SALTON SEA NATIONAL WILDLIFE REFUGE

CALIPATRIA, CALIFORNIA

ANNUAL NARRATIVE REPORT

CALENDAR YEAR 1986

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

REVIEW AND APPROVAL

SALTON SEA NATIONAL WILDLIFE REFUGE

CALIPATRIA, CALIFORNIA

ANNUAL NARRATIVE REPORT

CALENDAR YEAR 1986

Refuge Manager — Date: 7/13/87

Refuge Supervisor Review — Date: 7/29/87

Regional Office Approval — Date: 7/31/87

INTRODUCTION

Salton Sea National Wildlife Refuge is located 50 miles north of the Mexican border at the southern end of the Salton Sea in Californias' Imperial Valley. It is the southern-most refuge in the Pacific Flyway and the only refuge located below sea level. Because of it's southern latitude, -226 elevation and location in the upper Colorado Zone of the Sonoran Desert, the Refuge experiences some of the highest temperatures in the nation. Daily temperatures from May to October generally exceed lOO°F with temperatures of 116-119°F recorded yearly.

The Refuge was established in 1930 for the protection of waterfowl and other migratory birds. Originally, it included about 35,000 acres. Nearly 60 percent of the original acreage was open saline lake with the balance comprised of shoreline alkali flats, freshwater marshes, native desert scrub and farm fields. Due to the inflow of agricultural drain water and a subsequent rise in the level of the Salton Sea, all of the original refuge area has been inundated. In 1947, 24,000 acres were leased from the Imperial Irrigation District and divided between three agencies: California Department of Fish and Game (CDF&G), U.S. Navy and U.S. Fish and Wildlife Service (USFWS). Most of the current Refuge acreage of 47,827 acres has been flooded by a continued rise in the level of the Sea. At present, 2,500 acres of the Refuge is dry ground, with about 2,200 acres suitable for farming and marsh development.

Salton Sea NWR is flat with the exception of Rock Hill located near the Refuge headquarters. It is bordered by the Sea on the north and intensively farmed agricultural lands on the east, west and south. The Refuge is divided into two units, eighteen miles apart. Each unit contains managed marsh habitat, agricultural fields, alkali mudflats and desert brushlands.

Two rivers, the New and Alamo, border the Refuge. Both provide freshwater inflow to the Sea. The New River's source is water outflow and drainage from Baja California and Mexican border town of Mexicali. The Alamo River's source is agricultural drainage from the Imperial Valley.

The Salton Sea basin was a prehistoric extension of the Gulf of California and is the largest saline lake in California. It forms a natural sump for the 4,500 square mile Imperial Valley and northern Baja California with its only inflow source being either rainwater or agricultural drainage. The salinity of the Sea has steadily increased. In 1950, it was 35 ppt equaling the Pacific Ocean. In 1986, it was 39 ppt, fully ten percent saltier than the ocean.

Management emphasis is placed on the maintenance and improvement of wintering goose and duck habitat, and the reduction of waterfowl depredations to adjacent croplands. Protection and enhancement of nesting habitat for the endangered Yuma clapper rail, maintenance of habitat for nesting and migratory populations of sensitive species and other marsh birds and shorebirds, also are major objectives.

Salton Sea NWR provides habitat for over 371 bird species, 40 mammal species and many reptiles and amphibians. The Refuge winters up to 30,000 snow and Canada geese and 60,000 ducks daily from November through February. Marsh and shorebirds account for more than six million use days each year. Endan-

gered species that use the Refuge include the southern bald eagle, peregrine falcon, California brown pelican and Yuma clapper rail. A significant Yuma clapper rail population nests on the Refuge. Candidate (sensitive) species using the Refuge include the fulvous whistling duck, wood stork, long-billed curlew, mountain plover, and white-faced ibis.

INTRODUCTION

TABLE OF CONTENTS

WILDLIFE (cont.) Page

H. PUBLIC USE

I. EQUIPMENT AND FACILITIES

J. OTHER ITEMS

A. HIGHLIGHTS

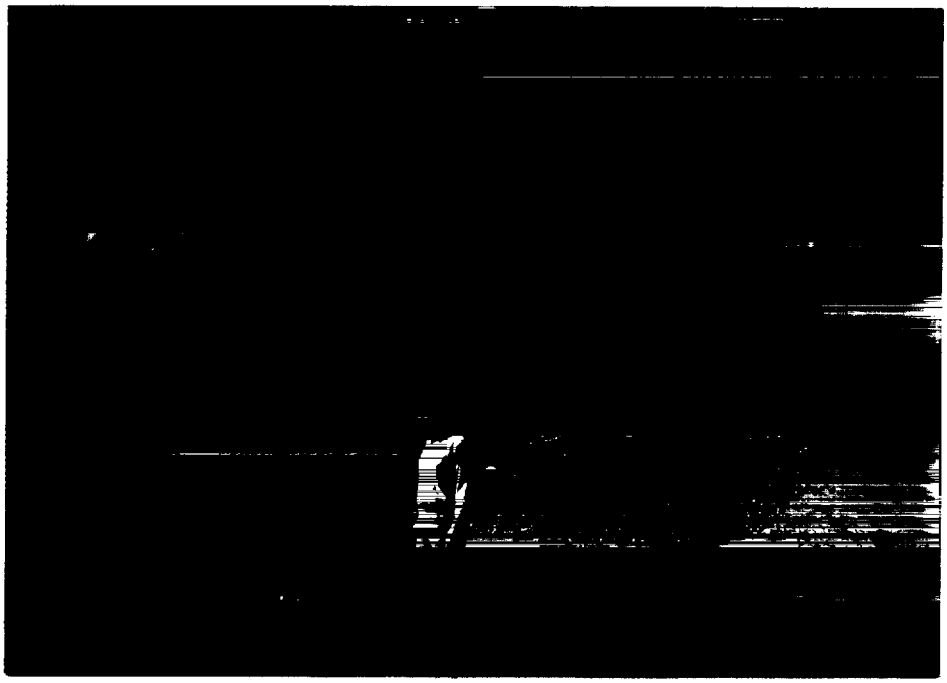
--On October 10 the area received more than 2.5 inches of rain (65% of years total) in a twelve hour period. The rain caused severe flood damage to 140 acres on the Hazard tract. (Section B)

--A contaminant monitoring program, the Salton Sea Basin Irrigation Drain Study, began in March. (Section D-5)

--In April, California Department of Health Services recommended limiting consumption of Salton Sea fish because of high selenium levels. (Section H-9)

--The Refuge staff was increased by two, a TFT Wildlife Biologist and TPT Clerk-Typist. (Section E-l)

--A 25 shot shell limit was initiated this year. (Section H-8)



Flood damage to Hazard Tract dikes after October 10 storm.
86NRSAL-1 WH

B. CLIMATIC CONDITIONS

The Imperial Valley experienced its sixth consecutive year of above average rainfall receiving 3.83 inches for the year, .90 inches higher than the long term average of 2.93 inches. More than 2.5 inches (65% of years total) of rain fell in a twelve hour period on October 10 causing considerable flooding on the Refuge. Only .5 inches of rain brings farming and other work to a halt because the nonporous clay soils in the area make the dirt roads impassable.

The desert climate of the Imperial Valley generates extremely hot summer temperatures. From May 26 through September 9, 1986 (108 days), on only six occasions did the daily high temperature fall below 100°F. The highest

temperature for the year was 116°F recorded on June 27 and again on August 1.

	1914 - 1985		1985	1986			
	Avg. Temp°F	Avg. Rainfall	Rainfall	Temperature Min	Temperature Max	Rainfall	Humidity
Jan.	55	.41	0.03	3 8	85	0.14	65.29
Feb.	59	.35	0.12	30	97	0.64	62.39
Mar.	64	.24	0.00	39	98	0.11	58.83
Apr.	70	.ll	0.00	51	102	0.00	43.50
May	77	.02	0.00	53	106	0.00	41.80
Jun.	85	.oo	0.00	63	116	0.00	43.65
Jul.	92	.09	0.02	64	114	0.06	42.70
Aug.	91	.38	0.15	67	116	0.00	54.48
Sep.	85	.39	1.40	50	113	0.01	43.16
Oct.	74	.22	0.36	54	97	2.59	58.87
Nov.	63	.19	0.90	39	87	0.28	60.26
Dec.	55	.53	0.76	29	76	0.10	66.35
Total		2.93	3.74			3.83	

The level of the Salton Sea has stabilized during the past four years between 226 and 227 feet below sea level. In 1986 the level of the Sea fluctuated from a high of -226.00 in January to a low of -227.15 in September, a variation of 1.15 feet. The evaporation total for the Sea in 1986 was over 9.5 feet (114.49 inches). The evaporation rate and the volume of irrigation runoff (surface and sub-surface flows) from the Imperial Valley agricultural lands determine the level of the Salton Sea.

D. PLANNING

2. Management Plan

Refuge Objective parts one and two were completed and approved by the Regional Office.

5. Research and Investigations

Refuge Personnel

On June 5 and 10, 1985, the Refuge biologist collected 12 heron and egret eggs from the White River Delta, north end of Salton Sea, Riverside County, and 12 additional egret eggs from Unit 1 along the south end of Salton Sea, Imperial County. The eggs were collected at the request of Dr. Harry Ohlendorf, USFWS, Patuxent Wildlife Research Center, Davis, California. They will be analyzed for pesticide and trace element contamination. As of December 31, 1986 results of the analysis had not been received.

On August 6 and 7, 1985, the Refuge manager and biologist collected 28 specimens of four species of fish from the Salton Sea at the request of Dr. Mike Saiki, USFWS, Columbia National Fisheries Research Laboratory, Dixon, California. As of December 31, 1986, results of the analysis had not been received.

a. Salton Sea Basin Irrigation Drainage Study

In a joint effort the USFWS, Bureau of Reclamation (BR) and U.S. Geological Survey (USGS) began working to identify if irrigation drain waters have caused or have potential to cause harmful effects on human health, fish and wildlife or other water users. The field screening will identify problems and determine whether more detailed investigations are needed.

Selected biota totalling 75 samples were collected and catalogued from six stations within the vicinity of the Salton Sea. Sixty-one bird samples of five species; double-crested cormorant (5), shovelers (16), ruddy ducks (l0), coots (15), and black-necked stilts (15) were collected on the Salton Sea NWR from March 19 to April 10, 1986. Ten additional black-necked stilts and four fish samples (mollies and tilapia) were collected off Refuge in late July 1986.

From December 2 to December 11, 1986, a set of 91 biological samples were collected and prepared for shipment to Patuxent Analytical Facility these included: plants; Potamogeton, Rumex and Scirpus (l0), freshwater clams (8), fish; Gambusia, mollies, tilapia and corvina (41) and birds; shoveler, coot, ruddy duck, black-necked stilt and double-crested cormorant (32).

b. National Lead Poisoning Monitoring Program

During the 1985-86 waterfowl season, 110 paired snow goose and 103 paired pintail iiver and gizzards were collected from hunters on the Refuge. The specimens were shipped to National Wildlife Health Laboratory, Madison, Wisconsin as part of the national lead poisoning monitoring program.

Results indicated livers from seven (6.8%) of 102 pintails, eight (10%) of 83 snow geese, and one (4%) of 26 Ross' geese had lead concentrations greater than 8 ppm (wet weight) which would be considered toxic if accompanied by gross lesions of lead poisoning. Ingested lead shot was present in gizzards from four (3.9%) of 102 pintails, two (2%) of 83 snow geese, and none of 27 Ross' geese.

Other Personnel

a. Reproductive Dynamics of Burrowing Owls (Athene cunicularia) in Southern California

Cameron Barrows

The investigator is attempting to determine: 1) factors for differential reproductive success, 2) degree of site and mate fidelity, 3) degree of juvenile survival and fidelity to natal area, 4) age and sex structure of wintering populations.

Research began in the spring of 1986.

E. ADMINISTRATION

1. Personnel

1. Gary Kramer - Refuge Manager, GS-11 PFT
2. Thomas Alexander - Assistant Refuge Manager, GS-9 PFT
3. William Henry - Wildlife Biologist, GS-9 PFT
4. Kathleen Arnett - Refuge Clerk, GS-5 PFT
5. Lee Laizure - Heavy Equipment Mechanic, WG-10 PFT
6. Richard Marquez - Crane Operator, WG-9 PFT
7. Marcos Orozco - Maintenance Worker, WG-8 PFT
8. Steve Clay - Wildlife Biologist, GS-5 TFT
9. Shelly Laizure - Clerk-Typist, GS-3 TPT

1 7 3 6 9
8 2 5 4 86NRSAL-2 GK

Tom Alexander reported to the Refuge on January 13 as Assistant Refuge Manager. He transferred from Noxubee NWR in Mississippi.

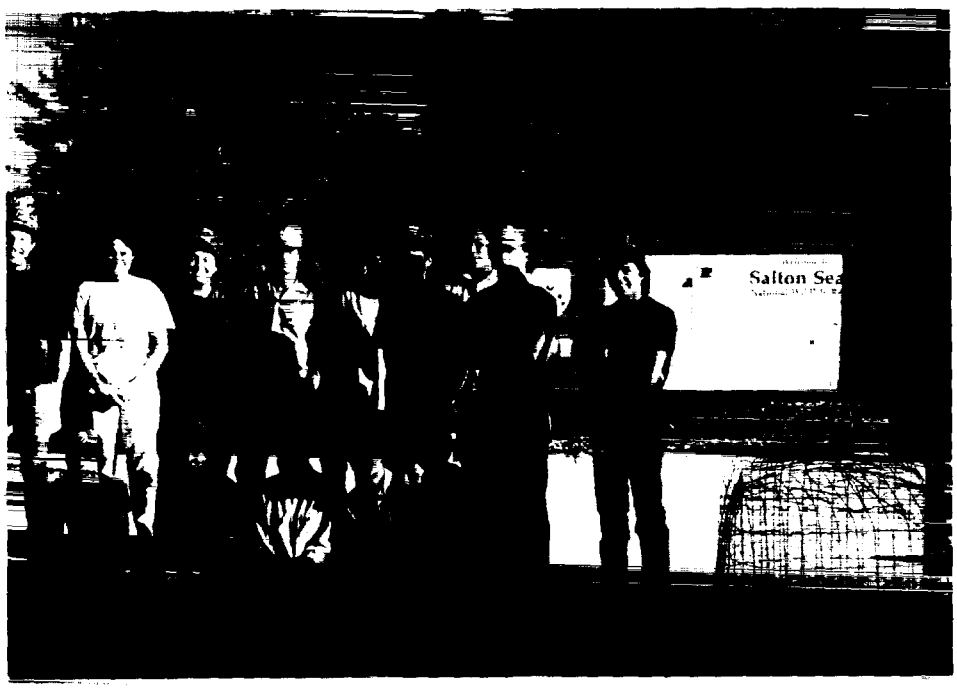
Kathy Arnett was upgraded to a GS-5 on March 25.

On July 7, Steven Clay was hired as a temporary biological technician ((X-404-5) to assist with contaminant monitoring on Salton Sea and Tijuana Slough NWR's. In September, he was converted to the wildlife biologist series and his appointment extended through FY 87. Steve started work with the Refuge as an SCA resource assistant on November 18, 1985. After two, 12 week tours with SCA he was hired as a YCC crewleader.

Shelly Laizure was hired as a part time (20 hours/week) temporary clerk-typist (GS-322-3) on November 9. Shelly also had previously worked for the Refuge; one summer as a YCC enrollee and two years as a secretary through the Imperial Valley College work study program.

2. Youth Programs

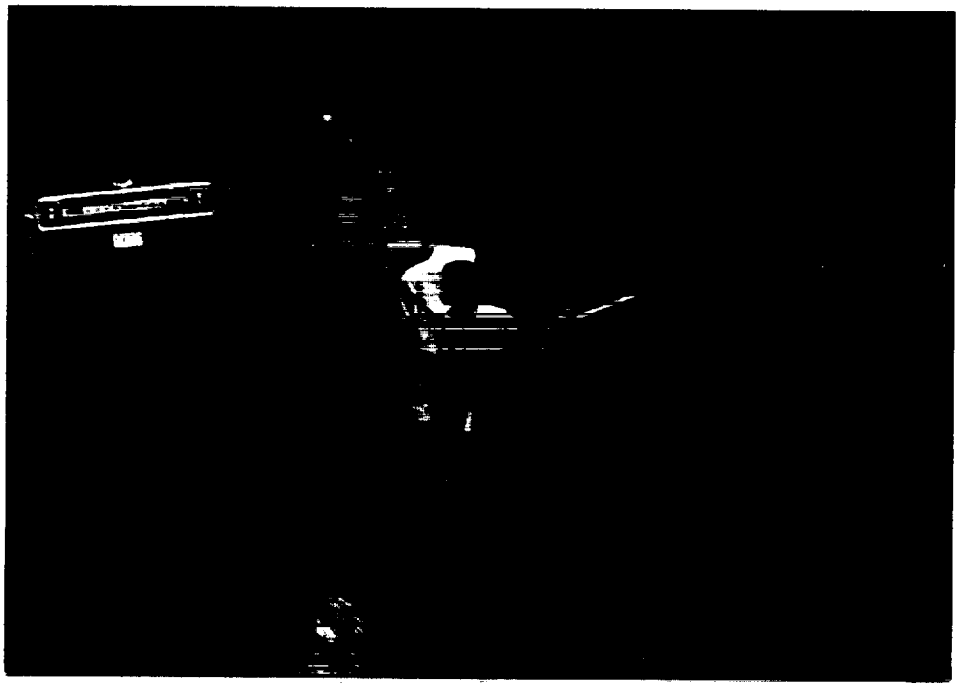
The Refuge hosted an eight week, non-resident Youth Conservation Corps (YCC) program which began on June 23 and continued through August 14, 1986. Steve Clay and Chris Ryland acted as crewleaders and supervised the 14 enrollees. On July 20, Steve resigned as crewleader to take a temporary Bio-Tech job at the Refuge. He was replaced by Juan Salinas. All crew members were from Niland, Calipatria or Brawley. Transportation was provided and all enrollees were picked up at predetermined stops.



