

QUIVIRA NATIONAL WILDLIFE REFUGE

Stafford, Kansas

ANNUAL NARRATIVE REPORT

Calendar Year 1992

U.S. DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
NATIONAL WILDLIFE REFUGE SYSTEM

REVIEW AND APPROVAL

QUIVIRA NATIONAL WILDLIFE REFUGE

Stafford, Kansas

ANNUAL NARRATIVE REPORT

Calendar Year 1992

Dave Kelly 1/10/94
Refuge Manager Date

D. Henry 1.14.94
Assoc. Manager Date

[Signature] 1/19/94
Regional Office Approval Date

INTRODUCTION

Quivira National Wildlife Refuge is located in Stafford, Reno and Rice counties in south-central Kansas. The establishment of the refuge was approved by the Migratory Bird Conservation Commission on May 3, 1955 and acquisition of the 21,820 acres was completed in 1969. The natural and developed marshes on the refuge provide resting and feeding areas for spring and fall migrating waterfowl and wintering habitat for mallards and Canada geese. Endangered species, other migratory birds, resident wildlife and the public benefit from Quivira's varied habitat.

The area is relatively flat with soils ranging from light sands to clay loam and from neutral to alkaline. Thirty-four refuge water units are filled naturally or by water diverted from Rattlesnake Creek through a system of canals and water control structures. Refuge waters are slightly to moderately saline and are highly productive of small invertebrates, small fish and submergent plants. When all the units are at capacity, the refuge contains over 6,500 surface acres of water.

A winter wheat-milo-fallow rotation is practiced on 1,300 acres by neighboring farmers in a cooperative farming program. The 13,000 acres of rangeland include wet meadows of saltgrass and cordgrass, subirrigated sites with big bluestem, switchgrass, indiangrass and eastern gamagrass, and dry sandy uplands covered with little bluestem, sandlove grass, and sand reedgrass. The trees in numerous shelter belts and old farmstead sites provide additional diversity of habitat. The Santana Research Natural Area has been set aside to maintain a small example of the original prairie that greeted the first pioneers. This 363 acre area contains stabilized sand dunes and 15 acres of century-old cottonwoods originally planted as a timber claim.

Spring and fall are the best seasons to visit Quivira Refuge. Wildlife, especially waterfowl and shorebirds, are at their peak numbers at these times. Hunting and fishing are permitted on 8,000 acres of the refuge in accordance with state seasons.

The combination of habitats at Quivira National Wildlife Refuge make an important contribution toward ecosystem diversity and the well being of our wildlife heritage in Kansas and the Central Flyway.

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K. FEEDBACK

A. HIGHLIGHTS

1. Rains finally came in late spring, breaking the year long drought and adding water to the wetlands. (Section B)
2. Personnel from the National Ecology Research Center continue shorebird research while a Coop Student from Oklahoma State University initiates a new shorebird project. (Section D.5)
3. ROS Dan Schaad transferred to Ouray NWR, Utah and was followed as ROS by Briedi Zinn, from Rainwater Basin WMD, Nebraska. (Section E.1)
4. Asst. Secretary of Interior Mike Hayden and Congressman Pat Roberts visited in October, to present a letter of appreciation to a local landowner for his participation in the Partners for Wildlife program. (Section E.7)
5. Water rights issues take up a lot of time but a cooperative attitude has developed between the Service and local irrigators. (Section F.11)
6. A \$30,000 surveying contract is completed in April to determine the wetland capacity on Quivira for water rights requirements. (Section F.11)
7. A June hail storm destroys 32 endangered least tern nests and kills 5 adult terns. (Section G.2)
8. Rufus-necked stint, a rare Asian sandpiper recorded on the Big Salt Marsh in August, causes a lot of birder interest. (Section G.5)
9. The wetland video for kids, DO YOUR PART, filmed on Quivira, is released and over 2000 copies distributed nationwide. (Section H.2)
10. Lakota Council Boy Scout's "Camporee" attracts 100 scouts and leaders to Quivira. (Section H.7)
11. The first Kansas Junior Duck Stamp Contest is a success with over 400 entries received. (Section H.12)

B. CLIMATIC CONDITIONS

The year started with mild temperatures and above average moisture. The lowest temperature recorded for the year was seven degrees in December and the hottest temperature was 102 in July. There were no below zero temperatures for 1992, which is unusual for Kansas.

Precipitation brought relief to drought conditions experienced in the past year. June received almost 5 inches above the average rainfall and August came in with 2 inches above average. Total precipitation amounted to 31.47 inches of moisture for the year. This is **twice** the precipitation recorded in 1991 and the highest in four years, and over 7.5 inches above the long term average.

Fall weather continued warm and the moisture condition improved. Significant snowfall occurred in November with a total of 9 inches and again in December with a total of 7 inches of snow and ice. Accompanying this snowfall were high winds causing drifting and poor road conditions throughout the area.

Table 1. Weather Data, Quivira NWR, 1992

Month	Precip.	Avg. Precip.	Max. Temp.	Min.Temp.
January	.89"	.57"	69	8
February	.23"	.84"	73	19
March	1.75"	1.40"	80	22
April	.60	2.19"	93	31
May	4.24	3.77"	95	42
June	8.30"	3.67"	98	54
July	2.56"	2.93"	102	59
August	4.82"	2.59"	85	62
September	.69"	2.42"	95	47
October	1.64"	1.80"	87	34
November	4.30"	.93"	73	11
December	1.45	.77"	53	7
Totals	31.47	23.88"		

All figures were recorded at the U.S. Weather Bureau Station, Hudson, Kansas, eight miles west of the refuge.

C. LAND ACQUISITION

1. Fee Title

In July, portions of the Hornbaker FmHA tract, transferred in fee title to the refuge, were mowed and large piles of old automobile tires removed in preparation for a major clean up operation. Clean up efforts started in late summer, continued through October on the tract. A section of Peace Creek flows through the property and had been used by the former landowner as a garbage dump for years. The refuge removed nine car bodies, two combines, a grain bin, machinery parts, and untold trash from the creek, plus other numerous piles of debris from the remainder of the tract. By year's end the area was clean and had been mowed and lightly disced in preparation for spring seeding of native grass.

In November, four low level dikes were constructed on the tract, using the rice dike plow, to impound water that normally runs off the area. These dikes will provide shallow water areas for wildlife.

D. PLANNING

4. Compliance with Environmental and Cultural Resource Mandates

Two Section 7 (Intra-Service) consultations were completed during 1992 for activities on the refuge. Both consultations involved proposals for new oil wells. One by Ainsworth Drilling Co., Colorado Springs, CO to re-enter an abandoned well and one for two wells for Hallwood Energy Companies, Denver, Colorado.

Brad Logan, an archeologist with the University of Kansas, was on station on July 21st to research sites along the Rattlesnake Creek for possible research projects.

5. Research and Investigations

Quivira NR 92 - "Habitat Management and Population Ecology Studies of the Least Tern in Kansas and Oklahoma" - Dr. Roger L. Boyd, Baker University, Baldwin City, Kansas

This was the 13th year of a long term study on the endangered least tern by Dr. Boyd. The study has continued to quantify population density and stability, reproductive success, movements of birds between colonies, the reasons for continued loss of nesting habitat, and the potential for managing habitat for the benefit of the nesting birds.

Under the continuing program, populations are monitored at Quivira NWR and at Salt Plains NWR, Oklahoma and along the Cimarron River in both states.

Because of a lack of funding, Dr. Boyd was unable to do as extensive research as in the past. Dr. Boyd was signed up as a refuge volunteer and we were able to assist with his transportation and some minor costs so the project could continue. Results of this year's program are addressed in Section G.2.

Quivira NR 92 - "Shorebird population surveys and movements" (Official Project Title Undetermined) - Dr. Susan Skagen, USFWS, National Ecology Research Center (NERC), Fort Collins, Colorado

Personnel with the FWS National Ecology Research Center, Fort Collins, CO returned this spring to continue research on shorebird use of Quivira. Their primary objectives are to monitor patterns of habitat availability and use by all shorebirds (plovers, sandpipers and phalaropes), to describe patterns of body condition of migrants and to determine length of stay.

Seven shorebird surveys were conducted in April; shorebird numbers averaged 1,420 and peaked at 2,467 on the 24th. The majority of these were peeps including Baird's sandpipers and semipalmated sandpipers. In addition there were considerable numbers of yellowlegs spp., dowitcher spp., American avocets, Wilson's phalaropes, hudsonian and marbled godwits, and snowy plovers. Five surveys were conducted in May with shorebird numbers averaging 1,838 and peaking at 4,631 on the 13th. NERC personnel completed research in June, conducting two surveys, showing a decrease in shorebird usage with counts averaging 390 and peaking at 562 birds. Species composition consisted of mainly white-rumped sandpipers, avocets, and snowy plovers.

To determine length of stay, microtransmitters were attached on the backs of 24 semipalmated sandpipers and several white-rumped sandpipers. These birds were monitored daily to determine migration chronology.

Quivira NR 92 - Stream-Aquifer and Mineral Intrusion Modeling of the Lower Rattlesnake Creek Basin---The Future of the Quivira National Wildlife Refuge - Marios Sophocleous, Kansas Geological Survey, The University of Kansas, Lawrence, Kansas

This research, began during 1990 and continued during 1992. It was initiated because many areas of western and central Kansas have experienced significant groundwater and stream flow declines, most severely within the last two decades.

According to the Kansas Water Office (KWO), extensive groundwater appropriations in the Big Bend Prairie aquifer have contributed to extreme low flows in the Arkansas River and Rattlesnake Creek (KWO, 1984), the latter of which is the life blood of Quivira NWR.

There is also major concern that the quality of ground and surface waters is deteriorating due primarily to "increased natural non-point mineral intrusion from underlying geologic formations; this increased mineral intrusion is a consequence of freshwater declines in the Quaternary alluvial aquifers of central Kansas."

The specific objectives of the research project are listed below, as they appear in the project proposal and include:

- 1) The present and future outlook for available surface and ground-water supplies to the Quivira National Wildlife Refuge, and strategies to maintain and/or enhance these supplies.
- 2) An analysis of the effects of overall regional appropriations and various patterns on stream base flows and mineral intrusion from underlying geologic formations. This will involve application of a coupled stream aquifer salt-water intrusion numerical model and field monitoring of the saltwater interface.
- 3) The impacts of minimal stream flows (and low flows) on the Quivira wetland.
- 4) Development of an overall mass balance for the Quivira wetland in order to properly interpret its function.
- 5) Determination of protective corridors around the Rattlesnake Creek for consideration for possible water right restrictions in cases of streamflows below established minima, or in cases of drought conditions.

