SAN LUIS NATIONAL WILDLIFE REFUGE

LOS BANOS, CALIFORNIA

ANNUAL NARRATIVE REPORT

Calendar Year 1989

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

REVIEW AND APPROVALS

SAN LUIS NATIONAL WILDLIFE REFUGE

Los Banos, California

ANNUAL NARRATIVE REPORT

Calendar Year 1989

Refuge Manager 6/29/90 Date

Refuge Supervisor Review Date

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INTRODUCTION

San Luis National Wildlife Refuge (NWR) is located 8 miles north of Los Banos in Merced County, California. It was established on June 7, 1966 when the Migratory Bird Conservation Commission approved the purchase of 7,332 acres of land. The actual purchase from the Westover Corporation occurred on February 2, 1967. On May 15, 1970, an unpatented 8-acre parcel was discovered. This parcel was withdrawn from public domain by Public Land Order 4824, under the authority of Executive Order #10355 of May 26, 1952 and added to the Refuge.

The Refuge lies within the historic flood plain of the San Joaquin River in the central San Joaquin Valley. The old oxbows of the river form the east boundary while Salt Slough makes up the west boundary. Approximately 2,690 acres are developed marshes, 3,940 acres are grasslands, and 700 acres are riparian habitat. Elevations range from 73 to 93 feet above mean sea level with a slight overall decrease in elevation from the southeast to the northwest.

The objectives of the Refuge are to provide habitat for migratory waterfowl and waterbirds, preserve and improve habitats that support endangered species such as the San Joaquin kit fox and Aleutian Canada goose, and maintain populations of native plants and animals.

A. HIGHLIGHTS

Drought conditions persist in the Valley ... (Sec. B)

Refuge continues to survive on "soft monies"...(Sec. E.5)

Intensive marsh management work continued in refuge wetlands ... (Sec. F.2)

Experimental grazing program continued with good wildlife (especially cranes) response ... (Sec. F.7)

Four prescribed burns totaling 206 acres were accomplished ... (Sec. F.9)

Enhanced maintenance begun on San Joaquin River Levee ... (Sec. F.10)

Duck and goose use figures remained above 10-year average... (Sec. G.3)

As many as 8,000 ring-necked ducks feed on aquatic plants grown in West Teal and Big Lakes ... (Sec. G.3)

Main auto tour route opened 7 days/week ... (Sec. H.1)

Hunting areas changed ... (Sec. H.8)

C Canal Extension and 4,800' of A Canal Extension completed. Borrow sites for these projects result in new wetland areas being created ... (Sec. I.1)

New 19-acre wetland unit (Souza 1) created with RPRP funding ... (Sec. I.1)

San Luis Canal Company begins rehab of water delivery system to refuge using FWS funds ... (Sec. I.2)

B. CLIMATIC CONDITIONS

Drought conditions continued in 1989. During the critical Oct.-Jan. period, less than 3" of precipitation fell. As of February 1, 1989, the Sierra Nevada had only received 77% of normal precipitation. The snowpack at that time was only 84% of normal according to the National Weather Service. The Palmer Drought Index showed an expanded area of drought in California comparing Jan. 23, 1988 to Jan. 28, 1989. All this following two previous years of drought.

The lack of heavy winter and early spring rains virtually eliminated the refuge's vernal pool community. Little rain in April and none in May coupled with winds dried out the uplands and marshes. A lower water table and the dry, windy conditions required more water per acre to irrigate refuge wetlands. Although temperatures remained seasonal, no relief from the dry spell came until late September when cloudy skies and two storms brought some rain. October brought more rain and hope for relief, but November was disappointing and December was one of the driest ever recorded. Normal Decembers bring 1.29" of rain; this year it brought .01" and abundant fog.

At the end of 1989, the Sierra snowpack was only 42% of normal. According to the California Department of Water Resources, recharge to California reservoirs via snowmelt and runoff was only half of normal in 1987 and 1988, and about 2/3 of normal in 1989. Unless we receive above normal precipitation in 1990, serious water shortages could impact the ability of the refuge to provide wintering waterfowl food and habitat.

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Table 1. 1989 Weather data for Los Banos, CA. a/

Month	High	Low	Precip.(in.)	Remarks
Jan	69	25	.60	
Feb	78	20	.93	Snow flurries
Mar	79	32	.64	
Apr	94	44	.39	
May	94	46	-	Windy
June	105	50	-	2 days of 100°
July	107	54	-	10 days of 100°+
Aug	101	54	.12	2 days of 100°+
Sept	100	48	1.42	2 days of 100°+
Oct	92	38	.85	
Nov	76	29	.28	Sunny, clear, no wind
Dec	67	24	.01	Fog, unusually dry
1989	High 107	Low 20	5.24"	Over 3" Below normal

a/ Data recorded at Central California Irrigation District headquarters in Los Banos, 10 miles south of San Luis NWR

Precipitation was significantly below normal this year with 5.24" recorded in Los Banos, only 61% of the annual average. Rainfall was equally spread between spring and fall, with 2.56" received from January through April, and 2.68" from August to December. This was the second consecutive year of below average rainfall as only 7.87" of rain occurred in 1988. The winter of 1988/89 saw the first snowfall in the Los Banos/Merced area since the early 1960's. Light snow occurred during the first week in February, 1989 as well as in late December of 1988.

Temperatures below freezing occurred in January (22 days), February (8 days), November (2 days) and December (15 days). Low temperatures were 20°F in February and 24°F in December. Temperatures exceeding 100°F occurred in June (2 days), July (10 days), August (2 days), and September (2 days). The high for the year, 107°F, occurred in July.

Dense fog, a common phenomena in the Central Valley, was present almost daily in December and January.

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D. PLANNING

4. Compliance with Environmental and Cultural Resource Mandates.

An Environmental Assessment, Finding of No Significant Impact, Environmental Action Memorandum and Section 7 Evaluation were completed for the rodent control program implemented along the San Joaquin River Levee (See Sec. F.10). The Lower San Joaquin River Levee District mandated that the refuge maintain the levee to the District's specifications or risk losing public access. The levee and its all weather road serves as an important part of the refuge's public use program.

Comments were provided to Ecological Services, Sacramento, concerning a Department of the Army permit application to discharge dredged material into the San Joaquin River adjacent to the refuge. The applicant, D & D Land and Water, Inc., proposed to construct a dam in the river which would raise water levels upstream sufficiently enough to permit operation of the applicant's pump during low flow conditions. The pumping operation was to be used to divert water onto the applicant's land for creation of duck habitat through the duck hunting season. Once the hunting season closed, the dam would be removed. The dam would be constructed each year for several years.

The refuge had no objections to the proposed work as described in the Public Notice. The project would cause no damage to wildlife or cultural resources. However, other agencies and organizations were opposed to the project and the application was subsequently withdrawn. It was later discovered in September that the dam had been erected even though a permit had not been issued. The dam was constructed of sand bags and was camouflaged with dirt, jointgrass and willow branches to give it the appearance of a beaver dam. The Corps of Engineers Office in Sacramento was notified of the violation.

Bert Gianelli, President of D & D Land and Water Inc., contacted the refuge in October to discuss the temporary dam situation. Mr. Gianelli stated he was unaware of the dam and that it must have been built by the individual who is farming a portion of his land. He also brought in a copy of a Stream or Lake Alteration Agreement issued by the California Department of Fish and Game which he felt may exempt him from the Corps of Engineers permitting process. He was informed that federal regulations, i.e., Section 10

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of the Rivers and Harbor Act, also apply here and that the temporary dam had to be removed. The Army Corps of Engineers allowed D & D a grace period of several weeks to remove the dam; however, after much procrastination by both the Corps and D & D, the refuge took the situation into its own hands since the dam was at least partially built on refuge property and removed it in late November.

Both the State Reclamation Board and the Lower San Joaquin River Levee District have agreed to go through the CEQA and the 404 permitting process in regards to their flood control project along the San Joaquin River adjacent to San Luis Refuge. Up until now, the refuge staff has taken the lead and pushed for consultation and review of the project. Now that the project is subject to a formal review process, Ecological Services in Sacramento will be taking the lead with the refuge playing a support role.

As a followup, Biologist Klett and Primary Assistant Manager Houk attended a meeting in Sacramento with personnel of the Lower San Joaquin River Levee District and Karen Miller, Ecological Services, to discuss the Army Corps of Engineers permit requirements for the Levee District's project. Since their initial meeting with the Corps of Engineers, the Levee District had expanded their plan to include all of the river under their jurisdiction that is scheduled for major work or routine maintenance. By addressing the entire river system, the cumulative effects of all the work, present and future, can be assessed. Although the original agreement had been expanded, the plan was never revised and was still as ambiguous as the original. The plan leaves much of the clearing to the discretion of the Levee District. An Environmental Assessment, containing a more detailed and specific plan, as well as possible alternatives and justification, must be drawn up. These documents would then be available for public review. As of year's end, an environmental assessment had not been completed.

The proposed site for the new hunter parking lot located in the northeast corner of the Nevada Unit was surveyed on July 18 for the presence of endangered/threatened and sensitive species. No signs of such species were found.

Biologist Klett provided training in July to Biologists Craig Martz and Paula Pebsworth of Caltrans in the proper identification of delta button celery and hispid bird's beak. They were shown stands of each plant plus habitat in which each is found. This information will be used when evaluating future highway construction in the area.

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5. Research and Investigations

San Luis NWR NR89 - Effects of Africanized honey bees on pollination by solitary bees.

Robbin Thorp, professor at U.C., Berkeley made periodic trips to the refuge to collect bees and flower samples as part of his continuing research on interactions between domesticated bees and native bee species. A progress report on his findings is forthcoming.

A group of Service research biologists visited on January 26 and 27 to discuss research needs. The committee, which included individuals from the Northern Prairie Wildlife Research Center as well as Deputy ARD Rob Shallenberger, toured all three refuges and inspected management programs and research efforts.

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E. ADMINISTRATION

1. Personnel

The following is a complete list of personnel who worked at the San Luis NWR Complex in 1989:

1. Gary Zahm, Refuge Manager, GM-13, PFT
2. James Houk, Primary Assistant Manager, GS-12, PFT
3. Rodney Blacker, Assist. Refuge Manager, San Luis NWR, GS-9, PFT
4. Kim Forrest, Assist. Refuge Manager, Merced NWR, GS-9, PFT, Transferred 1/10/89
5. Tom Melanson, Assist. Refuge Manager, Merced NWR, GS-9, PFT, EOD 1/29/89
6. Dan Severson, Assist. Refuge Manager, Kesterson NWR, GS-9, PFT, Transferred 12/18/89
7. Bob Flores, Assist. Refuge Manager, Kesterson NWR, GS-9, PFT, EOD 12/21/89
8. Steven Klett, Wildlife Biologist, GS-11, PFT
9. Joel Miller, Easement Biologist, GS-11, PFT
10. Fred Paveglio, Wildlife Biologist (Contaminants), GS-12, PFT, Transferred 6/20/89
11. Raymond Fuller, Engineering Equip. Operator, Merced NWR, WG-10, PFT
12. Cliff Imler, Engineering Equip. Operator, San Luis NWR, WG-9, PFT
13. Roy Shearer, Engineering Equip. Operator, San Luis NWR, WG-9, PFT
14. Walt Hammond, Irrigator, San Luis NWR, WG-4, Taper CC
15. Will Wakeling, Tractor Operator, WG-6, San Luis NWR, TFT Resigned 3/11/89
16. Rene Reyes, Tractor Operator, WG-6, San Luis NWR, TFT Resigned 1/28/89
17. Denise Hammond, Refuge Assistant, GS-6, PFT
18. Esther Rodarte, Clerk/Typist, GS-4, TFT
19. Sue Cortese, Clerk/Typist, GS-1, TFT, Resigned 6/2/89
20. Melanie Katen, Clerk/Typist, GS-1, TFT, 7/2/89 to 12/29/89
21. Sheri Clark, Wildlife Biologist (Contaminants), GS-7, TFT
22. Steven Clifton, Wildlife Biologist (Contaminants), GS-7, TFT, Resigned 2/25/89
23. Dale Garrison, Wildlife Biologist, GS-7, PFT
24. Steve Moitoza, Tractor Operator, WG-6, San Luis NWR TPT, 7/24/89 to 8/28/89

By the end of 1989, the refuge was fully staffed with all but two of the permanent full-time positions filled. An engineering equipment operator and a maintenance worker position remain vacant due to the lack of sufficient base funding.

Table 2. Staffing levels at the San Luis NWR Complex FY84-89.

Year	Permanent	Temporary
FY89	12	10
FY88	12	16
FY87	13	12
FY86	11	20
FY85	11	14
FY84	10	4

Wage grade personnel are not assigned to a specific refuge, instead they are assigned to the various refuges within the Complex as manpower needs change. During the year, Engineering Equipment Operator (EEO) Roy Shearer was assigned to San Luis almost 100%, EEO Ray Fuller was assigned to work at Merced 75% of the time and EEO Cliff Imler worked on Merced 38% of the time. Tractor Operator Steve Moitoza mowed roads and ditches and spent all but six days of his short work period at San Luis and Kesterson.

4. Volunteer Program

The refuge implemented a volunteer program utilizing candidates from the Student Conservation Association (SCA). The SCA is a nonprofit organization that solicits work for college students in the natural resource field. Both the SCA and the Service jointly provide nominal financial assistance and in return, the cooperating agency receives a highly motivated individual to assist on refuge projects. The volunteer also receives practical work experience needed to secure future employment.

Two SCA volunteers were selected to work at the San Luis Complex this year. Dan Browder of Princeton, New Jersey was employed from January through May and Joan Hourican of Spring Hill, Florida worked from September through December. These volunteers were instrumental in the completion of many of the refuge's biological programs including riparian restoration, wildlife surveys, and vegetation monitoring of the grazing and prescribed burning programs.

Local resident Howard Starkey continued to provide his volunteer services to the refuge's computer operations.

5. Funding

As usual, managing the budget at the San Luis NWR Complex was a very complicated and time-consuming process. We received funds from 13 different sources (see Table 3). Total funds managed by this office were $1,133,246.00

In 1261 and 1262 base funds, we expended $767,197.15 or 99.8% of the $786,600.00 that had been allocated. As always, we ensured that we spent all of the various monies that we received from other sources, i.e., BOR transfer funds, unless we wanted some to carry over into FY90.

Table 3 illustrates that we have only been able to survive due to the availability of "soft" monies. Many of these funds may not be available in FY90 therefore, our base budget will need to be increased to make up the difference. The refuge's base budget has simply not been increased sufficiently to keep pace with the increase in annual water costs. For example, since 1987, an acre-foot of water for San Luis NWR has increased from $ .75/ac.ft. to $10.37 in FY89. This is an increase of approximately $150K alone just for water delivery charges. Pumping costs have also increased substantially. Merced's primary source of water comes from 23 deep wells. The increase from $ .022/kwh in 1976 to the current rate of $ .074/kwh represents a 236% increase in energy costs in fourteen years. This increase at Merced has resulted in a 32% reduction in the amount of flooded habitat.

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Table 3. Total funds managed by the San Luis NWR Complex during FY89.

Type of Fund	Amount Allocated	Funds Expended	Balance
Base 1261	452,000	-	-
1261 Add-on for projected O&M deficit	30,000	-	-
Total 1261 Funds	482,000	487,015.18	-5,015.18
Base 1262	286,600	280,181.97	6,418.03
Total 126X Base + Add-ons (includes 24,800 of 126X Fire Funds)	768,600	767,197.15	1,402.85
10180-1664-26 RO End-of-Year Funds for San Luis Water	25,000	25,000.00	.00
1261-15 for F. Paveglio's PCS Move	44,200	40,505.88	3,694.12
1241 Pre-suppression Fire:	10,400	10,382.06	17.94
10131-1261-1X Souza 1 Resource Problems Project	30,000	29,979.51	20.49
3210 Realty funds for Grasslands Mapping Project	9,000	8,999.50	.50
8610 Merced Quarters Maintenance	2,600	2,797.20	-197.20
11420-1120 BOR transfer funds for Refuge Water Supply Investigation	3,000	3,000.00	.00
11420-1928-09 BOR transfer funds for Offstream Storage Supply	5,460	5,146.44	313.56
1971-13 BOR transfer funds for Grassland Contaminant Study	166,149	105,649.06	60,499.94
1971-14 BOR transfer funds for Kesterson Program	40,361	40,317.22	43.78
1971-28 BOR transfer funds for San Joaquin Kit Fox Study	28,476	28,776.15	-300.15
Total	$1,133,246	$1,067,750.17	$65,495.83

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Table 4. AWPA funding levels, FY83-89.

	Total "1260" AWPA Fund (X 1,000)
FY89 (w/add-ons)	$768.6
FY88	$779.3
FY87	$710.8
FY86	$864.9
FY85	$719.3
FY84	$570.8
FY83	$578.2

6. Safety

Ten monthly safety meetings were held. The field crew viewed a video on power woodworking tools while all personnel, including office workers, saw a video on risk-taking. Various topics from Family Safety and Health magazine were discussed. Listed below are some of the actions that were taken to alleviate safety defects:

1. Installed extension table, blade guard on table saw in shop.
2. Removed debris from shop yard.
3. Properly disposed of old batteries.
4. Completed first aid and CPR classes.
5. Installed medicine cabinet in shop restroom for first aid supplies.
6. Jorgensen serviced all refuge complex fire extinguishers.
7. Installed new eyewash station in the oil house.
8. Received annual hearing tests and sent results to Regional office.
9. Replaced start-stop switch on table saw.
10. Replaced back-up alarm in 770 road grader.

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11. Purchased new Carsonite road hazard markers and various safety road signs in December.

12. Installed two halon fire extinguishers next to the computer work station in the main office.

EEO Ray Fuller suffered an intercostal strain of muscles/ligaments on his right side while installing a hydraulic hose on the 8430 John Deere tractor at San Luis on June 22. He lost 10 days of work, the only lost-time accident on San Luis in 1989.

7. Technical Assistance

Biologist Klett attended an informal meeting on April 18 in Turlock to discuss classification of the San Luis Island Project. The meeting was arranged by the California Department of Parks and Recreation to solicit comments from the general public. The Department favors classifying the project as a state preserve or state park. Sport hunters voiced their concerns that such a classification would eliminate waterfowl hunting on the portion of the San Joaquin River that transects the project site. Final decision on classification is pending.

Biologist Klett attended a meeting of the Stanislaus County Board of Supervisors in Modesto on November 7. The agenda included consideration of Mape's Ranch as a possible candidate site for a future U.C. campus. Because this was not a formal hearing, no comments or discussion were allowed from the public. The board approved the action, which if successful, will have major ramifications to the Service's ongoing acquisition effort to preserve this valuable habitat.

Refuge personnel provided population data on marsh and water birds on San Luis, Merced and Kesterson refuges to the Assistant U.S. Attorney for use in the Carpenter Fish Farm Case. Before sentencing is carried out, it must be determined if the numbers of birds killed at the ponds represented a significant portion of the valley population of certain bird species. Given the different scenarios regarding the number of birds killed, the refuge determined that these figures were significant for black-crowned night herons, great blue herons, great egrets and snowy egrets.

Biologist Klett and Refuge Manager Zahm traveled to the Nature Conservancy's Carrizo Plain Preserve on November 28 and 29. The refuge was asked by the Conservancy to provide

technical assistance regarding possible crane management on the preserve. A tour of the preserve was given by Preserve Manager Chuck Warner and management stategies were discussed. A meeting was also held with cooperating agencies (BLM and California Department of Fish and Game) to discuss crane management.

8. Other

Biologist Klett and Refuge Manager Blacker attended a report writing workshop in San Fransisco on June 7-9.

Biologists Klett and Garrison attended the annual marsh management workshop held at Sacramento NWR on September 19-21. The topic of this year's workshop was habitat restoration.

F. HABITAT MANAGEMENT

2. Wetlands

In 1989, all water used in managed wetlands on the refuge was delivered via San Luis Canal Company ditches. Their C Canal ditch was shut down for rehabilitation Jan. 1 - May 16 (see Section I.8), thus, from January until March 11, water levels in managed wetlands were maintained via D Canal deliveries. No water was put into Moffits 2, 3N, 4N, 6N, and 6S as these units contained borrow sites for the planned A & C Canal project. South Marsh 4 was not flooded as it lacks adequate water control structures which must be replaced. Dickenson 2, Dickenson 3, N. Marsh 1E, and the Middle Teal units were not maintained in the winter (Jan. - March) since extensive rehabilitation (discing, channel cleaning, etc.) was scheduled to be accomplished. Water levels fluctuated, but were maintained through March or April, in the rest of the refuge wetlands to maintain waterfowl loafing and feeding areas and prevent undesirable weed growth until soil temperatures favored moist soil waterfowl food plant germination. Figure 1 depicts the 1989 San Luis Marsh Management Plan.

Spring drawdown took place between March 11 and April 21. The Horseshoe units in the Elk Pasture, Moffit 4S, Deadman Slough, and the South Ruddy units along with the section of C Canal from the south boundary to Dickenson Ferry Road (3.5 miles) were managed as semi-permanent wetlands this year. Moffit 4S and South Ruddy are basically drains which don't produce much plant food. Drain water from irrigations in adjacent units can be stored for re-use in our Deadman Slough storage reservoir.

With the exception of Souzas 1-3, which were extensively rehabilitated, first irrigations began on April 15 in Big Lake and finished with Mallard Slough on June 29. This water made a dramatic difference in some units during the dry spring with low water tables. For example, where no significant waterfowl food plants existed before the irrigation, a blanket of swamp timothy, patches of trefoil, and smartweed appeared in Dickenson 6. Many units in the hunt area produced more cockleburr and trefoil than in the past. First irrigation water was held on the widespread cockleburr stands for longer periods of time to enable the smartweed to outgrow the cockleburr. In the Moraga 1M unit, the cockleburr was twice as tall as the smartweed before the irrigation. After the irrigation, the smartweed was twice as tall as the cockleburr which had stopped growing. The remaining cockleburr was 80% dead. The swamp timothy understory remained healthy and growing after 11 days of being underwater.

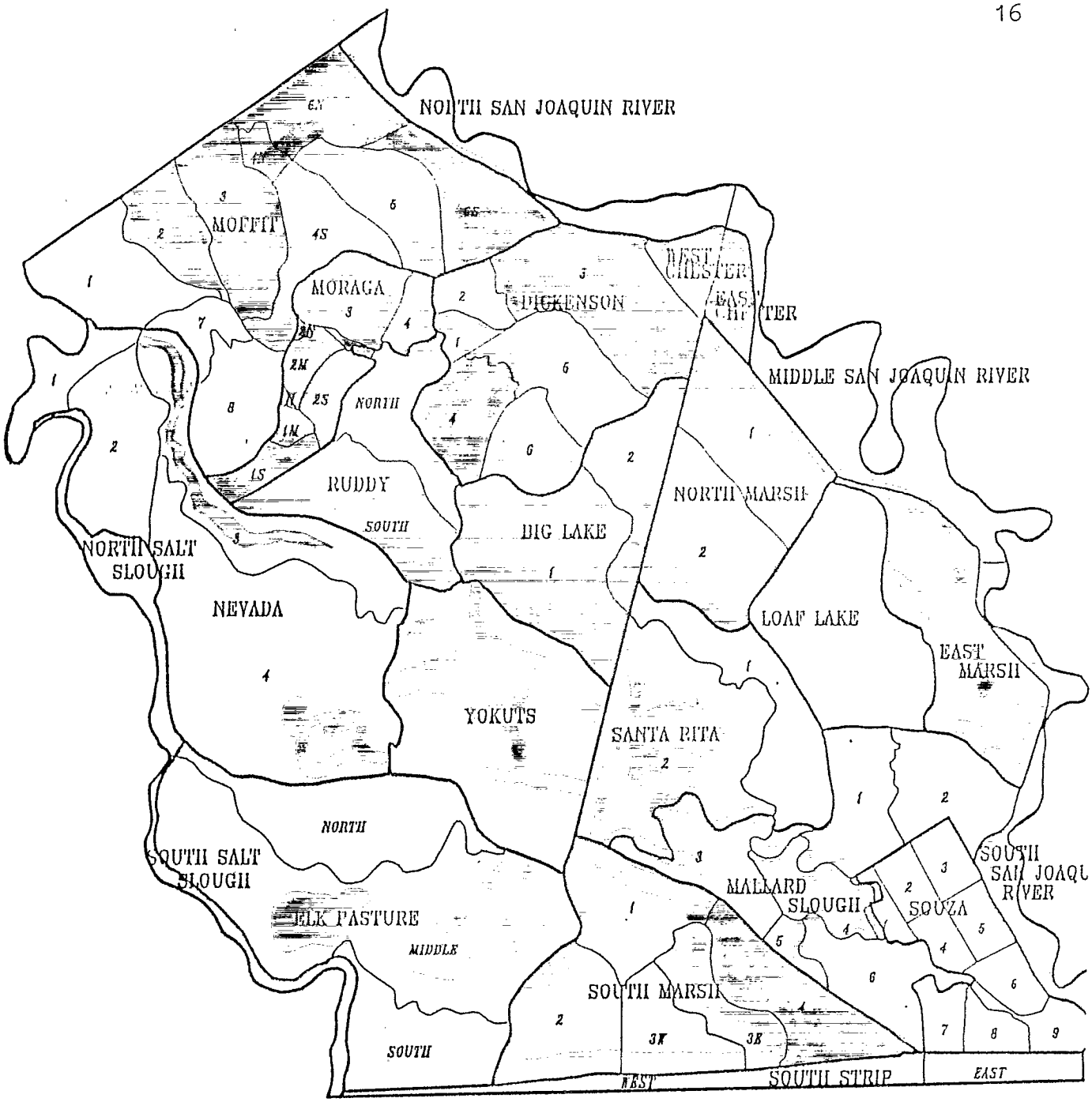

FIGURE 1. 1989 San Luis NWR Marsh Management Plan

Mixed marsh	Rehabilitated
Swamp timothy	Not managed (due to funding limitations)
Watergrass	Semi-permanent water

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Some of the swamp timothy stands in the hunt area units appeared to be stressed even while the soil was still moist with standing water just 12 feet away. The cool, dry, windy weather may have caused the plants to produce seed heads early. This development, coupled with limited station funding, led to single irrigations only on twelve units that were irrigated twice last year.