YCC crew smiling and ready to start off the day. 86NRSAL-3 WH

Safety awareness was stressed during each project and followed up with safety films including heat stress training, and the issue of leather gloves, hard hats and work shirts. Two accidents occurred during the summers' projects. An enrollee stepped on a nail and punctured his foot, while the other was a minor skin burn caused by exposure to a wood preservative.

Projects completed included: Cleaning and organizing of the Refuge headquarter's out-buildings (two-story, boat house, carport), cleaning of concrete irrigation ditches; construction, repair and painting of domestic water system; construction of split rail fencing and a plant nursery; brush clearing and landscaping of the headquarters area; signing and boundary posting; transplanting of mesquite and palo Verde trees to improve upland habitat; installation of a drip irrigation system and cleaning, repair and painting of boundary buoys.



YCC ditch cleaning on Unit 1. 86NRSAL-4 WH

On August 4, the YCC crew and staff traveled to Tijuana Slough NWR to begin a four day work detail. Housing and meals were arranged through the U.S. Navy at North Island Naval Station.

Organized environmental education activities included: A guided field trip through Tijuana marsh, a tour of Scripps Institute of Oceanography and the San Diego Natural History Museum, a guided nature hike into Anza Borrego State Park, and guided visits to the San Diego Zoo and Sea World. In addition, four slide/film presentations were given by Refuge personnel explaining the role and management of the National Wildlife Refuge System.

Recommendations for 1987 YCC program include: Continue to hire (2) youth leaders from past YCC crews and continue to hire SCA (2) crewleaders. Both crewleaders worked extremely well with their crews and accomplished more than expected.

3. Other ManDower Programs

In 1986, two programs were implemented to recruit additional manpower.

Two students sponsored by the Student Conservation Association (SCA) were hired as resource assistants. Steve Clay, who began in November 1985, completed his term the end of May 1986. Mark McNamara began a 12 week tour on November 15.

Steve assisted the staff in a variety of "odd jobs" ranging from building cabinets to installing a TV antenna. He also completed waterfowl surveys, hunter harvest surveys, goose age-ratio counts, collected waterfowl livers

and gizzards and gave tours of the Refuge to elementary school classes. Mark assisted in various construction projects on the Refuge. He conducted bi-weekly bird surveys, goose age-ratio counts, mortality transects and assisted in tours of the Refuge.

Shelly Laizure continued her work study appointment through April 1986. Her employment was possible through a cooperative agreement between the USFWS and Imperial Valley College. Under the work study program the college supplies eligible participants and pays 80 percent of their salary (minimum wage). The USFWS supplies suitable work and 20 percent of the salary.

Both the SCA and work study programs proved extremely valuable to the Refuge.

4. Volunteer Program

Bob Kramer, a retired Los Angeles fireman, who started working as a volunteer in December 1985, continued his work throughout 1986. Bob designed and built several sets of cabinets for the Refuge. Through his efforts we are finally able to organize our shop areas. His work is greatly appreciated by all.

On May 8, eleven 4-H students from Brawley planted native palo Verde seedlings to establish a cover strip along the headquarters alfalfa field.

4-Hers from Brawley helping to establish a tree row along the headqurters field. 86NRSAL-5 WH

5. Funding

A five year funding comparison for Salton Sea NWR and its satellites, Tijuana Slough and Coachella Valley NWR's is listed below.

ACTIVITY	FY 1982	FY 1983	ACTIVITY	N 1984	FY 1985	FY 1986
1210	207,300	212,000				
1220	--	500	1260	364,900	317,100	328,000
1240	5,000	4,000				
1400	35,000	35,000				
1230	--		1270	1,500	1,500	1,500
1520	--		1520	23,250	19,440	20,700
1994	53		8610	3,550	900	2,700
			7201	--	--	7,000
TOTAL	247,353	273,344		393,200	338,940	359,900
Jobs Bill	--	400,000				
Other			2841a	30,000		
			1971b		139,973	145,027
			1902c			15,000

a Construction and Anadramous Fish funding used for dredging and dune reconstruction at Tijuana Slough NWR.

b Mitigation funds received from the Bureau of Reclamation. Funds were used at Salton Sea NWR for habitat improvements.

c Habitat Resources Funding for contaminant studies(Salton Sea Irrigation Drainage Study).

The original amount annual worked planned for 1260 in FY 1986 was $332,000. However, in August a $4,000 budget reduction occurred.

6. Safety

The Refuge safety program is directed toward increased safety awareness among all staff members and maintaining a safe environment for the staff and visitors alike.

To involve the whole staff in the safety program, responsibility for the monthly safety meeting rotates through the staff; some topics addressed were heat stress, hearing protection, defensive driving, heavy equipment, shop tools, welding, ATC and aircraft safety.

Two accidents occurred during the 1986 YCC camp. One enrollee stepped on a nail which punctured his foot and another received a minor skin burn caused by exposure to a wood preservative.

Lee Laizure, heavy equipment mechanic, missed six days of work after he reinjured his back while trying to loosen a bolt. Lee has been on restricted duty since 1985 when his lower back problem was classified as an occupational disease. His back was first injured in 1965.

Marcos Orozco, maintenance worker, had two accidents in 1986. Marcos hammered a nail through some plywood he was holding with his foot, into his ankle. Marcos also aggravated an old wrist injury while removing concrete forms. The original injury happened during PR 24 training in 1980.

7. Technical Assistance

Technical assistance was offered to private duck clubs in Coachella and Imperial Valley again this year. This assistance has occurred for four years and is provided as a joint effort by the USFWS, CDF&G and Waterfowl Habitat Owner's Alliance (WHOA). A habitat monitoring program has been established on several duck clubs with Wendell Miller as the project coordinator. Wendell was hired on a temporary basis by the Regional Office. Bill Henry (Salton Sea NWR) and Rocky Thompson (CDF&G) provided additional assistance. All participating duck clubs were inspected and evaluated, with management practices recommended for each club to increase moist soil plants, reduce pest plants, and lower water and soil salinity levels.

In addition to those clubs selected for the joint USFWS-CDF&G-WHOA monitoring program, Refuge personnel provide technical assistance to other private landowners as part of a USFWS initiative to protect and enhance wintering waterfowl habitat in the Imperial Valley of California. The entire staff provided this service as appropriate. Actual assistance varied from providing written information, to telephone discussions, to actual on-site inspections and planning of habitat improvements. Most assistance was directed at improving moist soil management practices.

8. Other

In September, a revenue sharing check for $13,336.00 was presented to the Imperial County Board of supervisors by the Refuge manager.

F. HABITAT MANAGEMENT

1. General

Salton Sea NWR is geographically located in the upper Colorado Desert Region of the Sonoran Desert where annual rainfall rarely exceeds three inches. Native habitat consist of creosote bush - white bursage and palo Verde - mesquite communities with isolated riparian zones dominated by cottonwoods and willows. These basic habitat types are considered **climax** communities and are very stable unless disturbed.

As early as 1850, there were plans to alter the Salton Sink by bringing irrigation water from the Colorado River for irrigation. Since that time, over 500,000 acres have been converted from desert brushlands to agricultural lands.

2. Wetlands

Wetland management is directed toward production of natural foods to provide wintering habitat for waterfowl and nesting habitat for Yuma clapper rails.

Tract 1A (160 acres) in Unit I was drawn down and left dry throughout the year to facilitate land-leveling and levee rebuilding that was scheduled for the late summer and fall. Due to lack of funds and equipment this work has not been completed. The unit remained dry during the fall and winter.

Tract 2B was managed to provide varying aged stands of cattail, bulrush and watergrass. These areas are used by clapper rails for nesting and provide roosting and foraging areas for waterfowl and shorebirds. Water was maintained

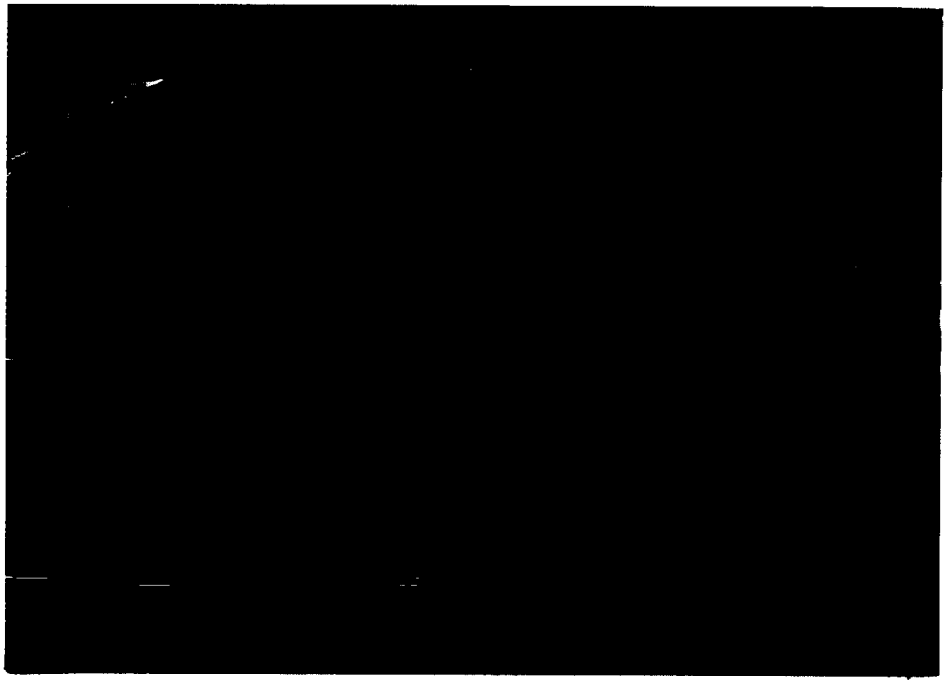
and circulated in 2B to keep shallow pools and flooded vegetation available for nesting clapper rails through the spring and early summer. Tract 2B was reflooded beginning in early October and maintained at shallow levels through July.

Tract 2B - flooded and ready for the Yuma clapper rails to arrive. 86NRSAL-6 WH

All water used to flood 1A and 2B prior to 1985 was agricultural drainage (primarily subsurface - "tile" drain water). Late in 1985, these waters became suspect of carrying toxic trace elements (selenium) and soluble pesticides and their use was discontinued. A new water delivery system is being developed and beginning in January 1986, all water used to flood 2B was class one agricultural water.

The four newly developed ponds on the Reidman Tract of Unit I were completed in March and seed bed preparation began immediately. All four ponds were seeded to watergrass but due to hypersaline conditions, only in one pond was a "decent" stand established. Irrigations in April, May and June were used on pond four due to high salinity levels. Fall floodup began October 6 and all ponds were at desired depths (4-6 inches) by October 9. Waterfowl use peaked during the months of December and January with over 2,000 wigeon and 5,000 white geese utilizing the new ponds. Shorebird use fluctuated greatly with peaks of over 800 long-billed dowitchers recorded in November and February.

On October 9, a thunder storm knocked out power and dumped 2.59 inches of rain in a matter of hours causing the Alamo River to overflow its banks. Water flowed into the Hazard tract creating a 140 acre lake on the north end of the unit. Ponds one, two and three were flooded with over three feet of water and all levees were nearly covered. Ponds four and five were back filled causing flooding of several blind sites. Pond nine also received back spill from the Alamo, causing a partial floodup.



The newly created Hazard lake. 86NRSAL-7 WH

Hazard ponds one and two remained barren of any vegetation due to the high water table and hypersaline soils ranging from 8,322 ppm to 19,200 ppm. Both ponds were drained in early March, and ponded from October to March in an attempt to drive the salts down. Daily waterfowl use rose to over 2,000 birds when shovelers moved in for the invertebrates in November and December.

Hazard pond three was drained in early March, and the south half disced in early September to control saltcedar seedlings. Alkali bulrush transplanting initiated in July 1985 by plugging was only partially successful due to hypersaline soils, and resulted in the establishment of scattered clumps.

Hazard ponds four and five were managed for swamp timothy and watergrass. Early March drawdown and one irrigation in early May producing good to excellent stands. The south half of pond four was disced to remove saltcedars. Daily pintail and teal use soared to over 6,000 birds using these two ponds during October and November. Each pond covers about 25 acres.

Hazard pond six was drained in early March to promote swamp timothy and watergrass growth. On May 15 a one percent solution of Roundup was applied to control extensive cattail stands. One irrigation in May produced good stands of watergrass. This was followed by discing and mowing on August 20 to open the area up for waterfowl hunting. The end result was heavy pintail use (2,000 birds daily) during the months of October and early November.

Hazard pond seven received a later drawdown (March 26) than the other Hazard ponds due to spring duck trapping operations. The later drawdown did not affect swamp timothy or watergrass production. A single irrigation in late May produced robust stands of swamp timothy accompanied by scattered sesbania and saltcedars. The entire pond was mowed, once on July 15 and again on

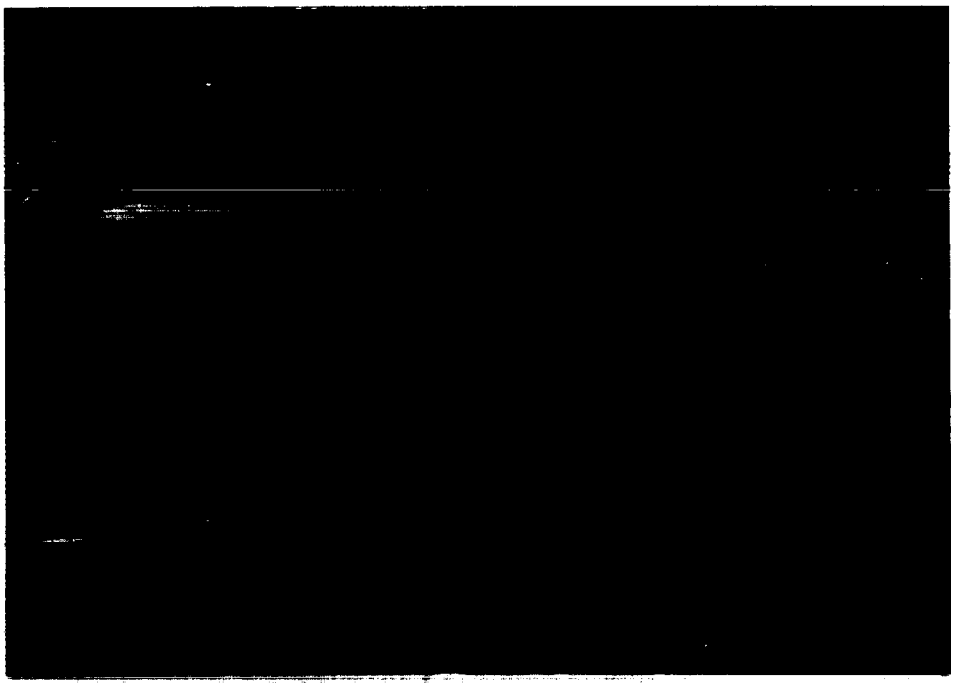
August 20 to control these weeds. Waterfowl use was good with peak pintail numbers reaching 2,000 during the first weeks of October.

Hazard ponds eight and nine remained at the mercy of the high water flows of the Alamo River. Draining was attempted in early March but high water levels in the Alamo River during April caused back filling of both ponds eight and nine. Pond eight dried by evaporation in late June with pond nine drying in September. Fall flood up was the result of back flowing of the Alamo River in early October. Due to the high water level of the Sea and high river flows, drainage of ponds eight and nine will remain a problem until a lift pump is installed.

Hazard pond ten was cleared of dense saltcedar thickets that had encroached in and around the impoundment. A 15 acre cattail patch was burned on September 2 and the four island blind sites were releveled with new blind pits added. A fifth island was removed along with portions of a divider levee running west through the unit. The unit was twice disced and then fall seeded with watergrass at 20 lbs./acre.

Great rail habitat!