During 1990, two 5-inch, fully screened to bedrock monitoring wells were established within the Rattlesnake Creek watershed. The wells were fitted with monitors to record mineral intrusions resulting from fluctuating aquifer elevations. During 1991-92, refuge personnel monitored the salt water/fresh water interface location on these two wells, which showed fluctuating trends due to seasonal groundwater use. The computer model for the hydrologic budget was developed and tested using data collected and covering different pumping scenarios.

This is a very important research project as it's results could have far reaching implications within this area of Kansas. We are expecting to be involved with this project and associated subjects for a long time into the future. More on this subject is addressed in the water rights (F.11) section.

Quivira NR 92 Effects of burning on shorebird habitat use at Quivira NWR (Exact title not determined) - Kelli L. Stone, Oklahoma State University, Stillwater, OK.

This graduate research project, started in 1992, will test the use of fire to improve or create habitat for shorebirds, especially the smaller sandpipers. Six wetland units (28, 29, 30, 14A, 14B, and 7) were burned in March and April, prior to the shorebird migration. Shorebird use and habitat parameters were monitored throughout the migration to determine fire effect.



Figure 1. Vegetative density sampling following prescribed burning to increase shorebird use on Unit 30. 92-KLS



Figure 2. Shorebird use of newly flooded wetlands following prescribed burns to reduce vegetative cover. 92-DRS

Quivira NR 92 Food habits of Ornate Box Turtles in Central Kansas (Exact title not determined) - Richard Kazmaier, Kansas State University, Manhattan, KS.

Refuge staff assisted in this graduate research project by collecting ornate box turtles to be transported to KSU for food habit studies. Following analysis the turtles were returned to the refuge and released in their original capture site. Food preference, and utilization were analyzed in the lab and a paper is being written for publication.

E. ADMINISTRATION

1. Personnel



Figure 3. Everyone, all cleaned up and ready. Back row: (L-R) Marks, King, Turner, Hall, Schaad, Meggers, McNickle and Hilley. Front Row: (L-R) Malone, Gatton, Brister, Allen, and Stone. 92-JDH

Table 2. Personnel, Quivira NWR, 1992

Name	Title	Apt.	Grade	EOD-Term.
1. J. David Hilley	RefMgr	PFT	GS-11	5/89
2. Vacant	AsstMgr	PFT	GS-09	
3. Daniel R. Schaad	AsstMgr	PFT	GS-07	5/88-10/92
3a. Briedi E. Zinn	AsstMgr	PFT	GS-07	11/92
4. Gary F. Meggers	RngTch	PFT	GS-05	5/85
5. Jan L. Turner	RefClk	PFT	GS-05	6/90
6. Carl D. Marks	MntLdr	PFT	WL-08	7/74
7. Stanley A. King	MntWkr	PFT	WG-07	9/82
8. Henry H. Hall	MntWkr	PPT	WG-07	1/89
9. Jody W. Brister	RngTch	TFT	GS-04	4/92-12/92
10. Byron L. McNickle	RngTch	TFT	GS-05	4/92-12/92
11. Brian K. Marks	BioTch	TFT	GS-04	1/92-6/92
12. Kelli L. Stone	BioTch	TFT	GS-05	4/92-8/92
13. Eric Allen	CoopStd	TFT	GS-04	6/92-11/92
14. Patty Malone	RngTch	TFT	GS-05	6/92-1/93

Brian Marks returned to full time duty in January as a Biological Tech to work on private lands activities. Brian is a Kansas native and works well with landowners. In June, Brian accepted a permanent assistant manager position with the Kansas Department of Wildlife and Parks at Lovewell Reservoir.

Range Tech/firefighter Patty Malone, an Oklahoma native, came on board in June. Eric Allen also came on board in June as an outdoor recreation planner coop student. Eric worked less than 90 days, left to return to school and resigned from the coop program in November.

Kelli Stone, Research Assistant for the National Ecology Research Center shorebird project, during the 1991 season, returned in April. She returned as a graduate coop student to conduct research for Oklahoma State University, centered on shorebirds at Quivira.

In October, Dan Schaad, Refuge Operations Specialist since 1988, accepted the Assistant Manager position for Ouray NWR, Utah. Dan did a good job while at Quivira and will be missed.

Briedi Zinn entered on duty on November 2 to fill the secondary ROS position, vacated by Dan Schaad. Briedi transferred from Rainwater Basin WMD, Kearney, Nebraska.

Table 3. Quivira NWR, Staffing, 1987 - 1992

FTE Year	Permanent		Temp.	YCC	Total
	Full Time	Part Time			
1992	7	1	6	1	10.00
1991	7	1	5	1	10.25
1990	7	1	3	1	9.97
1989	7	0	4	1	9.81
1988	7	0	5	2	10.46

2. Youth Programs

This started out as quite a year with the Youth Conservation Corps (YCC). In April, Amy Allen of Stafford, KS was selected to fill the YCC position. In May, Amy declined the position and so another youth was selected for the job. Andy Black of Lyons, KS was then selected for the position, began work June 1st, but lost interest in the job and quit on the 12th. Todd Gatton of Stafford, KS, who was working as a refuge volunteer, was the next selection for the position and began getting paid for his efforts the 15th of June. Todd was a hard worker and stayed till the end of the program.



Figure 4. YCC enrollee, and former volunteer Todd Gatton (Center), assisted by Firefighter Malone and Coop Student Allen, putting camo covering on the handicapped accessible hunting blind.
92-JLT

3. Other Manpower

This would have been the third year Quivira provided employment sites for individuals hired through the Job Training Partnership Act. The program provides employment for economically disadvantaged youths who work a total of 200 hours at minimum wage. Salaries are paid by the Kansas Job Service and the refuge provides the work site and supervision. Employees were requested in 1992 but due to budget cuts the state was unable to find persons meeting the income and need requirements.

4. Volunteer Programs

In February, the station received 13.5 hours of community service from a court appointed volunteer, as a result of a drug conviction. In April, he received a traffic citation and we received 5 more hours of "volunteer" help. His wife was also convicted and gave us 20 hours as a result.

Todd Gatton, a local high school senior, volunteered to gain experience in preparation for entering college to study wildlife. Todd was later converted to our YCC enrollee. As a volunteer, he constructed several new goose nesting structures and wood duck boxes to be used on the refuge and in the private lands program.

In November, volunteer and Manager's wife, Marty Hilley, conducted a Project WILD workshop for 25 people at Great Bend. The refuge provided materials and support for this program.

5. Funding

Funding for the refuge during the past five years is shown in Table 4.

Table 4. Quivira NWR Funding, FY 88 - FY 92

Account	92	91	90	89	88
1120	10,000	10,000	2,250		
1261	184,900	370,000	197,500	184,000	204,000
1262	185,000	125,000	145,000	104,000	110,000
6860	10,000	10,000	10,000	9,000	9,000
8610	7,200	9,400	8,000	8,000	9,800
1520					
1241/1510				16,000	15,400
9110	1,000	1,000			
9120	57,000	68,500	67,000		
9211	7,000				
TOTALS	462,100	593,900	429,700	321,400	348,200

6. Safety

Safety meetings were held throughout the year on a variety of topics, from winter driving hazards to heat stroke prevention. One accident occurred during the year and resulted in one hour of lost time while going to the doctor. Manager Hilley fractured his thumb while using the joiner in the refuge carpenter shop. While pushing a piece of wood through the joiner, the blade hit a knot causing the wood to jump back and strike the end of Hilley's thumb. Not only did it hurt like hell but he had to put up with a lot of ribbing from the crew that was even more painful.

Employees Marks, Hall, King, and Meggers completed hearing tests in January to establish baseline data to determine any future hearing loss.

Step tests were administered to all permanent staff involved in fire activities. Everyone huffed and puffed but we passed.

The salt content of the refuge drinking water continued to be high throughout the year. Bottled water was provided at headquarters and the shop for personnel and visitors. Two distiller units were installed in the refuge residences to provide adequate drinking water for the refuge families.



Figure 5. In May, the refuge hosted two one-day all-terrain vehicle rider courses, in conjunction with the SCS. The SCS provided instructor, certified two refuge and seven SCS employees.

92-BKM

7. Technical Assistance

The refuge talked with hundreds of landowners concerning wildlife extension agreements throughout the year. A lot of the landowners in central and western Kansas did not qualify because of soil types or they wanted something other than what our program provides. If we had been building "fish ponds" we would have been in business.

A total of 68 acres of wetlands were restored or enhanced during 1992 with WEA's. Nine more agreements were signed at years end, awaiting a contractor to complete the dirt work to restore another 60-70 wetland acres. In addition to the wetlands work, a total of 60 wood duck and goose nesting structures were given to private individuals, plus dozens of bluebird boxes.

In March, Bio Tech Brian Marks travelled to South Dakota for wetland training and an interagency meeting regarding private lands. In September, Quivira hosted a meeting with Kansas Wildlife and Parks concerning mutual concerns for the private lands program. In November, Associate Manager Dale Henry visited the refuge for a private lands meeting with the State.

Manager Hilley and MWL Marks attended a dedication ceremony in Wichita for the new "WILDLIFE PARTNERS" calendar. The calendar featured the artwork of M. Wayne Willis, a nationally known wildlife artist from Kansas. The calendar was developed through the North American Waterfowl Management Plan office and will be given to private landowners that participate in the Partners for Wildlife program. Assistant Secretary of the Interior Mike Hayden and Deputy Director Dick Smith were in attendance at the dedication.

The following day, Manager Hilley attended the dedication at Dodge City for the Wild Turkey Playa, the first playa lake purchased by KS Wildlife and Parks as part of the Playa Lake Joint Venture. Assistant Secretary Hayden, Deputy Director Smith and Regional Director Morgenweck were in attendance.

In October, a ceremony was held to present a letter of appreciation to Leon and Sherry Miller, local landowners who have participated in the Partners for Wildlife program. The Millers have developed a wetland along Peace Creek, adjacent to Quivira. Congressman Pat Roberts was the presenter of the letter. The ceremony was coordinated by Assistant Secretary of Interior Mike Hayden to familiarize Congressman Roberts with the Partners for Wildlife program. A tour of Quivira followed the ceremony.