Arrowhead and ammannia were substantially more widespread in Big Lake 1, West Teal and the East Marsh main channel this year. Mallard Slough produced robust stands of swamp timothy, smartweed, and watergrass. North Marsh and Santa Rita produced good stands of smartweed, swamp timothy and watergrass. These units were disced last year.

Robust seed heads on 18" swamp timothy plants in the Mallard Slough unit. 6/89 RAB

Second irrigations began May 24 in Big Lake and ended with South Marsh 2 on June 28 and Mallard Slough on June 29. Third irrigations were given to Big Lake, the Souza's, and the Teal units in the Elk Pasture. These units (Middle & West Teal and Souza 1-3) were rehabilitated and seeded to watergrass this year.

A new 19 acre moist soil unit was created in the Souza 1 unit via contract with Silveria Construction...(see Section I.1).

Figure 2 shows units rehabilitated this year to facilitate water management and achieve higher food production (see Section I.2). Souza 2 and 3 were disced to eliminate non-productive alkali areas and heavy mats of jointgrass, however, many clumps of tules and cattails were left for thermal cover and wildlife diversity. The water control structure between the two units was replaced and separate inlet structures were installed in each unit. After being seeded to watergrass (30-40 lbs./acre), Souza 2 was irrigated three times. The watergrass stand in Souza 3 was so good that a third irrigation was unnecessary.

Mallard Slough 6 and Loaf Lake were extensively disced to create open areas for goose and crane use. Uplands on both areas were grazed by sheep to provide open areas with newly germinated grasses for geese and cranes. Waterfowl use (mainly ducks) was encouraging and some crane use was noted; however, the goose tradition was broken 17 years ago when Loaf Lake was opened to public hunting in 1973. It will take several seasons before goose flocks become a common sight again.

South Marsh 2 and Big Lake were disced to open up ponds in dense stands of tules and cattails and rejuvenate the marsh bottoms for increased waterfowl food production. Ducks responded well to this enhancement. A flock of 5,000 ringed-necked ducks made the open ponds in the middle of Big Lake their home which dramatically increased the hunter harvest on this species...(see Section H.8). In South Marsh 2, similar openings benefited waterfowl and the non-consumptive refuge visitor. Some of the openings are visible from the main tour route to the delight of wildlife observers and photographers alike.

Refuge personnel used a rented self-propelled scraper and other refuge heavy equipment to combine Dickenson 1 and 2 into a single unit. The levee between these units was removed leaving small islands, and the access road/levee to the newly installed structure between Dickenson 5 and 1 was rehabilitated. This project created more open space in this mixed marsh unit as well as more efficient water control.

Refuge personnel also disced the tule/cattail choked channel in Mallard Slough 6 east of E Canal to provide open water for geese and crane use. Snow geese and cranes responded to this management in the fall and winter. The snow geese utilized the slough from E Canal to Mallard Slough. Uplands grazed by sheep and the open channel created an attractive loafing and feeding area for these species.

C-110868

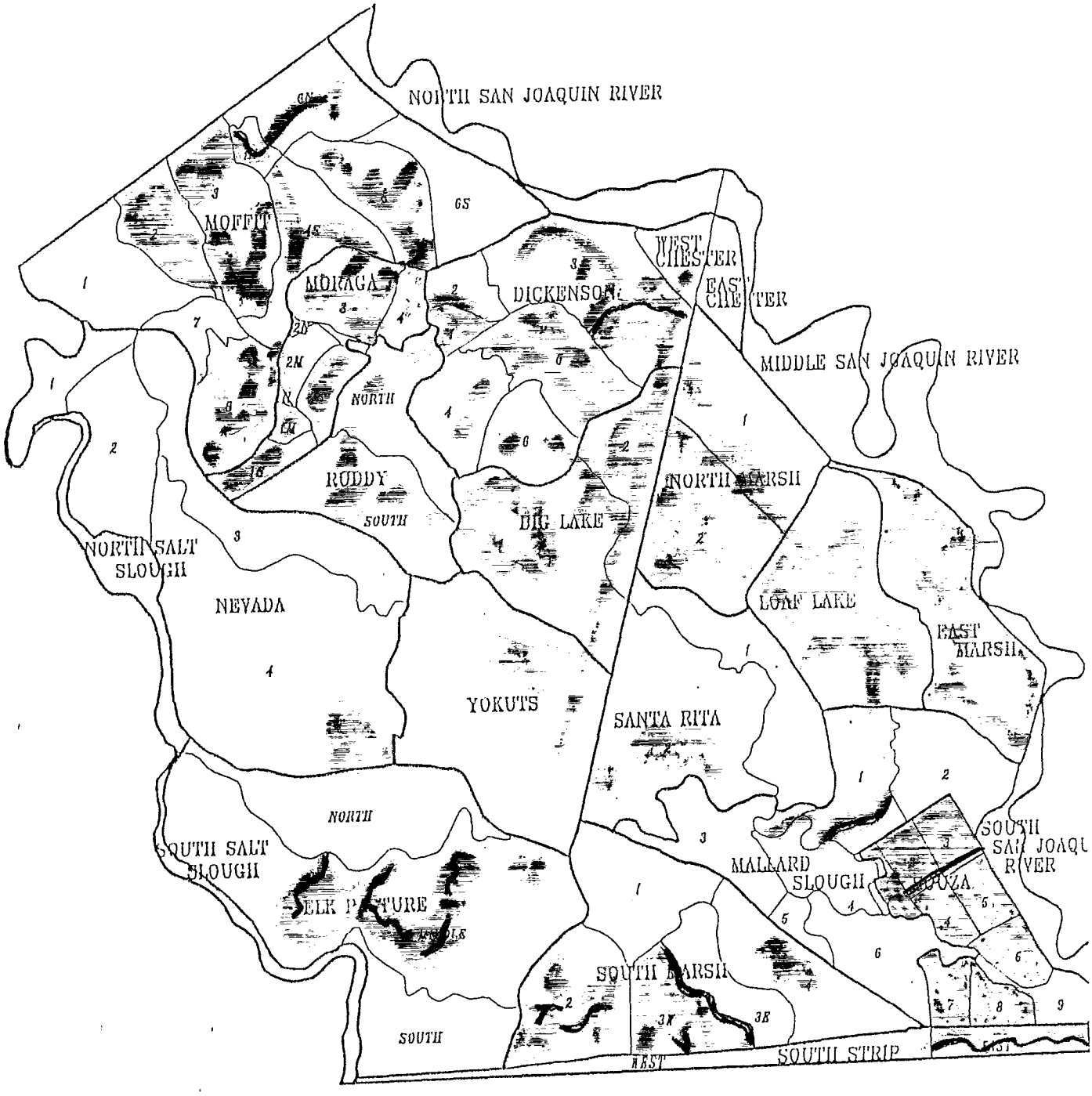


Figure 2. 1989 SAN LUIS MARSH REHABILITATION

AREAS DISCED

CHANNELS CLEANED

AREAS MOWED

C—110869

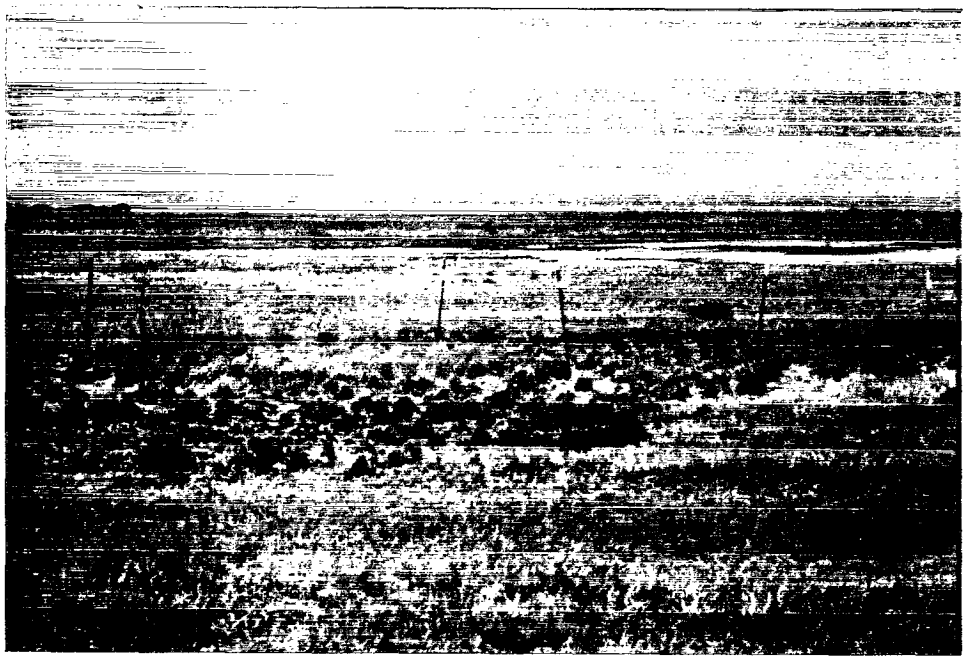
Rehabilitation of the East, Middle and West Teal units in the Elk Pasture consisted of discing Juncus and other non-productive areas, cleaning channels of sediment and vegetation, building loafing islands, installing new outlet structures, and seeding West and Middle Teal with watergrass. Elk as well as waterfowl, waterbirds, and cranes responded to the new open areas, loafing areas, and food. Thousands of red-winged blackbirds also were attracted to the new watergrass in Middle Teal. A prescribed burn on the uplands between the three units enhanced crane and waterbird use...(see Section F.9).

Aquatic plants produced in West Teal after rehabilitation. 9/89 GRZ

Refuge crews installed water control structures in Moffit 8, Moraga 1S, A Canal, C Canal, Dickenson 1, East Teal, West Teal, Moffit 5, Dickenson 3, Dickenson 6, West Chester, Souza 1, Mallard Slough, Souza 2 and Souza 3. Structures no longer needed were removed from C Canal and Souza 7 & 8. The goal is not just to replace a worn out structure, but to increase the efficiency of the water delivery system and to fine tune the water levels in each unit to minimize overfill or drainage problems thus producing more food and habitat with less water.

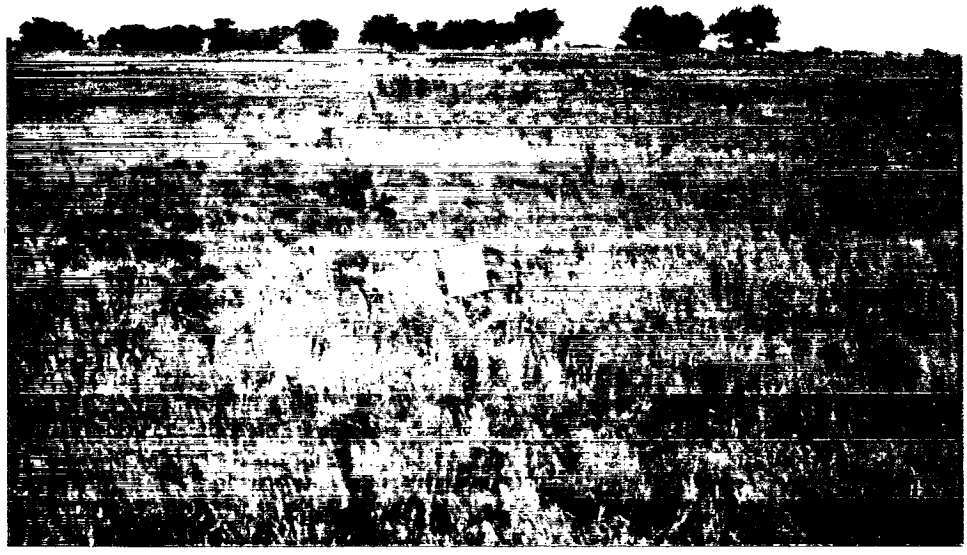
C-110870

in February as well as the erection and color marking of all permanent vegetation transect lines. Permanent photo stations were established on these grazed units in March. Photographs taken of these areas on a regular basis will help document any vegetation changes that may result from the grazing program. Small sheep exclosures were erected around stands of alkali sacaton in Mallard Slough 5/6, Mallard Slough 4 and Loaf Lake to determine possible effects of grazing on native plant species.

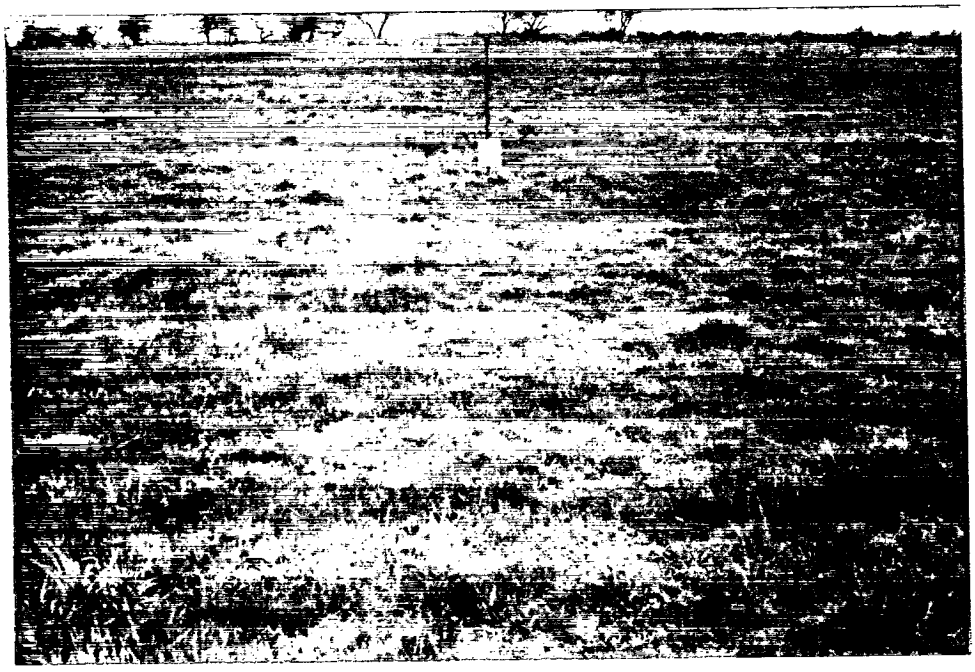


The sheep exclosures placed around alkali sacaton visually illustrated the initial effects of grazing on sacaton. Monitoring of the vegetation in these exclosures throughout the years will provide information on long-term effects of grazing. 10/89 JPH

All grazed units with permanent transects (Mallard Slough 5/6, Mallard Slough 4, South Marsh 3E, and South Marsh 2) were surveyed for plant species composition and percent cover. Some differences in plant species composition and percent cover of vegetation between grazed and ungrazed plots of each unit were documented. After the first year of grazing, most of this difference can probably be attributed to initial dissimilarities in species composition and not to the grazing itself. Any changes in vegetation composition resulting from the grazing will take several years to materialize, making it necessary to monitor the grazing program for a minimum of three years.



Mallard Slough 5/6 unit before sheep grazing...9/88 SBK



....during spring green-up after grazing .... 3/89 DB

C-110872

.... and in late spring with most annual grasses headed out. 5/89 SKB

Though it may take years to document any changes in vegetation as a result of grazing, one significant effect on alkali sacaton was observed during the first year. Most of the plants within the grazed areas produced many seed heads while seed production in ungrazed sites appeared low. It would seem that grazing may stimulate reproduction activity in this plant species. This phenomena, along with the exposure of more baren ground by grazing, may lead to the establishment of additional sacaton plants in the future.

C-110873

Fall flood-up started September 11 and by October 24, a maximum of 80 c.f.s. was coming into the refuge through the new C Canal system. By the end of October, 5,818 ac. ft. had been utilized to flood-up 2,469 acres of habitat...about 2 1/3 ac. ft. of water per acre of wetland at an average rate of 58 c.f.s. for 51 days. Flooded habitat included 95% of the hunt area. An additional 94 acres were flooded by the end of November, bringing the total flooded acreage to 2,563. This amount was maintained until the end of the year. In fact, many units were filled to the maximum levels in December as the San Luis Canal Company had notified the refuge that January water deliveries were to be curtailed for scheduled C Canal maintenance. Ideally, water levels should be dropped in December to concentrate invertebrate populations or to expose previously inundated seed sources. A letter was sent to San Luis Canal Company requesting a different maintenance shut down period in future years to facilitate intensive water level management during this critical portion of the wintering period. Rainfall cannot be expected to maintain all units, thus close coordination and cooperation with San Luis Canal Company is essential to allow the continuation of necessary wetland management operations and maintenance actions.

Table 5. 1989 San Luis NWR water deliveries. a/

Month	C Canal	D Canal	Noble Ditch	Total
Jan	0	469	0	469
Feb	0	362	0	362
Mar	0	534	14	547
Apr	0	468	36	504
May	1,041	10	5	1,056
June	777	60	140	977
July	511	0	6	517
Aug	230	20	120	370
Sept	2,190	0	0	2,190
Oct	3,894	0	0	3,894
Nov	1,668	0	0	1,668
Dec	1,067	0	0	1,067
Total:	11,378	1,923	320	13,620

a/ Includes delivered contract water and operational spill

C-110874

5. Grasslands

The large stands of star thistle that were expected to emerge and envelope portions of the refuge did not materialize in the spring. There was definitely a good seed source from last year; however, the lack of any spring precipitation and the presence of good stands of annual grass, old star thistle, and plant litter discouraged much production of this nasty weed.

6. Other Habitats

Native trees and shrubs were planted during the winter and spring months as part of the refuge's tree planting-reforestation project. Approximately 30 cottonwoods, willows and valley oaks were established at the San Luis entrance in February. Another 20 cottonwoods were also planted this same month along D Canal next to the equipment yard fence. Cottonwood and willow plantings consisted of large cuttings (5 - 7 ft. long with diameters up to 4") planted in augured holes 4 ft. deep. Valley oak trees were obtained from the California Conservation Corps where they were grown in 2 ft. long planting tubes to stimulate growth of long tap roots. These plantings required no watering thanks to their deep root system and the high water table in the planting sites. A high survival rate was experienced through the first growing season.

Wild rose plants were established in March between the trees planted along D Canal and along the east end of the riparian ditch next to the refuge entrance. The 35 plants were taken from established stands of wild rose found along the San Joaquin River just south of the refuge. It was hoped that these plantings would improve habitat diversity and help develop an understory in the tree stands; however, survival rates were low. The high mortality was attributed to the continued drought conditions in the area and to the late planting of the shrubs.

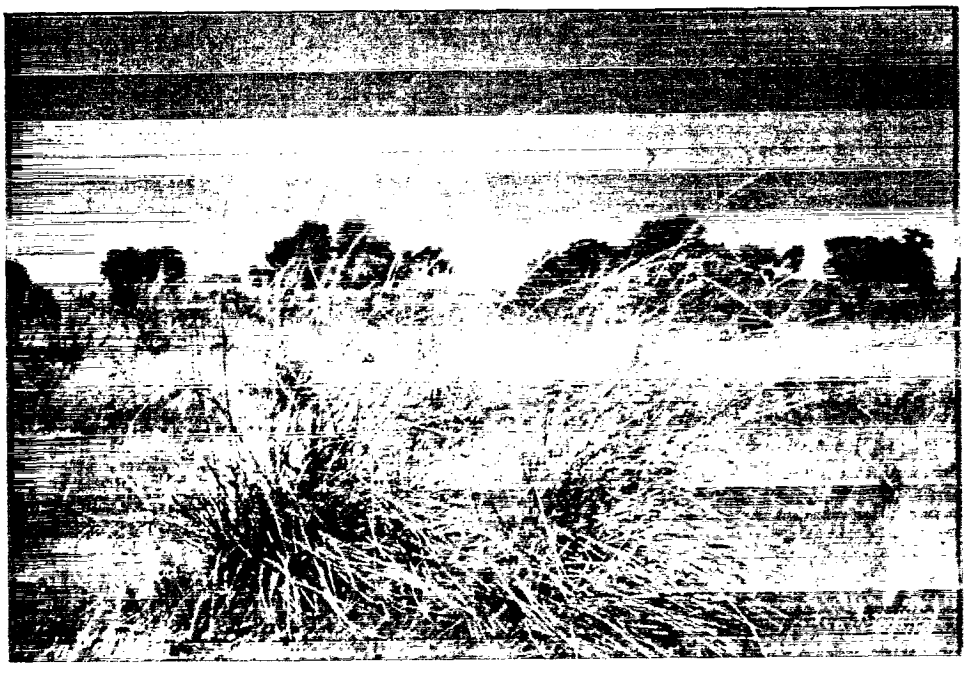
Nine valley oaks were planted in front of the San Luis Shop during the last week in May. Even though long rooted oaks were used, all plantings died.

A total of 69 valley oaks and 26 elderberry were planted in December at the refuge entrance and along the new drainage ditch located in the south east corner of the refuge. Trees were planted in augured holes 3 to 4 feet deep.

7. Grazing

Mapping of the grazed portions of Mallard Slough 4, Mallard Slough 5/6, South Marsh 3E and South Marsh 2 was completed

C-110875



Alkali sacaton grazed during 1988 exhibited increased seed production in 1989 when compared with ungrazed plants. 7/89 SBK

Selected marshes and sloughs adjacent to uplands slated for grazing were disced to provide open water for resting migratory birds. Major work was conducted in Loaf Lake and Mallard Slough 5/6. Wintering geese and sandhill cranes are attracted to areas that provide a combination of closely grazed grasslands and shallow open water.

The second year of the refuge's short-term intensive grazing program commenced with the moving of two bands of sheep (1,550) onto the refuge on August 24. Two additional bands of sheep were moved to San Luis from Merced bringing the total number of sheep grazing the refuge to 4,950. With the exception of South Marsh 3E, grazing of all units was completed by October 12. Late grazing was allowed on South Marsh 3E because this unit was one of the last areas scheduled for vegetation control and fall flood-up. Treatment of this unit was completed on October 19. Units treated this year were Nevada Unit (north half), Mallard Slough 5/6, Mallard Slough 4, South Marsh 3E and Loaf Lake (south half - see Figure 3). A total of 320 acres were grazed. South Marsh 2 was eliminated from the grazing program because of its small size and lack of wildlife use.

