

ARAPAHO NATIONAL WILDLIFE REFUGE
Walden, Colorado

also

**BAMFORTH, HUTTON LAKE,
MORTENSON LAKE and PATHFINDER**
National Wildlife Refuges
administered from Walden, Colorado

ANNUAL NARRATIVE REPORT
Calendar Year 1993

U.S. Department of the Interior
Fish and Wildlife Service
National Wildlife Refuge System

ARAPAHO NATIONAL WILDLIFE REFUGE
Walden, Colorado

also

**BAMFORTH, HUTTON LAKE,
MORTENSON LAKE and PATHFINDER**
National Wildlife Refuges
administered from Walden, Colorado

ANNUAL NARRATIVE REPORT
Calendar Year 1993

U.S. Department of the Interior
Fish and Wildlife Service
National Wildlife Refuge System

REVIEW AND APPROVALS

ARAPAHO NATIONAL WILDLIFE REFUGE
Walden, Colorado

also

BAMFORTH, HUTTON LAKE,
MORTENSON LAKE and PATHFINDER
National Wildlife Refuges
administered from Walden, Colorado

ANNUAL NARRATIVE REPORT
Calendar Year 1993



Project Leader

3/7/94

Date



Associate Manager (Zone III)

3-21-94

Date



Regional Office Approval

3/27/94

Date

INTRODUCTION

Arapaho National Wildlife Refuge was established in 1967 primarily to furnish waterfowl with a suitable place to nest and rear their young. The refuge was created to offset, in part, losses of breeding and nesting habitat in the prairie wetland region of the Midwest. Most of the land was purchased with funds derived from the sale of Duck Stamps.

Arapaho National Wildlife Refuge (NWR) is located in an intermountain glacial basin immediately south of Walden, the county seat of Jackson County, Colorado. The basin is approximately 30 miles wide and 45 miles long. Since it is the most northern of four such "parks" in Colorado, it is known locally as "North Park".

The Ute Indians referred to North Park as "Cow Lodge" and "Bull Pen." They were the first visitors to the area and remained only during the summer months to hunt bison, abandoning the valley during the long, snowy and icy winters. Their small numbers and nomadic life style left but a small imprint on the land.



93 NR1

8/93

JR

The first recorded exploratory footsteps to appear in North Park belonged to Jacques Bijeau in the year 1820. Like many of his French countrymen, Bijeau was lured by the promise of profit in trapping beaver. In 1844, Lieutenant John F. Fremont transversed the park from Northgate to Willow Creek Pass and recorded the following in his journal:

"The valley narrowed as we ascended and presently divided into a gorge, through which the river passes as through a gate - a beautiful circular valley of 30 miles in diameter, walled in all around with snowy mountains, rich with water and grass, fringed with pine on the mountain sides below the snow, and a paradise to all grazing animals."

Others like James O. Pinkham, came to exploit mineral wealth. Miners preferred the summer months for their endeavors. The first residents to brave the cold were Jacob Fordyce and his family. They stayed during the winter of 1878, two years after Colorado became a state and a full 50 years after the first explorers entered the valley.

The high elevation and northern latitude provides North Park with a unique climate. The refuge elevation ranges from 8,100 to 8,700 feet. North Park is classified climatically as a cold desert. Winters are very cold and normally have 60 inches or more of snow while the surrounding mountains receive at least 120 inches of snowfall. Extreme low temperatures of minus 50 degrees Fahrenheit have been recorded. Summers are cool and dry with high temperatures in the 80's and the average lows near 40 degrees Fahrenheit. Mean annual precipitation is only 9.6 inches and the mean annual temperature is 36.5 degrees Fahrenheit. There is an average of only 30 consecutive frost-free days each year.

Jackson County was formed in 1909 and supports a rural population of approximately 1,800 people of which about half live in Walden, one mile north of the refuge. The economy of North Park relies on four main resources. The largest and most stable of these is ranching followed by lumbering. Tourism and recreation are growing activities in North Park while mining currently is in a slump. Nearly one-half of the North Park population lives on ranches which indicates the importance of ranching to the economic stability of North Park.

The refuge currently encompasses 23,267 acres and when all proposed lands are fully acquired and the land exchanges are complete, the refuge will consist of approximately 24,080 acres. The refuge excluding the recent Stelbar acquisition, presently consists of 7,944 acres of irrigated and sub-irrigated meadows, 9,286 acres of sagebrush-grassland uplands, 771 acres of wetlands, 188 acres of riparian willow and stream habitat, and 64 acres of administrative lands including building sites and roads.

The refuge currently produces an average of about 7,275 ducks (10 year average) and 150 to 300 Canada geese annually although production varies from year to year. The current refuge objective is to produce 11,000 to 12,000 ducks and 500 Canada geese annually. To meet waterfowl production objectives and provide optimum habitat conditions for other species of wildlife, the refuge utilizes several habitat manipulation techniques such as pond development, water level manipulation, irrigation, rest-seasonal grazing systems and prescribed burning to create habitat diversity and maintain vegetative vigor, growth and density.

TABLE OF CONTENTS

	Page
A. <u>HIGHLIGHTS</u>	1
B. <u>CLIMATIC CONDITIONS</u>	1
C. <u>LAND ACQUISITIONS</u>	2
1. Fee Title	2
2. Easements	Nothing to Report
3. Other	4
D. <u>PLANNING</u>	4
1. Master Plan	Nothing to Report
2. Management Plan.	4
3. Public Participation	Nothing to Report
4. Compliance with Environmental Mandates	Nothing to Report
5. Research and Investigations	5
E. <u>ADMINISTRATION</u>	14
1. Personnel.	15
2. Youth Programs.	16
3. Other Manpower Programs	Nothing to Report
4. Volunteer Programs	20
5. Funding	21
6. Safety.	22
7. Technical Assistance	23
8. Other.	26
F. <u>HABITAT MANAGEMENT</u>	27
1. General	27
2. Wetlands	27
3. Forests	Nothing to Report
4. Croplands.	Nothing to Report
5. Grasslands	28
6. Other Habitats	Nothing to Report
7. Grazing.	29
8. Haying	33
9. Fire Management	33
10. Pest Control.	33
11. Water Rights.	Nothing to Report
12. Wilderness and Special Areas.	Nothing to Report
13. WPA Easement Monitoring.	Nothing to Report

G. <u>WILDLIFE</u>	34
1. Wildlife Diversity.	34
2. Endangered and/or Threatened Species.	35
3. Waterfowl.	35
4. Marsh and Water Birds.	42
5. Shorebirds, Gulls, Terns and Allied Species.	43
6. Raptors.	43
7. Other Migratory Birds.	43
8. Game Animals.	45
9. Marine Animals.	Nothing to Report
10. Other Resident Wildlife.	47
11. Fishery Resources.	50
12. Wildlife Propagation and Stocking	Nothing to Report
13. Surplus Animal Disposal.	Nothing to Report
14. Scientific Collections.	Nothing to Report
15. Animal Control.	50
16. Marking and Banding.	Nothing to Report
17. Disease Prevention and Control.	Nothing to Report
H. <u>PUBLIC USE</u>	50
1. General	50
2. Outdoor Classrooms - Students	Nothing to Report
3. Outdoor Classrooms - Teachers.	Nothing to Report
4. Interpretive Foot Trails.	50
5. Interpretive Tour Routes.	52
6. Interpretive Exhibits/Demonstrations.	53
7. Other Interpretive Programs.	53
8. Hunting.	54
9. Fishing	56
10. Trapping	56
11. Wildlife Observation	Nothing to Report
12. Other Wildlife Oriented Recreation.	Nothing to Report
13. Camping.	Nothing to Report
14. Picnicking.	Nothing to Report
15. Off-Road Vehicling.	Nothing To Report
16. Other Non-Wildlife Oriented Recreation.	Nothing to Report
17. Law Enforcement.	57
18. Cooperating Associates.	Nothing to Report
19. Concessions.	Nothing to Report
I. <u>EQUIPMENT AND FACILITIES</u>	59
1. New Construction.	59
2. Rehabilitation.	60
3. Major Maintenance.	62
4. Equipment Utilization and Replacement.	62

