

KLAMATH BASIN NATIONAL WILDLIFE REFUGES
Tulelake, California
Tule Lake, Lower Klamath, Clear Lake,
Upper Klamath, Klamath Marsh,
and Bear Valley
National Wildlife Refuges
California and Oregon.

ANNUAL NARRATIVE REPORT

Calendar Year 1990

U. S. Department of the Interior
Fish and Wildlife Service
NATIONAL WILDLIFE REFUGE SYSTEM

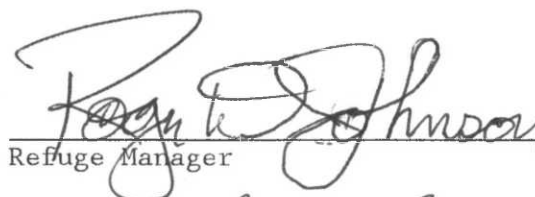
REVIEW AND APPROVALS

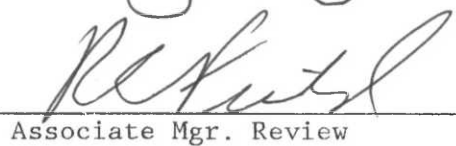
KLAMATH BASIN NATIONAL WILDLIFE REFUGE COMPLEX

Tulelake, California

ANNUAL NARRATIVE REPORT

Calendar Year 1990

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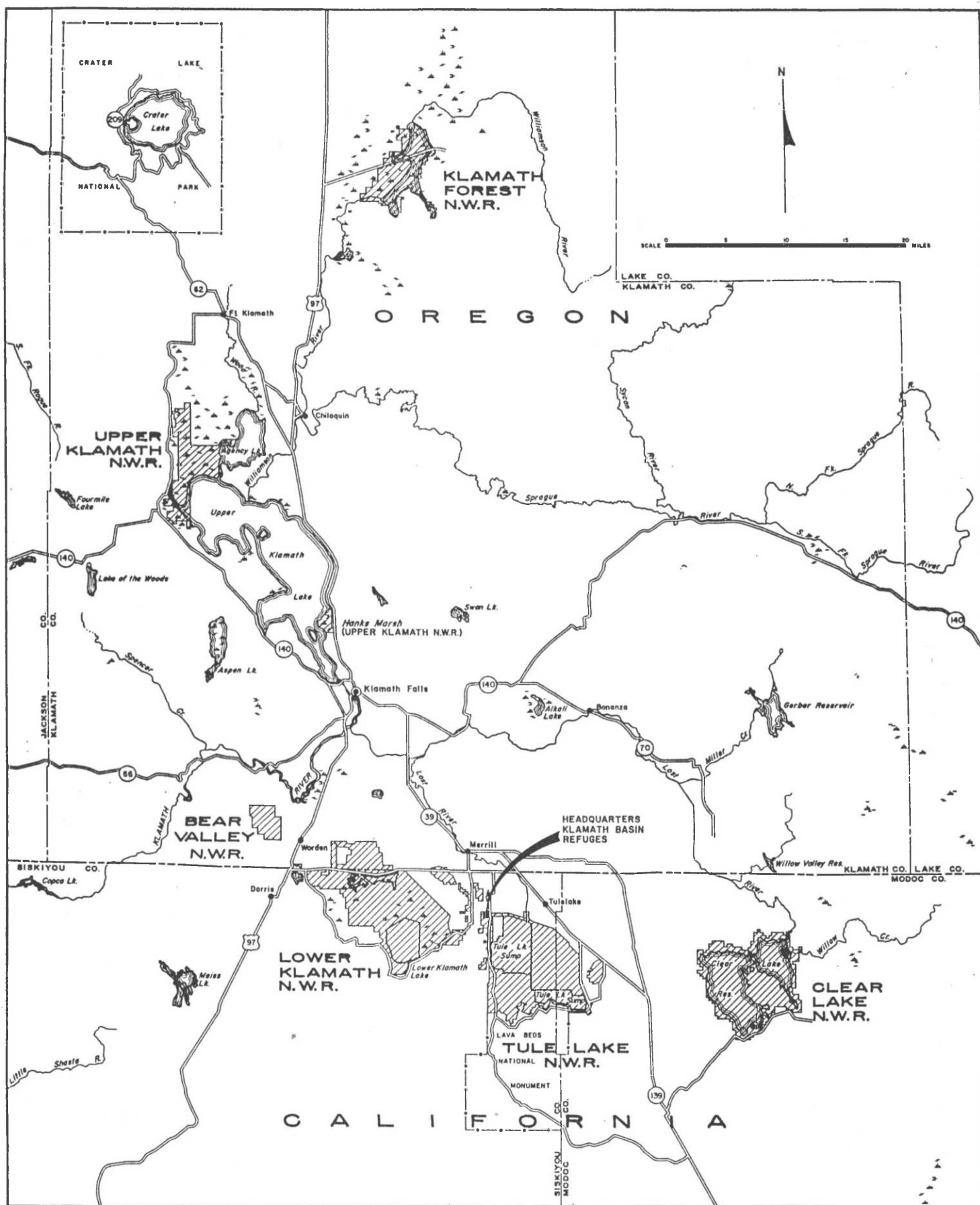


Figure 1. Map showing all six refuges in the Klamath Basin Refuge Complex, 1990.

KLAMATH BASIN REFUGES - INTRODUCTION

A historical consideration of the Klamath Basin reveals the origination of two conflicting interests which promote opposite ideals of land management. On one hand, there is the farming community with its associated needs of uniform fields and an ample water supply. On the other hand are the considerations of wildlife (particularly waterfowl) with its related dependency upon vegetated marsh habitat. The following historical profile illustrates the natural setting that the Klamath Basin was in prior to its "reclamation" for farming, as it portrays the subsequent habitat alteration which led to the development of the present human-oriented condition of this area.

The Klamath Basin, in southern Oregon and northern California, at one time contained approximately 187,000 acres of shallow lakes and expansive marshes. This region, with its rich soils and abundant food, supported peak concentrations of over 6 million waterfowl which rested in the Basin during the spring and fall to gather energy reserves for their migration along the Pacific Flyway. Additionally, the Klamath Basin provided vital nesting habitat for waterfowl, and colonial nesting species of pelicans, cormorants, egrets and herons.

Early settlers were also attracted to these rich lands, and their potential to grow crops for human use was soon realized. Water was diverted for agricultural irrigation purposes in 1882, and by 1883 approximately 13,000 acres of farmland were irrigated by means of works constructed by private landowners. In that year, the newly created U. S. Reclamation Service (predecessor to today's Bureau of Reclamation) began investigations which led to the first withdrawal of land by the Secretary of the Interior for the development of a federal irrigation project. On May 1, 1905, following a cession of California's and Oregon's water rights to the Federal government, the Secretary authorized the establishment of the Klamath Irrigation Project (since renamed the Klamath Reclamation Project), which directed the eventual irrigation of 235,400 acres. Construction on the project began in 1906, and the first areas were irrigated under this program on May 22, 1907. This initial construction effort was supplemented by the completion of the Clear Lake Storage Dam in California in 1910 and the Lost River Diversion Dam in Oregon in 1912.

The diversion and subsequent redistribution of this water, which was the life blood of the Basin's seasonal marshes and lakes, led to a reduction in waterfowl populations. As the marshlands were dried and converted to fields for farming, the Basin lost its capacity to support the large numbers of waterfowl which historically relied on the wetland's providence. In defense of the wildlife, the U. S. Department of Biological Survey (predecessor to the U. S. Fish and Wildlife Service) entered into an increasingly acrimonious debate with the U. S. Reclamation Service.

As an eventual result of this struggle, a complex of six National Wildlife Refuges - Clear Lake, Tule Lake, Lower Klamath, Upper Klamath, Klamath Forest, and Bear Valley - were established to preserve the Basin's remaining wildlife values.

Less than 25% of the historic wetland acreage of the Basin remains today, and virtually all of it is included in the refuge system. The refuges are protected and managed to insure future habitat for one of the nation's largest remaining concentrations of wildlife. With the exception of Bear Valley Refuge, which is managed as Bald Eagle wintering habitat, the Klamath Basin Refuges have been established primarily to manage waterfowl. The six refuges encompass 175,552 acres of various habitat types: extensive marshes, open water, grassy meadows, sagebrush and juniper uplands, coniferous forests, agricultural lands, rocky slopes and cliffs. This variety supports a tremendous diversity of resident and migratory wildlife. A total of 411 species of wildlife have been observed or are considered present on the refuges. Each refuge within the complex has a unique complement of wildlife dependent upon its own composition of the various habitat types.

Lower Klamath Refuge, established by President Roosevelt in 1908, was our nation's first waterfowl refuge. The 53,598 acre refuge is a varied mix of shallow marshes, open water, grassy uplands and croplands that are used by waterfowl and colonial birds.

Clear Lake Refuge, established in 1911, is the primary source of water for the agricultural program of the eastern half of the Klamath Basin, with water levels regulated by the Bureau of Reclamation. Its 33,440 acres consist of 20,000 acres of water surrounded by upland habitat of bunchgrass, low sagebrush, and juniper. Small islands in the lake provide nesting sites for pelicans, cormorants, and other colonial birds.

Established in 1928, the Tule Lake National Wildlife Refuge encompasses 39,116 acres of mostly open water and croplands. Approximately 15,000 acres are leased by farmers under a program administered by the Bureau of Reclamation. Refuge personnel or permittees farm another 1,700 acres of cereal grain and alfalfa. These crops, together with the waste grain and potatoes from the lease program, provide a major food source for migrating and wintering waterfowl.

Upper Klamath Refuge is a 14,376 acre refuge consisting entirely of marsh and open water, and is accessible only by boat. Established in 1928, the marsh provides excellent nesting and brood-rearing habitat for waterfowl and colonial birds such as pelicans, egrets and herons.

Klamath Forest Refuge was established in 1958 when the majority of its 37,616 acres was purchased from the Klamath Indians with Duck Stamp funds. The large natural marsh that makes up the majority of the refuge is an important nesting and migration area for waterfowl. The meadowlands around the marsh are attractive feeding areas for sandhill cranes, shorebirds, waterfowl and raptors. The pine forest adjacent to the meadows supports a diversity of species not found on most of the other Basin refuges. A large addition was made to the Refuge in 1989, when the Nichol and Horton ranches were purchased.

Bear Valley Refuge was established in 1978 to protect a major winter night roost site for bald eagles. An ongoing acquisition/easement program will eventually protect a total of 4,200 acres. The refuge is one of five eagle roosts in the Basin, and consists of large stands of old growth timber which protect the birds at night from the harsh winter weather.

REFUGE ACREAGE

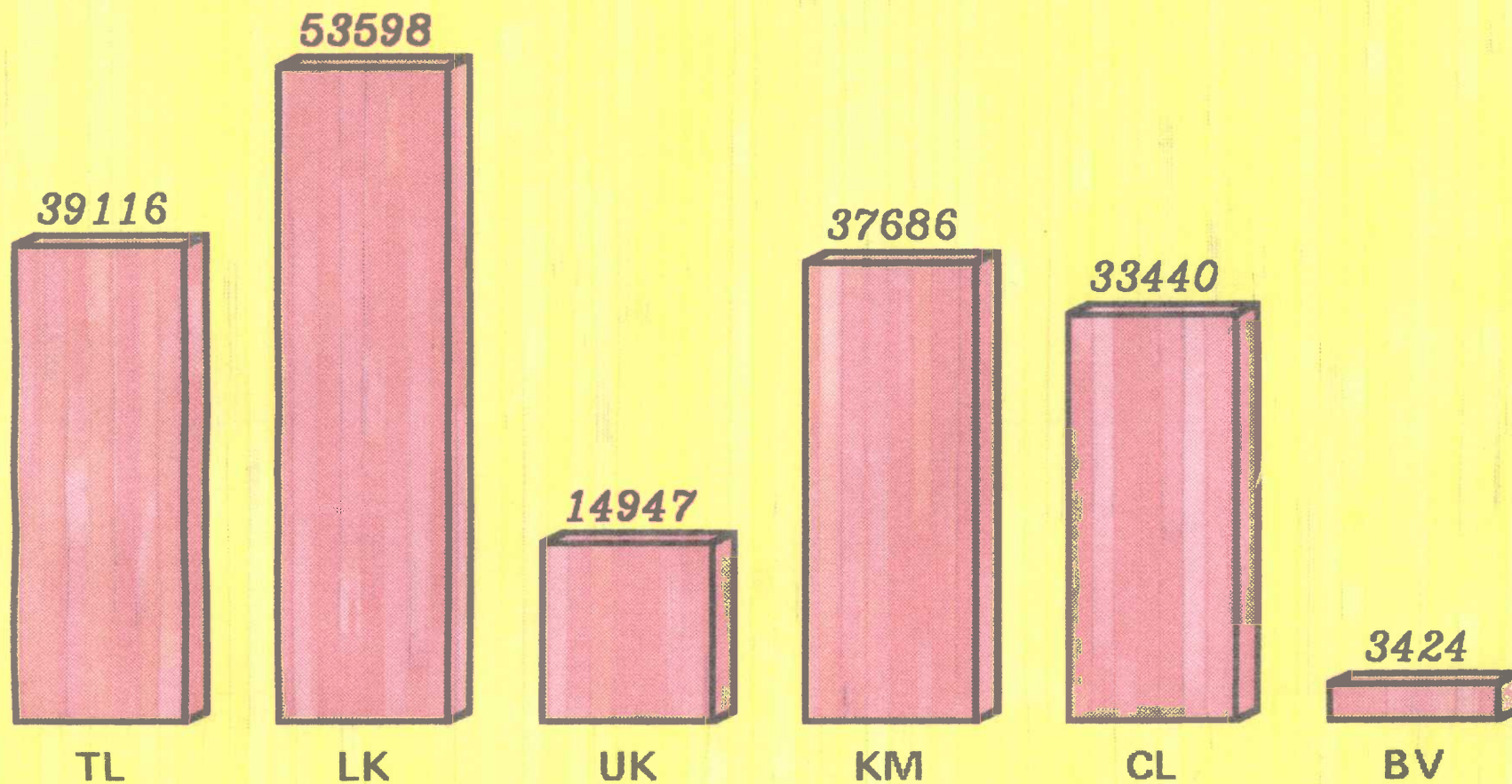


Figure 2. Acreages for the six refuges within the Klamath Basin Refuge Complex: Tule Lake, Lower Klamath, Upper Klamath, Klamath Marsh, Clear Lake, and Bear Valley, 1990.

TOTAL ACRES: 182,211

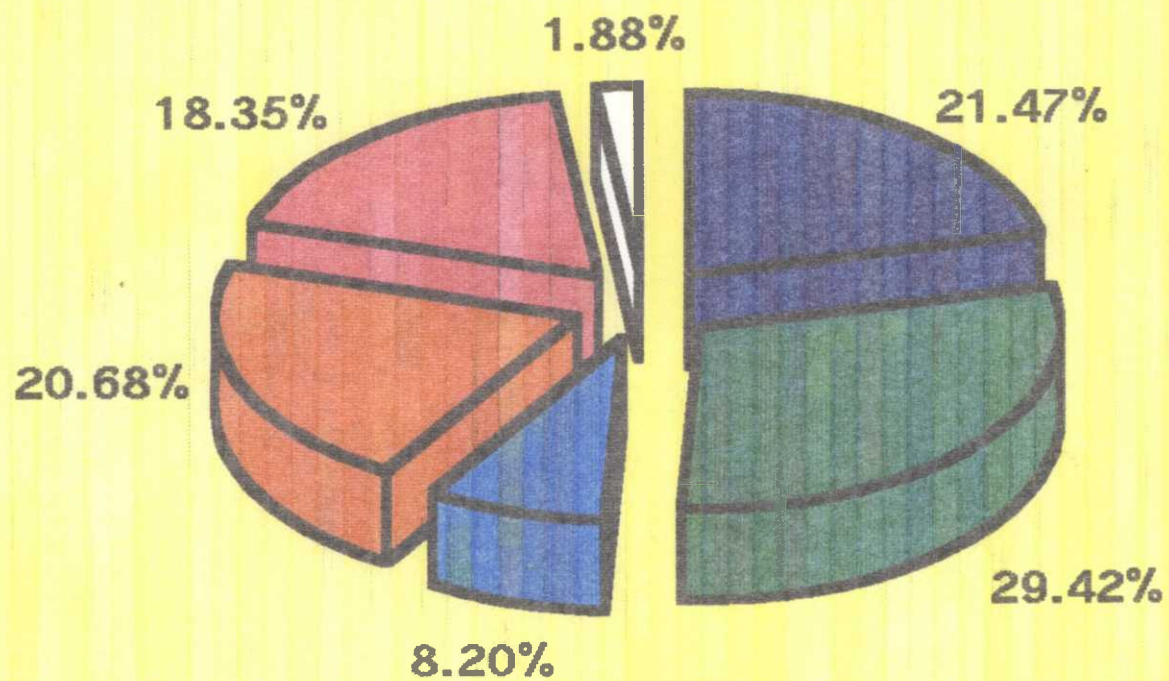


Figure 3. Acreage by refuge, Klamath Basin Refuges, 1990.

TULE LAKE NATIONAL WILDLIFE REFUGE

Tulelake, California

ANNUAL NARRATIVE REPORT

Calendar Year 1990

U. S. Department of the Interior
Fish and Wildlife Service
NATIONAL WILDLIFE REFUGE SYSTEM



TL-90-01 General view of Tule lake Refuge from Sheepy Ridge, showing its intensive agricultural program.

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TULE LAKE NWR - INTRODUCTION

The Tule Lake National Wildlife Refuge is located in extreme northern California in Modoc and Siskiyou Counties, approximately six miles west of the town of Tulelake. Created by Executive Order Number 4975 dated October 4, 1928, and amended by two subsequent Executive Orders (Number 5945 dated November 4, 1928, and Number 7341 dated April 10, 1936), the refuge was superimposed on lands ceded to the United States for reclamation purposes by the State of California as part of the Modoc Unit of the Klamath Reclamation Project.

The geologic processes at work throughout the history of the region are evident in the sparsely-timbered hills, uplifts, and cinder cones which surround the refuge. Other significant geologic, historic, and archaeological features are preserved in the National Park Service's Lava Beds National Monument, located directly south of the refuge.

Prior to 1977, these lands were jointly administered by the Fish and Wildlife Service and the Bureau of Reclamation under Agreements dated January 8, 1942, and June 28, 1946. At that time, pursuant to Public Law 94-223 (the National Wildlife Refuge System Administration Act Amendment of 1976) and Public Law 88-567 (Kuchel Act of 1964), the Service and the Bureau negotiated a new management agreement for lands in refuge status which overlay Bureau withdrawn lands in the Klamath Reclamation Project. Under the agreement signed on August 2, 1977, the Service assumed administration of all grazing and haying, and now issues these leases rather than the Bureau. The Bureau continues to administer the leasing of agricultural croplands and the Service directs all public use and wildlife management programs. The Tulelake Irrigation District, under contract with the Bureau, is responsible for maintenance of dikes and roads, and for water management. The Service is responsible for providing habitat for migrating and wintering waterfowl. The management of land and water units for this purpose is subject to contracts with the Bureau and the District for control and disposition of irrigation waters.

Most of the Tule Lake Refuge is comprised of lands reclaimed from under the waters of historic Tule Lake. Of the Refuge's total 39,116 acres, approximately 17,203 acres are irrigated croplands, 13,535 acres are water and marsh and 8,378 acres are uplands.

The 1,291 acre Peninsula Unit was added to the Refuge on February 20, 1980. Originally, it was a part of the lands withdrawn by the Bureau of 1905. They filed a relinquishment of withdrawal on October 14, 1977, after determining it was excess to their needs. The Service filed a withdrawal application on the same day because of the unit's importance as a raptor nesting and use area, and its abundant archaeological and geological history. A public land order was eventually signed transferring it to the Service.

A. HIGHLIGHTS

The Refuge staff reviewed 4 parcels of land as part of expanding Farm Bill responsibilities (see Section C-2).

The Refuge again cooperated in cackling Canada goose and snow goose collar reading projects to help gain additional knowledge of population dynamics throughout the flyway (see Section D-5).

The second comprehensive wellness exam was completed as a follow up to the wellness program initiated in 1989 (see Section E-6).

John Matthews retired after 30 years of service (see Section E-8).

A significant archaeological find was made on Sheepy Ridge (see Sections D-4 and 5).

Contaminant issues were prevalent in 1990 (see Sections D-5 and F-10).

Fire Management Officer, Jay Parks, came on board in July, 1990, transferring from BLM (see Section E-1).

Below normal moisture in the latter part of the year is expected to affect water resources for the coming year (see Section B).

Botulism losses were moderate and avian cholera losses were mild for 1990 (see Section G-17).

B. CLIMATIC CONDITIONS

Tule Lake Refuge is located at an elevation of about 4,000 feet, with climate characterized by wide seasonal and daily temperature ranges. In general, winters are cold, while summers are moderate and dry. Most precipitation falls during winter months. Cold weather is possible any time - frost and snow have been recorded in nearly all months. Moderately heavy winds are common February through early May.

Overall, the conditions for 1990 were colder, with above average annual precipitation and snowfall. Spring habitat conditions on the Refuge were normal with vernal wetlands in the local area recharged from snow runoff to near normal levels. However, during November and December we experienced above average temperatures and below normal moisture. This lack of moisture during this period may be a critical concern for the 1991 water supply.

The climatological data summarized in Table 1 was collected at Tulelake Irrigation District weather station, a distance of 6 miles from the Refuge Headquarters.

TABLE 1. Climatological Data, Tule Lake Refuge, 1990.

Month	Max Temp	Min Temp	Mthly Mean Temp	Dep 5-Yr Avg	Precip (In)	Dep 5-Yr Avg	Snow (In)	5-Yr Avg
January	50	2	29	+ 2	2.16	+1.13	9.75	
February	58	- 7	28	- 4	0.49	-0.35	7.50	
March	67	4	39	0	1.59	+1.49	7.00	
April	77	21	48	+ 1	0.54	+0.10	-	N
May	83	23	47	- 5	1.66	+0.73	-	O
June	88	28	55	- 6	0.80	+0.31	-	
July	91	31	63	- 1	0.13	-0.16	-	D
August	93	32	60	- 3	0.87	+0.67	-	A
September	88	30	55	+ 1	0.31	+0.63	-	T
October	76	15	61	- 5	0.46	+0.05	-	A
November	69	15	36	+ 1	0.71	-0.58	0.50	
December	59	-16	23	+ 6	0.53	-0.12	1.25	
Summary	93	-16	44	- 4	10.25	+1.64	26.00	

TID Information on Snowfall:	1985	1986	1987	1988	1989	TOTAL
(inches)	23.75	4.50	20.75	31.75	21.00	101.75
Average						20.35

C. LAND ACQUISITIONS

2. Easements

Refuge staff made on-site reviews and "move the dirt" money plans on four parcels of land in Siskiyou County in 1990. The reviews involved conservation easements on FmlIA foreclosures and funding to complement the Conservation Reserve Program as part of the Food Securities Act of 1985.

Wetland restoration projects were funded for all four of these parcels in 1990. The proposed Fish and Wildlife total cost share amount was \$26,946.00 for approximately 1,415 acres of restored seasonal wetlands and adjacent waterfowl nesting habitat. In addition to these funds, the Refuge received money to complete the following projects which had been initiated in 1989:

- | | | |
|---------------------|-----------|--------------------------------------|
| 1. Circle 5 Ranch | \$ 10,300 | CMP structures, water control survey |
| 2. Sheller property | 6,000 | Fence material, spray |

Again the emphasis on Farm Bill projects resulted in a noticeable increase of staff time required to administer the program. Approximately ten staff days were devoted to these activities in 1990.

D. PLANNING

2. Management Plan

The wildfire dispatch plan was updated and submitted to the Regional Fire Management Coordinator. Copies were provided to local fire districts that respond to fires adjacent to or on the Refuge.

An annual work plan for the Refuge was prepared and submitted to the Regional Office.

A habitat planning tour of Tule Lake Refuge was organized for key refuge staff. An annual habitat plan and synopsis of planned land use were subsequently prepared and used throughout the year.

3. Public Participation

The Refuge staff was actively involved in public participation programs in 1990. We continually tried to provide information to, and solicit input from our Refuge users through public meetings, news releases, refuge tours, and other avenues. A listing of these efforts follows:

- Post-hunt staff meeting to discuss public issues/problems/concerns (Jan)
- Public meeting in Klamath Falls re: public use programs - primarily hunting (Feb)
- Hunt meeting at Mt. Shasta Rod & Gun Club
- Sent out response to public meeting topics issued to public (Mar)
- Federal Register submissions for publication/comment
- Public contacts for Bear Valley prescribed burn - newspaper, door-to-door (Apr)
- Open Audubon meeting to discuss Bear Valley prescribed fire activities
- Established Refuge newsletter with wide circulation (Aug)
- Pre-hunt staff meeting (Sep)
- Television newsclips broadcast nationally (NBC) and/or statewide (4)
- Prepared and circulated Klamath Forest Habitat Plan/responded to comments
- Visitor Center contacts (11,500)
- Local historical tour with Ron Hellman
- Tulelake Butte Valley Fair - 5,000 personal contacts, 50,000 viewers (Sep)
- Sought recommendations from Oregon Waterfowlers Assoc. re: changes to Upper Klamath hunt boundary
- Bald Eagle Conference chaired by Refuge personnel (Feb)
- Public tour of Lower Klamath habitat management activities (May)
- Three staff members served as presidents of local service clubs

Other:

- | | |
|---|--------------------------------|
| - Response to phone calls | 8,000 (3,700 hunting-related) |
| - Response to letters | 7,550 (5,400 hunting-related) |
| - Daily staff contacts w/individual hunters | 17,000 (during hunting season) |
| - Local fair contacts | 5,000 |
| - Various meetings/programs | 50 |

We have scheduled additional efforts toward increasing public awareness and participation in our management programs for 1991. These activities will involve five of the six refuges in the complex.

4. Compliance with Environmental and Cultural Resource Mandates

A review of pesticide application practices on BOR lease lands and Refuge lands was made in 1990. The Siskiyou County Agricultural Commissioner reviewed and approved all pesticide use proposals for the Refuge. The Refuge reviewed all BOR applications for restricted chemical use, and we received summaries of all BOR pesticide applications on Refuge lands.

A Federal Antiquities Permit (90-KLB-R1-002) and a Special Use Permit for access were issued to Dr. John M. Beeton of University of California, Davis, to resurvey and investigate certain rockshelter cave sites along Sheepy Ridge. The research was focused on ancient human occupation of lakeshores. A sample of burned wood from a small hearth associated with a few bits of chipped stone and some fish bone has been dated to 11,450 years before present, with an error of plus-minus 340 years. This is quite a significant date, and is somewhat older than the archaeologists expected. Although this is only a single date, it stands as good preliminary evidence for early occupation of the shores of Tule Lake. Because this finding is among the older dates in the Americas, it is expected to generate considerable excitement in the archaeological community, and possibly beyond. Dr. Beeton anticipates announcing the date soon in an archaeological journal, and following that, will put out the word more widely to the media.

An effort to renew a blanket ACE 404 Permit for maintenance activities on Tule Lake and Lower Klamath Refuges was initiated in February, 1989, and continued through 1990 with no progress toward getting a permit. Our previous blanket permit expired in November, 1989. Administration of these permits is much too long. To date it has been 2 years since a request for renewal was initiated.

5. Research and Investigation

WHITE-FRONTED GOOSE STUDY - With the completion of the field work in the spring of 1990, a computer simulation model, REFMOD, was developed by Robert Frederick, William Clark (both of Iowa State University), and John Takekawa (Northern Prairie Wildlife Research Center). The model can be used to address the question of how current management of refuges and agricultural practices may affect the goose populations and what changes might benefit the populations. An abstract of a paper written by the biologists follows, to give an idea of the kinds of information REFMOD can provide:

APPLICATION OF A COMPUTER SIMULATION MODEL
TO MIGRATING WHITE-FRONTED GEESE
IN THE KLAMATH BASIN

Robert B. Frederick, Iowa Cooperative Fish and Wildlife Research
Unit, Iowa State University, Ames, IA 50011.

William R. Clark, Department of Animal Ecology, Iowa State
University, Ames, IA 50011.

John Y. Takekawa, U. S. Fish and Wildlife Service, Northern Prairie
Wildlife Research Center, 6924 Tremont Road, Dixon, CA 95620.

Abstract: A computer simulation model, REFMOD, was applied to white-fronted geese (*Anser albifrons*) in the Klamath Basin, northern California, to investigate the importance of food availability and hunting disturbance to migrating and wintering populations. The model validly described distances moved by geese from their Tule Lake Refuge roosting site (core) to feeding sites within the surrounding Klamath Basin arena, and exhibited a capability to simulate observed behavior, including time spent feeding and habitat use. Based on 25 stochastic simulations with input parameters set at control levels, white-fronted goose population dynamics were validly simulated over the fall and early-winter season ($P > 0.8$). When food was removed from within the Tule Lake Refuge boundaries, simulated geese had to fly farther ($P < 0.0001$) to find food, hastening emigration and resulting in a decline ($P < 0.05$) in use of the Klamath Basin by geese. Although barley is normally abundant within the basin and is extensively used by geese, simulated elimination of barley within the arena did not cause a reduction in goose numbers ($P > 0.05$). The elimination did cause an increase in the distance traveled to feed ($P < 0.05$), but the availability of other foods within the basin (e.g. potatoes) was evidently sufficient to support the population. The elimination of hunting within the Klamath Basin and the related decrease in disturbance of feeding birds had little effect ($P > 0.05$) in reducing the distance traveled to feed or in increasing goose numbers over the season. REFMOD can easily be used to evaluate the effects of other scenarios related to hunting regimes and food distribution and availability.

SNOW GOOSE BANDING/OBSERVATION PROJECT - The Klamath Basin Refuges continued as a cooperator in the International Snow Goose Neckbanding Project, monitoring neckbanded birds as they migrate through the basin. A total of 339 individual collars were sighted in the spring, while only 66 individual collars were recorded in the fall. The few collars observed in the fall were due to the low number of snow geese staging in the Klamath Basin this fall. The snow geese that did stop only stayed a short time, and then migrated south to the Sacramento Valley.

CAKCLING CANADA GOOSE NECKCOLLAR PROJECT - In accordance with the Office of Migratory Bird Management, neckcollars of cackling Canada geese were recorded in the Klamath Basin during the periods of October 15 - November 15, January 15 - February 15, and April 1 - 30. One biologist worked fulltime on this project, observing neckcollars from behind a spotting scope. Supplemental to the neckcollar recordings were characterizations of flock size and habitat use. The ratio of marked to unmarked geese was also estimated.

A grand total of 1,272 collar recordings were made this fall. Many repeat sightings of individual collars are included in the number; a total of 350 unique collars were observed.

In the fall, cacklers primarily feed on sprouting winter wheat or alfalfa on Tule Lake Refuge. This year was the exception rather than the rule. The majority of the time the cacklers mixed with other geese and fed on cereal grains and occasionally potatoes. This made collar reading a challenge, with the cacklers' heads just poking above the grain stubble and hiding behind the larger geese.

During the mid-winter reading period (January 15 - February 15) very few collars were seen in the Basin, and the collar reader spent a week at Sacramento Refuge Complex assisting with their collar reading effort. A total of 49 collar sightings were reported, but only 6 were unique individuals.

Most of the collar reading effort during the April period centered around Klamath Wildlife Area and the surrounding pasture lands near Klamath Falls. Some collars were observed at Tule Lake and Lower Klamath as well, but the majority of the sightings were made in the Klamath River/Tingley Lakes area. A total of 90 unique collars were recorded during this period.

ARCHAEOLOGICAL STUDY - Dr. John M. Beaton of the University of California, Davis, Department of Anthropology has been conducting surveys and test excavations at archaeological sites SIS 217, SIS 218, and SIS 108 on Tule Lake Refuge. Initial work began in 1989, and continued in 1990. In October of 1990, Dr. Beaton received the first radiocarbon date for human occupation of the archaeological sites. Dr. Beaton wrote, "A sample of burned wood, from a small hearth associated with a few bits of chipped stone and some fish bone, has been dated to 11,450 years before present, with an error factor of plus-minus 340 years. Although this is only a single date, it stands as good preliminary evidence for very early occupation of the shores of Tule Lake." Dr. Beaton also said that this is among the older dates in the Americas, and is quite a significant date. We are anticipating this study to continue in the summer of 1991.

PESTICIDE STUDY - Charles J. Henney of Patuxent Wildlife Research Center in Corvallis, Oregon, produced the following evaluation:

An Evaluation of the Effects on Upland Wildlife Species From
Pesticides Applied to Crops on the Klamath
Wildlife Refuges - A Preliminary Report - 1990

Introduction - General concern about the effects on wildlife of pesticides applied to crops on the Klamath Basin National Wildlife Refuges has been voiced over the last several years. Pesticides used on the refuge include some of the more toxic organophosphorus compounds including two (methamidophos and dimethoate) that were recently implicated in the deaths of sage grouse (*Centrocercus urophasianus*) in southeastern Idaho (Blus et. al. 1989). Some knowledge of the pesticides used on the refuge, combined with the tremendous decline in ring-necked pheasants (*Phasianus colchicus*) in the Klamath Basin (including the refuges), resulted in a feasibility study in 1990 to determine the best approach to evaluate pesticide wildlife interactions in the uplands.

The Department of the Interior "Task Group on Irrigation Drainage" designated the Klamath Basin as one of its sites for detailed studies. Although trace elements have been the most concern at other irrigation drainage projects, pesticides entering the marshes from nearby fields in the Klamath Basin may be sources for serious wildlife problems in the basin. This preliminary work was initiated in the spring of 1990 and was limited to upland bird species.

Study Area - The main portion of the study area is located at Tule Lake NWR, California, and includes about 17,400 acres of refuge lands involved in agricultural leases by Bureau of Reclamation. Crops grown on these lands in 1990 included: potatoes (16.5%), onions (3.1%), hay (2.0%), grain (67.9%), and Fish and Wildlife agricultural lands (10.5%). Control areas used during the investigation were Lower Klamath NWR, Clear Lake NWR, and Bear Valley NWR.

Results - Spray season -- spray activities were monitored throughout the field season. Almost all pesticides were applied by aircraft. Applications of herbicides and some fungicides began during the last week of June and continued to the second week of July. Organophosphorus insecticide applications began on 12 July and continued to the third week of August. Sprays were applied from 6:00 AM to about 1:00 PM. Afternoon breezes dictated the curtailment of daily spray operations. Methamidophos (for potatoes) is applied first in the morning, followed by applications of parathion and disulfoton to grain or onions (usually after 11:00 AM). The carrier used for these insecticides was water; however, applications of micro-nutrients or fungicides could have been mixed with the insecticides to limit costs.

Fields sprayed with OPs were not entered until 48 hours after application. Searches were made to located dead or moribund birds along field edges and daily activity areas outside of fields. Bird collections in sprayed areas were done at 2, 5, and 10 days post spray. The bird species collected depended upon use patterns in the ag lands. Species sampled in 1990 included Ring-necked pheasants (*Phasianus colchicus*), Brown-headed cowbirds (*Molothrus ater*), Red-winged blackbirds (*Agelaius phoeniceus*), Brewer's blackbirds (*Euphagus cyanocephalus*), Yellow-headed blackbirds (*Xanthocephalus*), Savannah sparrows (*Passerulus sandwichensis*), and Song sparrows (*Melospiza melodia*). Attempts were made to collect at least 5 birds of each species for each collection period. A list of birds collected is shown below:

Species	No. Birds Collected				
	0 Day	2 Day	5 Day	10 Day	Control
Ring-necked pheasants	1	2	2	2	8
Brown-headed cowbird	0	0	3	0	1
Red-winged blackbird	0	0	1	5	5
Brewer's blackbird	0	0	1	5	5
Yellow-headed blackbird	0	0	1	5	5
Savannah sparrow	0	6	7	6	5
Song sparrow	<u>0</u>	<u>7</u>	<u>6</u>	<u>5</u>	<u>5</u>
Totals	1	15	20	27	34

Raptors - Kestrel boxes erected in March were visited in late May and followed through the nesting season. Eight of 13 control boxes were occupied by kestrels, with 6 of 8 boxes fledging young (24 young fledged). Two of the control boxes were depredated. Kestrels did not nest in any of the 14 boxes placed in the ag lands. Also, kestrel young fledged before OP sprays were applied, therefore, they will not be used in the detailed study.

Other raptor species fledged well before OP insecticide applications, and could not be used to determine nesting success in relation to insecticide exposure. However, raptors associated with ag lands may be trapped and bled to monitor cholinesterase activity.

A young Great Horned Owl was found on 7 August between a potato field and a wheat field that were sprayed 5 days earlier with methamidophos (potatoes) and parathion (wheat). The bird was weak and wet from being on the ground. It was in good flesh and had no apparent injuries. A blood sample was taken and the bird collected. The young owl may have been exposed to OPs.

Pheasants - During the field season, daily observations were made of pheasants using the ag lands. The birds were found throughout the study area. Pheasants spend a considerable amount of time in potato fields foraging, but they roost in the grain fields. Many times pheasants were sprayed with both methamidophos and parathion. No mortalities were found, but the vegetative cover was such that mortalities would be almost impossible to find. Next year, 40 pheasant hens will be radioed to determine if OP insecticides are affecting the pheasant population.

Other Birds - Several other bird species associated with ag lands were monitored to determine habitat use and time spent in the various crops. Three species of blackbirds (Brewer's, Red-winged, and Yellow-headed) and the Brown-headed cowbird used the grain and potato crops for foraging. During spray applications, blackbirds and cowbirds would leave, but would return soon after the application. These birds tended to stay in one crop for up to an hour, then fly to another field and forage there. They would move back and forth between potato and grain fields. Therefore, these bird species could be exposed to several OPs following spray applications in several fields.

The Savannah sparrow set up nesting territories within the potato fields. Adult males perched on sprinkler heads to defend their territories. They fed in grain and potato fields and in the edges along fields and dike systems. Song sparrows nested in the riparian zones of the ditches, but fed in the same places as the Savannah sparrows.

Blackbirds, cowbirds, and sparrows were collected because of their potential exposure to pesticides. No other bird species were found in adequate numbers in the ag lands. No dead birds were found during the study, but the dense vegetative cover made it impossible to search for dead birds.

The 97 birds collected will be assayed for cholinesterase activity in the near future. This will provide additional information on degree of pesticide exposure.

Literature Cited - Blus, L. J. et. al. 1989. Effects of organophosphorus insecticides on sage grouse in southeastern Idaho. J. Wildl. Manage. 53:1139-1146.

CONTAMINANT STUDY - The Fish and Wildlife Service and U. S. Geological Survey initiated a project to study the effects of organophosphorus compounds on sediments and drainwater at Tule lake. The study is a continuation of a similar study conducted the last 3 years on inorganic compounds in drainwater and sediments.

E. ADMINISTRATION

TL-90-02 Back Row: 2, 25, 20, 3, 23, 22 AJS 3/91
 Middle Row: 5, 14, 9, 10, 16
 Front Row: 21, 17, 15, 4, 18, 19

1. Personnel

1.	Roger D. Johnson	GM-14	PFT	Project Leader
2.	Gary A. Hagedorn	GS-12	PFT	Deputy Project Leader
3.	Ronald S. Cole	GS-9	PFT	Refuge Manager
				EOD: 7/31/90 - K Marsh
4.	Akimi J. Shono	GS-7	PFT	Refuge Operations Spec.
5.	Jayson R. Parks	GS-11	PFT	Wildlife Biologist - FMO
				EOD: 7/29/90 from BLM
6.	James L. Hainline	GS-11	PFT	Wildlife Biologist
7.	David M. Mauser	GS-7	PFT	Coop Ed Student Trainee
				(Wildlife Biology)
8.	William C. Kent	GS-11	PFT	Outdoor Rec. Planner
9.	Patricia A. Durham	GS-7	PFT	Admin. Support Assistant
10.	Vicki W. Verley	GS-4	PFT	Office Automation Clerk

11.	Michael H. Phillips	GS-11	PFT	Fire Mgmt. Officer (RO) Transferred Boise 6/90
12.	Craig K. Emery	GS-5	TFT	Biological Technician Term: 5/4/90
13.	Michael W. Parker	GS-5	TFT	Wildlife Biologist EOD: 5/6/90
14.	Marsha L. Schreiner	GS-4	TFT	Interpretive Specialist
15.	Lowell D. Green	WS-9	PFT	Eng. Equip. Opr. Foreman
16.	Lawrence F. Bigoni	WG-10	PFT	Eng. Equip. Operator
17.	Henry A. Ebinger	WG-10	PFT	Eng. Equip. Operator Resigned 7/14/90
18.	Roger H. Nelson	WG-10	PFT	Eng. Equip. Operator
19.	Bill E. Sellers	WG-10	PFT	Eng. Equip. Operator
20.	David E. Thomas	WG-8	PFT	Eng. Equip. Operator
21.	Rodney G. McCollam	WG-8	INT	Eng. Equip. Operator
22.	A. Dean Barker	WG-7	PFT	Maintenance Worker
23.	Ronald M. Hellman	WG-10	PFT	Automotive Worker
24.	John F. Matthews	WG-10	PFT	Automotive Mechanic Retired 11/30/90
25.	Cecil C. Moore	WG-6	TFT	Tractor Operator EOD: 3/25/90 TERM: 11/17/90

1990 Fire Crew

1.	Aaron D. Drew	GS-5	TFT	Range Technician EOD: 5/20/90 RES: 8/31/90
2.	David P. Deemer	GS-4	TFT	Range Technician EOD: 6/3/90 TERM: 10/6/90
3.	Mark A. Lowrie	GS-4	TFT	Range Technician EOD: 6/3/90 TERM: 10/6/90
4.	Pamela C. Thomas	GS-3	TFT	Range Aid EOD: 6/3/90 RES: 8/21/90

3. Other Manpower Programs



TL-90-03 Fire crew mopping up wildfire at AJS 7/90
Oklahoma Flats (off-refuge).

The Refuge fire crew completed many maintenance projects this year, in addition to their fire-related duties. Major work accomplishments included:

- Posted a portion of Bear Valley boundary and replaced faded boundary signs on Tule Lake and Lower Klamath Refuges.
- Installed underground sprinkler system at south headquarters house.
- Cleaned CCC Camp buildings.
- Replaced fence on Lower Klamath Unit 1.
- Moved duck hospital cages to Lower Klamath Refuge.
- Maintained headquarters landscaping.
- Weekly trash hauling.
- Brushed out Bear Valley access routes.
- Cleared weeds around tour route signs.
- Disease surveillance and pickup.
- Duck banding.
- Washed/waxed all vehicles.
- Cleaned/swept all buildings.
- Picked up litter on Tule Lake, Lower Klamath, and Stateline Highway.

4. Volunteer Program

The year provided excellent opportunities for the volunteer program. Twelve volunteers contributed 1,148 hours, assisting us in meeting our objectives. A list of volunteers, projects, and donated time follows:

<u>Name</u>	<u>Project</u>	<u>Total Hours</u>
Joe & Geri Sloss	Upper Klamath maintenance/ visitor contact	520
Mark Lowrie	Hunter checkstation, CL plant surveys, organize map file, disease pickup, fire equipment maintenance	350
Dave Deemer	Fire equipment maintenance	70
N CA DU chapters	Assist w/disease pickup	40
Mary Paetzel	KF plant survey	200
Dean Baker	Photo blind construction/ rehabilitation	48
Greg Hagedorn	Disease pickup	20
Howard West	Photo blind rehabilitation	8

5. Funding

Following is a summary of funding over the past five years for the Klamath Basin complex (funds x 1000). Funding is presently inadequate to maintain programs and staffing, especially with new staffed refuge at Klamath Marsh.

TABLE 2. Funding by Subactivity, Klamath Basin Refuges, 1990.

Fiscal Year	MB (1230)	O & M (1260)	Exp Sales (6860)	Total
87 Funding	4.0	998.5*	2.0	1004.5
88 Funding	2.0	880.3*	8.0	890.3
89 Funding	5.0	897.7**	8.0	910.7
90 Funding	12.0	971.5***	13.0	996.5
		(a) (b)		
91 Funding	0	1078.0	13.0	1091.0
		(c) (d)		
*24.0 of fire money included (a) 60.0 of new refuge funding **25.0 of fire money included (b) 12.5 MMS deficiency projects ***39.0 of fire money included (c) 46.0 new refuge funding - 1261 (d) 65.0 MMS deficiency projects - 1262				

6. Safety

Monthly staff and safety meetings were held during the year along with weekly "tailgate sessions" each Monday morning. Topics of the safety meetings included physical fitness, wellness exam, handling wildlife/wildlife diseases, CPR/first aid, tractor/heavy equipment safety, defensive driving, fire drill/fire extinguisher use/fire equipment check/fire engine use, airboat/ATV/canoe safety, heat stroke/exhaustion, hearing safety tests, and winter driving.

G. Hagedorn, R. Hellman, L. Bigoni, and A. Shono served on the Safety Committee for the year. The Committee continued to meet on a quarterly basis. A Refuge-wide safety inspection of all buildings and facilities was conducted in July. Most deficiencies were corrected by the end of the year, with final corrections projected to be completed by February, 1991.

There were five minor no-time-lost accidents during 1990. Following is a brief account of the accidents:

1. Employee jumped across ditch and strained his back.
2. Employee got dirt in eye, which caused an infection.
3. Employee injured finger on ladder.
4. While dumping on top of fill, the bank gave way, causing dump truck to tip on its side. No injuries; minor property damage.
5. Employee aggravated knee injury while operating dragline.

Klamath Basin is a regional site for heavy equipment training and certification. Foreman Dale Green is a certified instructor. There was one dragline training course here at Klamath Basin in September and Dale traveled to Merrit Island, Florida, in June to give the 18-Wheeler Instructor Training Course.

All fire extinguishers were checked and recharged during December.

The Refuge continued to participate in an Interagency Safety Coordination Committee with local offices of Forest Service, Bureau of Reclamation, Bureau of Land Management, Soil Conservation Service, Bureau of Indian Affairs, and National Park Service. The committee has been very helpful by combining training needs, thereby reducing costs, and by providing a forum of ideas on safety equipment, wellness screening, training, hazardous materials, etc.



TL-90-04 Biologist Hainline demonstrating his high flexibility at this year's wellness exam. GAH 2/90

The Refuge initiated a wellness program in 1989, and we followed up this year with the same comprehensive wellness screening exam to note any improvements. The exam included assessments of blood chemistry profile, fitness, stress, pulmonary function, lung capacity, cholesterol screening, nutrition, body composition, flexibility, strength, coronary risk, hearing screening, and general health risks. The cost of this thorough exam was \$82.00 per employee. The Refuge received a corporate report giving total staff results and recommendations. Overall, some improvements were made from the previous year's results.

As part of the wellness program, we continued to offer a "fitness program contract" for those employees who desired to participate. Basically, an employee was allowed up to 1 1/2 hours per week of release time from the job when combined with personal time for specified physical fitness activities. This program was used by 2 of our employees.

7. Technical Assistance

Refuge personnel provide technical assistance as requested. Actual assistance provided included written information by mail, telephone discussion of problems, and on-site inspections. All assistance provided in 1990 was informal consultation.

8. Other

Training for a refuge with a large staff can be a major item of expenditure. Training costs in 1990 were \$2,390.60, and included the following classes:

<u>Procurement Refresher</u> <u>Preprinted Forms/Software</u> 12/10 - 12/14	Patricia Durham
<u>Procurement/Coop Agreement</u> <u>(Refresher)</u> 12/10 - 12/14	Gary Hagedorn, Ron Cole, Jay Parks
<u>Aviation Safety</u> 11/8	Gary Hagedorn, Roger Johnson, Jay Parks, Jim Hainline, Mike Parker
<u>Basic Law Enforcement</u> 1/5 - 3/21	Ron Cole
<u>Public Involvement Workshop</u> 6/25 - 6/26	Ron Cole, Gary Hagedorn, Bill Kent
<u>Lotus 1-2-3</u> 1/24 - 1/26	Patricia Durham, Akimi Shono, Gary Hagedorn, Bill Kent, Vicki Verley, Mike Phillips
<u>Drug Awareness</u> 7/26	Dale Green, Gary Hagedorn, Roger Johnson
<u>Winter Driving Skills</u> 1/18 - 1/19	Akimi Shono, Marsha Schreiner
<u>Basic Refuge Academy</u> 4/30 - 5/18	Akimi Shono
<u>Word Perfect 5.0</u> 120 hr. corresp. course	Vicki Verley
<u>Int. Fire Behavior S-390</u> 9/10 - 9/13	Akimi Shono

Fire Effects

1/9 - 1/12

Akimi Shono

Smoke Management

4/10

Akimi Shono

Chainsaw Training S-212

6/13 - 6/14

Akimi Shono, Aaron Drew, Mark Lowrie,
David DeemerBasic Firefighting

S-130, S-190

6/11 - 6/15

Pam Thomas

CPR Refresher

3/29

Akimi Shono, Gary Hagedorn,
David Deemer, Mark Lowrie, Pam Thomas,
Larry Bigoni, Dean Barker,
Hank Ebinger, Dale Green, Bill Kent,
Roger Nelson, Bill Sellers,
Dave Thomas, Aaron DrewStandard First Aid

8/23

Akimi Shono, Ron Hellman,
Larry Bigoni, John Matthews,
Dale Green, Dean Barker,
Cecil Moore, Roger Nelson,
Bill Sellers, Jay Parks, Mike Parker,
Vicki Verley, Mark Lowrie,
David Deemer, Roger JohnsonPublic Involvement

5/3

Akimi Shono

Interpersonal Relationships

4/30 - 5/1

Akimi Shono

Fire Time Recorder

5/31 - 6/1

Vicki Verley

Law Enforcement Refresher

4/2 - 4/6

3/5 - 3/9

Hank Ebinger, Bill Kent, Bill Sellers,
Dale Green, Roger Johnson,
Roger Nelson, Gary Hagedorn,
Larry BigoniSemi-auto Pistol

12/17

Bill Kent

R-Base Training

4/20

Patricia Durham

Administrative Workshop
4/17 - 4/19

Patricia Durham, Vicki Verley

Self Esteem/Stress
4/17

Patricia Durham, Vicki Verley

John Matthews was presented a pin and certificate in recognition of 30 years with the Service. John retired on November 30, 1990, after serving with the U. S. Fish and Wildlife Service for a total of 30 years; the last ten years as an automotive mechanic. He served with the USFWS for twelve years before enlisting for four years each in the U. S. Navy and the U. S. Air Force. In 1968, he rejoined the USFWS, stationed at Umatilla Refuge where he served until his reassignment to Klamath Basin Refuges in 1980. He and his wife, Shirley, will continue to live the good life in Klamath Falls, Oregon.

Roger Johnson served as an instructor at the Basic Refuge Academy, Bill Kent served as a regional firearms instructor and coordinator of regional inservice training, and Dale Green served as a regional heavy equipment instructor in 1990.

F. HABITAT MANAGEMENT

1. General

In 1928, Tule Lake Refuge was superimposed on lands withdrawn by the Bureau of Reclamation as part of the Klamath Reclamation Project. The project provides the opportunity for local residents to competitively bid to farm, hay and graze livestock on parcels of land owned and developed by the Federal Government. It is the Service's responsibility to manage land and water units for the benefit of waterfowl, subject to contracts with the Bureau and local irrigation districts for the control and disposition of irrigation waters. Today, the Bureau handles the cash lease program on approximately 15,000 acres of irrigated croplands on the refuge. The Service farms by force account or through cooperative farming agreements approximately 2,000 acres of "buffer strips" adjacent to water areas. The Service paid \$52,606 to the Tulalake Irrigation District for water delivery in 1990.

2. Wetlands

The wetlands of Tule Lake Refuge are comprised of about 10,500 acres of shallow open water with scattered beds of sago pondweed, and 2,500 acres of hardstem bulrush/cattail marsh. The area serves as an irrigation source and a return flow sump. Water levels are manipulated by the Tulalake Irrigation District by diverting inflows and pumping excess. Operating levels are established by agreement between the Service, the Bureau, and the District to provide winter drawdown for floodwater storage, to preclude nest flooding in the spring, and to reduce botulism outbreaks in the summer.

Siltation in Tule Lake has occurred over the years, resulting in considerable loss of depth. A loss of 14 inches of water column has been noted since 1959. This loss of capacity (depth) at the present rate has had serious impacts on wildlife use and wellbeing. Some impacts presently noted include much less use by diving species of ducks than was reported in the past. A number of scenarios have been proposed to address the problem of reduced capacity in the lake. They include raising the water level, dredging the lake, moving the lake, and doing nothing at all.

Last year at this time the preferred alternative was to relocate the lake. This proposal was considered to be too costly and therefore was scratched. Presently, the "do nothing at all" proposal is being accepted, seemingly by default.

As an investigation to the sump relocation project, we have been flooding three 2-acre plots to determine the response of submergent aquatic plants to various depths of permanent flooding and to monitor the vegetative succession and condition over time. We experienced problems holding water in the ponds because a culvert broke and the ponds drained until the culvert was fixed. The investigation was

therefore curtailed. It should be noted that the sago pondweed production in all three ponds was similar to the previous year. Also, since the sump relocation proposal is not being pursued, these ponds may be turned over to wild rice ponds, or seasonally flooded marshes.



TL-90-05 The experimental wild rice crop did well this year, and was used by a variety of waterfowl. AJS 9/90

In April, the 4-acre experimental pond was again seeded to wild rice. We prepared a rough seed bed by disking, fertilized the field with urea and zinc sulfate, seeded at a rate of 100 pounds per acre, harrowed the seed in and flooded it with six inches of water. After the seed germinated, the water was raised to one foot and maintained at that depth throughout the growing season. In July, the entire pond was treated with copper sulfate to control the growth of filamentous algae. Zon guns were used to keep the hundreds of blackbirds out; however, only with limited success. The cost of the project was \$800.00 for the seed and \$265.00 for the fertilizer and copper sulfate. Hopefully, the wild rice will reseed itself next year and we'll have a productive, self-sufficient wild rice crop. If all goes well, similar small wild rice plantings may be tried on other units of Tule Lake and Lower Klamath Refuges.

4. Croplands



TL-90-06 Burning mature winter wheat fields make the grain accessible to waterfowl like these cacklers. LFB 12/90

The primary objectives of farming on Tule Lake Refuge are to provide both green browse and grain for waterfowl during fall and spring migrations and to minimize depredation on Bureau of Reclamation leased lands. Both cooperative farming and force account farming are used to meet these objectives. Approximately 1,897 acres of these "buffer strips" adjacent to water areas were farmed. During 1990, the force account and cooperative farming programs (Figures 1 and 2) involved 804 acres of grain (barley and mature winter wheat), 796 acres of green browse (alfalfa and winter wheat), and 97 acres of dense nesting cover (tall and intermediate wheatgrass). See Table 3. All the grain, except for next year's seed, was left for waterfowl food. A portion of the standing mature winter wheat was burned in November to make the grain more accessible for waterfowl. The green browse is particularly important for the cackling Canada goose populations.

There were 15,391.2 acres farmed by private individuals under the Bureau of Reclamation cash lease program as authorized under the Kuchel Act (Table 4 and figures 3, 4 and 5). These crops are all harvested, with waste grain and potatoes providing an important waterfowl food source. Under the 1985 Farm Bill, a few unreported acres were classified as "wildlife food plots" and were left standing as part of the set-aside program. Over the years since the program began, there has been a notable decline in the numbers of acres signed up under this Federal assistance program.

Total revenue to the Bureau of Reclamation for lease lands on Tule Lake Refuge was \$1,280,490.51 (Table 4). Total revenue for all lease lands in the complex (Tule Lake and Lower Klamath Refuges) was \$1,670,448.47. Anticipated payout of the reclamation project is year 2006.

TABLE 3. Refuge Farming Program, Tule Lake Refuge, 1990.

Field	Acreage	Current Use	Permittee
A-1	41.11	Mature winter wheat	force account
A-1	41.11	Barley	force account
A-1	41.11	Barley	force account
B-1W	39.14	Wheatgrass (nesting cover)	force account
B-1E	39.14	Barley	force account
B-4	59.28	Barley	force account
B-5	51.69	Barley	force account
B-6	50.64	Oats	force account
B-7	26.42	Wheatgrass (nesting cover)	force account
B-2G	46.36	Oats	force account
B-2H	46.36	Oats	force account
B-2I	46.36	Oats	force account
B-2J	46.36	Barley	force account
B-2K	46.36	Barley	force account
B-2L	46.36	Barley	force account
B-2M	46.48	Mature winter wheat	force account
B-3N	37.89	Oat-pea hay/winter wheat	Wright
B-3S	10.00	Wild rice - subm. aq. plant exp.	force account
C-1A	103.25	Mature winter wheat	force account
C-1B	103.25	Fallow/winter wheat	force account
C-1C	103.25	Oat-pea hay/winter wheat	Wright
C-2A	96.94	Alfalfa (2nd year)	Wright
C-2B	96.96	Oat-pea hay/winter wheat	Hemphill
D-1	104.38	Oat-pea hay/winter wheat	Hemphill
D-2	99.07	Alfalfa (3rd year)	Hemphill
D-3	109.78	Mature winter wheat	force account
D-4	68.57	Mature winter wheat	force account
D-5	31.56	Mature winter wheat	force account
D-6A	40.70	Oat-pea hay/winter wheat	Ackley
D-6B	41.20	Mature winter wheat	force account
D-6C	40.90	Alfalfa (1st year)	Ackley
D-6D	31.60	Nesting cover/quackgrass hay	Ackley
D-6E	31.80	Mature winter wheat	force account
D-6F	31.70	Alfalfa (1st year)	Ackley
Force account farming acres		1,213.69	
Cooperative farming acres		683.41	
TOTAL		1,897.10	
Crop Type		Acres	
Grain (mature winter wheat, barley)		804.05	
Green feed (alfalfa, winter wheat)		796.17	
Nesting cover (wheatgrass)		97.16	
Oats (nematode control crop)		189.72	
Exper. crops (wild rice, subm. aq.)		10.00	

TABLE 4. Crop Types and Acreage Under the Bureau of Reclamation
Cash Lease Farming Program, Tule Lake Refuge, 1990.

Crop Type	ACRES				Total Acres
	Sump 2 SW Sump	Sump 3 League Nat	Area J Panhandle	Area N Pump D	
Barley	2099.9	5685.4	154.0	19.0	7958.3
Oats	2034.3	164.8	38.0	0.0	2237.1
Potato	682.1	2345.9	0.0	0.0	3037.0
Alfalfa	368.4	28.9	0.0	0.0	397.3
Wheat	97.5	942.2	0.0	0.0	1029.7
Peas	52.8	0.0	0.0	0.0	52.8
Onion	0.0	613.5	0.0	0.0	613.5
Flooded	35.5	20.0	0.0	0.0	55.5
TOTAL ACREAGE	5370.5	9809.7	192.0	19.0	15391.2
TOTAL REV \$\$	325,168.52	944,971.99	10,050.00	300.00	1,280,490.51

Figure 1 .Tule Lake National Wildlife Refuge
Southwest Sump

1990 Farming Program



LEGEND

- Access ramps
- == Access roads
- === County road
- Tile drain

KEY

- Wheatgrass (nesting Cover)
- Barley
- Oats
- Oat-Pea Hay / Winter Wheat
- Mature Winter Wheat
- Wild Rice - Subm. Aq. Exp.

Figure 2. Tule Lake National Wildlife Refuge
League of Nations and Frog Pond



Figure 3. Bureau of Reclamation Lease Land Farming Program, League of Nations, Tule Lake Refuge, 1990.