C-110876

SAN LUIS NATIONAL WILDLIFE REFUGE - SUB UNIT NAMES

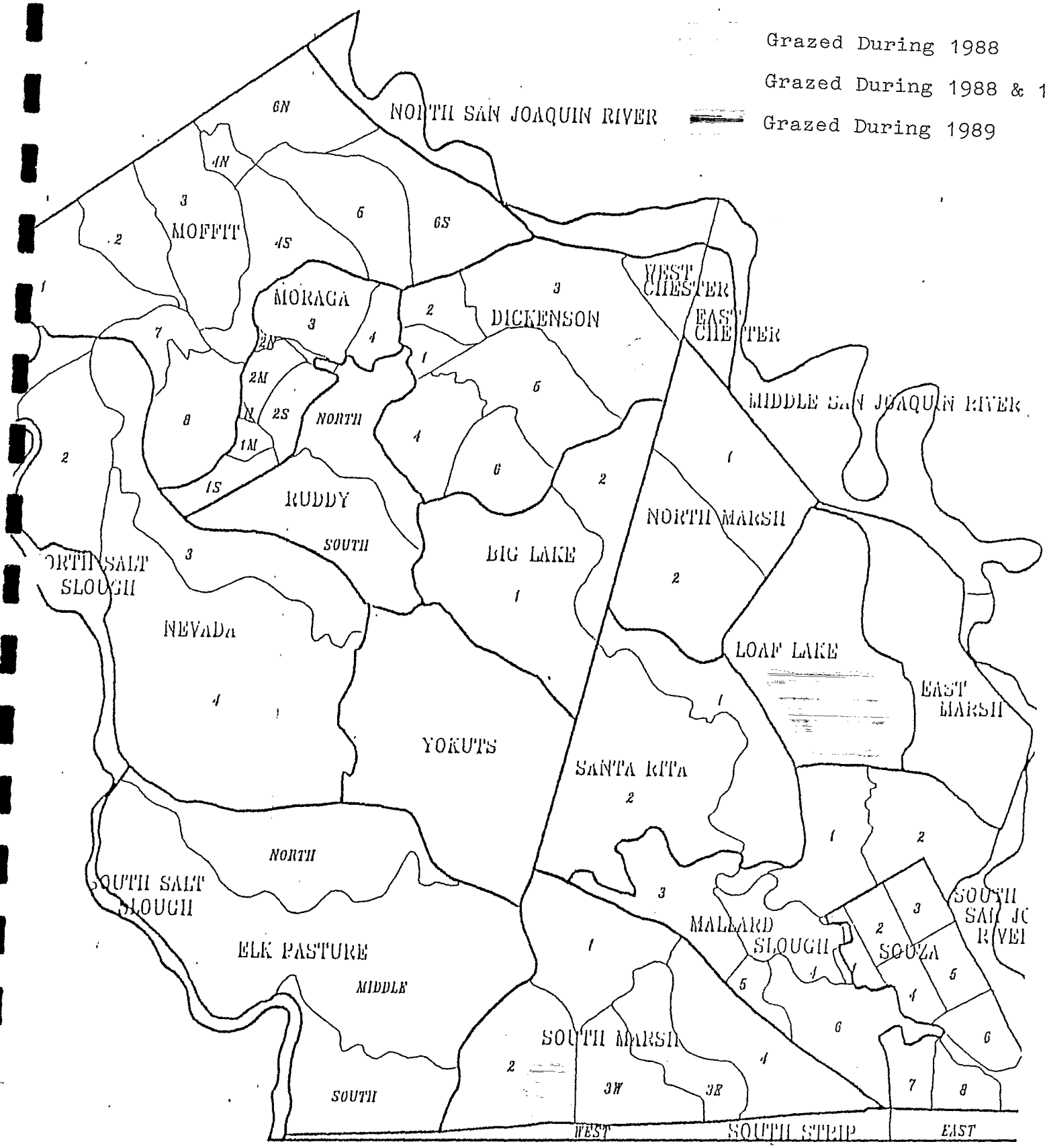


Figure 3. Areas grazed in 1988 and 1989.

C-110877

Although the grazed sites received better grazing pressure than last year, the program experienced some problems. The overall operations were sloppy with many of the restrictions and qualifications of the grazing permit not being followed closely. On several occasions, sheep either jumped or knocked down the temporary fencing and grazed areas outside of the grazing boundaries including the control sites containing the permanent vegetation transects. Other problems included the failure of the grazer to pick up trash and dead animals; speeding by sheep herders on refuge roads; and incorrect placement of temporary fencing. The grazer was also slow in removing equipment and fencing from the management units after grazing was completed. The problem became so bad that refuge staff had to threaten to remove the items and charge the grazer for the service. This grazer will not receive a permit in 1990.

The grazed sites received limited use by sandhill cranes and geese (see G. Wildlife).

9. Fire Management

Fire funding for the San Luis Complex totalled $35,200 ($24,800 in our 126X Base and $10,400 for 1241 Pre-suppression). As per scheduled activities, refuge personnel mowed and sprayed 65 miles of roads and disced 5.5 miles of firebreaks for wildfire presuppression (see Section F.10). Four prescribed burns totalling 206 acres were accomplished and one wildfire was extinguished along Salt Slough west of the Elk Pasture. Figure 4 shows prescribed burn activity locations. Figure 5 displays all known fires (wild and pre scribed) on the refuge for the past 10 years.

Refuge Manager Zahm discovered the Salt Slough wildfire at 8:30 p.m. on the 4th of July. A fisherman or a fisherman's vehicle was believed to be the cause of this fire. After extinguishing the head of the fire with a wet wool blanket, Zahm drove back to the shop, called two other refuge firefighters and drove the firetruck back to the fire. The fire burned 1.4 acres and scorched some willows before being extinguished just before midnight.

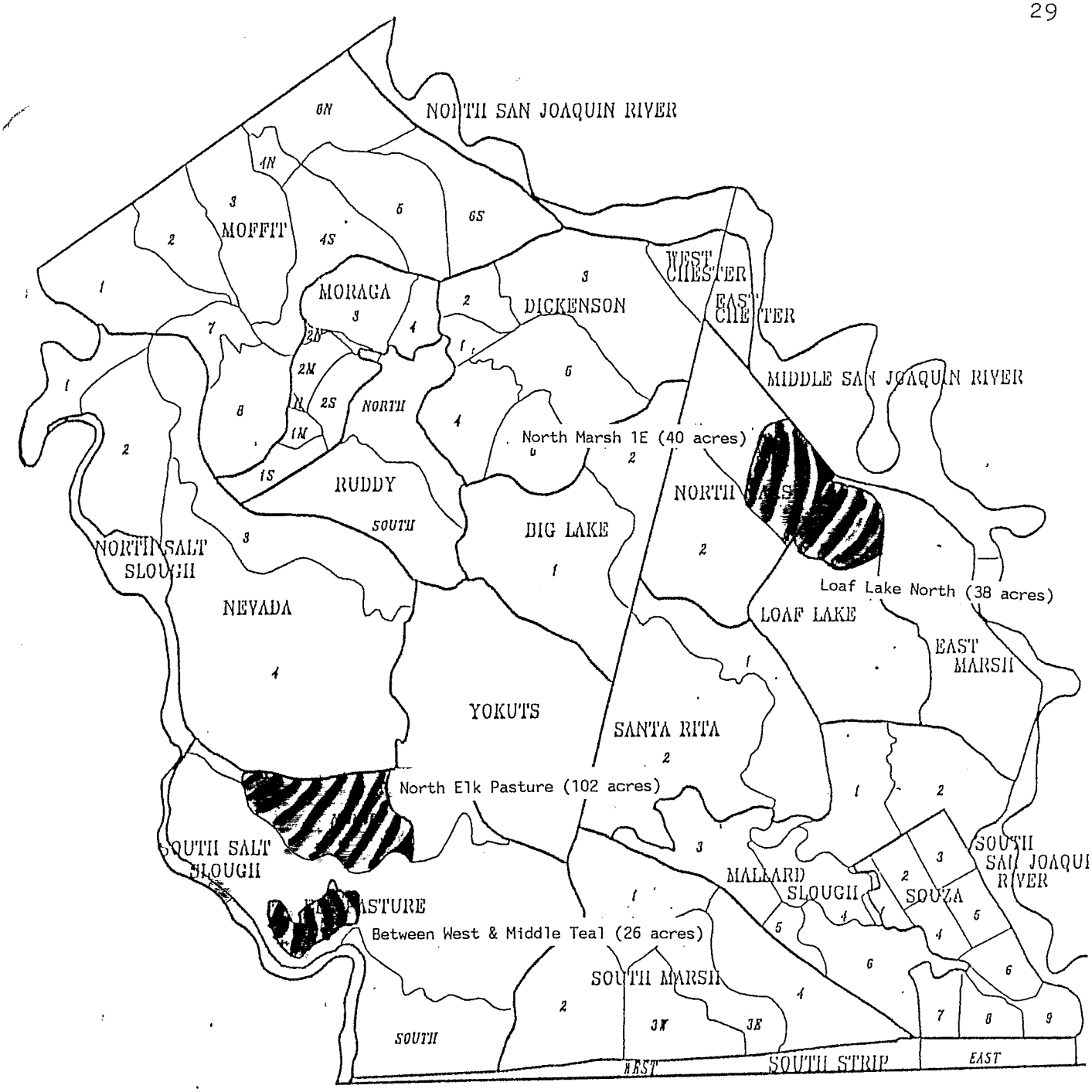


Figure 4. 1989 SAN LUIS NWR PRESCRIBED BURN AREAS AND FIRING TECHNIQUE.

Areas Burned

Wildfire

Strip Fires

Backfire

Total acres burned: 206 prescribed
1.4 wildfire

C-110879

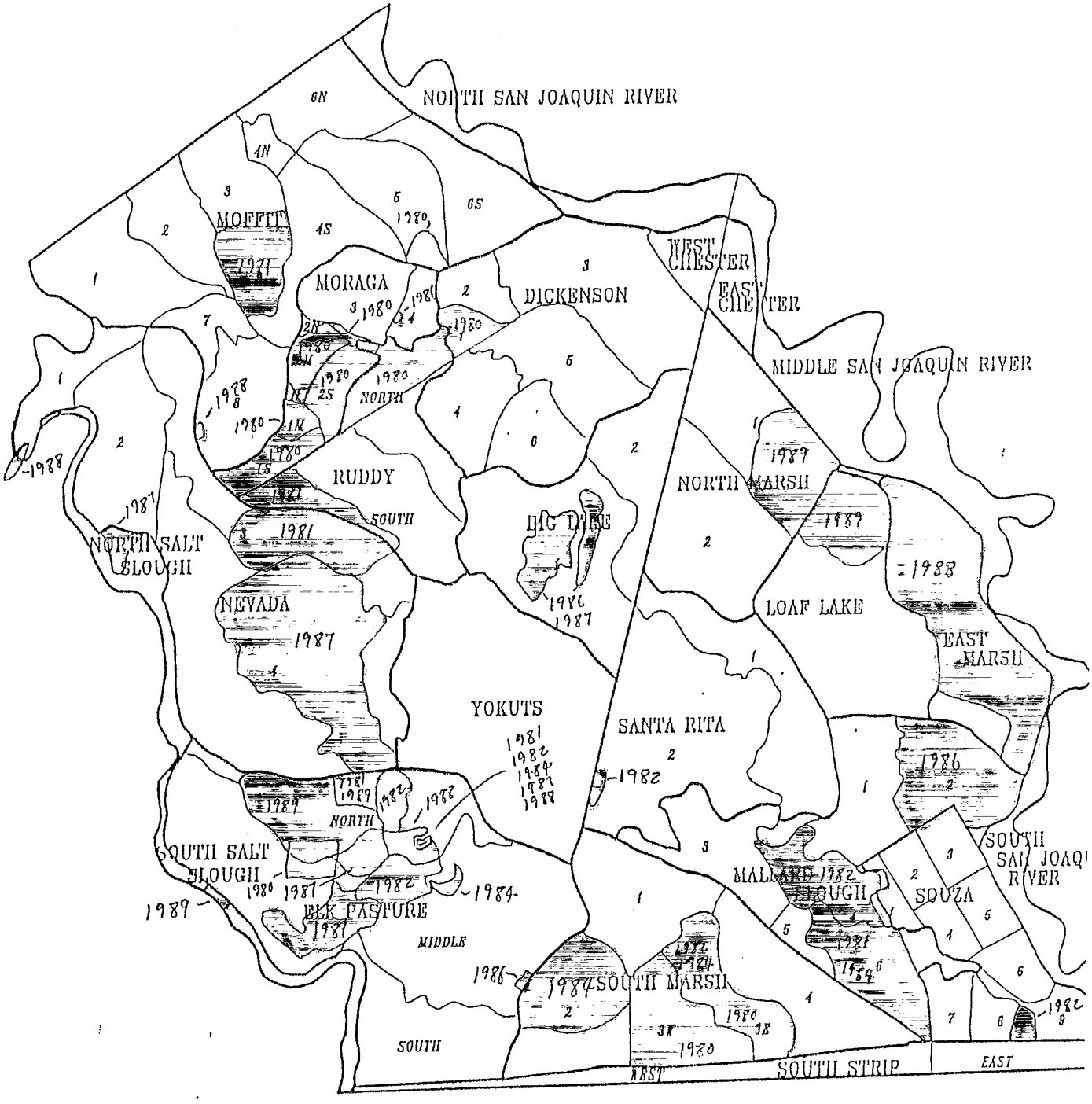


Figure 5. SAN LUIS NWR FIRES (1980 - 1989)

Prescribed Burns

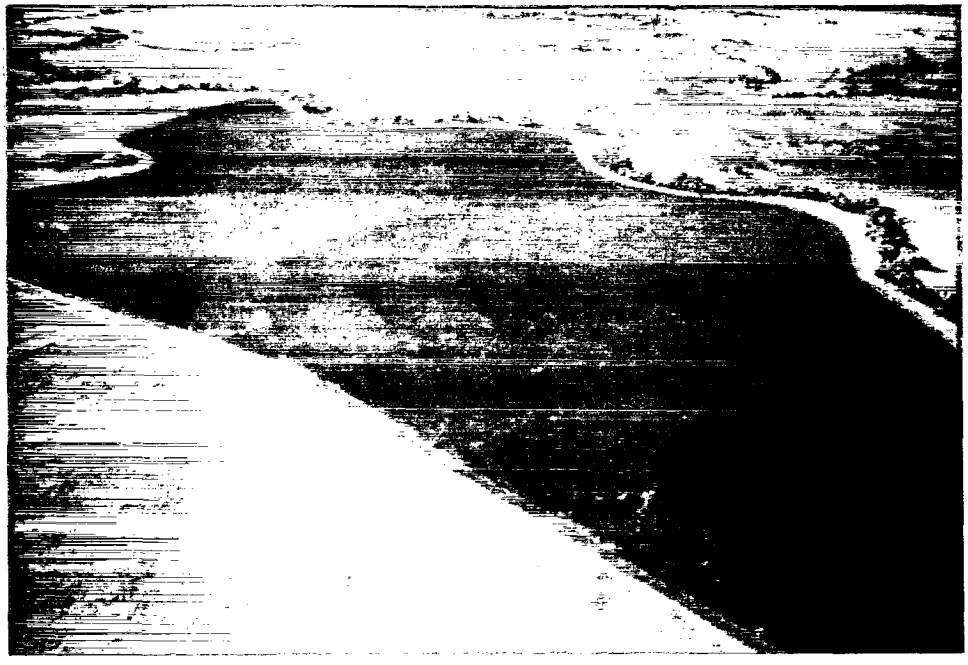
Wildfires

C-110880

Refuge firefighters prescribed burned a 102 acre portion of the North Elk Pasture on June 27. The northwest corner of this unit was last burned in January, 1981 and since then, the accumulation of old star thistle and other plant litter had severely reduced the quality of elk forage over the past few years. In concert with the burn, pre-burn vegetation surveys were conducted on the treatment site and a control site. An informal vegetation survey of the North Elk Pasture Burn was completed in July. While most of the area was still void of vegetation, some new growth had begun to emerge. Plants observed included alkali mallow, salt grass, rye grass and rushes. A formal survey was later completed in the fall and documented the presence of these weedy species though most of the area was still bare ground.

The tule elk used the burned area immediately for bedding sites and for relief from insects and ectoparasites. Raptors were attracted since the rodent population was made more accessible by the elimination of thick protective cover.

Pre-burn vegetation surveys were also completed in the fall on those areas slated for prescribed burning this year (North Marsh 1E, Loaf Lake North, Nevada 2, South Marsh 4, West Teal and East Teal). Followup post-burn vegetation surveys will be completed next spring.



Aerial view of N. Elk Pasture burn. 8/89 DJS

C-110881

Fireboss "Lulabelle", the matriarch of San Luis' herd, is giving instructions to burn crew on N. Elk Pasture burn. 6/89 RAB

On October 20, three more upland units were prescribed burned by refuge personnel... the 40 acre North Marsh 1E unit, the 38 acre Loaf Lake North unit, and the 26 acre area between West and Middle Teal in the Elk Pasture. The Model 1 fuels in these units burned quickly and cleanly. Pre-burn vegetative transects were done on all these units in late September. The day after the burn, a light rain soaked the areas.

The objective for these burns was to improve the native grasslands surrounding prime wetlands by removing dense litter, rank weeds, and tall vegetation, thus providing open (safe) loafing and feeding areas for geese and cranes. Other species benefiting from this enhancement would be shorebirds, raptors, and tule elk. A secondary objective was to suppress wildfire potential since these areas are adjacent to auto tour routes. Cranes, shorebirds and songbirds were observed on these burns at the close of the year.

In February, ARM Blacker attended the S-390 Intermediate Fire Behavior course in Boise, Idaho that was adapted to refuge fuels and burning situations.

C-110882

New Forester-type combination fog-steam hose nozzles were purchased and installed on refuge fire pumper units in March. Personal fire fighting replacement equipment such as field packs, gloves, Nomex clothes, helmets, fire shelters, etc., were purchased and distributed to all refuge firefighting personnel. Refuge firefighters passed the Step Test or an alternative 1 1/2 mile run in May. Firefighting implements are checked twice a year before and after the fire season to keep our inventory complete and serviceable.

The need for a lighting system to permit nighttime operation of the fire truck was made evident after the late night 4th of July wildfire. Two floodlights were installed to illuminate both sides of the pumper unit (and the surrounding area) as was a cabtop 360° spotlight which can be positioned from inside the cab. A rechargeable flash-light was mounted permanently in the cab.

As per Regional Office direction, seven surplus Unimogs were picked up at Fort Ord in September. Although fitted with hydraulic front end loaders and backhoes, they can be converted to fire pumper units by McCormick-Morgan in Sacramento. They were stripped of their implements, loaded on low-boy trailers, and shipped to McCormick-Morgan at the end of the year. McCormick-Morgan will check each Unimog for deficiencies and correct them if economical. They will be distributed to refuges in Region 1 as fire trucks, spray rigs or backhoes.

10. Pest Control

ARM Blacker used the refuge computers to calculate the acreage, amount of solution, and amount of concentrate of pesticide required to spray refuge roads, levees, and canals on all three refuges in the San Luis Complex. By entering only the areas which need chemical control each year, the manager can determine how much concentrate of each pesticide will be needed that season. Qualified refuge personnel with pesticide applicator certificates applied Round-Up to 23 miles of roads, Rodeo to 4 1/4 miles of canals, and 2-4-D to 3.5 miles of the San Joaquin levee this year. Table 6 lists the pesticides that were applied. Figure 6 shows the areas treated. Weed growth around 150 water control structures was also sprayed with Rodeo.

C-110883

Table 6. Refuge pesticide/herbicide use report, 1989

For SNL NWR

Proposal Number	Chemical (common name)	Date of Application	Rate of Application (lbs/acre)	Method of Application	Site Type (habitat, vegetation, crop)	Target Pest	Results (successful, failed, problems)
89SNL-02	Rodeo	3-6-89	5.4	Ground	water control structures	All Species	Successful
"	Rodeo	3-7-89	5.4	"	"	"	"
89SNL-01	Round-Up	3-13-89	6	"	Roadsides	"	Successful on grass not on hemlock
"	Round-Up	3-15-89	6	"	"	"	"
89SNL-05	2-4-D	5-4-89	3.84	"	Levee	Broadleaf	Successful
"	2-4-D	5-22-89	3.84	"	"	"	"
"	2-4-D	5-25-89	3.84	"	"	"	"
89SNL-02	Rodeo	6-20-89	5.4	"	Canals	Tules Cattails	Successful
"	Rodeo	6-22-89	5.4	"	"	"	"
89SNL-05	2-4-D	11-21-89	3.84	"	Levee	Broadleaf	Successful
"	2-4-D	11-24-89	3.84	"	"	"	"

C-110884

An intensive maintenance enhancement program was initiated after an inter-agency inspection (February 23) of the 5.92 mile section of the San Joaquin river levee. It was determined that maintenance standards set forth in a December 10, 1968 agreement between the Lower San Joaquin River Levee District and the Service were not totally being met. Following the inspection, a more comprehensive program was established. Refuge man hours and costs expended to control California ground squirrels, perform weed control, maintain levee surface, etc., are summarized in Table 7.

Bait stations, filled with rolled oats treated with the rodenticide diphacinone, were placed along the San Joaquin River Levee on the refuge in April. Gas cartridges were used later once a Section 7 evaluation was completed.

Table 7. San Luis NWR 1989 man-hours and costs spent on San Joaquin River Levee maintenance.

Employee	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Blacker	-	19	17	20	9	8	4	3	4	-	84	Squirrel control
Hammond	-	8	16	3	-	-	-	-	8	4	39	Bait boxes, spraying
Imler	24	32	-	-	-	-	-	-	-	-	56	Mowing
Klett	-	-	-	-	6	-	-	-	-	-	6	Squirrel control
Melanson	-	2	2	-	2	-	-	-	-	-	6	Bait
Moitoza	-	-	-	-	-	4	-	-	-	-	4	Mowing
Shearer	137	52	-	5	-	-	-	-	2	11	207	Grading, dragging
Total:	161	113	35	28	17	12	4	3	14	15	402	

Costs for levee maintenance and squirrel control were:

$ 400	- chemicals (Rodeo, Karmex, 2-4-D)
1,100	- concrete (to fill squirrel holes)
6,834	- salaries
1,210	- bait (diphacinone oats)
375	- bait stations
180	- gas cartridges
$10,099	Total

C-110885

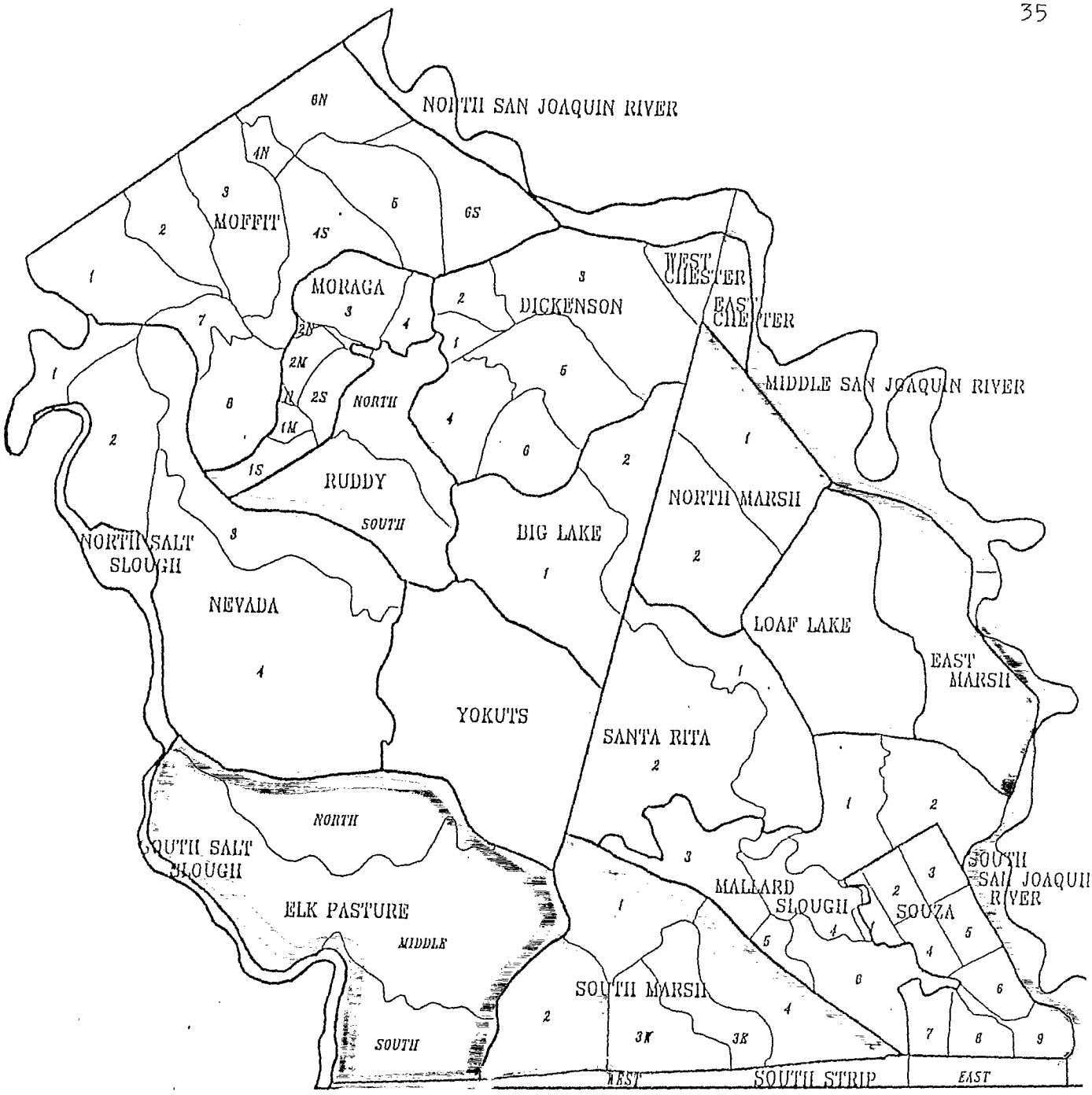


Figure 6. 1989 SAN LUIS NWR VEGETATION CONTROL MAP

Disced firebreak inside elk pasture

Sprayed with Round-Up

Sprayed with 2-4-D

Sprayed with Rodeo

C-110886

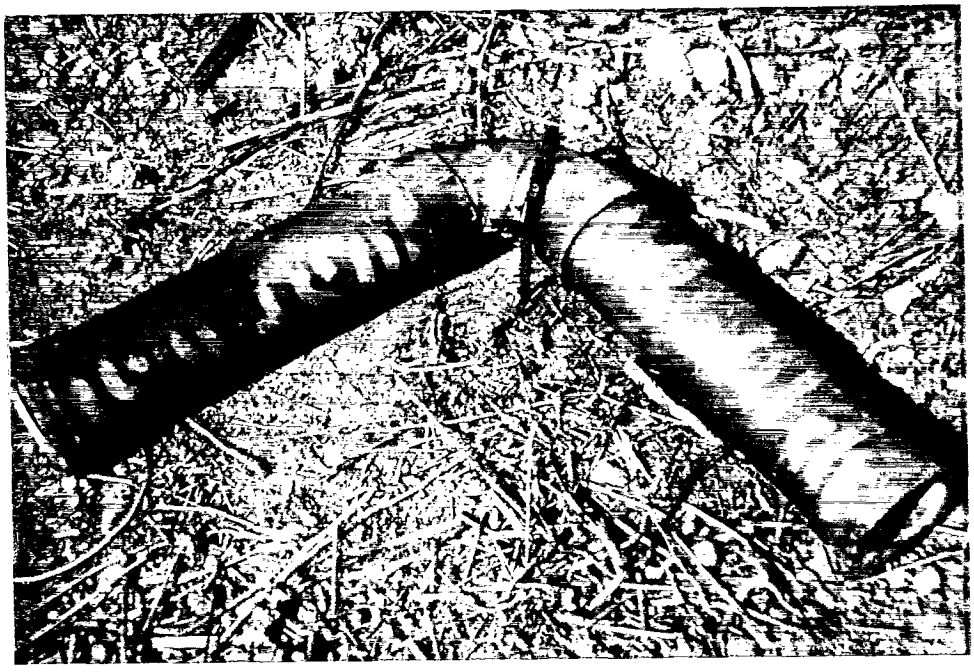
C-110886

Trimmed trees and underbrush enabled San Joaquin inspection and maintenance. View looking south along C Canal towards south boundary. 2/89 RAB

San Joaquin levee at East Marsh graded for weed and rodent control. 3/89 RAB

C-110887

The increased scrutiny of refuge operations and subsequent demands by the Lower San Joaquin River Levee District is direct and outright retribution for the refuge's earlier involvement with the District's unauthorized tree clearing/channel maintenance activities (see 1988 San Luis NWR Annual Narrative Report). An official, inter-agency review of past and present environmental damage to the San Joaquin River from irrigation and flood control activities is scheduled for 1990. Hopefully, priorities for the continued "protection" of the San Joaquin River will be more environmentally orientated and the money-wasting, environmentally damaging boondoggles associated with the current authorities of these local flood control districts will rightfully be eliminated.