I. <u>EQUIPMENT AND FACILITIES</u>	Continued
5. Computer Systems.	63
6. Other.	63
J. <u>OTHER ITEMS</u>	63
1. Cooperative Programs.	63
2. Other Economic Uses.	66
3. Items of Interest.	66
4. Credits.	69
K. <u>FEEDBACK</u>	Nothing to Report
L. <u>INFORMATION PACKET</u>	Inside Back Cover

A. HIGHLIGHTS

1. Purchase of a portion of the Stelbar Ranches adds 5,014 acres. (Section C.1)
2. New maintenance worker arrives from Missisquoi NWR. (Section E.1)
3. Three Private Lands projects completed. (Section E.7)
4. Four Colorado Duck Stamp funded wetland development projects begun. (Section I.7)
5. Owl Mountain Ecosystem Management Projects takes roots. (Section J.1)
6. MMS FY92 funded equipment finally arrives. (Section I.4)
7. First documented river otter sighting on the refuge. (Section G.2)
8. Largest wintering elk population ever recorded on the refuge. (Section G.8)

B. CLIMATIC CONDITIONS

Overall, the climatic conditions were good in 1993 with relatively mild temperatures and precipitation arriving when we needed it most. The refuge received 11.82 inches of precipitation resulting in excellent habitat conditions. Snowfall measured 55.6 inches in Walden, resulting in an average to good spring runoff.

Summer temperatures were several degrees cooler than "normal", resulting in a shorter growing season, while the winter season was near the normal average. The extreme high/low temperatures were 89 and -23 degrees Fahrenheit.

Table I.

1993 Weather Data: Walden, Colorado (NOAA)

<u>Month</u>	<u>Precipitation (inches)</u>			<u>Temperatures (degrees fahrenheit)</u>			<u>Normal Average</u>
	<u>1993</u>	<u>Normal</u>	<u>Snow</u>	<u>Max.</u>	<u>Min.</u>	<u>Avg.</u>	
January	0.41	0.51	7.2	40	-14	18.7	15.7
February	0.75	0.46	7.6	40	-23	17.9	18.4
March	0.74	0.61	7.0	61	-14	27.6	24.6
April	1.31	0.87	7.1	64	8	34.8	35.4
May	1.23	1.14	-	73	16	45.6	45.0
June	1.76	0.96	1.6	82	29	52.0	53.6
July	0.29	1.06	-	89	28	55.5	59.0
August	1.47	1.23	-	83	26	55.6	56.6
September	1.20	0.94	-	78	16	47.8	49.3
October	1.12	0.68	3.6	73	-10	37.6	39.2
November	1.29	0.52	16.5	50	-20	20.9	26.8
December	<u>0.25</u>	<u>0.51</u>	<u>5.0</u>	<u>44</u>	<u>-19</u>	<u>17.5</u>	<u>18.5</u>
Total	11.82	9.55	55.6				
Extremes				89	-23		

C. LAND ACQUISITION1. Fee TitleStelbar Acquisition

The proposed Stelbar land acquisition was approved for purchase by the Migratory Bird Commission in March. The actual purchase was finalized on May 26, 1993, completing Phase I of the project.

The North Park Wetlands Project was born at a multi-agency meeting in September, 1990. The primary focus of the meeting was the acquisition of a portion of the Stelbar Ranches (14,470 deeded acres plus associated water rights) which are adjacent to the refuge. The project involves the U.S. Fish and Wildlife Service (FWS), Bureau of Land Management (BLM), Colorado Division of Wildlife (CDOW), the Colorado Chapter of Ducks Unlimited (DU) and ranch manager/owner Blaine Evans. Stelbar Ranch was owned by E.B. Shawver and

consisted of three sub-units: Grizzly Creek, Soap Creek and the Illinois River ranches.

Acquisition of the Grizzly Creek, Soap Creek and a small portion of the Illinois River Ranch involved the following phases:

Phase 1 - Initial Service Acquisition

- a) The FWS as the lead agency in the partnership would purchase 5,014 acres and Blaine Evans would buy 3,578 acres. The water rights to McFarlane Reservoir and associated direct flow water rights would be split evenly between the Government and Mr. Evans.

Phase II - Land Exchanges, Water and Habitat Management

- b) Selected newly acquired lands will be exchanged for private, State, and Federal inholdings within the present refuge boundary. Management plans and habitat improvements would be implemented in cooperation with other public agencies and private parties.

In December work was initiated on developing an MOU with the BLM concerning the transfer of lands jurisdiction between the two agencies with plans for completion in early to mid FY94.



93 NR2

9/26/93

ECP

Pole Mountain property being considered for land exchange.

When the project is completed as proposed, the refuge will retain approximately 2,550 acres from the Stelbar acquisition and obtain an additional 1,717 acres from exchanges for a total 4,267 acres. This will increase the refuge acreage to 22,520.



93 NR3

10/15/93

ECP

A portion of the Stelbar showing good habitat potential.

Refuge Inholdings

Negotiations were not initiated during the year with the other two landowners having inholdings within the refuge totalling 1,560 acres.

3. Other

The Service leased two tracts of State school land totalling 640 acres from the Colorado State Land Board. The tracts may become Service property through a cooperative land exchange involving the Stelbar acquisition, Bureau of Land Management and the State of Colorado.

D. PLANNING

2. Management Plan

The Water Management Plan was updated again this year. No major changes occurred.

5. Research and Investigations

One special use permit was issued to Dr. Savage from the Center for Disease Control and Prevention out of Fort Collins, Colorado. The permit was for the collection of 500 mosquito larvae and 500 adult mosquitoes. The purpose is for the research of systematics and identification of Aedes mosquitoes from the Holarctic region using molecular and morphological techniques. Mosquitoes collected from the refuge were to be incorporated into this project. No annual report of research work has been submitted.

The following research projects on Arapaho were done in house as follows:

TRENDS IN AQUATIC VEGETATIVE GROWTH **Arapaho National Wildlife Refuge 1993**

By
Kenneth G. Thomas
Biological Science Technician

INTRODUCTION

Aquatic vegetation transects were conducted on five ponds at Arapaho National Wildlife Refuge during July 1993. Data collected from the transects will be used to compare aquatic diversity and composition changes through the years. Four ponds that were sampled in July 1991, were again sampled along with a fifth random pond, chosen because of its low duck production numbers.

METHODS

Four ponds were sampled in conjunction with an invertebrate study: East Fish Hatchery, 76, Goose, and Prairie Dog. The fifth pond was Hampton 2, and was selected because of its low productivity of ducks in previous years.

Each pond consisted of ten stations with 50 feet between each station. The transects ran parallel to the bank of the pond, in water no deeper than 36 inches. A 50 foot rope was used to measure the distance between stations, with a metal square foot frame surrounding the actual station. All true aquatic plant stems were speciated, counted, and water depth measurements were recorded at each station.

RESULTS

East Fish Hatchery- From a sample of ten stations on July 16, a total of 160 stems were counted with four stations empty, giving an average stem count of 26.7 per station. The predominant species was Zanichella palustris consisting of 96 percent of the total stems. Because the water was too deep after the sixth station, the last four stations were taken on the north side of the dike running west.