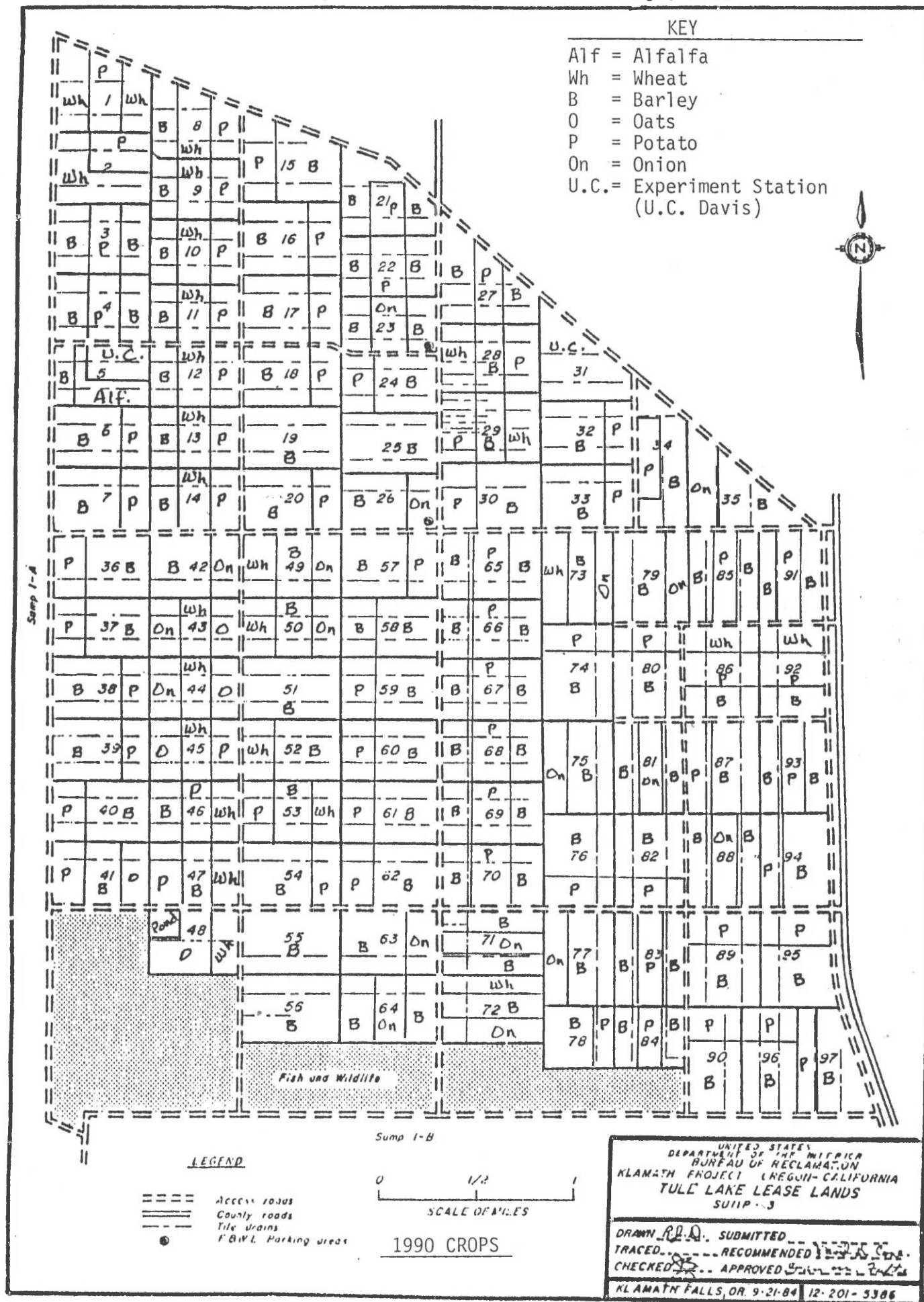
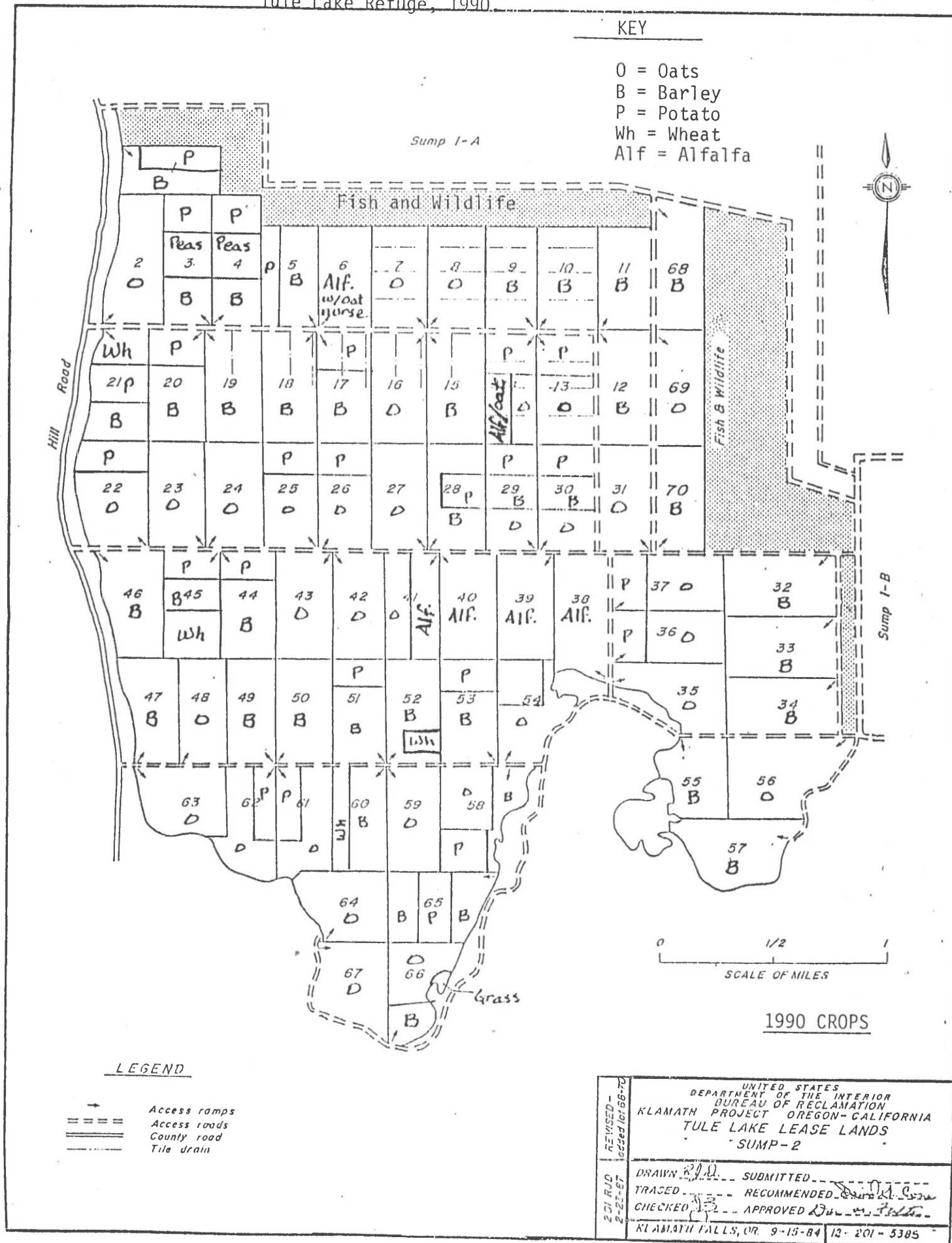
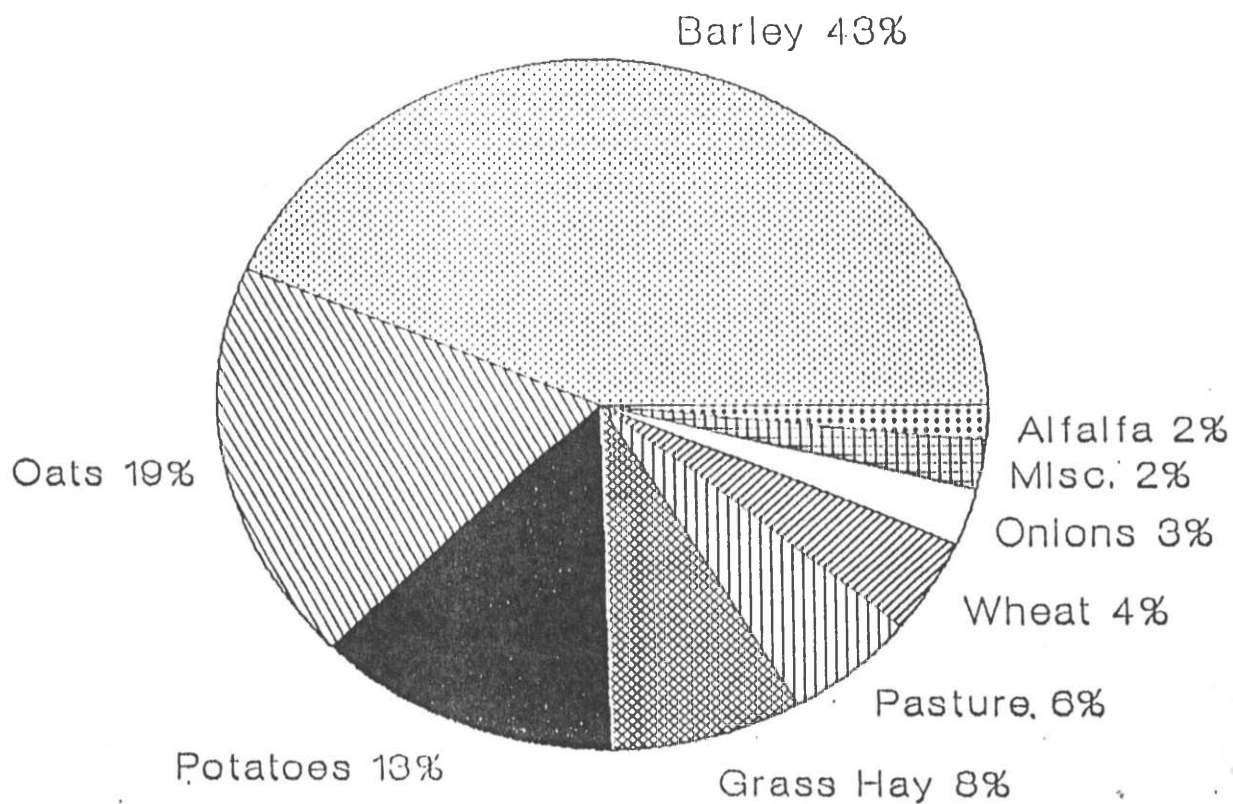


Figure 4 . Bureau of Reclamation Lease Farming Program, Southwest Sump, Tule Lake Refuge, 1990.





Misc. Includes: Fallow lands (529 ac.)
Peas (53 ac.)

Figure 5 . Bureau of Reclamation Lease Lands Crop Report, Tule Lake and Lower Klamath Refuges, 1990. Source: USBR

5. Grasslands



TL-90-07 Irrigating this section of the DNC allowed the wheatgrass to outcompete the weed basia. CAH 9/90

Approximately 20 acres were seeded to tall and intermediate wheatgrass along various dikes of the Frog Pond. This project was completed in cooperation with Tululake Irrigation District and the Bureau of Reclamation. Locations were along the south side of D1 and D2, and along the N12C canal.

6. Other Habitats



TL-90-08 Bald eagles in Cottonwood trees at Hovey Point. RCF 2/77

The cottonwood trees at Hovey Point continue to be attractive as a day roost for bald eagles. During the winter, numbers of up to 70 bald eagles have been seen roosting on these trees. This one acre area, consisting of approximately 20 cottonwood trees, also provides habitat to nesting hawks and owls. Despite its habitat value, this is the only such area on the Refuge. Riparian habitat and day roost sites are in very limited supply. The recommendations to improve the quantity and quality of riparian habitat for Lower Klamath Refuge (described in Lower Klamath Section F-6) would apply to Tule Lake Refuge as well.

8. Haying



TL-90-09 Alfalfa harvest by cooperative farmer. AJS 7/90

Three separate Cooperative Agreements and one Special Use Permit were issued to local farmers to provide green browse for migrating and wintering waterfowl (refer to Section F-4, Table 3). A total of 383.18 acres of oat-pea hay were planted in the spring and harvested in August. In exchange for the hay, the Cooperator irrigated, worked the ground, and seeded the fields to winter wheat in September.

This year 72.6 acres of alfalfa were established under the cooperative farming program. Harvest of this hay is generally between July 1 and September 10 of each year, and the Government's share is distributed evenly throughout the field and consists of new growth between three and five inches in height by September 10.

Ninety-nine acres of third year alfalfa were harvested under a Special Use Permit on field D-2. Under the conditions of the permit, harvest is allowed between July 10 and September 10 to insure proper stubble height by fall migration. The fee charged is on a per acre basis, and was bid at \$44.00 per acre for a period of 5 years, which ends with the 1992 growing season.

The green feed received heavy use by cacklers and other waterfowl during the spring and fall of this year. Fall use by cacklers was heavier in the green winter wheat than in alfalfa fields.

9. Fire Management



TL-90-10 Blacklining for a prescribed burn of winter wheat. AJS 12/90

Approximately 2,685 acres were treated with prescribed fire in Klamath Basin Refuges, at an estimated cost of \$9,672 for fuel, manpower and planning. Table 5 summarizes the prescribed burning on the complex.

TABLE 5. Prescribed Burning, Klamath Basin Refuges, 1990.

Fuel Model	Area	Acreage
3	Tule Lake Marsh - southcentral unit	400
1	Tule Lake ag. farm field/nesting cover	1100
9, 11	Bear Valley fuels reduction Unit 5B (poor burn conditions due to drought)	50
1	Tule Lake grain burns for goose feed	140
1	Lower Klamath ag farm field/debris removal burns	145
1	Lower Klamath spring burn Fairchild for goose browse	850
TOTAL ACREAGE		2685
TOTAL # BURNS		27

Following is a general accounting of fire fund expenditures in FY90:

HABITAT FIRE MANAGEMENT (1261):

Acct Code	Title	Cost	Description
1261-1000	Administration	5,913	Clerical support for fire program and burn planning
1261-2000	Planning	1,616	Burn plan preparation and coordination
1261-3000	Training	1,745	One person attended "Fire Effects" training and a smoke management workshop
1261-5100	Equip. Purchase	0	
1261-5200	Equip. Rental	0	
1261-5300	Equip. Maintenance	4,466	Repair of burn equipment, vehicles, pumps; installation of new equipment
1261-6500	Prescribed Burns	9,672	Personnel, time, fuel, and equipment time for prescribed burns
1261-7000	Facilities	7,565	Office costs, utilities, phone, phone instal. in fire cache
1261-8000	Monitoring/Eval.	6,589	Prescribed burn studies and evaluation time
1261-9000	Other	0	
	TOTAL	\$ 37,566	

FIRE PROGRAM MANAGEMENT (9110):

Acct Code	Title	Cost	Description
9110-1000	Administration	4,223	NORCAL fire team and other cooperators' meetings, clerical support, office supplies, budget, incidental travel
9110-2000	Planning	1,151	Fire Management Plan prep/coord for Lower Klamath
9110-3000	Training	0	
9110-4000	Interagency Agreements	12,000	Klamath Forest fire suppression agreement w/Winema NF; ODF suppression in Bear Valley
9110-5000	Equipment	1,577	Computer/office equipment
9110-9000	Other	0	
	TOTAL	\$ 18,951	
	FUND TARGET	\$ 20,000	

PRESUPPRESSION AND PREPARATION (9120):

Acct Code	Title	Cost	Description
9120-1000	Administration	42,000	FMO/fire crew salaries
9120-3000	Training	1,516	All fire crew & 1 PFT to S-212 Chainsaw Training; 1 fire crew member to S-130,190 Basic Fire Training; 1 PFT to S-390 Intermediate Fire Behavior; 1 PFT to S-261 Firefighter Time Recorder; all fire crew to CPR & Standard First Aid
9120-5100	Equip. Purchase	110,839	40T gooseneck lowboy trailer; fireline plow; 80-gal Terra Torch; fire cache equipment; Type 4 fire engine w/equip for KFNWR; FMO pickup
9120-5200	Equip. Rental	0	
9120-5300	Equip. Maintenance	36,296	Engine, pumps, cache equipment; radio repairs
9120-6000	Fuel Management	28,313	Bear Valley fuels reduction; prescribed burns
9120-7000	Facilities	1,687	Barracks housing agreement; phone
9120-9000	Other	0	
	TOTAL	\$ 220,651	
	FUND TARGET	\$ 232,500	

The seasonal fire crew was on duty by the first week of June through September. They responded to 12 fires; 1 32-acre fire on Sheepy Ridge at Tule Lake NWR, and 11 fire suppression assists off-refuge. Two fire assists were in Oregon and 9 were in California on USFS, Modoc National Forest cooperative land. An additional 4 fires occurred (2 Tule Lake, 1 Bear Valley, 1 Klamath Forest) on the Refuges, but were controlled by cooperators through suppression agreements. The 2 fires on Tule Lake Refuge occurred after the fire crew was released for the summer.

The FMO assisted with the instruction of basic fire suppression courses for Army military personnel at Fort Lewis, Washington. Army personnel were later mobilized for fire suppression at Yosemite National Park and Burns, Oregon.

The fire crew also worked on many non-fire projects. See Section E-3 for a list of completed projects. They represented Klamath Basin Refuges in 2 local parades, and brought a trophy home for a Tulelake Horseradish Festival parade float.

10. Pest Control

The control of purple loosestrife (*Lythrum salicaria*) is a cooperative effort with the Siskiyou County Agricultural Commissioner. This year there were 9 acres sprayed on Tule Lake Refuge, which equals the lowest acreage treated since the start of the program. The survey indicated that the loosestrife is still confined to the current treatment area, which is located in Tule Lake Sump 1-A. The total acreage this year was comprised of seedlings, so ground is being gained on the problem. The cost of the spray and helicopter application this year was \$1,095.50, and we shared the cost with Siskiyou County, Modoc County, Tulelake Irrigation District, and the Bureau of Reclamation.

One of the effects of loosestrife control on Tule Lake Refuge was the temporary loss of cattails (*Typha latifolia*). The acreage rate of Rodeo was reduced from seven pints per acre to four pints per acre. This was done as per the label change. Hopefully, this will also help leave more desired vegetation.

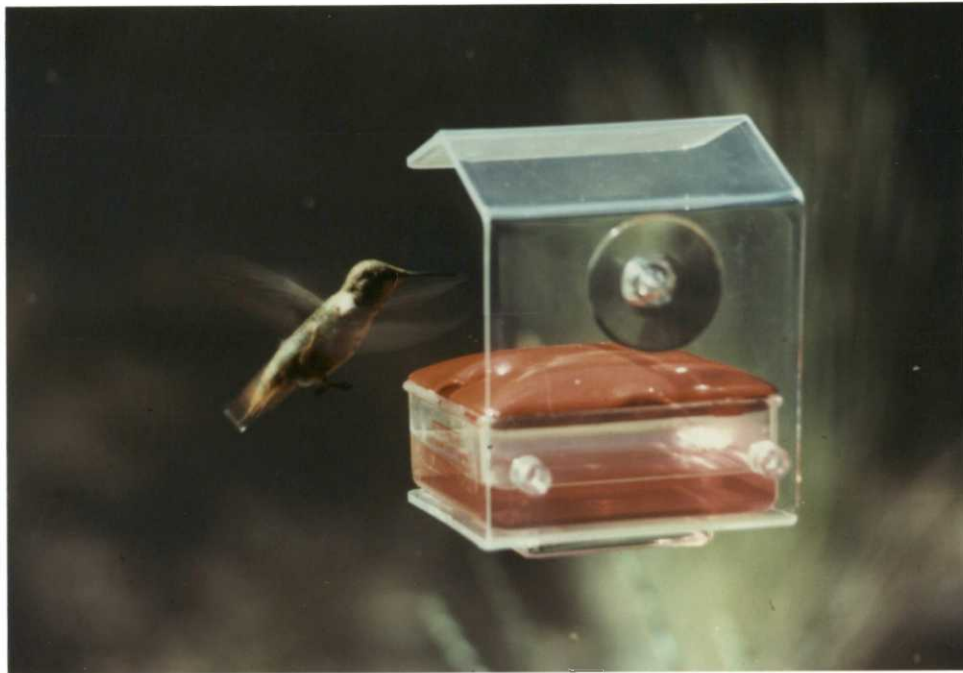
Mice were more of a problem on Tule Lake this year. We received 13 requests from the Bureau of Reclamation lease land farmers to apply rodenticides on 695 acres, compared to last year's nine requests on 269 acres. Diphacinone and Chlorophacinone were both used to treat potato and alfalfa fields on BOR lease lands.

Perennial pepperweed (*Lepidium latifolium*) has heavily invaded the western side of Sump 1-A along Hill Road. This is the first year this plant has been noted in such quantities. It can also be found along certain dikes in the Southwest Sump.

The use of pesticides on the BOR lease lands of Tule Lake Refuge is receiving regional and national review. The list of pesticides presently allowed contains several restricted chemicals. Although there has been no evidence of severe contaminant problems to date, this is a major agricultural area with high chemical use. The drainwater study and local monitoring are intended as a reconnaissance study to see if unknown problems exist. The Siskiyou County Agricultural Commissioner is very cooperative, and monitors and enforces application of all chemicals that are applied to Refuge lands. He provides us with a list of all chemicals applied, and is strict about enforcing local applicator violations. Issuance of any restricted chemical permits has been based on demonstrated need.

There are several practices that have been implemented by FWS and BOR on lease lands to reduce the use of chemicals, including:

- FWS uses no chemical fertilizers and few herbicides on force account farm lands.
- Dewatering and chaining ditches reduces need for aquatic herbicides.
- Crop rotation is required on 6600 acres to control barley rootknot nematode infestations, and reduces need for nematicides.
- Intense short-term grazing of alfalfa tracts removes vegetation and allows predators to work rodents; reduces rodenticide use.
- Fall work in Area K allows tillage control of quackgrass; reduces herbicide use.
- Rotation flooding for quackgrass control removes lots from production for 1 1/2 years; kills nearly 100% of quackgrass and reduces herbicide use.
- Grass plantings along some right-of-ways and ditchbanks reduces herbicide use by changing to more desired vegetative types.
- Some ditchbanks are mowed by TID instead of sprayed.

G. WILDLIFE1. Wildlife Diversity

TL-90-11 One of our more energetic visitors. 8/90

Unusual bird sightings for Tule Lake and Lower Klamath Refuges are summarized below:

TABLE 6. Unusual Bird Sightings, Tule Lake and Lower Klamath Refuges, 1990.

Species	Date
Cattle egret	06/20/90
Peregrine falcon	04/24/90, 12/04/90
Red phalarope	11/11/90
Western sandpiper	02/01/90
Franklin's gull (nesting)	06/15/90
Bonaparte's gull	05/01/90, 07/20/90
Northern pygmy-owl	01/02/90, 01/10/90
	01/23/90, 02/17/90
Belted kingfisher	12/06/90
American crow	04/10/90
Sage thrasher	11/24/90
Nashville warbler	04/22/90
Black-throated gray warbler	04/21/90
White-throated sparrow	10/21/90
Snow bunting	04/22/90, 11/11/90
Rosy finch	12/90

2. Endangered and/or Threatened Species

There was no change in the status of the bald eagle, peregrine falcon, short-nosed sucker, or Lost River sucker during the report period.

The maximum number of bald eagles recorded on Tule Lake was 176. This number was seen during the mid-winter inventory conducted on January 12. This is considerably fewer than the 664 seen the previous year. The same trend was observed in other areas of the Klamath Basin. Although we were at first concerned, we learned that other areas in the west were holding large numbers of bald eagles later than normal due to mild winter conditions. It was the opinion of most eagle "experts" that eagle numbers were relatively unchanged from the previous year, but birds were considerably more scattered throughout the northwest.

The first fall sighting of bald eagles was reported on October 19. It may be coincidental, but bald eagles seem to appear at the same time as or soon after the arrival of the first cackling Canada goose

flocks, and are often seen in the vicinity of flocks. Eagle numbers began to increase rapidly in December, and over 100 were apparent daily by the end of the year.

Several fisheries' investigations in recent years have failed to reveal any short-nosed or Lost River suckers in Tule Lake.

3. Waterfowl



TL-90-12 Tule Lake is a traditional area for extremely large numbers of snow, ross', and white-fronted geese.

Combined duck and goose maintenance was 27.6 million use days (Figure 6). This was a 24% decrease from the 36.5 million recorded in 1989. Fall goose use was 8.9 million - exactly the same as seen in the previous year. Fall duck maintenance was 10.3 million use days. This was a 31% decrease from 1989. Spring goose use days totaled 2.6 million - only one third of that seen the previous year. Duck maintenance in the spring was 5.8 million use days. This was little changed from the 5.9 million noted in 1989.

Goose populations were highly variable. White-fronted goose fall numbers showed considerable improvement from 1989. The fall peak of 83,500 was a 42% improvement over the 59,000 seen in 1989. The spring peak of 10,300 was down 75% from the 41,000 seen in the previous year. Other areas of the basin had populations at or above last year's spring levels, so this decline at Tule Lake may be simply a redistribution within the basin. Although we didn't conduct formal age ratio surveys this fall, it appeared that many of the flocks were at least one third young of the year, indicating excellent production.

Cackling Canada goose numbers were up substantially this fall. Peak numbers reached 64,000 in mid-November. This is a 45% increase from the 44,000 noted last year, and a 260% increase from the 17,800 seen in 1985. As is usually the case, few cacklers were seen at Tule Lake in the spring. These little geese continue to keep us guessing about their food preference. It appeared that when green winter wheat was provided, they preferred it. Then in 1987, they more or less ignored the winter wheat and turned to alfalfa. In 1988 and '89, they utilized both, but still spent little time in mature grain. In 1990, they decided that flying and feeding with white-fronts was the thing to do, and so they spent considerable time feeding in barley stubble, with reduced use of the green crops provided for them. And so it goes with cackler management on Tule Lake. We keep a smorgasbord out there and hope they find it satisfactory!

White geese (snow and Ross') numbers remained low, as they were in 1989. We noted a spring peak of 42,000, which was similar to the 48,000 seen in 1989. In 1988, we saw 147,000 white geese at Tule Lake in the spring. During the fall, the 56,000 peak noted this fall exceeded last year's 46,000, but fell far short of the 128,000 seen in 1988.

This change in white goose use at Tule Lake is puzzling. The fall use is apparently the result of overflight, and there seems to be no downturn in the numbers of white geese using the Central Valley in winter. The decline in spring is apparently the result of more use at other areas in the basin and not an overall decline in spring white goose numbers.

Fall duck use was down substantially. Mallard use declined by 25%, canvasback use by 62%, and widgeon by 43%. Other species were near 1989 levels, but in no instance exceeded them.

Spring use remained much the same as those seen in 1989. No species appeared in substantially different numbers than seen in the previous year.

TABLE 7. Waterfowl Maintenance (Use Days x Million)
Tule Lake Refuge, 1986-1990.

Year	Spring Duck	Spring Goose	Fall Duck	Fall Duck	Total
1986	2.05	2.70	7.07	9.00	20.82
1987	5.76	9.73	10.65	10.63	36.77
1988	6.80	7.95	10.76	11.79	37.30
1989	5.66	7.66	14.98	8.23	36.53
1990	5.80	2.61	10.34	8.89	27.64

We had a considerable increase in breeding ducks, a large increase in breeding Canada geese, and a major increase in nesting coots. Duck pairs totaled 2,807, representing an increase of 36%. Goose pairs were recorded at 171 - up 68%. There were 8,758 coot individuals recorded during the duck pair survey, which is up 394% from last year.

The increase in waterfowl production was a function of improved pair numbers, and not an increase in nest success or brood survival. As has been the case in recent years, raccoons are the number one cause of nest failure for those species nesting in Tule Lake marsh. Nest surveys in recent years have shown these animals to be the only significant predator in the marsh area.

There has been a long term decline in the numbers of redheads and ruddy ducks in Tule Lake marsh. This may be related somewhat to predation, but a more likely cause is the reduction in water depth within the marsh. Many areas have only a skim of water, and the submergent vegetation is gone. Tule Lake sump has lost some 14+ inches in depth due to siltation since 1959, and former areas which qualified as deep water marsh are practically dry, and unattractive to diving duck species. The water depth losses in Tule Lake continue to be the most serious impact on waterfowl use in the marsh.

TABLE 8. Five Year Production Trend
Tule Lake Refuge, 1986-1990.

	1986	1987	1988	1989	1990
Goose	517	232	281	277	307
Duck	6,850	6,320	7,027	2,324	3,208
Coot	8,000	2,066	4,447	929	2,627

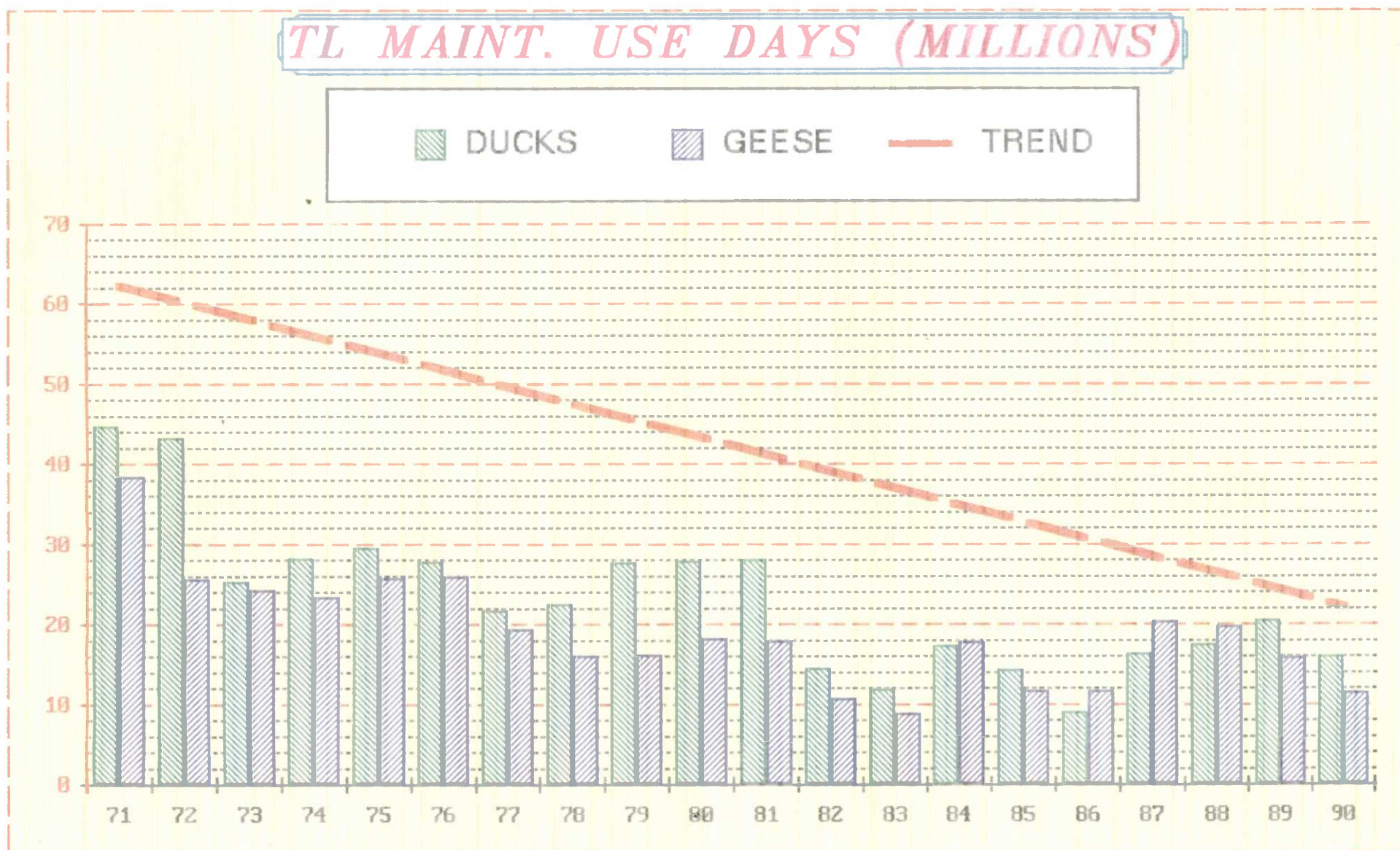


Figure 6. Waterfowl use days, Tule Lake Refuge, 1971-90.

4. Marsh and Water Birds

Colonial nesting species had a poor showing at Tule Lake. There were only about 20 great egret nests and about 100 black-crowned night heron nests in the marsh. A few were successful, but most showed evidence of predation, probably by raccoons.

Western grebes had no nesting success in their first attempt. Weather conditions were wet and cold during May, and it appeared most nests were abandoned, as happened under similar weather conditions in 1988. Some renesting occurred in very late summer, and it is not known whether these young successfully fledged or were attrited (a little Desert Storm lingo for you) at the onset of winter. Eared grebes established a nesting colony on the southwest corner of Tule Lake marsh, which numbered 300 nests. They were successful in their effort, and numerous young were fledged.

Good numbers of white pelicans were seen using Tule Lake for foraging during the spring and summer months. Over 600 were seen on a flight in mid-June, accompanied by almost 500 double-crested cormorants in a single foraging party.

5. Shorebirds, Gulls, Terns, and Allied Species

Numerous shorebirds were seen in pre-irrigated croplands and the mud flats around the marsh in the spring of the year. Commonly seen species included killdeer, American avocet, black-necked stilt, greater yellow-legs, long-billed dowitchers, western, least and Baird's sandpipers, and dunlin. Only the killdeer was observed nesting on Tule Lake.

Forster's and Caspian terns were commonly noted during the summer foraging near the pumping plant outlets or loafing on the tour route road. No nesting of either species was observed on the Refuge. Ring-billed and California gulls were present in large numbers during the summer, either foraging over the sump for fish or in the fields for meadow voles.

6. Raptors



TL-90-13 This Northern pygmy-owl was added to AJS
our list of unusual sightings.

The Klamath Basin Refuges were once again important habitat to thousands of migrating and wintering raptors. The Tule Lake Refuge and Lower Klamath Refuge raptor surveys were conducted on a bi-monthly basis during October 1 through April 30, and monthly during May 1 through September 30. The purpose of these raptor counts is to monitor population trends, as well as provide information on peak use and migrational timing. As is usually the case, 90 percent of the sightings along the transect routes were bald eagles, red-tailed hawks, northern harriers, and rough-legged hawks. The remainder included kestrels, prairie falcons, short-eared and great horned owls, golden eagles, peregrine falcons, Swainson's hawks, ferruginous hawks, sharp-shinned hawks, Cooper's hawks, and turkey vultures.

Data has shown that December, January, and February represent peak raptor populations of any given winter. These three months have been grouped together to best reflect a season's index. The numbers represented in Figures 7 through 10 depict numbers of raptors seen along raptor transects and not the Refuges' total population.

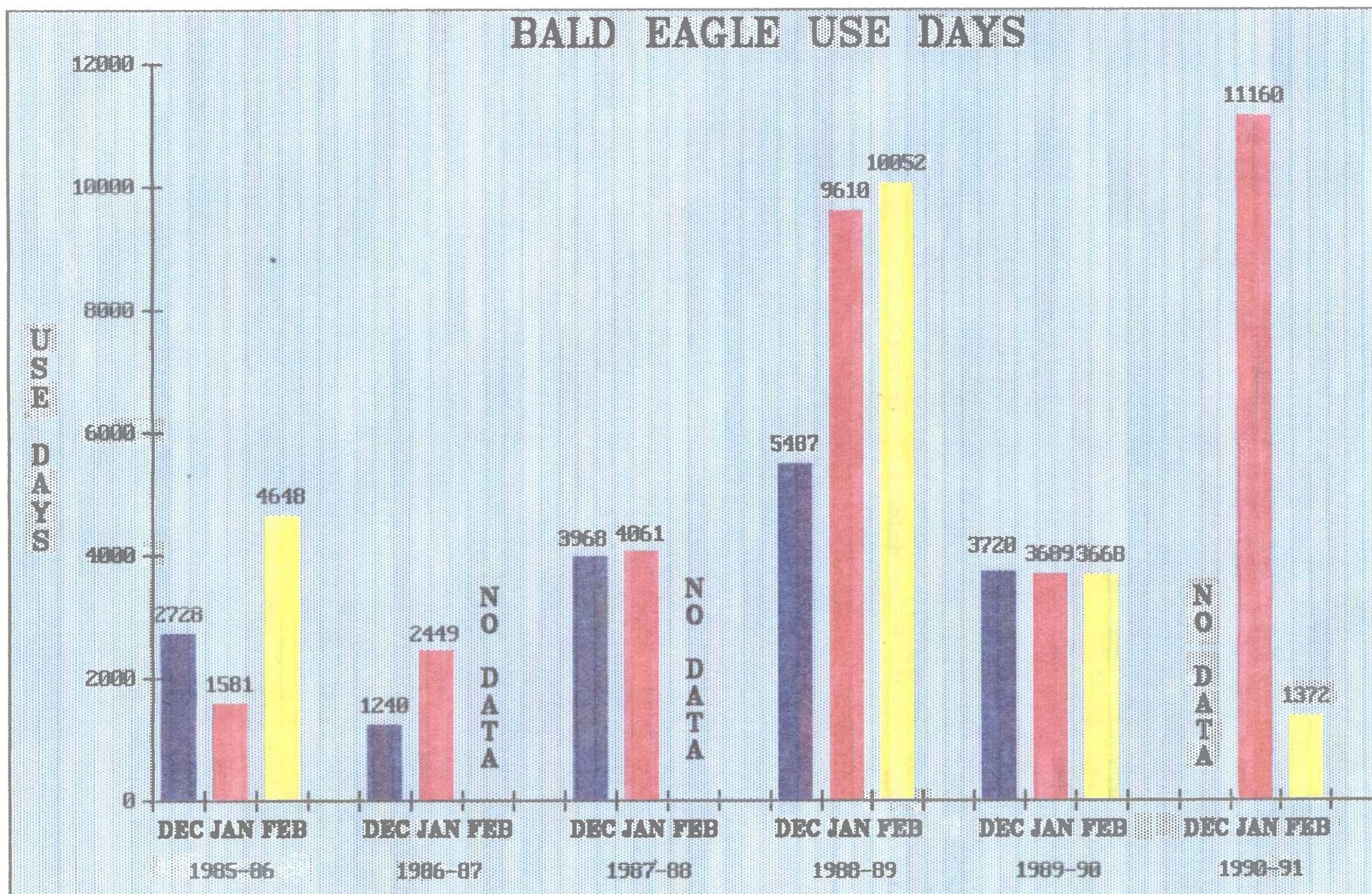


Figure 7. Bald eagle use days along Tule Lake and Lower Klamath Refuges Raptor Transect Routes, 1985-90

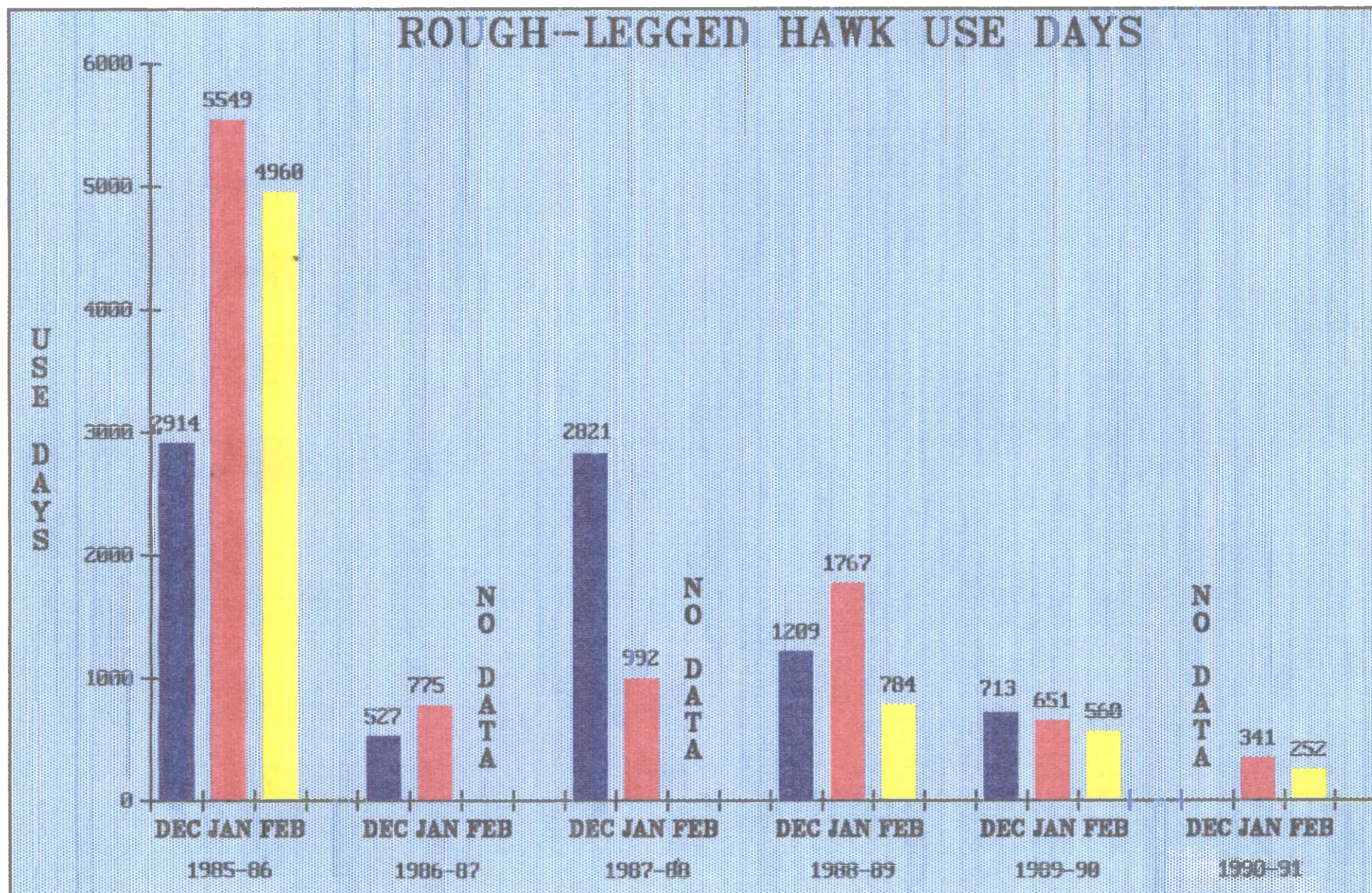


Figure 8. Rough-legged hawk use days along Tule Lake and Lower Klamath Refuges Raptor Transect Routes, 1985-90.

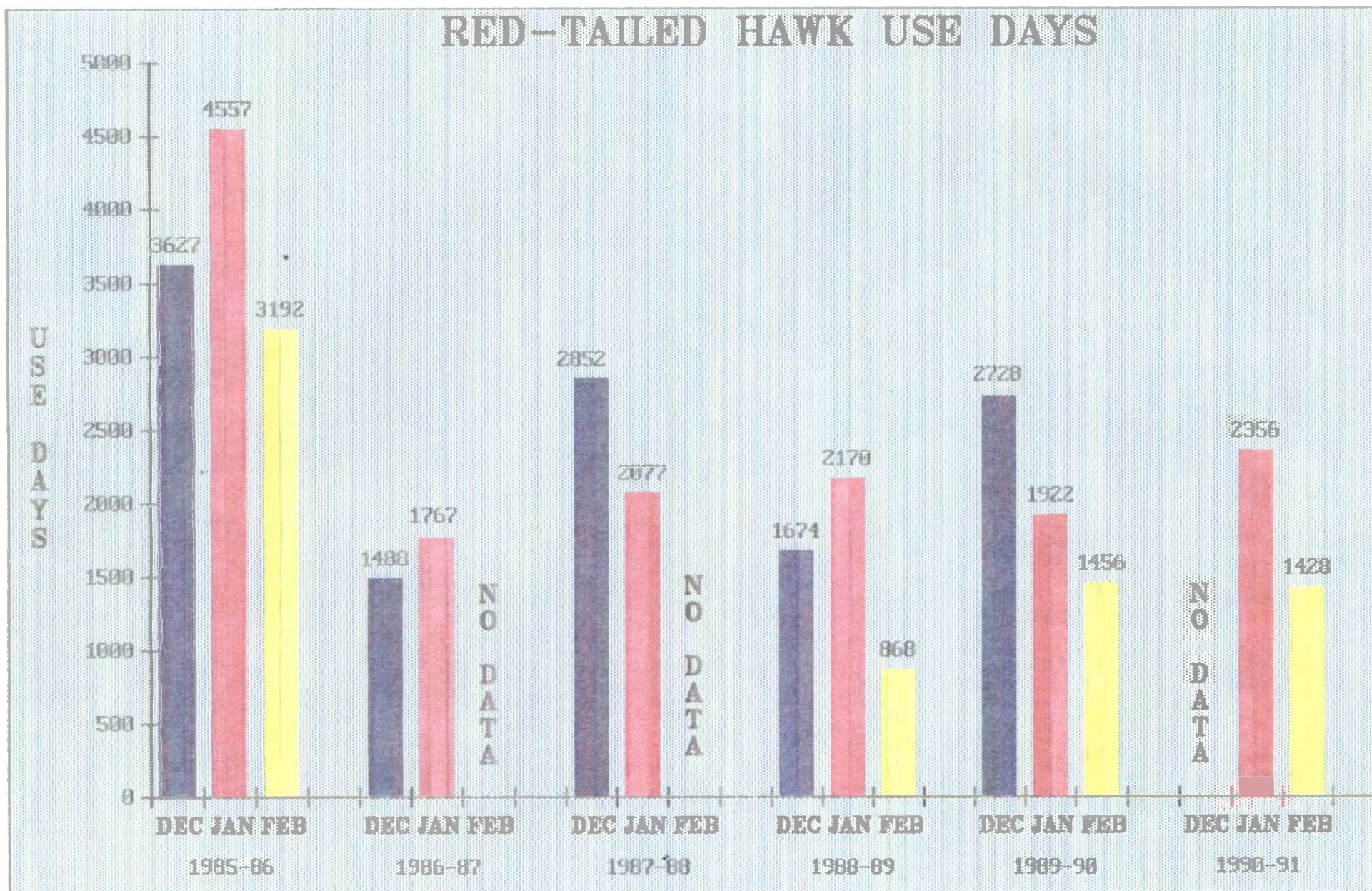


Figure 9. Red-tailed Hawk use days along Tule Lake and Lower Klamath Refuges Raptor Transect Routes, 1985-90.

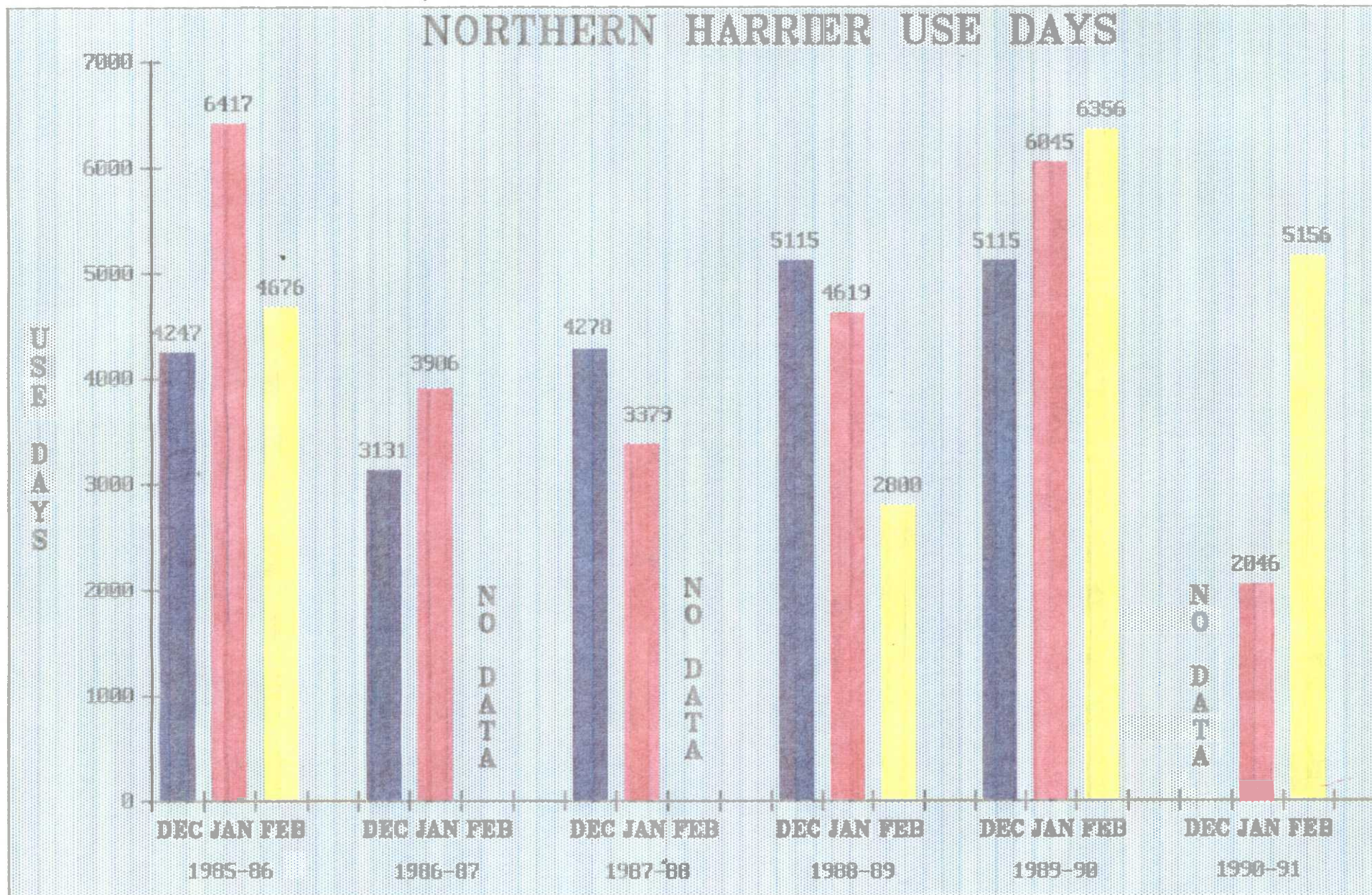


Figure 10. Northern Harrier use days along Tule Lake and Lower Klamath Refuges Raptor Transect Routes, 1985-90.

Peak bald eagle count for Tule lake and Lower Klamath Refuges was 651, recorded on January 11, 1991, during this year's annual midwinter bald eagle count. This year's peak was again greater than the eight year average (Table 9).

TABLE 9. Peak Bald Eagle Counts for Tule Lake and
Lower Klamath Refuges, 1983-91.

Winter of	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	8-Yr Avg
# eagles	383	376	487	193	460	965	681	651	525

Eagle night roost monitoring was initiated this year by the USFS. Changes in roosting bald eagle numbers may indicate stand suitability change or signify a downward trend in eagle use of the Klamath Basin. Eagle flyout counts from these night roosts were conducted bi-weekly from November through March. The four major night roosts of the Klamath Basin are Caldwell Butte, Sisters, Mt. Dome, and Bear Valley. These counts were coordinated between the USFS, BLM, ODFW, and Refuge personnel. Thus far, the Mt. Dome night roost has shown the greatest use by bald eagles.

Nesting by the red-tailed hawks, prairie falcons, kestrels, great horned owls, and barn owls was again noted on the rocky cliffs of the Peninsula, but the golden eagle nest was not occupied. Other nesting raptors on Tule Lake and Lower Klamath Refuges include northern harriers and short-eared owls.

Unusual raptor sightings included a peregrine falcon on Lower Klamath Refuge during the spring and winter, and a northern pygmy-owl on Tule Lake Refuge during January and February (see section G-1).

8. Game Mammals

TL-90-14 Trophy sized mule deer feeding in our force account barley field. AJS 10/90

As is usually the case, about a dozen nice, trophy-sized bucks took up residence in the southwest sump and Frey's Island in late summer, and remained there throughout the fall. Our herd of does, yearlings, and fawns at the headquarters remained at 1989 levels, but only about half the number seen in 1988. The highest count made was 31 animals in early September.

Pronghorn antelope are not common on Tule Lake, except in late summer when they are occasionally seen near the lower sump or in the southwest sump.

10. Other Resident Wildlife



TL-90-15 Pheasant in typical (lack of) spring cover. GAH 5/90

Upland game species appear to be making a slow recovery from the low in 1988. Pheasant production was much improved from 1989, and an increased take was recorded during the hunting season. We also saw improved production in California quail along Hill Road, and there were 11 coveys seen in the area from headquarters to the Lava Beds boundary. Two of these coveys had over 50 birds in them.

Meadow vole numbers were lower than 1988. Voles are a preferred food item for many predators, and high populations usually mean reduced nest predation on Tule Lake.

15. Animal Control

Over the last few years, the depressed fur market has seriously effected our muskrat control program (Table 10). Trappers have had little incentive to trap when muskrats are selling for less than a dollar each. Consequently, we have had limited trapping effort, and muskrat populations are increasing. In 1989, one trapper trapped for

less than a week and removed only 100 muskrats refuge wide. In 1990, we conducted bank-den counts along major water delivery canals and found high numbers of bank dwelling muskrats. Two special use permits for three trappers were issued to trap during the 1989-90 season, with one change. The division of sales, which had been on the basis of 90 percent to the trapper and 10 percent to the Government, was eliminated. A total of 1,867 muskrats were removed this year, which sold for an average of 94 cents each (Tables 10 and 11).

TABLE 10. Five-year Comparison of Trapping Activities, Tule Lake Refuge.

	1985-86	1986-87	- Season - 1987-88	1988-89	1989-90	5-Year Average
Muskrats removed	418	803	511	100	1,867	740
\$ Per Pelt	1.93	3.86	2.46	1.18	0.94	2.46

TABLE 11. Muskrat Trapping Summary by Area, Tule Lake Refuge, 1989-90 Season.

Area	Trapper	# Muskrats Removed	Incidental Species	
N Canal	H. Christensen	1,078	None	0
N Half	P. Collins	527	Raccoon	11
			Duck	2
S Half	M. Collins	262	Raccoon	1
TOTAL		1,867		

16. Marking and Banding

Banding efforts on Tule Lake Refuge were completely unsuccessful; no birds were banded on Tule Lake in 1990. Our cackler banding efforts never got underway, due to the reluctance of the cacklers to use our winter wheat or alfalfa fields. The cacklers mixed with the white-fronts and Canada geese, and fed a majority of the time in grain or potato fields. Our new nets and rockets never even got dirty!

We abandoned our mallard banding efforts on Tule Lake this year. For the past several years raccoons have made banding operations very difficult. This year, with many daytime raccoon sightings indicating a high raccoon population, and therefore an excellent chance of predation at trap sites, we decided to concentrate all of our efforts on Lower Klamath Refuge. Predators have yet to cause a problem at our banding locations on Lower Klamath.

17. Disease Prevention and Control



TL-90-16 Cackler infected with Avian cholera AJS 12/90
in convulsions.

Avian cholera was not a significant factor on Tule Lake Refuge during 1990. In February an outbreak which affected primarily coots resulted in the loss of an estimated 400 birds. The outbreak continued into March, and an estimated 100 snow geese died from the disease. In the spring months, an estimated 600 birds died of cholera on Tule Lake Refuge.

During the fall and early winter, avian cholera was virtually non-existent. In late November/early December a small outbreak occurred in the Lower Sump as cold weather began to hit the Basin. The outbreak did not persist, and an estimated 150 birds died. By the middle of December, there were no signs of cholera on the Refuge. As in past years, estimating avian cholera losses is difficult due to the intense scavenging by raptors during the outbreaks.

There were no losses to avian botulism on Tule Lake Refuge this year.

TABLE 12. Estimated Cholera Losses
Tule Lake and Lower Klamath Refuges, 1976-1990.

1976	3,000	1981	7,000	1986	2,000
1977	10,000	1982	14,000	1987	1,100
1978	5,700	1983	3,400	1988	19,600
1979	12,500	1984	4,600	1989	5,000
1980	3,500	1985	4,500	1990	1,250

H. PUBLIC USE

1. General

Tule Lake Refuge continues to account for the majority of visits in the complex, for a variety of reasons: the Headquarters Visitor Center is here, it's "on the way" to the Lava Beds National Monument, the large concentrations of waterfowl and raptors, and others.

Total visitation for 1990 was 191,598, a 7% decrease from 1989. Figure 11 provides a monthly breakdown of visitation.

A Refuge newsletter was initiated in 1990 to be circulated semi-annually. The intention is to improve communication with all Refuge users.

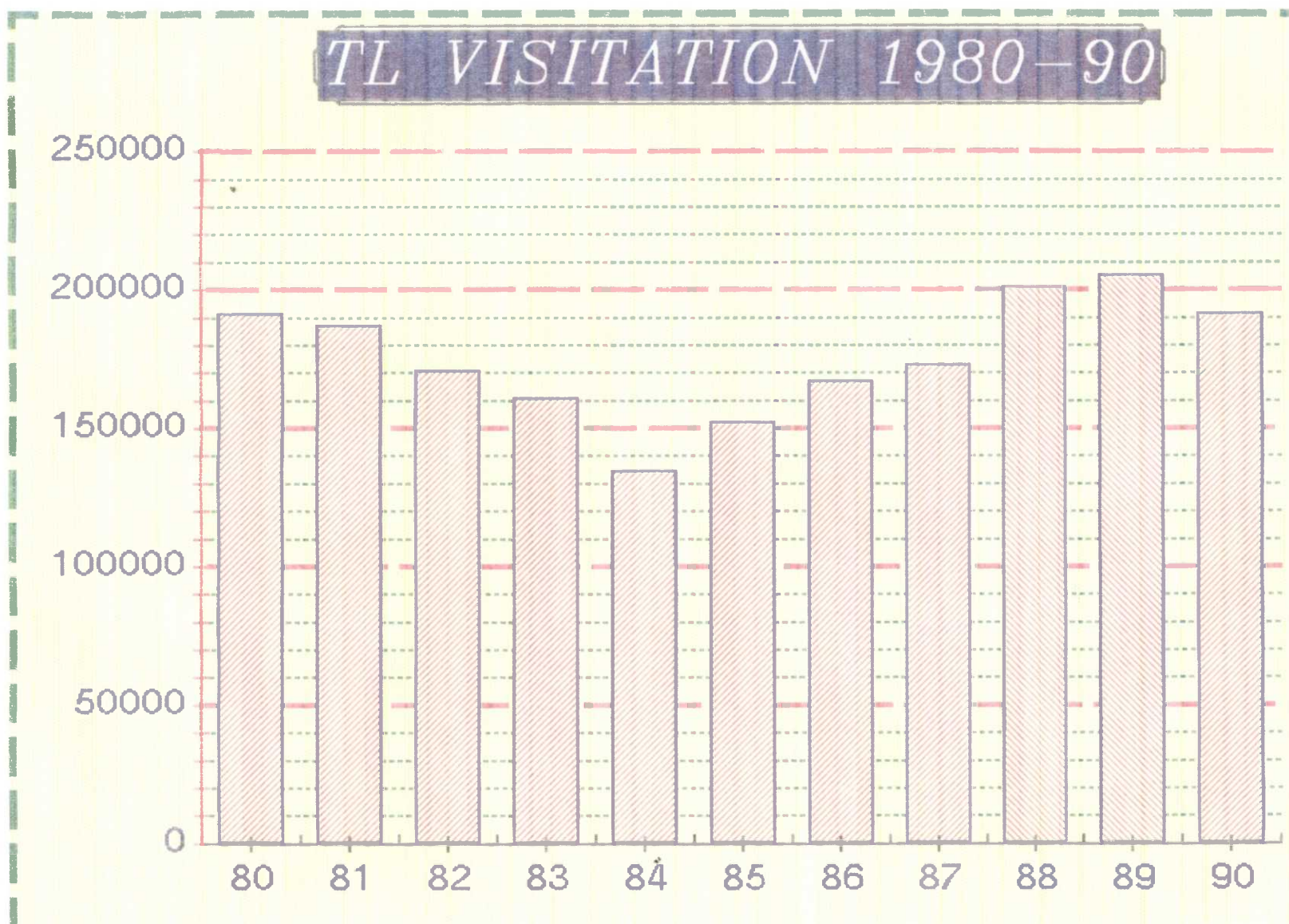


Figure 11. Total refuge visitation, Tule Lake Refuge, 1980-90.

