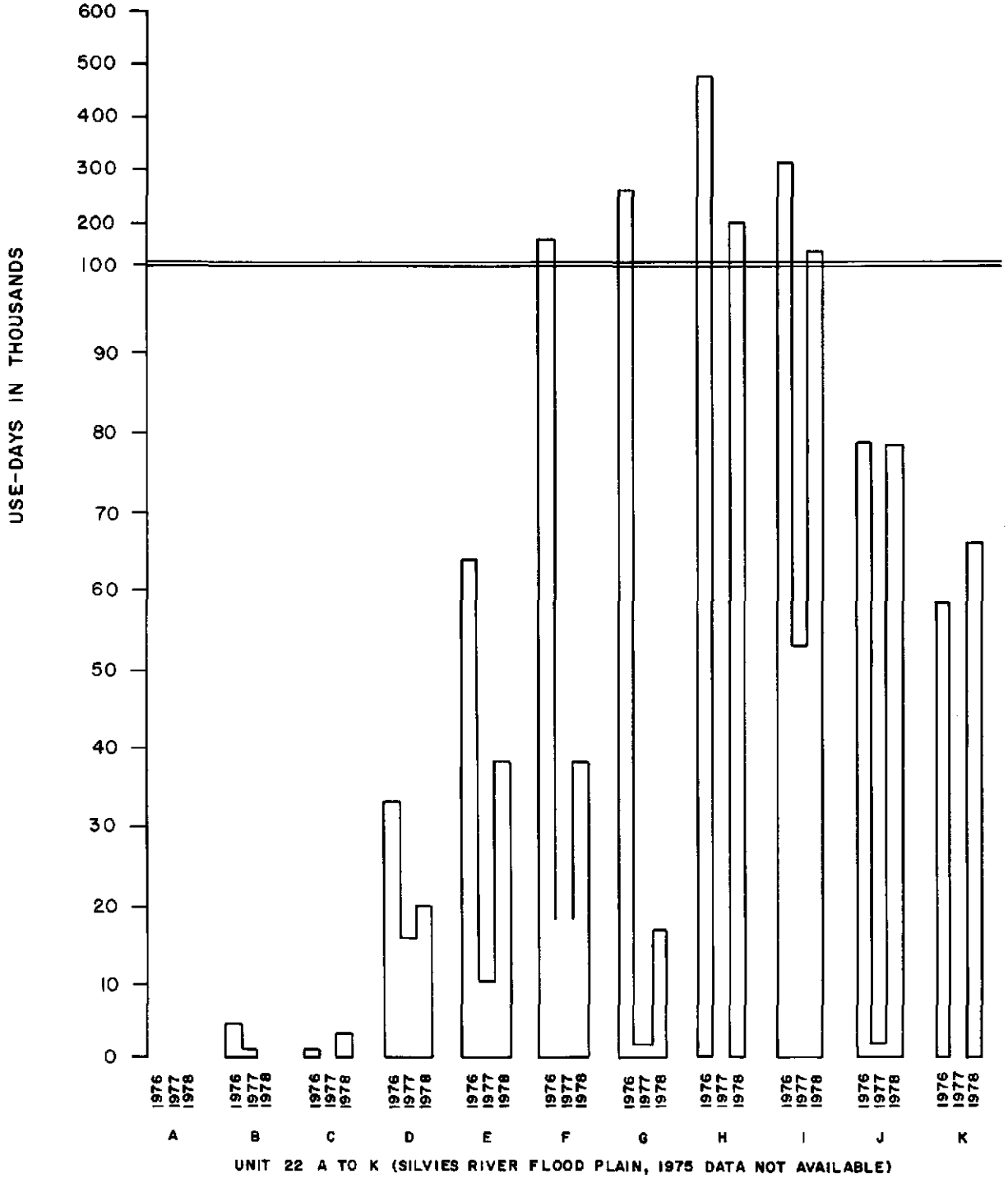


Figure 39. Spring Coot Use