Goose Pond- From a sample of ten stations on July 19, a total of 555 stems were counted. An average of 55.5 plant stems were counted per station with the predominant species being Potamogeton filiformes which comprised 47 percent of the total stems counted.

Prairie Dog-From a sample of 10 stations on July 19, a total of 1192 stems were counted giving an average stem count of 170.29 per station. Callitriche hermaphroditi was the predominant species consisting of 50 percent of the total stems.

Pond 76- From a sample of 10 stations on July 19, a total of 443 stems were counted giving an average stem count of 49.22 stems per station. The predominant species was Ranunculus aquatilis consisting of 46 percent of the total stems counted.

Hampton 2- from a total of 10 stations on July 19, a total of 736 stems were counted with an average stem count of 73.6 per station. Potamogeton filiformes was the predominant species making up 70 percent of the total stems counted.

DISCUSSION

A key to the aquatics plant species found at Arapaho NWR and pictures from previous studies were used to identify the plants for this study. However, the plant species should not be considered absolute as there is room for error on both the key and the observers decision because of the similarity in some plants.

This year was an above normal year for water with all ponds checked at 100 percent capacity. Therefore, transects were probably closer to the bank than they were in previous years.

Although the predominant species weren't the same as in previous years, the plants observed at the stations were similar. Comparing the ponds from this study year, Prairie Dog had the highest plant stem count and Pond 76 had the most species of plants, with eight species found.

East Fish Hatchery was dredged in the spring of 1990, which would explain the lower numbers of aquatic plants compared to the other ponds. Also this pond is deeper along the edges which could attribute to the decline in the growth of plants. Total stems recorded in this pond were about three times higher than in 1991 indicating that plants are finally coming back after the dredge. After the sixth station the water was too deep to go any further, so the last four stations were taken on the north of the pond running west. This effected the total number of stems with Zanichelia palustris not recorded until the seventh station.

Goose Pond plant numbers were higher than in previous studies, this could be due to the above normal water levels during year. The plant species were similar to previous years except for Zanichellia palustris and Callitriche hermaphroditj, which had not been found in Goose Pond before.

Prairie Dog had the same plant composition as in previous years, except for the low number of Zanichellia palustris this year. Three Potamogeton sp. were observed this year, whereas in 1991 only P. vaginatus was observed.

Pond 76 had the same plant stem total as in 1991 with the species almost the same but the predominant species in 1991 was Potamogeton foliosis and this year it was Ranunculus aquatilis. In 1991 only one plant of R. aquatilis was counted, whereas 205 plant stems were counted this year.

Hampton 2 had seven different species of plants and was the second highest in total numbers of the five ponds. This pond was selected because it has had a low productivity of duck broods in the previous years. We checked this pond to see if these low numbers correlated with the number or composition of aquatic plants. The pond had the same type of plants as the other ponds and even more plants than the other ponds therefore the brood numbers are probably not related directly to the plant life in the pond.

As mentioned in the study of 1991, the varying water levels and transect locations can make it difficult to compare the previous studies with this study. However, plant species can be compared to see if new species are coming in or are becoming more dominant as the ponds mature.

Table II. SUMMARY OF THE FIVE POND TRANSECTS

Pond Name	No. of Stations Sampled	Species	No. of Stations w/ plants	Total Stems	Avg. Stem Count/Stations w/ plants	Avg. Depth/Stations w/ plants
East Fish Hatcher Avg. Depth/ Stations-18.7"	10	Potamogeton filiformes	1	1	1.00	36"
		Zanichellia palustris	4	154	18.50	11"
		Myriophyllum exalbescens	1	5	5.00	36"
			TOTAL	160		
Goose Avg. Depth/ Stations-14.3"	10	Zanichellia palustris	1	57	57.00	12"
		Myriophyllum exalbescens	4	7	1.75	14"
		Potamogeton filiformes	9	263	29.22	14"
		Potamogeton foliosus	7	108	15.43	14"
		Callitriche hermaphroditi	3	7	2.33	15"
		Potamogeton vaginatus	6	31	5.17	15"
		Ranunculus aquatilis	9	82	9.11	15"
			TOTAL	555		
Prairie Dog Avg. Depth/ Stations-10"	10	Callitriche hermaphroditi	7	601	85.86	12"
		Potamogeton filiformes	5	389	77.80	13"
		Potamogeton foliosus	5	153	30.60	13"
		Ranunculus aquatilis	2	14	7.00	13"
		Potamogeton vaginatus	4	26	6.50	14"
		Zanichellia palustris	1	9	9.00	17"
			TOTAL	1192		
76 Avg. Depth/ Stations-16"	10	Hippuris vulgaris	3	34	11.33	15"
		Myriophyllum exalbescens	2	13	6.50	23"
		Potamogeton filiformes	4	143	35.75	20"
		Potamogeton foliosus	6	12	2.00	16"
		Potamogeton richardsonii	1	9	9.00	10"
		Potamogeton vaginatus	2	9	4.50	22"
		Ranunculus aquatilis	5	205	41.00	17"
		Myriophyllum verticillatum	7	62	8.86	19"
			TOTAL	443		
Hampton 2 Avg. Depth/ Stations-11"	10	Hippuris vulgaris	1	15	15.00	7"
		Myriophyllum verticillatum	3	5	1.66	11"
		Potamogeton foliosus	8	73	9.13	13"
		Ranunculus aquatilis	2	14	7.00	8"
		Potamogeton filiformes	9	518	57.56	11"
		Potamogeton richardsonii	8	62	7.75	11"
		Elodea canadensis	6	49	8.17"	11"
			TOTAL	736		

DIVERSITY AND POPULATIONS OF INVERTEBRATES AND
WATER QUALITY ANALYSIS ON THE
ARAPAHO NATIONAL WILDLIFE REFUGE

by
Jeremie Schroeder
and
Brian DeVries
Biological Technicians

The importance of invertebrates as a food source for waterfowl is no secret. Ducklings, egg laying females and molting adults require the protein found in invertebrates, which is not available in a plant diet (Krapu 1974). Chura (1961) found that class Ia ducklings feed exclusively on invertebrates. This protein source is crucial in their development. As ducklings mature, the high protein source becomes less crucial, and they slowly switch from invertebrates to a plant diet. The diet of Class III ducklings has been found to contain less than one percent invertebrates. This is not exactly the case in North Park, the intermountain glacial basin in which Arapaho National Wildlife Refuge is located. Because of colder temperatures and a short growing season, aquatic plants don't thrive in Arapaho's wetlands, thus making invertebrates a more important part of waterfowl diets at Arapaho National Wildlife Refuge.

Producing waterfowl is a primary objective of the Arapaho National Wildlife Refuge (ANWR). Obviously, invertebrate populations and factors which affect invertebrate populations, such as water quality, need to be considered when managing wetlands for waterfowl. This study will address invertebrate populations and water quality on the ANWR.

GOALS AND OBJECTIVES

The goal of this study is to assess taxonomic diversity and seasonal trends in the populations of aquatic invertebrates in five ponds on the ANWR.

Objectives

1. Determine the taxonomic composition of aquatic invertebrates in five ponds chosen to represent the wetlands of the ANWR.
2. The temperature, pH, dissolved oxygen and water depth of the five ponds will be recorded.
3. The invertebrate and water quality data will be listed and graphed for future comparisons between ponds. Management decisions may be based on these comparisons.