Figure 7. Approx. 40 people attended the dedication ceremony at the Miller Farm. (L-R) 1/2 of D. Wiseman, Manager Flint Hills NWR, B. Gill, FWE, G. Meggers, Quivira, L. Miller, S. Miller, Landowners, Congressman Roberts, Sec. Hayden, C. Marks, Quivira, J. Turner, Quivira, B. Schoonover, Manager Kirwin NWR. 92-KSW&P



Figure 8. Assistant Secretary of the Interior Mike Hayden presented Congressman Pat Roberts with a duck stamp print at the Partners for Wildlife ceremony. 92-JLT

8. Other

Manager Hilley travelled to Manhattan, KS on the 25th of April for the coordination meeting with the KS Dept. of Wildlife and Parks. Ty Berry and Rick Dornfeld also attended along with other KS refuge personnel.

RM Hilley travelled to Manhattan, KS on the 16th of April to attend the dedication of the new Kansas Cooperative Wildlife Research Unit. Assistant Secretary Mike Hayden, Director John Turner, Region 6 and Region 8 RDs and State personnel were in attendance.

F. HABITAT MANAGEMENT

1. General

The year 1991 was a very tough one for Quivira, with Rattlesnake Creek going completely dry in August. In 1992, the year again started with dry conditions but in June things took a turn for the better. In April, moisture was 1.5 inches below normal but by July, it was over 4 inches above the long term average. We were able to start water diversions and by early fall, all wetlands were full. Rangeland conditions improved with the moisture and produced a good seed crop. Cropland conditions were variable to say the least. The winter wheat crop was good but rains at harvest time made it hard to get to the grain. Spring planted milo was almost impossible to harvest due to the rains, much to the delight of the Canada goose flock.

2. Wetlands

In April, the first water diversion was made since June, 1991, and then mainly due to a shorebird research project and not an abundance of moisture. By mid summer precipitation improved and so did the wetlands. Water diversions from Rattlesnake Creek totalled approximately 5336.4 acre feet, and this along with direct precipitation and groundwater recharge filled the refuge wetlands by fall.



Figure 9. Aerial view of the Little Salt Marsh in August, 1992. In 1991, wheat was planted in the marsh bottom to reduce wind erosion, so this is a beautiful sight for the refuge staff, visitors and the birds. 92-JDH



Figure 10. Aerial view of the "10 Units", showing the smaller refuge wetlands with good water conditions. All were dry in 1991. 92-JDH

Manager Hilley, ROS Schaad, and Range Tech Meggers flew over the refuge on August 7th to observe wetland conditions, take aerial photos, and look for illegal water diversions along the Rattlesnake Creek. Two unauthorized pumping operations were discovered during the flight. The parties involved were contacted through the Kansas Department of Water Resources and asked to remove their equipment.

Water quality samples were continued by the refuge staff, twice a month at five points on Quivira throughout the year. This is part of a Service-wide effort to provide baseline data as mandated by Congress to establish water quality standards for wildlife. The testing may also help to identify possible contamination problems.

4. Croplands

Four refuge cooperators continued to farm 1181.1 acres on the refuge during 1992. Of this total, 439.5 acres were in winter wheat, 287.3 acres were in milo (grain sorghum) and 393.2 acres were scheduled to be summer fallowed. Because the refuge is pesticide free on all croplands, we have had problems with cooperators not undercutting or working their summer fallow and letting the weeds go to seed, creating problems for the next year. To alleviate this problem we now require the cooperators to work the summer fallow. We have also added cowpeas to the rotation to help crowd out some of the weeds and to enrich the soil.

During 1992, 43.6 acres of the summer fallow ground was to be planted to cow peas to overwinter as wildlife food. However, due to heavy rains and poor planting conditions, no planting was accomplished. In the spring, 59.3 acres were planted to cowpeas with the peas turned under in the fall for green manure, prior to winter wheat planting.

Initially, (in May) the winter wheat harvest appeared as though it might be two to three weeks early this year. However, with the cool, wet weather, harvest finally took place in late June.

The wheat harvest was fair to good (35-40 bushels/acre), due to adequate moisture early in the year. Whereas in 1991, we were dealing with drought conditions, this year we experienced just the opposite, almost too much moisture. Crops, such as milo, that were seeded in the spring did much better than last year. All but one crop was harvested this year, and that was due to the wet conditions and not being able to access the fields.

In addition to the farming done by cooperators, for the second year, the refuge force account farmed land south of headquarters that had been former cropland. There were 36.4 acres planted to native grass and 52.6 acres of sudan grass planted for a cover crop for grass rehabilitation. This area had been retired from the farming program and allowed to "go back" to grass. Unfortunately, annual weeds had taken over the area and since it was adjacent to headquarters and viewed by the public, we decided to seed it to a good mix of native grass. To reduce the weed competition, the area was disced and seeded to sudan grass in 1992 to prepare for the native grass seeding next spring. Also south of headquarters we planted a half acre to Lespedeza in the spring as an experimental crop. The planting was a "success" and produced a good stand of grass.

Six small strips of cropland (26.7 acres) south of the Bunkhouse were removed from the cooperative farming program and force account planted to experimental crops. This allows the testing of different crops for the refuge soil and climate, prior to putting them in the program. The crops planted in 1992 were varieties of sudan, cowpeas, millet, and lespedeza.

5. Grasslands

Native grasslands make up the largest habitat type on Quivira, consisting of over 13,000 acres. Cattle grazing, rest and prescribed burning are the major management tools used on the refuge grasslands.

B & W Seed, Stafford, KS, under a Special Use Permit, began native grass seed harvesting operations in September and continued through October. The refuge share, 1/3, cleaned and bagged, is used to re-seed some of the old "go back" crop fields. This share of the seed crop was welcomed this year due to the loss we took in 1991 when the harvesters had to go elsewhere for seed, leaving us with little or nothing for re-seeding.

In November, over 50 acres of sandhill plums were mowed in the refuge grasslands to reduce competition. The mowed areas are rested from grazing to allow the grass to grow in the cut plum thickets. This grass, plus the duff from the mowing operation, provides fuel within the thicket to allow the use of prescribed fires to further reduce the invading plums.



Figure 11. Native grass seed being harvested by a local seed company under a Special Use Permit. Harvest provides seed for future grassland improvements. 92-JDH

6. Other Habitats

Throughout January, tree planting efforts continued west and north of the shop building using the regional tree spade. By March, the job was completed with 276 trees planted around the shop and headquarters area. The trees will visually screen off the shop area from the planned visitor center. The resident deer herd is finding the area attractive as well.

Figure 12. The regional tree spade in action. It sure beats a shovel. 92-BKM



Figure 13. Newly planted evergreens will provide visual screening of the shop when the new visitor's center is constructed. 92-BKM



7. Grazing

Cattle grazing was used again in 1992 as the primary management tool as we continued with a high intensity, short duration, rotation strategy. This was the seventh year in which we have practiced this strategy which appears to be working well. Before this system was implemented, most areas on the refuge were either "understocked and overgrazed", or over rested. In the past, relatively small numbers of livestock were placed in large areas for a period of five to six months during the growing season, and basically forgotten about, until it was time to remove the cattle from the refuge during the winter. This resulted in severe overgrazing of some plants and under utilization of others. Invading trees and brush were able to encroach as a result of this type of grazing, along with very little prescribed burning.

The last several years have involved intensive facility development to provide a means to better manage the time that the grasslands are exposed to the cattle. Most development has been directed toward building single strand electric fences within large units to subdivide them into smaller more manageable areas; one unit in particular has been divided into as many as 32 paddocks.

Most important for the grazing program has been the establishment of strategic watering facilities for the cattle to allow better distribution. Windmills and cased wells with electric submersible pumps have been developed to spread out the grazing pressure. All windmill facilities are equipped with shallow overflow areas to provide water for wildlife. Four windmills in different areas of the refuge were "winterized" this year, so that wildlife will be provided with water year round.

Upon completion of the developments, the plan is to graze approximately half of the area in each grassland management unit in a given year; the remaining areas being rested to provide high quality cover for resident wildlife and ground nesting birds. The rested areas will also serve as a safeguard, should extreme conditions such as fire or drought occur, which would require changing of a grazing program in process. Eventually, each grassland management unit in a given year will have a high degree of diversity, as there will be many paddocks present which differ in growth due to different amounts of rest and grazing.

Special Use Permits are issued annually to current grazing permittees, if they desire to continue grazing cattle on the refuge. We issue the permits annually because it keeps the authority within our arena, and seems to help keep the permittees cooperative.

Special permits were issued to seven grazing permittees to bring cattle onto the refuge in 1992, for the grazing season from May 1 through October 1. Cattle were moved by the permittees on an average of 3 to 6 days. The grazing fee for 1992 was \$9.30/Animal Unit Month (AUM); although we continued offering economic incentives to the permittees, by reducing the costs per AUM, if they were successful in moving the cattle as scheduled. Total grazing fees for the program during 1992 were \$32,416.63. Table 5 summarizes the 1992 grazing program.

In May, 1991, Soil Conservation Service personnel began a range condition and trend survey on the refuge grazing units. This survey will be compared to a similar survey conducted prior to the start of the present high intensity/short duration grazing program. By years end, 1992, SCS was still working on the report, analyzing data.

Table 5. Quivira NWR Grazing Program, 1992

Permittee		Grazing Period	Livestock # & Class	AUMs	Acres Grazed	AUMs/ acre
Hamilton		5/01-10/1	140 C/c	875	2088	.42
Hildebrand		5/01-10/1	52 C/c	325	795	.41
Hornbaker		5/01-10/1	35 C/c	218	560	.39
McMurphy		5/01-10/1	85 C/c	531	1086	.49
Miller		5/01-10/1	140 C/c	875	1492	.59
Schweizer	B	5/01-10/1	45 C/c	281	1323	.21
	G	5/01-10/1	140 C/c	875	1939	.45
Turner		4/21-9/21	90 C/c	562	2365	.24
Total			727 C/c	4,556	11,648	.40avg.

* C - Cow, C/c - Cow with calf, Y - Yearling

We occasionally receive complaints from the general public concerning the grasslands, such as the refuge is hard to hunt because the grass is too tall and thick, or we are creating a tremendous fire hazard by producing grass which is waist high or taller in many areas. However, for all things considered, these are acceptable tradeoffs which we are willing to contend with for the benefits received.