Hazard 10 prior to saltcedar and cattail removal and leveling.
86NRSAL-8 WH



Hazard 10 flooded up after rehabilitation work. 86NRSAL-9 WH

The headquarter ponds were drained in March and all levees were reworked to remove the dense thickets of saltcedars. The Soil Conservation Service (SCS) surveyed the south pond and it was disced, leveled and a new drain box installed to facilitate complete and rapid drainage. The rock hill pond also had a new drain pipe and box installed to allow drainage, provide water circulation and control flood-up.

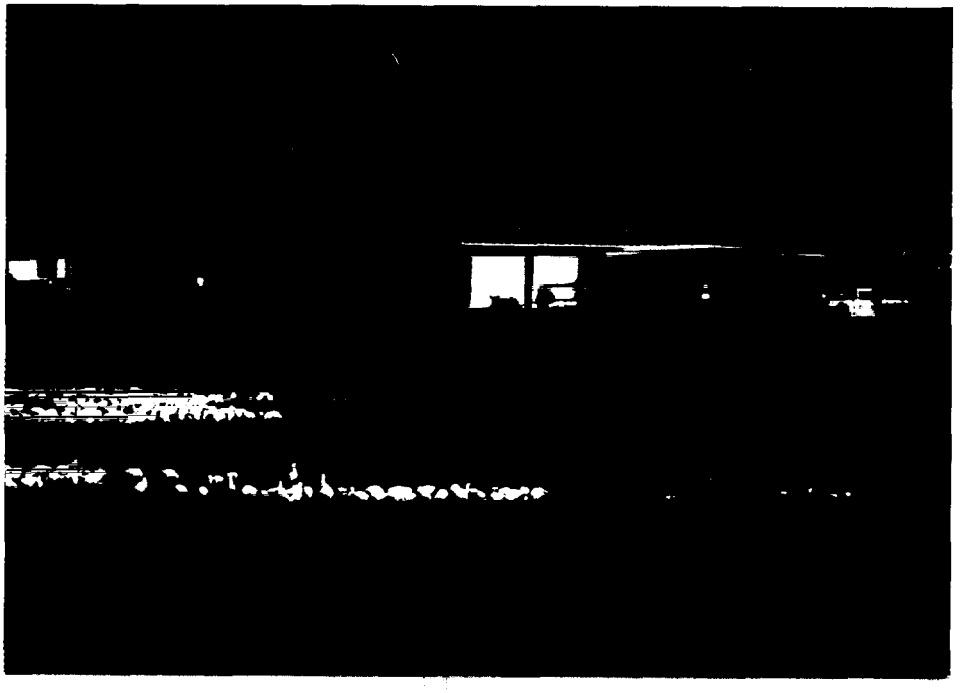
4. Croplands

The Refuge had 795 acres of goose pasture with 140 acres in alfalfa and 655 acres in combination of sudan grass (summer) and winter wheat (fall-winter). All farming is under a cooperative agreement that is renewed every four years. The cooperator harvest the alfalfa from April 1 to September 30 leaving the remaining (winter) cuttings for goose browse. The annual summer crop was Sudan grass which the cooperator harvests. To provide the governments share, the cooperator plants wheat, barley or rye grass in the fall (after October 1) and the entire crop is grown as green browse for wildlife. No harvesting or cutting of annual crops occurs from October 1 to March 30.

Snow and Ross geese utilizing the headquarters alfalfa field.
86NRSAL-10 GK

In late March the cooperator seeded Sudan grass on 460 acres in Unit I and an additional 195 acres on the Union Tract. In April, the headquarters field was prepared and seeded to alfalfa. The first Sudan and alfalfa cuttings were made in June with final cuttings in September. Irrigation of field crops was required every ten to twelve days due to the high temperatures and evaporation rates. Alfalfa and Sudan fields were hayed every 20-30 days. The total yield was 1865 tons of Sudan hay and 360 tons of alfalfa hay.

The Refuge fields provided a continuous source of goose browse throughout the winter months. The Unit II fields planted to wheat received limited use in 1986 compared to 1985, even though the fields were ready and waiting for the fall migrants. In contrast to the low use of green wheat, heavy use of alfalfa occurred in Unit II with 55 acres 100 percent utilized by mid-December. In Unit I (545 acres), both wheat and alfalfa were used heavily and completely consumed by the end of January 1987.



The same field as in the previous photo after three months of heavy grazing by the geese. 86NRSAL-11 WH

The four acre field behind the equipment yard was seeded to a short season barley by the Refuge staff and left standing for upland birds.

6. Other Habitat

On May 8, eleven 4-Her's from Brawley planted 100 native palo Verde trees along the edge of the headquarters alfalfa field. This will increase species diversity by providing native desert shrub and tree habitat along field borders.

9. Fire Management

On June 9, a fire along the Alamo River burned about 15 acres of riparian-saltcedar habitat. Although the fire started south of the Refuge boundary, over 80 percent of the area burned was on the Refuge. The Niland Fire District responded to the fire that was first discovered about 5:00 pm on June 9. With the help of a fire crew from Calipatria they fought the fire for over four hours. During this period the fire spotted ahead and across the river in the heavy saltcedar. At 9:58 pm the fire was declared out and all fire crews returned home.

On September 2, a fifteen acre prescribed burn was completed on Hazard pond ten by the Refuge biologist to remove excess cattail and saltcedar growth. Discing followed the burning to control cattail and saltcedar regrowth.

Prescribed burning on Hazard 10 to remove excess cattail and saltcedar growth. 86NRSAL-12 TA

11. Water Rights

The Refuge currently uses about 2800 acre feet (AF) of water per year for management of wetland units with 30 percent obtained as "free water". The "free water" is a mixture of irrigation water (operational spill) and surface drain waters. Included in the 2800 AF of water is the usage for newly developed 20 acre impoundments on the Reidman Tract which came on line in the spring of 1986. These areas were previously unflooded farmland.

In 1985 the quality of the "free" subsurface drain water used to flood some ponds was suspect of carrying toxic trace elements and soluble pesticides. As a result of these concerns the use of subsurface drain water was discontinued. Water quality monitoring has been initiated to determine if these drain waters are of an acceptable quality for irrigation and flooding of our wetlands. Until that data is analyzed, subsurface drain waters will not be used.

With the renovation of 300 acres in Tract 1A and 2B the need for delivered water will increase by an additional 1500 AF. This equated to $13,500.00 at the current price of $9.00 acre/foot for class one water purchased from Imperial Irrigation District (IID).

As the Central Arizona Project and a proposed water transfer from IID to the Southern California Metropolitan Water District comes on line it will cause stricter water conservation measures in the Imperial Valley. This will mean less surface drain water and irrigation spillage for use on the Refuge. The time has come to obtain additional funds to purchase water. If funding is not provided to purchase good quality water, some moist soil impoundments heavily used by waterfowl and nesting habitat for the endangered Yuma clapper rail may not be flooded.

G. WILDLIFE

1. Wildlife Diversity

A total of 371 species of birds, the most for any refuge in the United States, have been reported along with 40 species of mammals, 20 species of amphibians and reptiles and 13 species of fish.

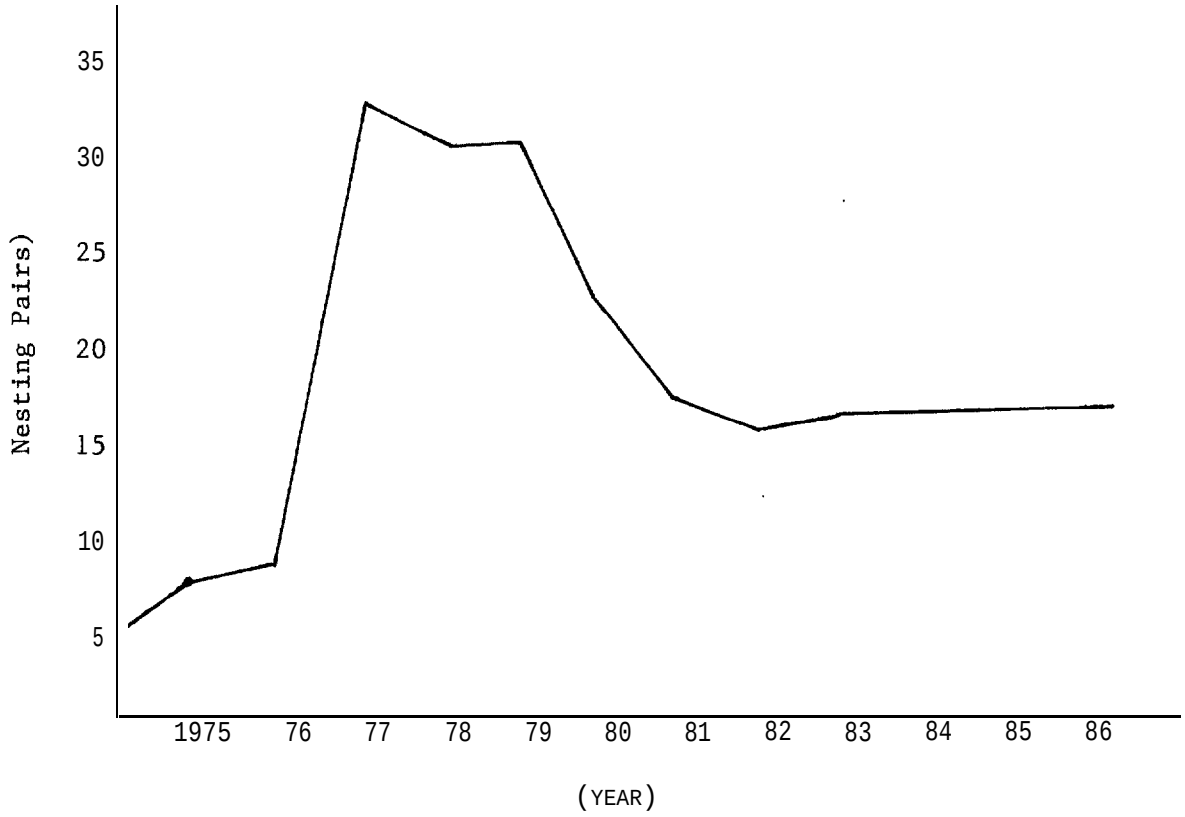
2. Endangered and/or Threatened Species

Yuma clapper rail populations remained at levels comparable to 1985 with an estimated 15 pairs scattered throughout the Refuge with the majority (60%) using tract 2B of Unit I. Other nesting activity was documented in Hazard pond ten and along both the Alamo and New Rivers.

The endangered Yuma clapper rail. 86NRSAL-13 UK

Wetland management for the production and maintenance of rail habitat continued with improved water level manipulation and the planning of a new water delivery system for Unit I. No longer will agricultural drain water be used, all water will be class one agricultural water or surface runoff.

The following graph shows nesting population of Yuma clapper rails (pairs) at Salton Sea NWR for the last 12 years.



Two Desert pupfish were found along the Hazard/Garst Road ditch by biological consultants working in conjunction with geothermal studies. This is the first pupfish observed on the Refuge for over four years. Follow up recovery efforts failed to produce any fish. This species was officially added to the endangered species list in March of 1986 with only two viable, self sustaining populations believed remaining in historic habitats in the United States.

Sightings of other endangered/threatened species included 220 brown pelicans and three individual peregrine falcons. All were observed during the fall and winter months. The first confirmed bald eagle sighting in over six years was made on December 12 by the Refuge manager.

3. Waterfowl

Goose populations wintering along the southern edge of the Salton Sea dropped from a high of 32,000 (1984) to 18,500 birds in 1986. Canada goose numbers were only 50 percent of normal and white goose populations were significantly lower than in 1984 and 1985. A poor white goose hatch and a mild winter which held birds to the north are significant factors in explaining the decline.

Monthly aerial flights were conducted in cooperation with CDF&G, to count waterfowl on Salton Sea NWR, Imperial Wildlife Area (Wister and Finney-Ramer Units), local duck clubs and private farmlands adjacent to the Salton Sea shoreline. This count area is described as the south end of the Salton Sea and Imperial Valley.

The Refuge goose population peaked at 7,500 during the months of January and February. However, this peak does not represent the exchange and movements between the Refuge and adjacent areas. The Refuge remains the only significant sanctuary within the Imperial Valley. Nearly every goose using the Imperial Valley utilized the Refuge ponds and farm fields sometime during the fall, winter or spring months.

The first snow geese arrived on October 17. The major influx occurred in November with 10,000 birds counted during a three day period beginning on November 12, when large flocks were observed arriving hourly.

Age ratio counts were conducted from early November to mid-December with less than two percent juveniles in the white goose flock. A total bust. Ross' geese comprised 30 percent of the white goose population including the first sighting of a blue phase Ross' goose.

Total duck use days increased to over 2,650,OOO a three-fold increase from the 1984-85 season with primarily pintail, shovelers, ruddy ducks and wigeon showing sharp increases. In February 1986, 42,000' ruddy ducks were counted in the Salton Sea area. This population represents 49 percent of the entire Pacific Flyway population of ruddy ducks.

Estimated Waterfowl Peaks, Salton Sea NWR and Vicinity 1986-87

		South End Salton Sea		
Species	Salton Sea NWR	Other Areas	Total	Date
Canada Goose	1,425	1,005	2,430	31 Jan.
Snow/Ross Goose	7,500	11,000	18,500	6 Jan.
Mallard	120	80	200	6 Jan.
Pintail	3,850	15,310	19,160	31 Oct.
Shoveler	6,385	23,235	29,620	6 Jan.
Green-winged Teal	3,515	9,010	12,525	10 Nov.
Cinnamon Teal	415	2,615	3,030	10 Feb.
Wigeon	3,200	2,930	6,130	25 Feb.
Ruddy Duck	9,040	32,680	41,720	25 Feb.
Scaup	785	2,710	3,495	30 Dec.
Canvasback	865	675	1,540	30 Dec.
Redhead	125	470	595	25 Feb.

4. Marsh and Waterbirds

Colonial nesting species continued to expand with more than 270 great blue heron, 1,200 cattle egrets and 100 great and snowy egret nests scattered among the three major colonies along the sea. Peak populations were established for white pelicans (18,000) double crested cormorants (1,800) and eared grebes (35,000).

5. Shorebirds, Gulls, Terns and Allied Species

Peak shorebird use continued during the fall and spring months (September-November and February-April). The mud flats and shallow ponds surrounding the Sea received heavy use by large concentrations of long-billed dowitchers, dunlin, western and least sandpipers and Wilson's and red-necked phalaropes.

Long-billed curlews, marbled godwits and whimbrels continue to be abundant during the fall and spring with mountain plovers commonly seen in large wintering flocks in open grass or plowed fields.

Black-necked stilts, avocets and killdeer nested on the Refuge again in large numbers.

Searches finally documented the nesting of 25 gull-billed terns and 10 snowy plovers with peak populations of 125 terns and 35 plovers observed.

More than 150 wood storks and 550 black skimmers were observed throughout the summer months. The skimmers nested just north of the Alamo River along the Sea. This breeding population of skimmers is at the northern limit of their range.

Black skimmers - a unique visitor to the Salton Sea.
86NRSAL-14 PJ

The Imperial Valley continued to provide foraging areas to several thousand wintering white-faced ibis. The Refuge ibis population fluctuated greatly with a peak of 300+ observed in October.

Large concentrations of ring-billed gulls (30,000) continue to gather during the winter months along the Sea edge and in the flood irrigated fields. Mixed in these masses are numerous allies including: yellow-footed, laughing, mew and California gulls, Forster's, black and caspian terns.

The second California state record of a lesser black-backed gull was sighted from mid-November 1986 to late March 1987.

6. Raptors

American kestrels and barn owls are abundant winter visitors and many remain to nest, primarily in the numerous hay stacks on the Refuge and in surrounding farm fields. Burrowing owls were a common sight along all major drainage ditches, primarily in Unit I.

Peregrines and prairie falcons were seen occasionally in the fall and winter. Red-tailed, ferruginous and marsh hawks were commonly observed throughout the fall and winter.

7. Other Migratory Birds

The Audubon Christmas Bird Count was conducted on December 18, 1986, 146 species totalling 95,254 individuals were recorded. Highlights included: a red-shouldered hawk, two lesser golden plovers, a lesser black-backed gull, four ruddy turnstones and a lark bunting.

UNUSUAL BIRD SIGHTINGS

Date: 1986	Species	Number
11/18	Lesser Black-backed Gull	1
11/2	Mountain Plovers	200
l/12-1/18	Stilt Sandpipers	40
4/2	Vermillion Flycatcher	1
12/2	Bald Eagle	1
6/25	Gull-billed Terns	125
5/30	Black Terns	220
6120	Wood Stork	150
10/2	Yellow-footed Gull	35
6/10-7/20	Laughing Gull	110
7/20-8/30	Black Skimmers	550
8/9-8/20	Red-necked Phalaropes	500
9/5	Brown Pelicans	220
2/6	Greater White-fronted Geese	35
12/5	Mountain Bluebird	45

10. Other Resident Wildlife

Desert cottontails, raccoons and striped skunks are very abundant on the Refuge, especially around the headquarters 'area. Soft-shell turtles, rattle-snakes, desert spiny and whiptail lizards also add variey to the fauna of the Refuge.