METHODS

Four ponds at ANWR have been studied in the past. These same ponds plus one additional pond were studied this year beginning in June and ending in September. One sample was taken each month from the same location at each pond. The five ponds studied were East Fish Hatchery Pond, '76 Pond, Goose Pond, Prairie Dog Pond and Hampton #2 Pond. Samples were taken at the following locations for each pond:

East Fish Hatchery:	Metal post on southeast corner.
'76 Pond:	Metal post on southwest corner.
Goose Pond:	Metal post on northwest corner.
Prairie Dog Pond:	Metal post on east side.
Hampton #2 Pond:	Fiberglass rod on northwest side.

All samples were taken within six meters of the post. At each post, water depth was measured in centimeters. Dissolved oxygen (DO) and water temperature were measured using a 54 ARC dissolved oxygen meter (YSI Inc.). Invertebrate samples were taken using a sweep net and Eckman dredge.

RESULTS AND DISCUSSION

A total of 49,639 individual invertebrates were counted from both sampling methods at all five wetlands (Table III). The dominant family was Cladocera with 82 percent of the total invertebrates. Two other families comprised more than 3 percent each; Copepoda (6.5 percent) and Talitridae (6.3 percent). Twenty other families were identified in the samples and accounted for the remaining 5.1 percent. In comparing the two different sample methods, the sweep method captured a dominating 98.8 percent of the total invertebrates.

East Fish Hatchery Pond produced more individual invertebrates than the other sampled wetlands. The total of 13,587 individual invertebrates at East Fish Hatchery was followed by 10,520 found at Goose Pond. Hampton #2 produced the highest diversity of invertebrate families with 18. Prairie Dog was second in total diversity with 16 different families. Cladocera was the dominant family in each wetland, ranging from 70.9 percent at '76 Pond to 94.6 percent at East Fish Hatchery Pond. The next most dominating family in each wetland was either Talitridae (3 wetlands) or Copepoda (2 wetlands).

Water depths ranged from 78 cm at '76 Pond on June 10th to 11 cm at Prairie Dog on September 14. Water level fluctuations of individual wetlands ranged from 4 cm at East Fish Hatchery to 65 cm at Prairie Dog during the four month study period. Extreme temperatures were recorded at Prairie Dog; a maximum of 24 degrees Celsius (69 degrees Fahrenheit) on July 12 and a minimum of four

degrees (33 degrees Fahrenheit) on September 14. On July 12 on East Fish Hatchery pH values ranged from 7.1 to 10.3 at '76 Pond on September 14. Dissolved oxygen levels ranged from 3.6 mg/L at Prairie Dog on September 14 to 12.2 mg/L at Hampton #2 on August 9. (Table IV)

One possible reason that East Fish Hatchery produced the highest number of invertebrates during the study is that water levels fluctuated the least of any wetland. This may have provided a stable environment for the invertebrate populations. The invertebrate study of 1991 expressed total numbers found as much higher than in previous years, and one explanation given was that overall water levels were more stable in 1991. With the exception of '76 Pond, peak invertebrate populations occurred during the first sample period in June. This was also expressed in the results of the 1991 study.

Suggestions for future studies are as follows. To estimate when peak invertebrate populations occur, begin the study earlier in the season, perhaps mid-May. Additional literature review would also supply various methods of invertebrate sampling and which water quality parameters most affect invertebrate populations. If water quality parameters that affect invertebrates are identified, then population and diversity differences among the wetlands may be explained. This would allow for more effective invertebrate management and thus more efficient waterfowl management for the entire refuge.

Table III. Numbers of macroinvertebrates by taxon collected from all study ponds.

TOTAL NUMBER OF MACROINVERTEBRATES COLLECTED

Family	6\10/93 Sweep	Dredge	7/12/93 Sweep	Dredge	8/9/93 Sweep	Dredge	9/14/93 Sweep	Dredge	Total
Annelida								1	1
Arachnid	2		4	1					7
Chironomid	7	83	1	67	103	23	793		1077
Cladocera	23330	4	7250	42	1015	6	9138		40785
Coleoptera							1		1
Copepoda			350				2867		3217
Corixidae			59		245	1	28	1	334
Decapoda							4		4
Diptera								1	1
Dytiscidae			46						46
Ephemeroptera			3	6	51				60
Gastropod		10	51	35	7	6	7	34	150
Haliplidae	2	1	18		35				56
Hirudinea			3	2		2		1	8
Hydracarina	247		7		153	2	2	3	414
Nematoda	12		150				3	37	202
Odonata	8		6	8	2				24
Oligochaeta		4		43	4	13			64
Perlidae	9								9
Plecoptera							1		1
Talitridae	253	9	480	22	2156	103	85	29	3137
Trichoptera							30		30
Zygoptera			11						11
Total/day	23870	111	8439	226	3771	156	12959	107	
Total		23981		8665		3927		13069	

Total Sweep 49039
 Total Dredge 600
 Total Invertebrat 49639

Table IV - Water quality measurements for all study ponds.

East Fish Hatchery

	6/10/93	7/12/93	8/9/93	9/14/93
Depth(cm)	69	69	65	68
pH	7.7	7.1	7.6	9.1
DOxygen (mg/l)	8.2	4.4	6.0	5.8
Temp C	11	17	16	10
Total Invert.	7189	4068	519	1811

Goose Pond

	6/10/93	7/12/93	8/9/93	9/14/93
Depth(cm)	50	35	45	31
pH	7.8	9.4	9.1	10.2
DOxygen (mg/l)	8.6	7.7	7.3	5.2
Temp C	11	17	14	5
Total Invert.	7113	1744	1183	480

76 Pond

	6/10/93	7/12/93	8/9/93	9/14/93
Depth(cm)	78	69	54	36
pH	7.2	8.4	9.1	10.3
DOxygen (mg/l)	7.2	11.2	9.2	7.5
Temp C	11	17	16	5
Total Invert.	556	1870	833	4329

Prairie Dog

	6/10/93	7/12/93	8/9/93	9/14/93
Depth(cm)	76	54	32	11
pH	7.5	9.4	9.0	9.3
DOxygen (mg/l)	8.7	12.1	4.2	3.6
Temp C	13	24	14	4
Total Invert.	5530	328	261	3871

Hampton #2

	6/10/93	7/12/93	8/9/93	9/14/93
Depth(cm)	67	47	52	40
pH	7.2	8.0	9.0	9.6
DOxygen (mg/l)	7.0	11.2	12.2	4.9
Temp C	11	21	18	7
Total Invert.	3593	655	1131	2575

E. ADMINISTRATION



93 NR4

5 9 3 6

TTF

7 8 4 1 2

Our diverse, well-trained and courteous staff is eager to serve you.

<u>EMPLOYEE</u>	<u>POSITION/GRADE</u>	<u>EOD</u>
1. Eugene C. Patten	Refuge Manager, GS-0485-11	7/02/78
2. Jerry Rodriguez	Refuge Operations Specialist, GS-0485-09	6/14/92
3. Richard M. Curtis	Maintenance Worker, WG-4785-08	1/10/93
4. Pamela S. Rizor	Wildlife Biologist, GS-0486-09	1/17/88
5. Terri L. Follett	Refuge Assistant, GS-0303-06	5/28/85
6. Kenneth G. Thomas	Biological Science Tech, GS-0404-05, TFT	4/05/93 - 12/05/93
7. Brian DeVries	Biological Science Tech, GS-0404-04, TFT	5/23/93 - 12/11/93
8. Jeremie Schroeder	Biological Science Tech, GS-0404-03, TFT	5/16/93 - 8/12/93
9. Robert Baxter	Intern Volunteer	6/01/93 - 8/06/93

1. Personnel

Richard Curtis from Missisquoi NWR, Vermont reported for duty on January 10, 1993 as the new Maintenance Worker.