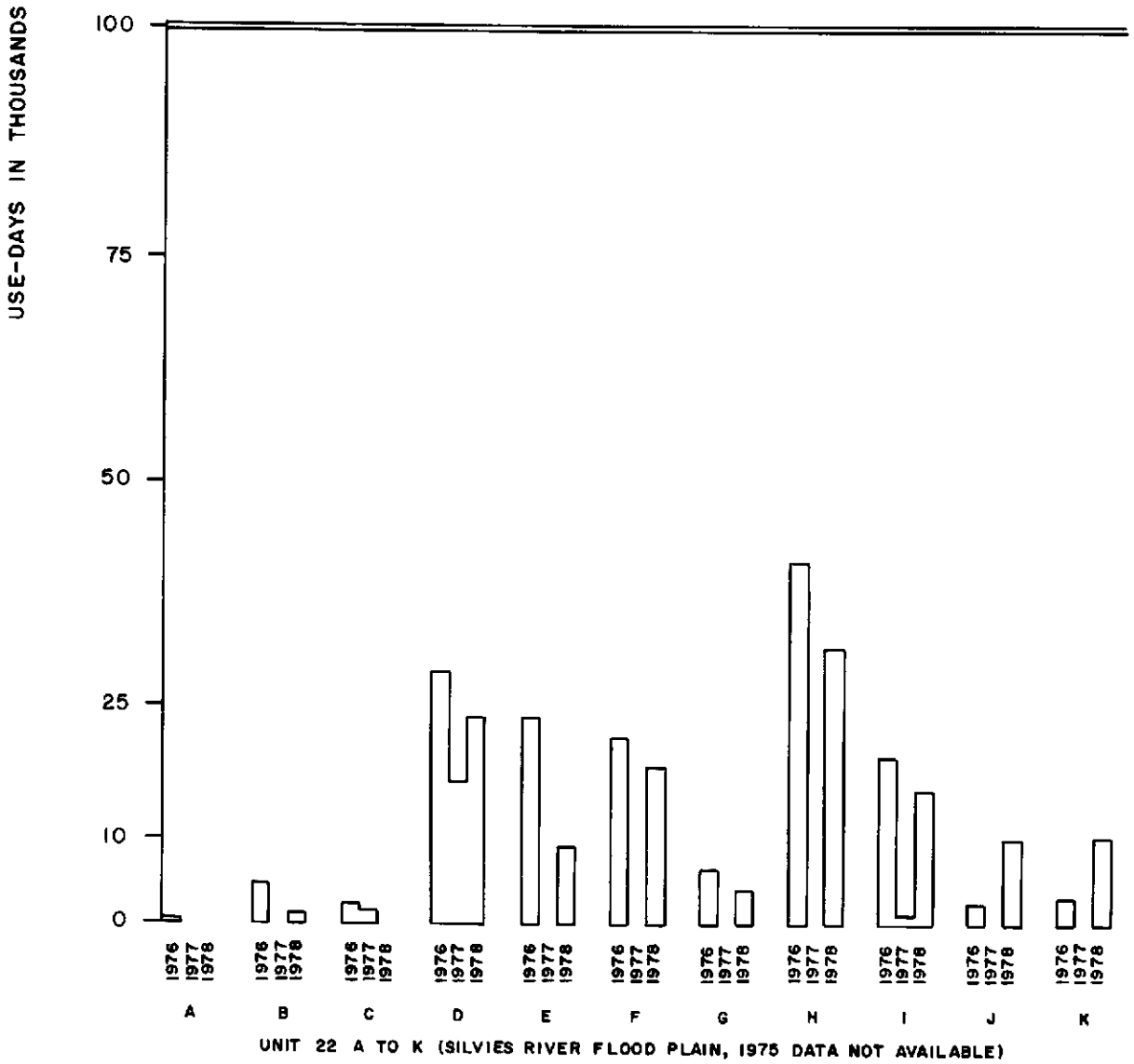


Figure 40. Fall Coot Use