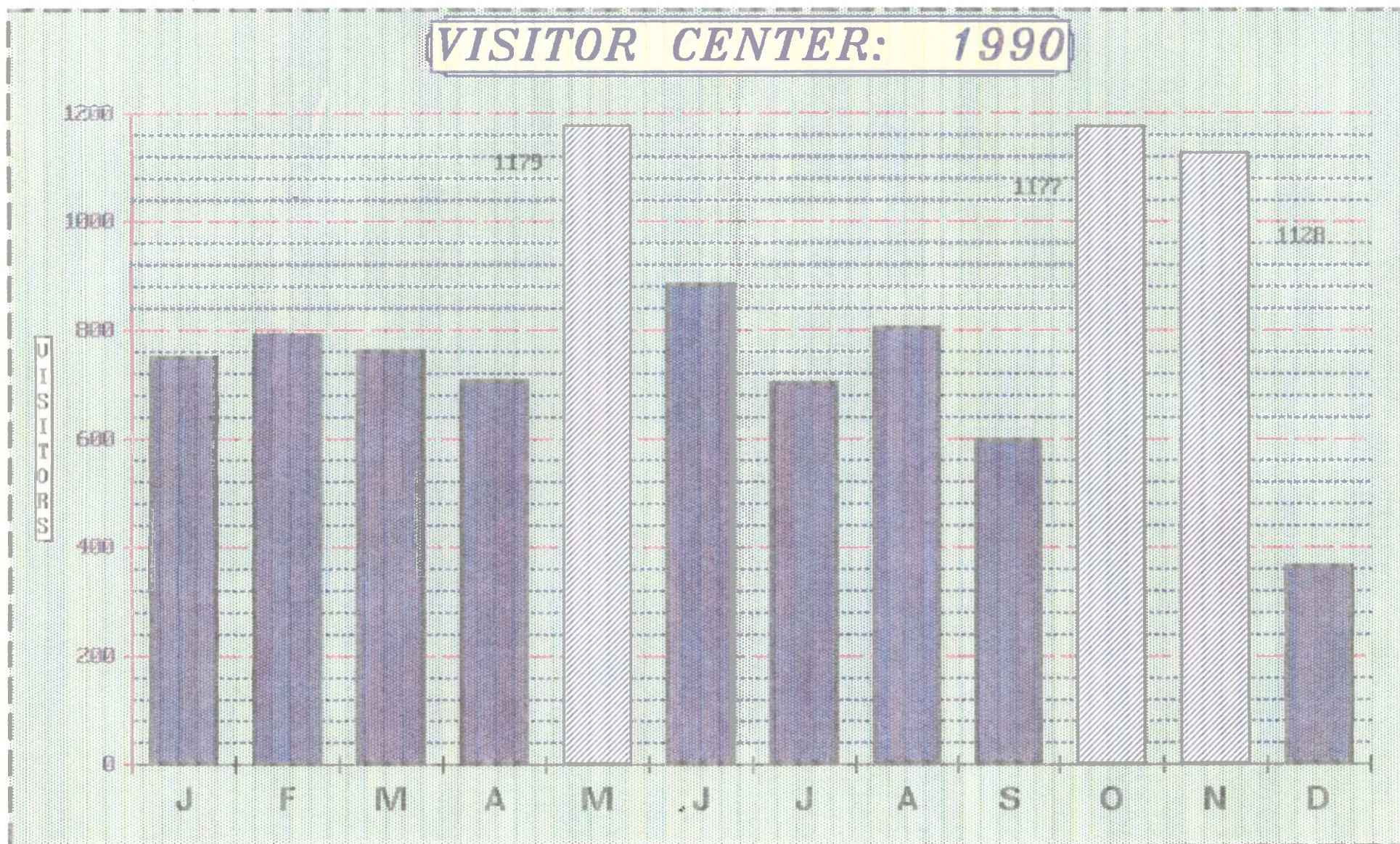


Figure 12. Visitor Center use by month, Tule Lake Refuge, 1990.

2. Outdoor Classrooms - Students

Visits to Tule Lake and Lower Klamath Refuges by classes increased sharply in 1990. Voters defeated a school funding measure in Klamath County, Oregon, which included monies for bus operating expenses. Consequently, school buses stopped running in early November, and field trips for students ceased. Prior to this, classes came in waves. We tallied 1,021 students using the Refuge, a 51% increase.

The annual School Forest Tour, coordinated by the Klamath County Extension Office, was held this year, prior to the end of school bus operation. Eight hundred twenty students participated in the 3-day event, where classes rotate among 8 instruction stations. Bill Kent and Oregon Department of Fish and Wildlife personnel presented 24 classes on wildlife conservation.

3. Outdoor Classrooms - Teachers

Bill Kent conducted a 10-hour Project WILD workshop on February 18 and 20 to 25 area teachers attended. An additional 17 teachers received our Teacher's Resource Packet, developed in 1987. These packets will undergo a planned review/update in 1991.

4. Interpretive Tour Routes

An estimated 14,052 visitors traveled the auto tour route this year, an 11% decrease. Planning is still underway for interpretive panels for this facility.

The canoe trail through Tule Lake Marsh provided an up close view of a marsh to 275 visitors.

6. Interpretive Exhibits/Demonstrations

The Visitor Center received 9,928 visitors this year, a 10% decline. Figure 12 reflects the general decrease in visitor use this year. As with the auto tour route, planning is progressing on an upgrading/renovation of the exhibits.

Though the number of visitors was down, the diversity of those individuals remains high. A review of the visitor register shows 48 states and 17 countries. After California, Oregon, and Washington, New York (?) led the visits; England, Japan, and Canada led the foreign visitors. Figure 12 shows Visitor Center figures for the year.

The Tulelake Butte Valley Fair was an opportunity for us to take our "show" on the road. We put up an exhibit on Pittman Robertson funds, and sold our new tee shirt (see H-18). We contacted some 5,000 people individually, another 50,000+ saw our booth.

7. Other Interpretive Programs

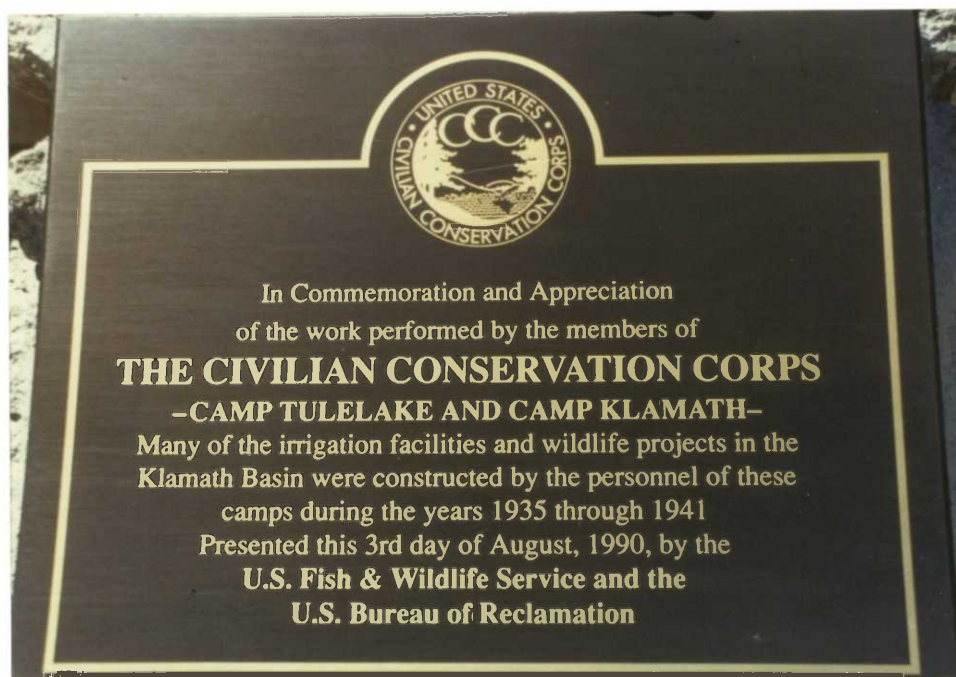
Various staff members spoke to groups in the Center; 29 programs were given to 1,217 visitors. The groups included Oregon Institute of Technology, Lake Alamanor Audubon, San Jose Community College, and Humboldt State University.

Off-refuge programs were presented to 19 groups/1,400 people. These groups included Umpqua Valley Audubon, Mt. Shasta Rod & Gun Club, Marble Mt. Audubon, Klamath Basin Audubon, Mt. Shasta Audubon, and others.

One of the year's highlights was our participation in the reunion of CCC personnel who worked at various camps in northern California, southern Oregon, and northwest Nevada. Activities included a memorabilia exhibit at the Tululake Fairgrounds, dinner dance, tours of work project sites, and more. A plaque, dedicated to those CCC personnel who worked on Bureau of Reclamation and Refuge projects, was installed outside the Visitor Center.



TL-90-17 Roger Johnson speaking to CCCers at WCK
Commemorative Plaque dedication.



TL-909-18 Commemorative Plaque. WCK

8. Hunting

TL-90-19 Hunter checkstation - 4:00 A.M. AJS 10/90
LE motivational session.



TL-90-20 Successful goose hunters. AJS 10/90

Waterfowl hunting at Tule Lake Refuge continues as one of the best outdoor experiences for sportsmen. A total of 6,127 hunters used the Refuge this year, a marked decrease (-17%) from last year. Severe cold weather in late November froze out hunters for a significant number of days; the fact that snow geese never really stopped over also contributed to the decline, as did that whitefront and Canada geese continually fed off-refuge.

A total of 6,371 ducks were harvested, a 13% decline; the goose bag totaled 1612 birds, a decline from the 2,097 taken last year. Harvest figures are separated by the three major hunting areas; Tule Lake Marsh (Tables 13 and 14), Tule Lake Space Blinds (Table 15), and Tule Lake Fields (Table 16). A five-year comparison of total waterfowl harvest on Tule Lake Refuge is shown in Table 17.

An interesting part of the hunting program this year was a public meeting held in February, where we presented proposals for a horsepower limit for outboard motors on Tule Lake and Lower Klamath Refuges, and a motorless area on Lower Klamath (see Lower Klamath Section H-8). Most comments opposed the motor size limitations, with the general opinion the motor size restriction would not greatly affect speeds or safety concerns.

The afternoon portion of the meeting was to be a session to receive comment on all facets of the public use program on the six stations of the complex. Unfortunately, only one "non-hunter" was present, and decided not to participate in the forum. Consequently, the Refuge only received further comment on the hunting program. The Refuge responded to all comments received at the meeting by letter to all participants. One result of the session was the establishment of a semi-annual newsletter which is sent to all types of Refuge users.



TL-90-21 Checkstation on new "permanent" site. AJS

A bright side of the hunting program was the designation of a 150'x150' site for the "permanent" placement of the checkstation. With the addition of a little gravel, some fence posts and a couple of days time, the site is a significant improvement over the usual mid-season quagmire.

Pheasant hunting improved over last year; some 1,000+ hunters took approximately 1,100 birds, a marked increase in take.

TABLE 13. Waterfowl Harvest Summary - Tule Lake Marsh
Tule Lake Refuge, 1990-91 Season.

Week	Hunters	Ducks	Geese	Ducks/Hunter	Birds/Hunter
1	829	2072	207	2.50	2.75
2	423	875	10	2.07	2.09
3	303	550	25	1.82	1.90
4	268	381	35	1.42	1.55
5	345	607	3	1.76	1.77
6	271	640	0	2.36	2.36
7	311	762	0	2.45	2.45
8	147	225	3	1.53	1.55
9	33	57/closed	0	1.73/n/a	1.73
10	2	closed	0	n/a	0
11	8	"	0	"	0
12	18	"	1	"	.06
13	4	"	1	"	.25
14	<u>0</u>	<u> </u>	<u>0</u>	<u> </u>	<u>0</u>
TOTALS	2962	6169	285	2.11	2.18

TABLE 14. Harvest Summary - Tule Lake Marsh Tule Lake Refuge, 1990.

Species	# Harvested	% Species Composition
<u>GEESE:</u>		
Canada goose	38	13
White-fronted goose	220	77
Snow/Ross' goose	29	10
TOTAL GEESE	287	100
<u>DUCKS:</u>		
Mallard	3,691	60
Gadwall	685	11
Wigeon	400	6
Northern pintail	497	8
Green-winged teal	280	51
Cinnamon teal	16	tr
Northern shoveler	436	7
Redhead	7	tr
Canvasback	44	1
Lesser scaup	12	tr
Bufflehead	38	1
Ruddy duck	6	tr
Wood duck	13	tr
Ring-necked duck	22	tr
Goldeneye	22	tr
TOTAL DUCKS	6,169	100
Duck Hunters - 2,930		
Duck Average - 2.11		
Est. Hours - 19,591		
59 Day duck season		

TABLE 15. Tule Lake Space Blinds, Harvest Summary
Tule Lake Refuge, 1990-91 Season.

Week	Hunters	Ducks	Geese	Goose Average
1	417	47	127	0.30
2	256	17	95	0.37
3	363	14	203	0.56
4	277	17	191	0.69
5	375	6	166	0.44
6	288	7	144	0.51
7	160	0	25	0.15
8	56	0	8	0.14
9	69	0/closed	23	0.33
10	31	closed	0	0.00
11	0	"	0	0.00
12	10	"	0	0.00
13	0	"	0	0.00
14	<u>0</u>	<u>"</u>	<u>0</u>	<u>0.00</u>
TOTALS	2,302	108	982	.43

Hunters - 2,302		% Species Composition	
Geese - 982		Snow Geese	43%
Season Goose Avg. - 0.43		White-Fronted Geese	39%
Est. Hunter Hours - 8,475		Ross' Geese	11%
		Canada Geese	7%
			<u>100%</u>

TABLE 16. Tule Lake Fields, Harvest Summary,
Tule Lake Refuge, 1990.

Week	Hunters	Ducks	Geese	Goose Average
1	266	72	46	0.17
2	80	7	31	0.39
3	52	6	24	0.46
4	79	9	45	0.57
5	105	0	117	1.11
6	87	0	18	0.21
7	36	0	12	0.33
8	46	0	16	0.35
9	70	0/closed	20	0.29
10	33	closed	15	0.45
11	3	"	1	0.33
12	2	"	0	0
13	4	"	0	0
14	<u>0</u>	<u>"</u>	<u>0</u>	<u>0</u>
TOTALS	863	94	345	.40

Hunters - 863
 Geese - 345
 Season Goose Avg. - 0.40
 Est. Hunter Hours - 3,893

% Species Composition

Snow geese	56%
White-fronted geese	33%
Ross' geese	8%
Canada geese	<u>3%</u>
	100%

TABLE 17. Five-Year Comparison of Waterfowl Harvest
Tule Lake Refuge, 1986-90.

	1986-87	1987-88	1988-89	1989-90	1990-91
Hunters	5,588	6,401	7,468	7,425	6,127
Ducks bagged	6,507	8,151	7,507	7,299	6,371
Geese bagged	1,742	2,239	3,672	2,097	1,612
Ducks/hunter	1.16	1.27	1.00	0.98	1.04
Geese/hunter	0.31	0.35	0.49	0.28	0.26
Birds/hunter	1.48	1.62	1.50	1.26	1.30

TL HARVEST by AREA: 1990

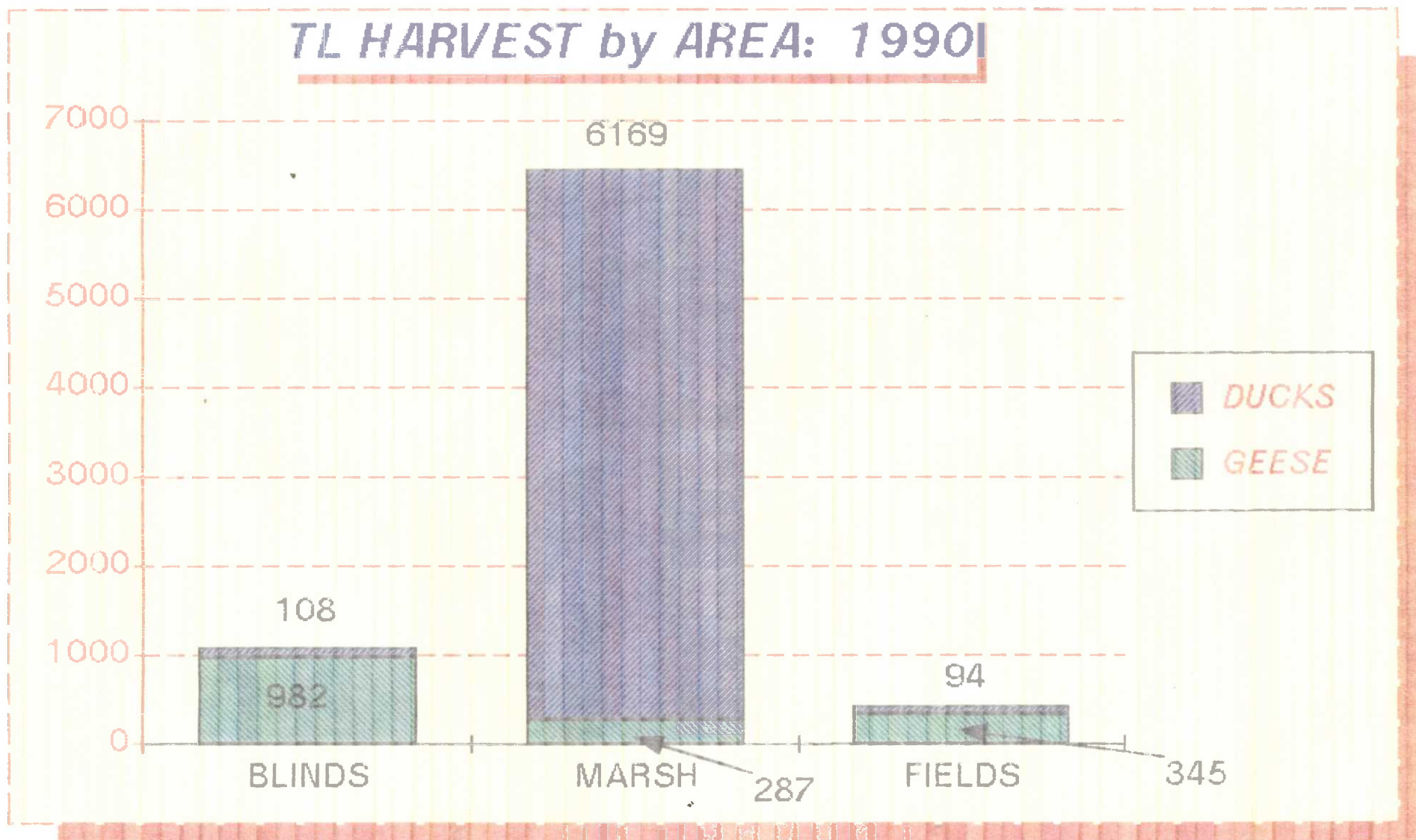


Figure 13. Waterfowl harvest summary by the three hunt areas, Tule Lake Refuge, 1990.

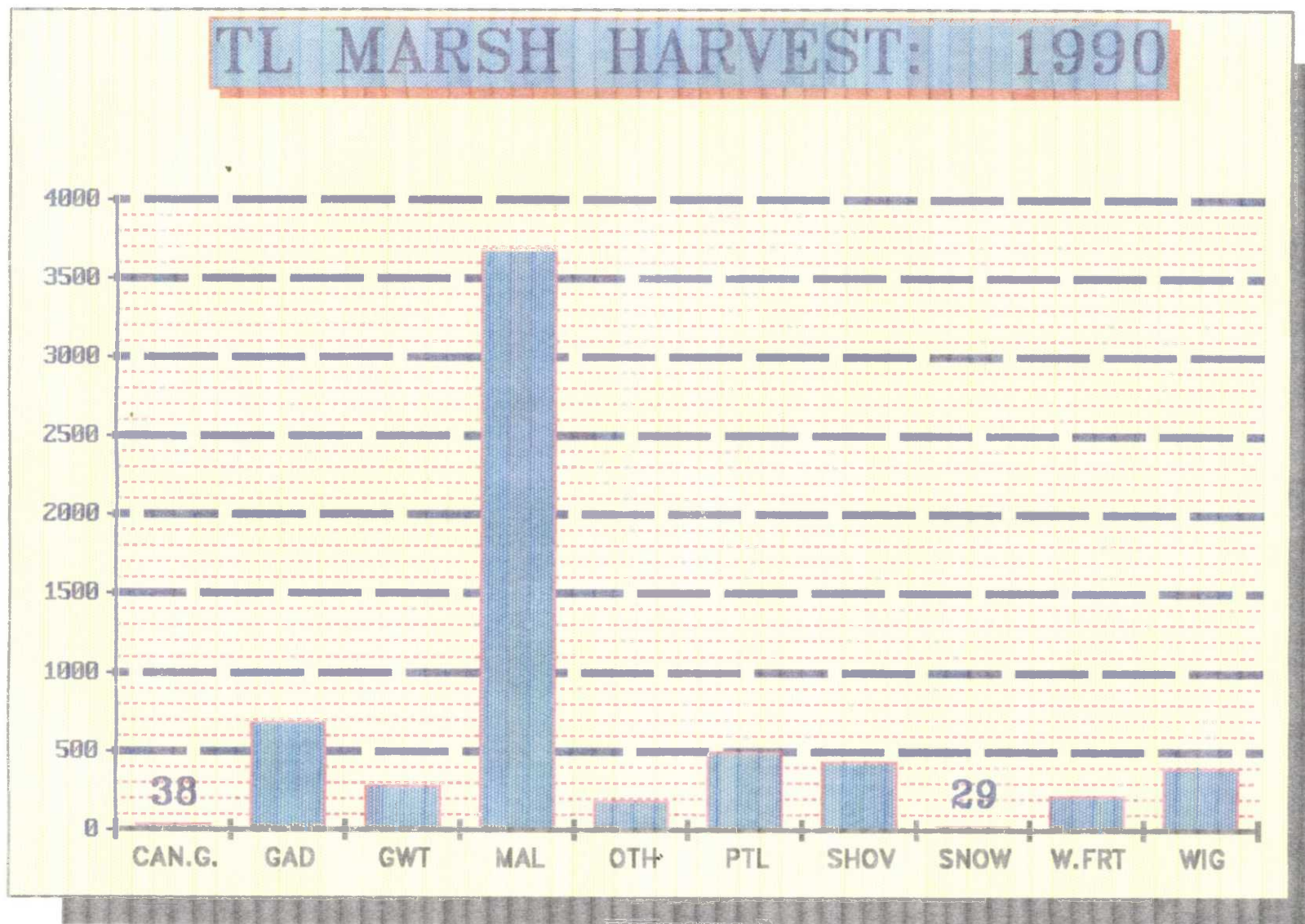


Figure 14. Species composition of harvest on Tule Lake Marsh Hunt Area, 1990-91 season.

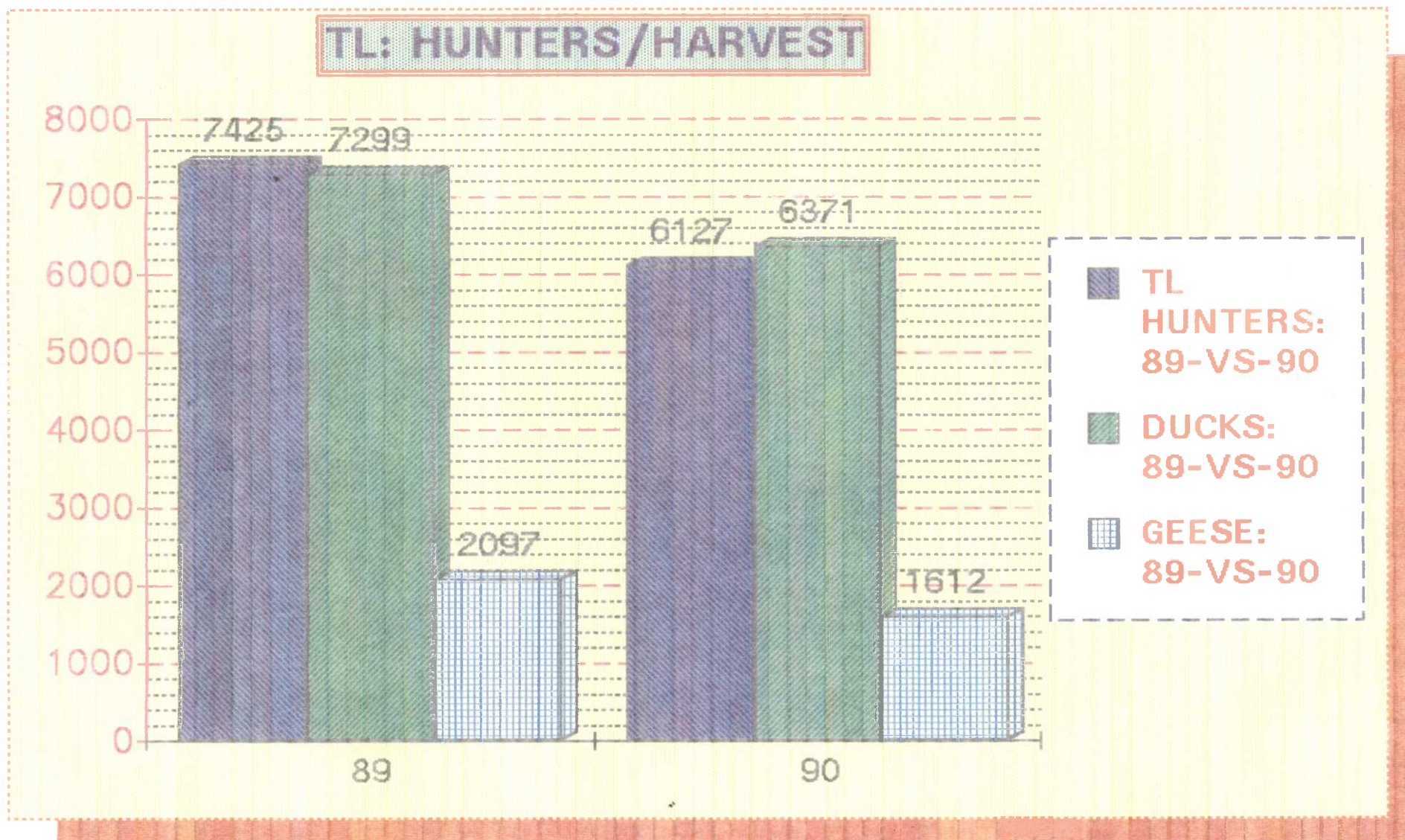


Figure 15. Comparison of hunter numbers and harvest totals for 1989-90 and 1990-91 seasons, Tule Lake Refuge.

TL HUNTERS/HARVEST

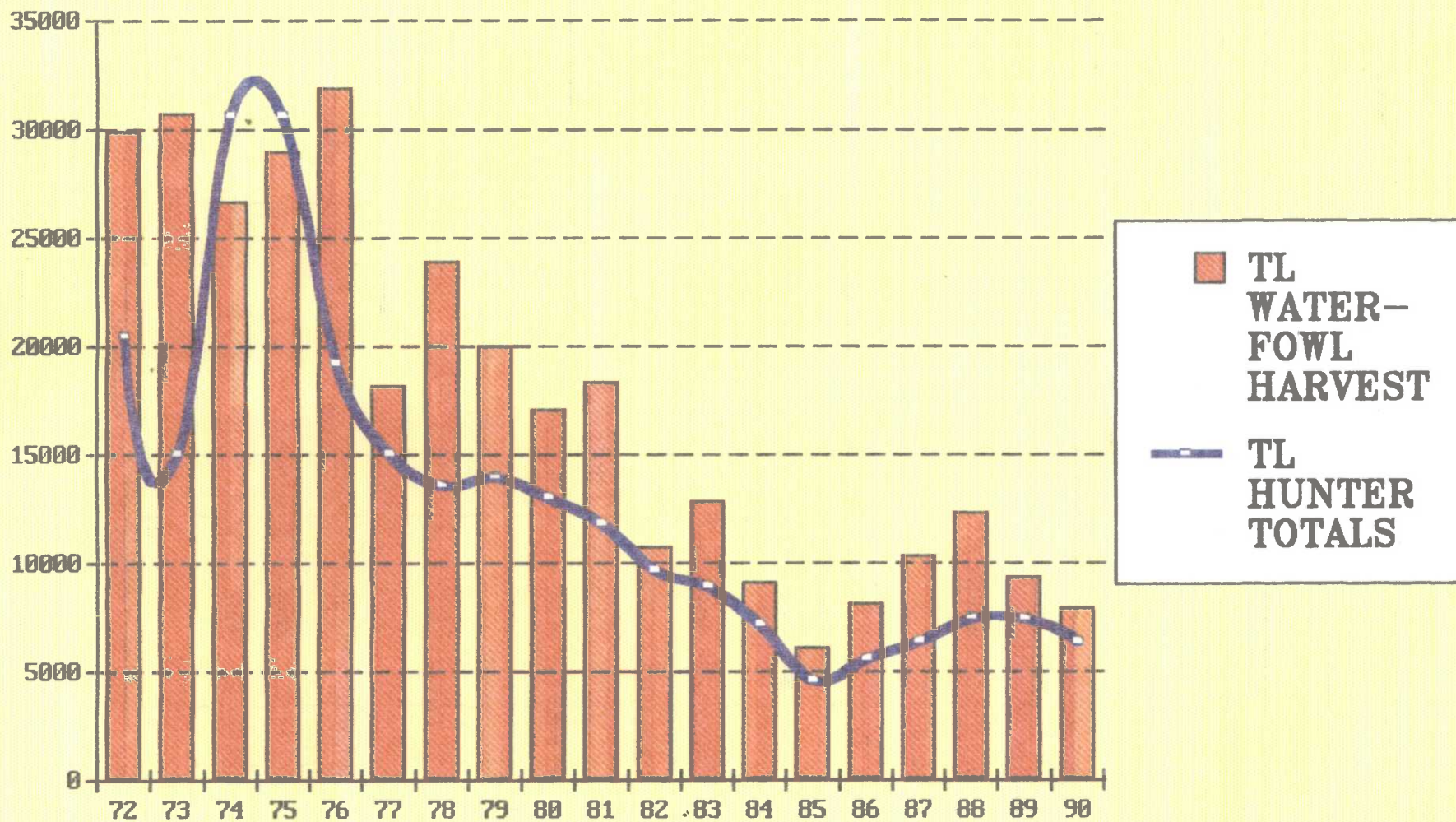


Figure 16. Comparison of hunter numbers and total waterfowl harvest, Tule Lake Refuge, 1972-90.

SALES: 1990

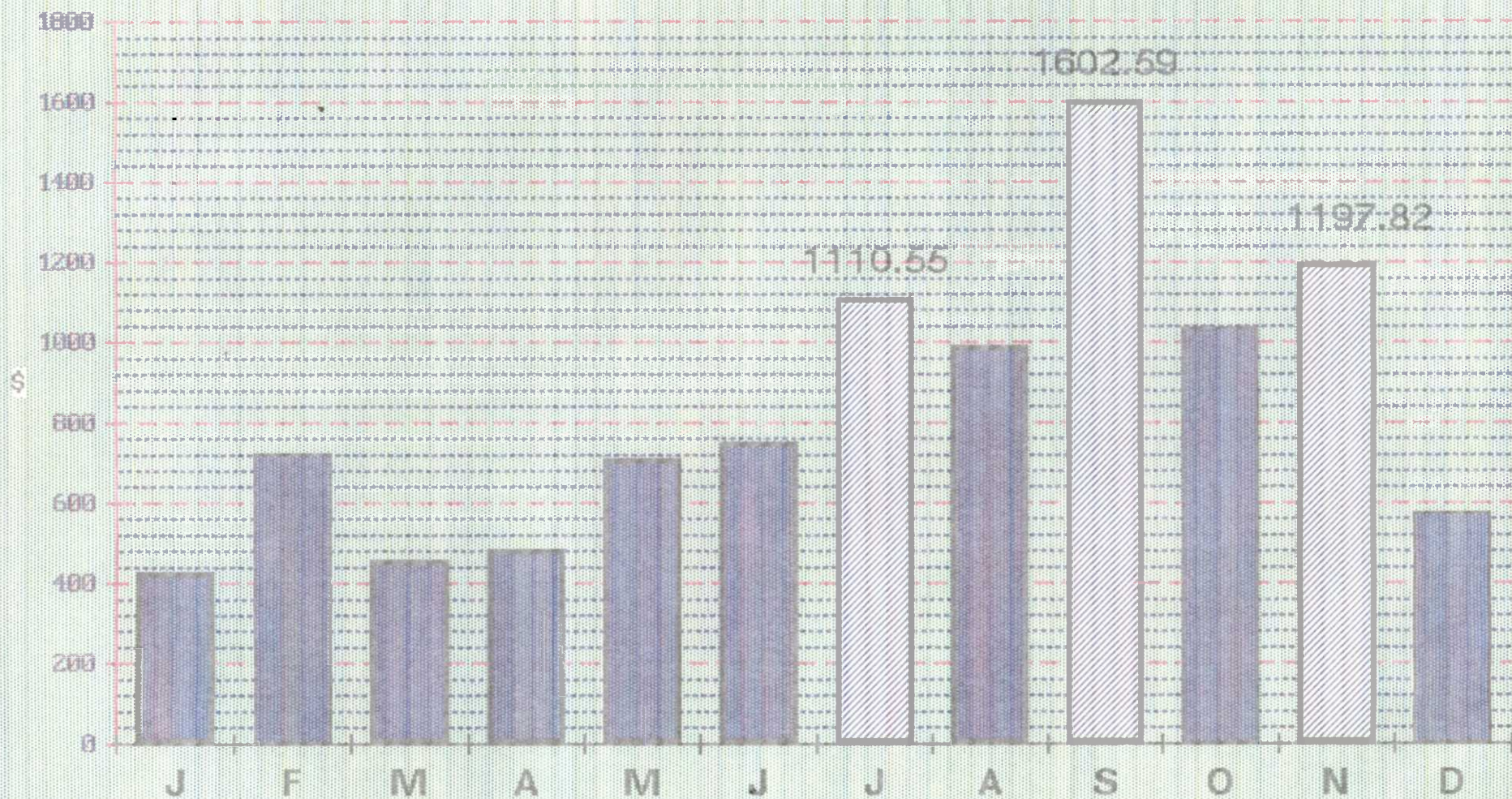


Figure 18. Total sales \$10,074.11, Visitor Center sales outlet, Tule Lake Refuge, 1990.

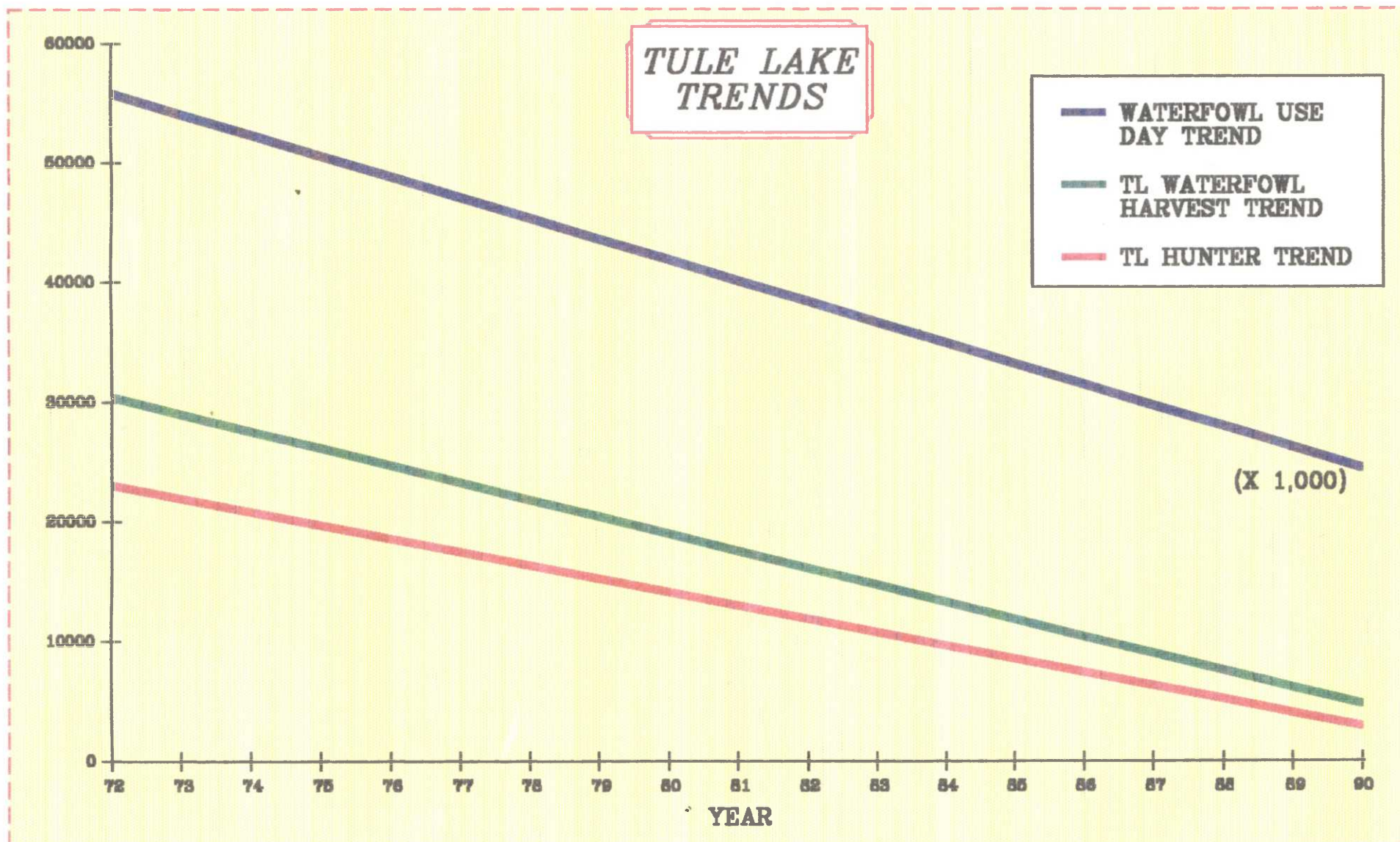


Figure 17. Comparison of waterfowl populations and hunting, Tule Lake Refuge, 1972-90.

10. Trapping

See Section G-15.

11. Wildlife Observation

This activity also showed a decline this year, though not as dramatically as others; 158,306 individuals enjoyed viewing wildlife. Swans, bald eagles, grebes, and other species continue to attract visitors every year.

12. Other Wildlife-Oriented Recreation

Approximately 525 visitors were identified as "photographers" this year; of these, 86 utilized the 5 photo blinds available on a first-come permit basis.

14. Picnicking

Two tables are available at headquarters; this activity is normally a part of other activities.

15. Off-Road Vehicles

Use of ORVs is prohibited. The Peninsula Unit usually receives some traffic at Christmas and early spring; spot checks are made to show a presence of enforcement.

17. Law Enforcement

Refuge officers wrote 12 cases on Tule Lake Refuge this year. As of this writing, 3 have closed out, with \$225.00 collected in forfeitures.

Following is a breakdown of citations issued:

Trespass	1
No permit	2
Take swan	1
Take cackler	2
Take whitefront out of season	3
Unauthorized route of travel	1
Toxic shot	1
Hunt closed zone	1

All officers qualified twice with sidearms, and received annual certification in CPR. Soft body armor was purchased, for all officers who requested it, from American Body Armor. Each officer was also assigned a multi-channel portable radio and charger; radios were programmed with local and state enforcement agency frequencies. Three Remington 870 shotguns were also purchased.

18. Cooperating Associations

Our sales outlet, associated with the San Francisco Bay Wildlife Society (SFBWS), had an excellent year. Sales totaled \$10,074.11, with September, November and July being the top sales months (Figure 18). In addition to increasing the number of books on sale, we began offering tee shirts. The shirts have a design submitted by Klamath Falls artist Pam Stoebsler, which features three birds representative of the Klamath Basin: bald eagle, white pelican, and Canada goose. The shirts have been extremely popular, and will increase available funds for our interpretive and educational programs.

Donated items from SFBWS included 20 pair of binoculars for use by school classes visiting the Refuge, and 5 feeders to place around headquarters to attract birds closer for better viewing. In addition, the Society donated 5 books, 1 cassette tape, and 10 tee shirts to visiting dignitaries and teacher workshop participants.



TL-90-22 Refuge tee shirt is new sales item. AJS

I. EQUIPMENT AND FACILITIES

3. Major Maintenance

Major work accomplishments on Tule Lake Refuge included a major cleaning effort at the CCC Camp and bone yard, installation of CMP at the B-3N experimental ponds, placement of rock on roads near Frey's Island, move duck hospital and reroof old hospital building, repair dikes on rice pond, and painting Quarters #1, and improved hunter checkstation site.

4. Equipment Utilization and Replacement

We continued to emphasize an organized approach of recording work orders for equipment repairs that are processed through the shop, and record all work order repairs and expenditures on a computer printout.

6. Computer Systems

Our Mitac microcomputers are in continuous use for general word processing, budget tracking, and inventories all year long. An increasing demand for computer time and the need for more technical and complex output made us recognize the need for a larger and more versatile system.

In October, we received our new UNIQ 386 microcomputer with VGA graphics board, CTX multiscan color monitor, 1408 KB extended memory, FasMath math coprocessor, KURTA digitizing tablet, Microsoft mouse, Epson IQ 2550 color printer, and Hewlett Packard Deskjet Plus ink jet printer. This system, used with the MS DOS 3.3 operating system, Design Cad 2 & 3D, Corel Draw, Norton Commander, and WordPerfect 5.0 software, has already allowed us to produce higher quality work.

Unfortunately, the system arrived too late to be used for the waterfowl and pheasant drawings, but we hope to have a good running program next year. The system has also proven very popular with the staff and has motivated previously uninterested people to learn about computers.

J. OTHER ITEMS

1. Cooperative Programs

A total of 96 Federal Duck Stamps were sold during the period from July 1, 1989, through June 30, 1990. This total is down from 144 sold in 1989. Of the total, 64 stamps (67%) were sold to hunters, and 32 (33%) to non-hunters. A total of \$1,200.00 was remitted to the Finance Center for the Duck Stamp Program.

Regular meetings were held with the Bureau of Reclamation and Tulelake Irrigation District regarding interrelated responsibilities on the Refuge. Issues such as depredations, fall work permit violations, grass seedings, pest plant control, muskrat trapping program, research projects, hunting program logistics, overhead power line problems, water, and road maintenance were discussed.

3. Items of Interest



TL-90-23 Interagency Archeological Resources GAH 5/90
district tour.



TL-90-24 FWS Director Turner and Regional Director GAH 9/90
Plennert visited the Refuge this year.

4. Credits

Hagedorn : Editing, miscellaneous sections

Shono : Introductions, Sections A; B; C; D-2, 4; E-6 thru 8;
F-3 thru 8, 10; G-1, 6, 15; J; editing

Kent : Sections D-3, E-4, H

Hainline : Sections F-1, G-2 thru 5, 7, 8, 10

Parker : Sections D-5; G-16, 17; F-2

Parks : Sections E-3; F-9

Green : Sections I-1, 2

Durham : Sections E-1, 5

Schreiner: Section I-6, editing

Cole : Klamath Marsh narrative

Johnson : Section K

Verley : Typing

LOWER KLAMATH NATIONAL WILDLIFE REFUGE

Tulelake, California

ANNUAL NARRATIVE REPORT

Calendar Year 1990

U. S. Department of the Interior
Fish and Wildlife Service
NATIONAL WILDLIFE REFUGE SYSTEM

LOWER KLAMATH

LOWER KLAMATH NWR - INTRODUCTION

Lying astride the California-Oregon border in Siskiyou County, California, and Klamath County, Oregon, the Lower Klamath National Wildlife Refuge was set aside by President Theodore Roosevelt as the "Klamath Lake Reservation" on August 8, 1908 through Executive Order Number 924. Two subsequent Executive Orders (Number 2202 dated May 14, 1915 and Number 3422 dated March 28, 1921) reduced the original 81,619 acres to the present 53,598 acres. As the nation's first waterfowl refuge and the first large area of public land to be reserved as a National Wildlife Refuge, it was listed in the National Registry on October 15, 1966 as both a National Historic Landmark and a National Natural Landmark.

The refuge was superimposed on lands ceded to the United States for reclamation purposes by the states of California and Oregon as part of the Klamath Reclamation Project, and was subject to the needs of the Project.

"At the time the area was made a refuge, in 1908, literally clouds of birds of many species darkened the sky; the thunder of their wings was like the roar of distant surf, and their voices drowned out all other sounds. These vast summer flocks, moreover, were greatly increased each fall when the legions of ducks, geese, swans, and cranes from northern nesting grounds stopped on their journey to their winter homes in the valleys of California, and again in spring on their return northward.

Prior to 1916 the waters of the lake were deep enough for fair-sized power boats, and boating trips were commonly made by visitors from the city of Klamath Falls down the Klamath River and directly into Lower Klamath Lake to see the vast colonies of western and eared grebes or the pelicans, herons, gulls, and terns that nested there by the tens of thousands. There, too, various ducks common to the Northern States, and, in addition, many Canada geese, nested and raised their young.

All this has changed, however, owing to the ever-increasing demand for agricultural lands. A gate was built across the channel leading from Klamath River into Lower Klamath Lake, thus preventing the water from flowing into the lake. Within 4 years this vast waterfowl paradise had dried up. Peat fires started, which in many places burned to a depth of 6 feet or more, leaving nothing but a vast alkaline, ashy desert from which clouds of choking dust arose, often obscuring the sun.

In 1942 water was pumped from Tule Lake to Lower Klamath by the way of a newly constructed tunnel through Sheepy Ridge. This eased the dust problem for Merrill and Malin, Oregon. Later appropriations made possible the construction of dikes, canals, and water control structures for development of marsh units for waterfowl. This work has reestablished Lower Klamath Lake as one of the great waterfowl areas in North America." (Thomas C. Horn, Refuge Manager, January 16, 1957.)

Prior to 1977, these lands were jointly administered by the Fish and Wildlife Service and the Bureau of Reclamation under Agreements dated January 8, 1942 and June 8, 1946. At that time, pursuant to both Public Law 88-567 (the Kuchel Act of 1964) and Public Law 94-223 (the National Wildlife Refuge System Administration Act Amendment of 1976) the Service

and the Bureau negotiated a new management agreement for lands in refuge status which overlay Bureau withdrawn lands in the Klamath Reclamation Project. The Service assumed administration of all grazing and haying leases and manages all public use and wildlife programs. The Bureau continues to administer the leasing of agricultural croplands on both the Tule Lake and Lower Klamath Refuges.



LK-90-01 Lower Klamath Refuge with Mt. Shasta
in background.

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A. HIGHLIGHTS

A twenty percent reduction in the grazing program was accomplished in 1990 (see Section F-7).

A mallard duckling survival study continued into its third and final field season in 1990 (see Section D-5).

Approximately 200 acres were restored to wetlands on the Straits Unit during 1990 (see Sections F-2 and I-1).

Waterfowl use was highest since 1961 (see Section 6-3).

B. CLIMATIC CONDITIONS

The climate of the Basin is generally characterized by cold winters and dry summers. Conditions in 1990 were colder than normal, with generally above average precipitation and snowfall. February set a new record for the month with 19.4 inches of snow, while May was the wettest on record since 1949. April was the warmest, while December was the coldest on record. Spring runoff was average, and recharged temporary wetlands in Sheepy West and Miller Lake Units. The below normal moisture during the latter part of the year may be a concern for the coming year's water resource. The climatological data summarized in Table 1 was collected at the National Weather Service at Klamath Falls Airport, a distance of approximately 10 air miles from the Refuge.

TABLE 1. Climatological Data, Lower Klamath Refuge, 1990.

Month	Avg. Temp.*	Depart/ Normal	Precip (inches)	Depart/ Normal	Snow (inches)	Depart/ Normal
January	31.8	+3.8	2.72	+1.22	12.3	+0.3
February	29.1	-3.8	1.01	-0.13	19.4	+14.0
March	41.0	+3.2	1.37	+0.39	4.9	-0.9
April	50.3	+5.3	1.20	+0.60	tr.	-2.2
May	48.8	-2.8	2.32	+1.48	tr.	-0.5
June	58.8	+0.2	0.25	-0.51	-	-
July	68.2	+1.6	0.58	+0.37	-	-
August	65.0	+0.5	1.33	+1.08	-	-
September	61.1	+2.7	0.43	-0.03	-	-
October	46.8	-1.4	0.39	-0.48	-	-
November	35.6	-2.1	0.84	-0.38	2.0	-2.4
December	22.2	-8.2	0.88	-0.78	4.7	-3.8
Year	46.6	-1.0	13.32	+2.83	43.3	-4.5

*Degrees Fahrenheit

D. PLANNING5. Research and InvestigationSURVIVAL OF MALLARD DUCKLINGS ON LOWER KLAMATH REFUGEPrincipal Investigator: David Mauser

This three-year study to determine the survival and habitat use of mallard ducklings at Lower Klamath Refuge was completed in 1990. It was conducted by Oregon State University Co-op student David Mauser in partial fulfillment of requirements for his PhD. In the past, a progress report was prepared by Dave, but he has been concentrating his efforts on writing his thesis. We are looking forward to the completion of Dave's thesis in summer of 1991, as it will contain valuable information to aid in our management of Lower Klamath Refuge.

NESTING HABITAT PREFERENCE AND NESTING SUCCESS OF DIVING DUCKS
IN SELECTED MARSH UNITS ON LOWER KLAMATH REFUGEPrincipal Investigators: Jim Hainline/Mike Parker

An investigation of diving duck nesting was conducted in 1984-85 by Refuge staff to determine diving duck nesting habitat and nesting success in permanent marsh Units 4-C and 9-A. It was found that nesting was concentrated by these species along areas of deeper open water adjacent to bulrush clumps and rarely elsewhere. Based on those findings, several broad level ditches were cut through the emergent vegetation in Units 4-C and 9-A in 1987-88 in hopes of increasing diving duck (especially redhead) nesting use.

This investigation was conducted as a followup to those habitat modifications to assess any changes in diving duck nesting use and success. It was expanded to include two seasonal marshes (Units 6-B and 4-A) for comparison. Unit 6-B is a dense stand of alkali bulrush interspersed with clumps of hardstem bulrush. Unit 4-A was similar in character, except that a "V" ditching plow and a large disk plow had been used to make over 4 miles of shallow, narrow level ditches in the unit.

Contrary to hopes and expectations, the dredged channels in Unit 9-A did not increase diving duck nesting density. Only 4 redhead nests were found in that unit, and 3 were successful. The placement of spoil when making level ditches such as those in Unit 9-A may be very important if diving duck nesting is the goal. The placement of the spoil along the ditch created islands of upland cover adjacent to the water, and not emergent vegetation. The nests found were within 50 feet of the water's edge in a block of emergent vegetation extending up to the edge of a deep channel. In areas where spoil islands separated the channel edge from the emergent vegetation no diver nests were found.

Although divers were unimpressed with our handiwork, dabbling ducks nested on the spoil in abundance. On one spoil island measuring 1300'x50' (1.5 acres), 24 gadwall, mallard, and Cinnamon teal nests were located. Of these 24 nests, 22 successfully hatched, and 2 were abandoned (investigator influence?).

Two redhead nests were located in Unit 4-C. Both were within 20 feet of a deep canal. One was located in a block of hardstem bulrush, while the other was in alkali bulrush along a dike. Both were successful.

Investigations in the seasonal marshes 4-A and 6-B yielded interesting results. Four redhead nests were found in Unit 4-A in 6.5 acres of searched area. This unit was one that had been "improved" by plowing narrow ditches through the alkali bulrush with a "V" ditcher and large disk plow. The ditches were approximately 12"-18" deep and 3'-4' wide. All 4 redhead nests were located within 75' of one of these ditches in hardstem bulrush vegetation. Hardstem bulrush occurs in this unit in scattered clumps within much larger blocks of alkali bulrush. All 4 nests were successful.

Two redhead nests were found in Unit 6-B. This unit is a seasonal marsh similar in character to 4-A, but without the improvement of the ditches. The area searched measured 8 acres. The nests were located in alkali bulrush and were built up with additional alkali bulrush material on top of a dense mat of alkali bulrush. One nest was successful and the other was abandoned.

TABLE 2. Waterfowl Nesting, Lower Klamath Refuge, 1990.

Unit	# Nests	Acres Sampled	Nests/ Acre	Avg. Robel at Nest	Simple Success
Shopfield	19	11	1.7	3.7	0.79
Fairchild	7	22	0.3	2.8	0.86

TABLE 3. Redhead Nesting, Lower Klamath Refuge, 1990.

Unit	Nests Found	Acres Searched	Wetland Type	Vegetation Type	Avg. Dist. to Open Water	Percent Success
4A	4	6.5	Seasonal	Hardstem bulrush	20'	100
9A	3	15.0	Permanent	Cattail	50'	66
	1			Hardstem bulrush	15'	100
6B	2	8.0	Seasonal	Alkali bulrush	n/a	50
4C	1	10.0	Permanent	Alkali bulrush	12'	100
	1			Hardstem bulrush	25'	100

This investigation suffered the same problems many diver studies have in the past. The areas searched seem small, and they are; but one individual working alone on foot can cover only a limited amount of habitat in a day. Because nests are usually located some distance from open water, the use of boats for nest searching has proved to be unproductive.

In spite of the limited effort and success, there were several inferences to be drawn from this investigation.

1. Redhead nesting success was relatively high in the areas surveyed.
2. Seasonal marshes are important redhead nesting areas.
3. Level ditching did not significantly improve redhead nesting density in permanent marshes.
4. The location of spoil during level ditching may effect the value of that action for diving ducks.
5. The use of small level ditches in dense emergent vegetation of seasonal marshes may significantly increase nesting density of redheads in those units.

MALLARD LEAD/STEEL INGESTION INVESTIGATION

Two hundred ten mallard gizzards were collected on Lower Klamath Refuge during the 1989-90 and 1990-91 hunting seasons to determine the number of ingested lead or steel pellets. The contents of the gizzards were flouroscope to enhance detection of the pellets. Many of the lead pellets had been ground down to only a fraction of their former size, and would probably have gone undetected without the aid of the flouroscope.

The percentage of gizzards with ingested shot (9.5%) is similar to previous years. Interesting is the fact that half of the gizzards with ingested shot had ingested both steel and lead. Since the mandatory shooting of steel shot on refuges in 1985, a decline of ingested lead and an increase in ingested steel has occurred on Lower Klamath Refuge. This is also reflected in the fact that fewer cases of lead poisoning have been reported.

TABLE 4. Summary of Mallard Lead/Steel Shot Ingestion, Lower Klamath Refuge, 1990.

# Examined	# W/Ingest Shot	# W/ Lead	# W/1 Lead	# W/2+ Lead	# W/ Steel	# W/1 Steel	# W/2+ Steel
210	20 (9.5%)	10 (4.8%)	7 (3.3%)	3 (1.4%)	10 (4.8%)	6 (2.9%)	4 (1.9%)

FEEDING ECOLOGY OF AMERICAN WHITE PELICANS

Principal Investigators: Leopoldo A. Morena/Daniel W. Anderson

A research crew from the University of California, Davis began a study on the feeding ecology of the American White pelican (*Pelecanus erythrorhynchos*). During the breeding season efforts were concentrated on the colonies at Lower Klamath and Clear Lake Refuges. The populations at the colonies were normal at the beginning of the breeding season. During the middle of the season a large scale die-off of adults occurred for about two months. In general, carcasses collected were of poor body condition (emaciated). It was thought that the birds may have been dying from chemical toxins, but lab reports did not support this hypothesis, and some reports listed the cause of death as simple starvation. The reproductive success of the pelicans, due to the adult mortality, was very poor with only about 50 young fledged. Investigation at the colonies revealed a large scale die-off of chicks, probably due to starvation, i.e. no adults to feed chicks.

The crew also placed eight radio transmitters on pelicans to aid in studying individual behavior such as habitat use and daily foraging patterns. In 1990, daily movements of pelicans was much less than would be found in an average or normal year. The radioed pelicans were tracked to their wintering grounds. They were found in the Central Valley of California, at Salton Sea and at inland lakes and reservoirs in southern Sonora, Mexico. Two of the radio marked birds died; one in the Klamath Basin when it struck a power line, and the second in southern Sonora, cause of death unknown. The UC Davis crew will be back in the spring of 1991 to continue their work.

F. HABITAT MANAGEMENT

1. General

Our primary management objectives include:

- a. Produce migration and production habitat of suitable quantity and quality for waterfowl and marsh birds.
- b. Provide habitat and protection for bald eagle (endangered), greater sandhill crane, and white pelican (sensitive).
- c. Cooperative farming on a sharecrop basis to sustain large fall, winter, and spring waterfowl populations.
- d. Commercial agriculture - refuge cash lease lands administered by Bureau of Reclamation.
- e. Provide opportunities for resource use such as hunting, birdwatching, photography, environmental education, and research.

To help accomplish these objectives, the Refuge is divided into rather large units approximately 1,000-4,000 acres in size. Each unit is assigned to one of six major habitat objectives based upon waterfowl needs:

Permanent Ponds - These units remain flooded throughout the year to provide for the needs of waterfowl, marsh birds, and resident wildlife. Characteristic plants include cattail, hardstem bulrush, and sago pondweed.

Seasonally Flooded Marsh - Water is removed from these units by June 30, and they remain dry through the summer months. Seed producing plants grow on the moist pond bottoms during the summer. After seeds mature, the units are flooded in the fall, making the food available to migrating waterfowl. These units are also used by nesting ducks. They are characterized by cattail, hardstem bulrush, alkali bulrush, smartweed, goosefoot, meadow golden dock, atriplex, etc.

Seasonally Flooded Upland - These are basically upland units that are flooded by spring runoff and hold water into the early summer months. They are important areas for spring migrating waterfowl and for waterfowl production.

Upland - Upland units are dominated by greasewood, cheatgrass, saltgrass, mustard, rabbit brush, sandberg bluegrass, and Great Basin wild rye.

Bureau Of Reclamation Lease Lands - Farming leases on Area F (Sheepy East) and Area K (Straits Unit) are managed by the Bureau of Reclamation for commercial agriculture. The provisions for managing for agriculture are mandated by the Kuchel Act of 1964 and a Cooperative Agreement of 1977 which clarified management on the overlay refuge.

Barley - The Refuge annually negotiates cooperative agreements for barley production on designated units. The barley is used heavily by migrating waterfowl.

TABLE 5. Land Management, Lower Klamath Refuge, 1990.