On November 4, 1993 our Refuge Operations Specialist, Jerry Rodriguez was transformed into an honest man. Theresa Hanks was kind enough to take "his" hand in marriage. The only problem was that both Jerry and Theresa thought they could keep this big event quiet from the staff!



93 NR5

11/93

KGT

This was only the tail end of the chivalry. You should have seen their house!!

In May, Refuge Assistant Terri Follett received a promotion from a GS-5 to a GS-6/7. After more than three years of paper shuffling, removing one RO barrier after another, we had almost given up on this ever occurring!

This year's temporaries consisted of the following individuals; Grant Thomas (Biological Science Technician, GS-5) returned for his third seasonal stint at Arapaho NWR. Grant again proved invaluable with his biological and heavy equipment background. Brian DeVries (Biological Science Technician, GS-4) was hired on as our YCC Crew Leader and Jeremie Schroeder (Biological Science Technician GS-3) rounded out our seasonal positions. Even though this was their first seasonal appointment with the FWS they were very instrumental and indispensable when it came to completing the various biological and maintenance projects on and off the refuge.

Robert (Bob) Baxter, a student intern from Colorado State University, volunteered his services for the summer. Bob assisted with a variety of biological and maintenance projects (see Section E.4).

Table V.

Refuge 5-Year Staffing Summary

<u>Year</u>	<u>PFT</u>	<u>PPT</u>	<u>Temporary</u>	<u>Volunteer</u>
1993	5	0	3	1
1992	5	0	3	1
1991	5	0	4	1
1990	5	0	4	0
1989	4	1	4	1

2. Youth Programs

This year's YCC program ran from June 14 through August 12, 1993. The crew consisted of six (three female and three male) enrollees with Biological Technician Brian DeVries as the crew leader. Two crew members were terminated due to disciplinary problems (beer in their lunch boxes).

Safety was stressed during the nine week program with the crew conducting one monthly safety meeting to the refuge staff, gaining public speaking experience in the process. We are happy to report that the 1993 YCC program was accident free.



93 NR6

BD

1993 YCC Crew left to right: Jody Pittington, Cory Slane, Tate Follett, and Jamie Myers.

The crew was again shared with the various Federal and State agencies within the County. The sharing of this program has enhanced cooperation between all the agencies that are prevalent in this isolated community. Participating agencies include: Bureau of Land Management (BLM), Soil Conservation Service (SCS), US Forest Service (USFS), Colorado Division of Wildlife (CDOW), Colorado Department of Parks and Recreation (CDPR), and the Colorado State Forest (CSF).

The following is a synopsis of the projects accomplished by this year's YCC crew:

Arapaho NWR Projects

- a. Litter pick-up of a 6-mile stretch of highway under the Adopt-A-Highway program.
- b. Removal of old fencing and stack yards.
- c. Transplanting vegetation to nesting islands.
- d. Waterfowl nest search in meadows and sagebrush uplands.
- e. Installation of new wooden sign posts, constructing a 600 ft. buck and rail fence and completion of the 0.5 mile nature trail.

- f. Beaver dam transects.
- g. Assisting with vegetative transects.
- h. General facilities maintenance - i.e. trash removal, grounds and vehicle maintenance, etc.

U.S. Forest Service Projects

- a. Planting willows for erosion control along river bends.
- b. Clearing timber and undergrowth for an eight mile mountain bike trail.

Projects for Other Agencies

- a. Constructed three strand barbed wire and buck and rail fences - CDPR
- b. Construct 1500 ft. buck and rail fence - CSF
- c. Timber stand improvement - CSF
- d. Cutting hauling, splitting, stacking firewood for campgrounds/rental cabins - CDPR
- e. Litter removal from lake shores and campgrounds - CDOW
- f. Campground maintenance/improvement and trail maintenance - CDPR
- g. Removal of stackyards and three mile barbed wire fence - BLM
- h. Construct and install waterfowl nest structures - BLM

Environmental Projects

- a. The educational highlight of the program was a field trip to the US Fish and Wildlife Services' National Ecology Research Center in Fort Collins, CO. A tour of the facility included a slide show of past and current USFWS research projects and a demonstration of GIS mapping. This visit demonstrated to the YCC crew that the Fish and Wildlife Service is involved in much more than just wildlife refuges.

During the summer YCC program, the enrollees also learned to identify some species of waterfowl and other wildlife, and learned about conservation and management of our wildlife resources.

- b. Various "mini-lessons" in conjunction with work for the refuge and other agencies covered the following topics: Timber thinning in a lodgepole pine forest; Moose and their management.



93 NR7
YCC learned the fine art of post hole digging.

8/93

BD



93 NR8
YCC installing one of the eleven repositioned steel shot signs.

8/93

BD



93 NR9 8/3/93
YCC building pole fence at interpretive trailhead.

ECP

4. Volunteer Programs

As previously mentioned (Section E.1), the refuge hosted a student intern volunteer from Colorado State University. Robert Baxter spent eight weeks assisting with a wide variety of wildlife, habitat, and maintenance projects. The refuge provided housing and paid a subsistence allowance of \$15 per day.

The local Boy Scout Troop #146, utilized the refuge for an Eagle Scout Project during the fall. Eagle Scout candidate Clint Harris, with assistance from Eagle counselor Jerry Rodriguez, proposed transplanting native vegetation on islands around the Refuge's Tour Route ponds. The purpose of the project was to improve wildlife habitat and nesting cover on high visibility areas of the tour route. A total of 12 boys and five adults spent a day transplanting cattail, bulrush, and sedges, and seeding grass on three islands at Potter Creek Pond. The mud fight between the boys and the adults at the end of the day brought the project to an end. Where do those boys (big and small) find all of that energy?



93 NR10 8/14/93
 Boy Scout Troop #146 transplanting veggies.

JR

5. Funding

Table VI.

Refuge 5-year Funding Summary

Fund	FY90	FY91	FY92	FY93	FY94
1260-0000	242,000	335,000	369,000a	370,000a	317,000a
1261-60YC	18,600b	18,300b	13,200b	14,000b	8,500
8610-0000	4,480	1,250	2,035	2,870	3,800
7201-6012	---	---	75,000c	63,200	---
1120-606B	27,500	10,000	10,000	10,000	12,500
9110-0000	13,500	1,400	13,000	4,000	3,900
TOTAL	300,480	441,951	476,035	450,070	345,700

a. Includes ARMM &/or RP &/or FLEX &/or Cost Share monies

b. Includes \$\$ from the USFS.

c. Carryover from the previous year

6. Safety

The refuge had three accidents during the year: 1) Employee was driving a refuge vehicle when a deer leaped across the highway, hitting the side of the vehicle. The vehicle sustained light damage. 2) The second incident resulted from an insect sting in the eye of an employee, requiring medical treatment. 3) The third incident involved \$1170 damage to a refuge vehicle on LE patrol. Upon exiting from a vehicle, the employee did not set the parking brake or close the door, the vehicle rolled back into a hill damaging the door and front fender.

All new employees were instructed in the proper operation of the 4x4 ATV's. The instruction consisted of setting up an obstacle course per owner's manual and reviewing all machine parts and maintenance.

Safety meetings were conducted each month with a different employee acting as chairperson. The meetings featured a safety film and a short discussion. Topics for both are as follows:

<u>Month</u>	<u>Film</u>	<u>Discussion</u>
January	Cold Can Kill	Cold survival
February	I Am Joe's Spine	Proper lifting
March	Radon Gas In Perspective	Radon gas
April	Fire vs. Fire	Burns to the skin
May	Hearing The Good Things In Life A Foot Closer To Safety	Proper safety equipment
June	Room To Live	Sunburn prevention
July	Close Encounters	General safety
August	Clinical Rabies In Animals	Handling stress
September	No Film	Human driving tricks



93 NR12 10/6/93 ECP
Putting the final touches on Goulette Pond.



93 NR13 10/06/93 ECP
Preparing to place structure in Hamill's Private Lands Pond.



93 NR14

11/10/93

ECP

Hamill dike finished just in time.