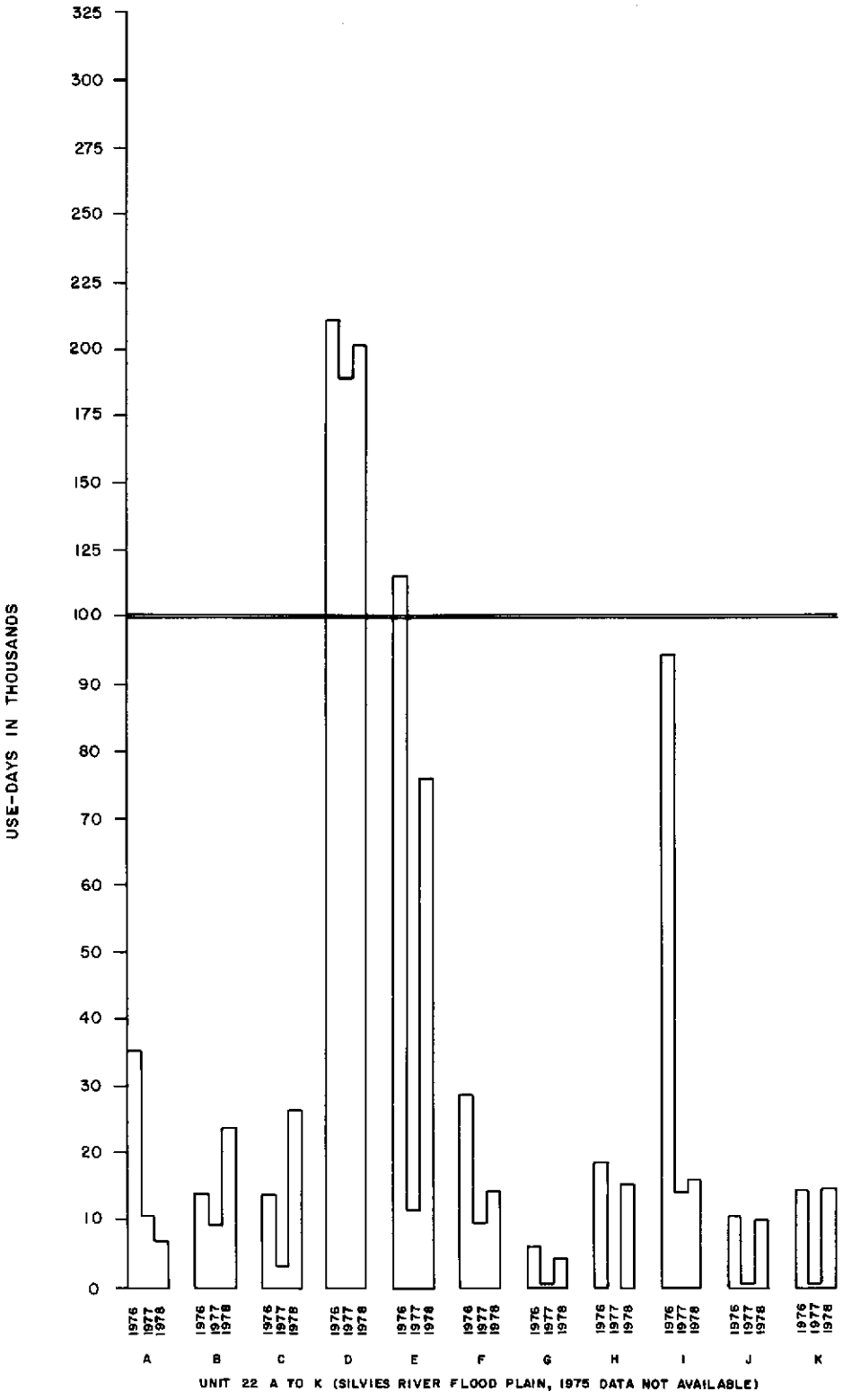


Figure 41. Spring Marshbird Use (Excluding Coot)