Figure 14. Properly controlled and timed cattle grazing has proven to be an effective tool for managing the refuge grasslands to provide maximum habitat diversity. 92-DRS

9. Fire Management

In 1992, we were only able to burn 2321 acres of the 3335 acre total for which we had approved prescribe burn plans. Typically, most of the prescriptions call for burning during the springtime, so that the bare areas which are created by the fires, may revegetate quickly. As always the spring weather failed to cooperate and several burns were not completed. In 1992, we did not submit any new plans for prescribed burns, instead hoping to finish the burns remaining from the previous year.

In March a prescribed burn was conducted in the Santana Research Natural Area and Water Units 28, 29, and 30. A total of 1320 acres was treated, with approximately 80% being burned. These water units were study sites for research being conducted by Coop Student Kelli Stone. The study examined the effects of burning on migrating shorebirds, primarily small sandpipers (See Section D-5). Burn coverage in Unit 29 was excellent (95-100%), while fair in Units 28 (75%) and 30 (80%). Regional Fire Ecologist Keith Blair was on the station to assist with operations and help Kelli collect fire data.

Two prescribed burns were conducted during the month of April. The Unit 14/20 burn totalled 801 acres and the Unit 7 burn covered 200 acres. Burn objectives were almost fully accomplished in the Unit 14/20 burn and partially accomplished in the Unit 7 burn. Water Units 7, 14A, and 14B are also study sites for the shorebird research.

A two acre wildfire caused by lightning occurred east of Unit 20B on June 27th. This was the only wildfire that occurred on the refuge in 1992. It was extinguished by the rain following the lightning.



Figure 15. Part of the firefront on the Unit 14B prescribed burn. The unit was burned to study the effects of fire on shorebird habitat use.

92-KLS



Figure 16. Regional Fire Ecologist Keith Blair assisted with the prescribed burns and with fire data collection in support of the shorebird research project. 92-KLS

10. Pest Control

Pesticide reduction and eventual elimination remains a long standing goal at Quivira and each year we get a little closer to that goal. A total of 11 pounds of pesticide were applied to grassland areas in 1992: 9lbs. of Weedone, applied to control field bindweed and 2 lbs. of Weedpro (2-4-D) applied to control tall whitetop (hoary cress).

Cooperative farmers are not allowed to use pesticides while farming on the refuge, unless they request in writing, and those requests must be approved at the Regional Office level. Cooperative farmers have not submitted any requests for pesticides in several years. Crop rotations and mechanical treatments have proven successful in most situations to control pest species.

11. Water Rights

The main source of water for Quivira is Rattlesnake Creek, which flows into the refuge on the southwest corner. Since the early 1970's, irrigation development within the watershed has increased and the resulting depletion of groundwater has affected the surface flow of the creek. The refuge has a 22,000 acre feet water right on the creek and we have informed the state of our intention to protect that right.

The Service has undertaken a research project with Kansas Geological Survey to determine the impact of irrigation on the creek flows and to develop a water model. (See Section D-5)

Cheyenne Bottoms a state wildlife area 35 miles north of Quivira is experiencing the same problem with irrigation development and reduced flows in Wet Walnut Creek. This controversy has created a lot of media coverage and has made the irrigators along Rattlesnake Creek very nervous. The irrigators have formed a group called the "Water Protection Association of Central Kansas" or "Water PACK". Manager Hilley has met with the Board of Directors and members of Water PACK several times to discuss problems and to try and stop rumors before it is too late. A good working relationship has developed and hopefully this will keep everyone working toward a solution instead of preparing for a fight and not talking.

In February, Cheryl Willis, Meg Estep-Johnson, Bob Green, Dave Schmitt and Manager Hilley attended a tour organized by Water PACK. Thirty-five individuals including members of the media, FWS and Water PACK toured the Rattlesnake Creek Basin and Quivira NWR. Later that day these individuals attended the annual Water Pack meeting in Pratt, KS along with 450 farmers and irrigators. Chief Engineer David Pope, Division of Water Resources, was present to explain his recent ruling to cut water usage for farmers along the Walnut Creek drainage to protect Cheyenne Bottoms WA. This is the first time in state history, water has been taken away from agricultural interests, in order to benefit wildlife.

Professional Engineering Consultants, Wichita, KS completed a \$30,000 contracted survey to develop capacity information on refuge wetlands on April 1st. This survey was conducted in preparation for possible water rights conflicts in the future.



Figure 17. Personnel from Professional Engineering Consultants, Wichita, KS surveyed the refuge wetlands to determine capacity data. Almost immediately after they finished, the rains started and filled most of the areas they were surveying.

92-BKM

Cheryl Williss, Bob Green, Dave Schmitt, Jana Mohrman, and Meg Estep-Johston were on station the 13th and 14th of April. A meeting with the Kansas Geological Survey was held to discuss the past year's accomplishments and 1992's scope of work on the stream-aquifer and mineral intrusion modeling of the lower Rattlesnake Creek. Members of Big Bend Ground Water Management District #5 and Water PACK were also present and participated in the discussion.

In December, Bruce Faulk, KS Department of Water Resources was given a refuge tour and shown our water management procedures. Bruce has been working on the Quivira water rights problems.

12. Wilderness and Special Areas

Portions of the Santana Research Natural Area were grazed again during 1992 as part of the refuge grassland management plan. Upon acquisition of the refuge, the 362 acre area was set aside to serve as an example of the original prairie that was present when the pioneers first arrived in this area of Kansas. The prairie remnant contains stabilized sand dunes and 15 acres of century old cottonwoods originally planted as a timber claim.

Years of absolute non-use have resulted in an invasion of brush species; the most common plant being sandhill plum. Through prescribed fire and controlled grazing the refuge is now attempting to restore this area to it's original condition. Results have been slow but are encouraging, as it appears that a greater density of native grasses are taking hold.

G. Wildlife

1. Wildlife Diversity

Quivira National Wildlife Refuge lies in the transition zone of eastern and western vegetation types, providing diverse habitat for a variety of wildlife. Some 252 species of birds, characteristic of both eastern and western North America, are known to use the refuge, along with 36 mammal and 57 reptile and amphibian species.

2. Endangered and Threatened Species

The wetlands and adjacent tall grass prairie of Quivira provide food and habitat for five endangered species including the whooping crane, interior least tern, bald eagle, peregrine falcon and piping plover. The entire refuge has been designated critical habitat for the endangered whooping crane.

Whooping cranes began to arrive for their spring migration in April again this year. On April 10th, two adults were spotted on the Little Salt Marsh. Later that day, a group of ten adults was observed on the flats north of the Big Salt Marsh. The third sighting occurred on the 25th when six adults were sighted on the LSM, giving us a total of 18 cranes. None of these birds were banded.

The first whooping crane sighting of the fall migration was made on October 23, when 4 adults and one juvenile were spotted on the west side of the Big Salt Marsh. On October 26, two adults were observed again on the BSM, whether these were the same or additional cranes, we were not able to determine.

Surveys to determine the presence of the federally endangered American Burying Beetles (Nicrophorous americanus), on Quivira was conducted in July and August. These surveys were conducted at the request of FWE, Manhattan, KS. There were no American Burying Beetles captured during this sampling period, however, the baited pitfall traps were effective in capturing other members of this genus (N. marginatus and N. tomentosus.)



Figure 18. One of the pit fall traps used to survey for the endangered American Burying Beetle on Quivira. 92-KLS

Dr. Roger Boyd, Baker University, Baldwin City, KS completed monitoring least tern production under a Volunteer Service Agreement, after he lost portions of his funding to continue the long term research. There were a total of 34 pairs nesting on Quivira in 1992 with 56 nests located during the study. This tied with 1990 as the highest number of breeding pairs recorded since the study began in 1980. Throughout the season all of the nests were located within the electric predator exclusion fence and all but one used the raised nesting pads or a modified oil well site.

On June 22, Boyd documented 32 active nests with one recently hatched. On the afternoon of June 25, a severe hailstorm traveled across the nesting area. It destroyed the 32 tern nests and 44 snowy plover nests, which were also using the nesting pads. Following the storm, 10 snowy plovers and 5 least tern adults were found dead. Renesting attempts were started by 16 pairs and all but one hatched at least one egg. Additional storms moved through the area in July and only one chick was known to have survived to fledge. This was down from 38 chicks fledged in 1991.

Quivira continues to be an important wintering area for bald eagles in Kansas. The first bald eagle sighting, an immature, for the fall was recorded on October 27 at 1:32 p.m. This sighting determined the winners to our "Bald Eagle Contest" where local school children guess the date and time for the return of the bald eagles to Quivira. The winners are awarded prizes donated by a local businessman and the contest is jointly sponsored by the Stafford Pride Committee and the refuge.

As the waterfowl numbers increased, so did the numbers of bald eagles using the refuge. Seven eagles, 5 immature and 2 adults, were feeding on the "slow ducks" in the November survey. The December eagle survey counted 9 bald eagles, 7 adults and 2 immature.

Peregrine falcons were spotted on the refuge several times throughout the year. Two peregrine falcons were sighted on Oct. 6 on the Little Salt Marsh and another was sighted on the 31st along the Wildlife Drive.

Piping plovers were observed on the refuge during both the spring and fall migrations.

Currently, the Arkansas Darter is listed as threatened in Kansas, and is listed as a category two candidate species and is under review for possible federal protection. This species was discovered in several bubbling springs on Quivira in 1991. These springs were checked again in 1992, following the heavy rains and runoff and the Darters appear to be thriving.

3. Waterfowl

The year started with mild weather and above average precipitation. During the mid-winter waterfowl survey in January, 2500 ducks and 7300 Canada geese were using the refuge. In January 1991, only 85 Canada geese and no ducks were present due to bad water conditions! Warmer weather in February brought in 9,800 ducks, mostly mallards, pintails, and green-winged teal, as well as 5500 geese. Waterfowl numbers began to drop in March as the birds didn't like the marsh conditions on Quivira and continued north.

In March, refuge staff participated in the Coordinated Annual Mid-continent White-fronted Goose Survey. A total of 37 white-fronts was counted on the survey; the peak of the spring migration occurred on February 18th with 1,392 birds.