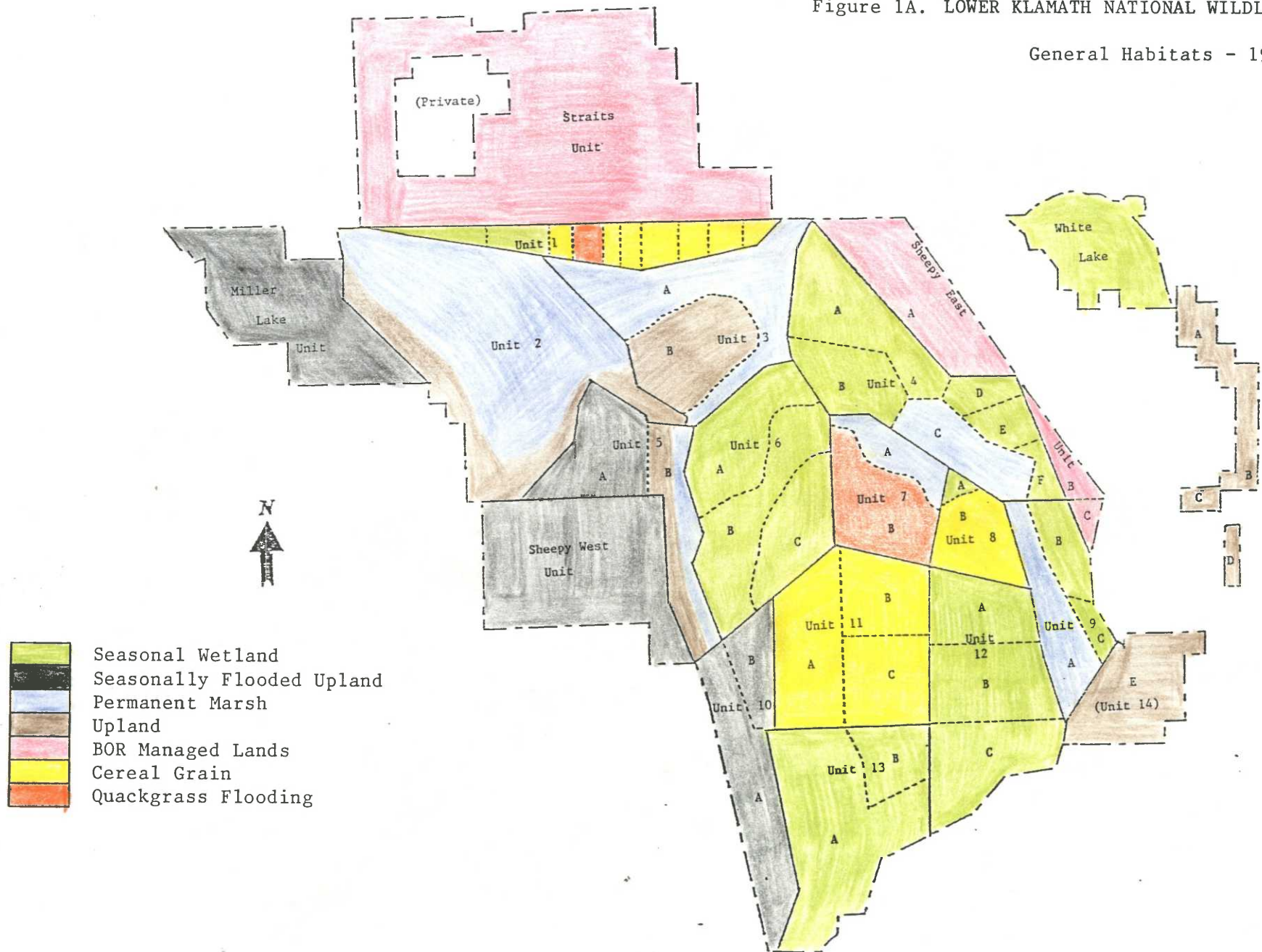
Use	Acreage
Cooperative farming	
cereal grain	3,818
quackgrass control	1,028
Permanent marsh	6,155
Seasonal marsh	15,227
Upland	
hay	200
grazed	7,630
other	5,841
BOR leased lands	7,106
Administrative	205
Total	47,210

TABLE 6. Habitat Acreages, Lower Klamath Refuge, 1990.

Unit/Cell	Grain	Quack Flood	Upland	Seas Flood Upland	Roads Dikes Admin	Perm Marsh	Seas Marsh	BOR	TOTAL
1-1	90								
-2	75								
-3	105								
-4	96								
-5	84								
-6	103								
-7		98							
-8	75								
-9							108		
-10							99		
Subtotal	628	98					207		933
2			2086			2226			
Subtotal			2086			2226			4312
3-A						1932			
-B			858						
Subtotal			858			1932			2790
4-A							1440		
-B							400		
-C						579			
-D							240		
-E							240		
-F							235		
Subtotal						579	2555		3134
5-A				955					
-B			170			138			
Subtotal			170	955		138			1263
6-A							1540		
-B							882		
-C							640		
Subtotal							3062		3062
7-A						597			
-B		930							
Subtotal		930				597			1527
8-A							63		
-B	747								
Subtotal	747						63		810
9-A						683			
-B							391		
-C							200		
Subtotal						683	591		1274
10-A			917						
-B							450		
-C							236		
Subtotal			917				686		1603
11-A	994								
-B	691								
-C	758								
Subtotal	2443								2443
12-A							900		
-B							1000		
-C							1193		
Subtotal							3093		3093
13-A							3295		
-B							350		
Subtotal							3645		3645
14			1820						1820
Subtotal			1820						1820
White Lk							1125		1125
Miller Lk			87	1788			200		2075
Sheepy W				2990					2990
Sheepy E								1441	1441
Area K								5665	5665
Other			2000		205				
Subtotal			2087	4778	205		1325	7106	15501
TOTALS	3818	1028	7938	5733	205	6155	15227	7106	47210

Figure 1A. LOWER KLAMATH NATIONAL WILDLIFE REFUGE

General Habitats - 1990



2. Wetlands



LK-90-02 Unit 9C seasonal marsh sandhill AJS 10/90
crane use.

Wetland acres comprise 61% of the total acreage of Lower Klamath Refuge. A total of 6,325 acres of permanent marsh and open water, and approximately 15,127 acres of seasonally flooded wetlands were maintained on Lower Klamath in 1990. Unit 1 Cells 9 and 10 were converted from marginal upland habitat to seasonally flooded wetlands. This conversion is consistent with a refuge goal of providing optimum wetland habitat. This new wetland will provide water for brooding waterfowl on the north side of Highway 161. This will limit attempts to cross the highway to access needed water, an event that has caused many waterfowl casualties during past breeding seasons.

The primary water source for Lower Klamath Refuge is excess water from Tule Lake. Approximately 80,000 acre-feet per year are pumped through a tunnel in Sheepy Ridge to Lower Klamath. The water is moved in cooperation with the Bureau of Reclamation, either through the Refuge via a Service-maintained canal system, or around the Refuge via a Bureau-maintained canal system. Water in excess of Lower Klamath wetland and cropland needs is delivered to the Bureau's pumps through the Straits Drain. From there, water can be pumped to the Klamath River. The Service pays the Bureau of Reclamation for pumping the first 50,000 acre-feet per year. Pumping costs for 1990 were \$28,933. Water for Lower Klamath may also be imported from the Klamath River via the Ady Canal to maintain pool elevations during times when Tule Lake pumping is insufficient to meet these needs.



LK-90-03 In lieu of spraying, farm Unit 7B was AJS 10/90
flooded for quackgrass control.

Unit 7B and Unit 1 Field 7 were flooded for quackgrass control in 1990. Alternate flooding of each of five grain units allows control of quackgrass in lieu of spraying. The flooding also produces vast beds of sago pondweed, and receives heavy use by divers.



LK-90-04 Smartweed (*Polygonum lapathifolium*) response AJS 9/90
in Unit 4-B after a June drawdown.

Emergent vegetation continued to develop in Unit 4B. This unit was converted from a permanent marsh into a seasonally flooded wetland in 1988.

The mid-June drawdown for most seasonal marsh units continued in 1990. Wetland plant communities were mapped in most seasonal marshes. This year an abundance of alkali bulrush (*Scirpus maritimus*) was observed. Although alkali bulrush is desired in some units for brood cover, far too many units were dominated by the plant. In 1991, we will "set back" the encroachment of the alkali bulrush in Unit 4D by planting it to grain for a season. If results are favorable, the selective farming of seasonal units may be incorporated in our management practices in order to control undesirable encroachment of plant species.



LK-90-05 For the cost of one culvert we were able to restore the wetland in Unit 10-C this year. AJS 1/91



LK-90-06 Wetland restoration project on Miller Lake Unit after one season. GAH 5/90

The fall floodup sequence was determined based upon past observations. Population data demonstrates that waterfowl use on the Refuge hunting areas declines drastically after the season begins. To compensate, these units are flooded earlier to maximize use of available resources. Other units were flooded in sequence in October, November, and December as the water delivery system allowed.

4. Croplands

The primary objective of the cooperative farming program on Lower Klamath Refuge is to provide grain for waterfowl during fall and spring migrations. Under the agreement, five cooperators planted approximately 3,696 acres of barley (Table 6 and Figure 1a). Conventional farming methods including fertilization and weed control spraying are required over the entire units. Crop divisions were made jointly in the fall prior to harvest. Cooperators harvested two-thirds of the crop, and left the remaining one-third standing in the field for use by waterfowl. The grain yields averaged 2.32 tons per acre, and ranged from a low 1.45 tons per acre in Unit 11-A to a high of 3.03 tons per acre in Unit 1 (Table 6). The low grain yield of 1.45 tons per acre in Unit 11A was the result of large patches of weeds which did not get sprayed.

The cooperative farm fields are flooded on a rotational basis one year out of five for quackgrass control. When flooded, these fields grow extensive beds of sago pondweed (*Potamogeton pectinatus*), which is utilized during summer by feeding and molting waterfowl, and during fall and winter by tundra swans, redheads, and canvasbacks. This year Unit 7-B was flooded for quackgrass control.

The Bureau of Reclamation cash lease farming program on Areas F and K (Sheepy West and Straits Unit) consists of 6,600 acres of barley, oats, and grass hay, all of which is harvested (Table 7, Figures 1b and 1c). Approximately 500 acres were flooded for quackgrass control, and they also grew extensive stands of sago pondweed, which were utilized by waterfowl.

TABLE 7. Crop Types and Acreage Under Bureau of Reclamation Cash Lease Farming Program, Lower Klamath Refuge, 1990.

Crop Type	Area F (Sheepy East)	Area K (Straits Unit)	Total Acres
Barley	816.7	1489.2	2305.9
Oats	248.7	2001.6	2250.3
Quackgrass hay	0.0	1940.0	1940.0
Flooded	351.1	123.0	474.1
TOTAL ACREAGE	1,416.5	5,553.8	6,970.3
TOTAL REVENUE	\$ 24,091.48	\$ 365,866.48	\$ 389,957.96

TABLE 6. Cooperative Farming Program, Lower Klamath Refuge, 1990.

Cooperator	Farm Unit	Field/Lot Number	Total Unit Acres	Cooperator				Government			
				Crop Type	Variety	Acres	Yield tons/acre	Crop Type	Variety	Acres	Yield tons/acre
F. Scronce	11-C	-	758	barley	Steptoe	505	1.9	barley	Steptoe	143	1.90
F. Scronce	11-C	-	-	-	-	-	-	barley	Klages	110	1.90
T. Liskey	11-A	N/S	895	barley	Steptoe	596	1.45	barley	Steptoe	298	1.45
R. & C. Carland	8-B	-	724	barley	Steptoe	483	2.00	barley	Steptoe	241	2.00
M. Long	11-B	-	671	barley	Steptoe	280	2.69	barley	Steptoe	231	2.56
M. Long	11-B	-	-	barley	Crystal	180	2.38	-	-	-	-
J. Liskey	1	lot 1	628	barley	Steptoe	90	2.76	-	-	-	-
J. Liskey	1	lot 2	-	barley	Steptoe	75	2.54	-	-	-	-
J. Liskey	1	lot 3	-	barley	Steptoe	105	2.60	-	-	-	-
J. Liskey	1	lot 4	-	barley	Steptoe	96	3.03	-	-	-	-
J. Liskey	1	lot 5	-	-	-	-	-	barley	Steptoe	84	3.00
J. Liskey	1	lot 6	-	-	-	-	-	barley	Steptoe	50.3	1.80
J. Liskey	1	lot 8	-	-	-	-	-	barley	Steptoe	75	1.50
TOTALS			3,696			2,410	2.37			1,232.3	2.04

Figure 1B. Bureau of Reclamation Lease Lands Farming Program,
Area K, Lower Klamath Refuge, 1990.

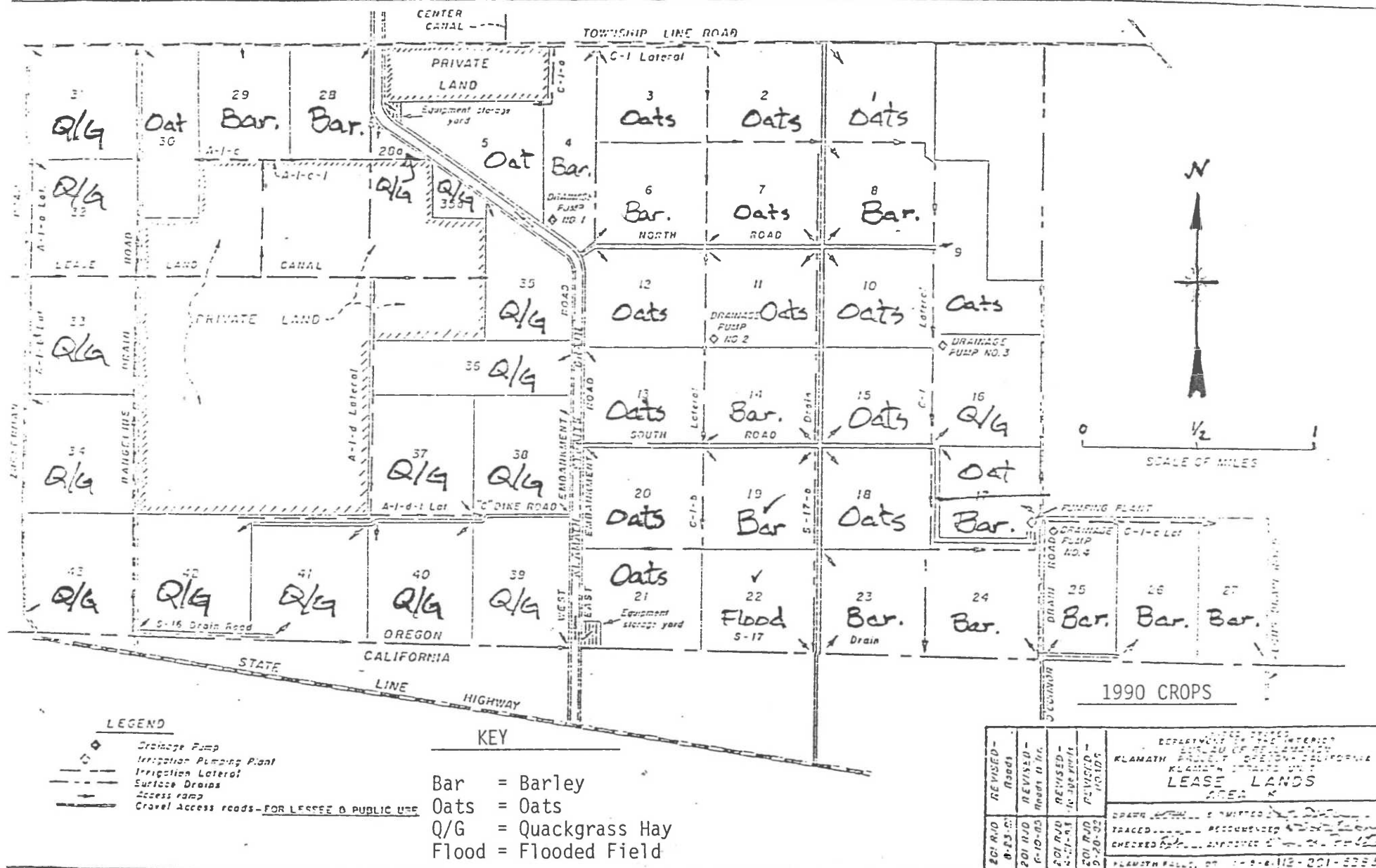
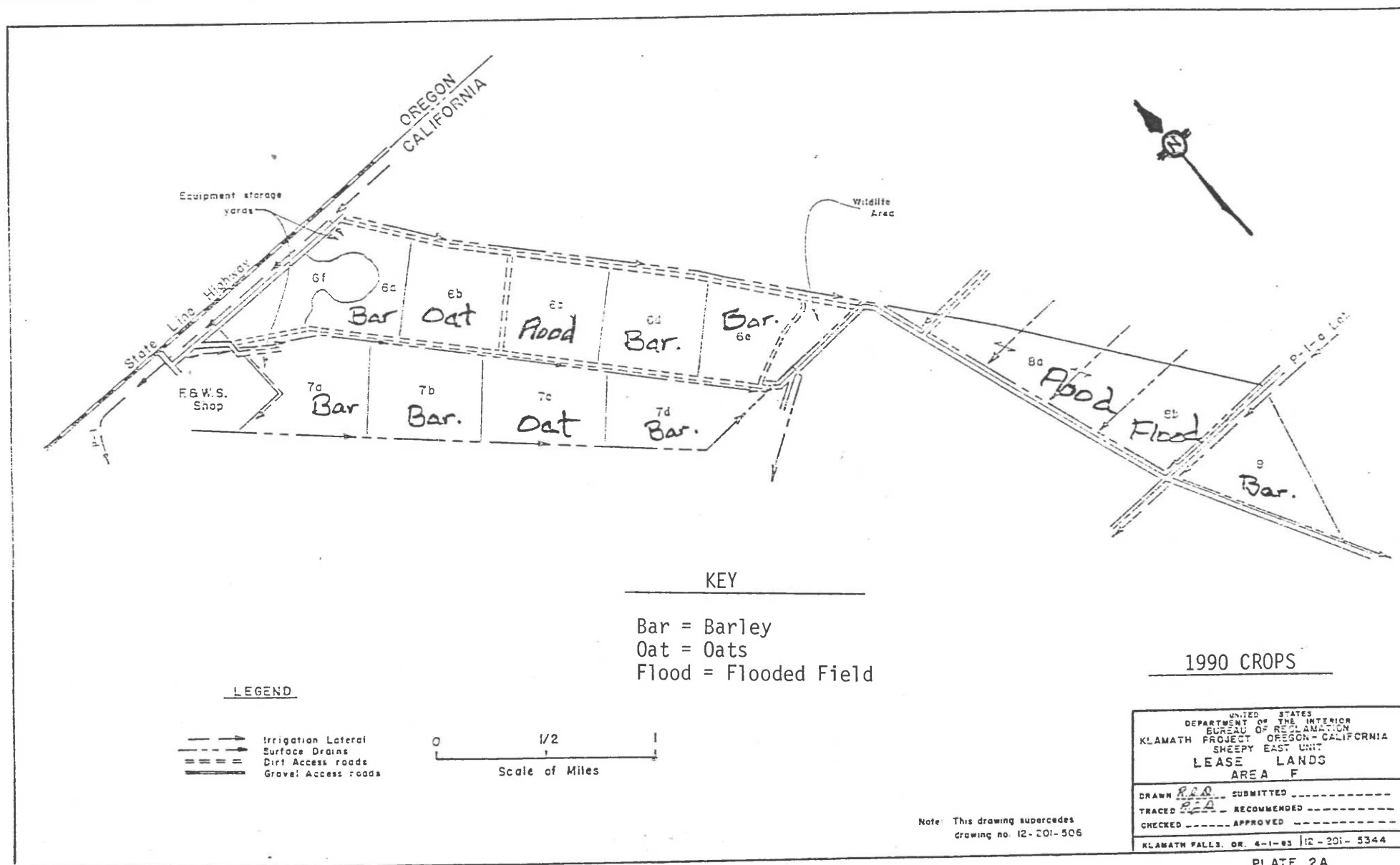


Figure 1C . Bureau of Reclamation Lease Land Farming Program,
Area F, Lower Klamath Refuge, 1990.



LK MAINT. USE DAYS (MILLIONS)

DUCKS GEESE trend



Figure 2. Waterfowl use days, Lower Klamath Refuge, 1971-90.

5. Grasslands

No additional plantings were made this year.

6. Other Habitats

Riparian habitat is generally lacking throughout the Basin and Lower Klamath Refuge. The few trees on the Refuge are used quite extensively as day roosts by the thousands of wintering bald eagles and other raptors. Establishment of riparian areas would benefit raptors and passerines, as well as address the issue of roost replacement.

In an effort to increase the amount of riparian habitat on Lower Klamath Refuge, willow cuttings were planted along approximately 1.75 miles of dike in the spring of 1989. That spring and summer they leafed out, but they did not develop root systems to keep them alive through the winter months. We are currently investigating better techniques in establishing the much needed riparian areas.

7. Grazing



LK-90-07 Grazing evaluation studies were initiated this year on the Miller Lake Grazing Unit. AJS 7/90

Cattle grazing is used as a management tool to provide spring habitat for migrating waterfowl. Seasonally flooded uplands are grazed during the dormant season and flooded by spring runoff. Under this management regime, invertebrate populations flourish and provide food for migrating waterfowl. Four special use permits were issued to fall-winter graze 5,810 AUMs on 7,630 acres of seasonally flooded uplands (Table 8).

A twenty percent reduction in our grazing program was accomplished this year (Table 9). Changes in management objectives, along with improved water management capabilities, resulted in the removal of 2,040 acres and 1,415 AUMs from our grazing program. These former seasonally flooded uplands are now managed as seasonal wetlands for waterfowl nesting. Justification was based on changes in management objectives as well as demonstrated overuse.

To improve accuracy for habitat monitoring purposes, as well as to eliminate the confusion of counting and calculating AUMs, all calves born in 1990 were counted as one animal unit beginning November 15 or December 1, depending on calving dates.

In summary, of the 5,810 AUMs allowed, 51,656 AUMs (or 97 percent) were used by the end of the 1990-91 grazing season. Refuge receipts totalled \$31,734.21.

One Special Use Permit was issued to intermittently graze cattle on about 70 acres in Lot 1. This greasewood upland is adjacent to private property owned by Orem and Sons, Inc. The permit is issued annually for a fee of \$420.00.

TABLE 8. Cattle Grazing Program, Lower Klamath Refuge, 1990.

Unit	Acres	AUMs Allwd	Intensity		Period Of Use	Permittee
			Rate \$/AUM	AUMs/ Acre		
Miller Lake (Lot 12)	1,675	600	6.00	0.36	07/15-12/15	M. McKay
Unit 2 (G-1)	1,400	1,000	5.50	0.71	10/01-01/31*	R. McKay
Unit 13A (G-3)	1,000	800	5.50	0.80	09/01-01/31	H. Porterfield
Sheepy West (Lot 10)	2,600	2,510	5.50	0.97	09/01-01/31	Porterfield/ Langer
Triangle (Lot 11)	955	900	5.50	0.94	09/01-01/31	Porterfield/ Langer
TOTALS	7,630	5,810		0.76	Overall	

*From Sheepy Creek to Otey Island cattle may be turned on 09/01/90.

TABLE 9. Grazing Reductions, Lower Klamath Refuge, 1990.

Unit	AUMs Allowed		Acres Under Grazing	
	1989	1990	1989	1990
Miller Lake (Lot 12)	700	600	2,075	1,675
Unit 2 (Unit G-1)	1,200	1,000	1,600	1,400
Sheepy West (Lot 10)	2,510	2,510	2,600	2,600
Triangle (Lot 11)	900	900	955	955
Unit 13A (Unit G-3)	1,750	800	2,000	1,000
Unit 13B (Unit G-3N)	165	0	450	0
TOTALS	7,255	5,810	9,680	7,630

8. Haying

Harvest of native grasses for livestock forage is used as a management tool to create spring habitat for migrating waterfowl. Under this treatment strategy, meadows were cut between August 20 and September 10 to avoid ground nesting birds. The forage is then baled and removed from the Refuge. Two special use permits were issued to hay 219.33 tons of hay on 200 acres (Table 10).

TABLE 10. Haying Program, Lower Klamath Refuge, 1990.

Unit	Total Unit Acres	Est Hayed Acres	Period of Use	Tons Harv	Rate \$/Ton	Revenue \$	Permittee
Sheepy Lake (Unit 2)	1,600	100	08/20-09/10	62.89	5.00	314.47	R. McKay
Miller Lake	2,075	100	08/20-09/10	156.44	5.00	782.18	M. McKay

9. Fire Management



LK-90-08 Fairchild Island prescribed burn AJS 2/91
for spring goose browse.

See Tule Lake report for a discussion of prescribed fire. Approximately 145 acres were burned for agriculture farm field/debris removal and 850 acres were burned in Fairchild Island for spring goose browse and decadent vegetation removal.

The Lower Klamath Fire Management Plan was revised and submitted to Region for approval in November.

10. Pest Control

The Department of Agriculture's Animal Damage Control Division conducted coyote control work on private land and U. S. Forest Service sheep allotments adjacent to the Refuge. We granted them a right of pursuit to take depredating coyotes on Refuge lands adjacent to these sheep allotments. Ten coyotes were taken on the southeast side of White Lake and 24 were taken along the southwest side of Sheepy West, for a total of 34 coyotes taken from Refuge land. A grand total of 131 coyotes were removed from surrounding areas during the period of April 24 through June 30.

We continued our spray program to eradicate the Canada thistle stands along the Straits Drain, Highway 161, Unit 1, and other visible stands throughout the Refuge. Banvel/2,4-D Amine was used to spot treat approximately 50 acres during June and July. We also introduced an adult arthropod, *Ceutorhynchus litura*, as a biological control method. One release of 100 of these stem-root weevils was made at selected sites on Lower Klamath Refuge in both Oregon and California at a cost of about \$100.00. It is hoped that biological control will be effective on Canada thistle.

G. WILDLIFE

1. Wildlife Diversity

(Refer to Tule Lake Refuge section G-1)



LK-90-09 Bank swallow colony at Otey Island gravel pit. The bank swallow is listed on California's threatened and endangered species list. AJS 6/90

2. Endangered and/or Threatened Species

There was no change in the status of the bald eagle, peregrine falcon, or Lost River sucker during the report period.

Peregrine falcons are fairly regularly observed on the Refuge during the summer months. There is a peregrine/prairie falcon cross fostering project being conducted nearby by the BLM, and we assume this increase in summer peregrine sightings is a result of that project.

The peak number of bald eagles seen on Lower Klamath was 376 noted during the midwinter inventory conducted on January 2. Earliest fall migrants were noted on October 19, when 3 were seen. Numbers increased rapidly in November and December, and 326 were noted on the December 20 aerial census flight.

3. Waterfowl

Combined duck and goose maintenance totaled 77.9 million use days. This is a 55% increase over the 50.2M seen last year and is the highest recorded on that refuge since 1961! If that number only represented a true picture of flyway populations and not the freak of drought phenomenon it was! With habitat conditions on Lower Klamath being excellent with plenty of water, and much of the rest of the state of California having poor water conditions, we had plenty of birds for a larger than normal fall stay (Figure 2).

Spring goose use was 2.1M days - up 17% from last year's 1.8M. Fall goose use was much improved from 1989. We recorded 3.0M use days - up 173% from the 1.1M noted in 1989. Spring duck maintenance increased by 77%. We recorded 21.2M use days versus the 12.0M seen the previous spring. Fall duck maintenance totaled 51.6M use days. This was a 46% increase from the 35.3 noted in 1989.

The large (77%) increase in spring use by ducks was the result of two changes from the previous year. The winter was mild with open water habitat available right from the first of the year. As a result, duck use in January and February increased some 5M days. In addition, we had a 51% increase in use by pintails and green-winged teal over that seen the previous year.

It is hard to explain the tremendous increase in fall duck use. Much of the increase came from pintail use. We had 7.8M use days by fall pintail in 1989, and 21.0M use days in 1990. Mallard maintenance increased by 26% to nearly 10M use days. We recorded 8.3M use days of green-winged teal maintenance, representing a 64% increase over the previous year. Most other species showed use similar to the previous year.

It was surmised that our pintail use reflected poor habitat conditions in other areas, especially in the Sacramento Valley. It is known that birds interchange between these areas rather commonly, so we may have seen birds returning to the basin after not finding what they wanted in the valley. Our peak count for pintails was 370,000 recorded on October 31. We had an average population of near 300,000 during the months of October and November.

Spring goose use remained relatively low, although we saw a small increase. Until we return to winters of better than normal precipitation, much of the highly favored goose pastures in Sheepy West and 5A (Triangle) remain unflooded in the spring.

Fall goose use was much improved overall. Most of the increase was due to white-front and cackler use. They were especially numerous in the Straits Unit, and good white-front hunting was experienced by many Oregon hunters. An undesired side effect was an improved kill of cackling Canada geese, a no-take species, by these same hunters. Incidental take of cacklers is not easy to eliminate when that species flies with flocks of white-fronts.

Waterfowl production was very good again in 1990. We had excellent numbers of most species, and nest success continues to be high, ranging from 40% in ruddy ducks to 73% for gadwalls. Total duck pairs numbered 15,612 - up 19% from 1989. Strangely enough, there were about as many species showing a decline as those showing increase, but increases in our major nesting species like gadwall and mallard easily masked those declines.

It will be interesting to see where the number of gadwall pairs will stabilize. In the past 5 years, their number has increased from 3,300 to 7,360 (123%). Mallard pairs have increased during the same period from 1,470 to 3,459 (135%). There may be many reasons why these species have increased, but one can't overlook the fact that we have converted 800 acres of barley and 1,200 acres of pasture into seasonal marsh during that period. Although we prefer the above explanation, we have experienced drier than normal conditions in the basin, and the availability of good habitat off-refuge has been more limited, thus possibly concentrating birds there.

TABLE 11. Waterfowl Production, Lower Klamath Refuge, 1990.

Species	Est. Number Breeding Pairs	% Change from 1989	Estimated Production
Canada goose	690	+ 32%	1,424
Gadwall	7,360	+ 27%	19,842
Mallard	3,459	+ 32%	3,847
Redhead	1,638	- 5%	1,761
Cinnamon teal	924	- 21%	2,009
Ruddy duck	864	+ 51%	1,037
Lesser scaup	528	- 6%	1,386
Pintail	418	- 24%	1,166
Northern shoveler	224	- 41%	470
Ring-necked duck	149	+496%	224
Canvasback	40	+ 60%	60
Wigeon	9	-	16
Bufflehead	8	100%	12
Coot	18,360	+ 88%	8,262
TOTAL			41,516

TABLE 12. Five Year Waterfowl Production Trend,
Lower Klamath Refuge, 1986-90.

	1986	1987	1988	1989*	1990*	Avg
Goose	2,400	2,137	1,710	1,536	1,424	1,841
Duck	24,745	37,285	39,415	29,859	31,812	32,623
Coot	9,000	9,133	15,258	5,115	8,262	9,354

*Reflects a change in method of calculation of production. Brood survival index reduced from .80 to .50

4. Marsh and Water Birds

White pelican nesting was unsuccessful again this year. As was the case in 1988, it was suspected that abandonment during a period of very wet, inclement weather in May was the primary cause. Other species in the Sheepy Lake nesting colony did somewhat better, with about 200 double-crested cormorants and 120 great blue herons successfully fledging young.

The nesting colony in Unit 12A was even more impressive in size this year. There were 500 great egret nests, 400 black-crowned night heron nests, and at least 700 white-faced ibis nests in the emergent vegetation. This is a seasonally flooded marsh, but water levels remain high enough into summer that the young birds fledge successfully and move to nearby permanent water. These species have moved from an emergent marsh that is permanently flooded to this area, so a seasonal flooding regime must suit their needs better than we think.

Unit 7A had fewer nesting marsh birds than last year. There were only about 100 ibis nests, 50 great egret nests, and 75 black-crowned night heron nests in this unit this year. This was down from last year's 300, 200, and 220 respectively. As the colony in Unit 12A continues to grow, this one continues to decline. The birds nesting in this unit did show excellent nest success, and few unhatched eggs or dead fledglings were found during a mid-July inspection.

Western grebes were unsuccessful in their initial nesting attempt. Like the pelicans, they appear to abandon if we get inclement weather during early nesting. Some did renest in very late summer (August), and about 25 juveniles were noted in September. We are unsure if these late hatch juveniles are mature enough to leave the basin before freezeup.

Eared grebes did very well, and there were over 700 nests in the Unit 3A colony. We were very careful not to cause a wave from our airboats that would wash eggs from the nests, during botulism pickup. We found that if we approached the colony area slowly, the adults had time to cover the eggs before they left, and we saw no evidence of abandonment or predation by gulls due to our botulism control activities. We were very pleased to see that the grebes were that tolerant. There was a smaller colony of about 400 nests in Unit 7A, which also was very successful. It was subjected to the same disease control activities as those in 3A, and the same techniques with the airboats minimized disturbance there as well.

There were 12 breeding pairs of sandhill cranes on the Refuge. We saw colts with 6 of those pairs, but only saw two fledged colts in the fall. It was suspected that coyotes or raccoons were the responsible predators.

5. Shorebirds, Gulls, Terns, and Allied Species

We have reduced our breeding population of California and ring-billed gulls on the Refuge to about 50 pairs on two small islands in Unit 6A. The removal of some rip-rapped islands in Unit 4C a few years ago displaced over 1,000 pairs of gulls. This has improved nest success and brood survival in this and nearby units considerably.

Sixteen pairs of long-billed curlews were noted in the quackgrass hay units of Area K. We have seen an increase in nesting by this species in that area in the past few years, as a result of management agreement with the Bureau of Reclamation that greatly reduced nest loss due to flooding during irrigation. No irrigation can take place between April 10 and June 1, which gives the curlews time to nest and hatch young.

Good numbers of nesting shorebirds were successful in fledging young. Seasonal marsh units such as White Lake, Miller Lake, 4B, 4D, 4E, 4F, 12A, and 12B were prime nesting sites for killdeer, American avocet, and black-necked stilts. White Lake and Miller Lake also had good numbers of breeding Wilson's phalarope. We saw no breeding pairs of snowy plovers at White Lake. Hopefully, they will return in the future.

6. Raptors

Please refer to Tule Lake Refuge raptor Section G-6.

8. Game Mammals

Mule deer were commonly seen residents of the Refuge. There were four especially nice bucks in Units 6A and 6B.

We observed up to 31 pronghorn antelope in the Straits unit during the summer months. There were 6 kids in the group. Antelope were also common in Units 10, 13, Sheepy West, and the Triangle during late summer.

10. Other Resident Wildlife

We've still had no improvements in ring-necked pheasant numbers for several years. The few nests found have been successful, but very few young birds are seen by the end of the summer. We again experienced a low harvest of pheasants during hunting season.

15. Animal Control

LK-90-10 Long time Refuge trapper, Pat Collins, AJS
with "A-double".

The primary objective of the muskrat trapping program is to reduce populations that would cause damage to dikes, roads, and water control structures. Within the marsh interior, muskrats are used to maintain waterfowl habitats at about 50/50 percent interspersions between emergent vegetation and open water habitats. The trapping program was designed to promote a stable and healthy population with the marsh interior, while reducing bank dwellers along dikes.

Three special use permits were issued to trap muskrats during the 1989-90 season; two covering the California portion of Lower Klamath Refuge and one for the Straits Unit on the Oregon side. The length of the season complies with the state trapping season, which was from December 15 through March 31. A total of 1,988 muskrats were removed (Table 13). The division of sales for the California trappers was on the basis of 90 percent to the trapper and 10 percent to the government. The Oregon side of the Refuge was trapped by the Klamath

Drainage District trappers, and 100 percent of those sales went to the trappers. The average price for pelts sold this year was 85 cents each, the lowest it has been in years (Table 14). The Government's share totaled \$163.11. With the depressed fur market, our trappers have had a difficult time making gasoline money, let alone a profit. This year, Tulelake Irrigation District has had to pay their trappers to remove problem animals. Will we have to contract for trapping by subsidizing the trapper? We may have to, if fur prices remain flat.

TABLE 13. Muskrat Trapping Summary by Unit, Lower Klamath Refuge, 1989-90.

Unit	# Muskrats Removed	Incidental Species	
1	4	Raccoons	7
2	546	Skunks	37
3	226	Weasels	27
4	422	Ducks	6
5	6		
6	207		
7	311		
8	106		
9	79		
12	5		
13	48		
Straits (OR)	28		
TOTAL	1,988		

TABLE 14. Five-year Comparison of Muskrat Trapping Activities
Lower Klamath Refuge, 1989-90.

	1985-86	1986-87	- Season - 1987-88	1988-89	1989-90	5-Year Average
Musk rats removed	2,942	3,098	2,850	1,697	1,988	2,515
\$ per pelt	2.42	3.66	1.19	1.32	0.85	1.89

16. Marking and Banding

LK-90-11 Swim-in duck trap on permanent marsh. AJS 7/90

Pre-season mallard banding efforts on Lower Klamath Refuge began on the 16th of July and ended on the 1st of August; banding ceased due to the outbreak of avian botulism. The earlier start was geared toward trapping local, hatch year birds, but we had very limited success. We may have to alter our trapping techniques in order to catch these local, hatch year birds. An attempt was made when we placed a swim-in trap in a seasonal marsh where hens and broods were observed. All we succeeded in doing was trapping a few more adult male mallards. During our 17-day trap period 2,012 ducks were banded. The table below shows a breakdown of species, age, and sex of all ducks banded:

TABLE 15. Breakdown of Ducks Banded, Lower Klamath Refuge, 1990.

Species	AIY-M	AIY-F	(HY)	(HY)	TOTAL
Mallard	1423	450	51	34	1958
Redhead	0	17	6	9	32
Lesser Scaup	0	1	5	3	9
Pintail	10	3	0	0	13
TOTAL					2012

17. Disease Prevention and Control

Avian cholera losses on Lower Klamath Refuge during 1990 were moderate. During the late winter/early spring months, we had a mild outbreak comprised primarily of coots and snow geese. An estimated 220 birds died during this outbreak. This was one of the lowest outbreaks on record. A mild winter and almost no snow geese overwintering probably aided in the low losses.

A moderate outbreak occurred during late November/early December on Lower Klamath Refuge. The outbreak seemed to be contained within Units 3A, 12A and B, and a few fields within the Sheepy East Unit. Units 3A and 12A and B had large concentrations of birds, as they were off limits to waterfowl hunting. The Sheepy East units had been barley fields that were being flooded, and attracted large numbers of birds. These large concentrations of birds and colder weather aided in the spread of the disease. Fortunately, the outbreak did not persist, and losses were estimated at 1,000 birds. The reason for the "short life" of the disease was not known, but a quick, hard freeze occurred in mid-December, and many birds left the basin. This probably helped influence a moderate outbreak, and you'll hear no complaints from us. As usual, raptors concentrated around the outbreaks, scavenging the dead and sick birds. This scavenging made estimating avian cholera losses difficult.



LK-90-12 Fire crew "doctoring" botulism infected waterfowl at our recently relocated duck hospital. AJS 9/90

Botulism surveillance on the Refuge began on the 11th of July. Although no dead birds had been observed while driving the dikes, concern for detecting an outbreak as early as possible warranted weekly airboat surveillance.

Temperatures in the Klamath Basin reached the 90's at the end of July; a notable outbreak ensued, and daily pickup began. The initial outbreak occurred in Unit 2 along the Sheepy Creek channel, and soon afterward the disease was observed in Units 1 - Units 1 Field 9, and 3-A, 4-C, 7-A, and 7-B. A "maggot cycle" never did occur, but botulism did linger on until the first week of October, when cool fall nights seemed to stifle the disease.

This year's losses (pickup and hospital deaths) totaled 3,701 birds, with an estimated loss of 6,000 birds. Losses were kept to a minimum due to early surveillance and an intense pickup effort.

Some points of interest are:

- a. Of 436 birds treated with a botulism antitoxin, 253 survived (58%).
- b. Unit 1 cell 9 was flooded for the first time in decades, and an estimated 1,100 birds died. Future outbreaks in this unit will not occur, as it will be managed as a seasonal wetland (i.e. it will be dry during the botulism season).

TABLE 16. Botulism Pickup by Unit, Lower Klamath Refuge, 1990.

Species	UNITS						
	1 fld 9	2	3A	4C	7A	7B	9A
Pintail	134	21	21	3	67	52	4
Northern shoveler	74	40	18	7	19	41	10
Mallard	262	268	237	52	79	69	26
Wigeon	4	1	4	0	20	27	0
Green-winged teal	251	42	3	11	1	13	0
Cinnamon teal	52	11	7	5	12	16	0
Gadwall	74	176	112	48	70	82	6
Ruddy duck	0	1	9	2	8	1	1
Lesser scaup	2	16	54	2	7	5	1
Redhead	0	6	7	1	9	5	1
Coot	32	11	56	92	66	80	15
Duckling	4	12	33	38	31	55	1
Unidentified	44	42	25	27	40	23	4
Other	36	3	9	16	16	8	1
TOTALS	969	650	602	304	445	477	70

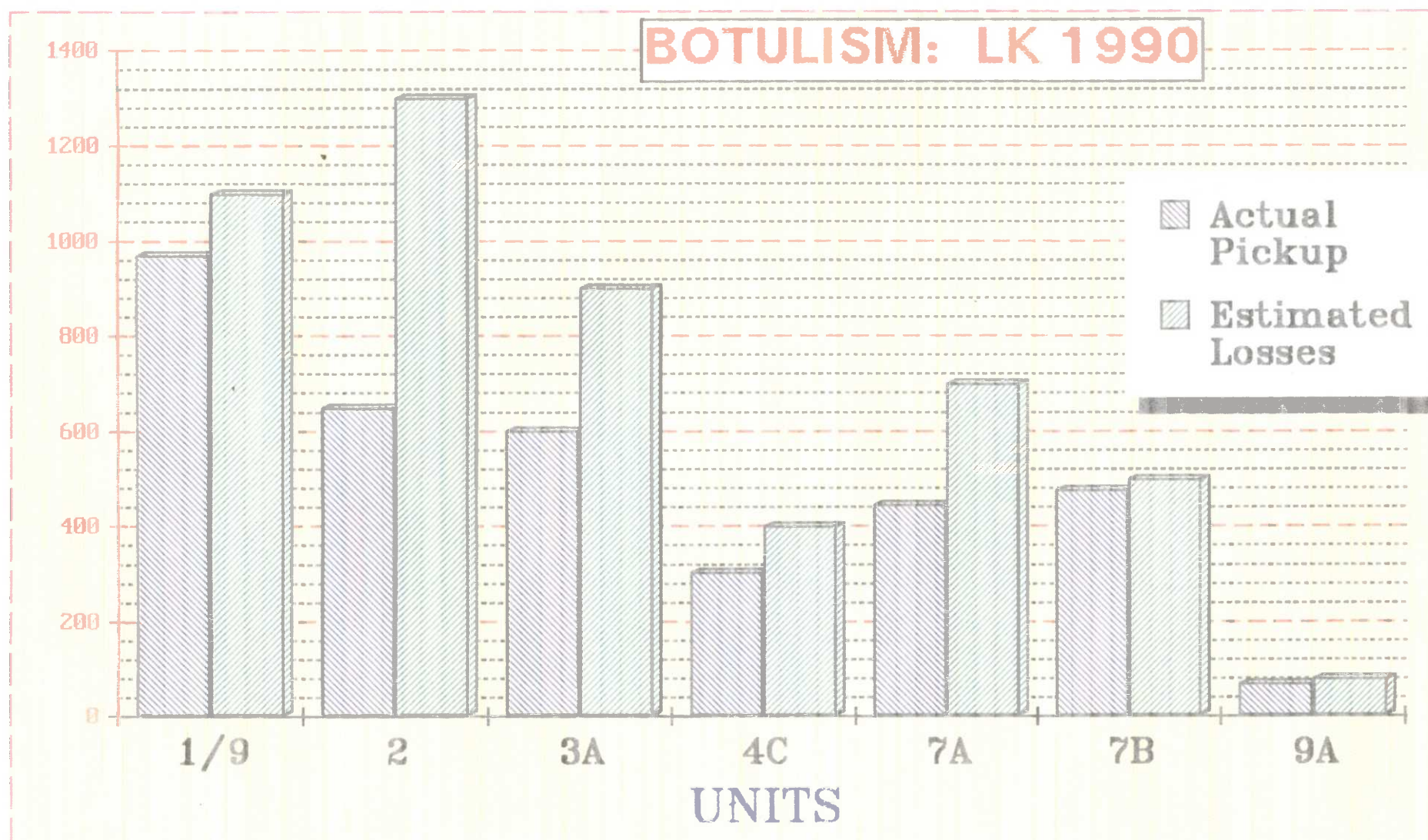


Figure 3. Avian botulism losses by unit, Lower Klamath Refuge, 1990.

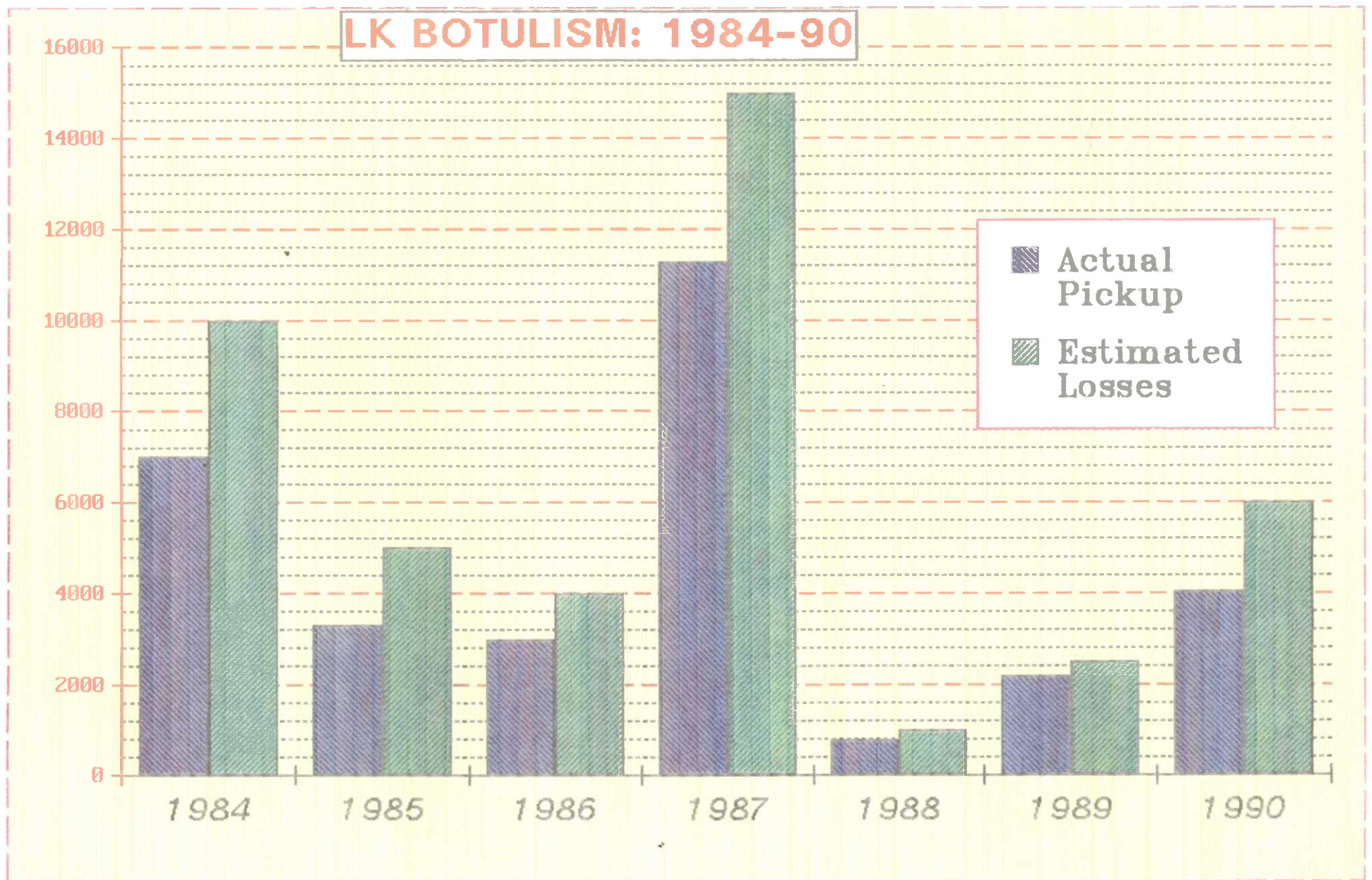


Figure 4. Botulism losses, Lower Klamath Refuge, 1984-90.

H. PUBLIC USE1. General

Primary visitor activities include wildlife observation, hunting, and photography. Total visits this year were 137,290, a 14% decrease.

5. Interpretive Tour Route

A total of 10,538 visitors were recorded on the auto tour route, a decrease of 16%.

8. Hunting

LK-90-13 Scull boat in Unit 4C. WCK

Waterfowl hunter visits totalled 6,761, an increase approaching 7% (see Figure 5, Lower Klamath Waterfowl Hunters). The harvest was slightly higher with 300 more ducks taken than last year, but only imperceptibly fewer geese. Mallard take was up considerably (16%) and pintail harvest slightly; with only one dry grain field open to waterfowl hunting, the numbers are especially significant, as the vast majority of ducks were taken in marsh units (see Tables 17 and 18).

The public meeting held in February (see Tule Lake Section D-3) concerned special regulations on motorboat use. One of the regulations proposed was to establish Unit 9 as a motorless/electric motor only area during hunting season. The consensus of comments, both written and oral, was that establishing a unit as motorless was okay, but "any other unit, not 9". Consequently, Units 4C, D, E, and F were posted as motorless/electric motor only.

Hunters using these areas were asked how the experience had been; responses were overwhelmingly positive. "Best hunting experience in years", "appreciate not having to put up with motorboats" were typical of the comments. Even one of the most ardent motorboaters tried it one day and admitted it was very pleasant, the hunting was good, and he would do it again.

Pheasant hunting was similar to last year, but with considerably less pressure. The birds were very hard to find, and hunters were spending a lot of time only getting exercise. We estimate some 755 hunters took only 450 birds.

TABLE 17. Lower Klamath Marsh - Waterfowl Harvest Summary,
Lower Klamath Refuge, 1990-91 Season.

Week	Hunters	Ducks	Geese	Ducks/Hunter	Birds/Hunter
1	1,894	4,765	85	2.52	2.56
2	857	1,596	14	1.86	1.88
3	586	1,169	40	1.99	2.06
4	509	964	7	1.89	1.91
5	517	607	14	1.17	1.20
6	462	806	3	1.74	1.75
7	272	427	0	1.57	1.57
8	171	299	0	1.75	1.75
9	155	240/closed	5	1.55n/a	1.58
10	1	closed	0	n/a	0
11	4	"	0	"	0
12	18	"	3	"	.17
13	60	"	20	"	.33
14	0	"	0	"	0
15	0	"	0	"	0
TOTALS	5,506	10,873	191	2.00	2.01

Duck Average - 2.00

Est. Hunter Hours - 27,897

59 Day Duck Season

TABLE 18. Lower Klamath Marsh - Harvest Summary,
Lower Klamath Refuge, 1990.

Species	# Harvested	% Species Composition
DUCKS:		
Mallard	4,133	38
Gadwall	1,444	13
Wigeon	1,323	12
Pintail	1,522	14
Green-winged teal	718	7
Cinnamon teal	93	1
Northern shoveler	750	7
Redhead	114	1
Canvasback	275	3
Lesser scaup	75	1
Bufflehead	291	3
Ruddy duck	39	tr
Wood duck	14	tr
Ring-necked duck	54	tr
Goldeneye	21	tr
Merganser	7	tr
TOTAL DUCKS	10,873	100
Duck Hunters - 5,506		
Duck Average - 2.00		
Est. Hours - 27,897		

TABLE 19. Lower Klamath Fields - Waterfowl Harvest Summary,
Lower Klamath Refuge, 1990-91 Season.

Week	Hunters	Ducks	Geese	Goose Avg.
1	337	328	66	0.20
2	114	80	29	0.25
3	75	10	45	0.60
4	72	7	3	0.04
5	72	12	9	0.13
6	93	28	21	0.23
7	97	30	8	0.08
8	57	24	5	0.09
9	52	7/closed	5	0.10
10	50	closed	16	0.23
11	59	"	20	0.33
12	51	"	22	0.36
13	68	"	53	0.74
14	58	"	55	0.81
15	<u>0</u>	<u>"</u>	<u>0</u>	<u>0.00</u>
TOTALS	1,255	526	357	0.28

Hunters 1,255
Ducks 526
Geese 357
Season goose avg. - 0.28
Est. hunter hours - 5994

% Species Composition:

Snow geese 30%
White-fronted geese 2%
Canada geese 68%

TABLE 20. Five-year Comparison of Waterfowl Harvest
Lower Klamath Refuge, 1986-90.

	1986-87	1987-88	1988-89	1989-90	1990-91
Hunters	7,982	7,210	6,097	6,302	6,761
Ducks bagged	144,474	11,590	11,217	11,089	11,399
Geese bagged	896	1,391	1,586	593	548
Ducks/hunter	1.81	1.61	1.84	1.76	1.69
Geese/hunter	.11	.19	.26	.09	2.08
Birds/hunter	1.93	1.80	2.10	1.85	1.77

WATERFOWL HUNTERS: LK

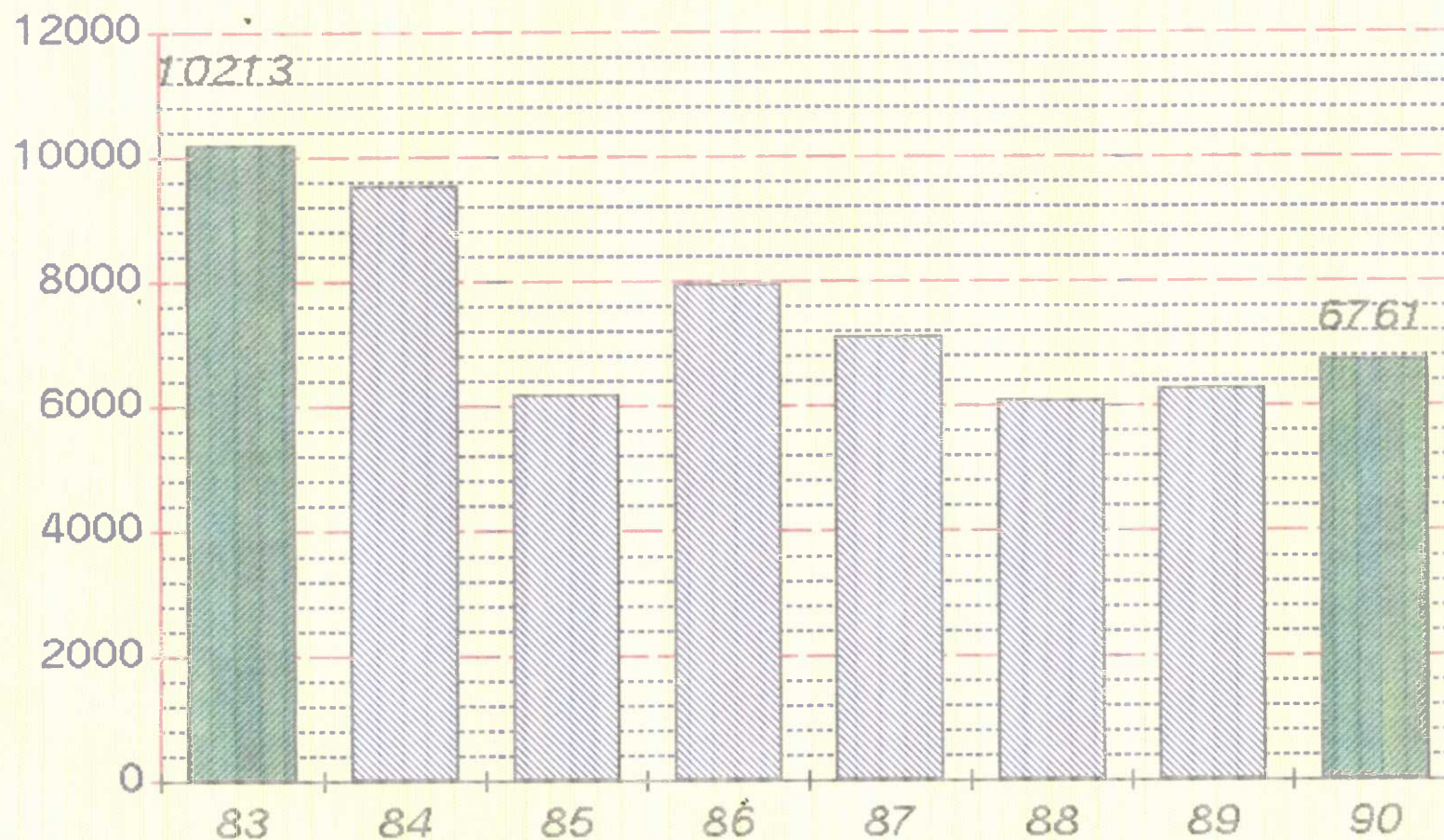


Figure 5. Waterfowl hunters, Lower Klamath Refuge, 1983-90.

LK HARVEST 1986 - 90

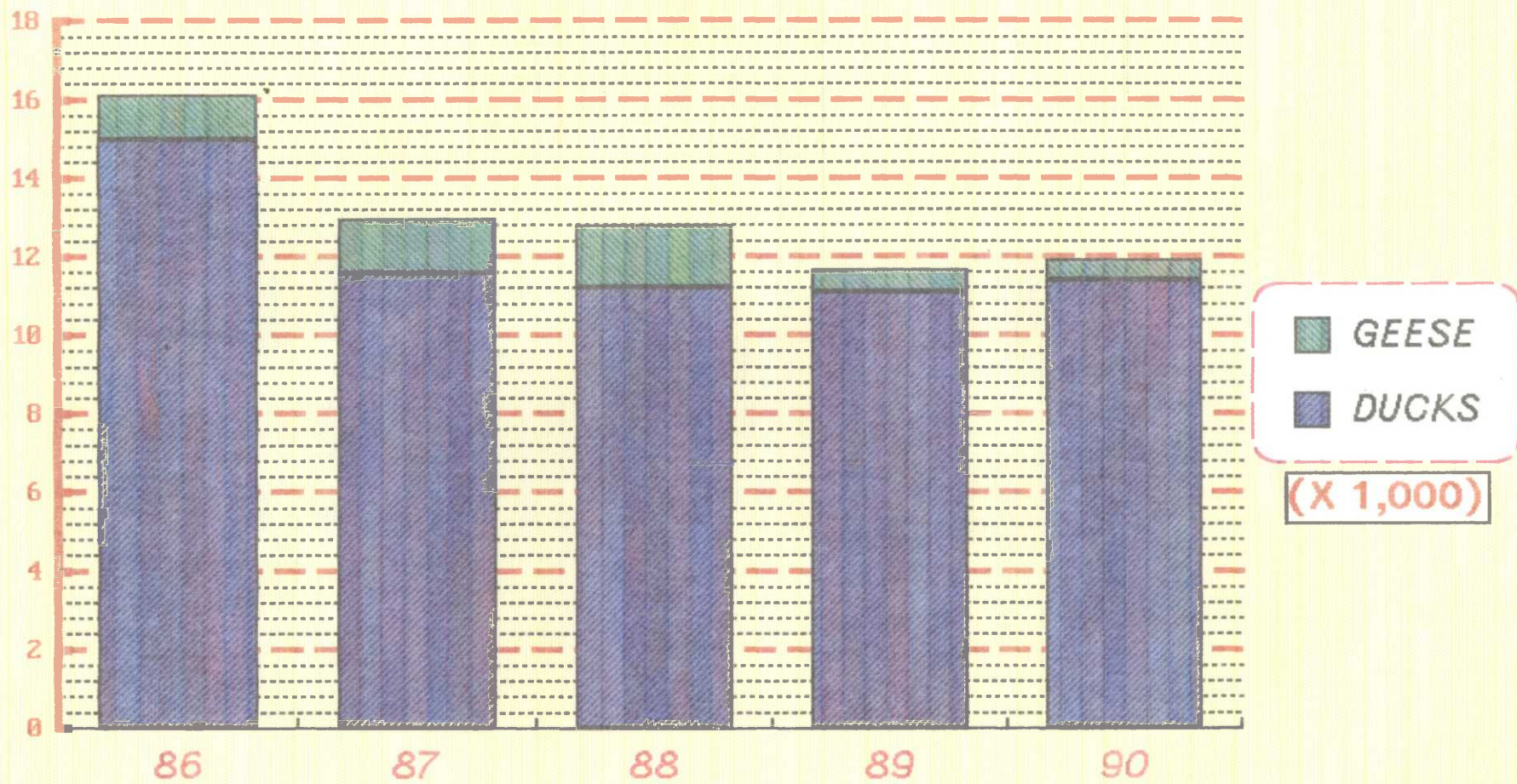


Figure 6. Waterfowl Harvest, Lower Klamath Refuge, 1986-90.