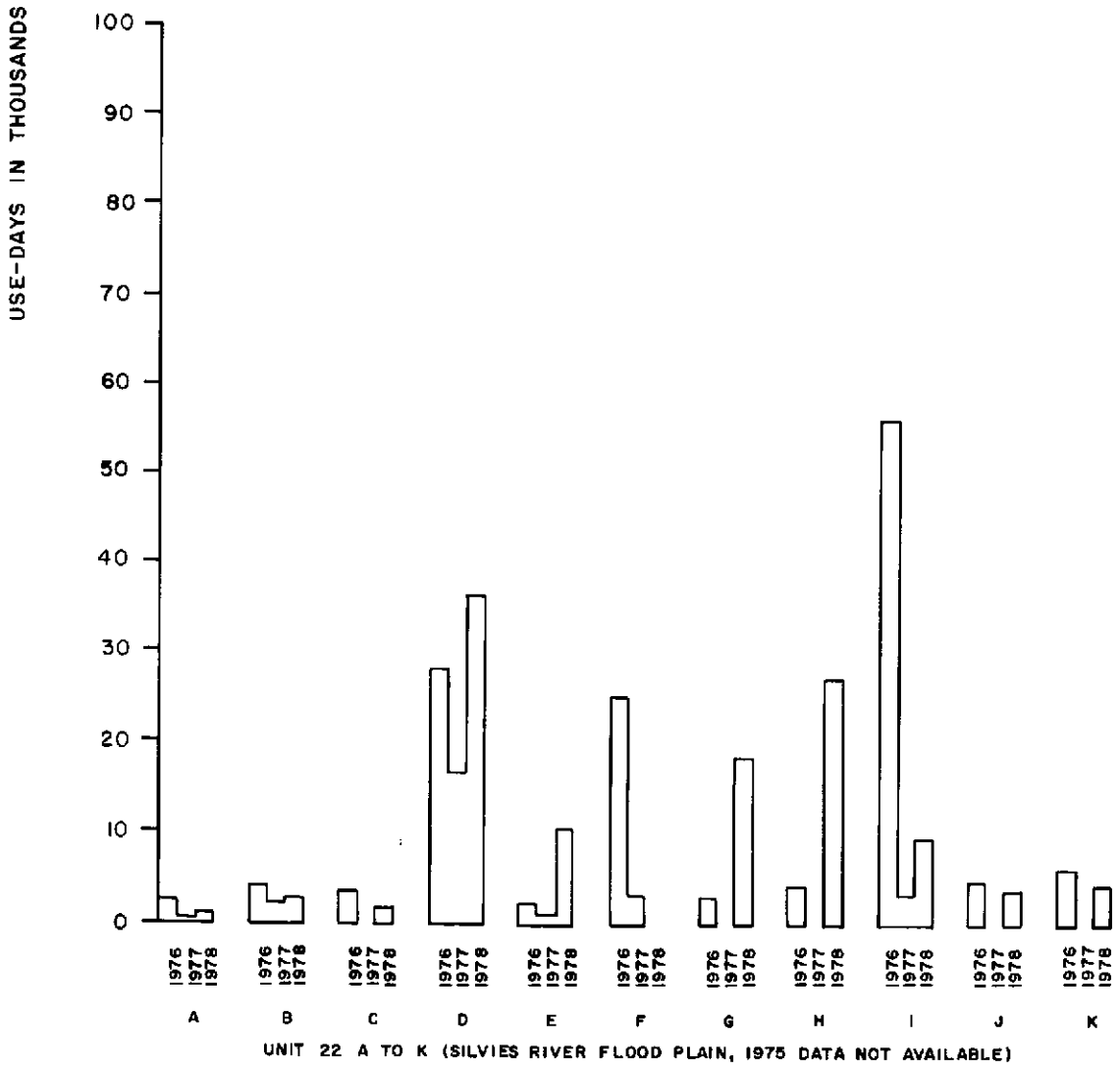
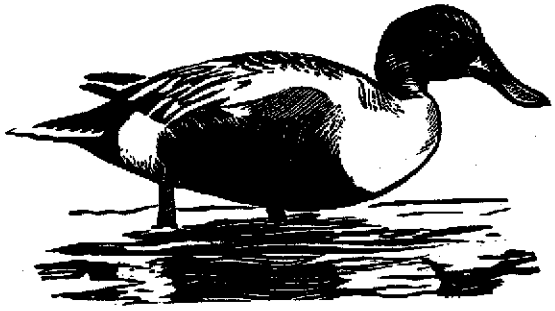