Squirrel bait station - Note tie-down rebar at center.
10/89 RAB

C-110888

Wilted sunflowers on San Joaquin River Levee 8 days after 2-4-D application. 10/89 RAB

11. Water Rights

San Luis NWR has not used its appropriative Salt Slough water right since 1985 when high selenium levels from upslope agricultural entities (via the Blake-Porter Bypass) contaminated the water source.

A 40 year Grant of Easement, signed with the San Luis Canal Company (SLCC) in 1988, insured annual water deliveries up to 33,500 ac. ft. to the refuge via the C Canal system. As per the annual escalation clause within the document, transportation charges increased from $10.00 to $10.37 per acre-foot.

The Bureau of Reclamation made CVP water available to the refuge via a temporary, interim interagency agreement No. 9-07-20-W0793. The Bureau delivered 16,878 ac.ft. of water to SLCC in 1989. SLCC delivered 12,820 ac. ft. to the refuge....4,058 ac.ft. (24%) attributed to system loss. The Grant of Easement allows up to 25% water loss in their system.

C-110889

G. WILDLIFE

2. Endangered and/or Threatened Species

The refuge hosted the Aleutian Canada Goose Recovery Team Meeting held February 28 - March 3. The main topic of discussion was the possible reclassification of the Aleutian Canada Goose from endangered to threatened.

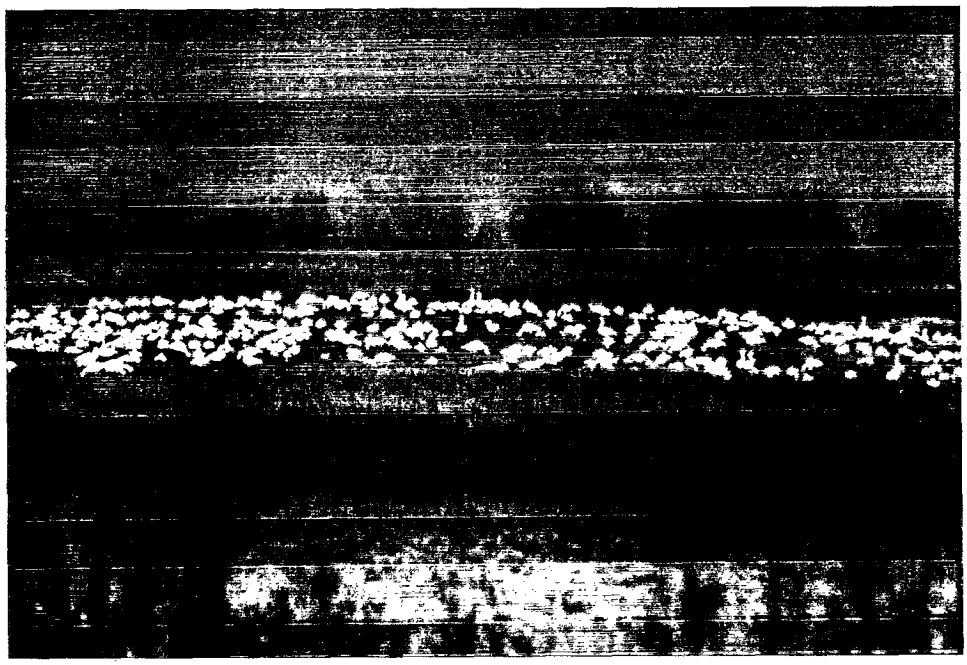
Swainson's hawks returned to nest in mid-March. The pair that has nested near the east Elk Pasture gate for years built a new nest in the tree adjacent to the old nest tree. The branch supporting the old nest had weakened causing the nest to droop precariously. The second pair nested in the southwest corner of the Elk Pasture. These birds also did not use last year's nest but rather built a new one approximately 10 ft. higher in the same tree. Both pairs fledged two young each.

A small number of tricolored blackbirds were observed in Big Lake at the Dickenson 6 inlet on March 13. Another group of tricolors were later observed in the cattails behind the shop on March 13. The birds only spent a few days in each location and then left the area. Small numbers of tricolored blackbirds were also observed in April feeding in the borrow areas being disced for the A and C Canal construction project. These birds may be part of the flock that roosted in North Gadwall Pond on Kesterson NWR. Smaller flocks of tricolors were regularly seen later in June feeding in the grasslands of the Gallo property just north of the refuge. The birds were probably part of the large group that were nesting and roosting in South Gadwall on Kesterson NWR at the time.

3. Waterfowl

The grazed units received good goose use at the beginning of the year. Up to 5,500 snow geese were observed feeding and loafing in Mallard Slough 5/6 during the first week in January. A few geese, including 200 snows, 50 white-fronted geese and 2 cacklers, were observed in South Marsh 3E on January 9. A flock of white-fronts, fluctuating between 40 and 300 birds, used the grazed portion of Nevada unit as a feeding and loafing site from January through mid-February. Most of the early goose use this year was concentrated in those grazed areas close to a water source. The geese seem to prefer heavily grazed uplands adjacent to shallow ponds having gently sloping banks. Future management plans include maintaining and developing good water sources on these grazed units.

C-110890



Snow geese fed and loafed on the grazed uplands of Mallard Slough 5/6 in January. This marked the first time that geese have used this unit for several years. 1/89 GRZ

Geese returned to the refuge in small numbers in November. Flocks of 4-40 white-fronted geese were loafing in the shallow water and along the levees of Souza 1 and 3 during the last week of the month. The grazed and burned uplands also received some use by geese as well. A group of white-fronts ranging from 40 to 75 birds were observed feeding and loafing along the small slough in Mallard Slough 5/6 during the last week in November. Six snow geese were also observed in the grazed portion of Loaf Lake on November 25. This was the first documentation of goose use in this unit since it was opened to hunting in 1973.

Goose numbers increased slowly throughout December with most activity concentrated in the Souza Fields and Mallard Slough 5/6 (grazed). Approximately 100 white-fronts were observed feeding and loafing in the grazed portion of Mallard Slough 5/6 at this time. Snow goose use on the grazed units also increased during December. Eight snow geese were feeding on tender grass shoots in South Loaf Lake (grazed) on December 1. Observations of flocks of snows ranging from 500 to as many as 3,000 were made in Mallard Slough 5/6 during the last week of December. During this same time, these snows were also using Souza 4, 6 and 7 as loafing and roosting sites.

C-110891

A total of 85,650 goose use-days were recorded for the year. While this figure represented a decrease of 14% from 1988, the 1989 goose numbers showed a 31% increase over the 10 year average (see Table 8). Numbers of geese (predominantly snow geese) using the Souza Fields decreased due perhaps to maintenance of higher water levels in these units; however, birds utilizing the new grazed areas increased dramatically.

Table 8. Waterfowl use days on San Luis NWR, 1980-89.

Year	Duck use days	Goose use days	Total Waterfowl use days
1980	19,442,850	15,570	19,458,420
1981	10,923,960	18,060	10,942,020
1982	6,120,750	58,800	6,179,550
1983	7,211,230	23,370	7,234,600
1984	6,635,520	131,100	6,766,620
1985	7,975,830	174,570	8,150,400
1986	11,650,470	37,800	11,688,270
1987	15,725,970	14,250	15,740,220
1988	11,321,610	99,570	11,421,180
1989	11,598,360	85,650	11,684,010
10 Year Average	10,860,655	65,474	10,926,529

The mid-winter waterfowl survey (conducted on January 10 - 11) found only 12,985 ducks on the refuge; however, actual populations were probably triple this figure. The diversity of habitat types on the refuge make counting waterfowl here quite difficult. Duck numbers remained low because of continued drought conditions within the breeding grounds. Numbers had dropped off significantly by February. An aerial survey conducted on February 16 counted an abnormally low 7,945 ducks. The majority of the ducks were utilizing traditional high use areas, including the Souza Fields; however, the hunting area received good use as well. Shovelers, pintail, green-winged teal and mallards were the most numerous species observed though cinnamon teal had increased by the end of February.

Numbers of waterfowl continued to decline in March as a result of the northern migration of waterfowl out of the area and the early drawdowns of many of the marsh units. Large numbers of shovelers, cinnamon teal and gadwall concentrated in the Souza Fields, Big Lake and Loaf Lake

C-110892

(units being held up for millet production). Numbers of green-winged teal in the Mallard Slough area and the Souza Fields dropped off dramatically although approximately 500 green-winged teal were observed in South Marsh 1 on March 20.

Duck populations were reduced to a few hundred as additional marsh units were drained during April in preparation for marsh management and irrigation. A ground survey on April 24 counted only 511 birds. The most abundant species observed were mallards, cinnamon teal and gadwall. Duck use was limited to the Souza Fields and South Marsh 1.

Duck broods, mainly mallards and gadwall, started to emerge in April and continued to be observed through the first week of July. Birds were concentrated along ditches and canals and in marsh units being maintained or irrigated. Production appeared high with many large broods being observed (as many as 11 ducklings per brood). Approximately 130 gadwall ducklings were sighted in South Ruddy on July 2. The refuge maintained between 300 - 500 ducks throughout the summer.

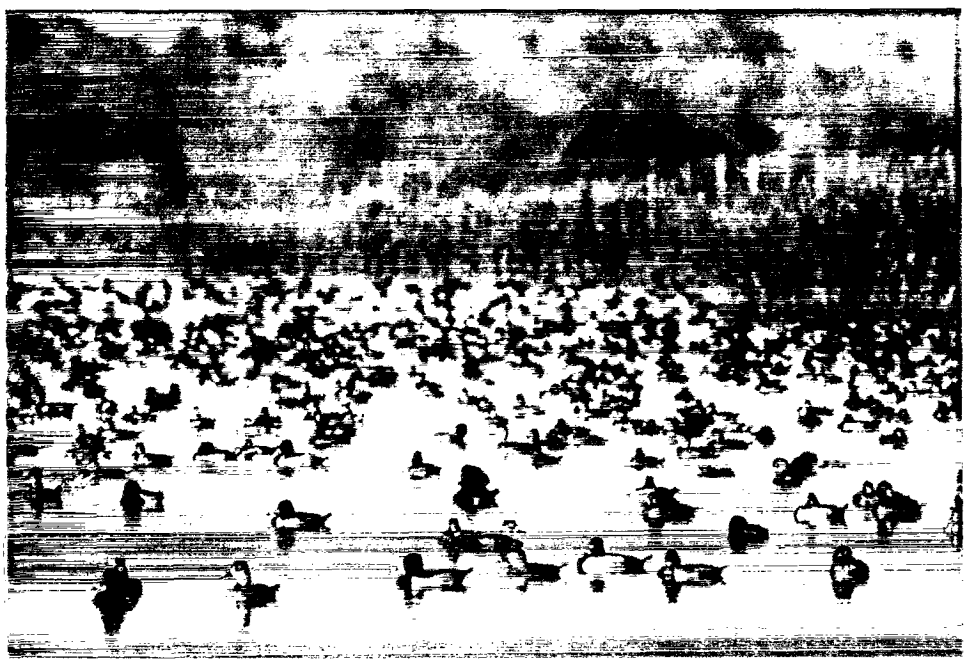
Waterfowl numbers started increasing by the end of August. Birds congregated in Deadman Slough where as many as 700 mallards could be observed resting. Equal numbers of ducks were also using West Teal and some of the various sloughs in the Elk Pasture. The flocks consisted predominantly of mallards with a few gadwall and cinnamon teal.

Numbers quickly grew and by the end of September approximately 10,000 birds were using the refuge. Mallards were the most numerous species observed. Activity was concentrated in Big Lake, North Marsh, West Teal and the Souza Fields.

The duck population continued to grow through October and reached approximately 50,000 ducks by the start of the waterfowl hunting season. Units receiving heaviest use included North Marsh, Souza Fields, the Elk Pasture and especially Big Lake. A number of wood duck sightings were made in mid-October. Approximately 8-12 were using S. Marsh 2 from October 14 - 20. Other observations of wood ducks were made in the Souza Fields, C Canal, and Mallard Slough.

While populations increased significantly in November, numbers of birds fluctuated widely from day to day. An aerial survey was conducted by the California Department of Fish and Game on November 1 (a hunt day) and counted 181,915 ducks. This represented a 100% increase over last year's count. However, a ground count on another hunt day (November 8) revealed only 59,500 ducks on the refuge. Ground counts are not very reliable due to the difficulty in observing all of the habitat from the road system. As in

year's past, the dominant species observed were pintails, green-winged teal and mallards. Ring-necked ducks were locally abundant in West Teal and Big Lake. As many as 8,000 ring-necks were using West Teal during November. This species, which had experienced a very successful production season in the northern Canadian provinces, were attracted to arrowhead and water plantain produced in this semi-permanent, deep-water marsh.



The marsh rehab work in West Teal created open deep water that attracted rafts of ring-necked ducks. The birds also fed on the increasing numbers of water plantain and arrowhead that were growing in this semi-permanent marsh. 11/89 GRZ

The duck population peaked for 1989 when 190,000 ducks were counted on a ground survey conducted on December 7. This was a particularly high figure especially since the survey was conducted on a non-hunt day. Birds observed were predominantly mallards, pintail and green-winged teal with activity centered in the Souza Fields, Mallard Slough Units and other east side areas. East Teal Lake received excellent use by gadwall. Between 500 - 600 gray ducks were using this unit throughout December.

C-110894

Duck use days for the year increased slightly when compared to 1988 (11,321,610 in 1988 and 11,598,360 in 1989). As in the past, the area of heaviest use was the closed zone (sanctuary). Most of the moist soil management work completed over the last few years has been concentrated in this area. Future plans call for increased marsh rehab and management in the hunting zone which should help distribute birds more evenly throughout the refuge.

An injured tundra swan was captured from East Big Lake in August and transferred to West Teal in the Elk Pasture. The swan took up residence in East Big Lake in March and was still using the pond in August when receding water levels had reduced the pond to little more than a mud hole. It was assumed the bird had been crippled during the hunting season and couldn't fly and that eventually, the bird would succumb to predators. West Teal was chosen as the relocation site because it contained adequate water for protection from predators and provided a good food supply.

An injured tundra swan was transplanted in August from the nearly dry East Big Lake to the more permanent marsh in the Elk Pasture. 8/89 GRZ

C-110895

All wood duck nest boxes were cleaned/repaired in March, and inspected through May for wood duck nesting activity. As in past years, the boxes continued to be heavily used by starlings. All starling nests were removed during inspections and the eggs and young destroyed in an effort to discourage use by these birds. No nesting by wood ducks was documented in any of the next boxes; however, screech owls successfully nested in 4 of the boxes.

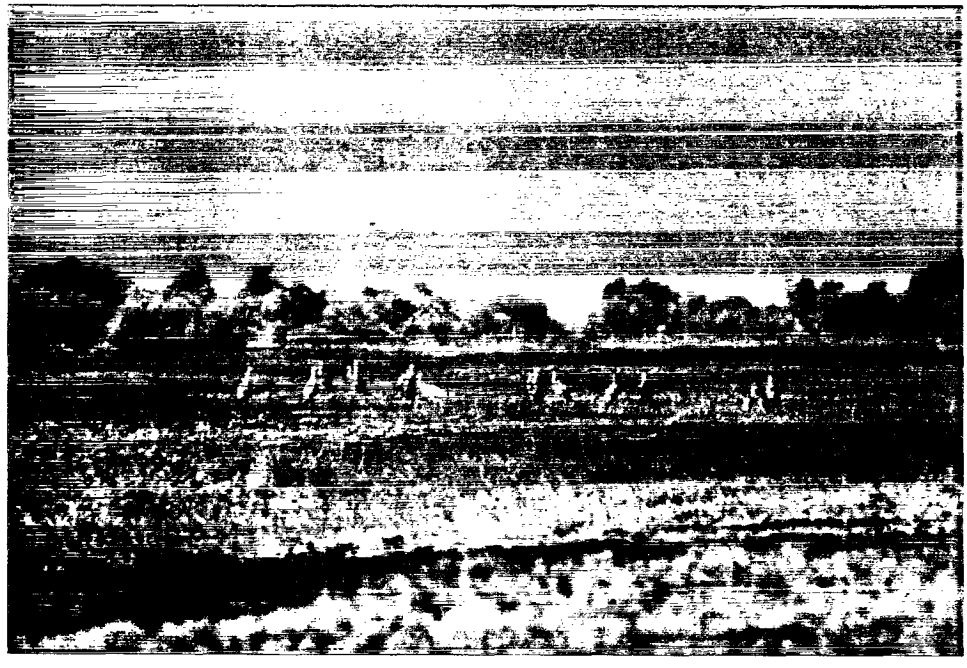
4. Marsh and Water Birds

Numbers of sandhill cranes remained low through the first quarter. Between 160 - 350 cranes were regularly observed during January in the Horseshoe Pond of the Elk Pasture, which was mowed and burned last fall. Another popular crane area was the North Marsh Unit. A flock ranging from 7 - 70 birds, including many greater sandhill cranes, used the shallow ponds for loafing and feeding during February. Limited crane use was documented in the grazed portion of Mallard Slough 5/6 at this time. Five cranes were loafing in this unit on February 14. The Souza Fields attracted both day and night use by cranes. A small flock of 150 cranes used Souza 5 as a night roost in mid-February and smaller numbers of cranes (50 or less) used Souza 3 off and on during the first half of March.

Lesser sandhill cranes returned to the area in mid-September, attracted to plowed corn fields just south of the refuge. The plowed corn fields continued to receive good use by cranes through October. The improved pastures adjacent to the corn fields and managed by the California Department of Fish and Game also attracted cranes at this time. As many as 800 birds were using these areas by month's end.

Birds were slow to use habitat on the refuge because of the disturbance associated with refuge marsh management activities and the grazing program. However, most of this activity had ended by mid-October and cranes began using the refuge in larger numbers. Several sightings were made of crane flocks, numbering as many as 250 birds, in the grazed portion of Mallard Slough 5/6. Other grazed units (Mallard Slough 4 and Loaf Lake) started receiving some crane use by the end of October. During the last week of October, a flock of 100 cranes used the North Horseshoe Pond while smaller numbers were also observed in West Teal, Middle Teal, and the Souza Fields. The North Elk Pasture burn also attracted cranes at this time. Many of the units, including West Teal and the Souza Fields, were possibly used as roost sites as well.

Cranes continued to use the refuge in small numbers in November and December. Flocks of 40-70 birds were regularly observed feeding in Souza 1 and 3 during November. Those areas that were burned, mowed, and grazed were particularly attractive to the cranes at this time. As many as 300 cranes were utilizing the grazed portion of Loaf Lake during the first week in November. The burned areas of North Marsh attracted 400 and 75 cranes on November 3 and 8 respectively. As many as 75 cranes fed and loafed in the mowed North Horseshoe Pond in early November and another 100 -250 birds were attracted to this same unit the third week in December. Souza 3 was used sporadically as a loafing area by as many as 600 cranes throughout the month of December. The birds were attracted to the main levees (which are mowed prior to fall floodup) and adjacent shallow water.



Sandhill cranes were quick to use the North Elk Pasture burn as a loafing and feeding site in the fall. 10/89 GRZ

White pelicans regularly used the shallow open water of some of the marsh units as loafing areas. While pelicans could be consistently seen throughout the year, overall numbers were small. Scattered observations were made of as many as 200 pelicans in the Souza Fields during mid-January. Pelicans frequented refuge ponds in the spring as water sources dried up in the surrounding Grasslands. Areas receiving use included Big Lake, South Marsh 2 and Deadman Slough. With the flooding of West Teal in September came good use by pelicans. This unit received extensive rehab

C-110897

work during the summer to eliminate rank vegetation and provide more open water and loafing islands. Approximately 75 pelicans regularly used the recently flooded Middle Teal during the first week of September. A small flock of 17 - 65 pelicans returned to this unit in October. Use by pelicans switched to the Souza Fields in December, as 20 birds used Souza 7 and 8 during the last half of the month.

The Souza Fields received some use by white-faced ibis during the winter months. Small flocks ranging from 20 to as many as 220 birds were occasionally observed feeding in the jointgrass and millet residue during January - March. Ibis were observed catching and eating small crayfish which may have overwintered within the jointgrass mats. Smaller numbers were attracted to these same units in late December.

All known wading bird rookeries were surveyed for nesting activity from March through June (see Figure 7). The nesting season is quite long in the Valley and the bird colonies can contain nests in different stages of development. Thus, it is difficult to come up with estimates of total annual reproduction. The East Marsh rookery, the only known rookery on the refuge, was slow in forming this year. This great blue heron rookery only contained 6 - 10 active nests with 10-12 young produced. The Gallo rookery #1 was in full swing when checked in April. The rookery had 46 adult great blue herons with 35 active nests and 5 adult great egrets with 5 active nests. By June, the rookery still had 8 great blue heron fledglings. The South San Joaquin rookery #1, situated south of the refuge, contained 60 great blue herons and 45 active nests when surveyed on March 20. This rookery remained active through June and when surveyed on June 23, still contained 20 great egret nests with 28 young and 10 great blue heron nests with 11 young. A new rookery (South San Joaquin #2) discovered in June, downstream from the South San Joaquin River rookery #1, contained 15 great blue heron nests with 20 young and 5 great egret nests with 7 young. Most of the young were of fledgling age. Undoubtedly this rookery had produced many more young prior to its discovery.

Extensive surveys were conducted on the remainder of the Gallo property along the San Joaquin River. Future plans call for the acquisition and addition of this property to San Luis Refuge, so efforts were made this season to survey wildlife in the area. One rookery (Gallo #2) situated at the north end of the Gallo property approximately 1.5 miles from Highway 165, contained 35 great blue herons with 17 active nests and 5 great egrets with 3 active nests. The rookery was still active when surveyed in June and contained 12 great blue herons and 4 great egrets - all of fledgling age. A second rookery on the Gallo property (Gallo #3) contained old nests but no birds or nesting were observed.