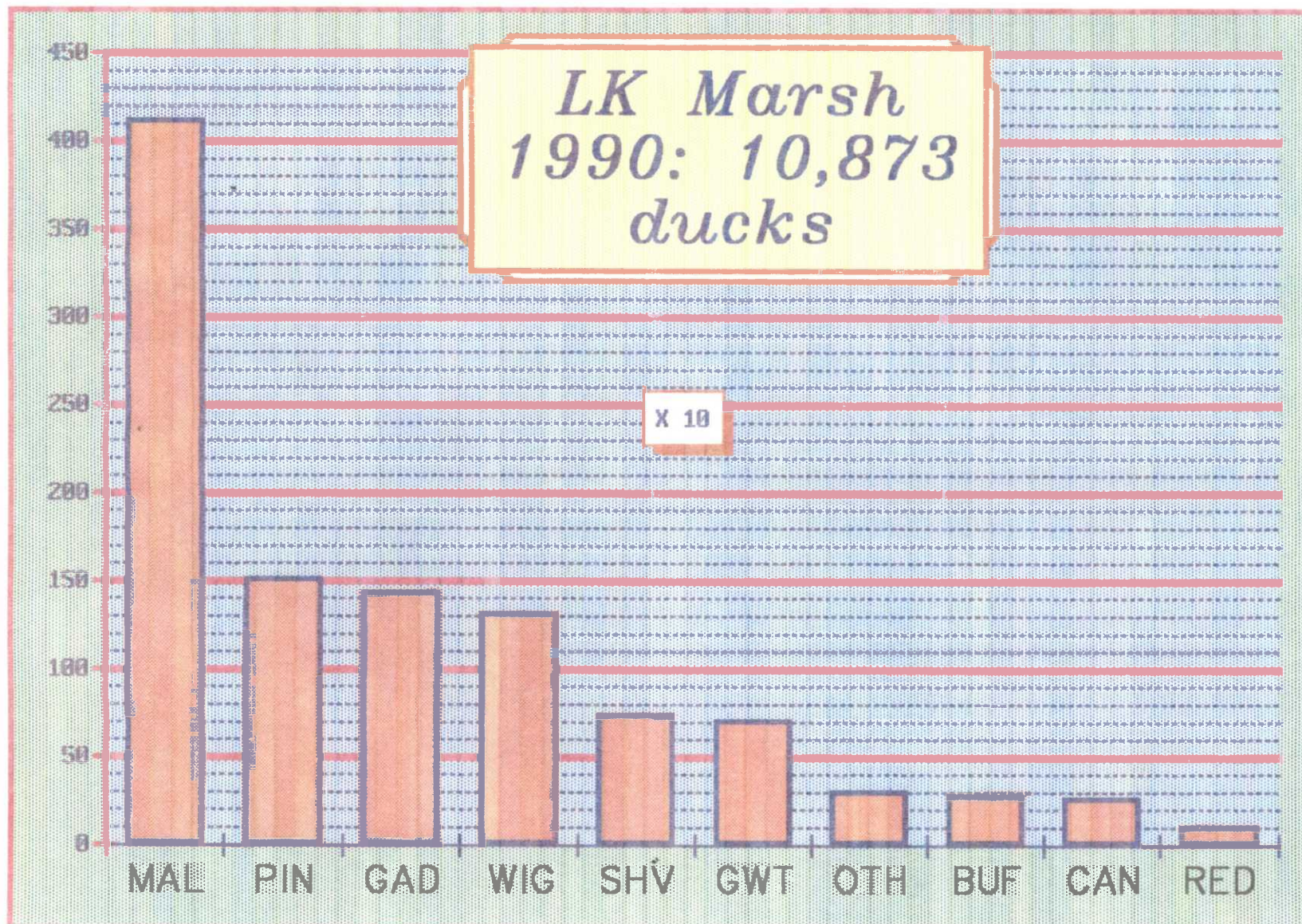


Figure 7. Duck Harvest, Lower Klamath Marsh Hunt Area, 1990-91 Season.

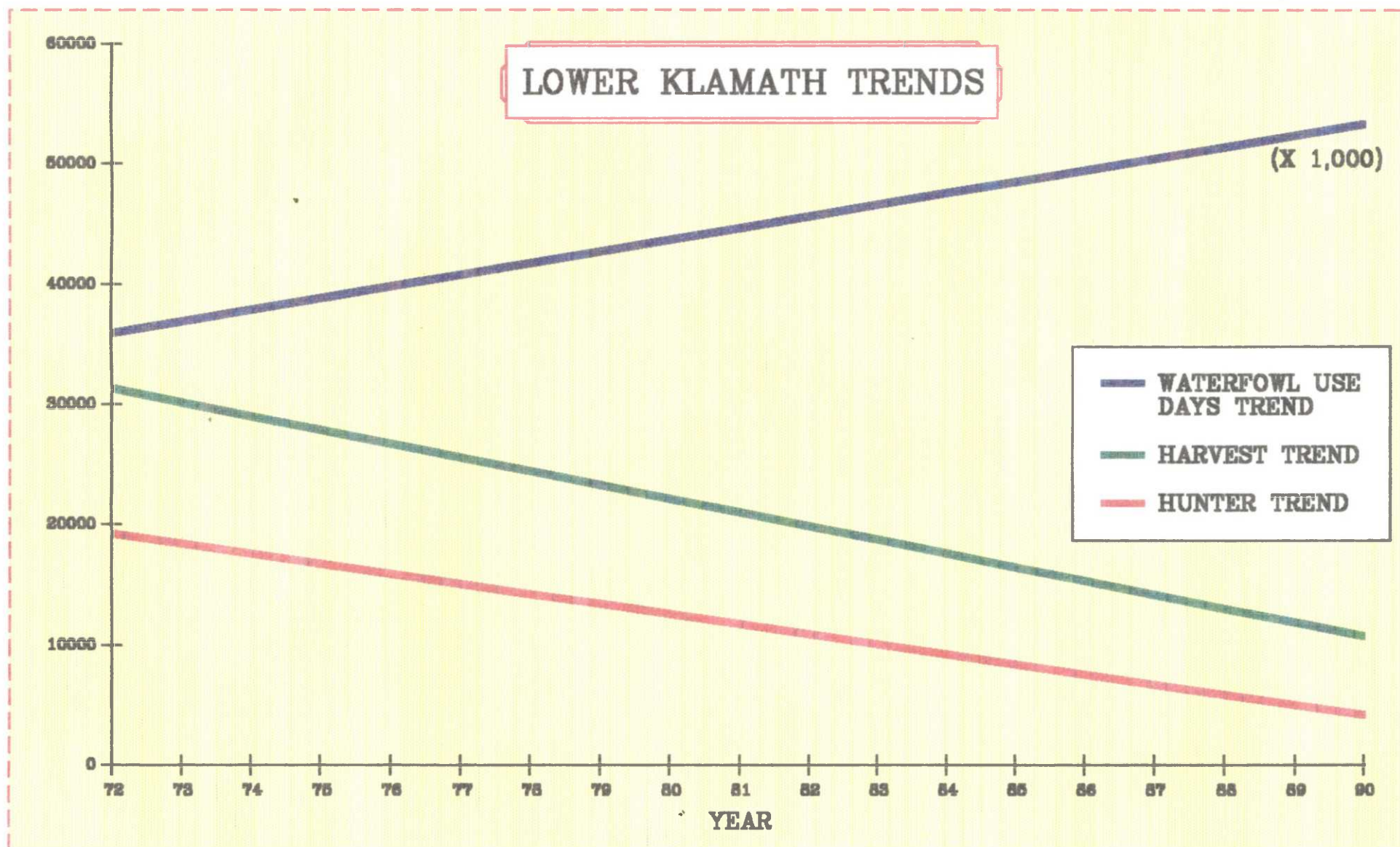


Figure 8. Comparison of waterfowl populations to hunting, Lower Klamath Refuge, 1972-90.

LK WATERFOWL MORTALITY 1990

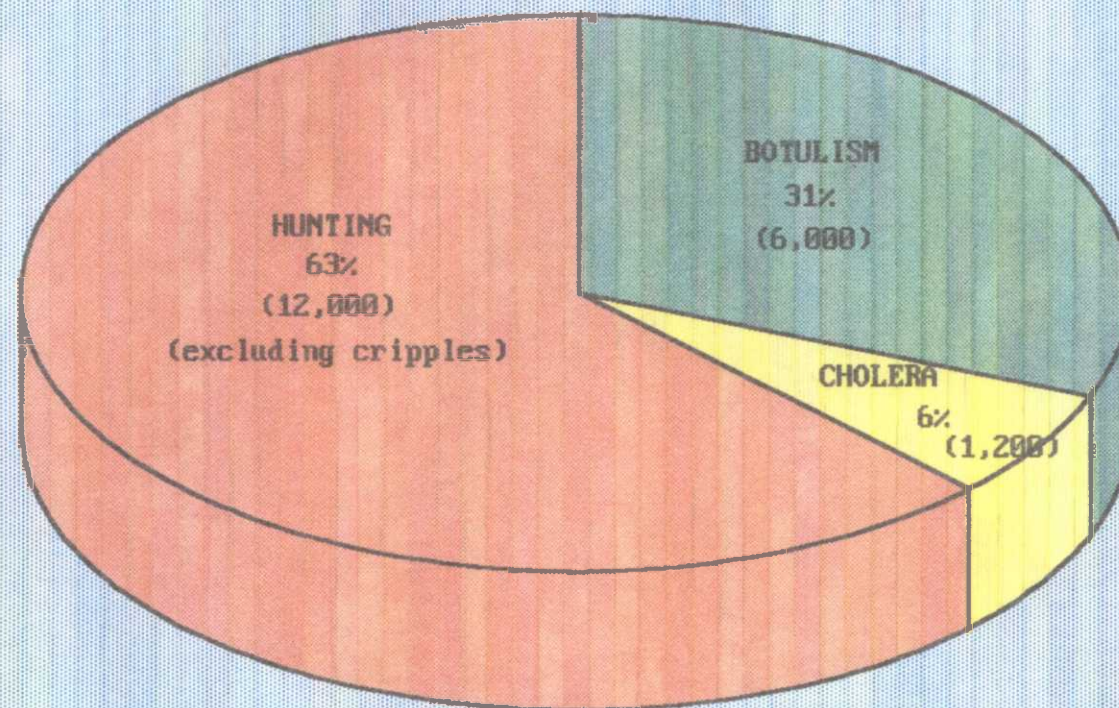


Figure 9. Waterfowl mortality on Lower Klamath Refuge, 1990.

10. Trapping

See Section G-15.

11. Wildlife Observation

This activity recorded 118,731 visitors this year, a 4% decrease.

12. Other Wildlife-Oriented Recreation



LK-90-14 New photo blind. WCK 12/90

Photography visits were tallied at 490, with experience levels running the complete gamut. Our photo blind, installed in August of 1989, was productive for 14 permitted photographers.

14. Picnicking

This activity occurs in conjunction with wildlife observation, hunting, and use of the tour route.

15. Off-Road Vehicles

ORVs are not a problem, except when the White Lake Unit freezes and 3- or 4-wheel ATVs show up.

17. Law Enforcement

LK-90-15 Dale Green bag checking waterfowl hunter AJS 10/90
on opening weekend.

Refuge officers wrote 21 cases this year. At this time, 2 have been dismissed (subjects could not be located), and 9 are closed resulting in \$1,510 forfeited.

The Straits Unit provided ample opportunities for giving/receiving assistance from Special Agent Harrington and the Oregon State Police Game Officers. Now that we have both mobile and portable radios with the OSP channels, cooperative enforcement efforts have increased and more violations are being detected and dealt with.

Special Agent Harrington cited 11 individuals on the Straits Unit this year during hunting season. These broke down as follows:

Take cackler o/o season	6
Take whitefront o/o season	2
Over limit (geese)	1
Toxic shot	1
Retrieving zone	1

Refuge Officer citations broke out as follows:

Trespass	1
Controlled substance	1
Over limit (ducks)	6
No federal stamp	1
No permit (opening weekend)	2
Take cackler	1
Take o/o season (ducks)	3
Take o/o season (white-front)	1
Toxic shot	3
Unauthorized route of travel	1



LK-90-16 ARPA violation; note human bones on surface. GAH 4/90

Each spring, we have problems with illegal excavation of known archeological sites. A burial site at Coyote Point seems especially prone to digging activities. Two individuals were cited for trespass in the area, but no ARPA cases were made. Again, the Refuge cooperated in an interagency task force with the BLM, Forest Service, and Park Service. Aerial reconnaissance flights were made, with ground teams located in various portions of the Basin. No citations were made.

I. EQUIPMENT AND FACILITIES

1. New Construction

A water transportation system designed to move Ady Canal water into Unit 1 fields 9 and 10 was completed in late May. Two thousand two hundred lineal feet of dike and drain were constructed along the south boundary of B/R Lot 43. Material from the drain was used to construct a 6' high dike with 12' top and 2/1 slope. The existing dikes along the east, south, and west sides were raised approximately 2'. Eighty feet of 24" flume was placed in the west end connecting with the Ady Canal outlet structure. One hundred thirty feet of flume was placed through the dike on the east end into Unit 1 field 10.

A concrete pad and wash rack were constructed on the south side of Lower Klamath shop, and open bay covered parking structures were built on each side of the vehicle storage building.

Four refuge draglines were moved into Unit 4B in early August to construct 8,000 lineal feet of dike, beginning at the syphon and paralleling the 4-6 dike south to the 4-7 dike, then extending east to the 4B-4C cross dike. Approximately 3,500' were completed before refilling the unit for fall waterfowl use. The remaining 4,500' will be completed in July. When completed, Unit 3 water can be used to service Units 4C, 7A, 8, 9A, and 12A,B,C without affecting the operating level of Unit 4B or the central canal which is used for drainage of private and lease lands east of the Refuge.

Approximately 10,000' of drain was dug in Unit 12C. The primary drain extends from the primary canal structure in the east end of the unit to the Unit 13 drain along the west side. Two secondary drains extending north for approximately 1,000' each and two drains to the south were completed. Unit 12C will be managed as a seasonal marsh for some time. In the past, the low areas could only be dried up by evaporation, which sometimes would take four weeks. The new drain system will speed up the evacuation of surface water from low areas and reduce the risk of botulism in the unit. Drains also provide brood water for young birds remaining in the area. Deep drainage or circulation of brood water can be achieved by using the Unit 13 pumping facility and spreading the water onto Unit 13.

The crew replaced the Unit 4-9 bridge in 1990. The decking and support timbers were breaking and deteriorating badly, and the bridge could no longer be used.

Dikes and CMP were placed in Miller Lake Unit south of Otey Island to allow water delivery and maintenance to seasonal marshes in that area.



LK-90-17 Unit 1 fields 9 and 10 wetland restoration project. GAH 6/90



LK-90-18 New islands in Unit 1. DM 7/90



LK-90-19 Unit 1 after floodup. AJS 10/90



LK-90-20 Lower Klamath shop improvement. GAH 12/90

2. Rehabilitation

The Model 8 (our senior dragline, 1941-1991) was used to clean 1.0 mile of the central canal, starting at the south end and working north. The north section was cleaned in 1987. The spoil was placed on the west bank, raising the dike and narrowing the canal so that smaller machines could be used to do the job in the future. After 50+ years of faithful service, the Model 8 would be very pleased to go into retirement, if replaced by a reliable CAT 225 extended reach excavator.

The Koehring #2 dragline was used to clean a 1.0 mile section of field drain in Unit 11A.

The 48" Waterman C10 headgate in the north dike Unit 11A was replaced, and a 48" headgate and 20' section of CMP in the east dike Unit 7A were repaired and reset.

The boat storage building was converted to our duck hospital, and all cages and facilities were moved from Tule Lake to Lower Klamath.

3. Major Maintenance



LK-90-21 Central canal cleaning. GAH 6/90

Other major maintenance projects completed included rocking road between Units 7 and 8, replacing Unit 7A pipe headgate in southeast corner, repairing dikes in Unit 2, Plumbing new duck hospital for water, etc.

Engineering located bench marks near all water control structures to allow placement of staff gauges on all units.

CLEAR LAKE NATIONAL WILDLIFE REFUGE

Tulelake, California

ANNUAL NARRATIVE REPORT

Calendar Year 1990

CLEAR LAKE

U. S. Department of the Interior
Fish and Wildlife Service
NATIONAL WILDLIFE REFUGE SYSTEM

CLEAR LAKE NWR - INTRODUCTION

Clear Lake National Wildlife Refuge, established in 1911, is the primary source of water for the agricultural program of the eastern half of the Klamath Basin with water levels regulated by the Bureau of Reclamation. Its 33,440 acres consist of 23,770 acres of water, surrounded by upland habitat of bunchgrass, low sagebrush, and juniper totalling 9,670 acres.

In addition to being a waterfowl migration area, Clear Lake hosts the largest nesting colony of white pelicans in California, as well as substantial numbers of other colonial nesting birds. The upland areas provide habitat for pronghorn antelope, mule deer, and sage grouse.



CL-90-01 General view of Clear Lake from WCK
the Clear Lake Hills.

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Willow Creek fencing project was completed in 1990 (see Section I-1).

Grazing evaluation studies were initiated in 1990 (see Section F-7).

Less than 30 white pelicans were fledged this year (see Section G-4).

B. CLIMATIC CONDITIONS

Above-average moisture in the first half of the year made up for the dry winter of 1989, and resulted in good growth of forbs and perennial grasses at Clear Lake Refuge. The below-average precipitation and snowfall reported between July and December is expected to be a problem for the 1991 water resources. Refer to Tule Lake Refuge Climatic Conditions section.

D. PLANNING

5. Research and Investigation

Contaminant Study - see Tule Lake Refuge, Section D-5.

F. HABITAT MANAGEMENT

1. General

Our primary management objectives include:

1. Provide migration, production, and molting habitat of suitable quality and quantity for waterfowl and marsh birds including colonial nesting species such as white pelicans, Caspian terns, egrets, and cormorants.
2. Provide habitat and protection for white pelicans (sensitive species) and bald eagles (endangered species).
3. Provide suitable upland habitat for sage grouse and pronghorn antelope.

The 33,440 acre Clear Lake Refuge consists of approximately 23,770 acres of water surrounded by upland habitat of low sagebrush, bunchgrass, juniper, and isolated riparian habitats.

2. Wetlands

Clear Lake serves as an irrigation reservoir, and water levels are manipulated by the Bureau of Reclamation solely for irrigation purposes. As a result, there is no active wetlands management program.

5. Grasslands

The U. S. Forest Service issues grazing permits in eight grazing allotments that include portions of Clear Lake Refuge around the perimeter shoreline of Clear Lake. The Forest Service has issued these permits in accordance with a 1955 Memorandum of Understanding between the Bureau of Reclamation and the Forest Service.

A 1977 Cooperative Agreement between the Bureau of Reclamation and the Fish and Wildlife Service specifies that Clear Lake Refuge will be administered by the Service and that leasing in this area for grazing will be by the Service and proceeds shall be retained by the U. S. Fish and Wildlife Service in accordance with 16 U.S.C. and 715s.

In 1989, we brought it to the attention of the Forest Service and Bureau of Reclamation that these agreements are in conflict. The Forest Service has continued to issue grazing permits through the years, including 1989, and has given proceeds to the Bureau of Reclamation.

The fencing at Clear Lake separating Service lands from Forest Service grazing allotments is in total disrepair. An agreement was negotiated with the Forest Service in 1990 to allow the Forest Service to continue issuing permits which include Refuge lands, with annual Service review and approval. The agreement has not been signed as of this date.

7. Grazing



CL-90-02 Cattle roundup off the "U". AJS 10/90

One Special Use Permit for grazing cattle within the 5,000 acre "U" was renewed for the fifth and final year of its agreement. A maximum of 600 AUMs were allowed and 561 AUMs were actually utilized at \$6.55 per AUM. The total cost of \$3,263.21 covered the period July 30 through October 22 during 1990. Normal period of use covered in the permit is from September 1 through November 15; however, cattle got around/through fences making an earlier turn on date this year.

The following three-part grazing evaluation study was initiated on the "U" during 1990:

1. Productivity clip plots were used to better gauge the amount and quality of range plants available, and thus to arrive at an animal carrying capacity that would insure long-term sustained production of plants.
2. Condition and trend transects (Daubenmire Method) were established on 3 major plant communities to gather baseline information on canopy coverage, species composition, frequency of occurrence, and soil condition (erosion and litter).
3. Utilization surveys were conducted on 3 major plant communities to provide information for making adjustments in grazing use.

TABLE 1. Plant List of Species Encountered in Grazing Evaluation Studies,
"U" Grazing Unit, Clear Lake NWR, 1990.

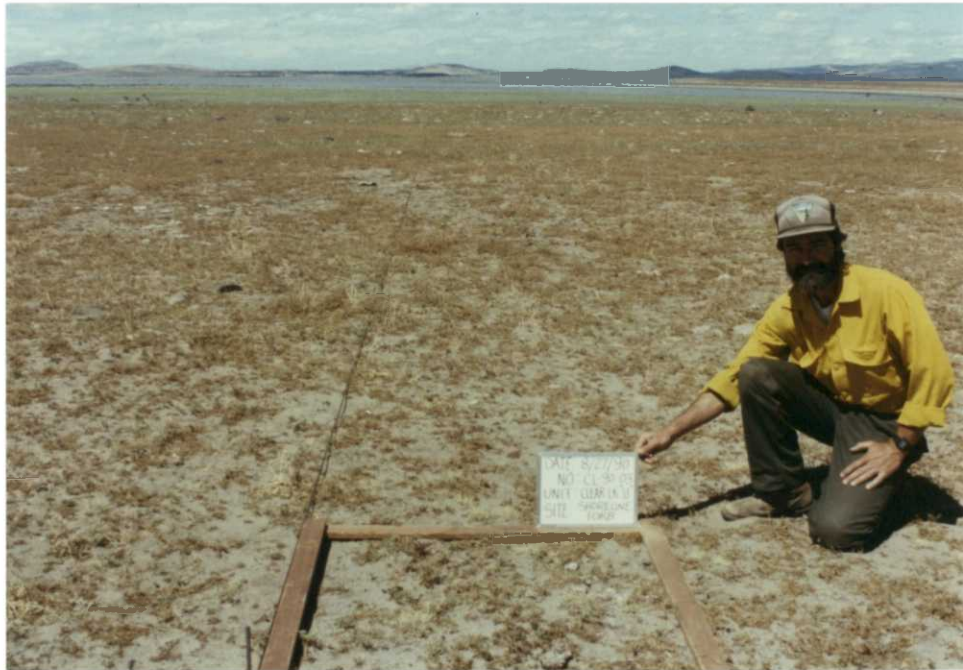
Family	Scientific Name	Symbol	Common Name
Boraginaceae	<i>Cryptantha ambigua</i>	(GRAM)	Forget-me-not
Caryophyllaceae	<i>Arenaria sp.</i>	(AR)	Sandwort
Compositae	<i>Artemisia arbuscula</i>	(ARAR)	Low Sagebrush
	<i>Blepharipappus scaber</i>	(BLSC)	Rough eyelash
	<i>Chyrsothamnus nauseosus</i>	(CHRA)	Rubber rabbitbrush
	<i>Chyrsothamnus viscidiflorus</i>	(CHVI)	Green rabbitbrush
	<i>Erigeron bloomeri</i>	(ERBL)	Daisy, fleabane
Cruciferae	<i>Sisymbrium altissimum</i>	(SIAL)	Tumbling mustard
Geraniaceae	<i>Erodium cicutarium</i>	(ERCI)	Storksbill
Graminae	<i>Agropyron spicatum</i>	(AGSP)	Bluebunch wheatgrass
	<i>Bromus japonicus</i>	(BRJA)	Japanese brome
	<i>Bromus marginatus</i>	(BRMA)	Perennial brome
	<i>Bromus tectorum</i>	(BRTE)	Cheatgrass
	<i>Cynodon dactylon</i>	(CYDA)	Bermudagrass
	<i>Festuca idahoensis</i>	(FEID)	Idaho fescue
	<i>Poa nevadensis</i>	(PONE)	Nevada bluegrass
	<i>Poa sandbergii</i>	(POSA)	Sandberg bluegrass
	<i>Sitanion hystrix</i>	(SIHY)	Squirreltail
	<i>Stipa thurberiana</i>	(STTH)	Needlegrass
	<i>Taeniatherum asperum</i>	(TAAS)	Medusahead
Hydrophyllaceae	<i>Phacelia sp.</i>	(PH)	Waterleaf
Juncaceae	<i>Juncus balticus</i>	(JUBA)	Baltic rush
Liliaceae	<i>Camassia quamash</i>	(CAQU)	Common camas
Leguminosae	<i>Astragalus sp.</i>	(AS)	Locoweed
	<i>Trifolium macrocephalum</i>	(TRMA)	Largeheaded clover
Onagraceae	<i>Oenothera tanacetifolia</i>	(OETA)	Evening primrose
Pinaceae	<i>Juniperus occidentalis</i>	(JUOC)	Western juniper
Polemoniaceae	<i>Phlox caespitosa</i>	(PHCA)	Phlox
Polygonaceae	<i>Eriogonum sp.</i>	(ER)	Buckwheat
	<i>Polygonum lapathifolium</i>	(POLA)	Smartweed, knotweed
	<i>Rumex sp.</i>	(RU)	Dock, sorrel
Rosaceae	<i>Fragaria virginiana</i>	(FRVI)	Wild strawberry
Scrophulariaceae	<i>Verbascum thapsus</i>	(VETH)	Common mullein
Umbelliferae	<i>Lomatium sp.</i>	(LO)	Desert parsley



CL-90-03 Though not as common as in the past, Great Basin wild rye still grows in isolated locations on the "U". AJS 7/90



CL-90-04 Soil erosion is quite obvious on much of the "U". AJS 11/90



CL-90-05 The shoreline forb plant community is especially important to pronghorn antelope populations. AJS 8/90



CL-90-06 The low sagebrush/bluebunch wheatgrass community is used by sage grouse. AJS 8/90

CLEAR LAKE NATIONAL WILDLIFE REFUGE

UNITED STATES
DEPARTMENT OF THE INTERIOR
R 6 E

MODOC COUNTY, CALIFORNIA
R 7 E

UNITED STATES
FISH AND WILDLIFE SERVICE

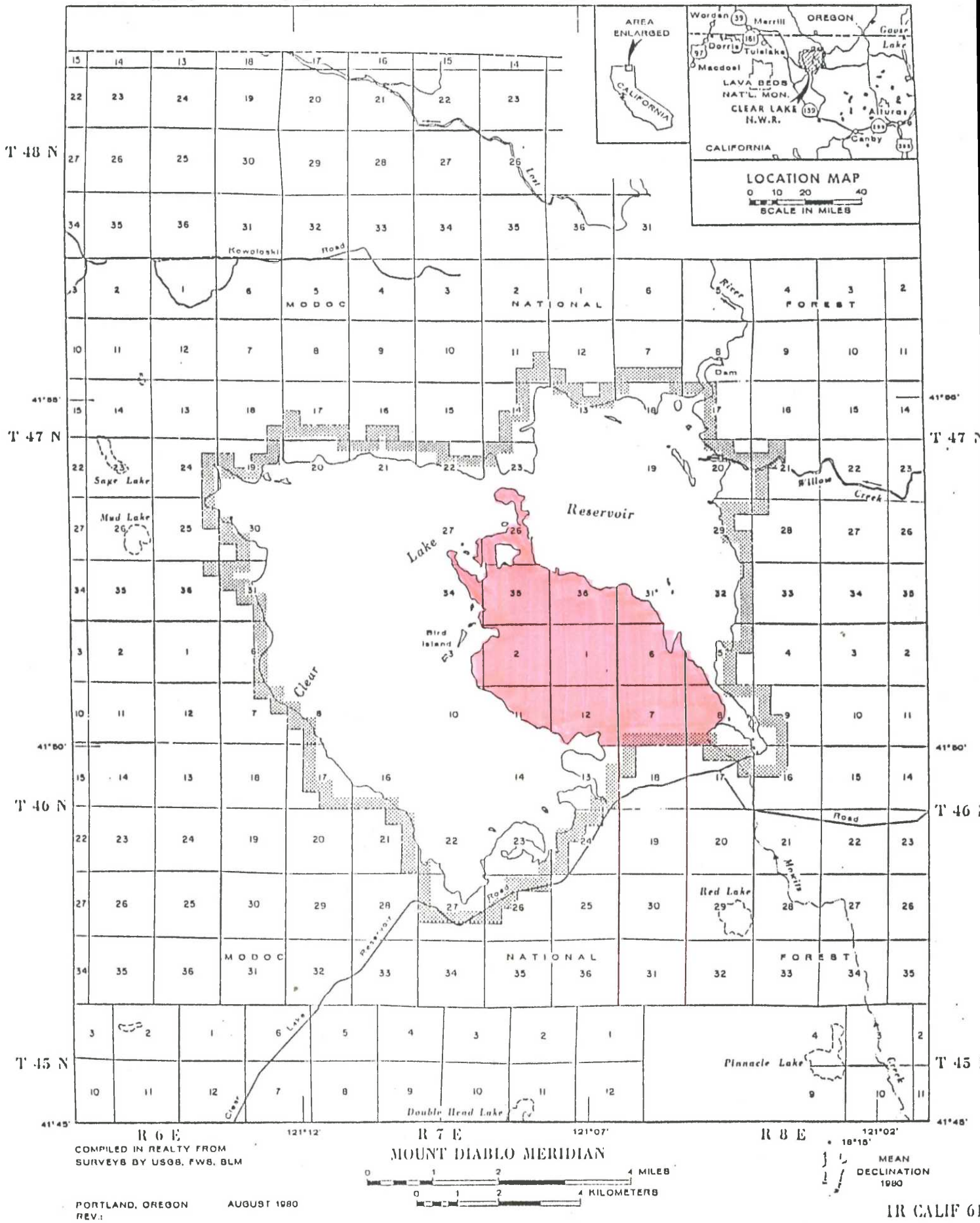


Figure 1. The "U" grazing unit, Clear Lake Refuge, 1990.

G. WILDLIFE2. Endangered and/or Threatened Species

There was no change in the status of the bald eagle, Lost River sucker, and short-nosed sucker.

Bald eagles were seen throughout the fall and spring months. Their numbers are meager compared with Lower Klamath or Tule Lake, and usually only 1 or 2 are seen at any given time. Our peak count was on March 1 when 4 were seen.

Mark Beuttner and crew of the Reno Fisheries Assistance Office set nets in Clear Lake to assess the status of Lost River and short-nosed suckers in the Clear Lake drainage. They found these fish in good numbers at the mouth of Willow Creek, but few were found elsewhere. Taxonomic studies continue on short-nosed suckers and apparent hybrids of that species to better describe those characteristics which are definitive of that fish. It appears we have an endangered species, but we're not sure what one looks like!

3. Waterfowl

Waterfowl maintenance totaled 302,500 use days in 1990. This was a 53% decrease from the 646,600 recorded the previous year, but in excess of that noted in 1988. The reservoir was at very low levels for much of the fall months. Canada goose use was somewhat depressed, probably due to the lack of fall rains and the resultant green forage normally available. Duck use was only about one third of that seen the previous year. Large declines were noted in spring pintail use and fall mallard use.

TABLE 2. Waterfowl Maintenance Use (Use Days x 1000)
Clear Lake Refuge, 1986-90.

Year	Duck	Goose	Totals
1986	59.0	188.7	247.7
1987	39.0	89.4	123.9
1988	118.5	113.8	232.3
1989	553.5	93.2	646.7
1990	214.6	87.9	302.5

The goose production news at Clear lake was both good and bad. We counted an increased number of Canada goose pairs (59 vs. 48), but we noted a much smaller brood size (3 vs. 4.25). The resulting production of fledged geese was down.

Duck pairs were down from 92 to 62 pairs. Mallard numbers duplicated 1989, but significant drops were seen in gadwalls and pintails. Nesting and fledging success was also down due to increased vulnerability to predation created by low water levels. Several islands were landbridged to the "U" peninsula.

TABLE 3. Five Year Production Trend for Waterfowl
Clear Lake Refuge, 1986-90.

Species	1986	1987	1988	1989	1990	Avg
Duck	330	322	406	136	79	255
Goose	110	92	85	130	93	102

4. Marsh and Water Birds



CL-90-07 The White pelican nesting colony is the largest in California. EJO

Water levels were low, but the primary white pelican nesting island was intact and not landbridged as were some other smaller islands. In early May, we estimated 1,750 pelican nests occupied. However, as at Lower Klamath, the very inclement weather toward the end of May apparently caused wholesale abandonment by the pelicans and less than 50 young were fledged. This is 1,000-1,200 less than in a good year. Double-crested cormorants nested on the same island, and these birds successfully fledged young. We estimated about 300 cormorants were produced.

Great blue herons and great egrets nested on the small rock islands east of the "U", and 30 heron nests and 40 egret nests were noted. This was 50% of the number seen the previous year.

5. Shorebirds, Gulls, Terns, and Allied Species

The Caspian tern colony at Clear Lake numbered 200 nests - down 33% from 1989. Most of the nests successfully fledged young. The colony island was landbridged just prior to fledging, but no significant predation was noted.

Ring-billed and California gulls again occupied the large rocky island near the dam. This colony has stabilized at about 5,000 nests the past few years.

There were large flocks of least and western sandpipers, dunlin, dowitchers, and yellow legs seen foraging at the periphery of the "U" during May. The low water levels apparently made some preferred feeding sites available to these species.

8. Game Mammals

CL-90-08 Antelope on the "U".

During the June 15 flight, 245 adult and 14 fawn pronghorns were noted on the "U". By September, we saw a higher than normal 800 antelope around the periphery of the lake and the "U", probably in response to severe drought conditions in the Clear Lake highlands. During the same September census, we also noted over 200 mule deer does and fawns using the "U" and Willow Creek areas.

10. Other Resident Wildlife



CL-90-09 Sage grouse booming. RCF

Ground counts of strutting sage grouse were conducted in March by the Klamath Audubon Chapter. Sixty-one strutting males were noted. This is apparently one of the few strutting areas still being used in the vicinity of Clear Lake.

H. PUBLIC USE

1. General

This Refuge is closed to public entry/use in spring and summer to minimize disturbance to nesting birds, particularly geese and white pelicans. Most visits occur along a U. S. Forest Service road which traverses portions of the south end of the Refuge.

Total visits for 1990 are estimated at 500.

8. Hunting

A estimated 200 waterfowl hunters used the Refuge this year. Access can be extremely difficult when there has been rain or snow; after freeze up, goose hunting on the ice can be productive.

A pronghorn antelope hunt is conducted on the "U" Peninsula the first weekend of the season, and on succeeding weekends until the quota of 10 bucks is taken. The State conducts the hunt, allowing only 5 hunters on the area at one time. Nine animals were taken the first weekend this year, and the hunt terminated.

11. Wildlife Observation

Species likely to be seen include pronghorn antelope, Canada geese, white pelicans, and a variety of passerines and shorebirds.

A permit was issued to the Klamath Basin Audubon Society in March to enter the Refuge and observe sage grouse on the lek located on the southeast corner of the "U" Peninsula. The group reported 61 males this year.

15. Off-Road Vehicles

This is a prohibited activity occurring in conjunction with artifact hunting.

17. Law Enforcement

Infrequent patrols of this Refuge only occasionally detect violations. Enforcement personnel from the Modoc National Forest alert us of prohibited activities seen during their regular patrols.

Artifact hunters have been and will continue to be the majority of violators. Gary Hagedorn detected two individuals who were probably looking for cultural resources; he did not see them actively searching and cited them for trespass. Water levels will probably drop to near or record levels in 1991; consequently, we have planned to patrol the area regularly during the "prime" pot hunting season in spring and early summer.

I. EQUIPMENT AND FACILITIES

1. New Construction

The Mammoth Springs area at the mouth of Willow Creek was fenced off from grazing in 1990. The construction was in cooperation with the Forest Service. We were able to tie into a contract which fenced off the riparian habitat along Willow Creek.

UPPER KLAMATH NATIONAL WILDLIFE REFUGE

Klamath County, Oregon

ANNUAL NARRATIVE REPORT

Calendar Year 1990

U. S. Department of the Interior
Fish and Wildlife Service
NATIONAL WILDLIFE REFUGE SYSTEM

UPPER KLAMATH NWR - INTRODUCTION

Upper Klamath National Wildlife Refuge is located on the northern tip of Upper Klamath Lake, approximately 20 miles northwest of the city of Klamath Falls in Klamath County, Oregon. Established in 1928 as a partial overlay on Bureau of Reclamation lands, its 14,947 acres consist almost entirely of marsh and open water which is accessible only by boat. Only 30 acres are classified as "upland" (some of which is pine forest) and include the site where the subheadquarters cabin is located. Included in this refuge is the 1,191 acre Hanks Marsh Unit, located on the southeast edge of the lake and about five miles north of Klamath Falls.

Water depths vary from several inches to six feet. There are no water control structures on the refuge. The Bureau of Reclamation, in agreement with the Pacific Power and Light Company, controls lake levels at the Link River Dam located 20 miles south of the refuge. Priorities for water level regulations, in descending order, are (1) domestic and municipal water, (2) irrigation, (3) Klamath River Fish Passage Agreement, (4) power generation, (5) flood control, and (6) recreation.

The marshes of both areas provide excellent nesting and brood-rearing habitat for waterfowl and colonial birds such as pelicans, herons, and egrets. They are also important as stopover areas for migrating waterfowl. Bald eagles and ospreys nest nearby and can sometimes be seen foraging in refuge waters.



UK-90-01 View of Upper Klamath Marsh with EJO
Harriman Peak in background.

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A. HIGHLIGHTS

Waterfowl maintenance and production were high during 1990 (see Section G-3).

B. CLIMATIC CONDITIONS

The year was colder and generally wetter than past years, with most of the moisture falling during the first part of the year. Refer to Lower Klamath Refuge Climatic Conditions section.

E. ADMINISTRATION

4. Volunteer Program

Joe and Gerry Sloss, a retired couple from Klamath Falls, contributed over 500 hours of volunteer time at this Refuge in 1990. We allowed them to park their RV at the Refuge cabin, and provided electricity and \$10/day subsistence. They made repairs to the cabin and garage, posted boundary, and made visitor contacts throughout the summer. As a result of their efforts, we have a much better idea on the types and quantity of visitor use at Upper Klamath.

F. HABITAT MANAGEMENT

1. General

Upper Klamath NWR is a 14,947 acre hardstem bulrush/cattail marsh located at the north end of Upper Klamath Lake. There are no Refuge water control structures. The Bureau of Reclamation, in agreement with Pacific Power and Light Company, controls lake levels at the Link River Dam located 20 miles south of the Refuge. Priorities for water level regulation, in descending order, are domestic and municipal water, irrigation, Klamath River Fish Passage Agreement, power generation, flood control, and recreation.

3. Forests



UK-90-02 Mountain pine bark beetle outbreak is occurring on portions of the uplands. AJS 8/89

A mountain pine bark beetle (*Dendroctonus ponderosae*) outbreak currently threatens pine trees and forests throughout Oregon. In the past 20 years the beetle population has steadily increased and has killed thousands of acres of trees which have been unmanaged or stressed by drought. Although the beetles attack all western pine species in this area, they prefer lodgepole and ponderosa pine. The adult beetles bore into these host trees and lay their eggs. Larvae feed on the inner bark in a horizontal direction, eventually girdling the tree. The beetles winter as larvae, maturing the following spring and summer. They then bore their way out of the host tree and fly off to attack new trees, thus repeating the cycle. The refuge has about 35 acres of forested habitat with some beetle damage. The primary species affected are ponderosa pine and lodgepole pine.

7. Grazing



UK-90-03 Northern extension unit. GAH 9/90

Approximately 2,360 acres of meadows and marsh in the Northern Extension Unit (Figure 1) were grazed by cattle to provide food for migrating waterfowl. One special use permit was issued, allowing 400 AUMs to be utilized through the period of August 10 through November 10. This year our permittee used 209.66 AUMs at a rate of \$5.00 per AUM. Refuge receipts totalled \$1,048.30.

UPPER KLAMATH NATIONAL WILDLIFE REFUGE

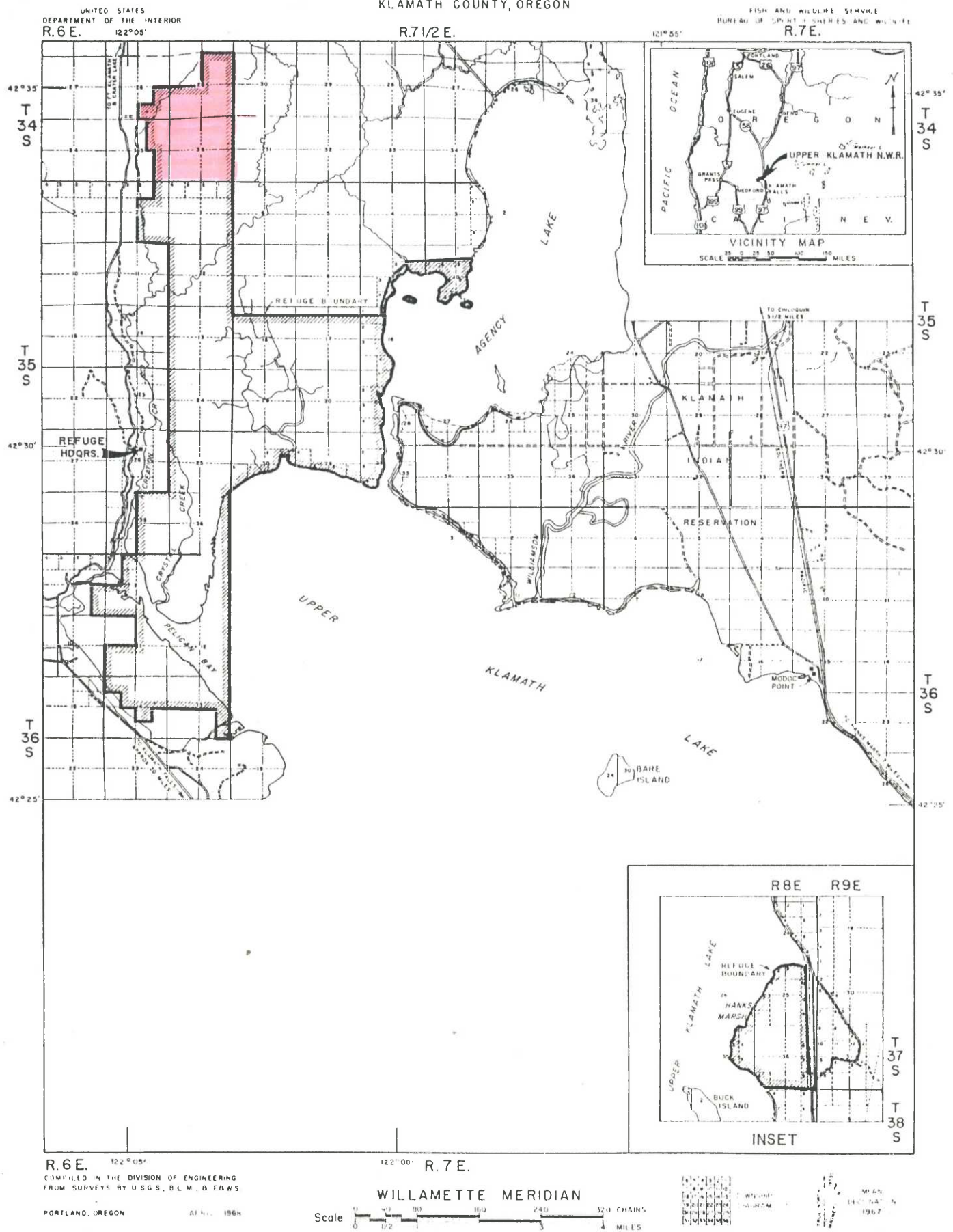


Figure 1. Northern extension grazing unit, Upper Klamath Refuge, 1990.

9. Fire Management

A reconnaissance helicopter flight over the marsh was made in cooperation with Winema National Forest. They have proposed a prescribed burn on a portion of USFS marshland adjoining and surrounded by USFWS marshland. The burn requires our cooperation and possibly a burn plan for a portion of the Refuge marsh. Also, the 1985 Fire Management Plan must be revised or amended to include the use of prescribed fire in the marsh.

G. WILDLIFE

2. Endangered and/or Threatened Species

There was no change in the status of bald eagles, short-nosed suckers, and Lost River suckers during the report period.

Bald eagles were seen foraging on and around the Refuge throughout the year. Concentrations are usually not large, and 2 to 4 individuals are normally seen. The peak number seen was 5 noted on December 5.

The spring fed creeks that flow through the Refuge have been found to be critical habitat for the endangered suckers during the hot summer months. This was especially true in drought periods like we experienced this past summer, as lake levels were quite low in late summer.

3. Waterfowl

Waterfowl maintenance was 12.1 million use days in 1990. This was a 95% increase over that seen in 1989. Spring use increased 33% (.4M vs. .3M) and fall use increased 113% (11.7M vs. 5.5M).

The tremendous increase in fall use was surprising considering the lack of water in the marshes. Apparently the drought throughout the area caused birds to concentrate on Upper Klamath Lake. Use on the lake was greatly increased as well as on the Refuge. We saw large rafts of mallards, pintails, shovelers, and scaup around the periphery of the marshes throughout the fall months.

Farming practices on Agency Lake (Tulana) farms were conducted in a way more beneficial to waterfowl for the past two falls; the new owner has reduced fall work of barley fields, and this food source has remained available throughout the fall. We've seen increased fall use by mallard, pintails, and white-fronted geese in the Agency Straits since this practice has been in place.

Upper Klamath Lake had some exciting numbers of waterfowl during the fall. The major species was the shoveler, with 250,000 of them on the lake during October. The peak number of waterfowl noted on Upper and Agency Lakes was 823,000 seen on October 19. Noteworthy peaks included 251,000 shovelers, 116,000 mallards, 159,000 pintails, 111,000 ruddy ducks, and 71,000 lesser scaup.

Although late season water levels dropped to very low levels, adequate water levels persisted through the nesting period. Most species of nesting waterfowl were up in number, and some spectacularly so. Numbers of breeding pairs and respective percent increases include Canada geese 471 (+147%); mallard 440 (+199%); redhead 593 (+246%); gadwall 220 (+47%); lesser scaup 99 (+36%); ringneck 149 (+2880%); canvasback 110 (+2650%); and coot 2475 (+534%). We were especially pleased to see the increased number of canvasbacks and ringnecks, back to near their former levels.

TABLE 2. Five Year Production Trend for Waterfowl
Upper Klamath Refuge, 1986-90.

Species	1986	1987	1988	1989	1990	Avg
Canada goose	750	394	631	562	989	665
Duck	1865	2647	2149	1360	2331	2070
Coot	1000	491	240	204	1114	610

Since 1989, we have calculated duck production using a survival index of .50 rather than .80, as had been used previously. This was the result of a brood survival study done recently at Lower Klamath NWR. We feel these figures are more realistic, and pre-1989 duck production figures should be reduced by 63% for comparison purposes.



UK-90-04 Wood duck nest box maintenance. JLH 5/90

4. Marsh and Water Birds

We again had no nesting by black-crowned night herons or great egrets in Hanks Marsh. We had previously thought water levels were too high in spring to allow nesting, but this may not be the case. There is a good amount of boating activity around this marsh, and some trespass does occur. This may be another contributing factor to the loss of this colony. There were 110 great blue heron nests on an island in the vicinity of the white pelican colony.

There were 160 pairs of white pelicans nesting on Upper Klamath along with about 600 pairs of double-crested cormorants. About 60 pelicans and 50 cormorants fledged from these colonies.

17. Disease Prevention and Control

An outbreak of avian botulism occurred in a portion of Upper Klamath Refuge known as Hank's Marsh. We picked up 348 birds in the marsh, with an estimated loss of 700 birds. Our pickup effort was confined to the deeper channels of the marsh due to the receding lake level. As a result, many dead birds were visible on the mud flats. At the time of the outbreak (late August-September), grain fields adjacent to the marsh were being harvested. This attracted large numbers of ducks to the area at an undesirable time. High ambient temperatures, a fluctuating water level, and a large concentration of ducks helped to create a substantial loss of birds at Hank's Marsh.

H. PUBLIC USE

1. General

Public use at Upper Klamath is limited to water-related activities. Waterfowl hunting, fishing, canoeing, and wildlife observation/photography are the only activities.

2. Outdoor Classrooms - Students

A few teachers from the Klamath Basin and Medford, Oregon, utilize the canoe trail for class activities. Aquatic investigations and bird identification are the basis for most classroom activities.

5. Interpretive Tour Route

An estimated 750 canoes plied the tranquil waters of the interpretive canoe trail this year. A brochure relates interesting facts about the marsh and its wildlife. Revisions to the brochure were begun this year, and a virtually all new edition will be printed next year. Maintenance of the trail and its signing is a cooperative effort with the Winema National Forest. Personnel from the Klamath Ranger District posted the trail with new Carsonite markers this year; hopefully the beavers will not find them as edible as the 4x4 posts previously used.

Personnel from the Forest Service approached us with a proposal for an interpretive hiking trail to be located on adjacent Refuge/FS lands near the Refuge cabin. Inasmuch as they will be providing most, if not all, of the funding, and we feel the project will be of benefit to visitors, the proposal was viewed favorably. Initial planning has been initiated, and the trail may be completed next year.

8. Hunting

Adequate water levels provided access to Refuge waterfowl hunt areas this year, and consequently, hunter use was up over last year. We estimate 1000+ hunters used the Refuge, with moderate success. There were over 60 vehicles counted opening day whose occupants were hunting the Refuge; bag checks showed an average of 2.46 ducks/hunter, primarily mallard and GW teal.

Refuge staff reviewed hunt area boundaries this year and concluded a "rearrangement" of the hunt area boundaries was in order. Removing hunting from the marsh west of Crystal Creek and the Refuge area of Pelican Bay will allow canoers to use the canoe trail in more safety; we will open an area south of the hunter access route from Malone Springs and add approximately 150 yards to the "strip" area around the south, east, and north sides of Four Mile Marsh.

9. Fishing

A very popular activity on Upper Klamath Lake and Refuge areas of open water, fishing once again recorded high levels of visitor use. Using data from the USFS concessioner at Rocky Point, and visitor contacts with our two volunteers, we estimate a total of 3,500 visits for fishing this year.

11. Wildlife Observation

The majority of Refuge visits are classified in this category. Most visitors use their own boats, although boats/motors and canoes may be rented from the USFS concessioner.

12. Other Wildlife-Oriented Recreation

We estimate some 150 visitors using the Refuge for photography.

13. Law Enforcement

Roger Johnson patrolled the Refuge during opening weekend of waterfowl season, and detected no violations. Special Agent Harrington and OSP Game Officers also patrol the Refuge. A law enforcement officer for the Klamath Ranger District conducts patrols adjacent to the Refuge and advises of unusual activity.

KLAMATH MARSH NATIONAL WILDLIFE REFUGE

Klamath County, Oregon

ANNUAL NARRATIVE REPORT

Calendar Year 1990

U. S. Department of the Interior
Fish and Wildlife Service
NATIONAL WILDLIFE REFUGE SYSTEM

KLAMATH MARSH

KLAMATH MARSH NWR - INTRODUCTION

Klamath Marsh National Wildlife Refuge is located approximately 50 miles north of the city of Klamath Falls, Oregon. U. S. Highway 97, joining Klamath Falls with Bend, passes approximately 7 miles west of the Refuge boundary. Silver Lake Highway bisects the Refuge east to west (Figure 1). Crater Lake National Park is 30 miles to the west, and the Refuge is surrounded by portions of the Winema National Forest and scattered privately-owned lands. The Refuge lies within the border of the former Klamath Indian Reservation and was established in 1958. Recent acquisitions have brought the total Refuge acreage to 37,616 (see section C-1).

The lands within this portion of southern Oregon are the product of successive volcanoes, glaciers, dry periods, and large inland lakes formed by geologic upheavals and melting glaciers. Mt. Mazama, whose cauldron holds Crater lake, erupted about 6,500 years ago and deposited a thick mantle of pumice over the entire area.

The Klamath Marsh area has been inhabited by forebearers of the Klamath and Modoc Indians since prehistoric times. In southern Oregon, wave-formed caves along the margins of lakes reveal evidence of man's use over the past 9,000 years. As a hunting and gathering society, a number of permanent and semi-permanent camp sites were established around the Marsh. Since that time, many of the Klamath Marsh lands were made part of the Klamath Indian Reservation, and remained so until the passage of the Klamath Termination Act of 1954, through which the reservation lands were sold to individuals and/or made part of the Winema National Forest and Klamath Forest NWR.



KM-90-01 View from Headquarters looking East RSC 8/90
along Upper Williamson River.

The Refuge is a very shallow basin formed by a pumice reef and rock sill. The large, shallow, natural bulrush/cattail marsh is surrounded by meadow and timberland which occupies an elongated, shallow basin in the Williamson River Drainage at an elevation of 4,500 feet. The long axis of the marsh is north and south, and extends for 17 miles. The main source of surface water is the Upper Williamson River. This is supplemented by several small springs and creeks which also flow into the marsh.

Proposed early development recognized the need to manage the water resource, and probably construct dikes, drains, pumps, and wells to accomplish this. The emergent marsh is in the late stages of eutrophication, and would need these features to change significantly. The recent acquisition allows improved water management capabilities on the north half of the Refuge.

Various soil types occur, and vegetative zones follow these types closely. Plant communities vary from submerged vegetation in open water, through emergent marsh and wet meadows to dry meadows and forested uplands. The diversity of these zones provides habitat types for a broad spectrum of wildlife within a relatively small area.

The basic objective of the Klamath Marsh National Wildlife Refuge is to preserve and enhance the marsh as a prime segment of the total wetland environment in the Upper Klamath Basin. Within this broad objective are the following specific wildlife and habitat objectives:

1. To develop the marsh to alleviate the critical shortage of wetland habitat within the United States.
2. To provide habitat for wildlife species of concern, threatened or endangered.
3. To provide habitat for nesting waterfowl with special emphasis on redheads, canvasbacks, and greater sandhill cranes.
4. To help provide sufficient spring and fall habitat for migrating waterfowl in the Pacific Flyway.
5. To maintain and enhance the wildlife habitat and diversity of the marsh.

The recent addition to Klamath Marsh enhances the opportunity for the Refuge to meet its objectives.

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K. FEEDBACK

L. INFORMATION PACKET

A. HIGHLIGHTS

Land acquisition agreements were finalized in 1990 (see section C-1).

Water rights issues remain unresolved (see section F-11).

Refuge staff on site (see section E-1).

B. CLIMATIC CONDITIONS

The end of 1990 was a particularly cold time for Klamath Marsh Refuge and the rest of the Upper Klamath Basin. Weather data summarized in Table 1 was gathered at the Chemult Ranger District weather station, a distance of approximately 20 miles north of the Refuge.

TABLE 1. Monthly Summarized Station Data (Chemult Ranger District), Klamath Marsh Refuge, 1990.

	TEMPERATURE (F)					PRECIPITATION (In.)	
	High	Date	Low	Date	Average	Total	Dep./Normal
JAN	55	8	- 1	3	26.5	2.82	-2.15
FEB	60	23	-20	14	26.4	1.48	.25
MAR	64	30	3	13	--	.96	-1.38
APR	--	--	--	--	--	--	--
MAY	68	5	20	8	37.5	--	--
JUN	88	22	22	1	54	.37	.63
JUL	95	16	27	3	63	.11	- .37
AUG	96	7	30	31	60.5	1.30	.59
SEP	90	11	28	26	57.6	0	--
OCT	83	1	12	17	44.1	0	--
NOV	61	12	12	2	30.8	.45	- .92
DEC	52	9	42	21	14.9	.32	-1.64



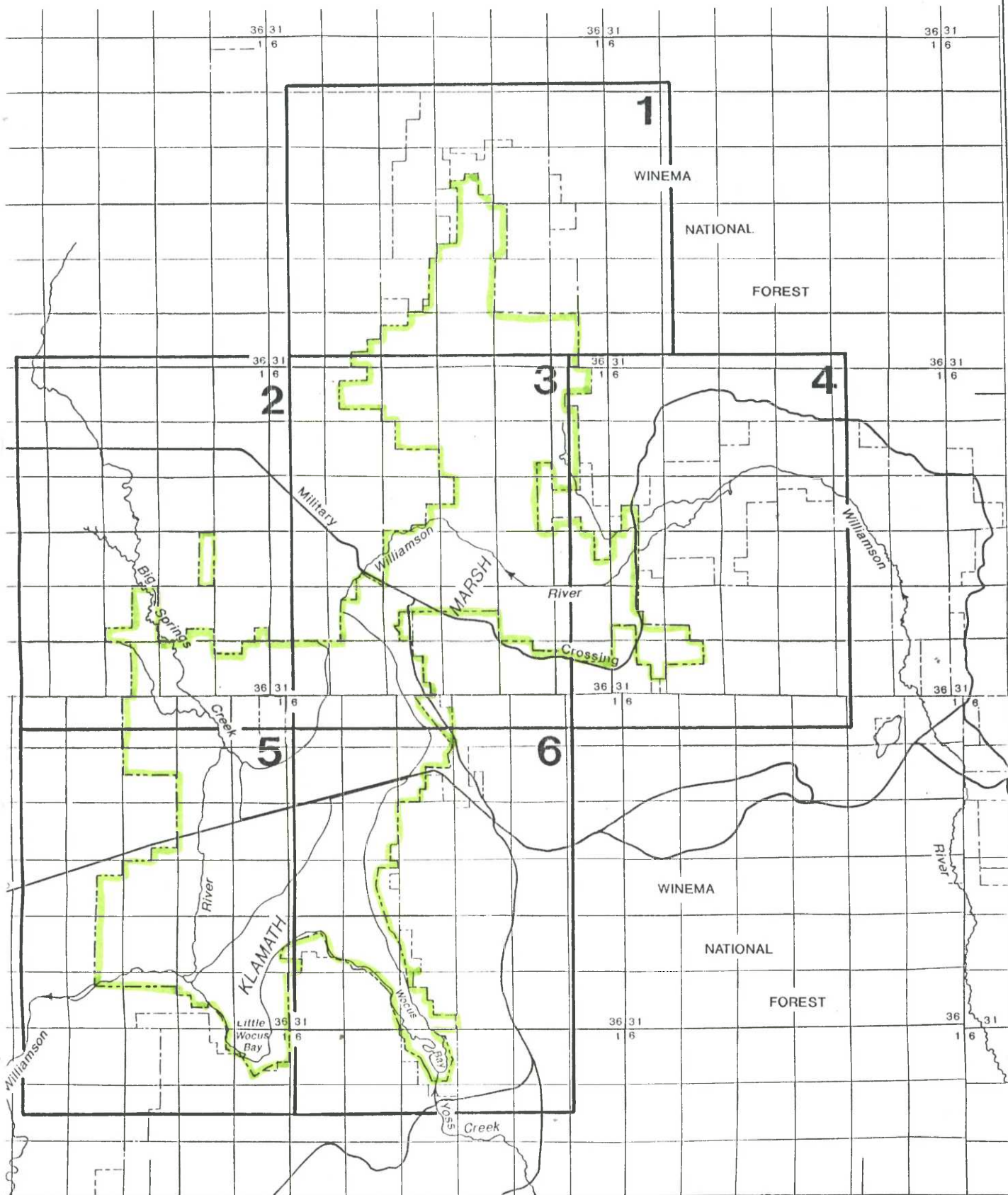
KM-90-02 It was a cold holiday for Refuge visitors RSC 12/90
in 1990.

C. LAND ACQUISITION

1. Fee Title

Phase II, the final phase of a two-year acquisition agreement with the Nicol Land Company, was completed on December 31, 1990. A total of 21,234.53 acres have been purchased from the Nicol and Horton ranches over the past two years (see Table 2). These lands were purchased using Land and Water Conservation Funds, and increase the total Refuge acreage to 37,616 (see Figure 2).

FIGURE 1. Klamath Marsh National Wildlife Refuge, 1990.