11. Fisheries Resources

During the mid-1950's, various species of marine fish from the Gulf of California were transplanted into the Salton Sea by CDF&G. Orangemouth corvina, sargo, gulf croaker, and tilapia have flourished and provide excellent sport fishing. CDF&G and other researchers consider the Salton Sea to be the most productive fishery in the western United States.

During recent years, the annual inflow of irrigation drainage to the Salton Sea generally has been balanced by natural evaporation. As a result, the five million tons of salt added to the Sea each year have slowly increased salinity to about 40,000 milligrams per liter. If salinity continues to increase, the marine fishery will eventually be destroyed. This will affect the food resources of some endangered species and numerous other fish-eating birds. Various mitigating measures have been proposed and studied, but no project has been funded to solve the salinity problem.

14. Scientific Collections

The California Department of Fish and Game collected 60 samples of four bird species and 45 fish samples from the Refuge. Double-crested cormorant, black-necked stilt, American wigeon, lesser scaup and four saltwater fish species were analyzed for selenium as part of the Selenium Verification Sampling Program.

Date	Collections	Results
February 24, 1986	40 bird samples of four species, Salton Sea NWR (Cormorants, Scaup, Wigeon, Stilts)	N/A
April 19, 1986	20 bird samples of two species, near Red Hill (Cormorants, Stilts)	N/A
	45 fish samples of four species, in Salton Sea near Red Hill (Corvina, Croaker, Sargo, Tilapia)	N/A

Preliminary results indicate elevated (above 2.0 ppm fresh weight) levels in three bird species analyzed.

Twenty-four fish samples collected in August 1985 from the southern end of the Salton Sea by the Colorado River Basin Region of the California Regional Water Quality Control Board had selenium levels ranging from 1.7 ppm in tilapia to 3.8 ppm in gulf croaker.

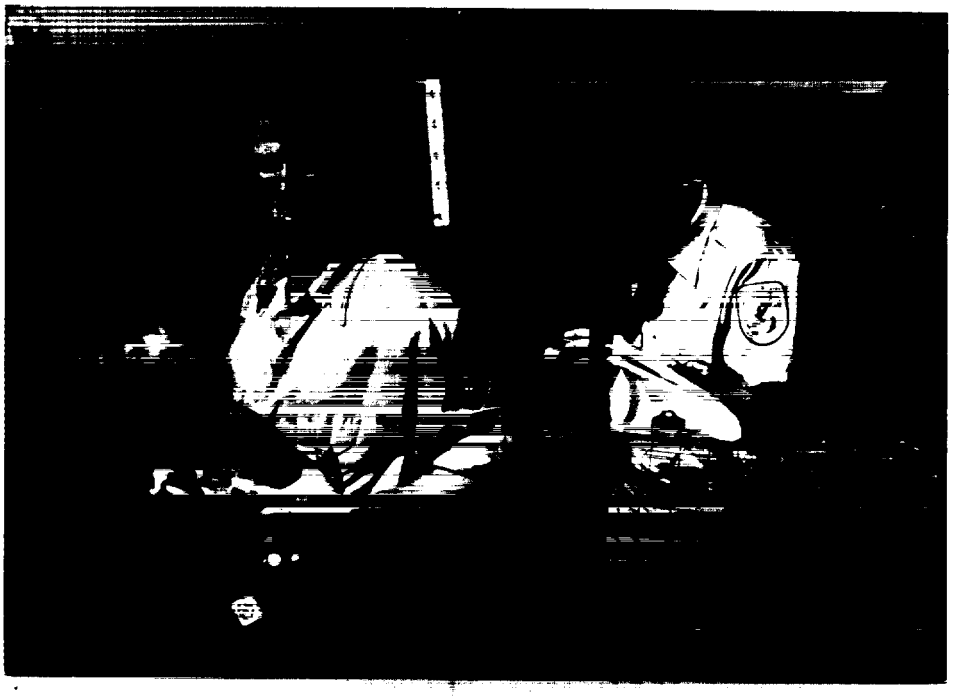
Date	Collections	Results
August 6 & 7, 1985	24 Salton Sea fish, near Red Hill	(Fresh weight, ppm)
	6 Corvina, Edible flesh	3.6 Selenium
	7 Croaker, Edible flesh	3.8 Selenium
	6 Sargo, Edible flesh	2.1 Selenium
	5 Tilapia, Edible flesh	1.7 Selenium

These preliminary results issued in May 1986 were followed by a formal health warning by the Department of Health Services limiting the amount of fish consumed to only eight ounces per month. Women who are pregnant, nursing mothers, and children age 15 and under should not eat fish from the Salton Sea.

16. Marking and Banding

Following the close of waterfowl season on January 19, duck trapping began with 259 ducks being banded at one trap location on the Hazard tract. The Refuge banding provides hands-on experience and is used in conjunction with

the environmental education program for elementary school groups and the SCA volunteer.



SCA volunteer Mark McNamara assists 'biologists with post-season banding program. 86NRSAL-15 WH

Table 1. 1986 Duck Banding Summary at Salton Sea NWR.

	Banded	Returns
Northern Pintail	121	(5) l-Sacramento Valley (10/86), 3-Imperial Valley (11/86), & (1) Rio Colorado, B.C. Mexico (11/86)
Cinnamon Teal	68	
Green-winged Teal	56	(2) Imperial Valley (10 & 12/86)
Mallard	25	
American Wigeon	4	
Redhead	3	
Ring-necked Duck	1	
Blue-winged Teal	1	

H. PUBLIC USE

1. General

This year public use was estimated between 25,000 and 30,000 with the bulk of the visitation occurring November through March. The Salton Sea has always been a popular area for bird watching and as the facilities continue to improve public use increases. In February, Wilderness Graphics from Tallahassee, 'Florida installed five refuge information signs, nine interpretative panels and four trail signs at the headquarters and along the Rock Hill Trail under contract # 14-16-OOOl-85093(NR) for a cost of $31,617.

Biologist, Steve Clay conducting a tour of the Refuge for elementary students from the local area. 86NRSAL-16 MT

The observation tower, started by YACC back in 1982, was finally completed this year and the landscaping in front of the office also was completed.

After five years the observation tower was finally completed. 86NRSAL-17 GK

About 35 birds needed for an interior exhibit were collect by Refuge staff and delivered to the San Bernadino County Museum for mounting. The mounted birds along with other exhibits are being developed and constructed by Howard Schureman and Associates. It is scheduled for completion in early 1987 under contract # 14-16-OOOl-86023(NR) at a cost of $26,990.

8. Hunting

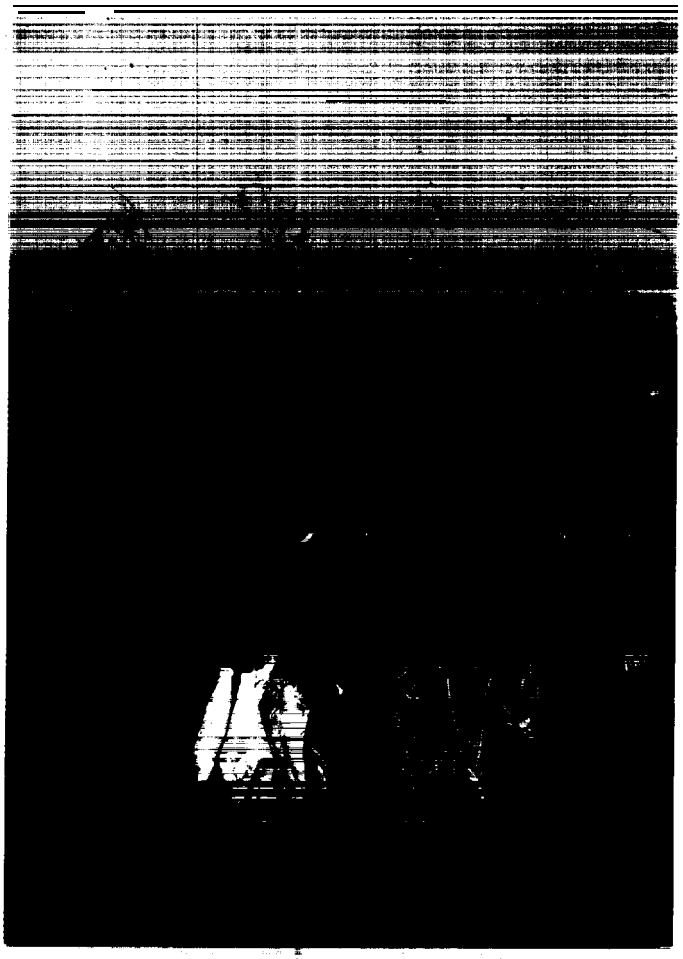
Hunting on the Refuge is limited to waterfowl hunting by permit only. Permits are issued by CDF&G as part of the Imperial Wildlife Area hunt.

The Refuge has ten waterfowl blinds located in moist soil units on the Hazard tract and four goose pits in green browse fields on the Union tract.

A 25 shell limit was initiated this year on the Refuge and the Imperial Wildlife Area. The regulation limits a hunter (in the field) to 25 shells in possession; there is no limit on the number of times a hunter may return to his vehicle to replenish his shell supply. The regulation is welcomed by most hunters as a method of improving hunting quality by reducing sky scraping and crippling. It will also reduce lead deposition.

This years duck season was split again with seasons running October 18 through November 30 and December 8 through January 11. The daily bag limit remained at five with not more than one hen mallard and one hen pintail in the bag and a possession limit of ten with not more than two mallard hens and two pintail hens. The goose season opened October 18 and ran through January 18, with a one week delay for Canada geese, October 25 through January 18. Limits were six per day/six in possession with no more than three white geese and three dark geese of which only one may be a Canada goose or two in possession.

The duck harvest was up significantly this year with 694 ducks taken compared to 270 last year. Hunting was best on the Hazard tract with 345 hunters taking 692 ducks and 44 geese for an average of 2.13 birds per hunter. Interest in the Union goose pits remained high despite a very low harvest level, 361 hunters took 89 geese and 2 ducks for an average of 0.25 birds per hunter. The snow goose harvest was the lowest in seven years, 51 percent below the seven year average.



Results of a fine days hunt on Salton Sea Refuge.
86NRSAL-18 GK

Waterfowl Harvest

	Ducks	Geese	Hunt Avg.	Total Hunters	Snow goose Harvest
1986-87	694	133	1.17	706	83
1985-86	270	237	1.10	460	200
1984-85	187	364	0.83	664	292
1983-84	152	193	1.07	305	132
1982-83	488	184	1.05	639	88
1981-82	82	245	0.73	444	201
1980-81	1084	203	1.45	886	100

9. Fishing

Much of the Refuge is inundated by the Sea. The majority of this area is open to public fishing. With an estimated 26,000 angler use days/year, these areas contribute significantly to the overall use of the Refuge. In a recent survey conducted by CDF&G, the Salton Sea had one of the highest catch-per-angler hour values of any inland fisheries within the State and possibly the

nation. Fishermen caught an average of 1.46 fish per hour for all four major fish species: tilapia made up 41 percent of this catch followed by bairdiella (gulf croaker) - 28 percent, sargo - 28 percent and corvina - 3 percent. This amounts to over 75,980 pounds of fish legally taken from the Sea each year.

In April, the closed area of the Sea adjacent to Rock Hill was opened to fishing for the first time. This area (approximately 1000 acres) has been closed since it was inundated in the early 1970's and acts as the only sanctuary for migratory birds on the Sea. The area was opened to, summer fishing, April 1 to September 30, on a trial basis after the Refuge biologist determined that fishing activity would not have a significant impact on nesting colonial birds. During the first summer no adverse effects were observed and compliance with the winter closure has been much better.

On April 26, California Department of Health Services recommended that adults limit their consumption of Salton Sea fish to no more than eight ounces per month because of the elevated levels of selenium found in fish samples taken by the State. Since the warning was issued fishing activity on the Sea has -been cut in half. Comparing May through December 1986 to the same period in 1985 the number of boats launched at Red Hill Marina were down 47 percent.

The "60 Minutes" story on the New River which aired on December 28 may further reduce angler interest in the Salton Sea. The New River, which "60 Minutes" called the most polluted river in the world, starts in Mexico and empties into the Sea near Unit I of the Refuge.

RED HILL BOAT LAUNCH RECORD

	1984	1985	1986
Jan	*	599	1152
Feb	*	1699	1116
Mar	*	1976	2126
Apr	2726	5237	3180
May	4266	4553	1781
Jun	1858	1614	1004
Jul	1572	1394	1227
Aug	1682	1794	765
Sep	1036	466	407
Oct	775	395	123
Nov	967	465	372
Dec	514	615	283
Total		20,807	13,536
		May-Dec 11,296	May-Dec 5,962

*No records kept before April 1984

11. Wildlife Observation

Wildlife observation at Salton Sea NWR translates into bird watching. The Refuge supports 371 species of birds, more than any other refuge in the United States. This year serious birders from Canada, England, Switzerland, Belgium, Norway, Australia and throughout the U.S. visited the Refuge to see a variety of birds found only in extreme southeastern California. Some of the rare or unusual birds that these people come to see include: Abert's towhee, brown and blue-footed booby, crissal thrasher, gull-billed tern, yellow footed gull, mountain plover, fulvous whistling duck, black-bellied whistling duck

and wood stork.

Audubon and Natural History Museum groups and University classes from all over the southwest annually visit the Refuge during January and February.

A group of birders scans the Salton Sea for possible life-birds. Birdwatching on the Refuge draws people from all over the globe. 86NRSAL-19 WH

17. Law Enforcement

The number one law enforcement problem was eliminated when the closed area of the Sea was opened to fishing from April 1 to September 30. Over the winter very little trespass occurred and no violation notices were issued.

Violations for 1986

Type of Violation	Number
Trespass (boating)	14*
Trespass (land)	5
Hunting without Duck Stamp	7
Taking non-game bird	3
Hunting with an unplugged shotgun	1
Hunting away from assigned blind site	1
Total	31

*All issued prior to April 1

I. EQUIPMENT AND FACILITIES

1. New Construction

Several projects were completed to improve the overall appearance of the headquarters area.

A redwood privacy fence was installed around the residence and between the maintenance area and public use area. The fence deters.the public from wandering through the maintenance compound and back yard of the residence.

The palm grove in front of the office and residence was fenced with 320 feet of cedar split rail fencing.

An automatic sprinkler system was installed in the palm grove and residence yard with the help of YCC and the whole area was seeded to bermuda grass.

Several small sections of concrete were poured this year to finish off the walkway around the office and residence.

2. Rehabilitation

In March, work was completed on the Bureau of Reclamation mitigation project. A total of $285,000 was provided to the Refuge for habitat improvement on the Flammang and Reidman tracts as a feature of the Colorado River Basin Salinity' Control Project, Title 1, contract # l-17-34-C0163. The mitigation project was started in 1985 with the cleaning and repair of drain tile on the Flammang and Reidman tracts.

The installation of additional subsurface drain tile and the replacement of the base line on the Reidman tract was completed in January by Lidco, Inc., contract # 14--16-OOOl-85139(LFG), at a cost of $88,894.

The Reidman tract was divided into an 80 acre field on the west and four 20 acre ponds on the east. Farmers Land Leveling, Inc. constructed the ponds, built a ditch pad between the ponds and field and lazer leveled the field and pond bottoms for $52,894.00, contract # 14-16-OOOl-86011(LFG).

Merril Corp., constructed a concrete water delivery ditch on the pad and repaired the concrete ditch on the north end of the Reidman tract for $67,357, contract # 14-16-OOOl-8642(LFG).

Imperial Irrigation District installed a drop-box in the Rock Hill pond and connected it to their lift pump. The only cost to the Refuge was the materials. Because the pond is below the level of the Sea, water was either pumped out with a Crisafulli pump or allowed to evaporate leaving behind a salt build-up.

Reworking the Rock Hill pond to facilitate drainage was delayed until the pond bottom was dry enough to support equipment. A ditch was dredged along two sides but springs fed by the Sea and pockets of water on the uneven bottom made drying very slow. Some dozer work was done on the upper end but a late summer rain turned the bottom to mud again and the project was postponed until next year.

The paddle-wheel scraper picked up from military surplus for Sacramento NWR was used to relevel the five acre Refuge field and to reconstruct levees, so the field could be flooded.

Merril Corp., concrete lined the water delivery ditches for the headquarter fields and five acre Refuge field at a cost of $27,140.23, contract # 14-16-OOOl-018(LFG).

Ryerson, Inc., reparied the concrete delivery ditch on the south side of the Hazard ponds for $1,494.03.

Work on the Headquarters Pond began in September but was cut short to accommodate arriving geese on November 8. Filling with water began on the 9th and geese started using it immediately. The removal of the screen created by the heavy growth of saltcedar on the exterior levees did not seem to bother the geese at all. The bottom leveling and center levee were finished but the exterior levee work was only started. The project will be completed next summer when the pond is dry.