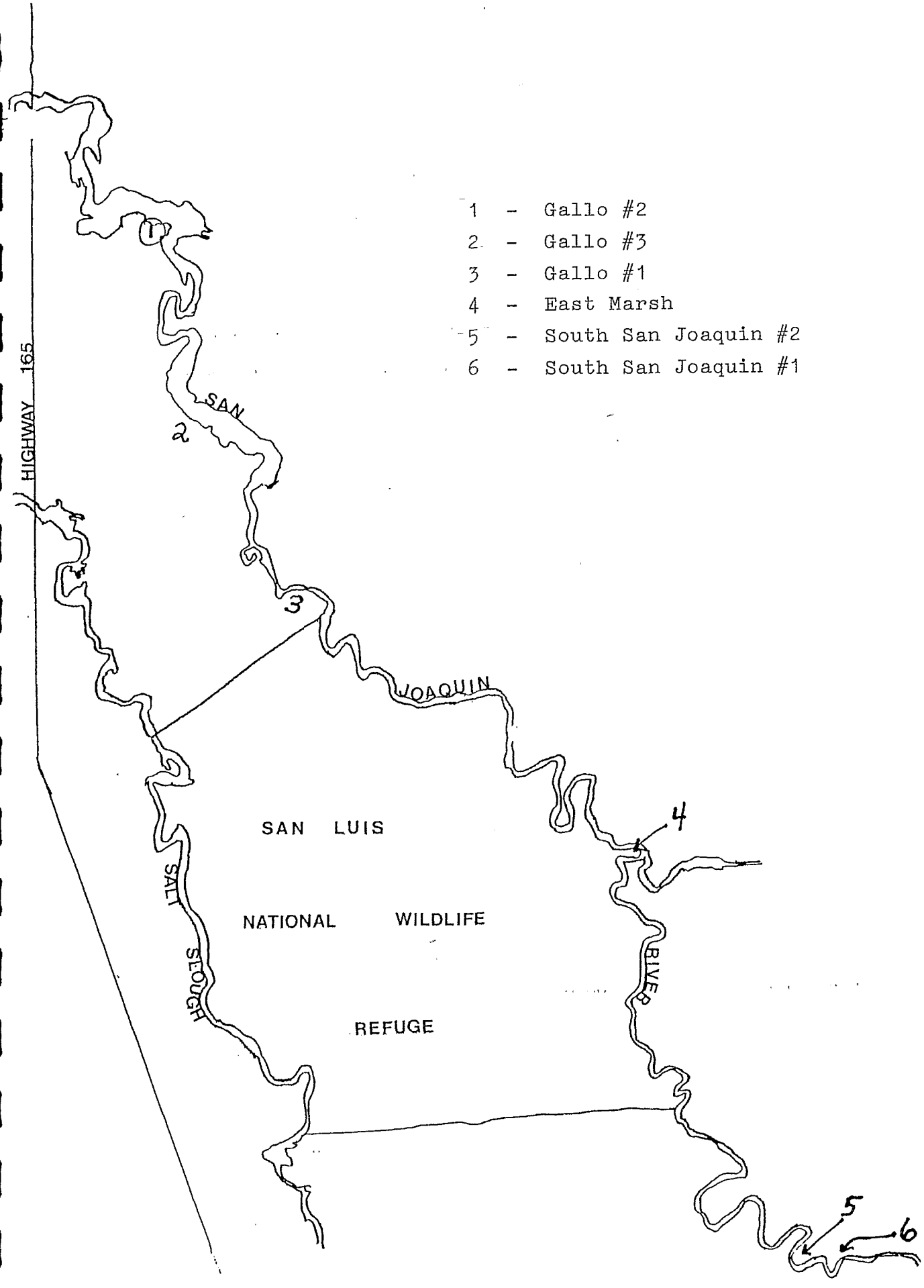


Figure 7. Colonial bird rookeries located on or near San Luis NWR, 1989.

C-110899

5. Shorebirds, Gulls, Terns and Allied Species

Changing water levels resulting from floodups, drawdowns and irrigations attracted numbers of shorebirds primarily during the spring and fall months. The Moraga units received excess water during November and December which flooded some of the lower upland areas, creating good feeding habitat for many types of shorebirds. The most consistent shorebird use unit continued to be Dickenson 4.

Only two observations were made of long-billed curlews all year. Two curlews were feeding in Dickenson 2 on December 22 and 16 birds were later observed in the Moraga's on December 26.

As in past years, a pair of black-necked stilts raised four young in the small alkali pond on the west side of South Marsh 2. This pond, located adjacent to the public tour route, allowed excellent public viewing opportunities of the stilts and a wide diversity of waterfowl and shorebirds.

6. Raptors

Monthly raptor surveys were conducted in the fall, winter and spring when raptor numbers were high and volunteer labor was available to complete the inventories. The raptor population remained low during the first quarter as only 77 birds were counted on the survey of January 25. This represented a 50 percent drop over last winter's counts. Numbers continued to drop through the spring as surveys conducted on April 24 and May 19 counted only 17 and 24 raptors respectively. The population remained low throughout the summer; however, by fall, their numbers started to increase as birds migrated into the area to winter. The raptor population peaked in December when 115 birds were counted.

The most numerous species observed were red-tailed hawks and northern harriers. Other species were locally abundant at certain times of the year. Large numbers of black-shouldered kites were observed in late summer and early fall as they migrated through the area.

The monthly surveys show a steady decrease in the raptor population since the counts were started back in 1986 (see Figures 8 and 9). The prolonged drought coupled with many man-induced factors such as pollution/contamination, habitat loss and pesticides may be contributing to this decline.

Figure 8. Red-tailed hawks observed during monthly surveys, 1986-1989.

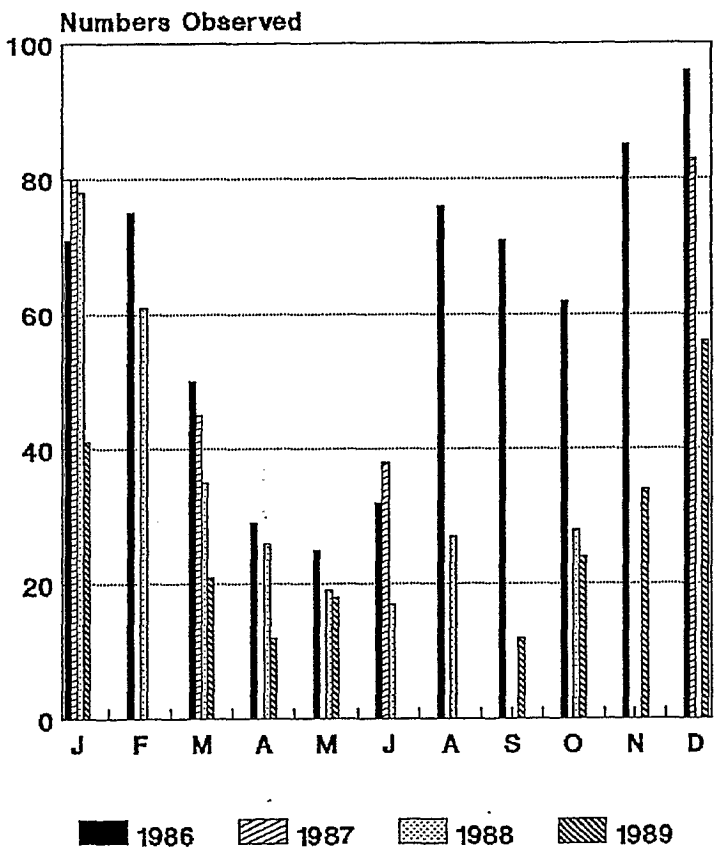
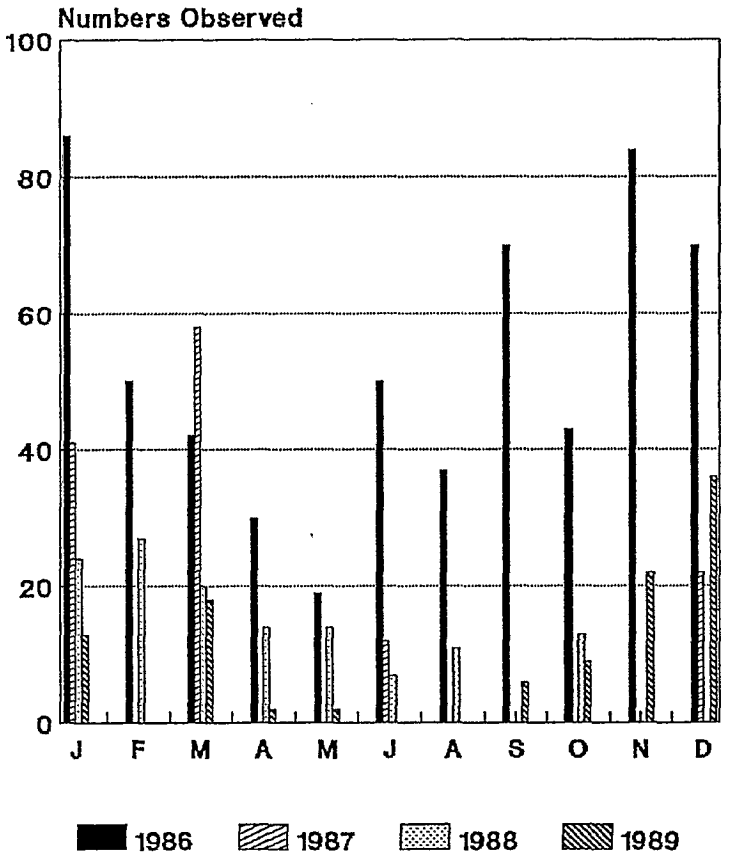


Figure 9. Northern harriers observed during monthly surveys, 1986-1989



(No surveys were conducted in July for the 4 year period).

7. Other Migratory Birds

A wildlife survey was established this year along the San Joaquin River to document primarily songbird occurrence during spring and fall migrations. The first surveys were conducted in September and were run weekly through October. Birds observed during the census included savannah sparrows, bushtits, starlings, rufous-sided towhees, white-crowned sparrows, hermit thrushes, crows, great blue herons, flickers, red-tailed hawks, scrub jays, great horned owls, great egrets, meadowlarks, yellow-billed magpies, Bewick's wrens, house wrens, tree swallows, song sparrows, mockingbirds, California quail, black phoebes and black-shouldered kites. Much of the habitat utilized within this riparian corridor could be destroyed if the Lower San Joaquin River Levee District is allowed to continue their planned flood control activities.

A flock of approximately 500 American goldfinches were feeding on yellow star thistle in the Yokuts unit during the second week of January.

A black-headed grosbeak and a blue grosbeak were observed along C Canal next to East Marsh on May 15.

Large numbers of turkey vultures were observed in the vicinity of the grazed areas during September. The birds were attracted to the sheep that routinely died during the grazing operation. The grazer was slow in removing these carcasses and vultures were quick to respond to this food supply. One observation counted 20 turkey vultures perched on the North Elk Pasture fence.

A mountain bluebird was observed in South Marsh 4 on September 28.

10. Other Resident Wildlife

A draft of the tule elk management plan for the San Luis herd was completed this year. This document was the result of the cooperative efforts of personnel of the U.S. Fish and Wildlife Service and the California Department of Fish and Game. The plan was sent to the Regional Office late in the year for review and approval. Once signed off by the Regional Office, the plan will be sent to the Regional Manager - California Department of Fish and Game for his signature.

Monthly tule elk surveys were conducted to determine population size and condition of the San Luis herd. The tule elk herd as a whole continued to do well. Most animals remained in good health with 3 new calves being born this year.

C-110902

The excellent antler development on this 2 year old tule elk is a good indicator of the exceptional quality of habitat in the Elk Pasture brought about by improved marsh and upland management. 11/89 GRZ

The California Department of Fish and Game transplanted a tule elk cow to the refuge from the Folsom Zoo on April 14. The animal was approximately six years old and in excellent condition. Like the other elk transplanted in 1987, this cow had a sterile implant surgically placed in its neck muscles that should prevent pregnancies for 2-3 years. The transplant, along with the three new calves, brings the elk population to 30 animals (15 bulls, 12 cows and 3 calves).

Lulu Bell, the semi-tame tule elk cow, showed signs of a skin disorder in late spring. She developed large scabby areas on her flanks and hindquarters that festered and attracted flies; however, most of the areas had healed by year's end with the exception of one sore on her left flank.

Biologist Klett was interviewed by the Los Banos Enterprise for an article on the history, biology, and management of the refuge's tule elk herd. The article appeared in the September 27 issue.

C-110903

Many small coveys of California quail were observed while conducting regular songbird/wildlife surveys along the San Joaquin River. This riparian area is important habitat for this game species, providing necessary cover, water and food. Future plans include discing small areas of dense weedy vegetation that would create more feeding areas and edge.

14. Scientific Collection

As part of the Kesterson Habitat Monitoring Program, personnel from CH2M Hill searched refuge uplands on April 20 for suitable sites to install pitfall traps. Samples of invertebrates taken from San Luis NWR will be used as controls to compare selenium levels of uncontaminated areas with those from Kesterson Reservoir. A total of six pitfall traps were dug in Big Lake, Santa Rita, Loaf Lake and Ruddy Lake during the last week in April. The traps were checked regularly through May and were removed at month's end. Invertebrates collected included beetles, sowbugs and spiders.

17. Disease Prevention and Control

The refuge has never experienced a serious disease outbreak and 1989 was no exception. A snow goose and a ruddy duck were found dead on the refuge in March and were sent to the National Wildlife Health Laboratory for analysis. The necropsies showed that the snow goose died of peritonitis as a result of a gunshot wound and the ruddy duck died of unknown trauma.

A kestrel, barn owl, snow goose and great horned owl were picked up later in the year and will be sent to the Health Lab in 1990.

H. PUBLIC USE

1. General

About 12,000 to 14,000 people visit San Luis NWR each year. Half of these come to hunt and fish; the other half pursue nonconsumptive activities. Photographers, especially those using video camcorders, have increased 45% in 1989 compared to the past 3 year (1986-1988) average.

Figures 10 and 11 display the distribution of visitors and recreation hours by group. Figure 12 is a comparison of the various user groups while Figure 13 displays the percentage of recreation hours on a monthly basis.

Funding is being sought to implement an I & R Plan which includes vehicle pull-outs with interpretive panels along both the elk and main auto tour routes; an observation tower for viewing tule elk; a visitor kiosk with a parking area, interpretive panels, and a nature trail.

The main tour route was closed during April while San Luis Canal Company used a portion of it to deliver concrete to line C Canal (see Section I.8). During the waterfowl hunting season, the main tour route was opened to the public during hunt days for the first time in many years since the hunting area was consolidated and made contiguous west of Dickenson Ferry Road (see the October 25, 1989 News Release in Section L. Information Packet). This change should increase non-consumptive use of the refuge during weekends in November and December when large concentrations of waterfowl can be seen and photographed from the main tour route.

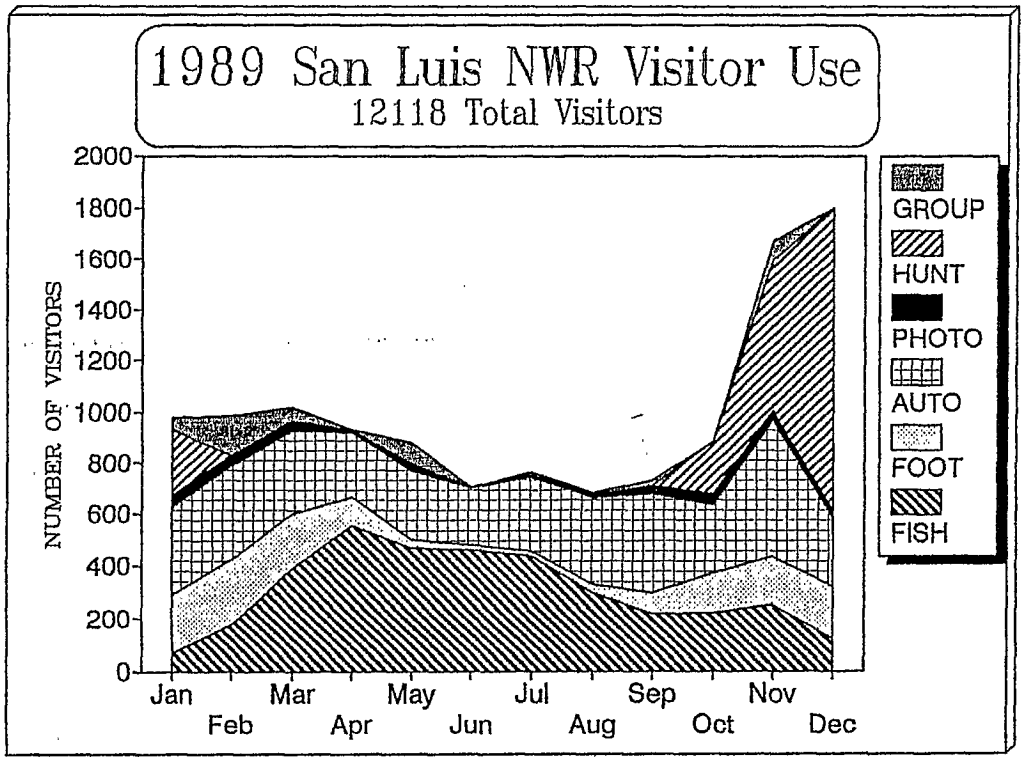
Biologist Klett escorted Bruce Reitherman, a free-lance photographer, through the Elk Pasture to film tule elk in their natural habitat. Mr. Reitherman is filming a program for BBC on wildlife of the United States.

2. Outdoor Classrooms - Students

The botany class from Merced College, Los Banos, was on the refuge on May 2 to study marsh plants.

C-110905

Figure 10. 1989 visitor use by group.



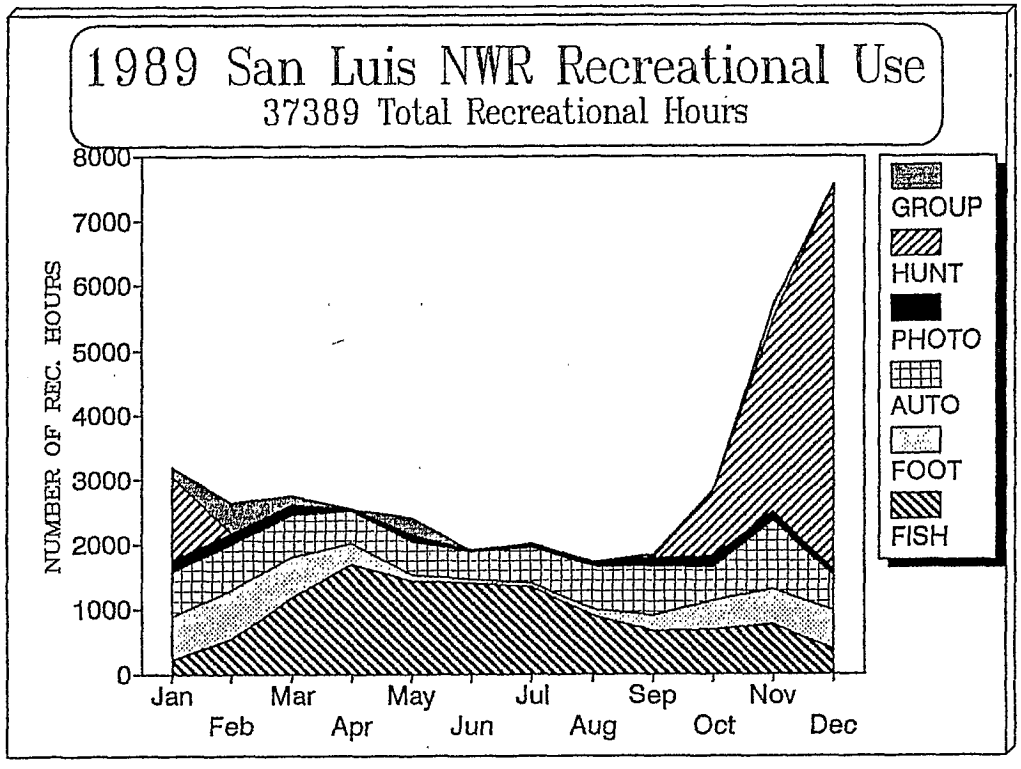
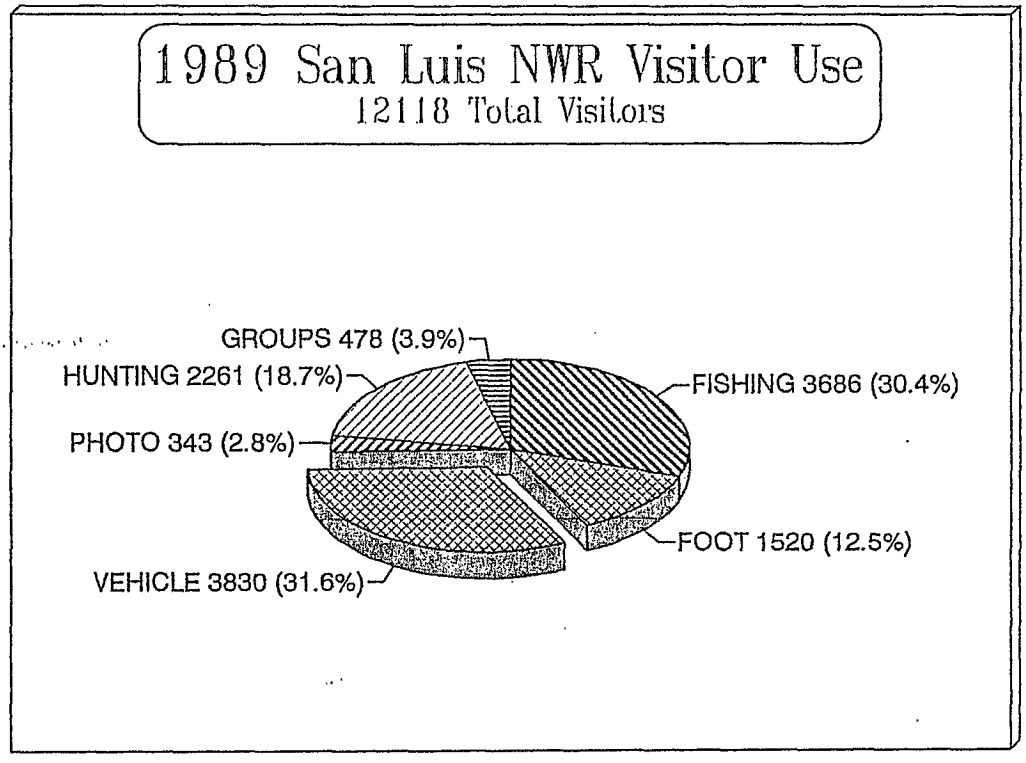


Figure 11. 1989 recreational hours by group.

C-110906

Figure 12. Comparison of the various public use groups on San Luis NWR for 1989.



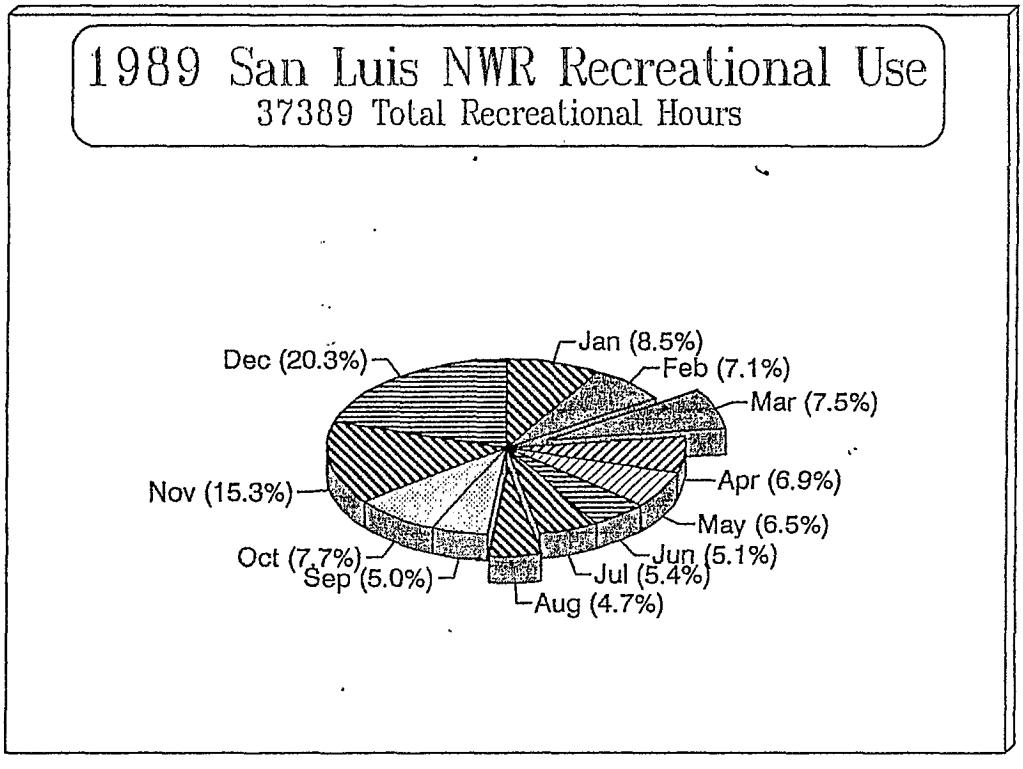


Figure 13. Monthly breakdown of the recreational hours expended by the public on San Luis NWR during 1989.