R 8 E 121°45'

R 9 E

R 10 E 121°30'

FROM
3LM, FWS

WILLAMETTE MERIDIAN

0 2 4 MILES

0 2 4 6 KILOMETERS

JANUARY 1990

True North
Magnetic N
18°

MEAN
DECLINATION
1990

1R ORJ

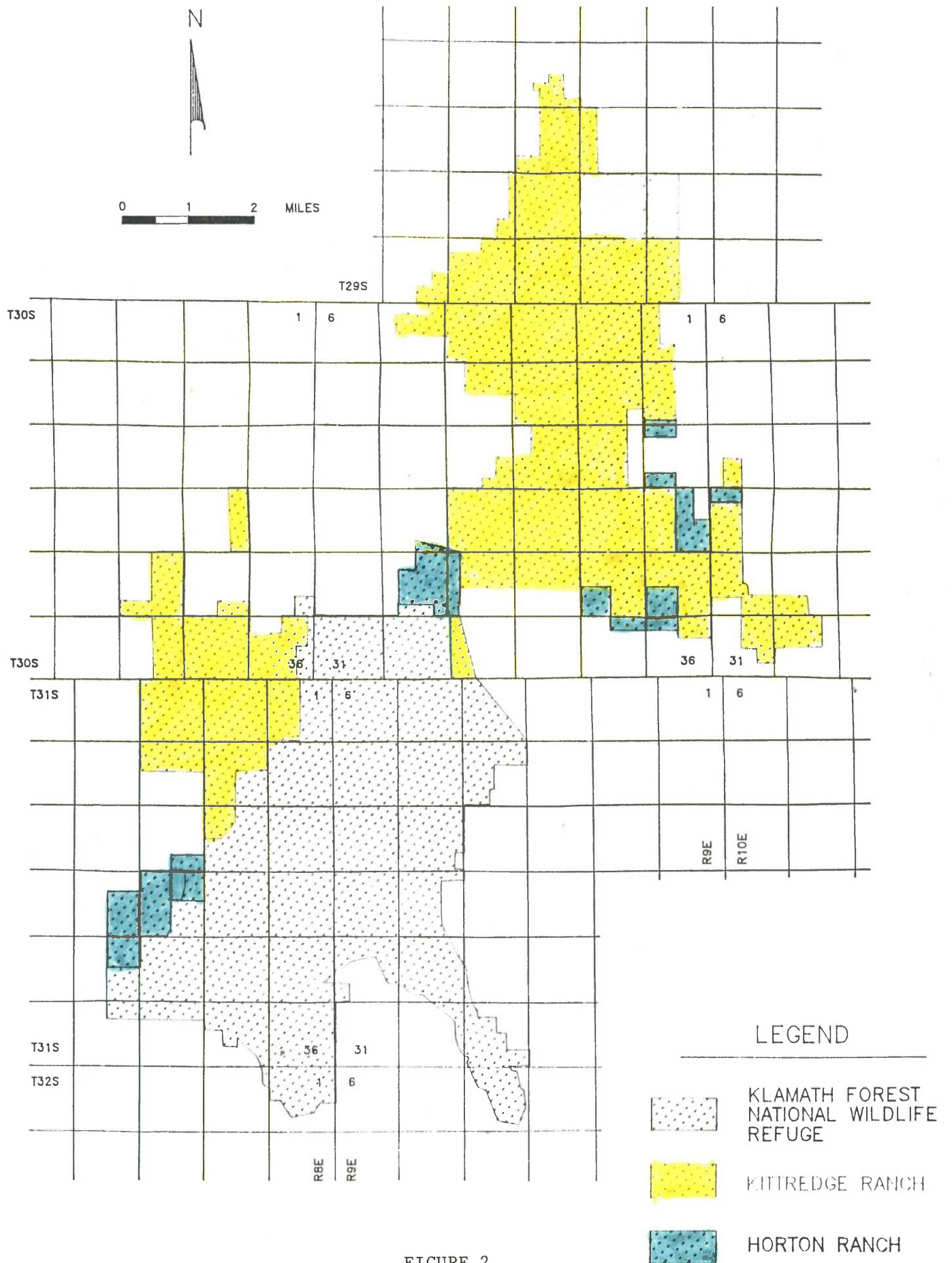


FIGURE 2.
LOCATION MAP

TABLE 2. Recent Acquisitions to Klamath Marsh Refuge, 1990.

Date Purchased	Cost	Acres	Seller
12/31/90	\$ 3,101,660.00	6,584.37	Nicol Land Co.
03/02/89	5,438,000.00	12,158.66	Nicol Land Co.
01/05/89	<u>961,853.00</u>	<u>2,491.50</u>	John C. Horton
Totals	\$ 9,501,513.00	21,234.53	

Other portions of the marsh have also been identified as potential additions (Figure 2). The Service intends to acquire them on a willing-seller basis if the owners wish to sell them at an appraised fair market value. Service appraisals have been conducted on parcels 1, 2, and 3. Appraisals have not yet been initiated on the remaining parcels because the owners have not demonstrated a willingness to sell (Table 3).

TABLE 3. Parcels Within Proposed Additions, Klamath Marsh Refuge, 1990.

Parcel #	Acreage	Owner(s)	Comments
1	760	Kenneth Knight	Service appraisal complete
2	120	Thomas Shaw	Service appraisal complete
3	320	Savannah Land Co.	Service appraisal complete
4	2,820	Mabel Schumaker	Not interested at this time
5	2,005	Tina & Bruce Emery	Willing to discuss further
6	560	Peachy Thomas	Possible land exchange
7	680	Marion Pinneo	Not contacted

The following is a chronology of the land status and acquisition history of Klamath Marsh NWR:

- 1841: When Oregon became a territory, the Indian rights by occupancy were recognized, but the title to the land remained in Federal ownership.
- 1864: The Indians signed a treaty ceding to the United States the title to all the land they claimed by nature of birth and occupancy, in trade for the title to a portion of the area held in trust by the United States for their exclusive use. This was called the Klamath Indian Reservation.

- 1954: The Klamath Termination Act of 8/13/54 (68 Stat. 718; 25 USC 564) as amended by PL 85-731 (8/23/58) and PL 86-247 (9/9/59), dissolved the Indian Reservation.
- 1960: Migratory Waterfowl Stamp Act Funds were used to purchase 14,641 acres of former Indian Reservation and 585 acres of privately-owned lands within the marsh (at a cost of \$32.53/acre), which became Klamath Forest National Wildlife Refuge.
- 1961: Most of the remaining 861,125 acres in the Reservation were sold to the U. S. Forest Service, forming the nucleus of the present Winema National Forest. The agreement to terminate the Reservation was not unanimous among the Indians. Four hundred seventy-four individual tribal members (23%) retained the rights to about 145,000 acres. These lands included about 1,190 acres known as Big Wocus Bay. This land was held in trust for the tribal members by the U. S. National Bank of Oregon.
- 1969: The Indians voted to terminate this trust agreement and sell Big Wocus Bay. The bank had two appraisals made, one for \$65,000.00 and the other for \$145,000.00.
- 1970: Bids for the sale of Big Wocus Bay were solicited, and the FWS appraised the property and bid \$105,000.00. This was the only bid received, but was rejected by the bank.
- 1976: The Tribe again wished to sell the Big Wocus Bay tract, with a minimum acceptable bid of \$168,000.00. Lack of funding prohibited the FWS from submitting a bid. The Nature Conservancy submitted a \$173,000.00 bid with the possibility of future reimbursement by the FWS. A local Klamath County rancher, John C. Horton, purchased the property with a high sealed bid of \$176,226.00.
- 1979: The FWS purchased the 1,190.49 acre Big Wocus Bay from John Horton in exchange for the following:
1. 239.89 acres of Refuge land
 2. \$319,700.00 (which included the value of 100,000 bf of timber that the FWS purchased to prevent from being logged)
 3. \$149,700.00 from a logging company which purchased approximately 500,000 bf of timber which were logged in 1982.

1989: The FWS purchased 2,491.5 acres from John Horton for \$961,853.00, using Land and Water Conservation Funds. This included the 239.89 acres the Service traded Mr. Horton for the Big Wocus Bay tract in 1979.

The FWS purchased 12,158.66 acres at a cost of \$5,438,000.00 from the Nicol Land Company in Phase I of a 2-phase purchase agreement.

1990: Phase II of the purchase agreement with Nicol Land Company was completed. A total of 6,584.37 acres were obtained at a cost of \$3,101,606.00.

D. PLANNING

2. Management Plan

An Interim Habitat Management Plan for 1991 was submitted and approved by the Regional Office in November of 1990. The Plan focuses on the operations of the Refuge in 1991 as they relate to habitat management. Special emphasis was given to grazing treatments and their use to achieve habitat management objectives.

Following are descriptions, objectives, and prescriptions for each of the 9 units (Figure 3). Past management activities would include CY-90 because of the FWS obligation under the purchase agreement to allow the former landowners to continue grazing through 1990. All objectives and prescriptions will serve as a guide for management during 1991, when the Refuge takes over complete operations of the acquired lands.

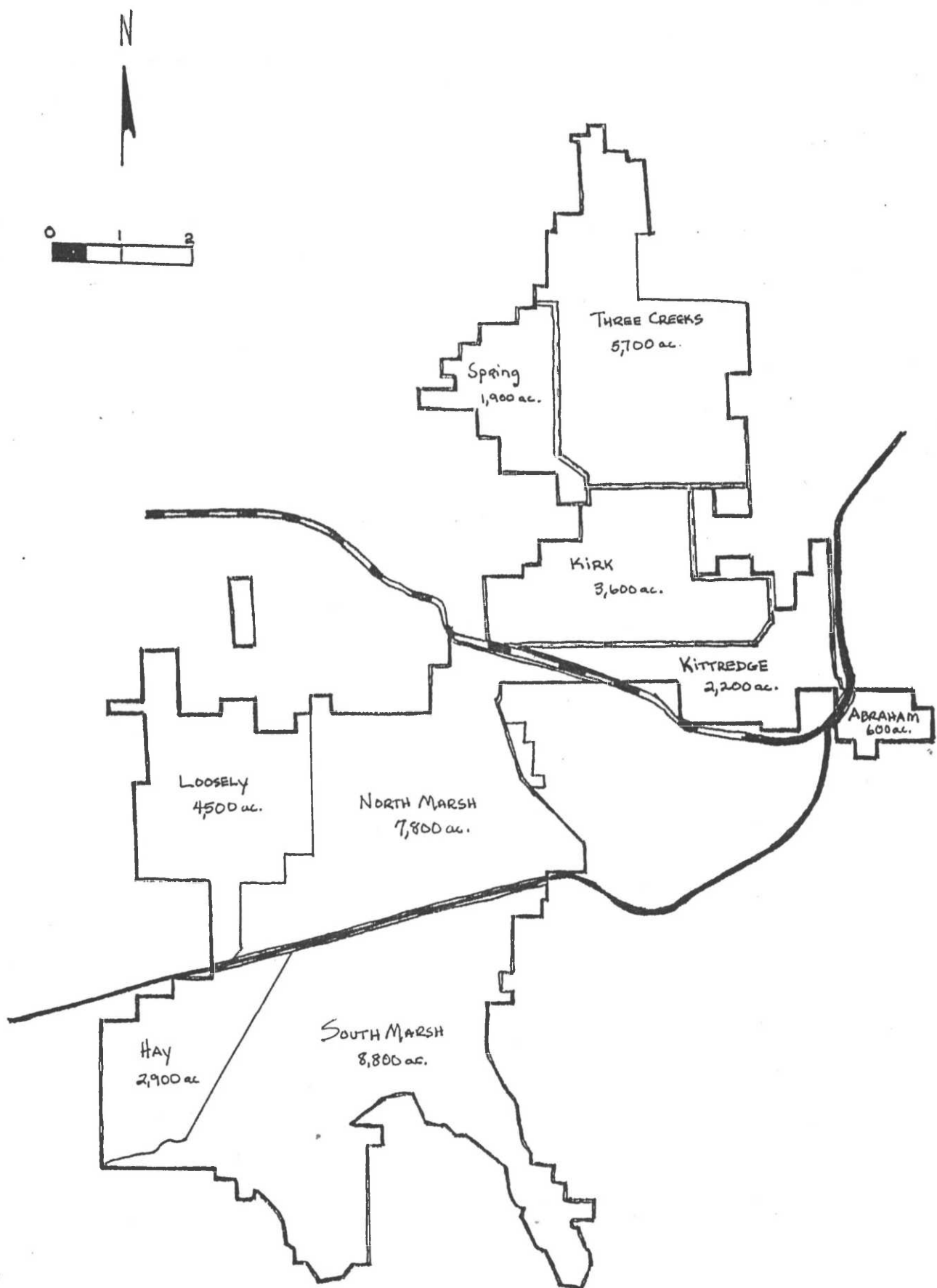


FIGURE 3. Unit Divisions on Klamath Marsh National Wildlife Refuge.

THREE CREEKS UNIT:

Description - This unit is approximately 5,700 acres comprised of about 2,000 acres of hardstem bulrush, cattail, and sedge dominated marsh, about 3,500 acres of upland grasses and sedge, and about 200 acres of mixed conifer and dry mountain meadow.

Water Source - Williamson River and annual snow melt.

Past Management - Dewatering of wetter sites via pumping to provide cattle pasture. Water removal complete by May 1. Well at Sagebrush Point provided stock water in late summer and fall. Approximately 15,000 AUMs grazed from May - November.

Management Objectives/Prescriptions

1. Provide permanent and seasonal marsh habitat for nesting and migrating waterfowl, sandhill cranes, and shorebirds. Establish a hardstem bulrush and cattail marsh to provide spring and summer forage and cover for resident elk.

Prescription: Construct several large nesting/loafing islands of approximately .25 acres each. This work must be completed by 1990, since the area will be too wet for equipment in 1991. Application for ACE 404 permit has been sent and project approval is pending.

Do not pump unit dry. Allow gravity flow of Williamson River water and snow melt to fill up this naturally low basin. An estimated 4,500 acres of this unit will be restored to wetland.

Removal of all cattle grazing. Without pumping, the majority of this unit will be under water. Areas that are not covered with water or saturated have been severely overgrazed. Removal of grazing from the permanent marsh areas will also reduce social competition and competition for forage between cattle and resident elk. Grazing will remain an option and will be used should it be determined the best technique to accomplish refuge objectives.

2. Provide nesting, roosting, and perching habitat for bald eagles.

Prescription: Coordinate with Forest Service to maintain the vigor of potential nest and roost trees both on and adjacent to the Refuge. This would include a plan to reduce the competition between understory lodgepole and existing ponderosa pine.

3. Establish riparian habitat along water delivery canals.

Prescription: Willows and other riparian vegetation will be established either by regrowth and/or by planting. If planted, cuttings from nearby willows will be used.

SPRING UNIT:

Description - This unit is approximately 1,900 acres comprised of about 1,700 acres of hardstem bulrush, cattail and sedge dominated marsh, and about 200 acres of mountain meadow and mixed timber habitat.

Water Source - Williamson River and annual snow melt.

Past Management - Dewatering of wetter sites via pumping to provide cattle pasture. Water removal complete by June 1. Approximately 5,000 AUMs grazed from May - November.

Management Objectives/Prescriptions

1. Provide permanent and seasonal marsh habitat for nesting and migrating waterfowl, sandhill cranes, and shorebirds. Establishment of a marsh will also provide spring and summer forage and cover for resident elk.

Prescription: Do not dewater unit. An estimated 1,500 acres of this unit can be restored to wetland.

Removal of all cattle grazing. Without pumping, the majority of this unit will be under water. Past grazing has prevented the regeneration of aspen stands along the west side of the unit. The vegetation in the upland areas needs time to recover so that nesting cover can establish. Grazing will remain an option and will be used should it be determined the best technique to accomplish refuge objectives.

2. Maintain and enhance nesting and roosting habitat for bald eagles.

Prescription: Coordinate with Forest Service to monitor bald eagle nesting activity.

Develop plan to maintain existing and potential nesting and roost trees.

3. Establish riparian habitat along water delivery canals.

Prescription: Willows and other riparian vegetation will be established either by regrowth and/or by planting.

KIRK UNIT:

Description - This unit is approximately 3,600 acres, almost all of which is dominated by sedges and upland grasses.

Water Resource - Williamson River and annual snow melt.

Past Management - A canal diverts the Williamson River around this unit. The meadows were irrigated periodically throughout the grazing season using river water. Approximately 6,500 AUMs grazed from May - November.

Management Objectives/Prescriptions

1. Provide seasonal marsh habitat for nesting and migrating waterfowl, sandhill cranes, and shorebirds.

Prescription: This was historically an area where the Main Channel and Cholo Slough spread out and formed sloughs and wetlands. This type of habitat can once again be created by using the present irrigation system. Summer water will be difficult to maintain, however approximately 3,000 acres of seasonal habitat will be established to compliment the permanent marshes in the Spring and Three Creeks units to the north.

Removal of all cattle grazing. The unit has been overgrazed and offers sparse nesting and escape cover for wildlife, and therefore will not be grazed in 1991. Grazing will be used in the future to provide habitat for migrating waterfowl, sandhill cranes, and other wildlife.

2. Establish riparian habitat along diversion ditches and canals.

Prescription: Willows and other riparian vegetation will be established by regrowth and/or by planting.

KITTREDGE UNIT:

Description - This unit is approximately 2,200 acres, 2,000 of which are dominated by sedges and upland grasses, and 200 of which are mixed conifer and mountain meadow. This was historically an area where the Main Channel and the Cholo Slough spread out and formed sloughs and wetlands.

Water Source - Williamson River and annual snow melt.

Past Management - A canal diverts the Williamson River around this unit. The meadows were irrigated periodically throughout the grazing season using river water. Approximately 5,000 AUMs grazed from May - November.

Management Objectives/Prescriptions

1. Provide seasonal marsh habitat for nesting and migrating waterfowl, sandhill cranes, and shorebirds.

Prescription: Summer water will be difficult to maintain. Approximately 2,000 acres of seasonal marsh will be established using water from Cholo Slough and the Main Channel. The existing irrigation ditches will be used to spread and maintain water for as long as possible.

Removal of all cattle grazing. The unit offers sparse nesting and escape cover for wildlife. Grazing will be used in the future to provide spring and fall goose browse and foraging areas for sandhill cranes.

2. Establish riparian habitat along Cholo Slough, the Main Channel, and diversion ditches and canals.

Prescription: Willows and other riparian vegetation will be established by regrowth and/or planting.

3. Maintain and enhance nesting, roosting, and perching habitat for bald eagles.

Prescription: coordinate with Forest Service to monitor bald eagle nesting activity.

Develop plan to maintain and enhance existing and potential nesting and roost trees.

ABRAHAM UNIT:

Description - This unit is approximately 600 acres, comprised of about 400 acres of upland grasses and 200 acres of mixed conifer and mountain meadow. This unit is a seasonally wet meadow. The date this unit dries up depends upon the amount of annual precipitation.

Water Source - Annual snow melt.

Past Management - Cattle were turned onto unit as soon as grass became available, usually in April. Approximately 500 AUMs grazed from May - June.

Management Objectives/Prescriptions

1. Provide seasonal wetlands for sandhill cranes and waterfowl from April - July.

Prescription: Removal of all cattle grazing. Unit has sparse nesting cover for sandhill cranes and waterfowl. Grazing will remain an option, should it be determined the best technique to achieve Refuge objectives.

Explore potential to develop a well to supply summer water.

2. Provide spring-summer-fall habitat for mule deer and pronghorn antelope.

Prescription: Maintain timber and mountain meadow habitat by reducing grazing and providing summer water.

3. Provide habitat for cavity nesters and small mammals.

Prescription: Develop a plan to protect and enhance snag, and dead and down woody debris components.

LOOSELY UNIT:

Description - This unit is approximately 4,500 acres comprised of about 4,460 acres of sedge and grass meadow and 40 acres of riparian willows that have been protected from cattle grazing.

Water Source - Big Spring Creek, Kane Spring, snow melt, and three artesian wells. Big Spring Creek originates west of the refuge boundary, but flows for about 4 miles within this unit. An unknown, but substantial amount of sub-surface water exists within this unit and surrounding area.

Past Management - As soon as it was dry enough, cattle were put on the unit, usually in May. Irrigation was accomplished using ditches off of Big Spring Creek, Kane Spring, and to some extent artesian wells. A pump out of Big Spring Creek also provided irrigation water. Approximately 13,500 AUMs grazed from May - November.

Management Objectives/Prescriptions

1. To develop, protect, and enhance the riparian and fisheries habitat along Big Spring Creek.

Prescription: Removal of all cattle grazing along riparian corridor and adjacent pastures.

Develop and implement a fisheries management plan to ensure and enhance the quality of brook trout habitat on Big Spring Creek.

2. Provide seasonal marsh habitat for nesting and migrating waterfowl, sandhill cranes, and shorebirds.

Prescription: Removal of all cattle grazing to allow vegetative cover to establish. The present irrigation system will be used to develop wetlands. Grazing may be used in the future to provide spring and fall habitat for migrating waterfowl and sandhill cranes.

Explore potential to develop sub-surface water.

NORTH MARSH UNIT:

Description - This unit is approximately 7,800 acres, of which about 6,600 acres are hardstem bulrush, cattail, and sedge dominated marsh, about 1,000 acres are sedge meadow, and 200 acres are mixed conifer and mountain meadow.

Water Source - Williamson River, Big Spring Creek, and annual snow melt.

Past Management - Approximately 400 acres are leased by the Refuge to grazing. The permit is issued for 400 AUMs from September - November. The remaining land in this unit was added to the Refuge with the acquisition. It totals about 800 acres. The grazing intensity was about 1,800 AUMs from May - November.

Management Objectives/Prescriptions

1. Provide permanent marsh habitat for nesting waterfowl, sandhill cranes, and other wildlife.

Prescription: The present condition of the marsh necessitates active management using a variety of techniques, including fire, grazing, and mechanical methods, to open up the dense stands of hardstem bulrush and cattail that have developed over the years.

2. Provide seasonal marsh habitat for waterfowl, sandhill cranes, and other wildlife.

Prescription: Continue present grazing intensity on leases G1 and W1.

Defer grazing in the 600 acre Military Field until September. Stocking rates will be 500 AUMs, with no more than 200 cow/calf pairs at any time.

3. Provide and enhance nesting and roosting habitat for bald eagles.

Prescription: Monitor eagle activity and develop plan to maintain nest and roost trees.

Remove all grazing from the South Crossing Field to protect timber and upland grass habitat.

HAY UNIT:

Description - This unit is approximately 2,900 acres dominated by sedge meadow and upland grasses.

Water Source - Williamson River and Sand Creek.

Past Management - A total of 960 acres were added to the Refuge with the acquisition. Approximately 1,500 AUMs were grazed from May - November. Of the remaining 1,940 acres in the unit, 400 acres have been leased annually by the Refuge for haying.

Management Objectives/Prescriptions

1. Provide spring and fall habitat for migrating waterfowl and sandhill cranes.

Prescription: Expand haying to include an additional 400 acres south and west of present operation. Design hay allotments to provide fire breaks in conjunction with prescribed burn plan.

Graze Horton Field (960 acres) with stocking rates of 1,250 AUMs from May - September, with no more than 250 cow/calf pairs at any time.

Graze hay allotments after cutting is complete and ample stock water is available. Stocking rate will not exceed 400 AUMs. Approximately 4 miles of fence needs to be constructed around hay allotments. Period of use will be approximately September 1 - October 15.

SOUTH MARSH UNIT:

Description - This unit is approximately 8,800 acres, consisting of about 5,500 acres of cattail and hardstem bulrush, about 1,000 acres of open water, 1,300 acres of sedge meadow, and 800 acres of mixed timber and mountain meadow habitat.

Water Source - Williamson River, annual snow melt.

Past Management - This entire unit was part of the old Klamath Forest Refuge. A grazing program was in effect during the early years of the Refuge, but was discontinued. Active habitat management has been minimal because of unresolved water rights issues and inadequate funding.

Management Objectives/Prescriptions

1. Provide permanent marsh habitat for waterfowl, sandhill cranes, and other wildlife.

Prescription: The present condition of the marsh necessitates active management using a variety of techniques, including fire, grazing and mechanical methods, to open up dense stands of cattail and hardstem bulrush that have developed over the years.

2. Maintain and enhance nesting and roosting habitat for bald eagle.

Prescription: Coordinate with the Forest Service to monitor bald eagle nesting activity.

Develop a plan to maintain existing and potential nesting and roost trees.

3. Provide seasonal marsh habitat for waterfowl, sandhill cranes, and other wildlife.

Prescription: Burn northeast portion of unit to remove residual/decadent vegetation in sedge meadow areas.

Construct fencing so that grazing may be used to augment prescribed burning program. Approximately 4 miles of permanent barbed wire and 2 miles of temporary electrical fencing need to be constructed.

The most critical problem facing the "old" Refuge over the last 30 years has been the inability to manage the water resource of the marsh to control plant succession. Over time, plant succession resulting from low water levels has reduced the open water acres that once existed, and lowered marsh productivity. These sustained low water levels are caused by upstream diversions of surface water and sub-surface depletion of the water table by an increasing number of wells in the surrounding area.

In the past, management of the north portion of the marsh (which includes the acquisition) included springtime pumping of water off of the low lying areas to encourage early forage for cattle. As the summer progressed, upstream water was used to irrigate pastures. As a result, the old Refuge has had an abundance of early spring water and a shortage of summer and fall water.

Projects to construct a complete water management system of dikes, drains, and control structures to manage water levels have been drafted and proposed for the past 30 years. Because of the prohibitive costs, however, these projects have never passed the planning stage. Meanwhile, the productivity continues to decline on a once productive marsh.



KM-90-03 Little Wocus Bay. Lack of water control on existing Refuge has contributed to accelerated plant succession and reduced productivity. RSC 7/90

3. Public Participation

Regional Office and Refuge staff met with representatives from the National Wildlife Federation, Audubon Society, Ducks Unlimited, Oregon Natural Resources Council, and Sierra Club to discuss future management plans of Klamath Marsh Refuge. The Habitat Plan for 1991 was sent to those present at the field trip, as well as to interested parties who were not in attendance, for comment.

4. Compliance with Environmental and Cultural Resource Mandates

Application requesting an ACE Section 404 Permit to construct nesting islands on Klamath Marsh Refuge was submitted in October, 1990.

An on-site cultural resource review was conducted on the Refuge in 1990. This was a general tour of the major cultural sites located on the Refuge, conducted by Refuge Staff Outdoor Recreation Planner Bill Kent, Regional Staff Archeologist Anan Raymond, and Klamath Tribe Cultural Resource Specialist Gordon Bettles. A more specific review focusing on the newly acquired lands will be conducted in 1991.



KM-90-04 Indian cremation site. WCK 5/90

6. Other

An on-site tour was conducted by Regional and Refuge staff regarding water rights, management planning, and future acquisitions.

E. ADMINISTRATION



KM-90-05 Ron Cole at Refuge Headquarters, AJS 1/90
Tulelake, CA.

1. Personnel

Ron Cole, Assistant Refuge Manager at the Klamath Basin Refuges headquarters in Tulelake, was reassigned as the Refuge Manager of Klamath Marsh Refuge. Ron and his family moved into Refuge housing at Klamath Marsh on August 1, 1990. This marks the first time that the Service has had on-site Refuge personnel at Klamath Marsh Refuge, and additional staff positions will be added as future funding permits.

3. Other Manpower Programs

The Chiloquin and Chemult Ranger Districts of the Winema National Forest were under agreement to provide fire protection on Refuge lands. The crews also accomplished project work on the Refuge, including staining the main house and duplex at the headquarters and posting the Refuge boundary.

4. Volunteer Program

Mary Paetzel of Grants Pass, Oregon conducted a plant survey on the Refuge. Her primary focus was on rare and endangered plant species. Though she did not find any species that were listed, she did identify and mount 25 species she found while surveying the hillsides and marsh edge around Big Wocus Bay.

Three volunteers from Roseburg, Oregon spent 3 days assisting with posting the Refuge boundary.

7. Technical Assistance

Refuge staff submitted comments regarding two planned timber sales on National Forest Service lands adjacent to the Refuge. These two sales, the Wild Analysis Area and the Willy Analysis Area, were each located less than 1 mile from the Klamath Marsh Refuge boundary.

The Wild timber sale included previously identified bald eagle nesting habitat, as well as potential eagle nesting habitat. Upon receiving comments, the Wild timber sale has been put on hold pending further analysis.

Refuge staff also assisted in marking part of Unit 7 of the Sandhill timber sale, located off of the 86 Road north of the Refuge headquarters. This harvest was a special cut designed to maintain the vigor and potential nest and roost trees for bald eagles.

F. HABITAT MANAGEMENT

1. General

The purchase agreement for the new Refuge lands allowed the former landowners to continue their cattle ranching operation through 1990. As a result, the Refuge did not take over operations and active habitat management of these lands until January 1, 1991.



KM-90-06 Cattle grazing continued through 1990. RSC 9/90

The Refuge has been divided into 9 management units. The approximate acreage of general habitat types in these units is shown in Table 4.

TABLE 4. Approximate Acreage of General Habitat Types, Klamath Marsh Refuge, 1990.

Unit	Perm Marsh	Seas Marsh	Timber/ Mt. Meadow	Total
Three Creeks	2,000	3,500	200	5,700
Spring	1,700		200	1,900
Kirk		3,600		3,600
Kittredge		2,000	200	2,200
Abraham		400	200	600
Loosely		4,500		4,500
North Marsh	6,600	1,000	200	7,800
Hay		2,900		2,900
South Marsh	6,500	1,300	800	8,600
Totals	16,800	19,200	1,800	37,800

2. Wetlands

Because the Refuge will not take over operations until 1991, the water delivery system of the acquisition was operated as it had been during previous years - to provide pasture and water for stock. This year was a particularly dry one, and it was difficult to maintain enough drinking water for stock, let alone irrigate pastures. Big Spring Creek had no measurable flow by the end of August. The Upper Williamson River was at about 20 cfs during this same period. The river channel at Military Crossing was essentially dry by September 1.

There is no evidence that shows the drought will not continue into 1991. By controlling the water system next year, the Refuge will be able to minimize the effects of the dry weather by allowing the river to flow into the Three Creeks Basin during the spring, rather than pumping the area dry to provide cattle pasture. This action would return the 6,000-8,000 acres of permanent and seasonal marsh habitat that historically existed prior to the agricultural diversions of the Williamson River.



KM-90-07 Three Creeks Unit was drained to provide RSC 6/90
pasture for cattle.

The acquisition allows for improved water management on the Refuge. The added control of surface water will allow the Refuge to revert the flows of Big Spring Creek and the Upper Williamson River back to their historic channels and sloughs that created Klamath Marsh.



KM-90-08 Aerial view of Three Creeks Unit. RSC 8/90

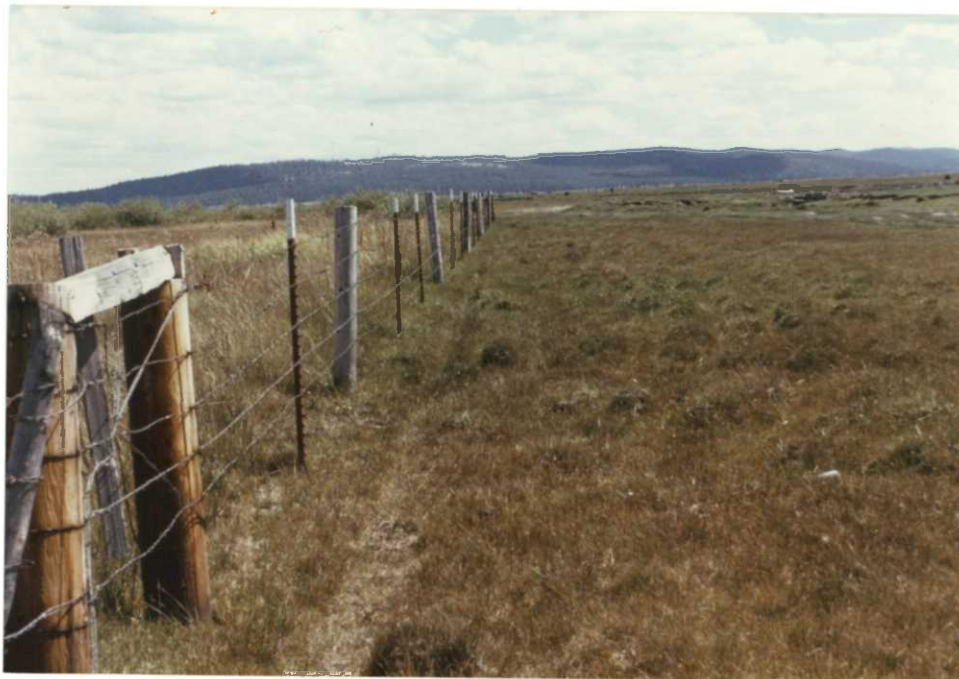


KM-90-09 Aerial view of Big Wocus Bay. RSC 8/90

3. Forests

Within the acquisition the Refuge acquired approximately 1,100 acres of timber and mountain meadow habitat, bringing the total on the Refuge to an estimated 1,800 acres. This is predominantly a lodgepole pine/ponderosa pine association.

The majority of timber and riparian habitat on the acquired lands received excessive grazing pressure over the past decades. These areas will be protected from grazing and enhancement projects will be implemented in 1991.



KM-90-10 Grazing has been kept out of area on left side of fence. Notice willow growth in background. RSC 6/90

The Refuge is bordered on all sides by the Winema National Forest. Several national forest areas adjacent to the Refuge have been identified and managed as bald eagle management areas. The Refuge has worked closely with the Forest Service to help achieve these management objectives. The main objective is to create a vigorous stand of open growing, large diameter branched trees to provide nesting and roosting habitat for bald eagles. This involves removing all lodgepole pine of merchantable size and leaving all ponderosa with nest and roost tree potential.

In recent years there has been an increased infestation of mountain pine beetles on the adjacent national forest lands, causing mortality among lodgepole and mature ponderosa pine. There is no evidence that the Refuge has suffered any infestation. The Refuge will continue to monitor forested areas for the earliest possible detection.

7. Grazing

Grazing on the lands formerly owned by the Nicol Land Company remained unchanged in 1990 from previous years due to the purchase agreement. Approximately 7,000 cow/calf pairs grazed on these lands from May - December. Table 5 shows the total AUMs grazed by unit in 1990.

TABLE 5. Comparison of Total AUMs Grazed by Unit, Klamath Marsh NWR, 1990-91.

Unit	Acres	AUMs	
		1990	1991
Three Creeks	5,700	15,000	0
Spring	1,900	5,000	0
Kirk	3,600	6,500	0
Kittredge	2,200	5,000	0
Abraham	600	500	0
Loosely	4,500	13,500	0
North Marsh	7,800	2,200	900
Hay	2,900	1,500	1,650
South Marsh	8,600	0	0
TOTALS	37,800	49,200	2,550

Grazing by Refuge permittees occurred as follows:

- a. **North Marsh Unit G-1 and W-1 Field** - A total of 480 AUMs grazed approximately 400 acres of seasonal wetland. The grazing period was August 14 - November 30. The total grazing fee collected was \$2,400.00, at a rate of \$5.00/AUM. The treatment objective is to maintain the current interspersed between open water, sedge, and emergent vegetation.

The permittee was warned again regarding opening gates to allow his stock to graze on adjacent Forest Service land. This is the second year in a row that the permittee was in violation of grazing trespass. Although his animals were only out for 2 days, he was "advised" that a third violation will result in the revocation of his permit.

- b. **Hay Unit (Horton Field)** - A total of 1,545 AUMs grazed approximately 800 acres of wet meadow. The grazing period was April 15 - September 30. The treatment objective was to maintain the sedge and grass component in a short, cropped condition to provide browse for Canada geese and spring habitat for migrating white-fronted geese and sandhill cranes.

Hay Unit (Hay Field) - A total of 282 AUMs grazed approximately 800 acres of hayed meadow. The grazing period was September 30 - November 1. The treatment objective was to clean up the cut grass hay remaining after the haying operation was complete. This area will shallow flood in the spring and provides migration habitat for white-fronts, cackling Canada geese and other waterfowl. It also provides spring and summer habitat for sandhill cranes and pronghorn antelope.

The total grazing fee collected for the Hay Unit allotment was \$13,500.00, at a rate of \$7.38/AUM. The permittee in this allotment was a former lessee of the pasture when it was a ranch. The AUM rate he paid the Refuge for 1990 reflects what he paid the former landowner to lease the same pasture. All of our grazing permittees have been notified that they will be charged this same rate for the 1991 grazing season.

Grazing will be reduced when the Refuge takes over operations in 1991 (Table 5). Because water is the most important tool available to affect and enhance marsh habitat, grazing will be removed on most of the Refuge so that water management may be used initially to restore and create wetlands. After wetlands have been established, grazing is one of several management tools which can be used to manipulate vegetation within marshes. Grazing will remain an option to be used to achieve habitat and management objectives.

Planned grazing for 1991 includes 4 grazing treatments:

- a. **North Marsh Unit (Military Field)** - A total of 500 AUMs will be used on approximately 600 acres of seasonally wet meadow. The grazing period will be September - November 15. The treatment objective is to maintain a portion of the sedge component in a short cropped condition to provide browse for Canada geese. Goose nesting occurs in the adjacent emergent vegetation to the south. Military Field will provide secluded browse and brood rearing areas for nesting geese.
- b. **North Marsh Unit (G-1 and W-1 Fields)** - A total of 400 AUMs will be used on approximately 400 acres of seasonal wetland. The grazing period will be September - November. The treatment objective is to maintain the current interspersed between open water, sedge, and emergent vegetation. This area is shallow flooded during the late fall and spring, and is used extensively by feeding waterfowl, sandhill cranes, and shorebirds. Nest surveys in the treated area have shown higher nest densities of

upland nesting waterfowl, particularly cinnamon teal, compared with adjacent untreated areas.

- c. **Hay Unit (Horton Field)** - A total of 1,250 AUMs will be used on 960 acres of seasonally wet meadow. The grazing period will be May - September 15. The treatment objective is to maintain the sedge and grass component in a short cropped condition to provide browse for Canada geese. This field offers a secluded area near nesting cover and within 1/2 mile of open water provided by the Williamson River.
- d. **Hay Unit (Hay Field)** - A total of 400 AUMs will be used on approximately 800 acres of sedge and grass meadow. The grazing period will be from September - October 15. The treatment objective is to clean up the cut grass hay remaining after the haying operation is complete. This area will shallow flood in the fall during an average water year, beginning in October, and can provide habitat for migrating white-fronted geese, cackling Canada geese, and American widgeon. The area also provides spring habitat for sandhill cranes, other waterfowl, and pronghorn antelope.

8. Haying

Harvest of native grasses for livestock forage is used as a management tool to create spring habitat for migrating waterfowl and sandhill cranes. One Special Use Permit was issued to hay Units A, B, E, F, G, H, and I (approximately 320 acres) on the west side of the Refuge, south of Silver Lake Highway.

Early in September, 251 tons were harvested, with a fee of \$5.20 per ton. After the haying operation was completed and when there was sufficient stock water available due to the natural rise in the water table, 282 AUMs grazed the hayed meadow to help clean up any remaining cut grass. The response to this treatment was excellent. We observed numerous white-fronts, cacklers and American widgeon using the area in the fall. We will continue to use this treatment in the future, providing the riparian component can be protected and the wildlife and habitat response remains favorable.



KM-90-11 Haying allotment. RSC

One of the concerns regarding the past haying operation is that many young willow sprouts have been cut each year. As a result, the further expansion of riparian habitat has been retarded. Next year we plan to have the permittees hay around these young willows. This will allow them to establish, as well as protect them in the event of a wildfire.

We plan to expand the haying operations in 1991 to include an additional 800 acres. This will bring the total area of Refuge meadow under a haying treatment to 1,200 acres, or about 6%. We will monitor wildlife use in these areas and rotate the hay treatments as wildlife and habitat response dictates.

9. Fire Management

The Refuge negotiated an agreement with the Winema National Forest to provide fire protection for the Refuge. Chiloquin and Chemult Ranger Districts each had crews assigned to areas that include the Refuge.

Crews from both districts spent time on Refuge project work. The two crews contributed 1,826 work hours and accomplished the following projects:

- a. Exterior staining of main house, duplex, pumphouse, and headquarters fence.
- b. Replaced signs/posts along "old" Refuge boundary.
- c. Posted 20 miles of "new" Refuge boundary.

On August 8, the Sugarpine Lookout dispatched the Chemult crew to smoke observed at the Pump Field. The fire was put out quickly. A total of .25 acres of sedge meadow was scorched. A severe lightning storm that passed over the Refuge the night before was the cause of the fire.

10. Pest Control

Continued overgrazing on many of the pastures has led to the establishment and spread of bull thistle. Water management to create wetlands will remove much of the problem in the low-lying areas, however, control of the bull thistle in the upland areas will have to be done using alternate methods.

11. Water Rights

The main sources of surface water are the Upper Williamson River, Big Spring Creek, Kane Spring, Sand Creek, and Mosquito Creek. Of the five, only Mosquito Creek flows seasonally; the others contribute water year round.

The Upper Williamson enters the Refuge via two natural channels, the Main Channel and the Cholo Channel. The Cholo Channel flows to the southwest, where it historically left its channel and spread into wetlands. The Main Channel enters the Refuge below the headquarters and ends at Rock Island, where it historically spread, forming wetlands with gravity flow to the north end of the marsh. When the north end of the marsh was full, water would overflow to the south, around the Peninsula, and once again form a channel at Military Crossing. South of Military Crossing, the river spreads out to feed wetlands north and south of Silver Lake Highway, finally forming channel and exiting the southwest corner of the Refuge. From here the river widens to form a pond at Solomon Flat, and continues to flow south to Kirk, where a lava flow forms a barrier. This natural dam restricts the Williamson flow enough to help create the wetlands that exist upstream.

Big Spring Creek flows through the Refuge for approximately 70% of its length. It is a continuously flowing spring-fed stream that is an important source of Refuge surface water. An electric pump located along the creek provides for additional irrigation capabilities. Kane Spring and Sand Creek are important toward maintaining wetlands on the Refuge.

Groundwater flows on the Refuge and surrounding area are significant, resulting in small springs, open water potholes, and artesian wells. The Refuge has four developed artesian wells; three in the Loosely Unit and one in the Horton Unit. Potholes in one area of the Loosely Unit are so numerous that about 40 acres were fenced off because cattle use was so dangerous. Domestic wells are located at the Summers house and headquarters facility. A third well that provides stock water in the Three Creeks Unit during the summer and fall grazing periods is located at Sagebrush Point.

Water levels were extremely low in 1990. By September 1, there was no measurable flow of the Williamson River at Military Crossing. According to locals, this is the first time they could recall such low flows since the 1940's.

As is always the case when water is at a premium, sound established water rights are critical. The Service obtained excellent water rights upon purchase of the acquisition.

Some of the water rights have been perfected - that is, they are certified, while some are still in the permit stage. All water rights, both certified and permit, were assigned to the Service when the purchase was finalized.

A request to perfect the remaining six water right permits has been filed by the Service. A State Water Right Examiner must complete a final proof survey in order to perfect the permits. Because of a large backlog of incomplete surveys, it is not anticipated that the permits will be certified earlier than 1992.

Meanwhile, to ensure proper perfection of the water rights, the Service is obligated to continue the following:

- Operate and maintain all identified diversions.
- Maintain any improvements necessary to distribute or contain water.
- Ensure water is applied to all areas to be irrigated as delineated on the application maps.

In September, 1990, the Oregon Water Resources Department filed a notice to begin adjudication of water rights of the Klamath River and its tributaries. The notice called for the filing of claims within the Basin by February 1, 1991.

On December 20, 1990, the United States filed a motion seeking a preliminary injunction enjoining the State from requiring the United States to file claims in the Klamath Adjudication. The preliminary injunction would provide for a short extension of the February 1 filing date.

One of the reasons behind the injunction is to resolve the question of the sovereign immunity of the United States against any adjudication of Federal rights by a state administrative proceeding. The United States contends that Federal rights can only be determined by the judicial proceedings of the court.

In the meantime, the Service is compiling information that will support our eventual claim to Klamath River water. Due to the limited time to make initial filings, the Service will use an additional approach. Using gauge height readings at Silver Lake Road, corresponding outflows at the USGS gauge at Kirk Reef, and aerial photography taken at different times of the year, a gauge height/marsh area table was developed (Table 6).

This table allows the determination of open water or saturated marsh associated with any observed gauge height. For example, when the water elevation for the marsh is 13.05 (i.e. 4113.05 ft.), the area of open water and saturated marsh is 9,876.74 acres.

The Service could use this information to file preliminary water claims for the Klamath Basin Adjudication as follows:

TABLE 6. Average Monthly Values (1955-89), Klamath Marsh NWR.

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Water lev	4512.98	4513.31	4513.53	4513.55	4513.70	4513.98	4513.97	4513.60	4513.41	4513.00	4512.72	4512.70
Acreage	9,650	10,860	11,650	11,750	12,290	13,350	13,270	11,920	11,220	9,700	8,650	8,600

In addition, 3 Stevens Type A Float operated water recorders were installed to help measure the amount of inflow of surface water onto the Refuge. Two recorders were installed at Military Crossing, measuring the river as it flows south, and one recorder was installed below the headquarters, to measure the Upper Williamson as it enters the Refuge. Dave Langman, Region 1 Staff Hydrologist, supervised the installations.



KM-90-12 Cole, Moore installing water gauge recording station below headquarters. DL 7/90



KM-90-13 Finished product. DL 7/90

There has been an increase over the years in the number of diversions out of the Upper Williamson River. Upstream diversions in particular affect the Refuge. This summer one ranch upstream ran a diesel powered generator and pump for 6 weeks straight, 24 hours a day, pumping water directly out of the river to irrigate cattle pasture. On August 3, the pump was found to be leaking diesel into the river. An estimated 150 gallons of diesel fuel spilled, coating the water surface with an oily film. The owner was directed by the Refuge to immediately shut down the pump, which he did. The leak was repaired and the pumping resumed two days later. There were no detected aquatic die-offs.

This type of diversion is common both upstream and downstream of the Refuge. If/when the Klamath Adjudication is complete, it is hoped the State will enforce the water laws and regulations that they are responsible for. To effectively monitor water use, they will have to establish recording stations along the river. To date, the State has been unwilling to do so.

Rather than diverting and altering the natural flow of water as past land use has dictated, it is the intent of the Service to return much of this area to its original state as a wetland. This type of water use will not involve any adverse effects regarding water resources, and will probably increase the quantity and quality of water for downstream users.

G. WILDLIFE

1. Wildlife Diversity

Klamath Marsh Refuge is considered one of the more biologically diverse of the Klamath Basin Refuges. The recent acquisition provides the Refuge with the opportunity for active water management. This will enable the Refuge to create a variety of habitats on thousands of acres, increasing Refuge bio-diversity.

2. Endangered and/or Threatened Species

There was no change in the status of the peregrine falcon and bald eagle during the report period.

Bald eagles are common throughout the year. Six bald eagle nests are located on or adjacent to the Refuge. Ten young eagles fledged from these 6 nests in 1990 (Table 7). The Refuge served as a cooperator with the U. S. Forest Service and the Oregon Cooperative Research Unit to access bald eagle production on and adjacent to the Refuge.

TABLE 7. Bald Eagle Nest Locations and History of Use
Klamath Marsh Refuge, 1978-90.

Site	'78	'79	'80	'81	'82	'83	'84	'85	'86	'87	'88	'89	'90
Lane		2	2	2	1	F	2	1	1	F	2	1	2
Three Creeks											1	1	2
Peninsula													1
Military Crossing								1	2	2	F	1	2
Kittredge			F	F	F	F	1	1	1	2	2	2	2
Wocus Bay W		AL	AL	AL	AL	AL	1	1	2	2	F	AL	NL
Wocus Bay E	2	F	F	F	1	F	AL	AL	AL	AL	AL	F	1
TOTALS	2	2	2	2	2		4	4	6	6	5	5	10

ABBREVIATIONS:

- 1, 2, 3 = Number of nestlings present when the nest was last observed.
 F = Failure
 AL = Alternate nest site; nest not used for nesting, but was one of two or more nests observed at an occupied site.
 NL = Nest not located.

Beginning in 1991, the Refuge will participate as a cooperator in the 1991 Midwinter Bald Eagle Count. With the acquisition of new lands, much of the habitat used by wintering eagles that have gone unsurveyed in the past will be surveyed for the first time next year.

In 1991, the Refuge will participate as a cooperator with The Nature Conservancy, Oregon Department of Fish and Wildlife, and the U. S. Forest Service, to conduct inventory work at Klamath Marsh for yellow rails (*Coturnicops noveboracensis*). The yellow rail is classified as a sensitive species for the USFS Region 6 and ODFW, and is a species that ODFW plans to petition to list as a State Threatened/Endangered Species.

Peregrine falcon sightings occurred at several locations on the Refuge, with four sightings in the Spring Unit and one in the Abraham Unit. Peregrines are known to nest 15 miles west of the Refuge at Crater Lake National Park.



KM-90-14 Bald eagle nest on Klamath Marsh Refuge. RSC

3. Waterfowl

Waterfowl maintenance was up in 1990. Total maintenance was 2.06 million use days - up from 1.8 million in 1989.

This year, much like a year ago, was a particularly dry one, and water availability for nesting and brood rearing was scarce. Many of the delivery ditches that normally provide some brood water were dry by mid-July. Duck and Canada goose production were calculated to be about the same as last year (Table 8). The primary nesting species of ducks included mallard, gadwall, redhead, ruddy, cinnamon teal, lesser scaup, and ring-necks.

TABLE 8. Five-year Production Trend for Waterfowl, Klamath Marsh Refuge, 1990.

Species	1986	1987	1988	1989	1990	Average
Canada goose	125	192	342	326	347	266
Duck	1,700	2,288	2,018	1,280	1,394	1,332
Coot	800	645	244	126	514	465

4. Marsh and Water Birds

A total of 46 pairs of sandhill cranes were observed on the Refuge in the spring. Thirty-two of these were observed in the Three Creeks and Spring Units. Nest search efforts were limited to 2 days; however, a total of 7 crane nests were located on approximately 140 acres in the sedge marsh/hardstem bulrush area north of the Peninsula. Upon rechecking, it was found that all 7 successfully hatched. Young birds were observed with adults on several occasions.

Most of the acquisition was dry by mid-May, so many nesting and brood rearing birds were susceptible to predation. It can be anticipated that when the Refuge takes over operations in 1991, nest success and survival of sandhill cranes and other water birds will increase, along with our inventory efforts.

White-faced ibis were observed on occasion during the summer. At present there are no nesting colonies of ibis on the Refuge, and these were probably non-breeding individuals. As marsh vegetation and permanent water develop, ibis may find Klamath Marsh a place in which to nest.



KM-90-15 Sandhill crane chick. RSC 6/90

A significant number of common snipe nest on the Refuge. Inventory efforts next year will provide production data on this species.

White pelicans were observed during the spring and summer feeding on the Refuge, particularly in Big Wocus Bay. As summer water is maintained next year in the Three Creeks Unit, we should see pelicans feeding there, as well. The drains and delivery ditches will provide an ample food source for all fish-eating birds, if sufficient water flows are maintained.

Approximately 15 miles of above-ground electrical power lines exist on the Refuge. Certain areas have shown a history of power line kills of pelicans, sandhill cranes, and great blue herons. The Refuge will work with the local power supply company, Mid-State Electric, to alleviate this problem.

5. Shorebirds, Gulls, Terns, and Allied Species

A colony of black terns nested in the South Marsh Unit. Long-billed curlews were observed in the spring and summer. The Refuge appears to be quite suitable for curlew nesting. Inventory efforts next year will better estimate total production of these species.

Other nesting species observed include willets, spotted sandpipers, and Wilson's phalaropes.

6. Raptors

No inventory efforts were made to estimate raptor use. Incidental observations include the following less common species:

Great grey owl	Long-eared owl
Goshawk	Prairie falcon
Peregrine falcon	Golden eagle

An effort will be made next year to inventory raptors and develop trend data. The Refuge has received volunteer commitments from several individuals to assist with transects and construct great grey owl nesting platforms on and adjacent to the Refuge.

Powerline kills of raptors have reportedly been a problem on the acquisition for many years. A particularly high rate of electrocutions of eagles and hawks has apparently occurred along the powerline which runs through the South Kirk Field. Elevated perches and insulators have worked well in reducing raptor electrocutions in the past, and the Refuge will work closely with Mid-State Electric to alleviate this problem.

8. Game Mammals

Pronghorn antelope, mule deer, and Rocky Mountain elk were observed throughout the spring, summer, and fall periods.

An estimated herd of 125 pronghorn utilize the Refuge and adjacent Forest Service and private lands.

Mule deer numbers have been on a steady decline over the past 15 years. The marsh lies within their summer range. Loss and degradation of key winter range, year-round hunting pressure by sportsmen, poachers and Tribal subsistence hunters have all contributed to the mule deer decline.

Rocky Mountain elk populations are increasing locally and throughout southeastern Oregon. Elk can be seen year-round on the Refuge. Forage and social competition between cattle and elk will cause elk to stay out of an area while cattle are occupying it. This competition was demonstrated when cattle were turned onto the Association and Three Creeks fields during the summer. Until cattle were present it was not uncommon to see elk foraging in these areas. Removal of cattle from this area in 1991 should result in an increase in elk use and extend the use period into the fall months.



KM-90-16 Elk in Three Creeks Unit. RSC 5/90

10. Other Resident Wildlife

There appear to be high numbers of ravens and coyotes on the Refuge, particularly on the acquisition lands. As previously mentioned, about 7,000 cow/calf pairs grazed annually on the former ranch. Each year approximately 150 cows and/or calves died of disease or natural causes, providing a food source for predators such as coyotes and ravens. As a ranch operation, thousands of acres of potential wetlands were dried up, providing habitat for what appears to be an infinite number of ground squirrels, yet another food source for coyotes and raptors. Many thousands of acres of private ranch land adjacent to the Refuge provide a similar food source for predators. These easy meals have turned many so-called predators into scavengers.

When the Refuge removes cattle and restores wetlands in 1991, much of the scavenging opportunities will disappear and cause a shift in the diet of some predators, particularly coyotes, possibly turning from cowhide and rodents to eggs and feathers. Waterfowl and waterbird nesting will increase dramatically, but will we just be setting the dinner table for species such as coyotes and ravens? This potential problem emphasizes the need to collect accurate production data to demonstrate the effects of predation on key species such as waterfowl and sandhill cranes.

11. Fishery Resources

Big Spring Creek, located in the Loosely Unit, has the potential to be restored to provide an excellent brook fishery. Excessive cattle grazing and summertime diversions have resulted in severe streambank erosion. Historical records indicate that willows and other vegetation lined the bank of this creek. Beaver dams and other natural barriers provided excellent habitat for eastern brook trout to flourish. Prior to intensive grazing, reports of catching 3-5 pound brookies were not uncommon.

The Refuge will work with Oregon State Fisheries biologists to conduct aquatic surveys to help develop a fisheries management strategy for Big Spring Creek and other potential fisheries on the Refuge.



KM-90-17 Intensive grazing along Big Spring Creek RSC 6/90
has resulted in severe streambank erosion.

15. Animal Control

The Klamath Tribe exercises trapping privileges through ancestral rights. No progress was made on negotiating an agreement for utilization of the resource.

The acquisition contains many miles of dikes and drains that are subject to muskrat damage. An assessment of damage will be done in 1991 to determine if a control program should be implemented.

H. PUBLIC USE

1. General

The majority of public use on Klamath Marsh Refuge occurs along the Silver Lake Highway, which bisects the Refuge. Travelers along this road are provided with good wildlife viewing opportunities, and are recorded for output purposes. An estimated 2,900 visits were made in 1990.

4. Interpretive Foot Trails

An opportunity exists to develop an interpretive foot trail along the Peninsula on Big Wocus Bay. The Public Use Plan for the Refuge will address the potential in further detail.

5. Interpretive Tour Routes

Opportunities to develop a combination mountain bike/cross country ski trail along the 690 road are currently being explored in cooperation with the Forest Service and the Klamath Tribe. This trail would use an existing Forest Service road and parallel the marsh along its eastern boundary down to Big Wocus Bay, then loop around Skellock back to the beginning at the FWS cabin. A natural bluff which overlooks Big Wocus could serve as an interpretive kiosk site. The information presented would be developed cooperatively between the Service, Forest Service, and Tribe, depicting wetland/forestland ecosystems and the historic role of the Tribe in the area.

6. Interpretive Exhibits/Demonstrations

The Silver Lake Highway has several turnouts which tourists now use to pull off and observe wildlife. An interpretive exhibit could be placed at each turnout to educate and inform those travelers who have time for a short stop along the road, but not enough time to drive on down to the interior of the Refuge. The Refuge is presently missing an excellent opportunity to inform the public.

8. Hunting

Approximately 15,000 waterfowl were using the Refuge on opening day. An estimated 64 hunters were on hand the opening weekend, killing 202 ducks and 35 geese on the first 2 days. Primary species taken were green-winged teal, mallards, widgeon, gadwall, and Canada geese.

Although these numbers pale in comparison to Tule Lake and Lower Klamath Refuges, the opportunity for success was quite good. This is mainly attributed to the uncrowded hunting conditions that exist. Additionally, when hunter numbers are few, hunter related conflicts are minimal. Most hunters come up the night before the opener and camp on adjacent Forest Service land. Shooting hours are all day, so many hunters opted for a morning hunt, mid-day siesta, and an afternoon shoot.

9. Fishing

Fishing is permitted in the borrow ditches along the Silver Lake Highway where it bisects the North and South Marsh Units. Although fishing has been a reported occurrence in the past, fishing was not observed this year.

The potential exists for fishing recreation along Big Spring Creek, providing aquatic survey data supports this activity, and it is compatible with Refuge objectives.

10. Trapping

The Klamath Tribe has trapping privileges through ancestral rights. No progress was made negotiating an agreement for utilization of the resource.

The acquisition lands contain many miles of water delivery ditches that are susceptible to muskrat damage. Muskrats have not been trapped on these areas for several years, and blowouts and ratholes are currently a problem. The Refuge will seek to fill a trapping permit next year to help control them.

11. Wildlife Observation

This activity accounts for most of the visitation, with the best opportunities along Silver Lake Highway, Big Wocus Bay, and Military Crossing Road.

17. Law Enforcement

Over the years, the distance from, and higher priorities at the other Refuges in the Complex, has resulted in little law enforcement being conducted by Refuge personnel at Klamath Marsh. What law enforcement there was occurred sporadically, and was patrolled by Service Special Agents and Oregon State Police game wardens.

This year one Refuge officer worked with the Oregon State Police during the opening weekend of waterfowl season patrolling the Refuge. Hunters were somewhat surprised to see anyone patrolling the area, yet showed their appreciation that someone finally was patrolling. An attempt was made during the first 3 weeks to contact every hunter possible. Contacts were made in the field and at hunt camps in the evenings. Most people contacted said they had been hunting the marsh for many years, citing the open space, lack of competition, and beautiful vistas as their reasons for returning each year.

One of the main law enforcement concerns on the Refuge is deer poaching. A problem with pursuing an investigation of a poaching incident is determining whether it is a subsistence hunt by the Tribe, or illegal poaching. The evidence left behind from either activity is identical; the methods used are one in the same.

The Tribe has expressed a concern over the decline of the mule deer population, and they have been openly critical of the deer management strategies implemented by the State. Yet, to date they have been unwilling to share with the Refuge data regarding subsistence harvest within the Refuge boundary.

The subject of subsistence use has been one of contention even after the Tribe's subsistence rights were upheld in Federal court. What has never been addressed adequately are the exact activities in which the Tribe can participate. Vague references have been written down such as "all those activities which are ancestral in nature". Activities such as the spring hunting and egg gathering of migratory birds are in direct violation of the Migratory Bird Treaty Act.

At present there is a public perception that the Fish and Wildlife Service is managing the Refuge for the benefit of the Tribe. This demonstrates the public relations problem that has developed over years of avoiding this issue. We must develop an agreement that specifically states what, when, and where subsistence activities are permitted.

I. EQUIPMENT AND FACILITIES

1. New Construction

The recent acquisition increased the exterior boundary of the Refuge from 32 miles to 81 miles. The Service contracted with a company from Portland, Oregon to survey the new boundary. The survey was to be completed by October, 1990; however, the surveyors encountered some problems and they will not complete the job until sometime next spring.

2. Rehabilitation

The main residence, duplex, pumphouse, and surrounding wood pole fence were painted.

5. Communications System

The nearest telephone line terminates 15 miles from the Refuge headquarters. Construction of a phone line is planned to begin in 1992, providing complete phone service by the end of that year.

A radio telephone was installed in August to serve as a temporary communication system until a phone system is operational. The unit was installed in the main residence, which currently serves as the office.

A desk top base station radio will be installed in 1991. This 100 watt unit will allow the Refuge direct radio communications with the Tule Lake headquarters, as presently no radio communication exists.

We have received authorization to program Oregon State Police and Winema National Forest frequencies into our mobile radios, and have established communications with these two agencies.

8. Other

All of the equipment and shop tools used by the ranch purchased in the acquisition remain on the Refuge. None of these items were acquired with the purchase. The Service is obligated, through the purchase agreement, to pay for the relocation of all the equipment and tools.

The majority of these items were critical to maintaining the water delivery system and facilities that are now property of the Service. When the Refuge takes over operations in 1991, active management will necessitate that the Refuge have at its disposal heavy equipment and other items in order to meet minimum management objectives. Although the Refuge is part of the Klamath Basin Complex, it is impractical to load a dozer or backhoe at Tule Lake and haul it 100 miles north to Klamath Marsh to fix a blown out structure or dike.