Removing "old growth" saltcedar on the headquarters pond.
86NRSAL-20 WH

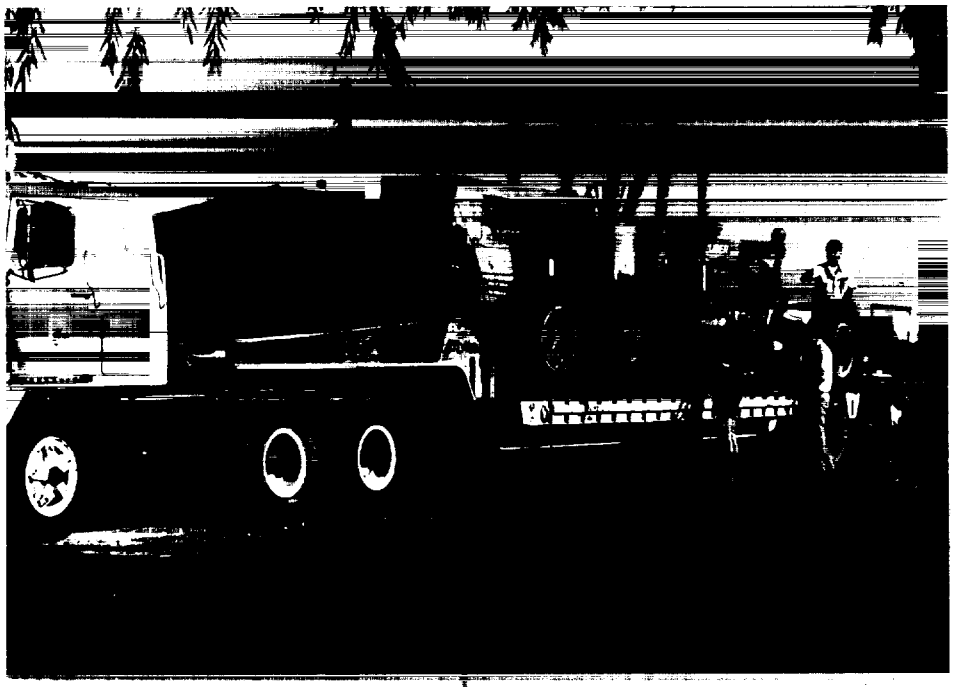
The Refuge domestic watersupply system was rehabilitated with the help of YCC. The gravel filter was cleaned out and refilled with new gravel, the filter was plugged with mud after only one and a half years of use. The holding tank was emptied, washed down and the mud in the bottom was cleaned out. The cover on the tank was rescreened and painted.

Work continued on the residence this year. The deteriorated laundry area on the back porch was converted into a second bathroom and laundry room. All painting, carpentry, and electrical wiring was completed by Refuge staff. The plumbing, dry wall and flooring installation were completed by contractors.

4. Equipment Utilization and Replacement

A new Dodge half ton pickup arrived in June. Unfortunately an 'AC' was left off the final order form and the pickup arrived with no air conditioning, a necessity in this part of the country. An add on unit was installed by a local garage. The new pickup replaced a 1976 Dodge pickup which had been inoperative for over a year.

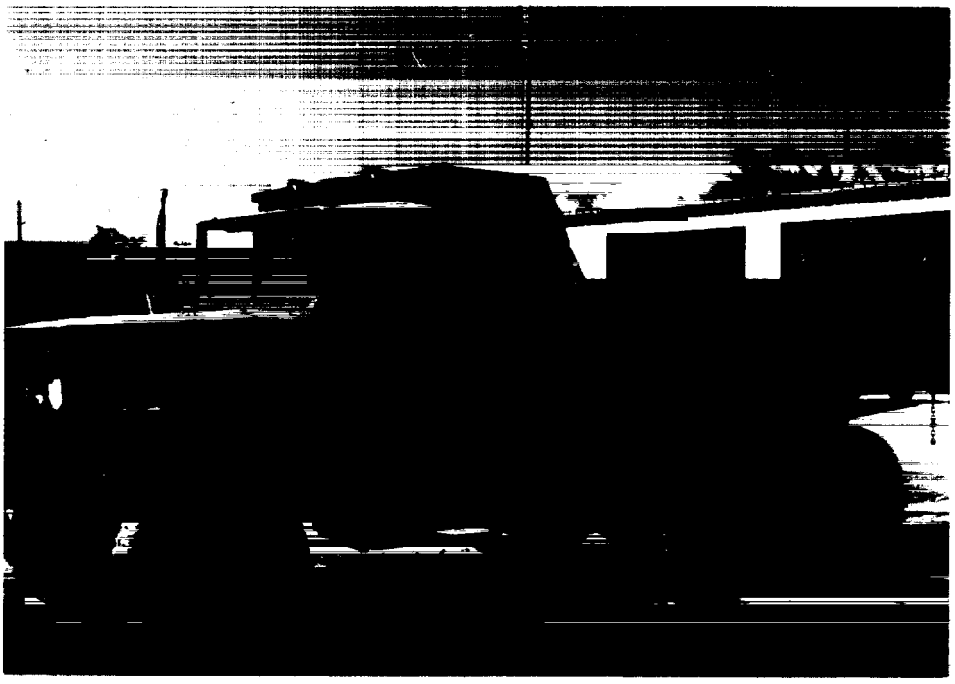
Three Huber road graders were picked up from the Yuma Marine Coprs Air Station Defense Property Disposal Office (DPD) in July. The Refuge kept the best one and transferred the other two to Kern NWR.



The arrival of the Huber grader adds a much needed piece of equipment to the Refuge. 86NRSAL-21

In June, the TD20 threw a rod while pulling the can. The 1960 model dozer was surplused because parts are no longer available. The dozer had been picked up on surplus from the Marine Corps in 1975.

The old military dump truck obtained in 1985 was painted with a lot of help from YCC; they sanded and masked the whole truck.



The old dump truck sports its new paint job, thanks to a lot of preparation by the YCC crew. 86NRSAL-22 WH

A 1979 Ford Custom 250 was picked up from Border Patrol in October. The truck only required minor repair but the 460 cubic inch engine with a four barrel carburetor does not get the best mileage.

The Aircat airboat continues to be a problem. After spending $2,000 on repairs in 1985 and 1986 the engine still does not run properly. At the end of the year it was back in the shop for an engine overhaul.

5. Communication Systems

In March, all the Refuge vehicles were ferried back and forth to Hendrix Electronics in Imperial to have the 2-way radios repaired or installed. Only the base station and the remote in the shop worked properly.

The system is better than nothing but in this area car to car 2-way radios do not work well. Conditions have to be near perfect before a mobile 100 watt output radio at Unit I can communicate with the base station less than ten miles away across flat terrain. All other agencies in the area have repeater systems and that seems to be the only answer for dependable communications in the Imperial Valley.

7. Energy Conservation

The Jade 2000 Thermostat control boxes were replaced with standard thermostats and seven day timers. One by one the Jade boxes had developed problems and the Refuge could not get proper servicing of the units.

Seven thermao pane windows were installed in the residence during 1986.

J. OTHER ITEMS

3. Items of Interest

Training continued as an important part of the overall Refuge program. In 1986, the staff spent more than 460 hours in formal training. Assistant manager, Tom Alexander, completed the four week basic Refuge Managers Training Academy at Blair, Nebraska. Alexander and refuge biologist, Bill Henry, attended the Annual Marsh Management Workshop in Fresno. Henry also attended the Regional Biologist Workshop in Sacramento, a symposium on Managing Inflows to California's Bays and Estuaries in Monterey, and he completed a Fire Behavior course (S-390) in Redmond, Oregon.

The three refuge officers, manager, Gary Kramer, maintenance worker, Marcos Orozco and Alexander, attended the March In-service refresher at Sacramento. In September, all three refuge officers requalified with service revolvers and shotguns at the El Centro police range with BLM LE officers.

Refuge clerk, Kathy Arnett, completed a three day course on Data Handling for Budget and Accounting Technicians in San Diego. Arnett, Henry and Alexander attended a one day Memo and Letter Writing Workshop in Long Beach.

Kramer represented the Refuge at the CDF&G/USFWS annual coordination meeting in Sacramento and attended the Regional Budget Meeting held in Reno, Nevada. Kramer and Alexander attended bi-monthly meetings of the Imperial County Fish and Game Commission.

4. Credits

Gary Kramer - E-5, K

Tom Alexander - A, D-2, E-l & 6, H, I, J-3

Bill Henry - D-5, E-8, F, G

Steve Clay - B, E-2, 3, 4 & 7

Editing by Gary Kramer

Typing by Shelly Laizure

K. FEEDBACK

As listed under Section D.5, Research and Investigations, samples of eggs (heron and egret) and fish (corvina, gulf croaker, sargo and tilapia) were collected by Refuge personnel in June and August 1985, respectively. At this writing (June 1987) the samples have not yet been analyzed.

In contrast, samples taken in August 1985 by the State of California (Water Quality Control Board), were analyzed and data released to the public in May 1986. The results were not encouraging and showed >2.0 ppm selenium in the edible flesh of Salton Sea fish. As a result of the sampling, a health warning regarding the consumption of fish from the Salton Sea was issued. Results of additional (December 1986) sampling by the State was released early in 1987 and showed elevated levels of selenium in the liver and edible flesh of waterfowl. Based on concerns brought about by these data, a Salton Sea Basin Irrigation Drain Study (Section D.5) was funded by the Department of Interior. The Refuge is responsible for collection of all biological samples for this study.

With the high level of interest and the demonstrated threat to human health, fisheries and wildlife, one would think that analysis of samples collected two years ago would have already occurred, but it hasn't. Because data from our sampling efforts are not available (no analysis performed) we get questions from the State people and the media as to why our analysis takes so long. They often ask if we are hiding something.

The Refuge staff collects the samples, sends them to Patuxent, deals with the public and media but gets no word on results for two years. Is this a professional way to handle such a controversial and potentially dangerous situation as contamination on a National Wildlife Refuge? No, it is not and we have been told just that.

This dissertation is to prompt someone to get off their backsides and demand, by increasing analytical capabilities, increasing personnel or funding, or by cutting red tape, that the samples be analyzed and the results be provided to the field. We need to know the extent and severity of the contaminant problem at Salton Sea NWR and be able to provide data to the media, interested public and other governmental agencies.

TIJUANA SLOUGH NATIONAL WILDLIFE REFUGE

IMPERIAL BEACH, CALIFORNIA

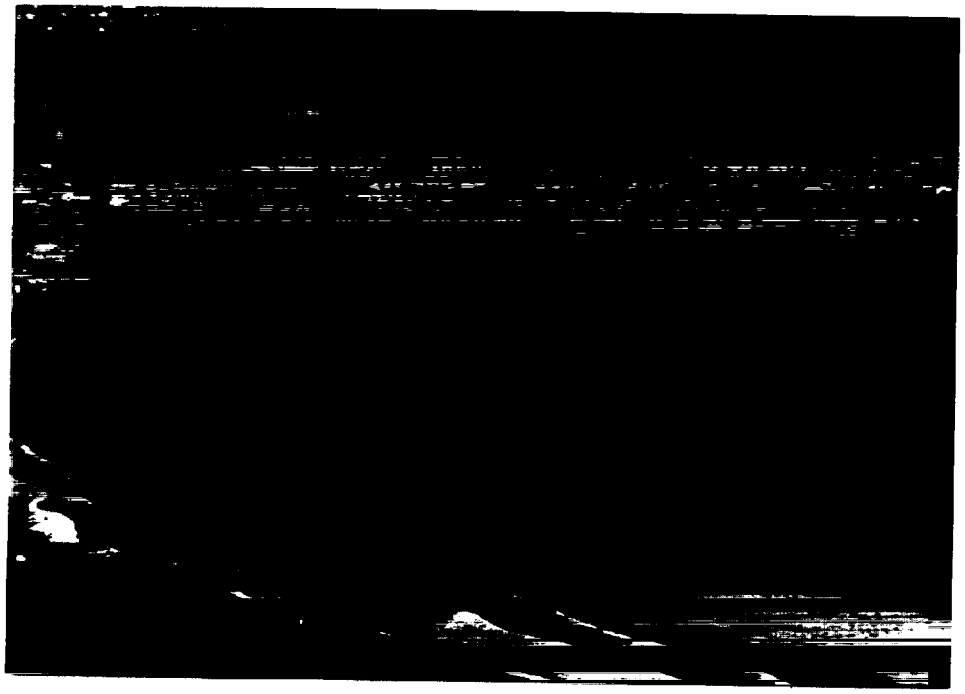
ANNUAL NARRATIVE REPORT

CALENDAR YEAR 1986

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

INTRODUCTION

Tijuana Slough NWR was established in 1980 and encompasses 1,056 acres of coastal wetlands, riparian, and upland habitats immediately north of the United States/Mexico border. As the southernmost estuarine system on the Pacific Coast of the United States, the Refuge represents one of the few remaining examples of relatively undisturbed, tidally-flushed coastal wetlands in southern California. The Refuge is located in the Tijuana River Valley in southern San Diego County and forms the northwestern portion of.the Tijuana River National Estuarine Reserve. The Reserve encompasses 2,531 acres and was established in 1982 in accordance with section 315 of the Coastal Pond Management Act. The Refuge is located in a highly urbanized area (cities of San Diego and Tijuana) with a combined population of over four million people. The Refuge is flanked by the City of Imperial Beach on the north, the Pacific Ocean to the west, the Mexican border to the south and Interstate 5 to the east.



Tijuana Slough NWR, "an Urban Refuge". 86NRTJS-1 WH

INTRODUCTION Page

TABLE OF CONTENTS

WILDLIFE (cont.) Page

H. PUBLIC USE

I. EQUIPMENT AND FACILITIES

J. OTHER ITEMS

K. FEEDBACK NTR

A. HIGHLIGHTS

--In early February, extremely high winds and waves accompanied by high tides caused severe erosion to the barrier dunes. This resulted in tidal blockage for three days before equipment could restore tidal circulation. (Section F-2)

--A detailed hydrological monitoring and topographic mapping study began. (Section F-2)

--An assistant manager was selected for Tijuana Slough NWR. (Section E-l)

B. CLIMATIC CONDITIONS

Weather conditions are typical of a coastal sub-tropical climate. Average rainfall is nine to ten inches annually. In general, January to March are the months that receive the most precipitation. Average temperatures reach annual lows of 52°F in winter and rise to 68°F in July. Prevailing winds are from the southwest during winter months and from the northwest in summer.

In 1986 the area received above average rainfall with 12.18 inches being recorded. Temperatures were normal, with a high of 90°F in August.

1986 Month	Precipitation (Inches)	Temperature	
		Max	Min
January	0.75	82	45
February	2.59	85	43
March	3.12	80	49
April	1.17	87	52
May	0.00	75	52
June	0.00	81	61
July	0.01	82	62
August	0.00	90	62
September	1.04	76	57
October	1.39	80	54
November	1.16	82	47
December	0.95	76	44
Total	12.18		

D. PLANNING

2. Management Plan

The Contaminant Monitoring Plan for Tijuana Slough NWR was completed and approved.

Refuge Objective Parts one and two completed and approved by Regional Office.

3. Public Participation

Tijuana Slough NWR is part of and managed in cooperation with the Tijuana River National Estuarine Reserve that was established in 1982. The land-owning and land use regulating-agencies are the California Department of Parks and Recreation (CDPR), U.S. Fish and Wildlife Service (USFWS), United States Navy (USN), and the cities of San Diego and Imperial Beach. In 1984,

the Navy under a cooperative agreement, transferred management of their lands to the USFWS.

To consolidate all management and protective interests in the estuary, an eight member group, the Tijuana River National Estuarine Reserve Management Authority (TRERMA) was formed. This management group is chaired by the CDPR with representatives from USFWS, State Coastal Conservancy, National Oceanic and Atmospheratic Adminstration (NOAA), California Coastal Commission, cities of Imperial Beach and San Diego and County of San Diego. The manager of Salton Sea NWR is the USFWS representative and attends monthly management meetings. There is also a Sanctuary Advisory committee who makes recommendations to the Authority on scientific and educational use.

5. Research and Investigations

Since the 1970's there has been a continuing research interest in Tijuana Estuary, with emphasis on the salt marsh vegetation. The research projects have directly followed the challenges posed by environmental changes and ecosystem responses. Studies have progressed from descriptions of species occurrences and measurements of wetland processes to long-term comparisons of the effects of disturbances. There has been a growing emphasis on the experimental determination of cause-effect relationships. The types of projects have shifted as the estuary experienced new and different envirnmental assaults.

All refuge research and investigations are evaluated by refuge staff and submitted to the Regional Office for approval. Field investigations and research projects involving Tijuana Slough NWR included the following:

Refuge Personnel

a. Tijuana Slough Contaminant Reconnaissance Study

Selected biota totalling 29 samples were collected and catalogued from three stations within the Tijuana Estuary. Eighteen bird samples of three species; wigeon (6), coots (6), and black-necked stilts (6) were collected. In addition, eleven composite fish and invertebrate samples composed of killifish, gobies, sculpins, mullet, mussels and mud crabs were collected on the Tijuana Slough NWR from October 21 to November 25, 1986.

Biologists Henry and Clay preparing bird samples for a Contaminant Study. 86NRTJS-2 JW

Other Personnel

a. Salt marsh monitoring and historical analysis of Tijuana Estuary

Michael B. March, M.S. candidate, and Joy B. Zedler, Wetland Ecologist, San Diego State University Foundation.