C-110907

7. Other Interpretive Programs

Biologist Klett made a presentation and request on December 6 for funding from the Rocky Mountain Elk Foundation for a tule elk interpretive project. The formal request was made at their regional project committee meeting held at the Grizzly Island Wildlife Management Area. The Foundation agreed to make a donation of $17,000 as partial funding for the construction of a tule elk observation tower and three interpretive display panels. Matching funds needed to complete the project were requested through the Service's Challenge Grant Program; however, this funding request was later denied. The remaining money needed for the project will be secured from other private sources and O & M money.

Biologist Klett gave a slide presentation on the natural history of the Central Valley to 25 women of the American Association of University Women on May 13. The program and meeting were held at Espana's Restuarant.

ARM Blacker wrote a letter in support of funding for environmental education projects for the Los Banos School District from the sale of personalized auto license plates. The school district will use the funding this year to set up a curriculum and purchase educational materials. Future funds from this source could be obtained to construct facilities such as a tule elk observation tower and interpretive panels. Donated labor and materials plus funding from this source could provide such facilities with little cost to the Service during the present times of fiscal restraint. The refuge should continue to support this program next year as it provides an opportunity for the community and service organizations to get involved with environmental education and wildlife projects on the refuge. These cooperative projects will enlist local support and enthusiasm for the refuge and the Fish and Wildlife Service.

ARM Blacker showed a video and gave a career talk to 25 students in the animal science class at San Luis High School in Los Banos in January. In April, he gave a slide presentation and talked about the importance of Central Valley wetlands to wildlife to over 100 high school and college agriculture educators at a Tracy, California meeting. In November, Blacker spoke to the Los Banos Rotary Club about the importance of the local Grasslands wetland area and the associated wildlife refuges to the overall North American Waterfowl Management Plan. About 40 Rotarians showed a keen interest in habitat losses and future wetland acquisitions, especially in light of the recent growth and construction boom in the Los Banos vicinity.

The following groups visited San Luis NWR in 1989:

13 Jan	Audubon Society	Turlock, CA	24	SG a/
24 Jan	Paradise School	Modesto, CA	24	SG
1 Feb	Paradise School	Modesto, CA	23	SG
7 Feb	Kings Canyon JC Wildlife Class	Reedley, CA	24	Blacker
14 Feb	Wakefield Elem.	Turlock, CA	60	SG
24 Feb	Calif. State Univ. Zoology class	Fresno, CA	8	SG
25 Feb	Audubon Society	Fresno, CA	12	Blacker
25 Feb	Girl Scouts - Modesto &	Fresno, CA	30	Blacker
3 Mar	Mariposa High School Biology Class	Mariposa, CA	50	SG
3 May	Merced JC Botany Class	Los Banos, CA	8	SG
16 May	Hilmar Elem. 1st grade	Hilmar, CA	65	SG
20 May	Cub Scouts	Modesto, CA	12	Blacker
27 Jul	St. Paul's Lutheran Day Care	Merced, CA	16	SG
28 Sep	CSUS	Turlock, CA	18	SG
11 Nov	Boy Scouts	Los Banos, CA	8	SG
21 Nov	Modesto JC Wildlife Class	Modesto, CA	10	Blacker
29 Nov	Tracy HS Ag. Class	Tracy, CA	20	Blacker
30 Nov	Merismos Christian School	Atwater, CA	40	Blacker

a/ SG = Self Guided Total Group Visitors - 452

8. Hunting

The 1989-90 waterfowl hunt on San Luis NWR was a 59 day split season, the same as last year. The first part of the season (Oct. 28 - Nov. 19) was separated from the second part (Dec. 2 - Jan. 6) by 12 days. Although the season consisted of 59 days, there were only 27 hunt days at San Luis since it is only opened to hunting on Saturdays, Sundays and Wednesdays. A four duck bag limit was in effect again this year with 3 mallards (only 1 hen) and only 1 pintail of either sex. One canvasback was restored to the hunter's bag this year after being totally protected last season (1988-1989). Shooting hours were changed back to the traditional 1/2 hour before sunrise to sunset.

Major changes occurred this year with respect to the realignment of the closed and hunting areas, parking lot #1 location, and the refuges's pheasant hunting program (see Figure 14). These changes are described in detail in the October 25, 1989 News Release in Section L. Information Packet.

C-110909

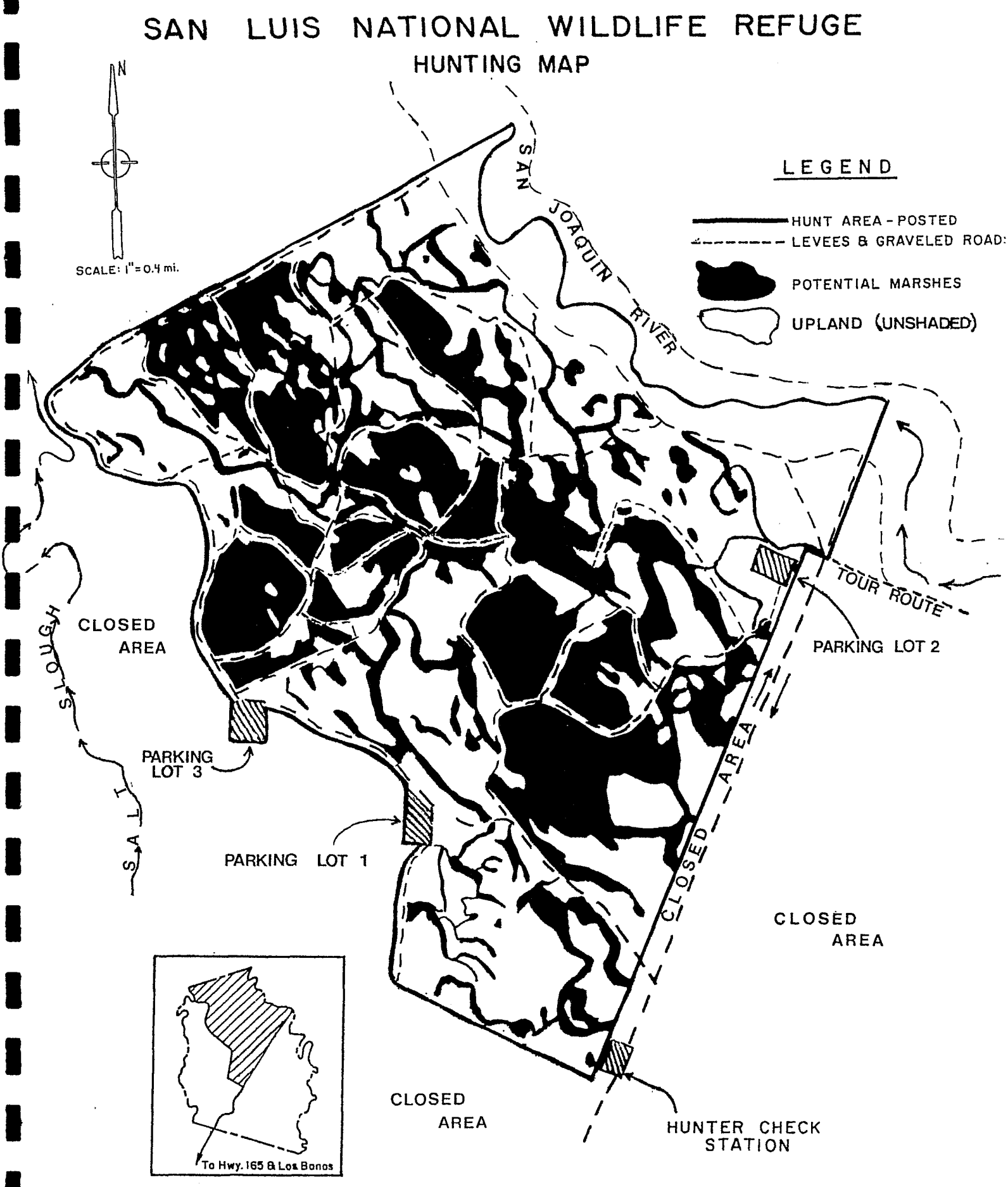


Figure 14. 1989 San Luis NWR hunting map.

C-110910

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF FISH AND GAME

UNITED STATES
DEPARTMENT OF INTERIOR
FISH AND WILDLIFE SERVICE

INFORMATION FOR ALL HUNTERS ON THE SAN LUIS NATIONAL WILDLIFE REFUGE

THE SAN LUIS NATIONAL WILDLIFE REFUGE IS CLOSED TO THE TAKING OF ALL CANADA GEESE OR ITS SUBSPECIES AFTER THE CLOSE OF THE FIRST HALF OF THE SPLIT DUCK SEASON. THE REFUGE IS ALSO CLOSED TO ALL HUNTING INCLUDING GOOSE, PHEASANT AND SNIPE DURING THE SPLIT OF THE DUCK SEASON.

THE REFUGE HUNTING PROGRAM IS OPERATED AS A COOPERATIVE EFFORT BY THE CALIFORNIA DEPARTMENT OF FISH AND GAME AND THE U.S. FISH AND WILDLIFE SERVICE

REFUGE REGULATIONS

1. Hunters must park in assigned parking lots.

2. Once a hunter has left the parking lot, he/she may possess no more than 25 shotgun shells. STEEL SHOT IS REQUIRED FOR HUNTING WATERFOWL, COOTS, AND MOORHENS.

3. Hunters must possess valid hunting licenses, stamps and Area permits while in the field.

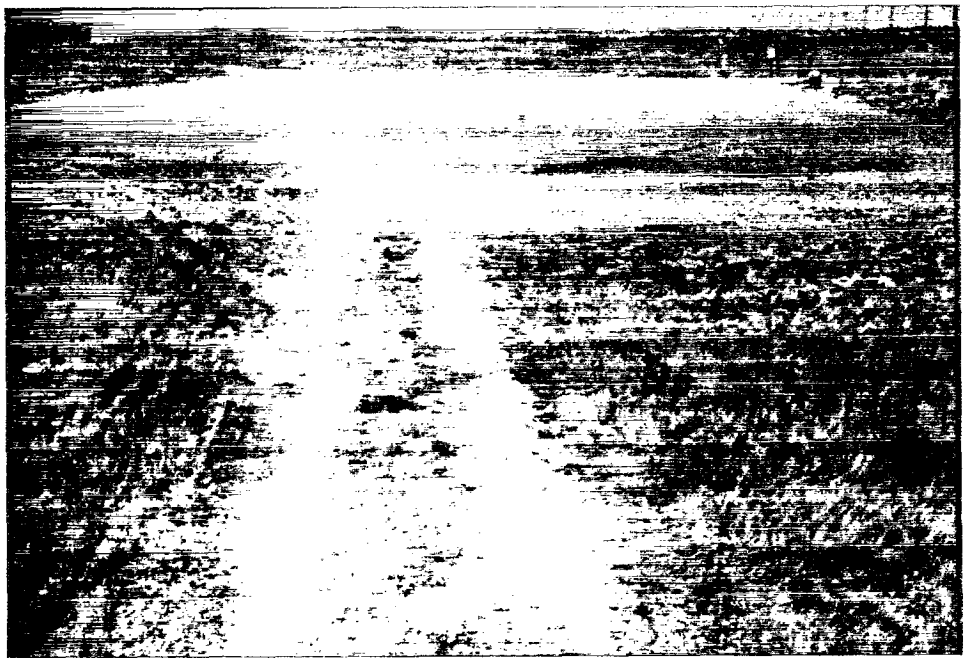
4. The Refuge is open to waterfowl and pheasant hunting only in the designated areas as shown on the map. Open areas are posted with public hunting signs.

5. Shooting hours for waterfowl are 1/2 hour before sunrise to sunset. Shooting hours for pheasants are 8:00 a.m. to sunset.

6. The check station will open two hours before each day's shooting time.

7. All hunters must check out at checking station and return permits upon leaving.

8. Shooting days and hours for the San Luis National Wildlife Refuge are posted at the check station.



New Parking Lot #1 will accommodate a larger number of hunters. 10/89 RAB

Since all the hunt areas are now west of Dickenson Ferry Road (Figure 14), a 20' wide lane was disced or mowed and posted (120 yards west of and parallel to the road) to keep hunters a safe distance from the main auto tour route. Non-hunters viewed and photographed waterfowl along this tour route for the first time in years during hunt days.

Due to the ongoing construction activities, three wetland units in the hunt area were not flooded by opening day of the waterfowl season: Moffit 2, Moffit 4N, and 25% of Moffit 6N. This slightly reduced the hunter quota for the first few weeks of the season. By the beginning of the second split (Dec. 2), all units were flooded and the hunter quota was at maximum capacity (110).

Table 9 and Figure 15 show the species composition of the waterfowl harvest. Green-winged teal, mallard, and northern shoveler are typically the top three species harvested. The harvest of ring-necked ducks, a species that experienced a population increase, rose sharply mainly due to the attractiveness of Big Lake and its Saggitaria and water plantain beds. The mallard harvest increased 25% from last year (686 to 855). However, mallards made up a smaller percentage of the total bag in 89-90 compared to the previous year (20% in 89-90 and 29% in 88-89). The gadwall harvest, compared to last season, quadrupled. We noticed a

high number of gadwall broods on the refuge and in the surrounding Grasslands this year. These local birds no doubt contributed to the increased gadwall harvest.

Table 9. Species composition of the waterfowl harvest, 1989-90.

Species	Oct.	%	Nov.	%	Dec.	%	Jan.	%	Total	%
Green-winged teal	167	40	308	42	1310	50	283	60	2069	49
Mallard	123	30	199	27	481	18	51	11	855	20
Northern shoveler	18	4	27	4	297	11	80	17	422	10
Ring-necked duck	33	8	108	15	125	5	13	3	279	7
Gadwall	14	3	24	3	171	7	18	4	227	5
Cinnamon Teal	22	5	37	5	44	2	3	1	106	2
American wigeon	13	3	6	1	68	3	8	2	95	2
Northern pintail	14	3	14	2	58	2	8	2	94	2
Wood duck	8	2	9	1	11	0	1	0	29	1
Snow goose		0	1	0	21	1		0	22	1
Coot	3	1	2	0	6	0		0	11	0
Ruddy duck		0	3	0	5	0	2	0	10	0
Canvasback		0		0	9	0		0	9	0
Ross' goose		0		0	7	0		0	7	0
Blue-winged teal		0		0	3	0		0	3	0
Bufflehead		0		0	2	0		0	2	0
Hooded merganser		0	1	0		0		0	1	0
White-fronted goose		0		0	1	0		0	1	0
Eurasian wigeon		0		0	1	0		0	1	0
Redhead		0		0		0	1	0	1	0
Total	415		739		2620		468		4245	

Overall, 2,221 hunters took 4,245 waterfowl (1.89 birds/hunter) during the 1989-90 season. Table 10 compares the waterfowl harvest results for the past 10 years.

Pheasant hunting coincided with the split duck hunting season and was open on Wednesdays, Saturdays and Sundays during November 11-19 and December 2-10. During the first split, 63 pheasant-only hunters plus an unknown amount of duck hunters took 46 roosters. Only 5 additional pheasants were bagged during the second part of the season by an unknown number of hunters (it was impossible to determine the number of pheasant hunters since CDF&G didn't even inform the public that pheasant hunting was still open on San Luis).

The FWS should make a decision about hunting pheasants and snipe during waterfowl season in a waterfowl area with lead shot. A simple regulation to close all wetland areas to lead shot (no matter what species is being hunted) would simplify law enforcement and eliminate adding lead to the marshes.

Table 10. San Luis NWR waterfowl hunt results, 1980-89.

Season	Total Hunters	Duck Harvest	Goose Harvest	Coot Harvest	Total Waterfowl Harvest	Avg. Birds Per Harvest
1980-81	4,056	8,666	32	310	9,008	2.22
1981-82	3,269	5,548	18	69	5,635	1.72
1982-83	3,297	5,667	30	181	5,878	1.78
1983-84	3,689	6,521	20	180	6,721	1.82
1984-85	3,043	4,741	22	36	4,799	1.58
1985-86	2,763	6,152	120	16	6,288	2.28
1986-87	2,626	4,911	12	67	4,990	1.90
1987-88	2,955	6,182	19	33	6,234	2.11
1988-89	1,693	2,352	21	11	2,384	1.41
1989-90	2,221	4,204	30	11	4,245	1.91
Average/ Year	2,840	5,142	32	67	5,242	1.85

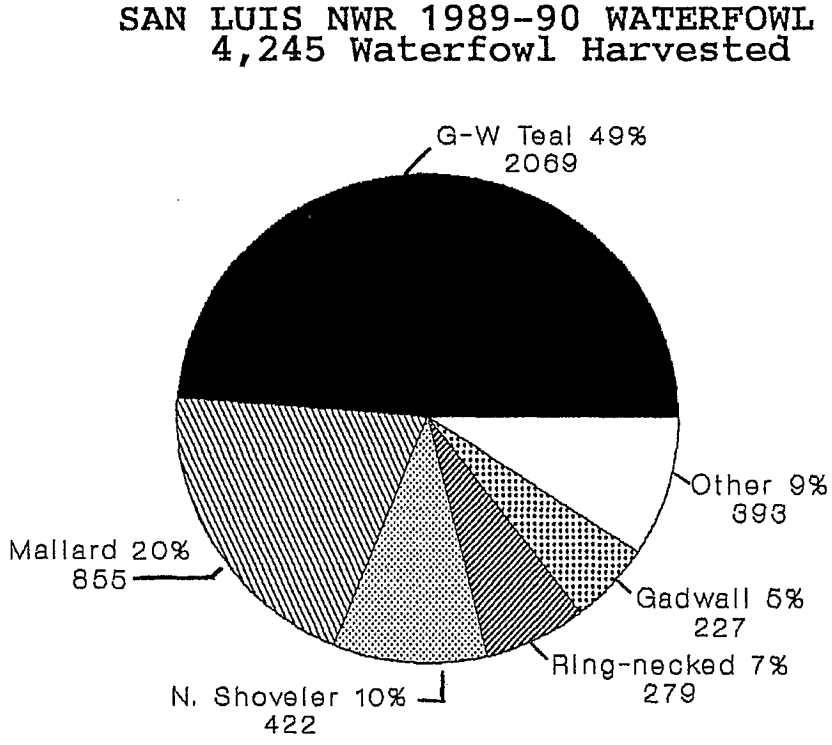


Figure 15. Species composition of the waterfowl harvest, 1989-90.

Table 11 depicts pheasant hunt data since 1980. Overall, hunter success has been very poor averaging 1 bird for every two hunters.

Table 11. San Luis NWR pheasant hunt results, 1980-89.

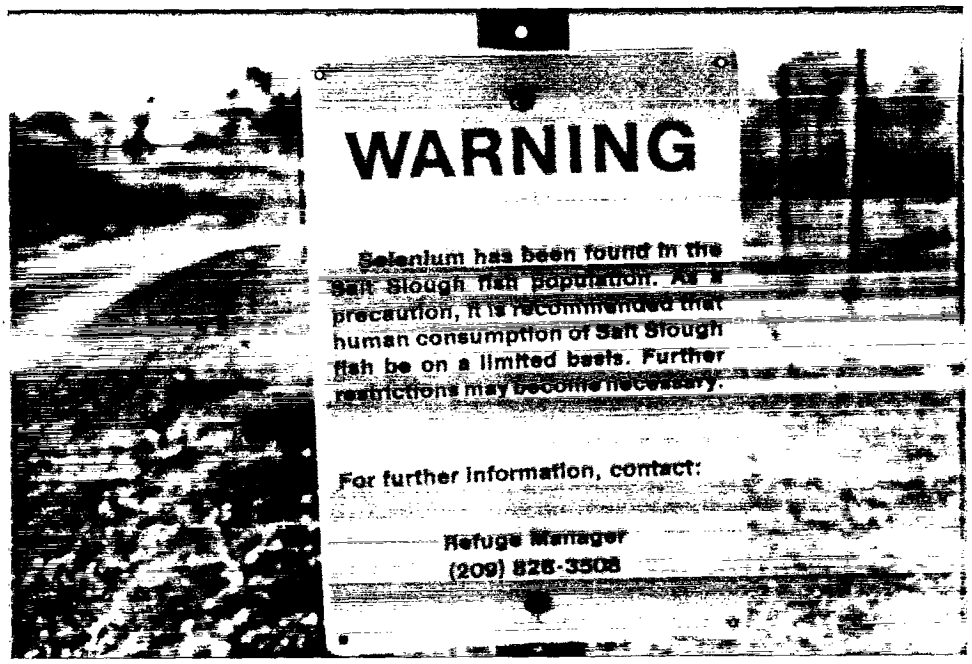
Season	Total Hunters a/	Pheasant Harvest	Avg. birds per hunter
1980-81	141	73	0.52
1981-82	79	34	0.43
1982-83	272	56	0.21
1983-84	394	153	0.39
1984-85	108	107	0.99
1985-86	69	51	0.74
1986-87	63	70	1.11
1987-88	46	65	1.41
1988-89	203 b/	76	0.37
1989-90	63	51	0.81
Total	1,438	736	-
Average/Year	144	74	0.51

a/ This is the number of hunters who only hunted pheasants. An unknown number of waterfowl hunters also hunt pheasants.

b/ Three days of pheasant only hunting took place during the split duck season closure. This increased pheasant hunter numbers.

9. Fishing

Although selenium warning signs are still posted, fishing is still popular along Salt Slough. The recreational value of fishing remains high whether or not consumption is taking place.



Sign warns anglers of selenium in Salt Slough fish. 1/90 GRZ

Several wildfires have been associated with refuge fishermen (see Section F.9). Lack of gravelled parking lots and deteriorated access roads with tall vegetation add to the fire danger and detract from the fishing experience. Refuge personnel gravelled a low water crossing on the access road north of the Elk Pasture in 1988. However, further erosion of the east bank of Salt Slough has endangered the integrity of the access road in several places. There are sections of barbed wire fence along Salt Slough that have been lost or made ineffective due to increased erosion and loss of the slough bank.

Erosion along Salt Slough leaves fence high and dry. Note proximity of road to eroded bank. 9/89 RAB

Until the selenium problem is eliminated from the Salt Slough food chain, it would not be wise to improve fishing facilities and encourage the public to poison themselves with selenium-tainted fish. However, since deteriorated roads, parking areas, and fence conditions lead to wildfires and cattle tresspass problems, a public fishing MMS project is badly needed now to restore access roads, parking areas and eroded stream banks along the entire western edge of San Luis refuge.

13. Camping

Although recreational camping is not permitted on the refuge, overnight parking is allowed in the hunter check station lot during the waterfowl hunting season. This ironic and discriminatory situation, which has been allowed to continue on all Central Valley refuges, will hopefully be eliminated once the revised Cooperative Agreement for hunting on NWR's between FWS and CDF&G is signed.

17. Law Enforcement

Five full time refuge employees with law enforcement authority concentrate most of their effort during the waterfowl hunting season. Table 12 shows the man-hours, number of hunters checked, and citations issued during the 1989-90 season. Periodic law enforcement patrols are also conducted on high public use holiday weekends, the beginning of dove season, and whenever problems are noted.

Table 12. 1989-90 San Luis NWR Complex waterfowl season law enforcement efforts.

Officer	Law enforcement hours worked	Estimated number of hunters checked	Number of citations
Blacker	63	175	1
Houk	60	65	9
Klett	30	40	0
Melanson	88	150	11(6 off refuge)
Miller	8	8	0

Citations included late shooting (3), over-limit of shells (4), hunting in a closed zone (3), possession of lead shot (6), damage to government property (1), disturbing plants-animals (2), taking protected species (1), and hunting away from assigned blind (1). A total of 8 citations were issued for violations at San Luis, 7 at Merced and 6 off-refuge (adjacent duck clubs to Merced).

Vandalism continues to be a problem. In April, the locked gate at the lift 5 pump station was pushed open with a truck. Apparently, fishermen drove through the gate to fish, picnic, and possibly camp illegally in the closed area northeast of lift 5. Vandals dented both rear wheel wells of ARM Blacker's Chevy S-10 pickup truck while it was parked in front of the complex office in Los Banos.

In May, someone removed the selenium warning signs at the northwest corner of the Elk Pasture. A new sign was erected 50 yards east of the corner. The other selenium sign at the southwest corner of the Elk Pasture was also moved 50 yards east. By moving both signs away from the picnic/fishing areas, future vandalism should be reduced. A third selenium sign is still posted near lift 5.

Frustrated dove hunters probably tore down the "No Dove Hunting" sign in the visitor contact point on September 1.