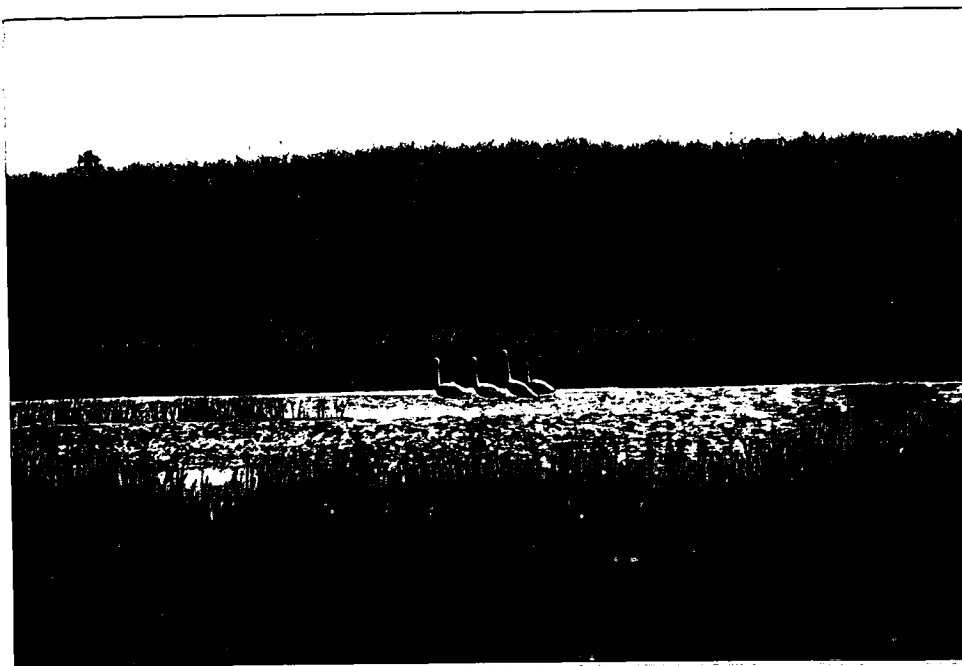


Figure 19. Four tundra swans were observed on the 4th of March. The swans continued to use the Big Salt Marsh until the 27th. Their close proximity to the Wildlife Drive provided some excellent viewing opportunities. 92-DRS

On November 3rd, a white-winged scoter was observed on the Little Salt Marsh. This was the first time this species has been recorded on Quivira.

The resident Canada goose flock continues to grow and 1992 was a good year for goose production. Part of the reason for the production is that the refuge increased the number of artificial nesting structures and the geese have readily accepted them.

Fall migration began early with 12,120 ducks counted in September, up considerably from the 5300 counted Sept. 10 in 1991. The first white-fronts arrived in the area the end of September. This year the fall migrants found water where last year there was none. Both on Quivira and on the nearby Cheyenne Bottoms State Wildlife Area there was an abundance of water. By November, over 100,000 ducks and 15,000 geese were using the refuge, compared to 6500 ducks and 5200 geese at that same time in 1991.

Normal annual rainfall averages 23.88 inches and by the end of November our precipitation total was 35.78 inches. Improved conditions inevitably had a great impact on the migrants this year, in our area and north of us. By December, most migrants had moved south, with a count of 12,000 ducks and 11,450 geese on the refuge. By the time of the December survey, 85-90% of the refuge's water was frozen.

4. Marsh and Water Birds

The first sandhill cranes showed up early in February and numbers peaked March 14th, with 25,000 counted on the refuge. The coordinated Annual Spring Sandhill Crane Survey was conducted on March 24 and found only 309 cranes still on the refuge. This was considerably different from 1991, when only 12,250 cranes staged at Quivira, waiting for better weather further north.

The first sandhill crane of the fall migration arrived on September 28 and found much better conditions compared to that of 1991. By November, 40,000 sandhills were using the refuge, quite a difference from the 5300 cranes counted in 1991.

King, sora and Virginia rails are frequently observed at Quivira during the summer. The elusive black rail continues to attract numerous birders to the Big Salt Marsh area. People using recorded black rail calls had the best luck in spotting the rails.

White-faced ibis were commonly seen during the summer particularly on the Big Salt Marsh. Birds were seen carrying nesting materials but no nests were confirmed.

Great blue and little blue herons, great, snowy, and cattle egrets, pied-billed and eared grebes, and double-crested cormorants are commonly observed. Western grebes were observed on the Big Salt Marsh in September.



Figure 20. Part of the 40,000 sandhill cranes that used Quivira during the fall of 1992. 92-JDH



Figure 21. Heavy rains in June/July sent water and small fish over the LSM spillway, making easy pickings for the snowy and cattle egrets. 92-DRS

5. Shorebirds, Gulls, Terns and Allied Species

Quivira has a diverse shorebird population, with up to 33 species recorded using the refuge. The more common shorebirds at Quivira include American avocets, Wilson's phalaropes, dowitchers, yellowlegs, snowy and semipalmated plovers, and Baird's, western and white-rumped sandpipers.

The first peeps of the year arrived on March 19 on the north flats. Shorebird researchers on the refuge conducted seven surveys in April with a peak counted of 2,467 birds. Five surveys were conducted in May with a 4,631 peak on the 13th. In June, two surveys recorded a peak of 562 birds as the migration was winding down. The researchers did not cover the entire refuge and all water units, so these counts are probably 25% or greater off for the total population of shorebirds using the refuge.

High water conditions in the Big Salt Marsh area flooded avocet, black-necked stilt, snowy plover, and least tern nests along the north flats early in June.

In August, FWS personnel conducted three shorebird surveys and numbers averaged 1,222 and reached a peak of 1,197 on the 29th. Greater and lesser yellowlegs were the predominate species present early in the month and shifted to semipalmated and least sandpipers later.

The highest shorebird count of the fall migration occurred on September 30th with a total of 2,565 birds counted. Species included yellowlegs spp., dowitcher spp., least and semipalmated sandpipers, snowy plovers, and black-bellied plovers.

Species composition differs between fall and spring migrations. Western sandpipers occur only in the fall, whereas white-rumped sandpipers occur only in the spring. Semipalmated sandpipers were more common in spring than fall, and least sandpipers more common in fall than spring. Buff-breasted sandpipers and pectoral sandpipers stop at Quivira in the fall.

A rufous-necked stint was observed north of the Big Salt Marsh on August 1st. This Asian sandpiper typically nests in Siberia and winters in Malaysia. There have only been 10 sightings of this species in the lower 48 states, and the Quivira sighting is the first for Kansas.

6. Raptors

Red-tailed hawks, northern harriers and great horned owls are present year around. Screech owls are commonly heard but rarely seen. Sharp-shinned hawks are frequently observed preying upon songbirds at headquarters and residence feeding stations throughout the winter. For the fifth consecutive winter, a dark-phased red-tailed hawk was present near the refuge headquarters. Ospreys and golden eagles are occasional visitors. Bird watchers spotted a golden eagle west of refuge HQ on January 3rd. An osprey was spotted on the Big Salt Marsh in September. Burrowing owls were recorded at both refuge prairie dog towns, and long-eared owls were observed several times by birders on the refuge.

Mississippi kites are summer residents and occasionally nest on the refuge. A fairly large number of Mississippi kites nest in large cottonwood trees in the nearby community of Stafford, Kansas, providing good viewing opportunities for the public.

7. Other Migratory Birds

Mourning doves are common during the summer and visible in large groups along refuge roads and field edges. No surveys were conducted to determine production or population levels.

Black-billed magpies are occasionally seen on the refuge. They have been known to nest here but no known nesting occurred this year.

On the 18th of December, Quivira hosted the Audubon Society's Christmas Bird Count. We had twelve participants from around the state that recorded 86 species totalling 25,418 individuals. This count was up considerably from last year's totals of 58 species and only 6,707 individuals. Also noted was the Sandhill Crane population, this year over 2600 cranes were reported whereas in 1991, no cranes were reported.

Thousands of red-winged and yellow-headed blackbirds use the refuge each fall. These birds roost in dense cattail areas in refuge water units. Each morning they fly off to feed in adjacent milo fields. Milo has normally been harvested by the time blackbirds numbers peak but in 1992, wet weather delayed the milo harvest and some damage occurred. No serious depredation complaints were received but several people mentioned "our birds" eating their grain.

8. Game Animals

White-tailed deer are seen frequently on the refuge. Mule deer use the refuge but are not as common as whitetails. Although not hunted on Quivira, the deer do wander on and off the refuge and thus provide good hunting opportunities on private land adjacent to the refuge.

Spotlight surveys initiated in 1989 in an effort to monitor the refuge deer population were continued through 1992. Normally, four surveys were conducted before, during and after the Kansas regular firearms season. This year, however, most surveys had to be canceled due to bad weather. On November 23rd, a total of 71 deer (11 males, 60 females) were observed from two survey vehicles. These numbers are down from previous years, but the tall vegetation, resulting from the increased precipitation, made it difficult to see the animals.

Cottontail rabbits and fox squirrels are the only legal game mammals at Quivira. Both are usually hunted incidental to upland bird hunting, in accordance with state regulations.

10. Other Resident Wildlife

The refuge is home to many species of small mammals, birds, reptiles and amphibians. Coyotes, raccoons, striped skunks and opossums are common. Badgers and bobcats are occasionally seen.

Ring-necked pheasant and bobwhite quail are common on the refuge. There is a lot of interest in these species because they are legal game on the refuge. Pheasant and quail numbers were down for the entire state due in part to the cool, wet weather during the nesting season as well as the severe hailstorm experienced in June.

Prairie chickens have been heard booming north of the refuge but a lek site has not been located on Quivira.



Figure 22. This raccoon frequented the refuge headquarters bird feeder throughout the spring, much to the dismay of the local birds.
92-JDH

Quivira has two prairie dog towns that draw a lot of visitor attention. In the winter of 1989-1990, the southern town died out for some unknown reason. No dogs appeared in the spring. Because of the popularity of this site to visitors, prairie dogs were live trapped on private land and from the remaining dog town and reintroduced to this site. In 1992, this town continued to prosper as young dogs were much in evidence and the public was happy once again.

11. Fisheries Resources

Drought conditions in 1991 resulted in a complete fish kill for all refuge units. In 1991, the Creek also dried up and compounded the problem since fish had no deep pockets along the Creek into which they could retreat.

Some fish must have found a little shelter, because when the rains returned, so did the fish. Not far behind were the white pelicans, grebes, herons and egrets looking for a meal. The returning fish also relieved some of our worries about having adequate food resources for the endangered least terns.

15. Animal Control

In the past, beavers have created problems with water management on the refuge by chewing flash boards and plugging up water control structures. The 1991 drought sent most of the beaver elsewhere, so with the return of water, we were happy to have them back. As long as they behave around our water control structures, they are more than welcome.