The necessary funds to purchase these items have yet to be obligated. The Service is currently exploring its options to purchase several equipment items and tools presently owned by the ranch. In the meantime, we are pursuing the possibility of leasing these items until such time as sufficient funds towards purchasing them are obligated.

A list of some of the items the Refuge is interested in purchasing follows:

Case backhoe, 1974	Northwest 25 dragline
Swaytamer trailer, 18'	John Deere 350 crawler/dozer
Caterpillar 12 grader	Chevy 3/4T pickup, 1978
cement mixer	Isuzu 27 generator
Ford flatbed dump truck, 1969	misc. shop tools

J. OTHER ITEMS

4. Credits

Ron Cole: A - J

BEAR VALLEY NATIONAL WILDLIFE REFUGE

Worden, Oregon

ANNUAL NARRATIVE REPORT

Calendar Year 1990

U. S. Department of the Interior
Fish and Wildlife Service
NATIONAL WILDLIFE REFUGE SYSTEM

BEAR VALLEY

BEAR VALLEY NWR - INTRODUCTION

Bear Valley National Wildlife Refuge is located 13 miles southwest of Klamath Falls, Oregon. It was established in 1978 to provide protection for wintering bald eagles. The Klamath Basin plays host to the largest wintering concentration of bald eagles (800+) in the lower 48 states. Eagles are attracted to the Basin by the large numbers of waterfowl which also winter here. Diseased, injured or weakened waterfowl provide a food source which is extensively utilized during the winter months. Bear Valley is one of four nighttime roosting sites used by these birds, and upwards of 300 eagles have used the roost at one time.

The refuge is currently 3,424 acres in size. The proposed final size is 4,198 acres. Habitat consists primarily of heavily timbered hillsides surrounding a timbered valley. Timber is primarily old growth ponderosa pine, Douglas and white fir, and incense cedar. The lower, drier elevations are a mixture of western juniper, ponderosa pine, bitter brush, and bunch grasses. Elevations range from 4,090 to 6,596 feet, with the average elevation being 5,000 feet.



90-BV-01 Bear Valley Refuge Bald eagle roost trees. RCF 5/80

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L. INFORMATION PACKET

A. HIGHLIGHTS

Underburning was completed on 60 acres of the Refuge in 1990 (see Section F-9).

B. CLIMATIC CONDITIONS

As has been recorded for the rest of Klamath Basin, it was a cold year in Bear Valley, with above average precipitation and snowfall. The first half of the year received above average moisture, which accounted for the bulk of this year's water resource. Refer to Lower Klamath Refuge Climatic Conditions section.

C. LAND ACQUISITION

1. Fee Title

Negotiations with Boise Cascade to acquire Tract 18-A are close to being finalized. Closing should occur on the tract early in 1991. The acquisition will add 774 acres to Bear Valley, bringing the total acreage of the Refuge to 4,198.

D. PLANNING

2. Management Plan

Prescribed fire plans were prepared for underburning at Bear Valley. See Section F-9 for details.

3. Public Participation

Prior to conducting prescribed burns at Bear Valley, a news release was issued detailing burning activities. We also went door-to-door to all local Refuge neighbors advising them of burning plans and soliciting response or problems. None were noted.

4. Compliance with Environmental and Cultural Resource Mandates

A formal Internal Endangered Species Section 7 Consultation was submitted and concurrence received for prescribed burning at Bear Valley.

5. Research and Investigations



BV-90-02 Kestrel nest boxes were put up as a part of a contaminant study (see Tule Lake Refuge Section D-5).

AJS 3/90

F. HABITAT MANAGEMENT

1. General

The habitat of Bear Valley consists primarily of heavily timbered hillsides surrounding a timbered valley. About 2,330 acres are classified as woodland, 1,092 acres as brush, and 2 acres as administrative land (access road). The drier sites on the south-facing slopes and lower elevations support a western juniper, bitter brush and bunch grass community. This gradually merges with a community dominated by ponderosa pine at about 4,600 feet elevation. On the north-facing slopes and at higher elevations ponderosa pine merges with incense cedar, Douglas fir and white fir. The timber consists of single or multi-storied stands, with each story generally even-aged. These timber stands make the area such a valuable roost site.

Bear Valley is a typical southern Oregon mixed conifer forest. The characteristics which make it an important eagle roost are: 1) its proximity to an abundant, dependable food supply; 2) the presence of suitable roost trees; 3) protection from inclement weather; and 4) lack of human disturbance. Changes in any of these characteristics can cause abandonment of the roost, which would increase stress on an already endangered species.

Suitable roost trees are large (2.5'-3' dbh, 90'-100' high), old (at least 200 years), have an open-branched structure capable of supporting the weight of many birds, and usually have a bare top (spike or snag). Previous landowners harvested all trees yielding an economic return. Regeneration was by chance, and areas burned by wildfire were not replanted. Favorable roost trees survived in spite of these practices.

The habitat management objective for Bear Valley Refuge is to perpetuate the roost area through management of old growth Douglas fir and pine trees. This will be accomplished by removing undesirable species such as white fir. Maintenance of the stand will be accomplished through mechanical or hand removal and prescribed fire.

9. Fire Management

Prescribed fire was used to reduce fuel loads and wildlife danger on Bear Valley Refuge. Through a cooperative agreement with USFWS, the Winema National Forest prescribe burned 60 acres on April 24, 1990. Due to drought conditions and heavy fuels in the burn unit, it was decided to postpone additional burning until conditions were more favorable. A fuels inventory has been completed, and will be summarized in 1991.

One 1/4-acre lightning fire occurred September 27, 1990. It was controlled by ODF under a suppression agreement.



BV-90-03 An example of pre-burn fuel loadings. GAH



BV-90-04 Burning heavy ground fuels. GAH



BV-90-05 With the city of Klamath Falls so close, smoke management is essential. GAH 11/89



BV-90-06 Habitat response after 1989 prescribed burn. GAH 5/90

G. WILDLIFE

2. Endangered and/or Threatened Species

There was no change in the status of the bald eagle during the report period. Peak use of the roost occurred earlier in winter than we normally see. The peak count was 116 noted on January 11. Earlier than normal flooding of grain fields and pastures in the area between Stateline Road and Midland provided considerable forage in the form of microtine rodents at this time. Bear Valley is the nearest roost site for eagles when they feed in this area.

There is one active eagle nest in Bear Valley; it has been continuously occupied for over 20 years. The pair was successful in fledging 2 young this year.



BV-90-07 Bald eagle pair successfully fledged two young this year.

H. PUBLIC USE

1. General

Public use of Bear Valley Refuge is prohibited totally from November to April to eliminate human disturbance to roosting eagles. Entry at other times of the year is generally by foot, due to road closures outside the Refuge enacted by the Oregon Department of Forestry or private/commercial landowners.

7. Other Interpretive Programs

Bill Kent was the chairman for the 11th Annual Bald Eagle Conference, held at the Oregon Institute of Technology on February 16-18, 1990. We co-sponsor this event with the Oregon Department of Fish and Wildlife and the Klamath Basin Audubon Society. Although some 450 people registered, a sudden, heavy snowstorm limited actual participants to about 300.

8. Hunting

Big game (mule deer) hunting is permitted on the Refuge during the designated State season. Due to the road closures mentioned above, hunter use is low.

11. Wildlife Observation



BV-90-08 Bald eagle night roost flyout count during the 11th annual bald eagle conference.

AJS 2/91

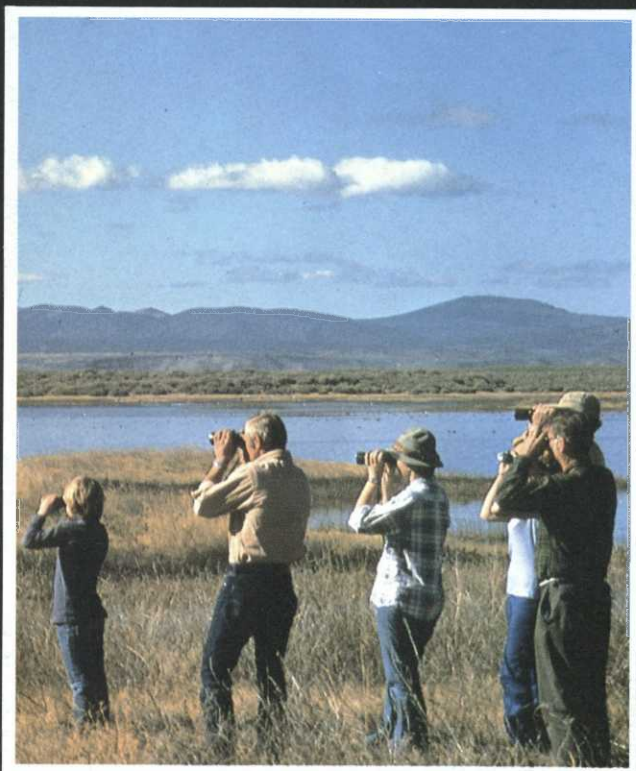
Visitors wishing to view eagles flying in or out of the roost are directed to a location outside the Refuge near Worden, Oregon. When a two-acre parcel outside the Refuge proper is acquired, an interpretive viewing site is planned.

17. Law Enforcement

Infrequent patrols are conducted throughout the year by Refuge personnel, Special Agent Harrington, and the Oregon State Police Game Officers. No violators were apprehended this year. ATV trespass occurs throughout the year, especially when the snow depths facilitate access without using roadways.

NATIONAL WILDLIFE REFUGES

A
Visitor's
Guide



R. C. Fields, USFWS

Wildlife of the Klamath Basin National Wildlife Refuges

California-Oregon



The refuges of Klamath Basin are six of more than 400 refuges in the National Wildlife Refuge System administered by the U.S. Fish and Wildlife Service. The National Wildlife Refuge System is a network of lands and waters managed specifically for the protection of wildlife and wildlife habitat and represents the most comprehensive wildlife resource management program in the world. Units of the system stretch across the United States from northern Alaska to the Florida Keys, and include small islands in the Caribbean and South Pacific. The character of the refuges is as diverse as the nation itself.

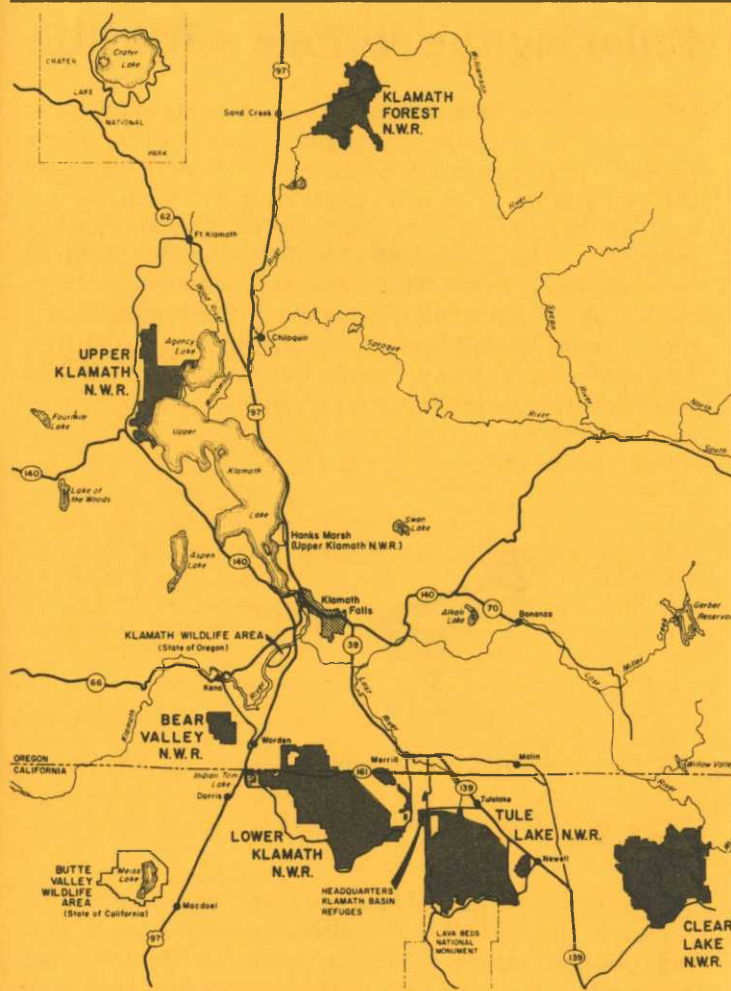


Welcome to the Klamath Basin Refuges

The Klamath Basin Refuges, located in southcentral Oregon and Northeastern California, are a complex of six national wildlife refuges - Clear Lake, Tule Lake, Lower Klamath, Bear Valley, Upper Klamath, and Klamath Forest. The first refuge in the complex, Lower Klamath NWR, was established in 1908 and was our nation's first waterfowl refuge. Except for Bear Valley NWR, which is a bald eagle wintering habitat refuge, the Klamath Basin Refuges have been established primarily to manage waterfowl. Prior to the 1900s, the Klamath Basin was composed of large shallow lakes and extensive marshes totalling nearly 185,000 acres. This immense marsh habitat was the home for untold thousands of marshbirds and annually attracted one-time fall peak populations of 6 million waterfowl. During the 1900s, the majority of the Basin marshes were reclaimed for agriculture. Approximately 36,000 acres of marsh and open water remain today, virtually all of it included in the refuges. The marshes are protected and managed to insure future habitat for one of the nation's largest concentrations of wildlife.

Habitat Diversity Supports Wildlife Diversity

The six refuges encompass 151,375 acres of various habitat types - extensive marshes, open water, grassy meadows, coniferous forests, sagebrush and juniper uplands, grasslands, agricultural land, cliffs and rocky slopes. This variety supports a tremendous diversity and abundance of resident and migratory wildlife. A total of 411 species of wildlife have been observed or are considered present on the refuges.



Enjoying the Refuge's Wildlife

The study of wild animals in their natural habitats is becoming an increasingly popular pastime for many people. Viewing refuge wildlife is best accomplished on the self-guided auto tour route systems available on the Tule Lake and Lower Klamath NWRs. Your viewing pleasure can be greatly enhanced if you have binoculars or a spotting scope. This equipment enables wildlife to be observed from a distance, thus minimizing disturbance. Refuge visitors are encouraged to contact headquarters to get up-to-date information on current wildlife viewing opportunities.



Birds

The Klamath Basin Refuges are internationally known for their bird life. Of major interest are the spring and fall populations of migrating waterfowl which have respective one-time use peaks of one-half and one million birds. Best viewing times are March and early November. During winter, the refuges will support several hundred thousands waterfowl and large wintering populations of birds of prey, highlighted by the largest wintering concentration of bald eagles in the lower 48 states. The spring and summer months are alive with nesting and brood-rearing activities by waterfowl and other marshbirds such as grebes, pelicans, cormorants, herons, egrets, shorebirds, gulls and terns.

The following bird list contains 253 species that have been observed on or near the refuges. In addition, 39 species are listed as accidental (seen only once or twice). The lists's common names and taxonomic order are categorized into family and sub-family groups and are in accordance with the 6th edition (1983) of the A.O.U. Checklist of North American Birds. For ease in transition, we have included former common names in () next to species that received significantly different names as a result of the 6th edition.

Bird List Key

The following symbols are used in the bird list.

Seasons

Sp - Spring, March through May
S - Summer, June through August
F - Fall, September through November
W - Winter, December through February

Abundance Codes

a - abundant, certain to be seen in abundance
c - common, certain to be seen in proper habitat
u - uncommon, present but not certain to be seen because of low populations or difficult observation opportunities
r - rare, known to be present but not every year
* - nesting species

Threatened/Endangered Species

Refuge Codes

The following location key is used in the event that a species is more apt to be observed on a particular refuge or refuges.

CL - Clear Lake NWR
TL - Tule Lake NWR
LK - Lower Klamath NWR
BV - Bear Valley NWR
UK - Upper Klamath NWR
KF - Klamath Forest NWR

COMMON NAME	REFUGE CODE	Sp	S	F	W
LOONS					
Arctic Loon	TL, UK	r			
Common Loon	TL, UK	u	r	u	r
GREBES					
* Pied-billed Grebe		c	c	c	u
Horned Grebe		u	r	u	
* Red-necked Grebe	UK	u	u	u	
* Eared Grebe		c	a	a	u
* Western Grebe		c	a	a	u
PELICANS AND CORMORANTS					
* American White Pelican		c	c	c	
* Double-crested Cormorant		c	c	c	u
BITTERNS, HERONS AND EGRETS					
* American Bittern		u	u	u	r
* Least Bittern		r	r	r	
* Great Blue Heron		c	c	c	c
* Great Egret		c	c	c	r
* Snowy Egret		u	c	c	
Cattle Egret		r	r		
Green-backed Heron	TL, UK	r	r	r	
* Black-crowned Night-Heron		c	c	c	u
IBIS AND SPOONBILLS					
* White-faced Ibis		c	c	c	
WATERFOWL					
Tundra Swan		c		c	a
Trumpeter Swan		r			r
Greater White-fronted Goose		a	r	a	c
Snow Goose		a	r	a	c
Ross' Goose	TL, LK	a	r	a	c
Emperor Goose	TL, LK	r		r	r
Brant (Black Brant)		r		r	
* Canada Goose		a	c	a	c
* Wood Duck	UK	u	u	u	
* Green-winged Teal		c	r	a	u
* Mallard		a	c	a	c
* Northern Pintail		■	c	a	c
* Blue-winged Teal	TL, LK	u	u	u	
* Cinnamon Teal		■	a	c	r
* Northern Shoveler		a	c	a	c
* Gadwall		■	c	a	u
Eurasian Wigeon		u		r	u
* American Wigeon		a	u	a	c
* Canvasback		■	u	c	u
* Redhead		c	c	c	u
* Ring-necked Duck		u	u	u	u
Greater Scaup		■		r	r
* Lesser Scaup		■	u	c	c
Oldsquaw				r	r
Surf Scoter	TL, LK, UK			r	r

COMMON NAME	REFUGE CODE	Sp	S	F	W
Common Goldeneye		r	r	u	c
Barrow's Goldeneye		r			r
Bufflehead		c	r	c	u
* Hooded Merganser		u	r	u	u
Common Merganser		c	r	c	c
Red-breasted Merganser		r		r	r
* Ruddy Duck		a	c	a	u
VULTURES					
* Turkey Vulture		u	u	u	
OSPREY, KITES, EAGLES AND HAWKS					
* Osprey	LK, UK	■	u	u	
Black-shouldered Kite	TL, LK	r	r	r	r
* Bald Eagle		c	u	u	a
* Northern Harrier		c	c	c	
* Sharp-shinned Hawk		u	u	u	u
* Cooper's Hawk		u	u	u	u
* Northern Goshawk	BV, KF	u	u	u	u
* Swainson's Hawk		r	r	r	r
* Red-tailed Hawk		c	c	c	c
Ferruginous Hawk		r		r	r
Rough-legged Hawk		c		c	c
* Golden Eagle		u	u	u	c
FALCONS					
* American Kestrel		c	c	c	c
Merlin		u		u	u
* Peregrine Falcon		r	r	r	r
* Prairie Falcon	TL, LK	u	u	u	u
GALLINACEOUS BIRDS					
* Chukar	TL	u	u	u	u
* Ring-necked Pheasant	TL, LK	c	c	c	c
* Blue Grouse	KF	u	u	u	u
* Ruffed Grouse	UK	r	r	r	r
* Sage Grouse	CL	u	u	u	u
* California Quail	TL, LK, BV	c	c	c	c
* Mountain Quail	BV, UK	u	u	u	u
RAILS					
* Virginia Rail		u	u	u	r
* Sora		u	u	u	r
Common Moorhen	TL, LK	r	r		
* American Coot		a	a	a	c
CRANES					
* Sandhill Crane		u	u	u	
PLOVERS					
Black-bellied Plover	LK	u	r	u	
Lesser Golden-Plover	LK	r		r	
* Snowy Plover	LK	u	u	u	
Semipalmated Plover	LK	u	r	u	
* Killdeer		c	c	c	u

COMMON NAME REFUGE CODE Sp S F W

STILTS AND AVOCETS

- * Black-necked Stilt
- * American Avocet

SHOREBIRDS

- Greater Yellowlegs
- Lesser Yellowlegs
- Solitary Sandpiper
- * Willet
- * Spotted Sandpiper
- Whimbrel
- * Long-billed Curlew
- Marbled Godwit
- Ruddy Turnstone
- Red Knot
- Sanderling
- Western Sandpiper
- Least Sandpiper
- Baird's Sandpiper
- Pectoral Sandpiper
- Rock Sandpiper
- Short-billed Dowitcher
- Long-billed Dowitcher

LK

SNIPE

- * Common Snipe

PHALAROPES

- * Wilson's Phalarope
- Red-necked Phalarope
- Red Phalarope

GULLS AND TERNS

- Franklin's Gull
- Bonaparte's Gull
- * Ring-billed Gull
- * California Gull
- Herring Gull
- * Caspian Tern
- * Forster's Tern
- * Black Tern

CL, TL, LK

DOVES

- * Mourning Dove

OWLS

- * Common Barn-Owl
- * Western Screech-Owl
- * Great Horned Owl
- * Northern Pygmy-Owl
- * Burrowing Owl
- * Spotted Owl
- * Great Gray Owl
- * Long-eared Owl
- * Short-eared Owl
- * Northern Saw-whet Owl

BV, UK, KF

BV, UK, KF

TL

BV, UK

UK, KF

BV, UK, KF

TL, LK

BV, UK, KF

GOATSUCKERS

- * Common Nighthawk
- * Common Poorwill

SWIFTS

- * Vaux's Swift

COMMON NAME REFUGE CODE Sp S F W

HUMMINGBIRDS

- * Calliope Hummingbird
- * Rufous Hummingbird

KINGFISHERS

- * Belted Kingfisher

WOODPECKERS

- * Lewis' Woodpecker
- Yellow-bellied Sapsucker
- * Red-breasted Sapsucker
- * Williamson's Sapsucker
- * Downy Woodpecker
- * Hairy Woodpecker
- * White-headed Woodpecker
- * Black-backed Woodpecker
- * Northern Flicker
- * Pileated Woodpecker

BV, UK, KF

UK, KF

BV, UK, KF

UK, KF

BV, UK, KF

UK, KF

BV, UK

FLYCATCHERS

- * Olive-sided Flycatcher
- * Western Wood-Pewee
- * Willow Flycatcher
- * Hammond's Flycatcher
- * Dusky Flycatcher
- * Gray Flycatcher
- Western Flycatcher
- * Say's Phoebe
- * Ash-throated Flycatcher
- * Western Kingbird
- Eastern Kingbird

BV, UK, KF

BV, UK

BV, UK, KF

CL, TL

LARKS

- * Horned Lark

SWALLOWS

- * Purple Martin
- * Tree Swallow
- * Violet-green Swallow
- * Northern Rough-winged Swallow
- * Bank Swallow
- * Cliff Swallow
- * Barn Swallow

JAYS, MAGPIES AND CROWS

- * Gray Jay
- * Steller's Jay
- * Scrub Jay
- * Pinyon Jay
- * Clark's Nutcracker
- * Black-billed Magpie
- * American Crow
- * Common Raven

UK, KF

BV, UK, KF

CL, TL

CL

UK, KF

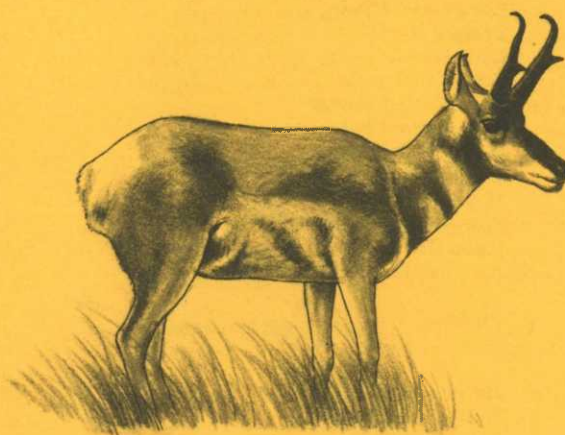
COMMON NAME	REFUGE CODE	Sp	S	F	W
CHICKADEES AND TITMICE					
* Black-capped Chickadee		u	u	u	u
* Mountain Chickadee	BV, UK, KF	c	c	c	c
* Chestnut-backed Chickadee	UK	u	u	u	u
* Plain Titmouse	CL	u	u	u	u
BUSHTITS					
* Bushtit		u	u	u	r
NUTHATCHES					
* Red-breasted Nuthatch	BV, UK, KF	u	u	u	u
* White-breasted Nuthatch	BV, UK, KF	u	u	u	u
* Pygmy Nuthatch	BV, UK, KF	u	u	u	u
CREEPERS					
* Brown Creeper	BV, UK, KF	u	u	u	u
WRENS					
* Rock Wren	CL, TL	c	c	c	u
* Canyon Wren	CL, TL	u	c	c	u
* Bewick's Wren		u	u	u	u
* House Wren		u	u	u	u
* Winter Wren		u	u	u	u
* Marsh Wren		c	c	c	u
KINGLETS, BLUEBIRDS AND THRUSHES					
* Golden-crowned Kinglet	BV, UK, KF	c	c	c	c
* Ruby-crowned Kinglet		c	r	c	
* Western Bluebird		u	u	u	u
* Mountain Bluebird		u	u	u	u
* Townsend's Solitaire		u	u	c	u
* Swainson's Thrush		r			
* Hermit Thrush	BV, UK	u	u		
* American Robin		c	c	c	u
* Varied Thrush		r		r	
THRASHERS					
* Sage Thrasher	CL	u	u	u	
PIPITS					
* Water Pipit		c		u	r
WAXWINGS					
* Bohemian Waxwing		r		r	r
* Cedar Waxwing		u		u	u
SHRIKES					
* Northern Shrike		u		u	c
* Loggerhead Shrike		c	c	c	u
STARLINGS					
* European Starling		c	c	c	c
VIREOS					
* Solitary Vireo	BV, UK, KF	u	c	u	
* Warbling Vireo	BV, UK, KF	u	c	u	

COMMON NAME	REFUGE CODE	Sp	S	F	W
WARBLERS					
* Orange-crowned Warbler		u	u	u	
* Nashville Warbler		u	u	u	
* Yellow Warbler		c	c	c	
* Yellow-rumped Warbler		c	c	c	
* Black-throated Gray Warbler		r	r	r	
* Townsend's Warbler		u		u	
* Hermit Warbler	BV, UK		c		
* MacGillivray's Warbler		u	u	u	
* Common Yellowthroat		u	u	u	
* Wilson's Warbler		u	u	u	
* Yellow-breasted Chat		r			
TANAGERS					
* Western Tanager		u	c	u	
GROSBEAKS AND BUNTINGS					
* Black-headed Grosbeak	UK	u	c	u	
* Lazuli Bunting		u	u	u	
TOWHEES AND SPARROWS					
* Green-tailed Towhee		u	u	r	
* Rufous-sided Towhee		c	u	u	r
* Brown Towhee	TL	u	u	u	u
* American Tree Sparrow	TL, LK	r		r	r
* Chipping Sparrow		u	c	u	r
* Brewer's Sparrow		c	c	c	
* Vesper Sparrow		u	u	u	
* Lark Sparrow		u	u	u	
* Sage Sparrow	CL	r	r	r	
* Savannah Sparrow		c	c	c	u
* Fox Sparrow		c	c	u	r
* Song Sparrow		c	c	c	u
* Lincoln's Sparrow		u		u	
* White-throated Sparrow		r		r	r
* Golden-crowned Sparrow		c		c	u
* White-crowned Sparrow		c		c	c
* Harris' Sparrow		r		r	r
* Dark-eyed Junco		c	u	c	c
* Lapland Longspur		r		r	r
* Snow Bunting		r		r	r
BLACKBIRDS, MEADOWLARKS AND ORIOLES					
* Red-winged Blackbird		a	a	a	c
* Tricolored Blackbird		e	c	u	r
* Western Meadowlark		e	c	c	c
* Yellow-headed Blackbird		c	c	c	r
* Brewer's Blackbird		a	a	a	c
* Brown-headed Cowbird		e	c	c	r
* Northern Oriole	TL	e	c	c	

COMMON NAME	REFUGE CODE	Sp	S	F	W
FINCHES					
* Purple Finch	UK, KF	r	r	r	r
* Cassin's Finch	UK, KF	u	u	u	
* House Finch		c	c	c	c
* Red Crossbill	KF	u	u	u	u
* Pine Siskin	UK, KF	u	u	u	u
* Lesser Goldfinch		u	u	u	u
* American Goldfinch		u	u	u	u
Evening Grosbeak		u	u	u	u
WEAVER FINCHES					
* House Sparrow		c	c	c	c

Accidentals

Brown Pelican	Glaucous-winged Gull
Little Blue Heron	Black-legged Kittiwake
Barnacle Goose	Common Tern
Egyptian Goose	Band-tailed Pigeon
Ruddy Shelduck	White-winged Dove
American Black Duck	Black-chinned Hummingbird
Garganey	Black Phoebe
Black Vulture	Northern Mockingbird
Red-shouldered Hawk	Bell's Vireo
Gyrfalcon	Black-and-white Warbler
Mountain Plover	Rose-breasted Grosbeak
Upland Sandpiper	McCown's Longspur
Hudsonian Godwit	Chestnut-collared Longspur
Semipalmated Sandpiper	Bobolink
Stilt Sandpiper	Orchard Oriole
Ruff	Rosy Finch
Parasitic Jaeger	Pine Grosbeak
Long-tailed Jaeger	Common Redpoll
Mew Gull	Barred Owl
Western Gull	



Mammals

All mammals listed are considered resident species with the exception of the bats which migrate out of the area during winter, much like some of the birds. Other mammal populations fluctuate on a seasonal basis due to hibernation, migrations between summer and winter ranges, and cyclical population fluctuations such as observed in rodents and predators.

The following animals listed by family, have been observed or are suspected (*) of being present based on current known home ranges. The names and order follow the "Revised Checklist of North American Mammals North of Mexico, 1982," written by Jones, Carter, Genoways, Hoffman, and Rice (Occasional Paper Number 80, T Museum Texas Tech University).

Shrews

Vagrant Shrew
 *Water Shrew
 *Pacific Water Shrew
 Trowbridge's Shrew
 *Merriam's Shrew

Moles

*Shrew-Mole
 Broad-footed Mole

Bats

Little Brown Myotis
Yuma Myotis
Long-eared Myotis
Fringed Myotis
Long-legged Myotis
California Myotis
Small-footed Myotis
Silver-haired Bat
Western Pipistrelle
Big Brown Bat
Hoary Bat
Townsend's Big-eared Bat
Pallid Bat
Brazilian Free-tailed Bat

Pikas

Pika

Hares and Rabbits

Nuttall's Cottontail
Snowshoe Hare
White-tailed Jack Rabbit
Black-tailed Jack Rabbit

Squirrels

Least Chipmunk
Yellow-pine Chipmunk
Allen's Chipmunk
Yellow-bellied Marmot
Belding's Ground Squirrel
California Ground Squirrel
Golden-mantled Ground Squirrel
Western Gray Squirrel
Douglas' Squirrel
Northern Flying Squirrel

Pocket Gophers

*Botta's Pocket Gopher
*Northern Pocket Gopher
*Western Pocket Gopher

Pocket Mice and Kangaroo Rats

Great Basin Pocket Mouse
California Kangaroo Rat

Beavers

Beaver

New World Rats and Mice

Western Harvest Mouse
Deer Mouse
Canyon Mouse
*Brush Mouse

Pinon Mouse

*Northern Grasshopper Mouse
Dusky-footed Woodrat
Bushy-tailed Woodrat
Montane Vole
Long-tailed Vole
Sagebrush Vole
Muskrat

Old World Rats and Mice

Norway Rat
House Mouse

Jumping Mice

Western Jumping Mouse

New World Porcupines

Pocupine

Canids

Coyote
*Red Fox
*Gray Fox

Bears

Black Bear

Ringtails and Raccoons

*Ringtail
Raccoon

Weasels and Relatives

Marten
Ermine
Least Weasel
Long-tailed Weasel
Mink
Badger
Western Spotted Skunk
Striped Skunk
River Otter

Cats

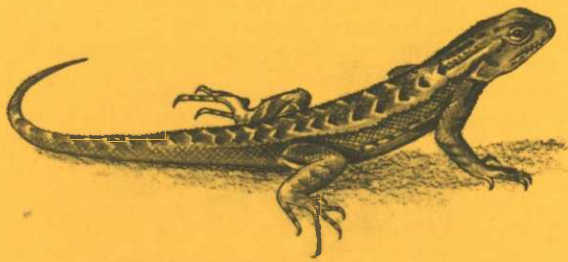
Mountain Lion
Bobcat

Elk and Deer

Elk
Mule Deer

Pronghorn

Pronghorn (Antelope)



Amphibians and Reptiles

A variety of amphibians and reptiles are found on the Klamath Basin Refuges. Amphibians prefer marshes, ditches, and streams while reptiles are usually found in grassy, rocky, dry upland areas. These creatures are usually secretive by nature and requires a little effort on the refuge visitor's part to see them. They are only seen from spring through fall, choosing to hibernate during the Basin's cold winters. The Western Rattlesnake and the Night Snake are the only venomous reptiles present on the refuges. Visitors should be aware of their presence but not become too overly concerned as they are not present in very large numbers.

Amphibians

Long-toed Salamander
Great Basin Spadefoot
Bullfrog
Spotted Frog
Western Toad
Pacific Treefrog

Reptiles

Western Pond Turtle
Short-horned Lizard
Sagebrush Lizard
Western Fence Lizard
Side-blotched Lizard
Northern Alligator Lizard
Western Skink
Rubber Boa
Racer
Night Snake
Striped Whipsnake
Gopher Snake
Western Terrestrial Garter Snake
Common Garter Snake
Western Rattlesnake

Fishes

A variety of fish species are present in the waters of the Klamath Basin Refuges. The majority of these play an important role by serving as an abundant and excellent food source for the many fish-eating bird species found on the refuges.

The following fishes are listed by family in accordance with "A List of Common and Scientific Names of Fishes from the United States and Canada," 4th edition, 1980 by C. Robbins, R. Bailey, C. Bond, J. Brooker, E. Lachner, R. Lea and W. Scott.

Lampreys

Pit-Klamath Brook Lamprey
Pacific Lamprey

Sturgeons

White Sturgeon

Trouts

Rainbow Trout
Brown Trout
Brook Trout
Kokanee Salmon

Minnows

Tui Chub
Blue Chub
Fathead Minnow
Speckled Dace

Suckers

Lost River Sucker
Klamath Largescale Sucker
Shortnose Sucker

Catfishes

Brown Bullhead

Sunfishes

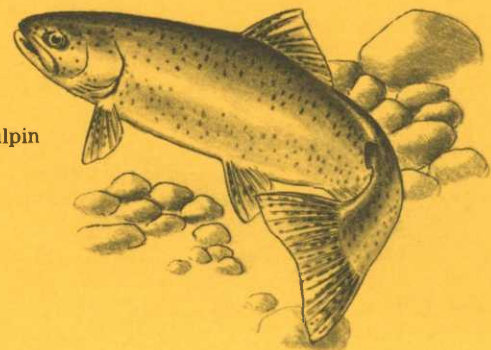
Sacramento Perch
Green Sunfish
Pumpkinseed
Bluegill
Largemouth Bass
White Crappie
Black Crappie

Perches

Yellow Perch

Sculpins

Klamath Lake Sculpin
Marbled Sculpin
Slender Sculpin



Acknowledgements

We are indebted to the many visiting professional and amateur wildlife observers who have assisted the refuge staff by providing important wildlife observations throughout the years. Our list is not considered final as we are sure new observations will continue to add to its quality and accuracy. We encourage and appreciate all observations and ask that they be reported to refuge headquarters as soon as possible.

We also would like to express special thanks to staff from the University of California-Davis, Oregon State University, and Oregon Department of Fish and Wildlife for their help in the preparation of this leaflet.

More Information

Klamath Basin National Wildlife Refuges headquarters is located five miles west of Tulelake, one-half mile south of the end of East-West Road. For further information contact:

Refuge Manager
Klamath Basin National Wildlife Refuges
Route 1 Box 74
Tulelake, CA 96134
Phone (916) 667-2231



Department of the Interior
U.S. Fish and Wildlife Service



Notes

Date_____ No. Species_____

Time Afield _____

Observers _____

Weather _____

Remarks _____

100

Take Pride in Klamath Basin National Wildlife Refuges

Refuge status is not failsafe protection. Wildlife and their habitats will always be vulnerable to careless public use and abuse. Too often it seems that because these natural resources belong to everyone, they are seen as the responsibility of no one. Refuge managers cannot do their jobs without support from everyone who is committed to the future of wildlife, their habitats and the valuable recreation opportunities they provide.

The North American Waterfowl Management Plan

The North American Waterfowl Management Plan (NAWMP) provides opportunities for you to take part in supporting the preservation of habitat for decreasing waterfowl populations. Your support is needed to ensure that enough high-quality habitat is maintained to restore the declining number of North American ducks, geese and swans. The NAWMP invites you and your support to become part of its historic conservation success story.

How You Can Help

Observe rules and report any destructive activity you see. Rules have been made for your protection and for the benefit of the natural resources.

Take your trash home with you.

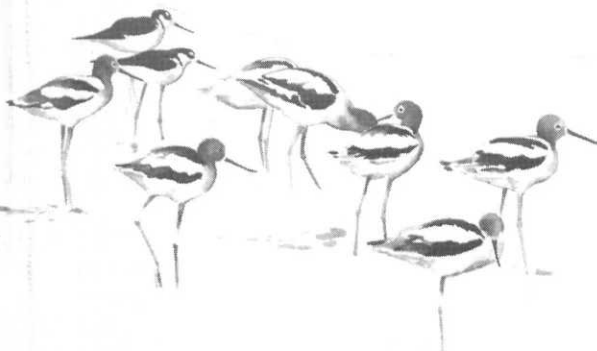
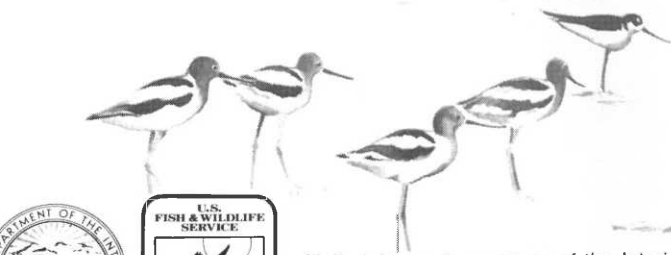
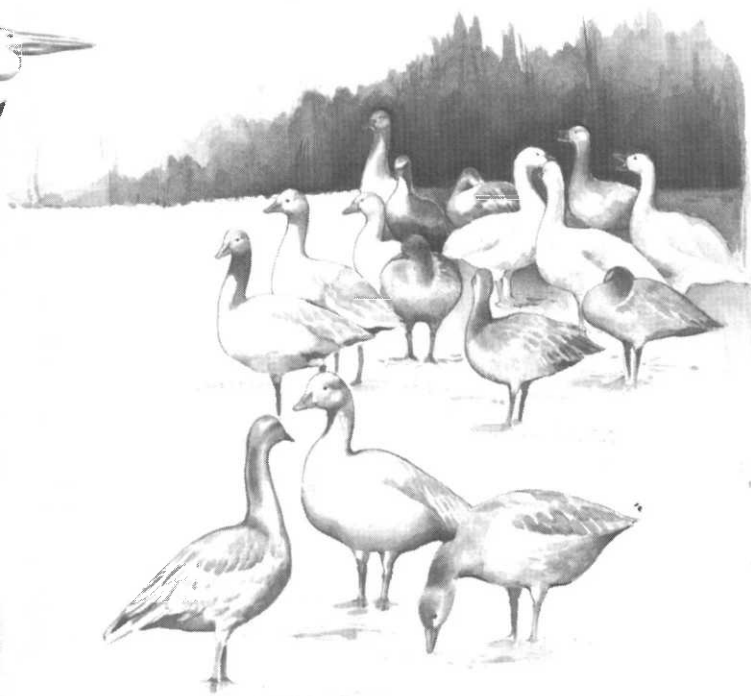
Look for opportunities to communicate the good stewardship message to others.

One way to demonstrate your support is by volunteering your time and skills to assist managers in the management and protection of these resources. Please contact the refuge volunteer coordinator for further details.

Klamath Basin

National Wildlife Refuges

California - Oregon



United States Department of the Interior
Fish and Wildlife Service

RF11660 September 1988

Why Are The Refuges Here?

Once Extensive Marshes

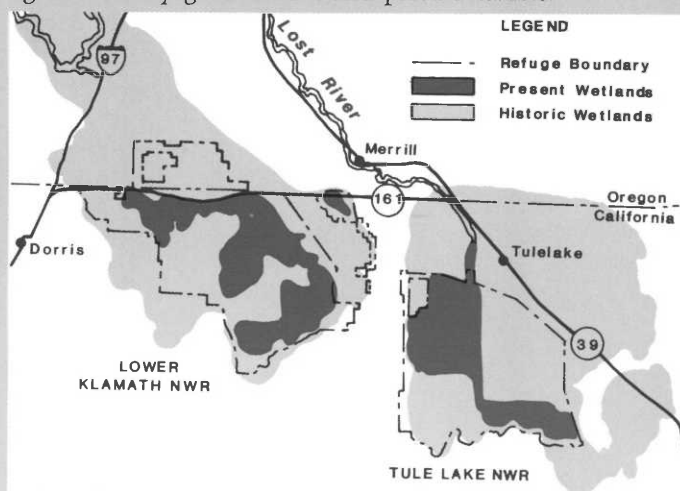
Historically, the Klamath Basin was dominated by about 185,000 acres of shallow lakes and extensive marshes. These lakes and marshes attracted peak fall concentrations of over six million waterfowl and supported large concentrations of marsh birds such as pelicans, cormorants, egrets and herons.



Oregon Historical Society

Marshes Shrink Drastically

Today less than 25% of the historic wetland acres remain. In 1905, the U.S. Bureau of Reclamation initiated the Klamath Reclamation Project to convert the marshes and lakes of Lower Klamath and Tule Lake to agricultural lands. Oregon and California gave to the federal government any lands that could be reclaimed from under the waters of Lower Klamath and Tule Lakes. As these lakes and marshes were dried up, the land was converted to irrigated agriculture and opened to settlement. Today, the Basin's extensive agricultural economy is mostly based on lands converted from wetlands to agriculture by government and private efforts.



Refuges Protect What Remains

To conserve the Basin's remaining wildlife values six National Wildlife Refuges (NWR) have been established. The U.S. Fish and Wildlife Service manages and protects this valuable wildlife habitat and regulates wildlife oriented recreation. Even though the Basin's marsh habitat has been greatly reduced, the refuges still attract the majority of migrating Pacific Flyway waterfowl and support peak fall concentrations of nearly one million birds — one of the largest concentrations in the United States. Agricultural and water programs are coordinated under an agreement between U.S. Fish and Wildlife Service and Bureau of Reclamation.



Diverse Habitats Support Diverse Wildlife

A variety of habitats exist on the six refuges - marshes, open water, grassy meadows, coniferous forests, sagebrush and juniper grasslands, agricultural land, and cliffs and rocky slopes. This variety supports diverse and abundant populations of resident and migratory wildlife. A total of 411 wildlife species have been observed or are considered present on the refuges.





Seasonal Wildlife Highlights

Fall - Waterfowl migration begins in late August and September with the arrival of pintails and white-fronted geese. Peak numbers of nearly one million ducks and geese are usually present around early November. Other major species include snow, Ross' and Canada geese, mallards, wigeon, green-winged teal, and tundra swans. August and September are good months to view a variety of marsh birds such as pelicans, cormorants, egrets, herons, gulls, terns and grebes. They generally migrate out of the Basin by late October.

Winter - From December through February, the Klamath Basin hosts the largest wintering concentrations of bald eagles in the lower 48 states. More than 500 of these majestic raptors are attracted to the refuges by the thousands of waterfowl that winter here, providing an abundant food source.

Spring - Marsh, April and May are alive with activity as waterfowl and shorebirds stop in the Klamath Basin on their way north to Alaskan and Canadian breeding grounds. They rest and feed here to build up sufficient body fat to carry them through their long migration. In addition, thousands of marsh birds and waterfowl nest in the Basin's marshlands.

Summer - Large numbers of young birds can be seen along the auto tour routes from May through August. The refuge marshes are among the most prolific waterfowl and marsh bird production areas in the northwest. An estimated 45,000 ducks, 2,600 Canada geese, and thousands of marsh and shorebirds are raised here each year. Three of the few remaining white pelican nesting colonies in the west are located on Upper Klamath, Lower Klamath and Clear Lake Refuges.

Visitor Information

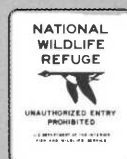
The headquarters office for the complex is located on Hill Road, six miles west of Tulelake, California. Additional information on refuge activities may be obtained here.

Refuge regulations help protect visitors and resources. Please observe them.

As you travel through the refuges you will encounter regulatory signs such as speed limit and parking area signs. Other signs you will see include the following.



Auto Tour Route - Follow these signs on the Lower Klamath Refuge to enjoy the interpretive panels along the auto tour route.



National Wildlife Refuge - This sign is used to show the boundaries of the refuges. Entry is allowed only on designated access routes.



Area Closed - Certain areas of the refuges are closed to visitors for management purposes. Entry beyond this sign is prohibited.



No Vehicles or Authorized Vehicles Only - Motor vehicles are not allowed beyond this sign. Please do not block access.



Waterfowl Hunting Only or Public Hunting Area - The area beyond these green signs is open to waterfowl or waterfowl/pheasant hunting only during regular State seasons. Check with refuge manager for details.

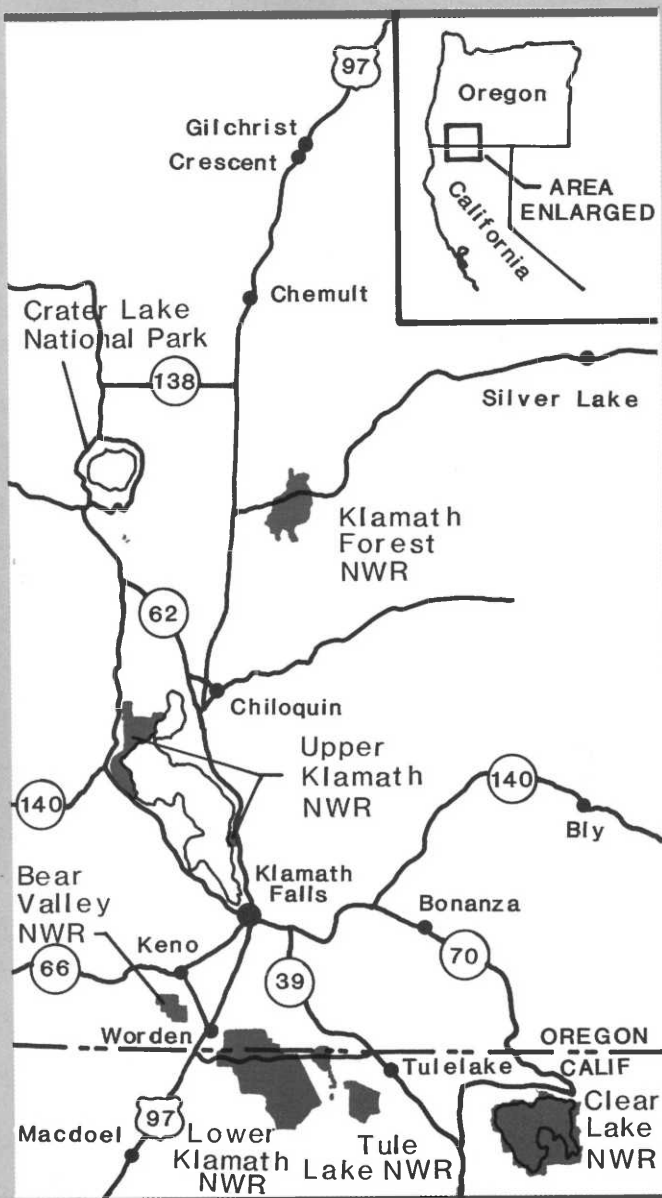


Pheasant Hunting Only - The area beyond these yellow signs is open to pheasant hunting during the regular State season. Permits may be required during part of the season. Check with the refuge manager for details.

For Further Information

For further information about these refuges, the Refuge System, or volunteer opportunities, please contact:

Refuge Manager
Klamath Basin NWRs
Route 1 Box 74
Tulelake, CA 96134
Phone (916) 667-2231



Nearby Areas of Interest

Klamath Wildlife Area
Oregon Department of Fish and Wildlife
1800 Miller Island Rd., West
Klamath Falls, OR 97603
Phone (503) 883-5734

Butte Valley Wildlife Management Area
California Department of Fish and Game
PO Box 429
Macdoel, CA 96058
Phone (916) 398-4627

Lava Beds National Monument
PO Box 867
Tulelake, CA 96134
Phone (916) 667-2282

Modoc National Forest
Doublehead Ranger District
PO Box 818
Tulelake, CA 96134
Phone (916) 667-2247

Winema National Forest
Supervisor's Office
2819 Dahlia St.
Klamath Falls, OR 97601
Phone (503) 883-6714

Crater Lake National Park
PO Box 7
Crater Lake, OR 97604
Phone (503) 594-2211

For Lodging Information:

Klamath County Visitor's Association
PO Box 1867
Klamath Falls, OR 97601
Phone (503) 884-0666

Tulelake Chamber of Commerce
PO Box 592
Tulelake, CA 96134
Phone (916) 667-5178

Hunting

Upper Klamath

National Wildlife Refuge
Oregon

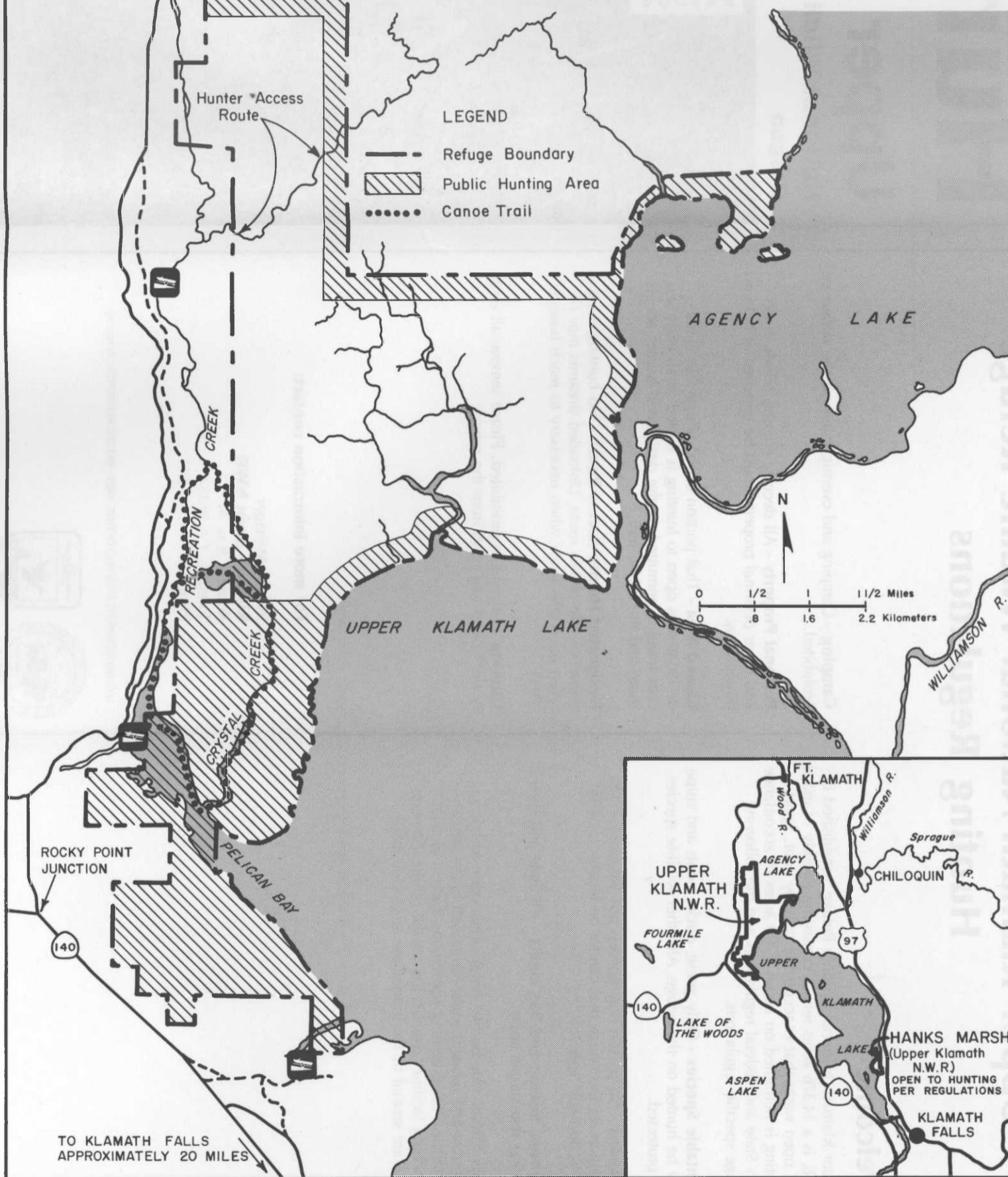
Notice: All hunters are required to carry and use shells containing only steel shot when hunting ducks, geese and coots on Upper Klamath National Wildlife Refuge. Check State regulations for a complete description of the steel shot zone.



TO FT. KLAMATH
& CRATER LAKE

U.S. FISH AND WILDLIFE SERVICE
UPPER KLAMATH NATIONAL WILDLIFE REFUGE

HUNTING MAP



Upper Klamath National Wildlife Refuge Hunting Regulations

Welcome

Upper Klamath National Wildlife Refuge, established in 1928, is a 14,376 acres refuge consisting entirely of marsh and open water that is accessible only by boat. Sport hunting is permitted on about 5,700 acres in accordance with State and Federal regulations and the following refuge specific regulations.

Huntible Species - Only geese, ducks, coots and snipe may be hunted on the refuge. All other wildlife species are protected.

Weapons - No person may possess any weapon or ammunition on the refuge that cannot be legally used for taking huntible species.

Licenses, Season and Bag Limits - All State and Federal hunting regulations apply.

Boats - Boats may be use on all areas open to hunting. Air-thrust and inboard water-thrust (jet) boats are prohibited. All State boating regulations apply. No boat launching facilities are located on the refuge, however there are several in the immediate area. (See map)

Camping - Camping and overnight use on the refuge are prohibited.

Personal Property - All decoys, hunting blinds, boats and other personal property must be removed at the end of each day.

Closed Area - That portion of the refuge that is not designated as open to hunting is closed to all entry, except travel is permitted on the designated hunter access route and the canoe trail.

Designated Hunter Access Route - No hunting is permitted on the access route. Unloaded firearms may be taken on access route when necessary to reach hunting areas.

Littering - Littering is prohibited. Please remove all empty shell cases and trash from the refuge.

For more information contact:

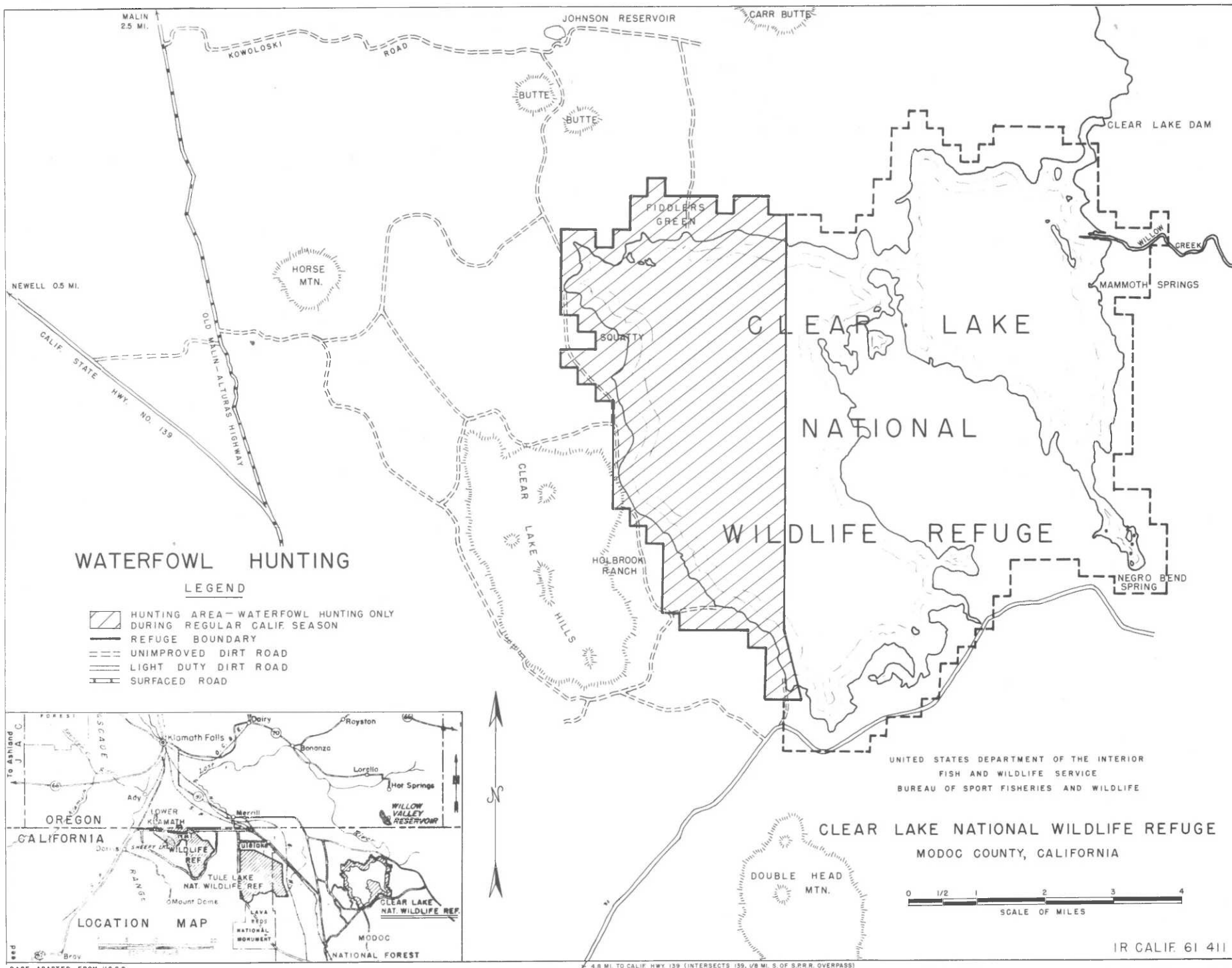
Refuge Manager
Klamath Basin NWR
Route 1 Box 74
Tulelake, CA 96134
Phone (916) 667-2231

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RF 11665

August 1986

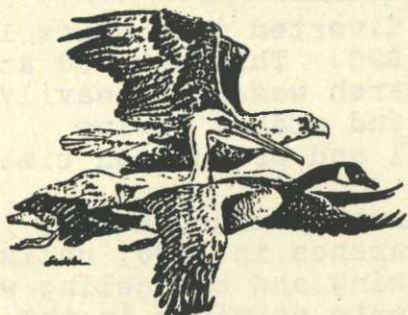


Northeastern California

	<u>Season</u>	<u>Bag Limit</u>
DUCKS	Oct. 13 - Dec. 10	4 daily/8 poss.
	The daily bag limit of four may include not more than the following: <ul style="list-style-type: none"> a. 3 mallards, only one of which may be a hen. b. 1 pintail, either sex. c. 2 redheads OR 2 canvasbacks OR 1 of each 	
GEESE	Oct. 13 - Jan. 13	3 daily/6 poss.
	The daily bag limit of three may include not more than the following: <ul style="list-style-type: none"> a. 1 white-front. b. 2 Canadas. 	
WHITE-FRONTs	Oct. 13 - Nov. 4	1 daily/2 poss.
PHEASANTS	Nov. 10 - Dec. 9	2 daily/4 poss.