Refuge Assistant Terri Follett spent innumerable hours working on the Budget Tracking System (BTS) program, answering questions, solving problems and programming the new BTS revision. She spent a major portion of every week providing solutions and answers to computer configuration problems/errors, along with various other computer software and technical questions from assorted field stations in the Region.

Refuge Operations Specialist Rodriguez and Biologist Rizer met with a private land consultant to discuss a wetland development proposal in Routt County.

Following is a list of services or assistance provided by Arapaho NWR staff to various agencies throughout the year:

A. BLM

1. Memorandum of Understanding - in place document which governs the sharing of heavy equipment to the benefit of both agencies.

B. USFS

1. Temporary housing - the Case Cookhouse is used by temporary and volunteer USFS employees.
2. Memorandum of Understanding - an agreement to work with the Forest Service and other agencies towards a centralized visitor center in Jackson County.

C. CDOW

1. Law Enforcement - mutual assistance provided in law enforcement and bag checks during fishing, upland game, waterfowl, and big game seasons.
2. Committee Member - Patten and Rodriguez served on the Habitat Partnership Program Committee. The program was formed to resolve big game forage and fence conflicts with ranchers.
3. Refuge staff transported gravel to the North Delaney Buttes Lake to fill water control structure washout.
4. Refuge staff assisted in aerial waterfowl and big game counts

E. Jackson County Fire Department

1. Cooperative Agreement - mutual assistance provided in fire protection and suppression.

F. Revitalization Committee

1. Rizer met with various individual from other agencies to discuss interpretive displays for the local communities kiosks.

8. Other

A check in the amount of \$23,003.00 was presented to Jackson County as the Revenue Sharing payment for FY92. The check, delivered on April 13, represented 81.1 percent of full entitlement. The County returned the check April 29, indicating they could not distribute the funds to the local units of government, as mandated by Public Law 95-469 of October 17, 1978, per legal counsel. The check was returned to the County on August 17 stating that contrary to their legal counsel it had been determined by the Regional Solicitor's Office that the

County had the legal authority to distribute the funds. The County finally accepted the monies, but continues to express objection to the FWS as to their authority to pass payment. On December 17, the Regional Solicitor sought counsel with the Attorney General of Colorado for a final decision on the matter.

F. HABITAT MANAGEMENT

1. General

Weather conditions were near normal in 1993. A good snowpack in the mountains, coupled with a wet spring, supplied more than sufficient water to irrigate meadows and fill impoundments for optimum habitat conditions.

2. Wetlands

The ice on the Illinois River began to break up during the month of March, allowing headgates to be opened and giving us an early start on irrigation. By mid April all refuge ponds were open with traditional spring habitat conditions prevailing for the first time in several years. Irrigation continued through the end of July keeping wetlands in above average conditions.

Additional water from the Illinois River became available in late August and was useful in refilling ponds that had been drawn down during the summer months for dike rehabilitation work.

The Water Management Plan incorporates planned draw downs of specific ponds each year, when possible, to aid in the production of emergent and sub-mergent vegetation and encourage invertebrates. During the previous four years a number of the scheduled draw downs were canceled or postponed, usually due to the prevailing water situation. Sometimes the lack of water effectively resulted in an unscheduled draw down for certain ponds so, although the timing may have changed, the end results were achieved. This year, the adequate moisture conditions allowed all scheduled draw downs to be accomplished.

As we continue to monitor vegetation growth and invertebrate populations within ponds, planned draw downs will be adjusted accordingly. Occasionally water management is dictated by the priorities we set for rehabilitation of dikes and water control structures.

5. Grasslands

a. Irrigated and Sub-irrigated Meadows

Arapaho NWR relies heavily upon irrigation water for habitat management purposes via 49 full or partially owned water rights involving 321.471 cfs of water. The Illinois River is the primary source of refuge water (over 300 cfs), while Spring Creek, Potter Creek and Antelope Creek provide a combined total of less than 20 cfs of water. Fourteen headgates located along the Illinois River divert water into more than 70 miles of primary irrigation ditches. Secondary and spreader ditches flood irrigate up to 8,000 acres of meadow to maintain and perpetuate quality migratory bird breeding and nesting habitat.

The primary objectives of meadow management is: provide shallow, well dispersed, open water areas as soon as possible in the spring; attract waterfowl and other migratory birds; and provide high quality nesting and brood rearing habitat for waterfowl and other wildlife.

Irrigation efforts began in earnest during April and continued into late July. Headgates were closed in early August to increase the river flow and dry the meadows prior to grazing. A total of 38,752 acre feet of water was diverted for irrigation and to recharge wetlands. This was more than double the amount of acre feet diverted during the last two years, and surpassed all records since 1986 (our last year of above average snowfall).

b. Uplands

The sagebrush uplands are managed primarily to provide a diversity of grasses, forbs and shrubs as habitat for various species of wildlife such as the Brewer's sparrow, sage grouse and pronghorn antelope. Livestock grazing and prescribed burning are the two major management tools utilized to manage the uplands.

Above normal precipitation and mild temperatures during the growing season provided more than adequate moisture to produce excellent early and mid season plant growth. Heavy snows along with numerous timely spring and summer rains are needed next year for the refuge uplands to remain in good condition.

7. Grazing

After several years of snow and wind, most of the residual vegetation tends to mat down, inhibiting new plant growth and ultimately reducing the quality of cover for most wildlife species. Livestock grazing is the primary habitat manipulation tool the refuge uses to restore plant vigor and enhance community diversity.

Generally, the uplands are grazed in the spring after there has been sufficient new plant growth. The cattle are then removed, prior to the end of the growing season, to allow grazed plants to recover with new growth before the end of the growing season. Most of the refuge meadows are not grazed until after August 1, or after the majority of waterfowl and other migratory birds have completed their nesting activities.

Refuge personnel determine the maximum number of AUM's to be grazed on each grazing unit. The permittee is then free to determine how he will utilize the AUM's allotted to him within the time frame specified on his grazing permit. We try to encourage the permittee to run larger herds and to utilize the available AUM's as soon as possible. The permittee is furnished fencing supplies by the refuge and is responsible for conducting all minor fence repairs. Most permittees remove all of their cattle from the refuge prior to, or during, the month of October as heavy snowstorms accompanied by strong winds may develop in North Park anytime after the middle of October.

The current grazing program utilizing complete rest for a year, seasonal rotation and rest rotation at various grazing intensities, provides a mixture of different vegetative treatments on refuge grasslands. (Table VII) Although this grazing program has basically provided the desired biological diversity over the years, there is always room for improvement and changes.

In 1988 we initiated HRM (Holistic Resource Management) on the former L. Hampton tract which involved establishing goals, setting objectives, installing vegetative transects and locating a grazing permittee who would be willing to work with us in utilizing HRM concepts on the unit. Two years later, the initial program was expanded to include the Anderson/Allard tracts. Each year some adjustments are made attempting to increase the overall benefits to wildlife and the habitat. (Tables VIII and IX)

These fields are beginning to show some positive results, particularly on the sagebrush-grassland uplands which have had a history of over-grazing and over-resting in the same fields. Bare ground in these fields appears to be decreasing while ground litter is increasing. Hopefully more new grass seedlings and forbs will become established in the next few years.

Table VII.