17. Disease Control

In late February, a coyote carcass was sent to the Veterinary Diagnostic Lab in Manhattan, KS to be analyzed for rabies. The coyote was found in a weakened/disoriented condition and was dispatched near refuge headquarters. Results received late in the month were negative for rabies.

H. Public Use

1. General

Over 500,000 people are located within a 1 1/2 hour drive of Quivira. The refuge receives a lot of visitors but they seldom stop at headquarters because the building is inadequate and doesn't have space for exhibits or displays.

Senator Robert Dole, after conferring with refuge staff, provided a cure by successfully obtaining a \$800,000 congressional add-on, in 1991, for development of facilities on Quivira. Of this money, \$200,000 was to be used to improve the water management capabilities on the refuge. The remaining \$600,000 to be used to provide more public use facilities. New facilities planned include an office addition to house wildlife interpretive exhibits and a public meeting room.

Designs were developed for the Headquarters Addition, by Regional Office Engineering, and a bid solicitation was issued in 1992. Unfortunately all of the bids were unacceptable and no contractor could be found. Contracting will try again in 1993 to find a successful bidder.

During 1992, 31 states and two foreign countries were represented by those signing the guest register at headquarters. Visitation increased with the influx of water in the refuge marshes. Actual visitation is unknown but was estimated at 15-20,000 people for the year.

2. Outdoor Classroom - Students

Quivira provides a diversity of wildlife and habitats, making it an ideal site for environmental education.

In January, Manager Hilley attended a meeting in Wichita, KS concerning the Wichita National Environmental Center. In attendance were Regional Office personnel Darrell Mahlik, Bill Godby, Ray Rauch, Frank Bryce and representatives from Kansas Wildlife and Parks and the City of Wichita. The facility, to be located adjacent to the Chisholm Creek City Park, will be the center for environmental education for the three agencies in the Wichita area. The Center is the result of a cooperative partnership between the agencies. The land and building will be constructed by the FWS, with congressional add-on funds, provided through the help of Senator Bob Dole. The State will provide \$1 million for exhibits and interior fixtures and the City will provide \$500,000 for landscaping and modifications to the park.

This is a unique endeavor and will provide more opportunities than for any agency alone. FWS personnel at the Center will be supervised from Quivira, 78 miles away. During 1991, the Service purchased land for the Center and during 1992, design efforts were initiated.

On October 14, to kick off the annual "Bald Eagle Contest", the 6th grade classes from Stafford visited the refuge for a field day. Project WILD activities were conducted, bald eagle videos were viewed and the students conducted wetland studies, nature walks, and discussions. The activity will be an annual event for Stafford 6th graders in the future.

The final footage for the kid's wetland video, DO YOUR PART, was shot in February on Quivira, by Gene Brehm, KS Wildlife and Parks. The video was released in early summer and has been very successful. Over 2000 copies were distributed to educators throughout the nation.



Figure 23. The return of water to the wetlands encouraged teachers to use the refuge for environmental education. Dan Schaad works with a group from St. John/Hudson along the shore of the Big Salt Marsh.
92-BKM



Figure 24. Students from Stafford participate in a "Habitat Lap Sit", a Project WILD activity as part of their Eagle Day activities.
92-DRS



Figure 25. Wetland studies, with the aid of the "Discovery Scopes" were a highlight of the Stafford 6th graders "Eagle Day".
92-DRS

5. Interpretive Tour Routes

The refuge maintains a 5 1/2 mile auto tour route around the Big Salt Marsh on the north end of the refuge. An interpretive kiosk with an educational exhibit marks the start of the tour. Visitors drive along elevated dike tops which allow good wildlife viewing opportunities.

Two other kiosks are located along refuge roads to inform and educate the public. These displays provide a historical background of the refuge, explain why Quivira was established and tell a little about the management of the refuge.

In October, a site was prepared for a new informational kiosk along County HWY 484, which bisects the refuge. The kiosk will be built in the shop during the winter as a cold weather project and moved to the final site.

In December, a small interpretive kiosk was built for later placement at the south prairie dog town. A new interpretive panel has been developed for this area which is a popular attraction for refuge visitors.

6. Interpretive Exhibits/Demonstrations

The refuge participated in the Stafford County Fair from July 22-25th. A booth describing Quivira and its public use opportunities was manned by staff and family. Approximately 2500 people visited the booth.

For the sixth consecutive year, Quivira staff, along with personnel from Flint Hills and Kirwin NWR, participated in the Kansas State Fair, Hutchinson, KS, from September 11-20. An exhibit describing the three national wildlife refuges in Kansas was used along with wildlife mounts, wood duck nesting boxes, and a "touch and feel" table for kids. The fair provides an opportunity to tell people about the refuges, answer questions and to promote our private lands program. A record 30,000 people visited the booth.

In August we received a new Telex viewer projector which was quickly put to use at the State Fair.

7. Other Interpretive Programs

Refuge staff spent a lot of time in 1992 presenting programs and giving tours. The effort has paid off with increased public awareness of the refuge and its' objectives. Table 9 is a summary of the 1992 refuge interpretive programs.

Table 9. Quivira NWR, Interpretive Programs, 1992

Date	Program	Attendance
1/28	Turner - Stafford FFA slide presentation	12
3/4	Schaad - Refuge tour for St. John Nursing Home	11
3/26	Hilley - Refuge tour for KS Academy of Science	49
3/28	Schaad - Refuge tour for Messiah Lutheran Church, Wichita, KS	15
4/11	Hilley - Refuge tour to Ft. Niobrara/ Valentine NWR's personnel	6
4/20	Schaad - Refuge tour for clients and staff of Parkview Learning Center	12
4/22	Turner - all day school program at Stafford school for Nat'l Wildlife Week	200

4/24	Turner - slide presentation at Stafford Intermediate and High School-Endg.species	125
4/25	Hilley - Refuge talk for Girl Scouts of Topeka, KS	22
4/25	Hilley - Refuge talk for KS State University biology students	12
4/27	Schaad and Turner - Refuge tour for 5th and 6th graders of Hudson Middle School	80
5/1	Turner - Endangered Species slide program for Hudson Elem. 5-6th grade	87
5/7	Schaad - Refuge tour for Elyria High School biology class	4
5/7	Turner - worked a visitor contact station in S.Haven, KS for KS Dept.Tourism	350
5/12	Turner - Refuge tour for Lyons Grade School 3rd graders (30) and Stafford High School gifted students (8)	38
5/21	Hilley - slide program for KS Engineering Society in Great Bend, KS	15
6/23	Schaad, Stone, and Allen - Refuge tour/ wetland video for Bob Johnson Youth Center	24
6/25	Hilley presented the wetland video to Stafford Optimist Club	13
6/27	Hilley, Turner, Malone worked the refuge display/exhibit - Hutchfest @ the mall	250
8/10	Turner - Refuge tour for Girl Scouts of Preston, KS	25
9/10	Turner - Refuge tour for Sr.Citizens of the St. John Recreation Commission	14
9/21	Hilley - program on FWS career opportunities for Hutchinson Community College	30
10/6	Turner - Refuge tour for the St. John Extension Office	15
11/30	Turner and Zinn - slide presentation to the Sterling Rotary Club	25
	TOTAL	1434

Figure 26. In May, Quivira hosted the Lakota Council, Boy Scouts "Camporee", for three days. Over 100 Scouts and leaders attended.
92-DRS



Figure 27. Managers Hilley and Schaad lead the Scouts on a hayride tour of the refuge.



In July, Quivira was a stop on a tour for 20 people reviewing wetland and riparian areas with Kansan Wildlife and Parks.

Karl Grover, manager of Cheyenne Bottoms WA and a contractor visited in September to examine our handicapped accessible hunting blind to help in their plans to build one of their own at the Bottoms.

A two day, ten hour hunter safety course was conducted at the refuge environmental education classroom from Oct. 31-Nov.1. Over 32 students attended the course which was instructed mainly by volunteers.

In association with the Stafford Pride Committee, the refuge sponsored the third annual "Bald Eagle Contest" for the local grade school kids. Students picked the date and time that the first bald eagle of the fall migration would appear on Quivira. Rex Milton, a local businessman, provided prize money for the top three winners.



Figure 28. ROS Zinn presented the prizes to the winners of the annual Bald Eagle Contest. (L-R) Geraldine Johnson, Briedi Zinn, 2nd-Amber Ewing, 1st-Danny Pfister, 3rd-Craig Fuller, Rex Milton.

92-JLT



Figure 29. The refuge families participated in the Stafford Oktoberfest Parade for the third year.

92-JDH

high waterfowl concentrations, the success was the best in several years. Improved habitat conditions on the north flats and North Lake increased hunter success for ducks in these area.



Figure 29. This young man and his father were checked almost daily as they tried to get the young hunter his first duck. After a long wait, the young man finally scored on his "first".
92-JDH

Good water conditions also attracted more goose hunters into the refuge. Canada goose season ran from November 21-January 24, 1993. Hunter success was marginal as the cold weather, snow, and ice moved the birds out of the refuge earlier than normal.

Pheasant and quail season ran from November 14 through January 31. Because of the thick, native grasslands on Quivira, pheasant hunting is difficult. Over 250 hunters were on the refuge for the opener. Success was spotty as the heavy cover gave the birds every advantage.

The non-hunting zone around the bunkhouse was expanded and delineated with new fencing. We had problems in the past with shotgun pellets hitting the windows in the Environmental Education classroom.

9. Fishing

Some fishing by the public normally occurs on the Little Salt Marsh and along Rattlesnake Creek as it enters the refuge. The main species caught are carp, bullheads and some catfish. Because of the fluctuating water levels caused by drought and low flows in Rattlesnake Creek, the maintenance of a viable fishery at Quivira is difficult.

During 1992, as the wetlands began to refill following the drought, some fishermen returned to the refuge faster than the fish. If the water persists they might eventually catch something.....such is fishing.

11. Wildlife Observation

Visitation to Quivira continues to increase each year. With the larger cities such as Great Bend, Hutchinson, and Wichita within a short drive, a lot of people take the opportunity to come out to see the wildlife.



Figure 30. The man in the smoke is Jim Richardson, photographer for the National Geographic Society. Jim was here in April to photograph our prescribed burning activities. The photos will be used in an article to be written on wetlands, their problems and management. 92-KLS

12. Other Wildlife Oriented Recreation

Quivira has been designated as a location to collect entries for the Federal Junior Duck Stamp Design Contest. The program was created to educate young people about wetlands and waterfowl conservation through the arts. Entries began arriving in January and continued through the March 15 deadline.