This is a continuation of a seven year monitoring program that began in 1979 to document in detail how the lower salt marsh responds to changes in salinity brought about by flooding, fresh water discharge and sewage inflows.

The project will continue monitoring of the salt marsh for six years and update and record species compositional changes that have occurred with recent disturbances to the estuary. Secondly, the study will analyze all available aerial photographs (1928-84) to determine how the distribution and amount of each habitat type have changed.

b. The effects of wastewater discharge on the Tijuana Estuary: Response of phytoplankton to nutrient enrichment and salinity reduction

Peggy Fong (Brown), M.S. candidate, and Joy B. Zedler, Wetland Ecologist, San Diego State University Foundation.

The study determined the volume and nutrient loadings of treated effluent that can be released into the estuary without causing management problems and what effects these discharges have on phytoplankton diversity and productivity.

Field research began in early December 1984 and data collections continued through March 1986, an M.S. Thesis is on file at SDSU.

c. The effect of wastwater discharges to Tijuana Estuary: Responses of channel macroalgae

Regina Rudnicki, M.S. candidate, and Joy B. Zedler, Wetland Ecologist, San Diego State University Foundation.

The project assessed the physical factors that effect the growth of channel macroalgae, monitor the effects of algae blooms on other channel biota and determine how treated wastewater would effect macroalgae growth.

Field investigation began in December 1984 and data collections continued through March 1986, an M.S. Thesis is on file at SDSU.

d. Effects of wastewater additions on clapper rail habitat: Does nitrogen enhance cordgrass growth or increase cordgrass mortality bv stimulatine insect herbivorv?

Jordan Covin, Researcher, and Joy B. Zedler, Wetland Ecologist, San Diego State University Foundation.

The study provided 1) baseline data on newly described Dipteran insect that effects the growth of Spartina foliosa, 2) assesses the response of the insect to increased nutritional quality of S. foliosa due to increased wastewater flows from the Tijuana River.

Research‘began in the summer of 1985 and continued through March 1986. A final report has been completed and is on file with NOAA.

e. Effects of habitat type and human disturbance on an endangered wetland bird: Belding's Savannah Sparrow (Passerculus sandwichensis beldingi)

Abby White, M.S. candidate, and Joy B. Zedler, Wetland Ecologist, San Diego State University Foundation.

The study determined 1) how habitat selection for breeding territories is influenced by vegetation and human disturbance, 2) how disturbance varies with habitat type and the type of disturbance.

Research began in the spring of 1985 and was completed in June 1986, an M.S. Thesis is on file at SDSU.

f. Dune vegetation restoration at Tijuana Estuary

Brian Fink, M.S. candidate, and Joy B. Zedler, Wetland Ecologist, San Diego State University Foundation.

The project will provide critical information regarding revegetation efforts at the Tijuana Estuary barrier dune. Methods of accelerated propagation will be undertaken leading to the revegetation of the entire length of coastline within the Refuge.

Research is underway and will continue through February 1987.

g. Dune vegetation reestablishment at Tijuana Estuary: Interactions between the exotic annual (Cakile sp.) and the native perennial (Abronia sp.)

Lisa Wood, M.S. candidate, and Joy B. Zedler, Wetland Ecologist, San Diego State University Foundation.

The study will involve: 1) the germination and seedling establishment of dune species on reconstructed dunes, 2) compare the species composition of natural versus reconstructed dunes, 3) determine optimal salinity and moisture conditions for germination and seedling establishment of Cakile maritima and Abronia maritima.

Research is underway and will continue through February 1987.

h. Monitoring of fishes and invertebrates at Tijuana Estuary

Chris Nordby and D. Dexter, Ecologists, San Diego State University Foundation.

This project will provide a fisheries background data base for estuarine tidal flushing, channel dredging and habitat restoration within the estuary.

Research is underway and will continue through March 1987.

6. Other

A committee was formed in September to select an architect for a CDPR funded visitor center and a designer for the interior exhibits. Members for the committee were selected from TRERMA, Southwest Wetlands Interpretive Association (SWIA), and the private sector. The most active members are USFWS and CDPR from TRERMA, three SWIA members and a local architect who volunteered his time. The State Coastal Conservancy (SCC) was not active on the committee but they were instrumental in securing funding for the visitor center.

A local architectural firm (Rob Wellington Qulgley, AIA Architects) was selected to design the building and a Seattle, Washington designer (Vincent Balisky and Associates) was chosen to work on the interior exhibits.

By the end of December the preliminary building design was accepted and approved and work on the design of the interior exhibits was well underway.

E. ADMINISTRATION

1. Personnel

Tijuana Slough NWR remained as an unstaffed satellite through 1986. However, the Refuge will have an on-site manager in early 1987. The GS-9 managers position was "green sheeted" in November and Marc Weitzel was selected in December. Marc will report to Imperial Beach on January 21.

The Refuge received administrative and maintenance support from the complex headquarters at Salton Sea NWE.

2. Youth Programs

An on-site Youth Conservation Corps (YCC) progr did not occur on the Refuge during 1986. However, the YCC crew from the Salton Sea NWR spent four days

(August 4-8) at the Refuge. Projects completed included: Trash and litter pick-up and removal; control of exotic vegetation; planting of native species to revegetate and stabilize beach dunes; signing and posting of Refuge boundaries; repair of the drip irrigation system on the beach dunes and transplanting of cordgrass along a dredged channel. Special attention was given to salt marsh ecology and it's cleanup which improved habitat conditions for several endangered species.

3. Other Manpower Programs

Salton Sea NWR SCA volunteer Steve Clay assisted in many projects at Tijuana Slough including; sign posting, fencing, and monthly bird surveys.

Posting the California least tern nesting colony. 86NRTJS-3 PJ

4. Volunteer Programs

The Southwest Wetlands Interpretive Association (SWIA) provided a grant to produce a brochure detailing the natural history of the Refuge and adjacent lands. They also ran an interpretive booth at the local fair and were instrumental in the set up of the Visitor Center Committee. The Refuge staff greatly appreciates the efforts of this organization.

Julie Bubar provided volunteer photographic work for use in the SWIA brochure as well as other interpretive displays for the area.

Paul Jorgensen, Sanctuary Manager of the Tijuana River National Estuarine Reserve is an on-site manager employed by CDPR. Because his office is located near the Refuge, he often acts as our eyes and ears on a volunteer basis. Paul also provided many hours of volunteer labor assisting in projects on the Refuge.

5. Funding

See Salton Sea NWR narrative.

7. Technical Assistance

The Refuge provided technical assistance to the State of California, CDPR and California Department of Fish and Game (CDF&G) regarding endangered species management within the Reserve. Logistical and technical assistance was provided during surveys of light footed clapper rails, California least terns, snowy plovers and Belding's Savannah sparrows.

The Refuge manager remained an active member of TRERMA and provides input to all management decisions affecting the estuary.

8. Other

On September 8, a revenue sharing check for $23,173.00 was presented to the San Diego County Board of Supervisors.

F. HABITAT MANAGEMENT

1. General

The Refuge administers 85 percent of the 1,255 acres of critical salt marsh habitat within the Reserve. The Refuge has responsibility to protect and enhance federally-listed endangered species populations and critical habitats within the Refuge and Reserve. These include one plant species, the salt marsh bird's beak (Cordylanthus maritimus ssp. maritimus), and several birds: the light-footed clapper rail (Rallus longirostris levipes), California least tern (Sterna antillarum browni), least Bell's vireo (Vireo bellii pusillus) and brown pelican (Pelecanus occidentalis californicus). The peregrine falcon (Falco peregrinus anatum) is an infrequent visitor. One additional species, Belding's Savannah sparrow (Passerculus sandwichensis beldingi) is listed as endangered by the State of California.

The Federally endangered salt marsh bird's beak. 86NRTJS-4 PJ

The Refuge contains salt marsh, tidal creeks and channels, mudflats, ocean front sand dunes and uplands. The Tijuana River bi-sects the Refuge and flows westerly through sand dunes to the Pacific Ocean.

Important plants in the upper salt marsh include shoregrass (Monanthochloe littoralis), and two species of pickleweed (Salicornia subterminalis) and (S. bigelovii), and sea lavender (Limonium californicum). The endangered Belding's Savannah sparrow often nests in the upper marsh, primarily in pickleweed stands. The lower elevations of the salt-marsh are dominated by native cordgrass (Spartina foliosa). This plant provides dense cover and nesting material for the endangered light-footed clapper rail.

The extensive beach front sand dune area provide California least terns and Western snowy plovers with nesting sites. Portions of this dune area are closed to all entry, from April to September, for the protection of these species.

Tijuana Slough preserves some of the last remaining coastal wetlands in southern California. 86NRTJS-5 WH

2. Wetlands

During the winters of 1982 and 1983, severe storms battered the coast of Southern California. During the storms, the tidal channel in Oneonta Slough was filled with sand that washed into the estuary from the dunes. The northern-most obstruction was at the foot of Sea Coast Drive and the southern-most was halfway between Sea Coast Drive and the mouth of the Tijuana River. These obstructions resulted in reduction of tidal flows in the estuary, periodic closure of the Tijuana River mouth and created a number of management problems related to endangered species and their habitats. In addition, three dams on the Tijuana River watershed have reduced the River's flow to a trickle. The reduction in river flows and loss of tidal flushing eventually caused drastic changes in the plant communities of the saltmarsh and severe impacts on the endangered salt marsh bird's beak and the light-footed clapper rail. The blockage also created stagnant tidal pools and mosquito problems. The longest closure and complete absence of tidal flushing took place from April - December 1984.

The eight months of closure had devastating effects on the estuary, causing channels to become hypersaline, shallow tidal creeks evaporated and the bottom turned to brick and marsh soils became so dry and hypersaline (over 100 ppt in September 1984) that large areas of low-marsh vegetation died out.

Since 1982, several attempts were made to open the mouth of the Tijuana River by the Refuge staff. However, after each attempt the ocean established a sand bar across the mouth and tidal flushing was restricted or blocked within hours. In May 1984, preparations (Endangered Species & Section 404 permits) for a large scale dredging project were initiated by the Refuge staff.

From September 1984 to January 1985 the Refuge crew dredged over 6400 cubic yards of sand and sediments from Oneonta Slough. The project was designed to create a large enough tidal prism to keep the River mouth open and restore tidal flow to the salt-marsh plant communities.

On December 11, 1984, due to heavy rains and flooding of the estuary, the mouth of the River had to be reopened. Water was rising at one inch per hour and flooding was occurring along Sea Coast Drive. Two dozers worked to cut the sand plug at the River mouth and let the water out.

From January to April 1985, additional dozer work was required to push the sand that had been dredged out of the estuary westward to recreate the barrier dunes. Some finish dredging took place in January 1985 to open Oneonta Slough to tidal flushing.

On February 1, 1986, the mouth of the Estuary became blocked with sand due to extremely high winds and waves accompanied by high tides. This cut off all tidal flow for a period of three days. After one and a half days of dozing the tidal flow was restored on February 4. The mouth has since remained open with continued tidal flushing throughout the year.

It is apparent that estuary closures are directly related to significant reductions in the estuary tidal prism. The reduction in tidal prism are caused by sand dune blowouts and over wash fans from storm waves coupled with high tides. Accurate measurement of parameters needed to estimate the estuaries present tidal prism will be the highest priority in future Refuge planning.

In March 1986, a detailed hydrological monitoring and topographic mapping study of the Tijuana Estuary was initiated by Dr. Philip B. Williams and Associates under contract to San Diego State University Foundation with funding from the State Coastal Conservancy. Preliminary analysis have shown a wetlands reduction of 60 percent over the last 100 years. More significantly, the tidal volume of the estuary has been reduced, as reflected in the reduction in the tidal prism by about 80 percent, from 1550 acre-feet to 290 acre-feet now. This study will provide the data needed to plan all future dredging operations.

Additional dredging to increase the tidal prism has been approved for N 87. Actual contract dredging will occur early in CY 1987.

If no action is taken, it is possible that within the next two decades, substantial additional tidal prism will be lost, resulting in almost permanent closure of the entrance channel and the conversion of the remainder of the wetland to salt flats or stagnant brackish marsh.

6. Other Habitats

During the 1985 Oneonta Slough dredging project, the dredge material was pushed westward to reconstruct the barrier dunes in order to prevent high tides and storm waves from washing sand back into the slough. In conjunction with rebuilding the barrier dunes a revegetation project was initiated to reestablish native plant species. Over 600 seedlings were planted from January to April 1985. During the summer of 1985, our YCC crew installed 3000 feet of drip irrigation line. The drip irrigation lines will assure

the seedlings become well established. Once established the dune vegetation will not require irrigation.

During the winter of 1986 extreme high tides accompanied by strong on shore winds caused severe damage to the barrier dunes. Breaching occured at three points causing sand to wash into Oneonta Slough. Additionally the wave action washed out over 50 percent of the drip system and dune plants.

A second revegetation program is planned for the fall of 1987 after extensive repairs and rebuilding of the breached dunes is completed.

G. WILDLIFE

2. Endangered and/or Threatened Species

a) California Brown Pelican

As in previous years, brown pelican use of Tijuana Slough NWR continued at a moderately low level compared to other areas along the California coast. Major use occurred near the mouth of the River where the birds fed and roosted. Peak use was from July through October in numbers rarely over 100 individuals.

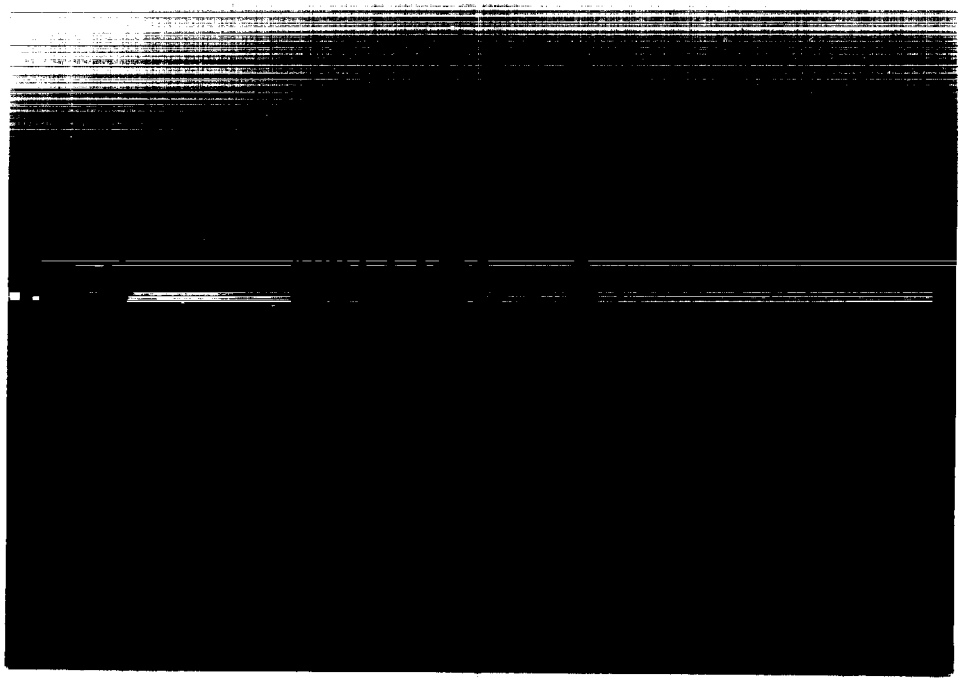
b) California Least Tern

Management efforts for this species consist of protecting and improving nesting and foraging habitat, and closely monitoring the breeding population on the barrier dunes near the River's mouth.

Californialeastterns with chick. 86NRTJS-6 PJ

In 1986, the nesting sites were monitored again by contract biologist Elizabeth Copper under the direction of CDF&G. An estimated 41 least tern pairs nested along the River mouth beginning in late April. The majority of the initial first wave nests (24) were found along the south spit with only six nests found on the north spit. Nest destruction and chick mortalities were suspected by high tides and illegal alien foot traffic.

In an effort to reduce illegal alien foot traffic, 300 feet of nylon snow drift fencing was installed along the south end of the tern colony on the South spit. This apparently helped to route foot traffic around the colony. An estimated 25-40 young were fledged, up from the last two years.



Construction of barrier fence to stop foot traffic through the tern nesting colony. 86NRTJS-7 PJ

Tijuana Slough NWR California Least Tern Nesting Data 1982-1986

YEAR	1982	1983	1984	1 9 8 5	1986
PAIRS	21-30	60-65	SO-66	64	36-41
YOUNG FLEDGED	17+	50+	12-20	18-20	25-40

C) Light-footed Clapper Rail

Census activities were repeated on several occasions in March and April resulting in only four individual rails. Following the closure of the estuary mouth and subsequent habitat degradation in 1984 (see F-2, wetlands) the near extinction of the clapper rail population in the estuary was probably due to a combination of stresses including reduced food supplies, poor cover and lack of predator protection.