SUMMARY OF 1993 GENERAL GRAZING PROGRAM

Unit	Upland	Meadow	Total	AUM's		Permittee
	Acres	Acres	Acres	AUM's	Acre	
C5	49	27	76	71.39	.93	Anderson
C19&21	181	13	194	3.25	.01	Anderson
C12	16	836	852	892.53	1.04	Burr
D3	230	208	438	374.25	.85	Burr
D5	378	--	378	48.73	.13	Burr
D6	148	127	275	224.95	.81	Burr
D8	286	87	373	143.07	.38	Burr
E2	120	500	620	571.14	.69	Burr
A8	915	15	930	268.58	.28	Hudspeth
C1	300	11	311	37.48	.12	Hudspeth
A6	27	264	291	285.00	.97	Stephens
A7	130	263	393	392.50	.99	Stephens
A9&10	75	217	292	316.54	1.08	Stephens
C11	167	253	420	224.88	.53	Stephens
D4	123	28	151	57.30	.37	Stephens
D9	99	24	123	45.84	.37	Stephens
A2a	117	2	119	30.49	.25	Swift
A2b	90	15	105	48.78	.46	Swift
B19	16	75	91	109.76	1.20	Swift
B20	--	129	129	145.68	1.12	Swift
C6	--	236	236	102.10	.43	Willford
C9	--	80	80	199.71	2.49	Willford
Totals	3,467	3,410	6,877	4,593.95	.66	

HRM grazing activities for 1993 are summarized in the following tables:

Table VIII.

HRM GRAZING, (Hampton, Fox, & Brocker tracts) 1993

Field or Paddock	Acres				Total	Dates	Days	Grazing	
	Meadow	Riparian	Upland					AUM's Used**	AUM's /Acre
21	44	5	121	170	6/07-7/6	30	64.80	.38	
9&10*			350	350	7/07-22	16	34.56	.09	
1a			115	115	6/28-29	2	26.03	.22	
1b		1	115	116	6/30-7/1	2	26.03	.22	
2		1	175	176	7/02-3	2	26.03	.14	
18	59	6	8	73	7/04-08	5	65.08	.89	
27a	47	3	2	52	7/09-12	4	52.07	1.00	
26a	66	1	2	69	7/13-17	5	65.08	.94	
25a	71	1	2	74	7/18-22	5	65.00	.87	
11	67		95	162	7/23-26	4	67.84	.41	
17	74		10	84	7/27-30	4	60.28	.71	
16	75		5	80	7/31-8/3	4	60.28	.75	
15	90		5	95	8/04-08	5	75.35	.79	
6	45		121	166	8/09-12	4	60.28	.36	
7			157	157	8/13-14	2	30.14	.19	
13	30		12	42	8/15-16	2	30.14	.71	
14	53		5	58	8/17-19	3	45.21	.77	
8			149	149	8/20-21	2	30.14	.20	
B17	110	4	2	116	8/22-31	10	150.70	1.29	
23	88	6	42	136	9/01-08	8	120.56	.88	
22	141	4	4	149	9/09-19	11	165.77	1.11	
24a	87	2	3	92	9/20-26	7	104.11	1.13	
24b	32	8	22	62	9/27-29	3	44.53	.71	
25b	38	9	22	69	9/30-10/3	4	59.49	.86	
26b	36	5	21	62	10/04-06	3	44.53	.71	
27b	56	2	18	76	10/07-11	5	74.36	.97	
20	44		37	81	10/12-15	4	59.49	.73	
19	67	9	20	96	10/16-21	6	89.24	.92	
3	14	3	102	119	10/22-23	2	29.75	1.70	
4	36	4	56	96	10/24-27	4	59.49	.61	
5	131	3	108	242	10/28-11/15	19	254.43	2.35	
Totals	1601	77	1906	3584			2140.79	.76	

* Individual fields combined.

** AUM's vary as cattle herd composition changed throughout the grazing period.

Table IX.

HRM GRAZING (Anderson and Allard tracts) 1993

Field or Paddock	<u>Acres</u>			Dates	Days	<u>Grazing</u>	
	Meadow	Upland	Total			AUM's Used	AUM's/ Acre
L	48	3	51	6/11-18	8	71.01	1.39
K	45	9	54	6/19-23	5	64.87	1.20
J	86	--	86	6/24-7/2	9	116.78	1.35
I	84	--	84	7/03-10	8	104.86	1.24
M	33	--	33	7/11-14	4	53.83	1.63
E	29	21	50	7/15-18	3	40.36	.80
F	34	18	52	7/19-22	3	40.36	.77
G	42	52	94	7/23-27	4	53.83	.57
H	63	19	82	7/28-8/3	7	94.22	1.14
N	31	--	31	8/04-07	3	40.36	1.30
TOTALS	495	122	617			680.48	1.13 AVG.

Although we were able to gather only limited duck nesting density and success data this year, it does appear that cattle do not seriously affect the success of nests as long as the nests were initiated before the cattle entered the field. Our past, and much of our current meadow grazing program, has been based on the assumption that grazing during the nesting season severely reduces nest success. Based on this assumption we have always delayed meadow grazing until after August 1st, when the majority of the nesting activity has ceased. Management strategies may change in the future.

In 1994 grazing fees will be \$7.55 per AUM, remaining the same as last year. The 1991-1993 three year average fall cattle and calf price of \$85.72 per CWT represents a 2.5 percent increase over the 1992 base survey price of \$84.70 per CWT. The 1994 approved grazing fee is adjusted to the 1992 base survey rate of \$7.65 per AUM.

8. Haying

One cooperative farming agreement was issued for haying 138 acres of meadow on the Anderson tract. The refuge's harvest, 25 percent, was 54 tons (approximately 1800 bales). The haying operation serves several purposes as follows:

- a. Provides a resident elk herd of 200 to 225 animals plus another 500 to 600 non-resident wintering elk, and up to 100 mule deer a winter food source and at the same time reduces big game damage to haystacks on adjacent private lands.
- b. Provides a source of hay to utilize on cooperative basis with the Division of Wildlife in preventing or minimizing big game damage complaints from other landowners in the County as the need arises.
- c. Provides the refuge with hay to utilize as nesting material in goose and duck nest structures.
- d. Provides a wet hayed meadow on the refuge each spring to attract migratory birds and waterfowl.

9. Fire Management

The Fire Management Plan addresses prescribed burning as a grassland management tool to be utilized on an expanding scale as the local community becomes more receptive to its use. However, the extensive use of grazing (especially HRM practices) has reduced the need for prescribed burning on the refuge in recent years. Prescribed burning in the future will be confined to those areas that have a predominance of unpalatable vegetation and require removal of duff, and areas where the decadent willows require rejuvenation to improve browse for moose and deer.

Two prescribed burns were planned for the year but were not completed due to inadequate weather conditions.

10. Pest Control

Canada thistle is the primary noxious weed found on the refuge although yellow toadflax has also been identified on one area in the southwest corner of the refuge. In the past, efforts to control Canada thistle were limited to spraying 2,4-D herbicide. These efforts were minimally successful and in 1988, all chemical spraying was eliminated and biological control was undertaken.

The initial agent released was the stem mining weevil, Ceutorhynchus litura and later the Canada thistle stem gall fly, Urophora cardui. Last year, due to a shortage of weevils coupled with a high demand, the refuge did not receive any stem mining weevils. Because of the purchase order that could not be honored last year, the refuge was at the top of the list this year, and received 300 weevils. They were separated into three groups of 100 and released in May at three sites.