Winners were selected for the Contest on March 31st. The design voted best of show was done by Jennifer Mosher, 18, of Hoyt, KS. Jennifer's detailed color pencil drawing of four wood duck ducklings won her a trip to Washington, D.C. to see the Federal Duck Stamp judging in the fall as well as tour the U.S. Mint and Smithsonian. The judging panel consisted of Jim Reid, public relations director for the Coleman Company; Carol Garrett, Public Use and Education, RW; Dick Burch, Kansas chair of Ducks Unlimited; Ray Linder, art specialist with the State Board of Education; and Lee Queal, regional director of Ducks Unlimited. Joan Allemand, creator of the program, along with Manager Hilley and Refuge Clerk Turner were also present to assist with the contest.

Designs made by the twelve 1st place winners of the contest were shipped to Washington, D.C. on April 29th. The designs were sent for a signing ceremony and to be displayed at the Bureau of Engraving.

Coleman Company, Wichita, KS agreed to purchase a Duck Stamp for each student that entered the contest. Over 425 entries were received and Coleman donated \$6,375 for the stamps and ultimately for wildlife habitat.

Figure 31. (L-R) Dick Burch, Ducks Unlimited, Carol Garrett, PUE, and Jim Reid, Coleman Co. looking over the entries for the first Kansas Junior Duck Stamp Contest. 92-JDH



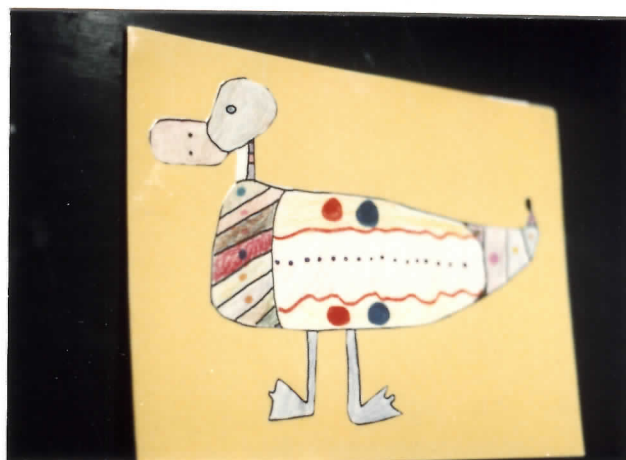


Figure 32. Examples of the work done by young Kansas artists for the Junior Duck Stamp Contest. 92-JDH

17. Law Enforcement

Manager Hilley and ARM Schaad travelled to Marana, AZ for LE Inservice Training in January.



Figure 33. Firearms Instructor Steve Knode was here on September 9th to requalify refuge officers from Flint Hills, Kirwin, and Quivira NWR's. Also present for requalifications were SRA Manny Medina and SA Case Vendel.

Due to state budget problems, several conservation officers with the Kansas Department of Wildlife and Parks used the refuge Environmental Education Classroom for base operations in working the September early teal season at the Cheyenne Bottoms WA.

Each weekend during the hunting seasons and periodically throughout the year, refuge officers conducted law enforcement patrols. A lot of hunters were contacted but most were legal because they have learned that if you hunt the refuge, chances are good that you'll be checked.

Five violation notices were issued for hunting related activities during 1992, one hunting in a closed area, one lead shot field possession, two vehicle trespasses, and one hunting without a state hunting license.



Figure 34. Deer season (outside the refuge) opened December 2-13. No problems occurred other than a couple of wounded deer which entered the refuge. After the season however, on December 16th, a deer was poached west of headquarters, tagged probably with a rifle season tag that wasn't filled. There were no suspects. ROS Zinn looks over the blood trail and remains left in a township road. 92-JDH

I. Equipment and Facilities

1. New Construction

A fencing contractor constructed a one-mile fence along the northeast side of the Marsh Road, surrounding a piece of cropland. This was to aid our grazing program and discourage poaching by preventing vehicle access to the cropfields.

2. Rehabilitation

In January, the entrance road near the Aspen tank battery was rehabed. Recent spring flows in the area had begun to wash out the road.

Mild, dry weather in February allowed the crew to start rehab work on the Darrynane nine-bay water control structure. Riprap was removed from the downstream side of the structure to assess erosion damage, which was worse than we had anticipated. Metal pilings that form the toe wall were badly deteriorated and a huge void was present under the concrete apron and structure base. By March's end 91.5 yards of concrete had been used to construct a new footing/toe wall and to cap and fill in the void. Completion of the rehab work finally came in April. Eggrock and riprap were used to backfill the downstream side of the structure. Total cost for materials and labor on this project were \$23,000 but would have been three times that without a good crew.

Figure 36. A new footing was poured for the Darrynane 9-Bay water control structure.
92-DRS



Figure 37. Over 30 cu.yds of concrete were pumped to fill the void discovered under the 9-Bay structure. 92-DRS

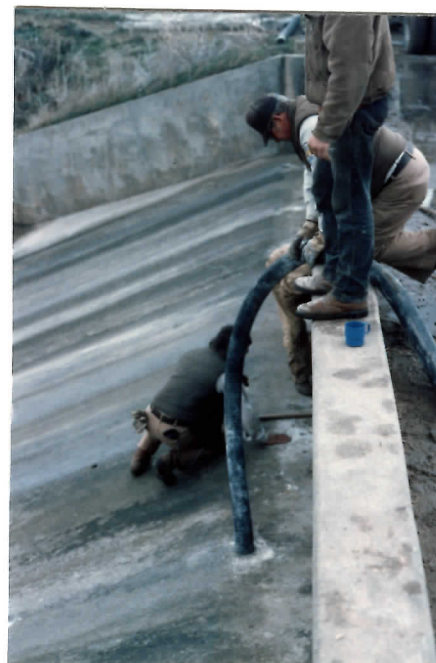


Figure 38. The 9-Bay after the new wall and apron have been added and the void filled. 92-BKM



Figure 39. Water flowing over the 9-Bay at last. This is one of the most important structures on the refuge and is now in good shape. 92-DRS



Efforts were started to raise to North Flats road to allow better access to two oil wells for inspection and to allow fire fighting access to the northern boundary of the refuge. A water control structure will be installed across the road to allow water manipulation on the flats, for least tern management.

A lot of time and effort was used to prepare the handicapped accessible hunting blind for the waterfowl season. Propane heaters were purchased, new benches installed, rank emergent vegetation removed, a turn-out was constructed, and the entrance road was graded.



Figure 40. The walkway and barrier for the A-2 water control structure was rehabed in 1992.

92-BKM

A local decorating center out of Great Bend, KS replaced the tile floor in the bunkhouse. Sealant was applied to the joints and cracks in the emergency spillways on the LSM and Unit 20B.

Rangeland developments, which have been designed to enhance the grazing program, continued during 1992. The major facilities such as electric fences and watering cells are complete at this time. Refuge crews repaired barbed wire fences, constructed many miles of permanent single-strand electric fence, repaired windmills, water tanks, etc. to make sure the grazing program worked and we got the desired results.

3. Major Maintenance

In mid December, Unit 62 dike washed out, taking out part of the Marsh Road as well. Damage resulted when water piped through a kangaroo rat burrow, eventually taking all the surrounding sand/soil with it, causing the wash out. The road was closed overnight and road repairs were made the next day. The dike was later repaired when weather conditions were better and dry soil available.



Figure 41. Part of the Marsh Road washout that resulted from the failure of the Unit 62 dike in December. 92-JDH



Figure 42. Egg rock and rip rap were hauled and leveled on the Artesian Road west of the Little Salt Marsh. This makes this an all weather road for waterfowl counts, shorebird research, etc. 92-BKM



Figure 43. The refuge crew working on forming the new concrete spillway on Unit 58. New spoil was added and the spillways enlarged to provide better water movement. 92-DRS

Concrete spillways were built to replace earthen or soil cement spillways on Units 11, 14A, 14B, and 58. This was a major MMS project during the year and made more difficult by the rainy weather.



Figure 44. A new concrete spillway on Unit 11, replacing an earthen spillway and giving an extra margin of safety in a flood situation.

92-DRS

4. Equipment Utilization and Replacement

With the heavy rains during the summer months, we were forced to do a lot of rainy day projects instead of field work. Considerable time was spent on equipment repair and maintenance. The IHC dump truck received an engine overhaul and a rebuilt hydraulic cylinder on the dump bed, the clutch was replaced on the IHC stake bed, and a new gear box on the Woods mower.

A 200 gallon sprayer, formerly used for weed control, was converted to a portable fire pumper. The unit is loaned to local farmers who are prescribed burning CRP near the refuge.

New equipment obtained during 1992 included: a Telex slide viewer/projector, John Deere Model 63C tandem disk, Canon NP2020 copier, Model 870 Remington shotgun and a new GE washer and dryer for the bunkhouse.

J. Other Items

1. Cooperative Programs

The refuge continues to monitor, each week, the U.S. Geological Survey gauging station on Rattlesnake Creek. The creek levels are recorded and any equipment failures are reported to USGS.

Quivira once again participated in the Audubon Society's Christmas Bird Count. The count was conducted on December 22 with 12 participants. A total of 86 species and 25,418 individuals were recorded during the count, up from the 58 species and 6,707 individuals counted in 1991.

2. Other Economic Uses

Interest in oil production on the refuge continued during 1992. Aspen Drilling Co., Great Bend, KS continued clean up of a salt water spill in January at their saltwater disposal well (Quivira well # 34) Along with this clean up effort, Aspen also removed an old saltwater disposal tank from the site. Aspen will also rehab several containment dikes around pumpjacks and install new muffling devices on some of the units.

An oil spill occurred on February 4th at Quivira Well #10 operated by Rama Oil Co., Stafford, KS. The spill occurred along the lead line between the well and tank battery. Rama initiated clean up efforts on the 26th. A backhoe was used to remove the old lead line and contaminated soil and a new PVC pipeline laid. In addition to these efforts some other existing problems were dealt with. The old salt water disposal tank was removed, the old disposal lead line cleaned and capped, and a larger capacity disposal tank installed at the tank battery site. By February 28th, containment dikes around the well and tank battery had been rehabed and most of the dirt work around the lead line had been completed.

Another oil spill was discovered on the 5th of February at Quivira Well #75 operated by F.G. Holl, Wichita, KS. Less than one barrel of oil had flowed from the pumpjack and spilled into a small wetland. Company reps were contacted and responded immediately to the problem. On the 7th a clean up crew began removing oil soaked soil from around the pumpjack, spreading absorbent material on the wetland, and constructing containment dikes around all pumpjacks and the tank battery. All dike work was completed on the 11th.