Figure 42. Fall Marshbird Use (Excluding Coot)

REFERENCES



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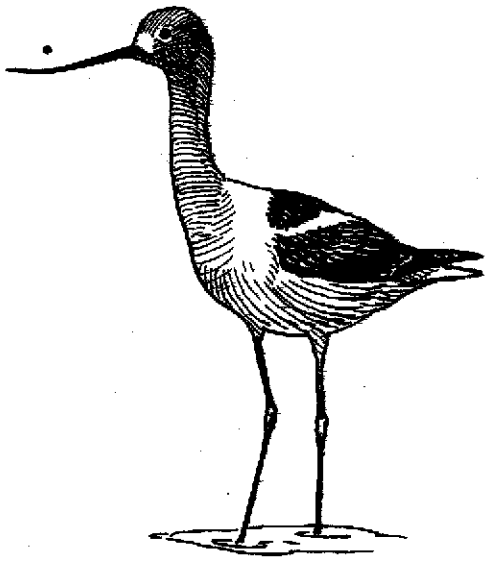
APPENDIX



APPENDIX A.

Examples of data collection forms used for each major group. Species for which data were collected are indicated on the forms.

WATERFOWL

TOTAL BASIN POPULATIONS

Week of _____

	Total Numbers	Total Use Days
Whistling swan		
Trumpeter swan		
TOTAL SWANS		
Canada goose		
Lesser Canada goose		
Cackling goose		
White-fronted goose		
Snow goose		
Ross' goose		
TOTAL GEESE		
Mallard		
Gadwall		
Pintail		
Green-winged teal		
Blue-winged teal		
Cinnamon teal		
American wigeon		
Shoveler		
Wood duck		
Redhead		
Ring-necked duck		
Canvasback		
Lesser scaup		
Common golden-eye		
Bufflehead		
Ruddy duck		
Hooded merganser		
Common merganser		
TOTAL DUCKS		
Coot		

SHOREBIRDS

TOTAL BASIN POPULATIONS

Week of _____

	Total Numbers	Total Use Days
Semipalmated plover		
Snowy plover		
Killdeer		
Black-bellied plover		
Common snipe		
Long-billed curlew		
Spotted sandpiper		
Willet		
Greater yellowlegs		
Lesser yellowlegs		
Pectoral sandpiper		
Baird's sandpiper		
Least sandpiper		
Dunlin		
Dowitcher		
Western sandpiper		
Marbled godwit		
American avocet		
Black-necked stilt		
Wilson's phalarope		
Northern phalarope		
TOTAL		

MARSHBIRDS

TOTAL BASIN POPULATIONS

Week of _____

	Total Numbers	Total Use Days
Horned grebe		
Eared grebe		
Western grebe		
Pied-billed grebe		
White pelican		
Double-crested cormorant		
Great blue heron		
Great egret		
Snowy egret		
Black-crowned night heron		
American bittern		
White-faced ibis		
Lesser sandhill crane		
Greater sandhill crane		
Virginia rail		
Sora		
California gull		
Ring-billed gull		
Franklin's gull		
Bonaparte's gull		
Forster's tern		
Caspian tern		
Black tern		
TOTAL		