Primary Assistant Houk wrote a memo to the Associate Manager in the Regional Office recommending eliminating alcohol consumption in the hunting area. It is becoming more and more common for "hunters" to be in possession of large quantities of beer and other alcoholic beverages when we check them in the field.

New signs in the hunt area eliminated most problems that were associated with trespass into closed areas, however, some people still have problems obeying signs and regulations.

Blacker, Klett and Melanson attended the mandatory 40 hour law enforcement refresher course in Sacramento March 6-10; Houk and Miller attended the April 3-7 session. All requalified at the Los Banos Police handgun range on November 3 and completed first aid and CPR classes in May.

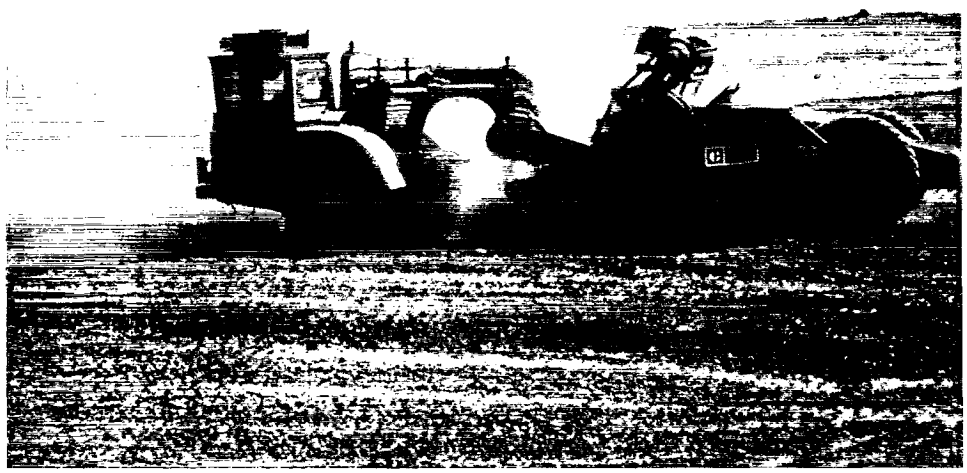
Hunting in the closed zone is one of the more common violations at San Luis. This unsuspecting "puke" made Refuge Officer Houk's day. 12/89 JEH

I. EQUIPMENT AND FACILITIES

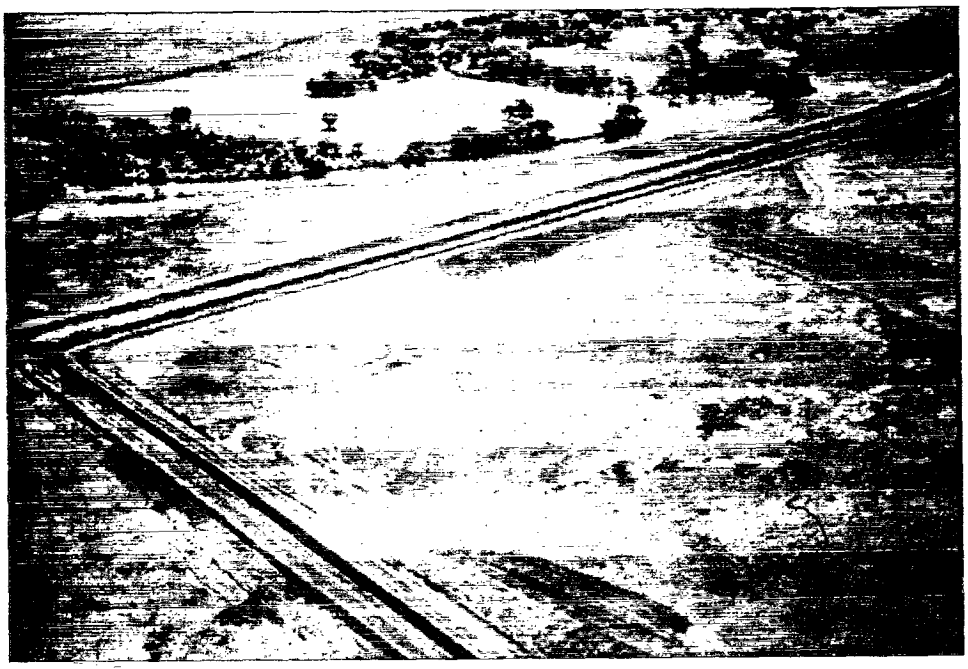
1. New Construction

Warren E. Gomes Excavating, Inc., commenced work on the C Canal Project on April 18 after winter rains shut down this project last December. Six inches of compacted fill was added to the west dike of C Canal Extension from the Moffit 5 ditch turnout to the north boundary (5,850'). 4,865' of A Canal Extension was constructed from the north end of C Canal Extension to station 90 about halfway across the north end of the Moffit 2 unit.

Borrow sites for this project created and enlarged wetlands in Moffit 2, 3N, 4N, 6S and 6N, Dickenson 3 and North Marsh 1E units. The new canals provide efficient water deliveries to five existing refuge moist soil management units totaling 174 acres. A 50 cfs. flow of water can now be delivered without pumping costs to the north boundary of the refuge to assure a firm supply for the Gallo property which should be acquired in the near future. The completed portion of A Canal Extension extends far enough west to deliver water to every ditch going north into the Gallo property wetlands.



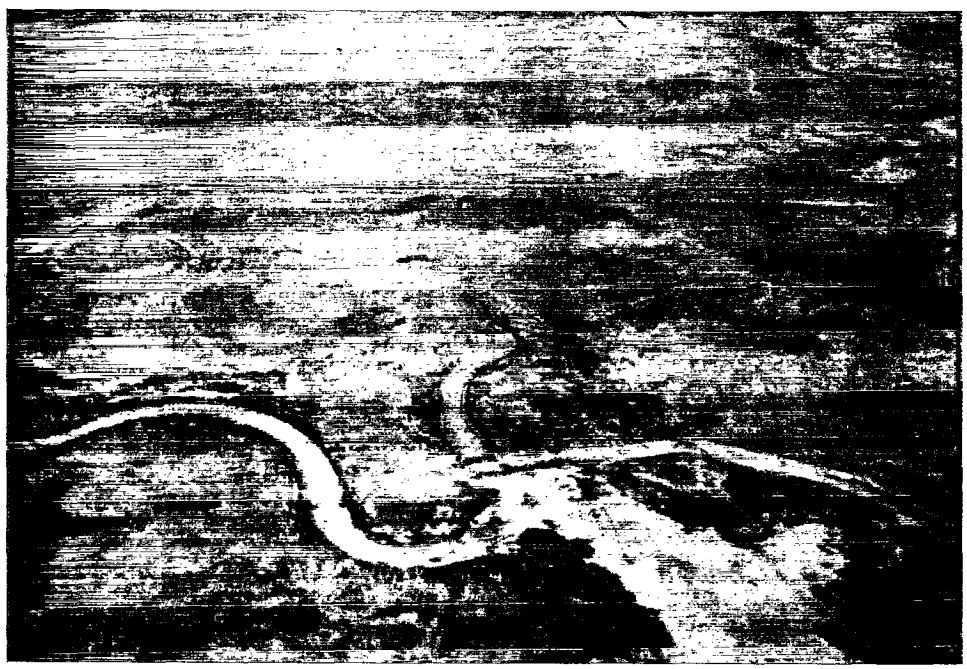
Contractor smoothing borrow site in Moffit 6N with a CAT-623 scraper to create new wetlands. 5/89 RAB



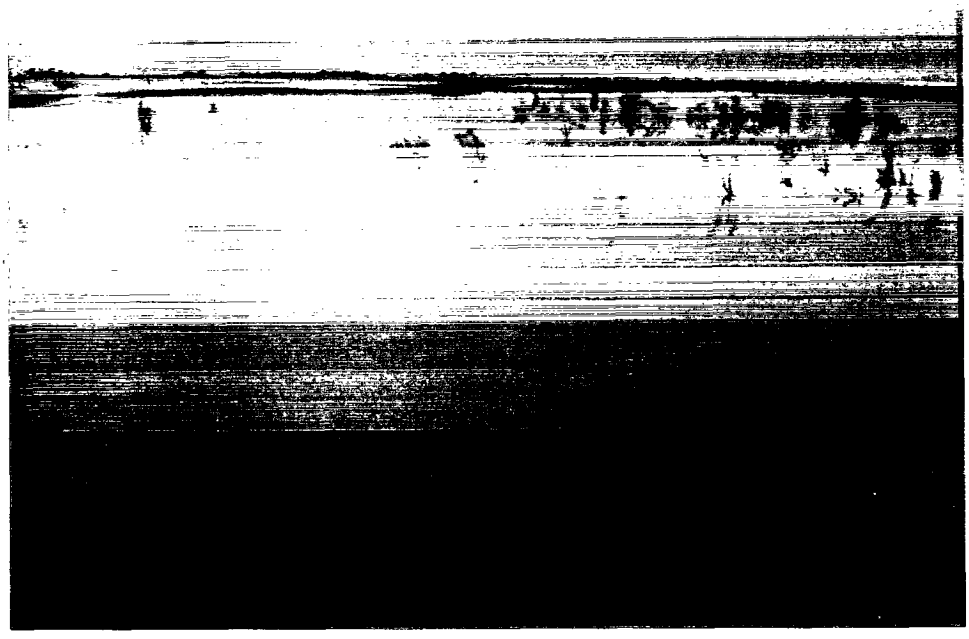
Aerial view of Moffit 6N. Note borrow sites. C Canal Extension - top of photo. A Canal Extension is at lower left. Gallo property in lower left part of photo. 8/89 DJS

Moffit 4N - borrow sites created new wetlands. (Aerial view looking south to north). 8/89 DJS

Moffit 4N - first flooding after borrow removed for A and C Canal extension project. 1/90 GRZ



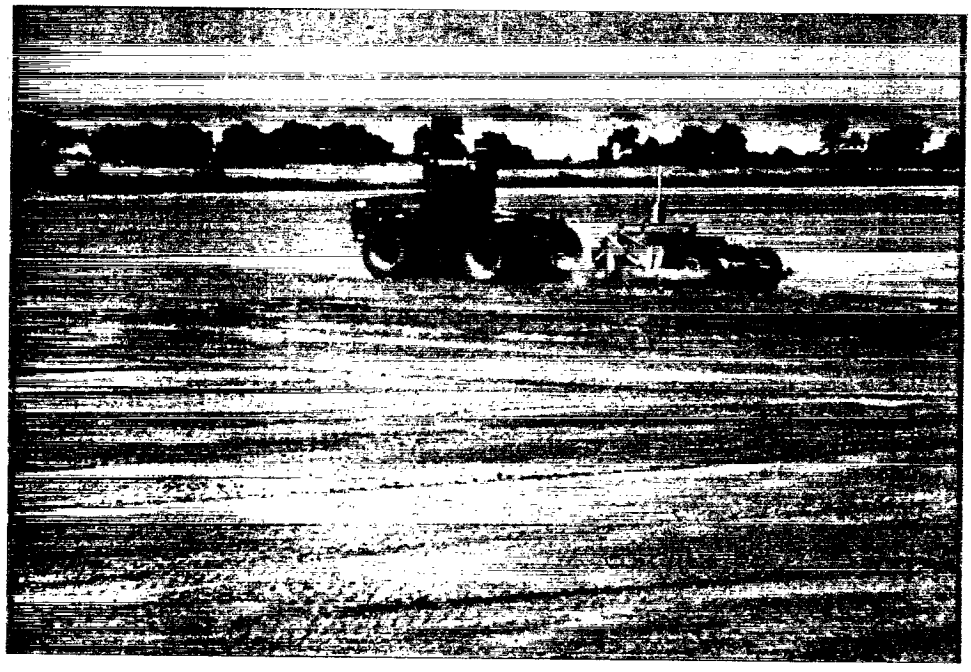
Aerial view south to north of Moffit 3N borrow site for A and C Canal project. 8/89 DJS



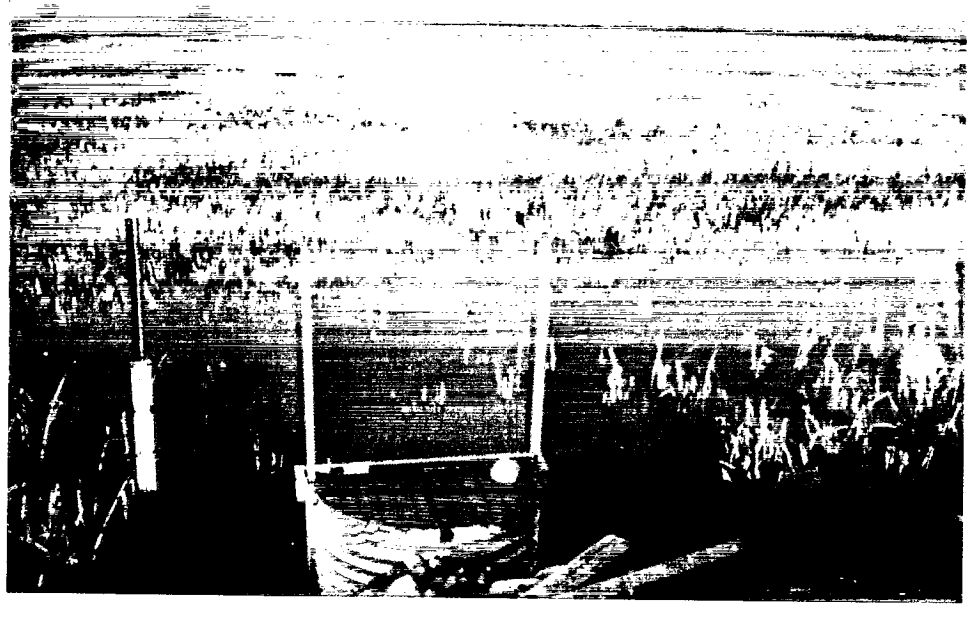
Looking north to south in Moffit 3N after enlargement of wetlands via A and C Canal project. 12/89 GRZ

Following the addition of $30,000 of RPRP funding, Silveria Construction of Tracy, CA began the land leveling and dike construction associated with the conversion of 19 acres of abandoned cropland to a moist soil marsh unit (Souza 1). After laser-leveling the field so the north end was one foot higher than the south end for drainage purposes, Silveria built new dikes, repaired old dikes, and created a new access road to the northeast corner of the unit from the Mallard Slough road. A loafing island was created with excess borrow material.

Refuge personnel added new inlet and outlet structures (24"), seeded the new unit with watergrass, disced it lightly, and irrigated it. Two more irrigations in August and early September produced a fair stand of watergrass. A variety of wildlife, including snow geese, sandhill cranes and ducks utilized the new wetland. The loafing island and the location of this unit (isolated from the main tour route) add to its usefulness as a feeding and loafing unit.

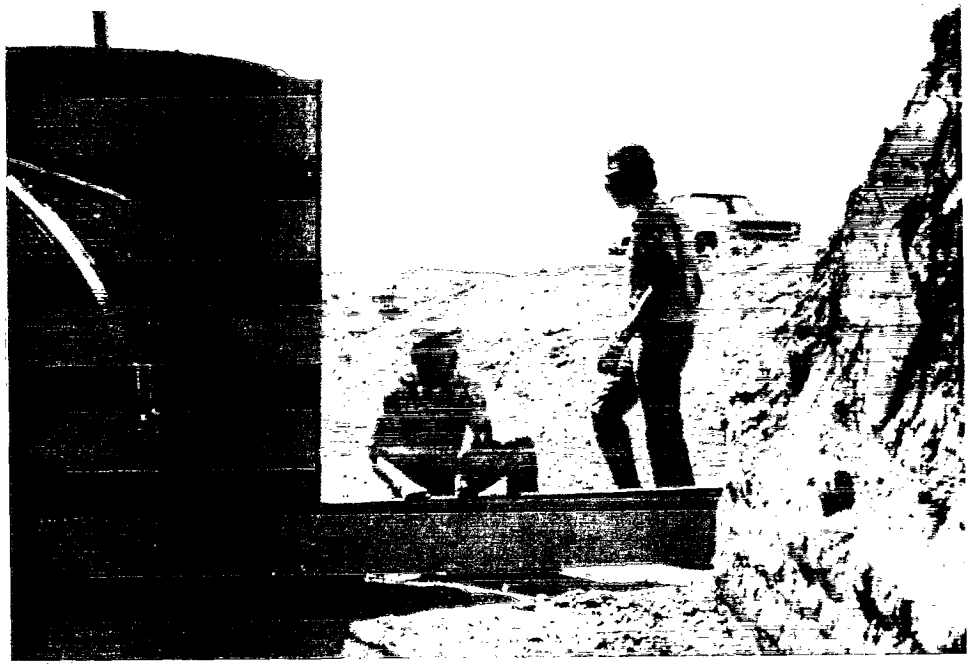


Silveria Construction building loafing island in southeast corner of new Souza 1 unit. 6/89 RAB



Souza 1 after first fall flooding - note new outlet structure and staff gauge on land-leveled, seeded unit. 1/90 GRZ

Refuge personnel installed numerous water control structures in conjunction with the C Canal and Souza 1/2/3 projects. Redwood headwalls, cobble, flared end sections, compacted fill, safety screens, and staff gauges were added to reduce erosion, ease maintenance, provide safe access, and improve management on all new wetland management units.



Installing redwood headwalls on 54" water control structure in C Canal at the Dickenson 3 turnout. 6/89 RAB

Table 13. New water control structures installed on San Luis NWR in 1989.

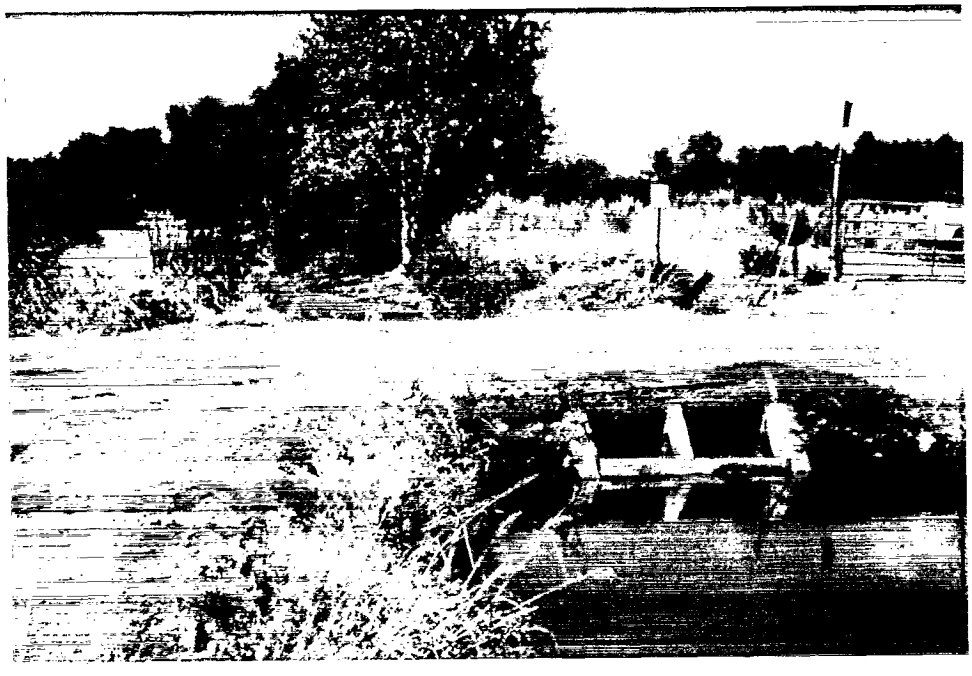
	Name	Pipe Diameter	Month Installed
1.	Riparian ditch outlet	12"	May
2.	C Canal Ext. X-over @ Dickenson 3	54"	June
3.	C Canal Ext. X-over @ Moffit 5	54"	June
4.	C Canal - Dickenson 3	30"	June
5.	C Canal - Moffit 5 ditch	36"	June
6.	Souza 1 inlet	24"	July
7.	Souza 1 outlet	24"	July
8.	Souza 2 inlet	24"	July
9.	Souza 3 inlet	24"	July
10.	C Canal - W. Chester	24"	July
11.	Moffit 5 ditch - Moffit 5	30"	Aug
12.	Big Lake - Dickenson 6	30"	Aug
13.	Mallard Slough road - Souzas	24"	Aug
14.	East Teal outlet	24"	Oct

The San Luis Canal Company received $2,284,000 from the Service in 1988 to make improvements to their water delivery system as compensation for alleged sub-irrigation damage to adjacent cash crops when water deliveries are made to the refuge.

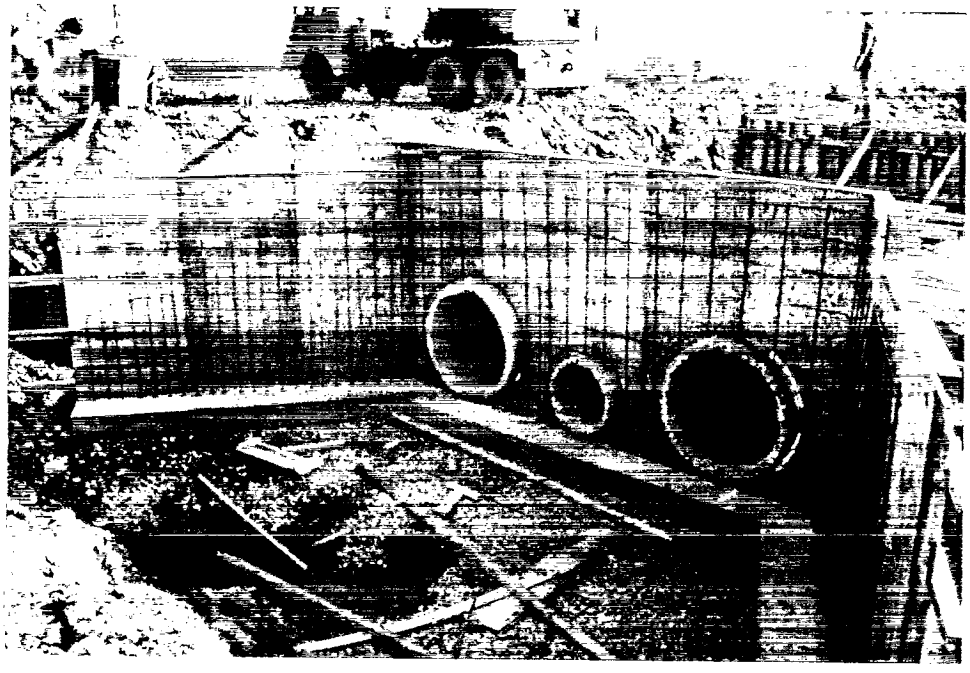
A concrete weir containing two 42" screwgates and one 24" screwgate was constructed in February at the Island C Canal's terminus near the refuge's southeast corner. Each screwgate is associated with a stop log system so the gate can be opened and fine adjustments to water flows can be made with the stop logs.

On March 30, a concrete lining project was initiated on the 100 cfs capacity Island C Canal. The SLCC project continued throughout April and was finished on May 3. The concrete lining ranges in thickness from 2-1/2" - 3-1/2" throughout the 6,455 ft. long section of canal. Approximately 1,700 cu. yards of concrete were poured to line this section of canal and build 3 in-line water control structures. SLCC personnel assisted refuge personnel in the removal of an existing, but undersized (36") screwgate at the junction of C Canal and the Lift Canal. Removal of this in-line restriction will allow full volume deliveries to the refuge.

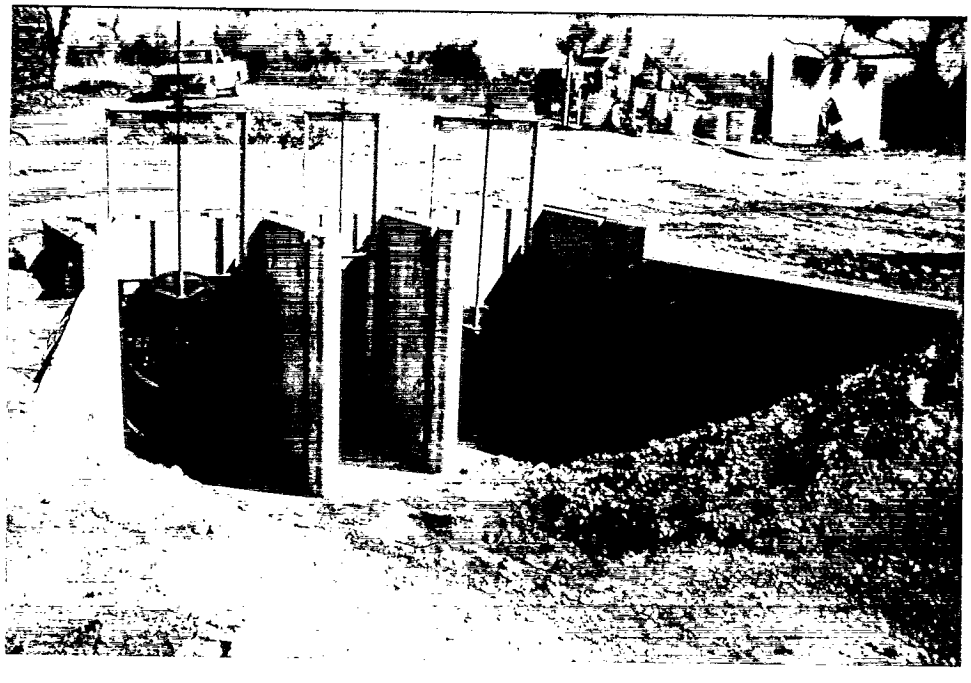
SLCC personnel installed double metal gates on each side of the new boundary line weir (C Canal) and spread gravel for all-weather access. As per previous agreement, SLCC personnel re-gravelled and re-graded portions of the tour route from the refuge entrance to the terminus of the Island C Canal.