Figure 45. A lead line failed on Rama Oil Company's Quivira #10 well, resulting in a oil spill. The company cleaned up the spill and rehabed several facilities to prevent future occurrences.

92-DRS



Figure 46. An oil spill at Quivira Well #75, operated by F.G. Holl, was discovered in February. Approx. one barrel spilled and was cleaned up by the company. The pumper received a stern warning from the refuge and the company because he had tried to cover up the spill by placing dirt over the area and not reporting the incident.

92-DRS

In February we received a response from Hallwood Energy Companies (HEC), Denver, CO regarding the SUP issued to them early in December allowing them to directionally drill two oil wells southeast of the Big Salt Marsh. HEC had obtained a permit from Kansas Wildlife and Parks and was in the process of obtaining the drilling permits from the Kansas Corporation Commission. HEC requesting to drill these wells during the driest time of the year. An amended SUP was issued allowing HEC to commence drilling operations in July and August.

An oil spill occurred near the Aspen tank battery on March 13th. A coupling had failed on a tanker truck operated by Koch Service Inc. allowing oil (less than 2 barrels) to spill on the entrance road. A small amount of oil also ran off into an adjacent wetland. Koch reps took immediate action and removed the oil soaked soil and spread an absorbent material on the adjacent wetland. There were some communication problems encountered during the event because Koch had initially contacted KS Wildlife and Parks, instead of the refuge.

In April, Hallwood Energy Companies (HEC), Denver, CO began rehab work on containment dikes for Quivira Wells 58, 59, 60 and 66. By the 18th preliminary work on the dikes had been completed. Eggrock was placed on dike surfaces to prevent erosion and fences constructed around the pumpjacks to exclude cattle.

In June, a small oil spill occurred from the Texaco Trading and Transportation Co. (TTC), pipeline near Units 48 and 49. TTC immediately responded, but due to high water levels, they were only able to temporarily repair the line and clean up the contaminated soil. In October, they returned to remove the contaminated soil and make permanent repairs.

On November 16th, Hallwood Energy Company, Denver, CO, started drilling the first of two new oil wells, Sleeper #3 and #4, in the northeast quarter, Section 4, T22S, R11W. The wells were diagonally drilled from an existing pad to avoid complications from the originally proposed sites, which were located in wetlands. Both wells were successful and are to be completed with pump jacks early in 1993.



Figure 47. A temporary repair, made on the Texaco Trading and Transportation pipeline that crosses the refuge near Units 48 and 49. Permanent repairs were finished when water levels permitted. This could have been much worse because of the flow volume and location near the wetlands, but the company was quick to respond.

92-DRS

Larson Operating Co., Great Bend, KS contacted us to drill for oil on the Eriksen lease (NW/4, Sec. 3, T22S, R11W) in October. Proposed locations are in areas classified as wetlands by Don Haley, FWE, Manhattan, KS. A meeting was scheduled for early December with company representatives to discuss options and alternate sites for drilling but was postponed and rescheduled for 1993.

Ainsworth Drilling Company, Colorado, re-entered an old abandoned well site in December at #1 Sleeper (NE 1/4, Sec. 5, T22S, R11W). They were successful in reaching marketable oil.

3. Training and Items of Interest

Manager Hilley and Refuge Assistant Turner attended budget tracking and credit card training in Denver, CO in February.

Manager Hilley travelled to Anchorage, AK to attend Fire Management for Line Officers training in February.

ROS Schaad participated in the Central Flyway Wingbee at Flint Hills NWR February 18th-21st.

On February 29th, Hilley, Schaad, Turner, and Marks attended Intermediate Wordperfect training at Wichita State University.

ROS Schaad traveled to Kearney, NE to attend the Regional Migratory Bird Workshop the 22nd - 27th of March.

Manager Hilley and ROS Schaad travelled to Valentine, NE in April for Workforce Diversity Training and Ray Rauch's going away party.

Range Tech/firefighter Patty Malone attended basic fire training (S-130, S-190) at Fort Niobrara NWR in June.

Manager Hilley attended an Environmental Education Methods workshop sponsored by OTE and San Francisco Bay NWR July 13-17.

Refuge Assistant Turner and firefighter Malone attended a Project WILD workshop in Topeka, KS in August.

Manager Hilley, Refuge Assistant Turner, and Volunteer Marty Hilley were certified as Project WILD facilitators at a twelve hour workshop in Hays, KS on the 15th of August.

Manager Hilley and ROS Schaad attended the Zone III Project Leaders meeting in Estes Park, CO the 23-27 of August.

Sheri Featherman, Regional PUE supervisor, visited the refuge on November 18th to view public use facilities and review plans for the new visitor's center addition. Skip Ladd, ARD, visited the refuge on the 19th and was given a tour of the facility.

Refuge Manager Hilley received a Special Achievement Award for his performance during 1992. Refuge Assistant Turner also received a Special Achievement Award for her efforts during the Kansas Junior Duck Stamp Contest.



Figure 48. A going away party was held for Dan Schaad, following word of his transfer to Ouray NWR, Utah. We miss him but it was fun sending him off. 92-JLT

4. Credits

Briedi Zinn and Dave Hilley wrote this narrative report. Everyone else edited, laughed, made fun of our work, etc. All hands helped assemble. Photos, taken with refuge and personal equipment, are credited by initials.

K. FEEDBACK

All in all, it was a good year at Quivira. Rains filled the dry wetlands and we got a lot accomplished. I want to thank the Quivira staff for their dedication and efforts throughout the year. A refuge manager deals with short budgets, excessive paperwork and sometimes a not so kind public, but it sure makes it worthwhile to work with a quality staff.

Many in the Regional Office helped get us through the year, Water Rights, Engineering and Refuges and Wildlife Staff, to name a few. These folks kept the "Tweed-Backs" off our neck and for this we are grateful.

Welcome

Located in south central Kansas, Quivira National Wildlife Refuge lies in the transition zone between eastern and western prairies. The name "Quivira" comes from an Indian tribe living in the area when the Spanish explorer, Coronado, visited in 1541. In quest of gold, treasures, and the fabled "Seven Cities of Cibola," Coronado found, instead, fertile grasslands, abundant wildlife, and small agricultural villages of Indians.

Each year, for untold years, the ancient Big and Little Salt Marshes have provided food, cover, and a resting place for thousands of waterfowl migrating between breeding and wintering areas. Indians and early settlers hunted waterfowl in these marshes, and, shortly after the turn of the century, commercial hunting provided wagonloads of waterfowl to Kansas City restaurants and other eastern points. The Refuge was established in 1955 to protect valuable waterfowl habitat, and today, these marshlands remain a major stopover for thousands of migrating birds.

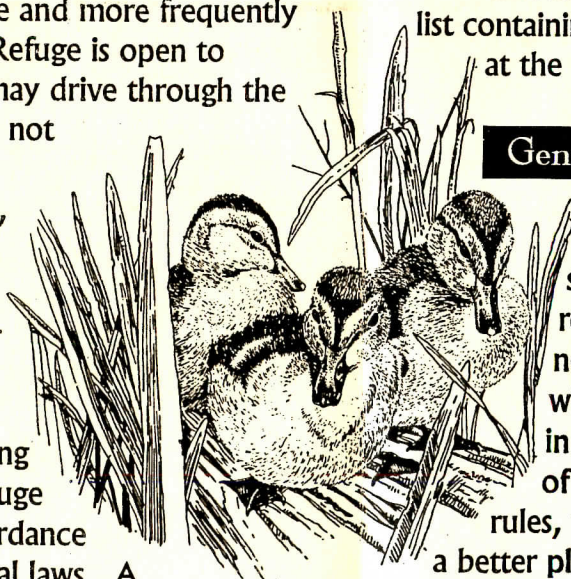


Quivira National Wildlife Refuge is one of a network of over 400 refuges across the United States. Refuges provide valuable habitat for hundreds of species of birds, mammals, reptiles, amphibians, fish, and plants. National Wildlife

Refuges are managed to protect endangered plants and animals, to provide for the needs of migratory birds, to preserve natural diversity, and to provide places for people to understand and enjoy wildlife.

Spring and fall are the best seasons to visit Quivira NWR, since wildlife, especially waterfowl, is abundant and more easily viewed at these times. Try to schedule your visit early or late in the day when wildlife is most active and more frequently seen. Much of the Refuge is open to hiking, and visitors may drive through the Refuge on any roads not closed by signs or barriers. In addition, two photography blinds are available on a first-come, first-served basis.

Hunting and fishing programs on the Refuge are managed in accordance with State and Federal laws. A separate brochure describing these programs and special regulations is available



at the Refuge headquarters, located 8 miles north of Zenith, Kansas. Hunting is permitted on 8,000 acres of the Refuge, and fishing is permitted in all Refuge waters. Food and lodging are available in Stafford, Great Bend, and Hutchinson, which are 13, 32, and 28 miles, respectively, from the Refuge.

A Birder's Paradise

Located where the relatively lush vegetation of the east blends into the more arid grasslands of the west, the Refuge supports numerous and varied plant communities, which attract birds common to both eastern and western North America. Over 250 species of birds have been observed on the Refuge.

Birdwatchers can pick up a Refuge bird list containing more detailed information at the Refuge headquarters.

General Refuge Regulations

Although the following rules and regulations may seem inconvenient or overly restrictive to some, they are necessary for the protection of wildlife and their habitats, and, in some instances, for the safety of visitors. By observing these rules, visitors will make the Refuge a better place for themselves and the wildlife they come to enjoy.

Vehicles and Parking

Motorized vehicles are permitted only on developed roads and parking areas. Driving off-road or on roads closed by signs or barriers is prohibited. Parking in front of gates or on bridges or water control structures is likewise prohibited.

Camping

Overnight camping is not permitted. All visitors must leave the area at the end of each day.

Boating

Boats and canoes are not allowed.

Fires

No fires of any type are permitted within the Refuge.

Firearms

Possession of firearms is prohibited except as authorized during the hunting season within the hunting areas.

Littering

Littering is prohibited. Please remove all trash from the Refuge.



The U.S. Fish and Wildlife Service seeks to afford persons with disabilities full accessibility of reasonable accommodation. Contact Refuge Headquarters for information or to address accessibility problems. For the hearing impaired, use your State Relay System for the Deaf.