Clapper rails are considered generalists in terms of feeding with the majority of foods being marine dedapods, isopods, snails, crabs, fishes and insects. This prey base was essentially wiped out in the absence of tidal flushing resulting in starvation as a likely cause of rail mortality. Declining cover during the nesting season also may have led to nesting failure by reducing the area of available dense cordgrass for nest construction and concealment thereby making nests and rails more visible to predators. Finally, the lack of tidal flushing greatly reduced protection from mammalian predators.

By the fall of 1986, as many as 18 individuals had been observed. It's believed some of the pre-closure population may have immigrated upstream and nested in the brackish and freshwater marsh habitats along the river.

Census of Light-footed Clapper Rails at Tijuana Marsh, California

YEAR	1980	1981	1982	1983	1984	1985	1986
PAIRS	26	31	25	41	38	0	0
*Individuals						4*	16-18*

Light-footed clapper rail. 86NRTJS-8 PJ

d) Least Bell's Vireo

The first confirmed record of breeding by least Bell's vireo was made in May 1986 by personnel of San Diego State University. A breeding territory was located along the Tijuana River near the eastern edge of the Refuge boundary. Survey routes are being established through riparian habitat to insure that breeding populations are carefully monitored and protected.

This species was officially added to the endangered species list in late 1985 with an estimated five percent of the vireo's historic breeding habitat

remaining. From 1977 through 1983 virtually all potential California habitat was surveyed, but only 285 breeding pairs at 45 sites were found.

3. Waterfowl

The mid-winter waterfowl survey for southern coastal California, conducted in early January in cooperation with CDF&G, was the only aerial survey completed. Problems with CDF&G non-compliance in using air safety equipment (e.g. flight helmets, suits and intercoms) and the reduced budget of both agencies prevented flying additional surveys. In recent years, the Southern California coast, including Tijuana Slough NWR has been surveyed monthly between October and February.

Estimated Waterfowl Peaks 1986-87, Tijuana Slough NWR

Species	Number	Date
Pintail	225	12 Jan.
Wigeon	425	27 Dec.
Shovelers	150	12 Jan.
Green-winged Teal	55	16 Dec.
Cinnamon Teal	75	11 Feb.
Ruddy Duck	25	12 Jan.
Lesser Scaup	40	27 Dec.

In June, two duck broods pintail and mallard) were observed in the estuary with 7-9 ducklings each. Other known nesters include ruddy duck and cinnamon teal.

4. Marsh and Water Birds

No nesting colonies of herons or egrets have been located within the Refuge boundaries, but the estuary affords a loafing and foraging site for many cormorants, grebes, herons, egrets, ibis and other marsh and water birds.

5. Shorebirds, Gulls, Terns and Allied Species

Major shorebird concentrations occurred during the fall, winter and spring months (November through April). Large groups of mixed shorebirds including: willets, dowitchers, dunlin, godwits, curlews, avocets, stilts and plovers crowd the mudflats and sandbars of the estuary. Forster terns were common throughout the summer months and were suspected of nesting within the estuary, but there were no confirmed reports. Caspian, elegant terns and black skimmers were commonly observed foraging and roosting within the estuary along with western, California, Heermann's and ring-billed gulls.

6. Raptors

Year round raptor sightings within the Refuge in 1986 included: numerous kestrels, northern harriers, black-shouldered kites and red-tailed hawks. Unusual observations included: two golden eagles, several ospreys and an occasional peregrine and merlin during the fall and spring migrations.

7. Other Migratory Birds

The annual Audubon Christmas Bird Count was conducted on December 19, 1986 with 194 species reported. No unusual or rare birds were recorded.

16. Marking and Banding

This marked the 12th year of banding least tern chicks in conjunction with all other known least tern colonies in California. A total of 20 individual chicks were banded with USFWS markers by CDF&G contract biologist Elizabeth Copper.

17. Disease Prevention and Control

There has been no documented disease outbreaks within the Tijuana River Estuary, but due to chronic flows of untreated sewage effluent that is deposited into the River and estuary, the potential remains high.

H. PUBLIC USE

1. General

Tijuana Slough receives approximately 25,000 visits annually. Because of the Refuges' urban setting many of these visitors are from the local area and use the sanctuary like a city park. Although wildlife observation is a popular activity; jogging, hiking and bike riding are high on the list of public uses. Surfing off the Refuge beach area also is very popular. Fishing is restricted to the ocean surf and hunting is not permitted.

2. Outdoor Classrooms - Students

The CDPR offers several special environmental education classes to groups, upon request. In 1986, some of the groups to take advantage of these programs were Adult Education classes from the local community college, Biology classes from two colleges, local junior high and high schools and the Girl scouts.

11. Wildlife Observation

SWIA volunteers conduct tours on the first and second Saturdays of each month. The program started in 1984 and remains very popular. An average of 30 visitors per week learn about wildlife and the Refuge through the tours.

17. Law Enforcement

The number one problem in this area is the illegal alien traffic from Mexico. The U.S. Border Patrol estimates that an average of 670 illegals travel through the Refuge every 24 hours. Refuge officers do not attempt to apprehend the illegals; this is left to the Border Patrol.

Border Patrol checking for illegal aliens at the end of Seacoast Drive. 86NRTJS-9 GK

Illegal activities such as off road vehicles, dumping and littering have been reduced through signs, barriers and patrol by personnel from Salton Sea NWR and Border Field State Park. However, these problems will continue at unacceptable levels until the Refuge is staffed and the area is given the attention it needs.

I. EQUIPMENT AND FACILITIES

1. New Construction

A marsh excavation project created 8500 square feet of intertidal habitat that had previously been upland. Additionally an opening in a levee adjacent to the area was widened to 20 feet to ensure tidal flow. The work was developed as a mitigation project associated with PN 84-154, William Roberts, Shelter Island Yachtways Boatyard. On site work began in November and the project was delayed due to extreme high tides in December. The project should be completed by March 1987.

Mitigation work to create additional intertidal habitat.
86NRTJS-10 WH

2. Rehabilitation

The mouth of the Tijuana River was reopened in February after it was closed by extremely high winds and waves accompanied by high tides. The tidal flow was cut off for only a three day period.

The D-7 dozer was kept at Imperial Beach in case winter storms closed the mouth again. The mouth remained at least partially open through the winter.

At the end of April the mouth of the river was completely opened and the D-7 was transported back to Salton Sea NWR.

In February, the D-7 also was used to rip (chisel) several miles of road running through the high marsh and upland. The dirt roads were ripped one and a half to two feet deep to promote new growth and prevent vehicle traffic, mostly by the Border Patrol.

D-7 was used to rip old roads to discourage foot and vehicle use and to promote revegetation of high marsh areas.

86NRTJS-11 WH

The maintenance crew also spent a week in August working with YCC removing litter and rubble, repairing fences, gates and posting boundaries.

J. OTHER ITEMS

4. Credits

Tom Alexander - A, D-2, 3 & 6, E-l, H, I

Bill Henry - D-5, E-3, F, G

Steven Clay - B, E-2, 3, 4, & 7

Editing by Gary Kramer

Typing by Shelly Laizure

COACHELLA VALLEY NATIONAL WILDLIFE REFUGE

THOUSAND PALMS, CALIFORNIA

ANNUAL NARRATIVE REPORT

CALENDAR YEAR 1986

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

INTRODUCTION

Coachella Valley NWR is presently a 2,338 acre refuge in Southern California located about 10 miles east of Palm Springs in the heart of the rapidly developing Coachella Valley. The Refuge was established in 1985 as part of Coachella Valley Preserve with the primary purpose of protecting the threatened Coachella Valley fringe-toed lizard (CVFTL) and the desert ecosystem that supports this species. The Preserve is a 13,000 acre area jointly managed by the Bureau of Land Management (BLM), the Nature Conservancy (TNC), California Department of Fish and Game (CDF&G) and the U.S. Fish and Wildlife Service (USFWS). Because of the expanding human population of the area, which has doubled to over 180,000 people during the last ten years, the Preserve is essential to protect an array of desert ecosystems threatened by the development associated with this population growth. The three most dynamic ecosystems are the palm oasis woodlands sustained by water available through fractures in the bedrock along the San Andreas Fault, perennial desert pools, a result of the San Andreas Fault which forces ground water through fractures to the surface, and the blow-sand habitat necessary for the survival of the CVFTL. In addition to the CVFTL, the Preserve supports three amphibians, 23 reptiles (including the flat-tailed horned lizard, a candidate species for federal listing), 180 birds and 25 mammals. Two plant species found on the Refuge are listed as endangered by the State of California and are being considered for federal listing.

Coachella Valley fringe-toed lizard habitat; sparsely vegetated drifting windblown sand dunes. 86NRCOA-1 CB

The state's second largest grove of native fan palms (*Washingtonia filifera*) is located on the Preserve.

86NRCOA-2 CB

INTRODUCTION

TABLE OF CONTENTS

WILDLIFE (cont.)

H. PUBLIC USE

I. EQUIPMENT AND FACILITIES

J. OTHER ITEMS

K. FEEDBACK

A. HIGHLIGHTS

--The Habitat Conservation Plan was signed by the USFWS in April. (Section D-4)

--The Coachella Valley Preserve System management plan was completed and approved by all four management agencies. (Section D-2)

--Nine tracts totaling 973.7 acres were purchased for $3,568,835.00. (Section C-l)

--In May, the Refuge population of the CVFTL was censused. (Section G-2)

--This is the first Coachella Valley NWR annual narrative report.

B. CLIMATIC CONDITIONS

Weather conditions in the Coachella Valley are typical of the southern interior desert. The area averages less than five inches of rain annually with January through March being the months that receive the most rainfall. The area experiences extremely hot summer temperatures.

In 1986 the high temperature for the year was 119°F recorded in June.

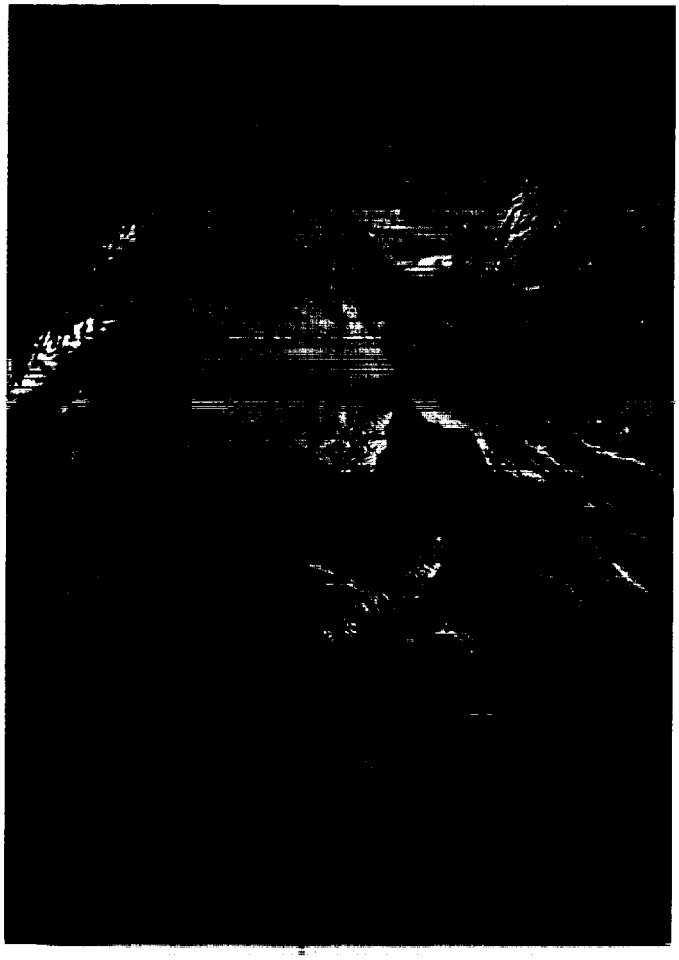
1986 Month	Precipitation (Inches)	Temperature Max	Temperature Min
January	0.16	95	36
February	1.99	108	34
March	0.95	99	48
April	0.00	103	53
May	0.00	116	61
June	0.38	119	69
July	0.00	115	70
August	0.00	113	81
September	0.00	114	62
October	0.48	94	52
November	0.00	90	45
December	0.00	76	36
Total	3.96		

C. LAND ACQUISITION

1. Fee Title

During FY 86, nine tracts totaling 973.7 acres were purchased at a cost of $3,568,835.00. Since acquisition began in 1985, a total of $8,362,059.00 has been expended to purchase 2338 acres.

Realty is still actively negotiating with a single land owner to complete acquisition. Acquisition will be completed in 1987 with the purchase of one more tract (10 acres).



Aerial photo of the Coachella Valley Preserve (outlined in blue) with Coachella Valley NWR in lower portion of the photo. 86NRCOA-3 CB

D. PLANNING

2. Management Plan

A draft of the Coachella Valley Preserve System Management Plan prepared by Cameron Barrows, TNC preserve manager was distributed to the management agencies for comment in August. The finalized Plan was approved in October by the four land owning agencies - USFWS, BLM, CDF&G, and TNC. The Plan lists ten goals and then details the actions needed to meet them. The goals are as follows:

1) Maintain and enhance the natural condition of all lands within the Coachella Valley Preserve System.

2) Restrict vehicle access within the Coachella Preserve System to the minimum number of routes needed to service authorized rights-of-ways and private land.

3) Remove all exotic species of plants and animals where and when feasible to the benefit of native species.

4) Restrict the use of firearms from all lands within Coachella Preserve System.

5) Remove abandoned buildings, cars, and debris

6) Establish hiking and equestrian trail systems through the major habitats of the Coachella Preserve System. Locate equestrian trails outside sensitive habitats such as palm oases and sand dunes.

7) Provide the public with information on the resources, origin and cooperative nature of the Coachella Valley Preserve System.

8) Monitor the sensitive biological components contained within the Coachella Valley Preserve System.

9) Make the Coachella Valley Preserve System available for use by researchers.

10) Provide refugia for endangered species of native plants and animals which occur in similar habitats (e.g. desert pupfish).

Management meetings with a representative from each agency are held monthly to coordinate each of the agencies activities on the Preserve. The chairmanship of the Management Committee rotates among all four agencies. In 1986, TNC acted as chairman.

4. Compliance with Environmental and Cultural Resource Mandates

A Section 7 Consultation was completed by BLM, on behalf of all four management agencies, for fencing the boundary of the entire Preserve.

In April, the Habitat Conservation Plan (HCP) was signed by the USFWS. Previously the HCP had been signed by BLM, CDF&G, TNC, the County of Riverside and the cities of Desert Hot Springs, Palm Springs, Cathedral City, Rancho Mirage, Palm Desert, Indian Wells, La Quinta, Indio and Coachella. The signing of the HCP cleared the way for issuing an Endangered Species Act Section 10(a) permit. This allowed the incidental taking of CVFTL and the development of CVFTL habitat outside the Preserve boundaries. As a stipulation of the 10(a) permit developers are required to pay a $600.00 per acre fee which goes into an endowment fund for the Preserve.

5. Research and Investigations

Other Personnel

a. Fraction of net primary production attributable to mycorrhizal fungi in a warm desert ecosystem.

Dr. T.V. St. John, National Science Foundation grant BSR 86-96089.

The study will attempt to estimate: the fraction of net primary production attributable to vesicular-arbuscular mycorrhizal symbionts in a warm desert ecosystem and the production of carbon allocation to the symbionts, based on NPP and fungal respiration.

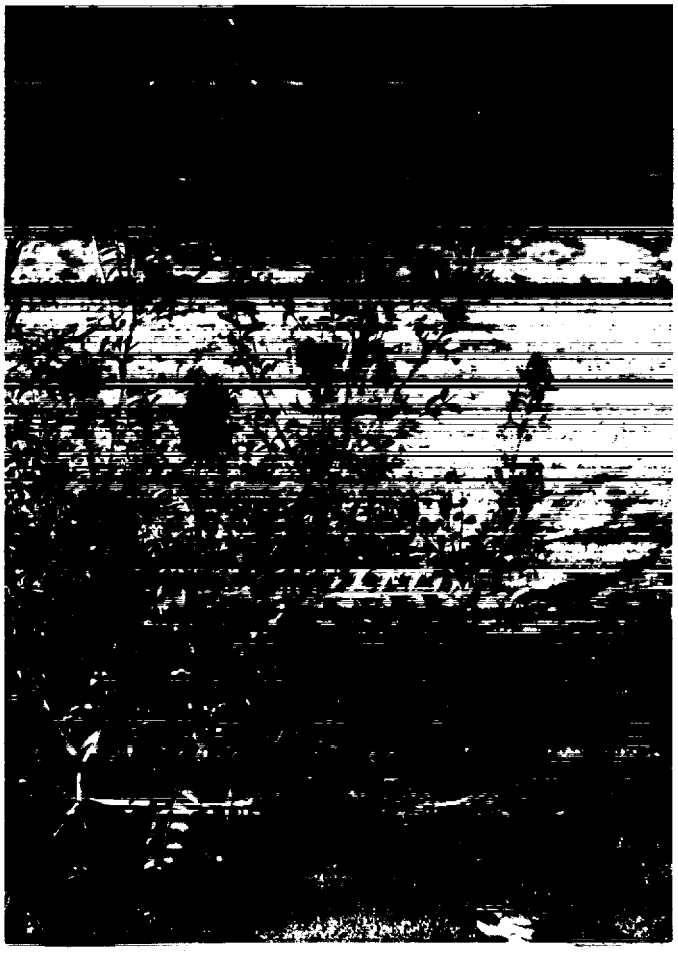
Field research is underway and will continue through October 1987.