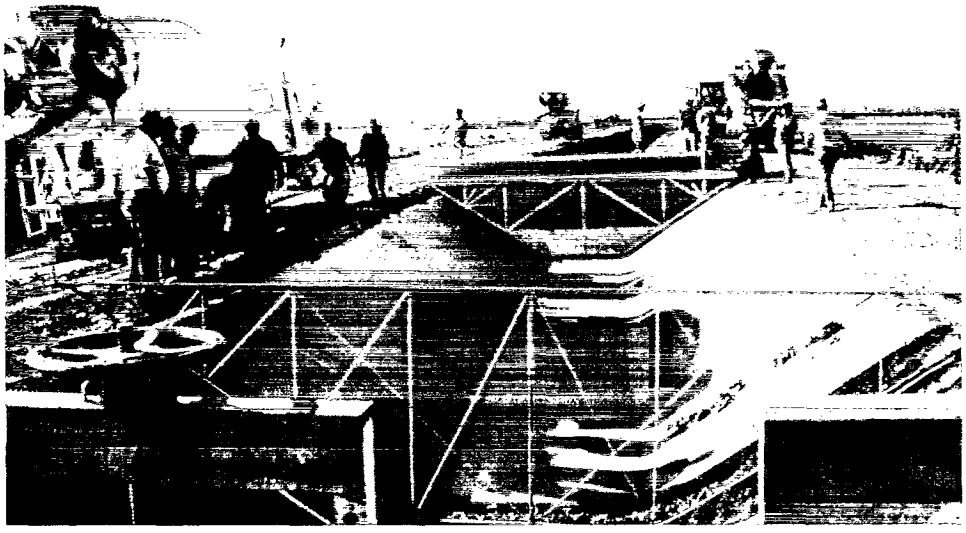
Old C Canal inlet structure at refuge boundary prior to replacement. 8/85 GRZ



Downstream side of San Luis Canal Company's new 100 cfs. concrete weir on C Canal funded by FWS. 3/89 RAB

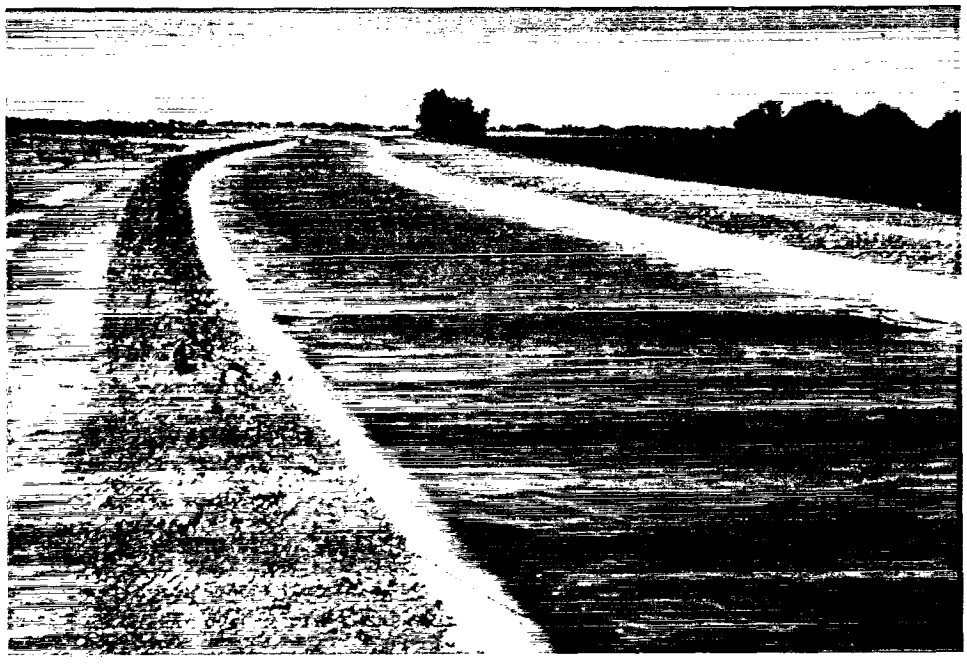


Upstream side of San Luis Canal Company's new concrete weir on C Canal at the refuge boundary. 3/89 RAB



San Luis Canal Company pouring first section (6,455 ft. long, 3" thick) of C Canal concrete lining. 3/89 RAB

Finished section of concrete lining on C Canal. Note edge is about 3" thick. 3/89 RAB



Refuge water delivery via new concrete lined C Canal. 7/89 GRZ

In an attempt to perform an activity which would qualify for the "Take Price in America" campaign, the San Luis Canal Company used their excavator to dig a meandering 3,700 ft. long by 6 ft. deep interceptor canal within the southern portion of the South Strip, an ex-agricultural unit. This canal, which was designed by Refuge Manager Zahm and Primary Assistant Houk, has 7 inset ponds with gradually sloping banks on the northern side of the canal. These small ponds will hold water, thus elevating the water table for a variety of native trees and shrubs which will ultimately be planted on the sloping banks. Emergent vegetation (essentially cattails and bulrush) will be allowed to flourish in the canal proper. This canal, set up on an east to west gradient, will capture ground water and canal seepage which currently impacts crop production within the adjacent Bowles Corporation farm land. This water will ultimately be re-utilized within other portions of the refuge. This project will serve as an outstanding example of government and private sector cooperation which will result in a total win-win situation for both parties.

Interceptor canal/riparian corridor constructed by the San Luis Canal Company in the South Strip unit. "Take Pride in America" project. 1/90 GRZ

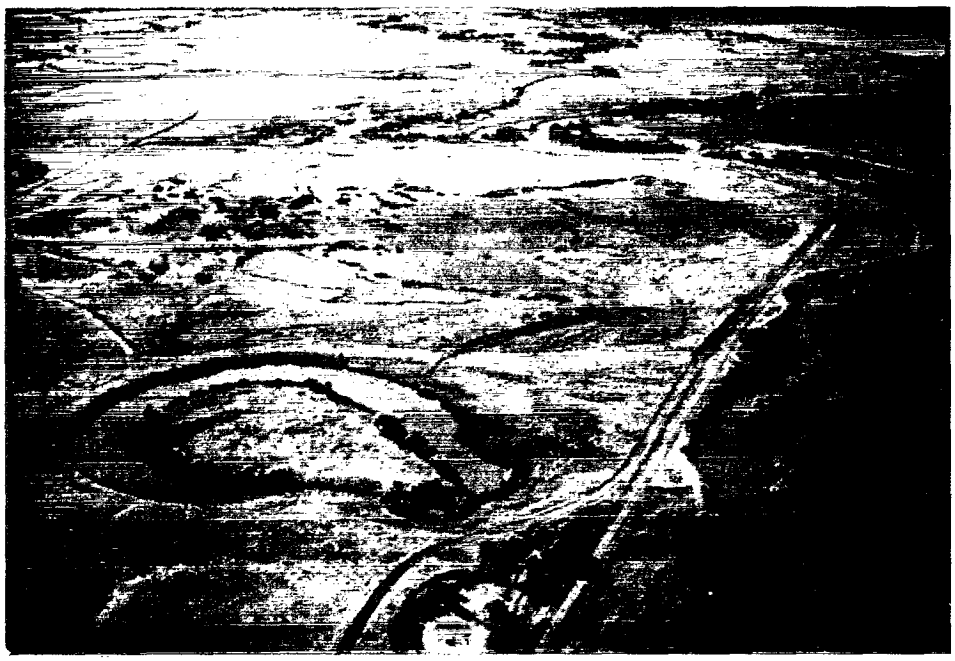
2. Rehabilitation

Freezing temperatures (a very unusual condition) broke several water pipes at the San Luis shop in February. Refuge personnel replaced the thin walled PVC pipe with heavier-walled sections less susceptable to freezing.

Refuge personnel removed the West Teal outlet structure in late April, shot levels to ascertain proper drainage of all pond bottoms throughout the unit, and started discing Juncus areas. During May, both Middle and West Teal received extensive channelization and discing to improve water level management, increase moist soil plant species, and facilitate drainage. A larger 30" outlet structure was installed in West Teal on May 9 and a flared end section was added to the Middle Teal outlet so it would function properly after levels showed the structure was lower than the pond bottoms in the unit. Refuge employees seeded both units with watergrass and applied a first irrigation on May 25.

To complete the elk pasture rehabilitation, refuge personnel disced and shaped the small pond east of the North Horseshoe pond to create additional permanent water in September. In October, they created a loafing island and disced the pond bottom in the East Teal unit. A 24" outlet structure was installed in East Teal to provide flow-through drainage for this permanent water unit.

Shearer cleaning channel near new outlet structure in West Teal unit. 5/89 RAB



Looking east across newly rehabilitated and seeded West Teal to Middle Teal in top center of photo. Large, open pond in West Teal attracted the most ducks. 8/89 DJS

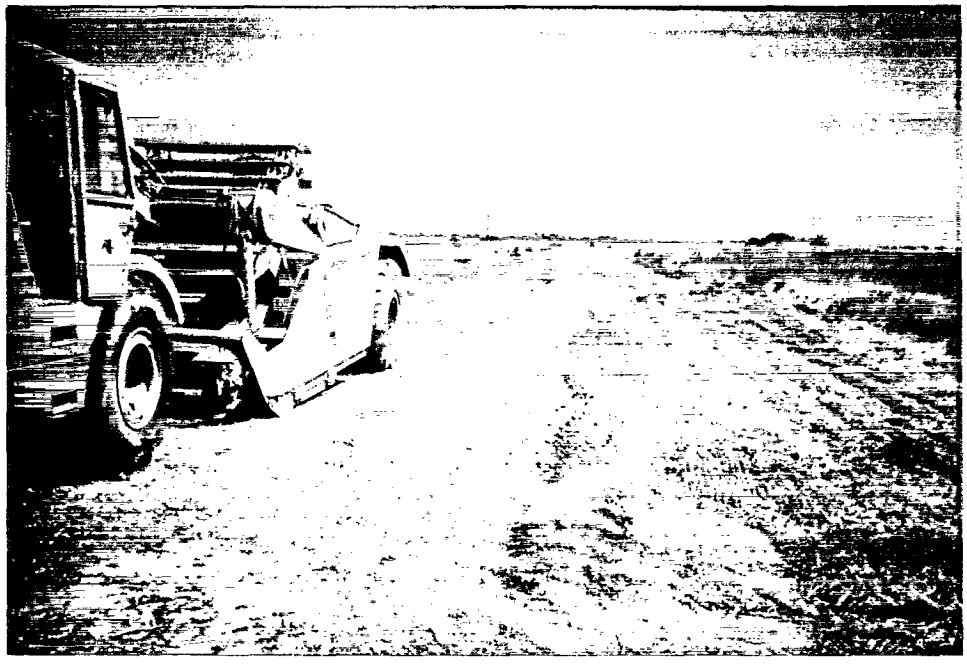
Table 14. Water control structures rehabilitated on San Luis NWR in 1989.

Unit	Pipe Diameter	Date	Remarks
1. West Teal Outlet	30"	May	Replaced
2. Middle Teal Outlet	18"	May	Added Spreader
3. C Canal - Lift Canal (screwgate)	36"	May	Removed
4. Souza 2-3	24"	Jul	Replaced
5. Souza 7-8	24"	Jul	Removed
6. A Canal - Moffit 8	30"	Aug	Replaced
7. A Canal - Moraga 1S	24"	Aug	Replaced
8. A Canal X-over	42"	Aug	Replaced
9. Moraga 4 - Dickenson 1 (slide gate only)	18"	Aug	Replaced
10. Dickenson 5 - Dickenson 1	30"	Oct	Replaced

In May, Silveria Construction added 6" of fill material onto the main tour route along the east side of C Canal connecting Dickenson Ferry Road to the San Joaquin levee road. They scraped the fill from the adjacent East Chester unit. The job took 4-1/2 hours using two CAT 623 self-propelled scrapers and cost $1,170. This brought the old east bank of C Canal up to engineering specifications to carry 70 cfs water flows at this point along the canal.

In August, refuge personnel graded gravel onto this newly raised section of the main tour route. At the same time, they graded gravel over newly installed water control structures and the east 1/3 mile of the north boundary road.

Refuge personnel used a rented 11-yard self-propelled scraper to rebuild a 1/2 mile section of the dike between the Dickensen 5 and Dickenson 1 units, remove a 1/3 mile dike between Dickeson 1 and Dickenson 2, add a 40-yard access road into the Moraga 1M outlet structure from A Canal, remove excess fill material from around an old island in Moraga 1M, add gravel to the Mallard Slough to Souza road, add fill to raise the west bank of C Canal at the north end of East Marsh, and strip gravel from old parking lots 1 and 4.



Refuge personnel used a rented scraper to rehab a levee between Dickenson 1 and 5. 9/89 RAB

Areas rehabilitated by discing are shown on Figure 2 in the Wetlands section (F.2).

4. Equipment Utilization and Replacement

New nozzles and an electric solenoid system were added to the 300 gallon Bean sprayer. This modification enables a single operator to save time and chemicals when spot spraying sections of a road or canal since spray patterns can be changed from one side of the tractor to the other or turned off completely without stopping and getting out of the tractor. The Bean sprayer's 11 hp Koehler engine was replaced with a new 11 hp Honda which is more efficient and easier to start.

In April, the complex replaced a GSA Chevy S-10 pick-up that met age and mileage requirements with a full sized pick-up. The S-10's do not have enough ground clearance for the rough refuge roads and levees.

Since the C Canal Project enables all water deliveries to be made through the new C Canal weir (see Section I.1), the 36" flow meters at the old C & D Canal water control structures were taken to Water Specialties in Porterville and refitted with new indicator-totalizer heads calibrated for the 42" pipe in the new weir. The refuge purchased a third meter for the 24" pipe in the weir so all three pipes can be metered separately. Water Specialities added rotating mounting brackets to all three meters to ease installation and maintenance.

Marfab, a local welding shop, designed and constructed a heavy duty dual wheel assembly for the 18' Schmeiser cultipacker. Refuge personnel added hydraulics which operate the wheel assembly from the cab of the 8430 tractor.

The refuge purchased a new 2-man portable power auger (post-hole digger) in November for installing sign posts, head-walls and planting trees.

Region 1 picked up 7 surplus Unimogs from Fort Ord in September. San Luis and Klamath Basin Refuge personnel drove to Ford Ord and hauled these machines to San Luis. The Unimogs were eventually sent to the McCormick Morgan Co. in Sacramento for overhaul via Regional fire management funds (see Section F.9 Fire Management).

5. Communications Systems

All radios on the Complex operate on the low band frequency at 34.81 Mhz. Being on a low band frequency has inhibited recent efforts to upgrade the radio system. The majority of other government agencies in the area (Sheriff, Calif. Dept. of Fish & Game, Calif. Dept. of Forestry, Police Dept., etc.) have converted their systems to high band frequencies.

The Complex has a justifiable need to communicate with these agencies while conducting law enforcement and fire management activities. In order to do this, multiple channel high band frequency radios are needed. This would involve conversion-replacement of the entire Complex's radio system at considerable expense, however, it would result in improved officer safety when conducting after hours or weekend law enforcement duties, as well as when conducting fire management activities.

6. Computer Systems

The San Luis NWR Complex currently has three computer systems: a CP/M DEC Rainbow, a Mitac IBM-AT compatible, and a Zenith IBM-AT compatible laptop. Refuge personnel installed a 3-1/2" 1.44 MB disc drive in the Mitac so files on the same disc could be loaded into either IBM format computer.

The refuge complex purchased a Brother HL-8e laser printer in April. A 4-way AaBb crossover switchbox was installed so both IBM type computers could use both the old 24 pin Fujitsu DL2400 or the new laser printer simultaneously. The telephone company repaired the dedicated modem line to the computer in November. The refuge then purchased and connected a Ricoh fax machine to the modem line. It has paid for itself already by the timely transmittal and receipt of important information.

7. Energy Conservation

Because of more stringent state and county regulations, the two 2,000 gallon underground fuel storage tanks, installed in 1985 at a cost of $32,000, have become liabilities. The monitoring, testing, upgrading, and reporting requirements will cost the refuge about $12,000 over the next four years and 320 man hours of time and energy lost from more important projects. The tanks could be replaced next year with above ground units that would meet all state and local requirements and would not require daily monitoring, quarterly reporting, and annual testing and calibration. The longer we wait to replace them, the more time, energy and money will be wasted. Modifications costing $3K - $4K will be required by the end of 1993. The refuge prepared a memo to the Regional Office requesting replacement as soon as possible with RPRP, contaminant, or year-end funds.

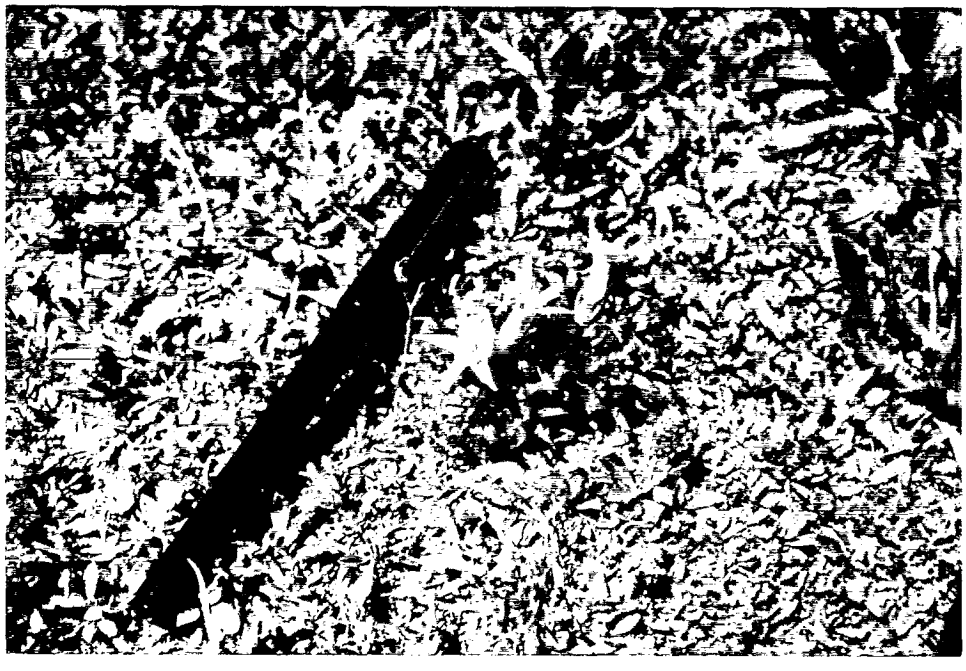
J. OTHER ITEMS

1. Cooperative Program

The waterfowl hunting program was again jointly administered by the San Luis NWR Complex staff and the California Department of Fish and Game. In 1965, a Cooperative Agreement was signed between the two agencies that defined specific responsibilities for managing the hunting program on certain California refuges. This agreement, which contains inconsistencies and is always subject to individual or agency interpretation, has been in the process of being revised by the two agencies for the past 3 years. San Luis Refuge Managers Zahm and Houk have contributed greatly to this effort. Hopefully, the new agreement will be signed by both agencies in 1990.

3. Items of Interest

Bob Edminster, a botany professor at the Merced College (Los Banos Branch), discovered a sensitive plant on San Luis NWR during a May 3 botany class field trip. Broomrape (Orobanche grayana Var. Jepsonii), usually parasitic on Artemesia californica, (locally known as mugwort) was growing on a gumweed (Grindelia camporum) plant, and was located near the end of Dickenson Ferry Road in the flood plain of the San Joaquin River, 100 yards east of the river levee. This plant is only found in a few isolated spots in the Central Valley. It appears to grow in association with delta coyote thistle (Eryngium rasemosum) ... an endangered plant listed by the State of California.



Parasitic broomrape discovered on San Luis NWR.
6/89 RAB

A San Luis waterfowl hunter informed Primary Assistant Manager Houk that he had bagged what he thought was a Mexican duck, Anas diazi, in the Moffit 3 unit during the 1987 season. The hunter had the specimen mounted and brought it to the office to be examined where Refuge Manager Zahm confirmed that it was indeed a rare Mexican duck.

Rare Mexican duck (Anas diazi) bagged during the 1987 hunt season. 7/89 DJS

4. Credits

The majority of this report was written by ARM Rod Blacker. Biologist Steven Klett wrote sections D.4, D.5, E.4, F. 6-7 and Section G. Primary Assistant Jim Houk prepared sections A., E.1, E.5, J.1, J.4, and K. and together with Manager Gary Zahm, edited the report. Susan Cortese, Clerk, typed the report. Photo credits: GRZ - Gary Zahm; RAB - Rod Blacker; DJS - Dan Severson; SBK - Steve Klett; JEH - Jim Houk; JPH - Joan Hourican; and DB - Dan Browder.

K. FEEDBACK

The San Luis NWR Complex continues to survive only due to the availability of "soft monies", i.e., Bureau of Reclamation transfer funds, or end-of-year "emergency" funds appropriated by the Regional office. Although significant progress has been made in many key areas with respect to the overall operations of the Complex, the lack of a sufficient base budget for the past several years has created many problems.

Several hundred acres of "wetland" habitat remain dry or not adequately managed resulting in a reduction in the quantity and quality of wintering waterfowl habitat. The last 3 years of extended drought conditions increases the need for sufficient high-quality habitat for our dwindling waterfowl/waterbird resources even more than in normal precipitation years. Managing the wetland habitat with less than an adequate supply of water due to funding limitations has also increased the weedy plant encroachment into many of the marshes, thus reducing the amount and quality of food produced. This weed invasion will take many years to correct with adequate water and habitat management practices.

Two wage grade positions have remained vacant for over 3 years again because of insufficient base funding. During the same time, the refuge's routine maintenance requirements have increased considerably as a result of the rehabilitation of the internal water distribution system at San Luis, required maintenance on the San Joaquin River Levee, increased management efforts at Kesterson, etc.

The associated duties that these "soft monies" bring with them also can cause major disruptions to the overall operations. For example, both Refuge Manager Zahm and Primary Assistant Houk spent as much time dealing with the Kesterson Reservoir contamination issue as they did any other refuge program. These collateral duties mean that less time is available for overseeing the refuge's day-to-day activities including unfortunately, personnel management. Many routine assignments, including the preparation of Annual Narrative reports, require more time due to these other extraneous duties.

During this extended period of operating with less than adequate funding levels, the Complex has also chosen (or been given no choice) to tackle many difficult and controversial issues. Most obvious of course is the Kesterson/Grasslands selenium contamination/cleanup problem, but others include the loss of the

traditional water source for San Luis NWR and the urgent need to negotiate a long-term contract with San Luis Canal Company for water deliveries, Kesterson Mitigation Plan, major hunt program changes, FERC/MID issue, rapid expansion of the City of Los Banos, etc., etc., etc. The refuge has also spent a considerable amount of time helping with the planning and acquisition efforts for the San Joaquin River NWR, West Gallo property, Freitas Ranch and the East Grasslands Waterfowl Management Area.

While there are certainly some advantages to accepting "soft monies", it has not worked out well here at the San Luis Complex. This Complex is without a doubt one of the most intensively managed refuges within the NWRS due to its important role with respect to providing critical wintering waterfowl habitat. It is a year-round job for a large and multi-disciplinary staff that doesn't provide any catch-up periods for some of the more routine administrative duties. The added duties and responsibilities from the soft monies as well as all of the other controversial actions have certainly added to an already heavy workload creating even more stress and demands on the limited staff. All of this is mentioned just to point out that the one aspect of the operation that could have helped us out the most (and still could) is increasing the base budget to the needed level, i.e., at least $1,000,000. Until the station budget is increased sufficiently, all aspects of refuge management including personnel, habitat, administrative, maintenance, etc., will continue to greatly suffer.

The near-guarantee that up to 20,000 acres of new fee title refuge lands and that at least 10,000 acres of new easements will be added to the Complex will only exacerbate the compounded and aforementioned problems. There must be immediate realization/ action by Regional and Departmental administrators of the need for additional funds, equipment and personnel for the Complex. Head nodding, smiley faces and atta-boys will just not accomplish the tremendous resource obligations and public use responsibilities that come with this expensive and important piece of Central Valley real estate.