Oregon (Klamath County)

	<u>Season</u>	<u>Bag Limit</u>
DUCKS	Oct. 20 - Nov. 8 AND Nov. 22 - Dec. 30	4 daily/8 poss.
	The daily bag limit of four may include not more than the following: <ul style="list-style-type: none"> a. 3 mallards, only 1 of which may be a hen. b. 1 pintail of either sex. c. 2 redheads OR 2 canvasbacks OR 1 of each. 	
GEESE	Oct. 20 - Jan. 20	3 daily/6 poss.
	The daily bag limit is increased to 6 providing the following: <ul style="list-style-type: none"> a. not more than 3 are dark geese and not more than 3 are white geese. White geese are snow and Ross' geese. All other geese are dark geese (Canada and white-fronts). 	
WHITE-FRONTs	Nov. 1 - Jan. 20	1 daily/2 poss.
PHEASANT	Oct. 13 - Nov. 25	2 daily/8 poss.



Words from the Wetlands

Volume 2 No. 1

News from Klamath Basin NWRs

Winter/Spring 1991

Our second newsletter will give you a more detailed look at some of our management programs, including our prescribed fire program at Bear Valley Refuge. Also in the first of our features on cooperating agencies, the Oregon Department of Fish and Wildlife is highlighted.

Inside

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As part of our effort to keep refuge users up to date on our activities, we have initiated a schedule of tours and events which will help you understand our mission and programs. These activities will be advertised in both print and broadcast media well in advance, so you may mark your calendars. As we asked in our first edition, please, let us know what you think about our programs and activities.

Calendar of Tours/Programs

February - Bald Eagle Conference	June 9- Upper Klamath Canoe Tour
March - Goose Tour	July 13- Bear Valley Tour
April 27 - Tule Lake Canoe Tour	August 24- Lower Klamath Operations Tour
May 11 - Klamath Forest Tour;	September 6-8- Tulelake/Butte Valley Fair;
25 - Lower Klamath Tour;	14 -Archaeological Tour
26 - Historical Tour	

More events may be scheduled at a later date.

'Tis The Season... Winter is a time for raptors, especially bald eagles. Viewing lasts until mid-March...February 15 - 17 the 12th Annual Bald Eagle Conference will be held in Klamath Falls. Contact Klamath Basin Audubon at (503) 883-5732 for registration info...April sees the arrival of Spring migrants. Thousands of tundra swans as well as white pelicans, Caspian and Forster's terns, Western and eared grebes, sandhill cranes and many other species arrive in the Basin...Photography opportunities are many as breeding plumages and courtship behavior are seen throughout the refuges...Spring is also time for environmental education. The refuge's Teacher's Resource Library holds a wide range of activity ideas and curriculum for area teachers. Call headquarters for more information and to schedule class field trips...Finally a word of caution. As young wildlife appear the temptation to get close and touch is irresistible. Many babies which seem to be abandoned actually have parents just out of sight. Remember that the more disturbance parents and young are subject to, the less chance those young have of surviving. Please, give them their space.



View from the Marsh....by Roger Johnson

Concern about contaminants and how they may affect fish & wildlife in the Klamath Basin is expressed by conservation organizations, sportsmen groups and individual visitors. Our fish and wildlife are in fact the barometer with which the status of our environment can be measured.

An intensive evaluation of contaminants in the Klamath Basin, particularly on the several National Wildlife Refuges, is scheduled to begin in 1991. This planned comprehensive research will primarily involve the University of Washington's Cooperative Fish & Wildlife Research Unit, the U.S. Geological Survey, and the U.S. Fish & Wildlife Service, with support from the Bureau of Reclamation, Ducks Unlimited and the suppliers, applicators and users of agricultural chemicals.

Our view from the marsh will be much clearer with the factual, accurate information we expect to obtain from this collective effort.

Habitat... The summer/fall of 1990 was an active time for completing planned habitat improvement projects. Examples of accomplishments include:

The Mammoth Springs area of Clear Lake Refuge was fenced to exclude cattle grazing from Forest Service lands. This area is well used by a variety of wildlife including sage grouse, antelope, geese, wading birds and songbirds.

At Lower Klamath Refuge, Fields 9 and 10 (210 acres) of Unit 1 were converted from marginal upland to wetland by constructing a water delivery system. We feel this long narrow unit along Hwy 161 will save many young Canada geese from dying when trying to cross the highway to return to water from feeding areas.

Additional ditching and dikes were constructed in Miller Lake unit to allow water diversion to 660 acres. This will especially benefit waterfowl and cranes during spring migration and early summer production periods.

Water was diverted into Units 10 B and C in 1990. This new 700 acre seasonal marsh was used heavily by waterfowl and cranes during migrational and production times.

Alkali bulrush dominated many seasonal marshes in 1990, unlike 1989. Disking and channeling were used to create openings in the vast stands of this low growing bulrush. Where stands become too dense farming, varying water drawdown times, and disking will be used to make a better interspersation of open water and vegetated areas. These alkali bulrush areas have proven very beneficial to duck production, however, and some will be left.

A 1991 habitat management plan for Klamath Marsh Refuge in Oregon was prepared and approved. Many former marsh areas will be allowed to retain water in 1991 and cattle grazing reduced significantly over much of the area.

The Klamath Basin Refuges will continue to provide some of the finest habitat for waterfowl, bald eagles, sandhill cranes, etc. found anywhere in North America.

Bear Valley... In 1987, a habitat management study was conducted by the Oregon Cooperative Wildlife Research Unit at Oregon State University on Bear Valley NWR. Based on the recommendations of that study, a prescribed fire plan was developed and initiated in 1989, and will continue this Spring. The objectives of the prescribed burns are to reduce ground fuels, thereby reducing the risk of a catastrophic wildfire spreading through the eagle roost sites and onto surrounding land.

Forest fuels have accumulated over the years due to past aggressive fire suppression, regrowth, and past timber management activities leaving slash in many areas. Large ponderosa pine and Douglas fir are preferred eagle roost trees and are fire resistant due to their thick bark. These trees will be maintained, along with smaller, younger age replacement trees as future roost sites. The reduction of ground fuels will reduce the size and intensity of any wildfires that may occur in the future.

The prescribed burns are a cooperative effort between the U.S. Forest Service and the USFWS, and are conducted by the Winema National Forest Hotshot Crew.

Their expertise has been a valuable asset to the prescribed fire program in Bear Valley. Approximately 820 acres of the 3,400 acre refuge have been treated with prescribed fire since the spring of 1989.

Why Fire? ... Many of you may have witnessed the field burning of winter wheat fields and thought - what a waste! Fall/winter burning of some of the refuge's wheat fields provides forage for migrating geese. Burning removes the stalks and leaves most of the grain intact on the ground, available for the geese and other waterfowl. The standing grain is not generally available to waterfowl. The scorched grain is definitely preferred by the birds and creates large population concentrations for a few days. In order to keep disease at a minimum from these concentrations, several fields are burned, dispersing the birds around the refuge.

Only a few fields are burned and the remainder are left standing in the event of heavy snowfall which knocks the grain down, making it available to the birds. The remaining grain also makes excellent cover for other wildlife such as pheasants, quail, small mammals, and deer.

Spotlight on...

The Klamath Basin is famous for the largest wintering population of bald eagles in the lower 48 states. A combination of traditional roost areas (Mt. Dome and Bear Valley) and a large food resource of wintering waterfowl gives rise to some 700-800 bald eagles migrating from Canada, Montana and Idaho. When a hard freeze occurs it is not uncommon to see eagles gathered around a tightly packed flock of waterfowl scavenging the ducks and geese that are unable to endure the harsh winter conditions. The largest concentrations can be seen in mid-January through mid-February with as many as 500 eagles seen on the refuges under unique conditions.



Winter is also an excellent time to view a wide variety of other raptors in the Basin. Northern harriers, red-tailed hawks, rough-legged hawks, kestrels, prairie falcons, short-eared and great horned owls occur in large numbers. Occasionally a unique raptor arrives in the basin, the most recent being the presence of a gyrfalcon on Tule Lake NWR in November of 1989.

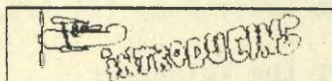
As spring nears, most of the eagles and other raptors gradually disperse, returning to their traditional breeding areas. Approximately 50 pairs of bald eagles nest in Klamath County as do red-tailed hawks, prairie falcons, kestrels, great horned owls, barn owls, short-eared owls and golden eagles.

Avian cholera is a highly infectious disease which spreads rapidly through waterfowl and other migratory bird populations. Ranked with avian botulism and lead poisoning as a major cause of waterfowl mortality, outbreaks of this disease commonly occur in four major focal points in the U.S., one of which is our own Klamath Basin.

Early detection is the first defense in controlling this disease; however, death can be so rapid that birds may literally fall out of the sky or die while feeding, with no signs of illness, making early diagnosis difficult. Caused by a bacterium, avian cholera is transmitted by bird-to-bird contact, ingestion of contaminated food, and perhaps in aerosol form. Scavengers such as crows and gulls are often found dead from the disease, but deaths of raptors such as eagles and hawks are far less frequent. In fact, duck carcasses can provide a valuable food source for these wintering birds.

While a vaccination and post-exposure treatment of waterfowl have been developed, there is no practical method of immunizing large numbers of free-living migratory birds. To control an outbreak, the recommended procedure is to collect and incinerate carcasses, preventing the bacterium from contaminating the immediate area and the carcasses from attracting new birds to the area. Refuge biologists spend hundreds of hours each year performing disease surveillance and pickup; however, freeze-ups in the cold fall/winter months can make this job nearly impossible.

Visitors need not be afraid to come to the refuges during an outbreak. Avian cholera does not pose a high human health risk because of differences in susceptibility to different strains of the bacterium. Most infections that do occur result from an animal bite, scratch or lick, primarily from animals which have come into contact with a carcass. It is not recommended to use dogs for picking up carcasses because of this possible later exposure to people.



Refuge Employees

Dale Green

Dale began his career with USFWS in 1957 as a dragline oiler. After 2 years he was promoted to Equipment Operator, and in 1974 to Refuge Foreman. He is presently also an Equipment Operator Certification Training Instructor. He has "seen several improvements to the refuges, better roads, irrigation systems, habitat and several pieces of modern construction equipment. My plans are to continue working until my children complete their education."

He and his wife Juhree have 7 children, 2 at home and the rest in Germany, Kansas, South Dakota and San Luis Obispo. They also have 5 grandchildren with 2 more on the way.

Jayson Parks

Jay was born, raised and will probably be buried in Montana. He spent 13 years with the Bureau of Land Management in Wyoming as a Range Conservationist/ Wildlife Biologist. New to the refuge in August, he's happy and thankful to finally work on a wildlife refuge, something he has dreamed about since college. "I've always been interested in waterfowl/wetland habitat management and find the diversity of work here very interesting."

He and his wife Kim have two full-time hobbies named Trent (age 3 1/2) and Kayley (age 2), who "we wouldn't trade for anything". Other hobbies include boating, skiing, hunting, fishing, and photography.

Other Agencies...

The Oregon Department of Fish and Wildlife (ODFW) is the agency responsible for management of wildlife resources belonging to the state of Oregon, and shares responsibility with the USFWS on migratory species and those with special status like Threatened and Endangered. The Department Mission is "to protect and enhance Oregon's wildlife and their habitats for use and enjoyment by present and future generations".

The Klamath District is one of about 22 in the state, all within seven department management Regions. The district includes nearly all of Klamath county. Also located in Klamath County is a department fish hatchery at Fort Klamath, and a wetlands/wildlife management area, Klamath Wildlife Area, south of Klamath Falls.

The Klamath Basin in Oregon has a wide variety of habitats ranging from high altitude alpine areas down through marshlands to high elevation semi-desert areas. As a result of the varied habitats and numerous migratory species, the Basin probably hosts more species than any other area of Oregon. Due to the wide variety of habitats and vast numbers of migratory wildlife in the Klamath Basin, the USFWS and ODFW find themselves working together often.

Volunteers...Gain rewarding

experience with the U.S. Fish and Wildlife Service: Sign up as a volunteer and we obtain the experience of your life! This exciting work includes wildlife and habitat surveys, visitor contacts, clerical, maintenance, photography, conservation education, and is available for all age groups.

Our thanks and appreciation to refuge volunteers: Mark Lowrie volunteered 310 hours to a variety of

We cooperate in responding to numerous damage complaints involving waterfowl and raptors. Recently the two agencies worked together banding geese to study their movement patterns and trapping goslings for transplant to other areas or states. A common bond between agency personnel is also created through educational activities. A major cooperative activity has been the work done to secure and manage important bald eagle wintering habitat.

Beginning in the mid 1970's the two agencies began identifying key eagle feeding and night roosting areas in the lower Klamath Basin. This led to the protection of several night roost areas, including the Bear Valley Refuge near Worden. A vital part in its establishment was the cooperative effort to gain public and political support. The truly successful Klamath Basin Bald Eagle Conference (our 12th in 1991) was born out of the controversy over identification of eagle habitat needs.

In the future I know we will strive even harder to work together on common wildlife, habitat and educational activities, even the controversial ones.



Ralph Opp
District Wildlife Biologist

refuge programs including checkstation operation, map filing, grazing evaluation study, grounds maintenance, and disease surveillance/pickup...**Ducks Unlimited** Northern California Chapters assisted our biologists with botulism pickup in August (40 hrs)...**David Deemer** installed a light bar and a P.A. system on the fire engine (24 hrs.)...**Dean Baker**, a local photographer, repaired photo blinds on Sheepy Ridge and the Lower Sump (24 hrs.).

Interested? Contact the Volunteer Coordinator, Klamath Basin NWRs, (916) 667-2231.

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U.S. DEPARTMENT OF THE INTERIOR
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UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
KLAMATH BASIN NATIONAL WILDLIFE REFUGES
ROUTE 1 BOX 74
TULELAKE, CALIFORNIA 96134

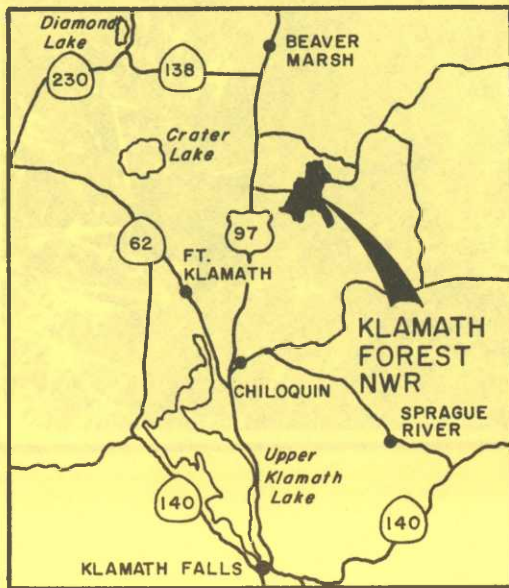
Hunting

**Klamath Forest
National Wildlife
Refuge
OREGON**






KLAMATH FOREST NATIONAL WILDLIFE REFUGE
U.S. Fish and Wildlife Service

HUNTING MAP

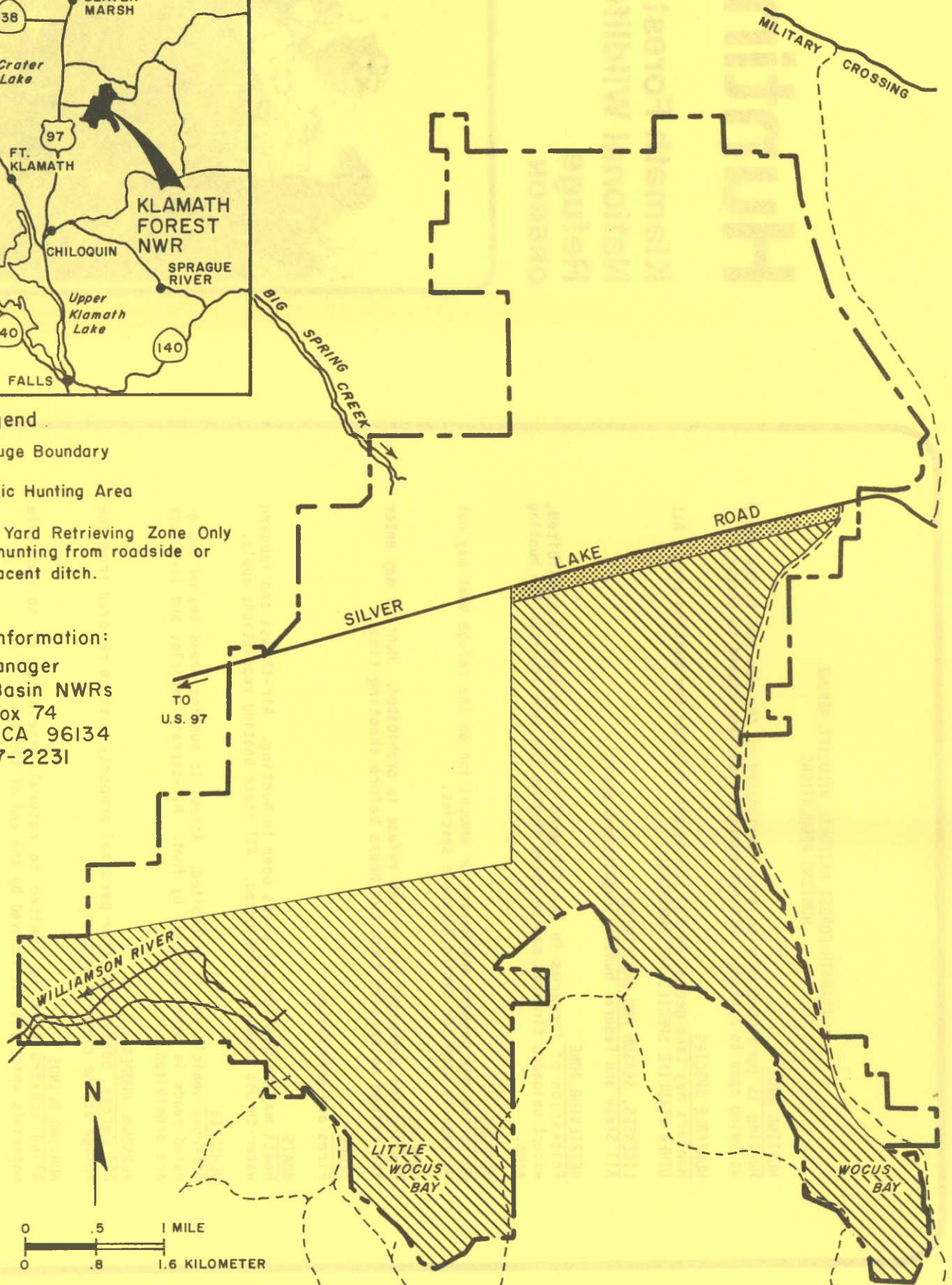


Legend

-  Refuge Boundary
-  Public Hunting Area
-  100 Yard Retrieving Zone Only
No hunting from roadside or adjacent ditch.

Additional Information:

Refuge Manager
Klamath Basin NWRs
Route 1, Box 74
Tulelake, CA 96134
(916) 667-2231



KLAMATH FOREST NATIONAL WILDLIFE REFUGE
HUNTING REGULATIONS

HUNTING AREA

Hunting is permitted only on areas designated on the map and in the field as being open to hunting. All non-hunting areas are closed to access.

HUNTABLE SPECIES

Hunters may take geese, ducks, coots, and snipe on the hunting area. ALL OTHER WILDLIFE SPECIES ARE PROTECTED.

LICENSES, SEASON AND BAG LIMITS

All State and Federal hunting regulations apply.

RETRIEVING ZONE

Possession of firearms in the 100-yard retrieving zone is prohibited, except unloaded firearms may be taken through the zone to reach the hunting area.

WEAPONS

No person may possess any weapon or ammunition on the refuge that may not be legally used for taking huntable species.

CAMPING

Camping and overnight use on the refuge is prohibited. Hunters may enter the refuge no earlier than two hours before shooting time.

FIRES

Fires are prohibited.

BOATS

Boats may be used on all areas open to hunting. Air-thrust and inboard water-thrust boats are prohibited. All state boating regulations apply.

VEHICLES

Off-road vehicle use is prohibited. Access to hunting areas beyond designated roads is permitted only by foot. All-terrain vehicles and livestock are prohibited.

PERSONAL PROPERTY

All decoys, boats, and other personal property must be removed from the refuge at the close of each day.

HUNTING BLINDS

Blind construction is limited to natural vegetation or to portable materials which must be removed by the end of the day.

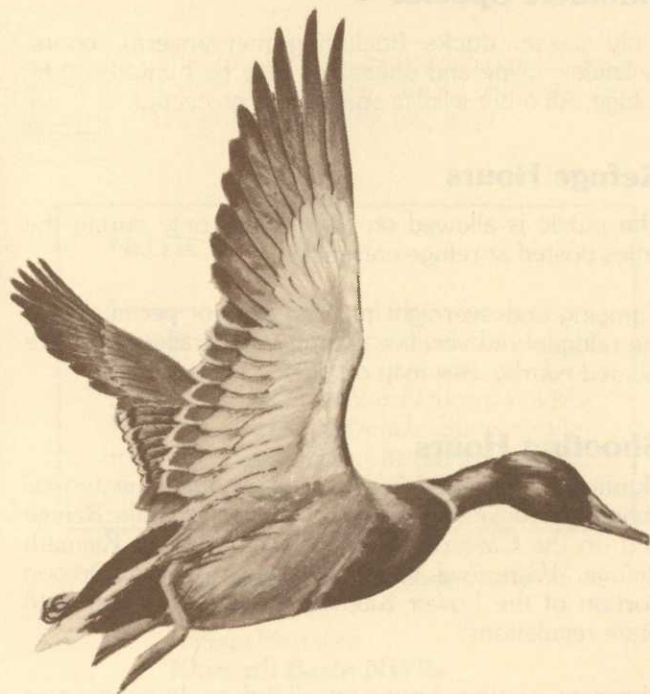
LITTERING

Littering is prohibited. Please remove all empty shell cases and trash from the refuge.

HUNTING 1990

Tule Lake & Lower Klamath National Wildlife Refuges

California - Oregon



Licenses

All hunters must carry valid State hunting licenses and all required State and Federal stamps and permits.

Permits

Waterfowl: During the first two days of waterfowl season, all hunters 16 years of age and older must carry a valid entry permit for the controlled unit in which they are hunting. Hunters under the age of 16 must be accompanied by a permitted adult. Permits are issued in advance of waterfowl season to applicants selected by a lottery.

Pheasants: Entry permits for hunters over 16 years of age will be required for the first four days of the California State pheasant hunting season for the controlled hunt areas. Advance reservation will be available, by lottery, for those days.

Huntible Species

Only geese, ducks (including mergansers), coots, gallinules, snipe and pheasants may be hunted on the refuge. All other wildlife species are protected.

Refuge Hours

The public is allowed on the refuges only during the times posted at refuge entrances.

Camping and overnight parking are not permitted on the refuge; however, five campground/trailer parks are located nearby. See map on back.

Shooting Hours

Hunting is permitted 7 days a week. Legal waterfowl shooting hours end at 1:00 p.m. on the Tule Lake Refuge and on the California portions of the Lower Klamath Refuge. Waterfowl shooting hours for the Oregon portion of the Lower Klamath Refuge correspond to State regulations.

Pheasant hunting hours on all refuge hunting areas correspond to State regulations.

Boats

Boats may be used on all areas open to waterfowl hunting. Air-thrust and inboard water-thrust (jet) boats are prohibited. Unit 4c, d, e, f on Lower Klamath refuge is a motorless, or electric motors only, area. Boat launching is not permitted after 1:00 p.m. **State lighting requirements are enforced by refuge officers.**

Retrieving Zones

Possession of firearms in retrieving zones is prohibited, except unloaded firearms may be taken through the zones when necessary to reach hunting areas. Decoys may not be set in retrieving zones. Restrictions apply to both waterfowl and pheasant hunting.

Access Route

It is illegal to shoot from or across any access route or parking area. Motor vehicles are allowed only on designated access routes. These roads may be closed during parts of the season. **EXCEPTION:** Waterfowl hunters may only drive off access routes to set out or pick up decoys in the following field units - The League of Nations, The Panhandle, Miller Lake and Straits Unit.

Unit Intersections

Markers are posted at the following Lower Klamath NWR unit intersections (A) - Units 3, 4, 6; (B) - Units 4, 6, 7; (C) - Units 6, 7, 11; (D) - Units 7, 8, 11, 12; (E) - Units 4, 9, Sheepy East. Hunters unfamiliar with the refuge should use a hunting map in conjunction with the intersection markers.

Removal of Personal Property

All decoys, boats and other personal property must be removed from waterfowl hunt areas by 2:00 p.m., and from the refuges at the close of each day.

Weapons and Ammunition

No person may possess any weapon or ammunition that may not be legally used for taking waterfowl or pheasants on these refuges.

Accidents

All accidents and injuries occurring on the refuge must be immediately reported to the Refuge Manager, Klamath Basin NWRs, Route 1 Box 74, Tulelake, CA 96134. Phone (916) 667-2231.

Hunter-Made Blinds

Temporary hunting blinds may be built of natural vegetation. **The use of pit blinds is not permitted.**

Spaced-Blind Areas

Blind sites in the spaced-blind areas will be selected by lottery at the beginning of each day's hunt. The daily lottery begins approximately two hours before shoot time. Call the refuge office, (916) 667-2231, for current times. The lottery will be held at the check station located on County Line Road.

Only those receiving blind assignments from this check station may hunt in the spaced-blind areas. Hunters may draw only one blind site and may not hunt from any other site. Hunters may not possess loaded firearms further than 100 feet from their assigned blind.

Each blind must have a spread of at least one dozen goose decoys.

Hunters may not shoot at birds that are beyond normal effective range. Those who persist in shooting at out-of-range birds will be subject to removal from the area.

Handicapped

The refuges cover a variety of habitats including rough uneven terrain, deep waters, dense stands of bulrushes (tules), stubble fields and ditches, etc. Rainfall can make roads and fields muddy and slippery, making them more difficult to negotiate. Hunting difficulty varies by area and hunters should examine their own abilities and limitations before using the refuge. Handicapped persons should hunt with a partner. Consult the refuge manager for suggestions for hunting the area safely.

Signs and Boundaries

These signs will help you find hunting area boundaries. The wording applies to the area behind the sign. Some posts have signs on two sides - **READ BOTH SIDES**. Watch for boundary corners and check your location with this map.



When this boundary sign is used alone on a post, it means **NO HUNTING**. You may enter the area only on designated access routes.



Motor vehicles are not allowed beyond this sign. Do not block access.



This area is closed to **ALL** entry. No hunting or sightseeing is permitted. No roads or trails are open to the public.



This area open for waterfowl hunting only. Daily permit required. Permits available by drawing prior to hunt time.



Motor vehicles are allowed on this route. Speed limit 35 MPH except where otherwise posted. No shooting from or across the road. Some of these roads will be closed during part of the season.



Used alone or beneath a refuge boundary sign. The area behind this sign may be hunted as permitted by refuge regulations.



This area is open during regular State pheasant season. Waterfowl hunting is prohibited. Entry permit required the first four days of the season.



You may pass through this area to get to hunting units. You may retrieve downed birds. Loaded firearms are prohibited.



This area is open only during regular State waterfowl season. Entry permits are required during first two days.

NOTICE

Hunters must use and be in possession only of shells containing steel shot when hunting ducks, geese or coots on Tule Lake and Lower Klamath National Wildlife Refuges. Check applicable State regulations for a description of the entire steel shot zone.

For more information, contact:

Refuge Manager
Klamath Basin NWRs
Route 1 Box 74
Tulelake, CA 96134
Phone (906) 667-2231

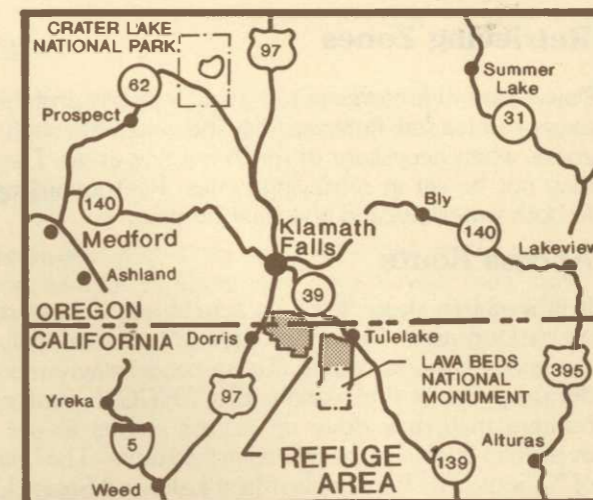


Department of the Interior
U.S. Fish and Wildlife Service

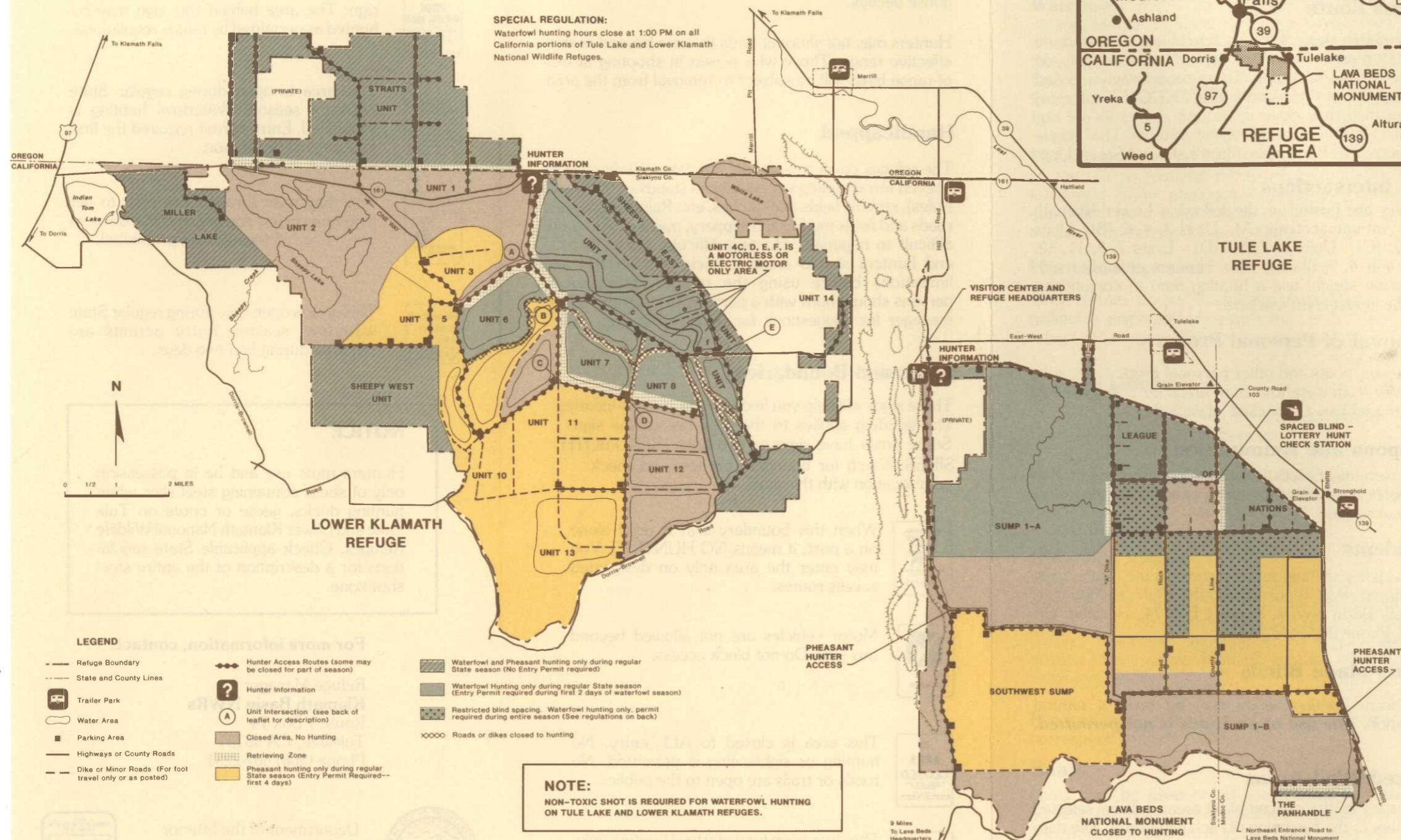
RF11660

August 1990





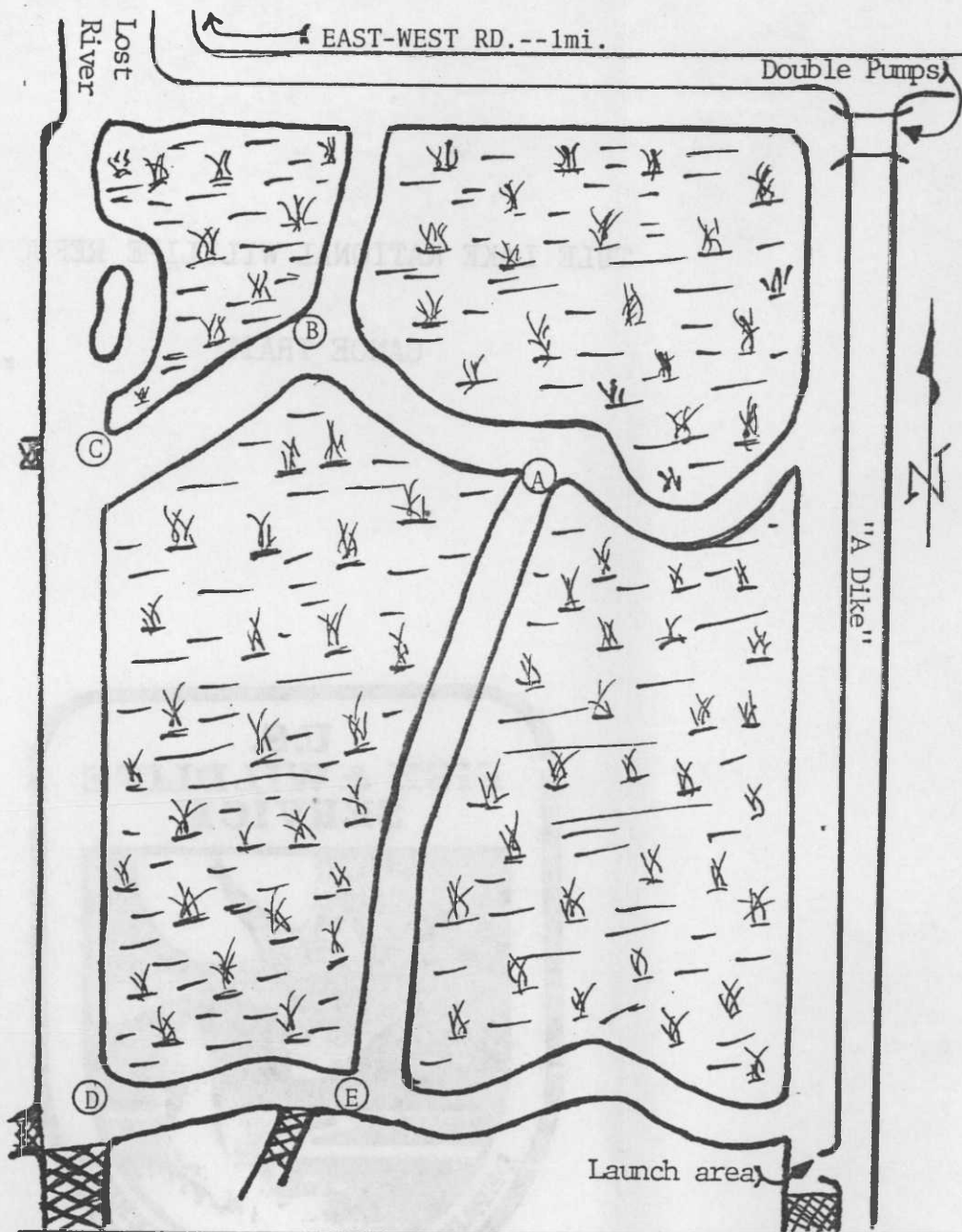
SPECIAL REGULATION:
Waterfowl hunting hours close at 1:00 PM on all California portions of Tule Lake and Lower Klamath National Wildlife Refuges.



TULE LAKE NATIONAL WILDLIFE REFUG

CANOE TRAIL





--TULE LAKE NWR--
CANOE TRAIL

The Tule Lake marsh is a sump...that is, there is no natural surface water outlet. In the early 1900's the Tule Lake basin included 85,000 acres of marsh and open water. Today 13,200 acres of marsh and open water remain as an irrigation source and return flow sump for agriculture and wildlife. Water levels are established by agreement with the Fish and Wildlife Service, Bureau of Reclamation, and the Tulalake Irrigation District to preclude nest flooding in the spring, reduce avian botulism problems in the summer, and provide for winter drawdown for flood storage.

The 100 acre canoe area is part of a 2500 acre hardstem bull-rush/cattail marsh. Canoers paddle along recently dredged channels which improved water circulation and created open water areas in a silted and overgrown marsh. Spoil banks and islands provide nesting areas for waterfowl and other birds. Canoers may also see deer and other types of wildlife as they quietly paddle along the channels.

The canoe trail area may be closed at various times during the year due to fluctuating water levels and nesting wildlife. Generally, the trail is open for use from July through September. Please remember however, that the wildlife is the most important part of Tule Lake Refuge, and management requirements may cause the trail to be closed at times it would normally be open.

Contact refuge headquarters for information on trail opening and closing: 8:00am--4:30pm, Monday through Friday
phone: 916/ 667-2231


Weekends/Holidays 8:00am - 4:00pm

Overnight camping is not permitted at any time

Canoe Trail Regulations: Trail open during daylight only

(A) Intersections

Outboard motors and fishing are not
allowed

 Closed Channel:

Canoers must stay in the canoe, and
in designated channels.

Tule Lake National Wildlife Refuge
Rt. 1 Box 74
Tulalake, CA 96134





Wildlife

Different habitats in the Upper Klamath area support a variety of wildlife. Each species of wildlife has its own requirement for food and cover in one or a combination of these habitats.

When the combination of habitats such as forest, marsh, and open lake are brought together, as they are in this area, a richer, more varied environment is created. It provides food, cover, and nesting habitat for a greater variety of wildlife species than if these habitats existed separately. The same combination of habitats, and its resulting wildlife and fish, attracted Klamath Indians to the shores of the lake to hunt and fish.

255 different species of birds have been observed in the area including 170 who nest here. The most unique birds found here include red-necked grebe, white pelican, least bittern, sandhill crane, wood duck, bald eagle, and osprey.

The most notable mammals to observe on your canoe trip are river otter, muskrat, and beaver.

For a more complete bird checklist, please see Birds Klamath Basin National Wildlife Refuges published by the U.S. Fish and Wildlife, RF11660-2, August 1978.



Plants

One of the most common plants found in the marsh is Wokas or pond lily, a large-leaved water plant with large yellow cup-shaped, waxy-looking flowers. Seeds from this plant were harvested for winter food supplies in times past by Klamath Indians using dugout canoes. The common tall marsh plant found is bullrush, although cattail can also be seen.

Regulations

Canoe enthusiasts are reminded of the following regulations:

1. Upper Klamath National Wildlife Refuge is open to the public during daylight hours only. Overnight camping is not permitted.
2. Boaters must remain on designated trails. All other areas of the refuge marsh interior are closed to protect nesting wildlife.
3. Outboard motor use is prohibited on the shortcut trail that meanders through the marsh from Recreation Creek to Crystal Creek.

Information

For more information contact:

U.S. Fish & Wildlife Service
Klamath Basin National Wildlife Refuge
Rt. 1, Box 74
Tulelake, CA 96134
916-667-2231

U.S. Forest Service
Klamath Ranger District
1936 California Ave.
Klamath Falls, OR 97601
503-883-6824



Forest Service · USDA
Pacific Northwest Region
Winema National Forest



DEPARTMENT OF THE INTERIOR
U.S. FISH AND WILDLIFE SERVICE

Upper Klamath Canoe Trail





Canoeing

The canoe trail winds through a portion of the 15,000 acre fresh water marsh administered by the U.S. Forest Service and the U.S. Fish and Wildlife Service. Development of the trail is a cooperative effort of both agencies.

Two routes are available. A six mile route travels from Rocky Point, north on Recreation Creek, south on Crystal Creek to Pelican Bay, returning you to Rocky Point.

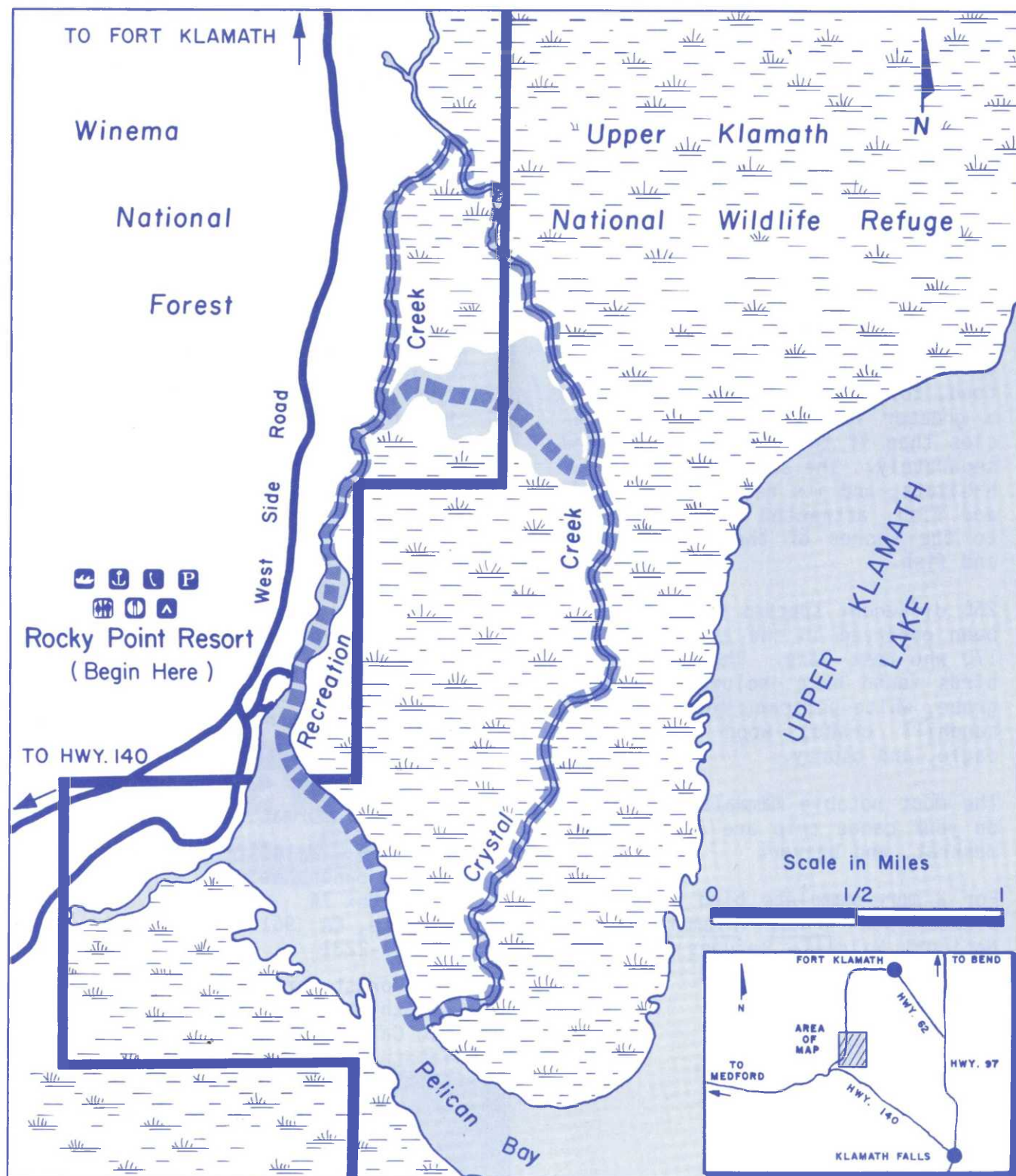
The 3 1/2 mile route shortcuts from Recreation Creek through an open area in the marsh.

Preparing for your canoe trip is important. Suggested items include:

Suntan lotion	Towel
Mosquito repellant	Food and drink
Hat	Binoculars
Sunglasses	Camera
Windbreaker/jacket	Waterproof bag

Please carry your drinks in unbreakable containers. Remember a life preserver or flotation cushion is needed for each canoeist.

Two canoeists in good physical condition can comfortably paddle 2 mi./hr., so plan your trip accordingly.



Special Accommodations: The Fish and Wildlife Service is in the process of removing barriers to accessibility for disabled visitors. Some refuges have made facilities and programs more accessible, especially to visitors in wheelchairs. However, there is limited access at many refuges. Please contact the refuge prior to a visit for current information.

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MISSOURI

Mark Twain (See Illinois)

Clarence Cannon, Box 88, Annada, MO 63330

Mingo, Route 1, Box 103, Puxico, MO 63660

Square Creek, Box 101, Mount City, MO 64470

Swan Lake, Box 68, Sumner, MO 64681

MONTANA

Benton Lake, Box 450, Black Eagle, MT 59414

Bowdoin, Box J, Malta, MT 59535

Charles M. Russell, Box 110, Lewistown, MT 59457

Lee Metcalf, Box 257, Stevensville, MT 59870

Medicine Lake, HC 51, Box 2, Medicine Lake, MT 59247

National Bison Range, Moiese, MT 59824

Red Rock Lakes, Monica Star Route, Box 15, Lima, MT 59739

NEBRASKA

Crescent Lake, HC 68, Box 21, Ellsworth, NE 69340

Fort Niobrara, Hidden Timber Route, HC 14, Box 67, Valentine, NE 69201

Valentine

Rainwater Basin Wetland Management District, Box 1686, Kearney, NE 68848

NEVADA

Desert National Wildlife Range, 1500 North Decatur Blvd., Las Vegas, NV 89108

Ash Meadows

Pahranaqui

Ruby Lake, Ruby Valley, NV 89633

Sheldon, P.O. Box 111, Room 308, U.S. Post Office Bldg., Lakeview, OR 97630

Stillwater, Box 1236, 1510 Rio Vista Rd., Fallon, NV 89406

Fallon

NEW HAMPSHIRE

Wapack, Wren Hill Rd., Sutherland, MA 01776

NEW JERSEY

Edwin B. Forsythe, Box 72, Oceanville, NJ 08231

Brigantine

Barnegat, Box 544, Barnegat, NJ 08005

Great Swamp, Pleasant Plains Road, Rd 1, Box 152, Basking Ridge, NJ 07920

NEW MEXICO

Bitter Lake, Box 7, Roswell, NM 88201

Bosque del Apache, Box 1246, Socorro, NM 87801

Sevilleta, General Delivery, San Acacia, NM 87831

Las Vegas, Route 1, Box 395, Las Vegas, NM 87701

Maxwell, Box 276, Maxwell, NM 87728

NEW YORK

Iroquois, P.O. Box 517, Alabama, NY 14003

Montezuma, 3395 Route 5/20 East, Seneca Falls, NY 13148

Worthington, P.O. Box 21, Shirley, NY 11967

Morton

Target Rock

NORTH CAROLINA

Alligator River, P.O. Box 1969, Mantoloking, NC 27954

Cumtux

Pea Island

Mackay Island, P.O. Box 31, Knotts Island, NC 27950 (NC and VA)

Mattamuskeet, Rt. 1, Box N-2, Swansquarter, NC 27885

Cedar Island

Pungo

Swanquarter

Fee Dee, Box 760, Wadesboro, NC 28170

NORTH DAKOTA

Annowood, Rural Route 1, Pingree, ND 58476

Long Lake, Moffit, ND 58560

Valley City Wetland Management District, Rural Route 1, Valley City, ND 58072

Audubon, Rural Route 1, Coleharbor, ND 58531

Leas Ilo, Dym Center, ND 58626

Dee Lacs, Box 578, Kenmare, ND 58746

Crosby Wetland Management District, Box 148, Crosby, ND 58730

Lostwood, Rural Route 2, Box 98, Kenmare, ND 58746

Devils Lake Wetland Management District, Box 908, Devils Lake, ND 58301

Lake Alice

Sullys Hill National Game Preserve, Fort Totten, ND 58335

J. Clark Saiyer, P.O. Box 66, Upham, ND 58789

Kulm Wetland Management District, Box E, Kulm, ND 58456

Tenaskon, Rural Route 1, Box 75, Gayoga, ND 58013

Upper Souris, Rural Route 1, Foxholm, ND 58738

OHIO

Ottawa, 14000 W. State Route 2, Oak Harbor, OH 43449

OKLAHOMA

Little River, General Delivery, Broken Box, OK 74962

Salt Plains, Route 1, Box 76, Jet, OK 73749

Sequoyah, Route 1, Box 18A, Vian, OK 74962

Tishomingo, Route 1, Box 151, Tishomingo, OK 73460

Washita, Route 1, Box 68, Butler, OK 73625

Optima

Wichita Mountains, Route 1, Box 448, Indianola, OK 73552

OREGON

Hart Mountain National Antelope Refuge, U.S. Post Office Bldg., Lakeview, OR 97630

Klamath Basin Refuges, Route 1, Box 74, Tulelake, CA 96134

Bear Valley

Klamath Forest

Lower Klamath (Oregon and California)

Upper Klamath

Malheur, Box 245, Princeton, OR 97721

Umatilla, P.O. Box 239, Umatilla, OR 97882 (Oregon and Washington)

Cold Springs

McKay Creek

Western Oregon Refuges, 26208 Finley Refuge Rd., Corvallis, OR 97333

Ankeny

Bandon Marsh

Basket Slough

Cape Meares

William L. Finley

Willapa (See Washington)

Columbian White-tailed Deer (Oregon and Washington)

Lewis and Clark

PENNSYLVANIA

Erie, RD 1, Wood Duck Lane, Guy Mills, PA 16327

Carlin National Environmental Center, Suite 104, Scott Plaza 2, Philadelphia, PA 19113

PUERTO RICO

Caribbean Islands, Box 510, Carr. 301, KM 5.4, Boqueron, PR 00622

Buck Island (Virgin Islands)

Cabo Rijo (Puerto Rico)

Culebra (Puerto Rico)

Desahecho (Puerto Rico)

Green Cay (Virgin Islands)

Sandy Point (Virgin Islands)

RHODE ISLAND

Ninigret, Shoreline Plaza, Route 1A, Box 307, Charlestown, RI 02813

Block Island

Sachuest Point

Truston Point

SOUTH CAROLINA

Cape Romain, 390 Bulls Island Rd., Awendaw, SC 29429

Carolina Sandhills, Route 2, Box 330, McBee, SC 29101

Pinckney Island

Santee, Route 2, Box 66, Summerton, SC 29148

SOUTH DAKOTA

Lacreek, HWC 3, Box 14, Martin, SD 57551

Lake Andes, Rural Route 1, Box 77, Lake Andes, SD 57356

Karl E. Mundt

Madison Wetland Management District, Box 48, Madison, SD 57042

Sand Lake, Rural Route 1, Box 25, Columbia, SD 57433

Waubay, Rural Route 1, Box 79, Waubay, SD 57273

TENNESSEE

Cross Creeks, Route 1, Box 229, Dover, TN 37058

Hatchee, Box 167, Brownsville, TN 38012

Chickasaw

Lower Hatchee

Reelfoot, Route 2, Hwy 157, Union City, TN 38261

Lake Isom

Tennessee, Box 849, Paris, TN 38242

TEXAS

Anahuac, Box 276, Anahuac, TX 77514

McFaddin

Texas Point

Aransas, Box 100, Austwell, TX 77950

Attwater Prairie Chicken, Box 518, Eagle Lake, TX 77434

Brazoria, Box 1088, Angleton, TX 77515

Big Boggy

San Bernard

Buffalo Lake, Box 228, Umbarger, TX 79091

Grulla (New Mexico and Texas)

Muleshoe, Box 549, Muleshoe, TX 79347

Hagerman, Route 3, Box 123, Sherman, TX 75090

Laguna Atascosa, Box 450, Rio Hondo, TX 78563

Santa Ana, Route 1, Box 202A, Alamo, TX 78516

Rio Grande Valley

UTAH

Bear River Migratory Bird Refuge, Box 459, Brigham City, UT 84302 (Temp. Closed)

Fish Springs, P.O. Box 588, Dugway, UT 84022

Oquir, 1680 W. Hwy. 40, Room 1220, Vernal, UT 84078

VERMONT

Missisquoi, Route 2, Swanton, VT 05488

VIRGINIA

Black Bay, 4005 Sandpiper Rd., P.O. Box 6286, Virginia Beach, VA 23456

Chincoteague, Box 62, Chincoteague, VA 23336

Eastern Shore of Virginia, RFD 1, Box 122B, Cape Charles, VA 22310

Great Dismal Swamp, P.O. Box 349, Suffolk, VA 23434 (NC and VA)

Mason Neck, 14416 Jefferson Davis Highway, Suite 20A, Woodbridge, VA 22191

Presquisle, Box 620, Hopewell, VA 23860

WASHINGTON

Columbia, 44 S. 8th Ave., P.O. Drawer F, Othello, WA 99344

Nisqually, 100 Brown Farm Rd., Olympia, WA 98506

Dungeness, P.O. Box 698, Sequim, WA 98382

San Juan Islands, 100 Brown Farm Rd., Olympia, WA 98506

Ridgefield, 301 N. Third, P.O. Box 457, Ridgefield, WA 98642

Conboy Lake, P.O. Box 5, Glenwood, WA 98619

Turnbull, Route 3, Box 385, Cheney, WA 99004

Umatilla, P.O. Box 239, Umatilla, OR 97882 (Oregon and Washington)

McNary, Box 308, Burbank, WA 99323

Toppenish, Route 1, Box 1300, Toppenish, WA 98948

Willapa, Ilwaco, WA 98624

Columbian White-tailed Deer (Oregon and Washington)

Lewis and Clark (See Oregon)

WISCONSIN

Horicon, W. 4279 Headquarters Rd., Mayville, WI 53050

Necedah, Star Route West, Box 386, Necedah, WI 54646

Upper Mississippi River Wildlife and Fish Refuge (See Minnesota)

La Crosse District, P.O. Box 415, La Crosse, WI 54601

Trumpealeau, Route 1, Trumpealeau, WI 54661

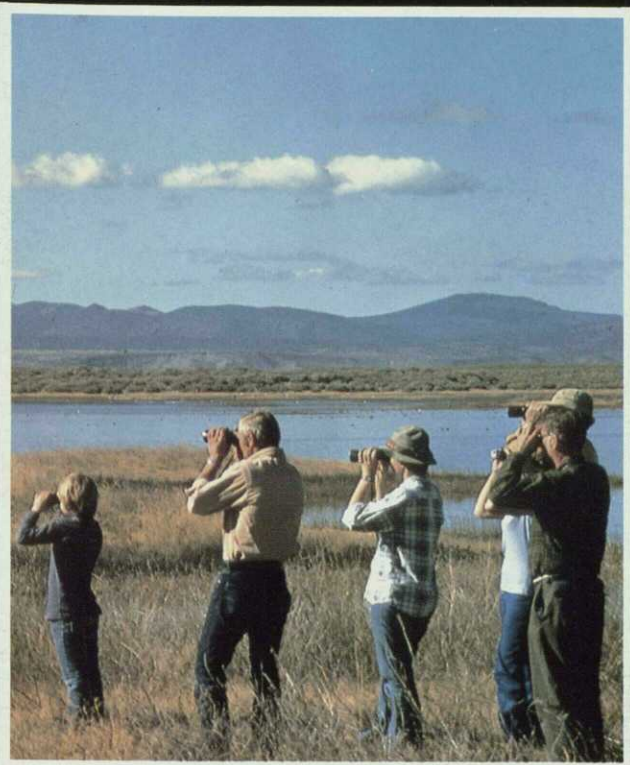
WYOMING

National Elk Refuge, Box C, Jackson, WY 83001

Seedskaadee, P.O. Box 67, Green River, WY 82935

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A Visitor's Guide



R. C. Fields, USFWS

The National Wildlife Refuge System is a collection of over 90 million acres of lands and waters managed specifically for wildlife. In 1903, tiny Pelican Island in Florida was established by Theodore Roosevelt as the first National Wildlife Refuge. Now nearly 450 National Wildlife Refuges enable you to catch a glimpse of a unique wildlife heritage.



J. P. Mattson, USFWS

"The human future depends on our ability to combine the knowledge of science with the wisdom of wildness."
—Charles Lindbergh



B. Shellenberger, USEPA

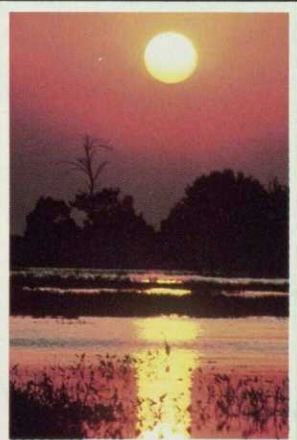


J. R. Nickles, USFWS

"We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect."



J. J. Houli USEFWS



A. Weber, USFWS

Tips for Visiting National Wildlife Refuges

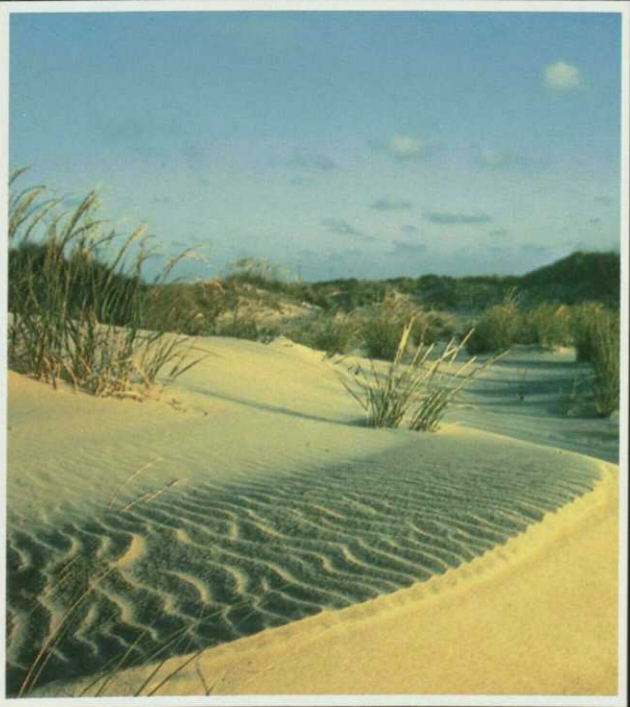
- Use this "Visitor's Guide" to identify refuges of special interest.
- Contact refuges prior to your visit to receive specific information regarding directions for access, special activities, regulations, and other helpful information.
- Get to know refuges and wildlife close to your home first.
- Take advantage of viewing opportunities by boat, tram or bus available on some refuges.
- Please keep this and other refuge publications for future reference or pass them on to a friend.
- Please respect plant and animal life.



D. B. Marshall, USFWS



D. Menke, USFWS



J. H. Snyder, USFWS



NATIONAL WILDLIFE REFUGES

NOTE: This is not a map of the entire Refuge System, but only those refuges which provide visitor opportunities.



Department of the Interior
U.S. Fish and Wildlife Service



Region I

Lloyd 500 Building, Suite 1692, 500 N.E. Multnomah Street, Portland, OR 97232
(CA, ID, HI, NV, OR, WA)

Region II

Box 1306, Albuquerque, NM 87103
(AZ, NM, OK, TX)

Region III

Federal Building, Fort Snelling, Twin Cities, MN 55111
(IL, IN, IA, MI, MN, MO, OH, WI)

Region IV

Richard B. Russell Federal Building, 75 Spring Street, SW, Atlanta, GA 30303
(AR, AL, FL, GA, KY, LA, MS, NC, SC, TN, PR)

Region V

One Gateway Center, Suite 700, Newton Corner, MA 02158
(CT, DE, ME, MD, MA, NH, NJ, NY, PA, RI, VT, WA, WV)

Region VI

Box 25486, Denver Federal Center, Denver, CO 80225
(CO, KS, MT, NE, ND, SD, UT, WY)

Region VII

1011 E. Tudor Road, Anchorage, AK 99503
(AK)

Washington Office

Division of Refuges, U.S. Fish and Wildlife Service,
Department of the Interior, Washington, D.C. 20240