F. HABITAT MANAGEMENT

1. General

The Refuge contains large areas of blow-sand fields which are created by a combination of surface water and wind transport processes. The sand fields are dependent upon periodic flooding which funnels sand down the watershed to create sand fields and dunes. This action coupled with strong winds create and maintain the blow sand habitat critical to the CVFTL.

The Refuge presently administers 13 percent of the proposed 13,030 acres of designated critical habitat for the federally threatened CVFTL and is responsible for the protection of some 81 annual herbs, eight perennial herbs, 29 shrubs and vines, 23 rushes and sedges, three trees and two succulent plants. Species of special concern which may occur include Wiggin's croton (Croton wigginsii), flat-seeded spurge (Euphorbia platysperma), and Coachella milk-vetch (Astragalus lentinginosus var. coachellae).



The Coachella milk-vetch, a species of special concern. 86NRCOA-4 BC

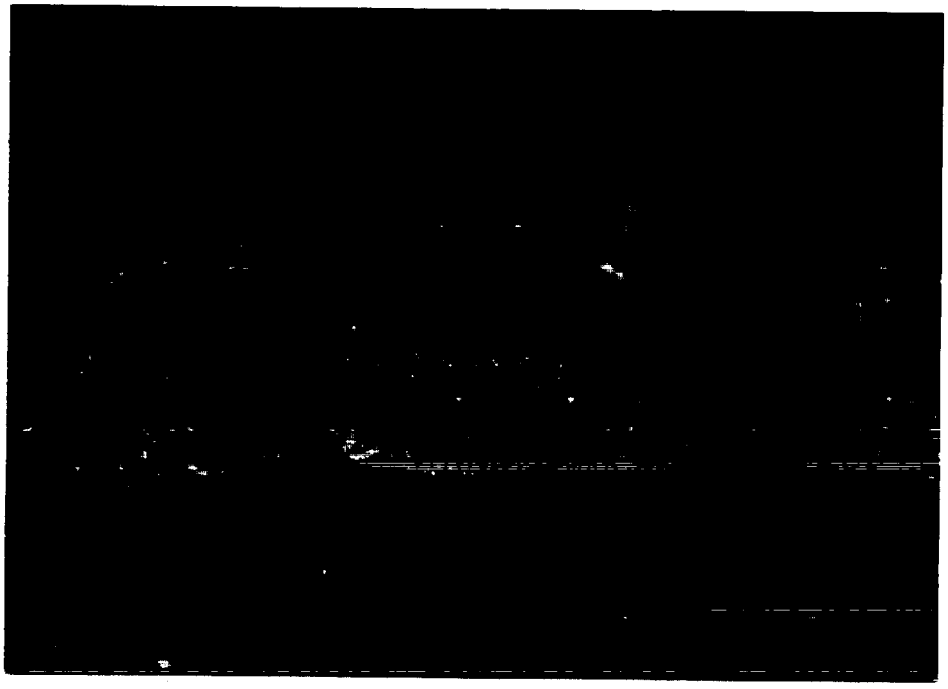
G. WILDLIFE

1. Wildlife Diversity

Vertebrate species observed in the general vicinity of the Refuge include: three amphibians, 23 reptiles, and 25 mammals, many of which occur as permanent residents; and 180 birds which are primarily migrants and utilize valley floor habitats on a seasonal basis.

Two species of special management concern include the flat-tailed horned lizard (Phrynosoma mcallii) (FTHL) and the CVFTL.

The FTHL, a candidate species for federal listing, is also present in sandy habitats where soils are sufficiently hard to support colonies of harvester ants, their principal prey. The species is generally considered difficult to find and, although the geographic range is relatively extensive, FTHL's are comparatively rare throughout.



Flat-tailed horned lizard, a candidate species for federal listing. 86NRCOA-5 CB

2. Endangered and/or Threatened Species

The CVFTL is a highly specialized species endemic to blow-sand areas of Coachella Valley and was federally listed as threatened on September 25, 1980 (Federal Register 45:188). In a parallel action, the State of California Fish and Game Commission designated the CVFTL as "endangered".

The federally-listed, threatened Coachella Valley fringe-toed lizard. 86 NRCOA-6 CB

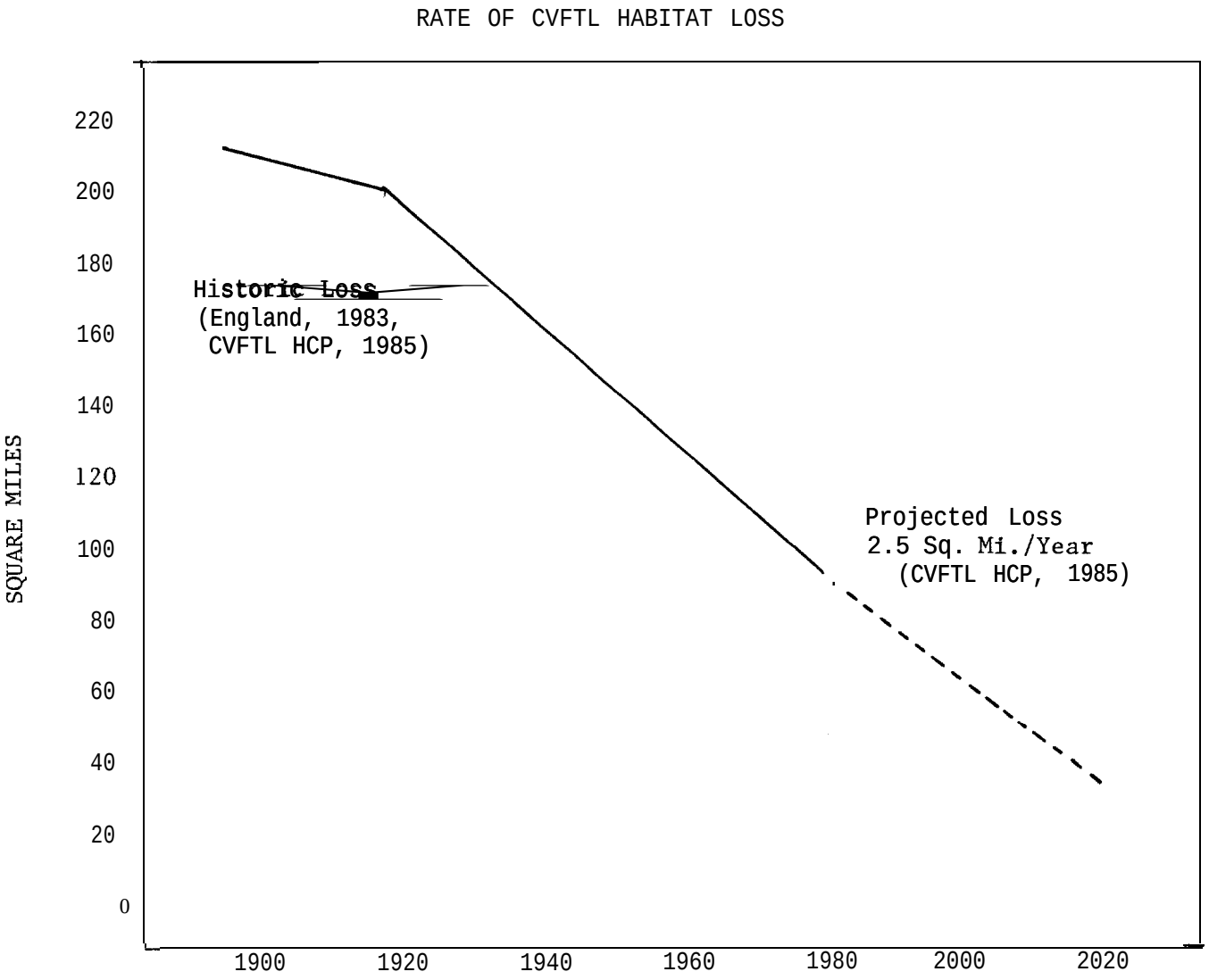
In order to determine existing populations of CVFTL on the Refuge, a monitoring program was initiated in May 1986. Three permanent 1000 meter transects, covering the full diversity of CVFTL habitat, were established and censused during the period of May 14 to July 8. Each of the three transects is surveyed once daily, for six days in a row. Running a transect consists of two people walking abreast and agitating any vegetation occurring within five meters of the transect midline. All sightings of CVFTL are recorded, along with any other sightings of reptiles or mammals.

During the 1986 censusing, 44 adult, seven juvenile and nine hatchling CVFTL were sighted. Through personal communications with Dr. Allan Muthit was learned that only ten percent of the CVFTL population is active at **any** one time.

Through his research he has also derived an adjustment factor to be used when determining populations based upon transect data. This factor was used in deriving population estimates for CVFTL on the Refuge. For 1986, the peak population estimate of CVFTL on the Refuge was 2185 individuals.

Historically, some 200 square miles of the Valley and an additional 70 square miles in peripheral areas were covered with loose, windblown sand and served as CVFTL habitat. The range of this species has been reduced by 50 percent, principally due to the loss of habitat associated with agricultural development and urbanization. It is projected that, without some type of restrictions to protect habitat, all the remaining CVFTL range could be lost within 50 years (Figure 1).

FIGURE 1: RATE OF CVFTL HABITAT LOSS



The continued perpetuation of this highly specialized species is dependent upon the continuing renewal of windblown (aeolian) sand. Wind shielding by development stabilizes and eventually prevents renewal of its habitat and results in elimination of the lizard population. Other threats to habitat include off-road vehicles, flood control projects, and invasive exotic plants.

The CVFTL (Uma inornata) is a medium-sized lizard that displays several striking adaptions for living in the severe environment of blowsand ecosystems. These include the species' ability to "swim" through sand, run across the surface at high speed, and dive into the sand to escape predators and heat. Physical characteristics that make this possible are the small, rounded scales on the lizard's skin, the enlarged scales or “fringes" on the toes for which the lizard is named, a wedge-shaped nose, double eye membranes, and a skin flap over the ear to keep sand out.

Taxonomically, the species is related to two other species of Uma, the Colorado fringe toed lizard (U. notata) and the Mojave fringe toed lizard (U. scoparia). Because of their geographic isolation from each other, the three species are functionally separate, even if they occasionally interbreed in captivity. By virtue of its isolation in the Coachella Valley, U. inornata has evolved morphological and behavioral differences from the other two species.

Fringe toed lizards use burrows of other animals and can construct burrows in loose sand, with only minimal adhesive structure, which they apparently use for thermoregulation and for incubating their eggs. The lizard is active when its body temperature is between 26" and 45°C, with a mean of 38°C (100°F). It attains these temperatures by basking on the sand. When the external temperatures are too hot, the lizards spend most of the day underneath the surface and are active only in the early morning and late afternoon. The species hibernates from November to February or March when external temperatures are often below its activity range.

Individual fringe-toed lizards live for about five years. They attain sexual maturity at two years and breed each year thereafter. Multiple clutches of eggs may be laid in one season. Hatchlings appear from late June to early September. It is reported that the amount of winter rainfall can influence reproduction in Uma. In years of low rainfall, winter annual plants may fail to germinate, and do not support the normal insect population on which the CVFTL feeds. In response to a reduced food supply, the reproductive system of the lizards is depressed and fewer young are produced.

Similar to other lizards, CVFTL are omnivorous, but they seem to have a preference for insects over other food items. Predators on CVFTL include snakes, birds, and other lizards (e.g. leopard lizards).

While the taxonomy, sand adaptations, behavior and reproductive physiology are relatively well known, the population biology and ecology of the species has been little studied. Information such as the population density throughout the Valley, population size and reproduction from year to year, movement of individuals, barriers to movement, and contiguity of sub-populations throughout the Valley are conjectured, but not documented. CVFTL may be more abundant on natural blowsand sites where plant density and diversity are greater.

H. PUBLIC USE

1. General

The Preserve receives approximatley 10,000 visitors annually. Most of the visitation occurs from November through April. The majority of the people visit the Palm House, which is owned by TNC and acts as the Preserve headquarters. Other uses are hiking, birding, and photography particularly along the trails located on the north end of the Preserve.

The Refuge, located on the south half of the Preserve, has no hiking trails and relatively low public use. Horse back riding is a popular activity but will probably be restricted to other areas of the Preserve in the future because of damage to fringe-toed lizard habitat. Most of the prime lizard habitat within the 13,000 acre Preserve, is on the Refuge.

17. Law Enforcement

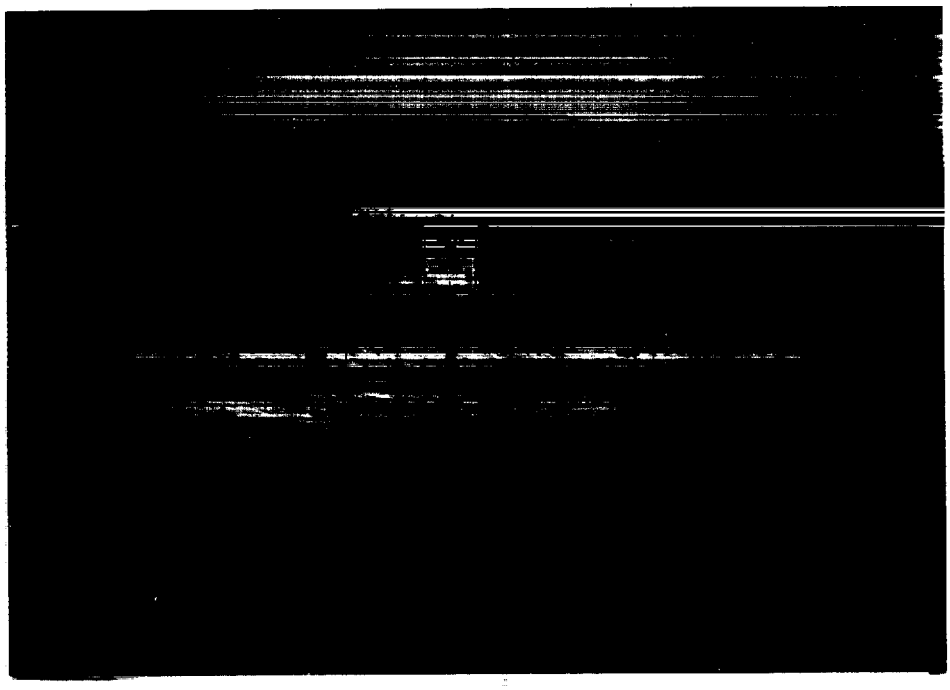
Trespass by off-road vehicles (ORV) is the most serious problem on the Preserve. ORV's directly impact the fringe toed lizard by destroying habitat, and inadvertantly harassing the lizards. A few cases of actual mortality caused by ORV's running over lizards, eggs and burrows has been documented.

ORV damage to fragile dune ecosystem.
86NRCOA-7 TA

The first major law enforcement effort to control ORV use took place Easter weekend when two Refuge Officers from Salton Sea NWR worked with two BLM Rangers. Prior to that effort, TNC with help from BLM and volunteers had installed a three strand barb wire fence along 38th Avenue and Washington Street. The weekend was fairly successful; no violation notices were issued but more than 75 public contacts were made directing ORV use elsewhere. The fence was cut and repaired several times over the weekend and a few ORV's made it on and off the Preserve without being apprehended, but for the first time the public was aware the area was closed to ORV use.

The LE effort over Easter weekend helped reduce the ORV traffic, but some people persisted in using the area. During the remainder of the year BLM issued over 100 federal violation notices and state tickets on the Preserve. Most of the tickets were issued by BLM Rangers because of their broader authority under CFR 43 to inforce laws on all public lands and their state authority granted by CDF&G. BLM also has the lead responsibility for law enforcement on the Preserve and has a Ranger patrolling the area regularly. USFWS works with BLM on all weekends and on an as needed basis.

Between the patrolling, fence repairing and new fence construction, the ORV traffic was reduced considerably by the end of the year.



The fence was cut and repaired many times but persistence paid off and ORV use has declined significantly. 86NRCOA-8 TA

I. EQUIPMENT AND FACILITIES

2. Rehabilitation

In May, the D-7 dozer and front-end loader were transported to the Preserve to remove a saltcedar tree row and two buildings on Nature Conservancy land. The property was later transferred to the USFWS. The project took a week because all of the building material had to be hauled to the local dump due to a county ordinance. The saltcedar trees were buried on site.

5. Communication Systems

A Yaesu hand held programmable ten channel radio was purchased by TNC and given to the USFWS. It will be used for law enforcement activities on Coachella Valley Preserve.

J. OTHER ITEMS

4. Credits

Tom Alexander - A, C, D-2 & 4, E-l & 5, H, I

Bill Henry - D-5, F, G-l

Steve Clay B, E-3 4, G-2

Editing by Gary Kramer

Typing by Shelly Laizure