Following is a summary of the biological agents:

C. litura

Elk Pond Dike:	Larva present - plants wilting
Hubbard Ditch:	Larva present
Midland Ditch:	Larva not found, unidentified insect impacting plants
Spring Creek:	Larva present - plants wilting
Tour Route Pond:	New release
Antelope Pond Dike:	New release
Allard Bridge:	New release
<u>U. cardui</u>	
Allard Bridge:	No evidence of flies
Tour Route:	Plants wilting, some galls
S. Allard Contour :	Not checked

G. WILDLIFE

1. Wildlife Diversity

Although the refuge's primary objective is the production of waterfowl, the protection, maintenance and perpetuation of all other indigenous wildlife and plant communities is also important. Most habitat management techniques such as prescribed burning, grazing, irrigation, pond construction, and plant seeding benefit all native species, plant and animal, in one way or another.

2. Endangered and/or Threatened Species

Two bald eagle sightings were reported this year in the fall.

Greater sandhill cranes are listed as an endangered species by the State of Colorado. Unconfirmed reports indicate they are nesting in North Park (but not on the refuge). Several flocks of cranes (from 15 to 50 birds) were observed on various areas of the refuge this fall.

River otter tracks and slides were documented on the Illinois River in March, a first for the refuge. In July, an otter was observed in South Allard Pond, confirming the earlier track sighting. River otters are listed as an endangered species by the State of Colorado.

3. Waterfowl

a. Ducks



93 NR15

5/18/93

ECP

Paddy O'Mallard says "Follow me".



93 NR16

7/93

JR

The Ruddy, always a favorite!

The first waterfowl sighting of the year was March 24th on the West Fish Hatchery Pond. Unlike previous years, this sighting was unusual in its diversity, with mallards, green-winged teal, L. scaup, gadwalls, and pintails being observed. This diversity may be attributed to the fact that the ducks arrived approximately one to two weeks later than normal. By mid-April the duck population was approximately 3,000 and peaked in July at over 6,000, slightly lower than last year.

Breeding pair counts were conducted on May 12th and again on May 26th. The results of 2.57 pairs per wetland acre was slightly lower than last years 2.7. This change was not significant when compared to previous data, considering that water levels have varied substantially during the past eight years. Water fluctuation has played a major role through the years in calculating pairs per wetland acre.

The first duck broods of the year were observed on June 30th, roughly a week later than last year. Based on past experience, we started nest dragging this year on June 21st and were very successful in finding a variety of nests that represented all species found on the refuge.

This was the fifth year that we used nest dragging to monitor nest success/predation rates and the effects of short term, high density grazing upon nesting waterfowl. Because this is not an attempt to determine waterfowl production, we sample areas with high concentrations of waterfowl nesting as well as areas that represent our HRM grazing. Between nest dragging and random finds, we located 135 nests which were used in the analyses. Results are summarized in Table V.

There are 16 elevated nest baskets scattered throughout the refuge, along the Illinois River. These structures were installed in an attempt to increase mallard production but they have had little success as far as mallards are concerned. One mallard, along with two Canada geese, were documented nesting successfully in these structures.

Based on our brood counts, duck production on the refuge was estimated at 5,460 (Table XI). Even though this represents a 16 percent increase over last year, we still are unable to achieve the levels recorded in the mid 1980's as shown in Figure 1. This year, with average precipitation, we were able to keep all wetlands near optimum condition during the breeding season, but cooler than normal weather seemed to have had a detrimental effect on the production.



93 NR17

7/93

JR

"Hey, are these kids yours or mine?"

Table X.

1993 NEST DATA

-Approximately 1150 acres dragged or walked.
 -135 nests located (117 dragged, 18 walked).
 -1 nest per 8.52 acres or 0.12 nests/acre.

<u>Fate</u>	<u>Number</u>	<u>Percent</u>
Hatched	65	48.1
Predated	60	44.5
Abandon	10	7.4
	135	100.0

<u>Species</u>	<u># Nests</u>	<u>Percent</u>	<u># Broods</u>	<u>Percent</u>
Mallard	15	11.0	25	4.7
Pintail	7	5.1	9	1.7
Gadwall	38	28.1	163	30.4
Wigeon	4	2.9	32	6.0
Cinn\BWT	13	9.6	35	6.5
GWT	1	1.0	22	4.1
Shoveler	14	10.3	42	7.8
L. Scaup	37	27.3	146	27.2
Redhead	5	3.7	24	4.5
Ruddy	1	1.0	38	7.1
Totals	135	100.0	536	100.0

<u>Species</u>	<u># Nests</u>	<u># Successful</u>	<u># Predated</u>	<u># Abandon</u>	<u>Apparent Success</u>	<u>Mayfield Success</u>
Mallard	15	6	9	0	40.0	20.5
Pintail	7	3	3	1	42.9	15.8
Gadwall	38	19	18	1	50.0	33.0
Wigeon	4	2	2	0	50.0	41.0
Cinn\BWT	13	6	7	0	46.2	20.2
GWT	1	0	1	0	00.0	00.0
Shoveler	14	8	5	1	57.1	35.2
L. Scaup	37	17	14	6	45.9	30.6
Redhead	5	3	1	1	60.0	26.3
Ruddy	1	1	0	0	100.0	100.0
Totals	135	65	60	10	48.1	29.7

For all nests: Mayfield Nu = 70.0
 E = 1,996.4
 h = 34.0

Table XI.

Arapaho National Wildlife Refuge
ESTIMATED DUCK AND CANADA GOOSE PRODUCTION 1973-1993

Species	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93
BW/Cinn Teal	83	196	218	402	507	421	376	82	174	193	996	696	1154	857	1551	719	570	389	606	361	483
Canvasback	0	0	7	0	0	7	23	0	0	0	5	30	0	0	0	0	0	0	0	0	0
Gadwall	235	247	337	483	446	856	476	291	663	1414	1536	2394	2863	2293	1695	2383	1127	758	1259	1190	1379
GW Teal	140	244	295	354	352	500	219	13	247	737	713	507	302	455	450	588	577	138	173	248	313
Mallard	627	650	517	566	363	663	245	48	435	922	408	414	249	383	617	418	358	158	438	246	315
Pintail	449	555	472	661	275	400	373	63	430	1291	958	1626	733	782	782	738	389	214	516	213	130
Redhead	17	52	20	85	128	289	190	49	25	328	491	182	300	563	216	199	66	117	283	77	157
Ring-neck	0	0	0	0	0	0	8	0	0	7	0	7	0	0	0	0	0	0	0	0	0
Ruddy	42	50	59	77	76	138	13	9	12	178	242	316	364	527	267	641	160	89	242	87	325
L. Scaup	386	570	410	635	156	510	474	291	77	748	1046	1174	1266	1638	1193	1194	707	331	1080	518	1169
N. Shoveler	138	247	167	113	210	515	80	187	233	859	1340	688	968	552	1393	1010	1044	355	868	750	740
Am. Wigeon	322	345	412	402	224	821	98	137	263	1045	1497	1012	1557	1423	1205	1528	1077	547	875	896	449
Unidentified	0	0	0	0	0	0	0	0	0	7	0	7	0	0	0	14	0	78	29	5	0
Total Ducks	2439	3156	2914	3778	2737	5120	2575	1170	2559	7729	9232	9053	9756	9473	9369	9432	6075	3178	6369	4591	5460
Canada Goose	5	4	0	7	0	21	48	114	100	125	127	148	212	253	300	457	225	275	200	160	110
C. Merganser	6	8	0	8	8	13	0	0	0	40	0	0	10	30	30	0	0	25	0	0	0
Totals	2450	3168	2914	3793	2745	5154	2623	2317	2659	7894	9359	9201	9978	9756	9699	9889	6300	4391	6569	4751	5570

Figure 1:

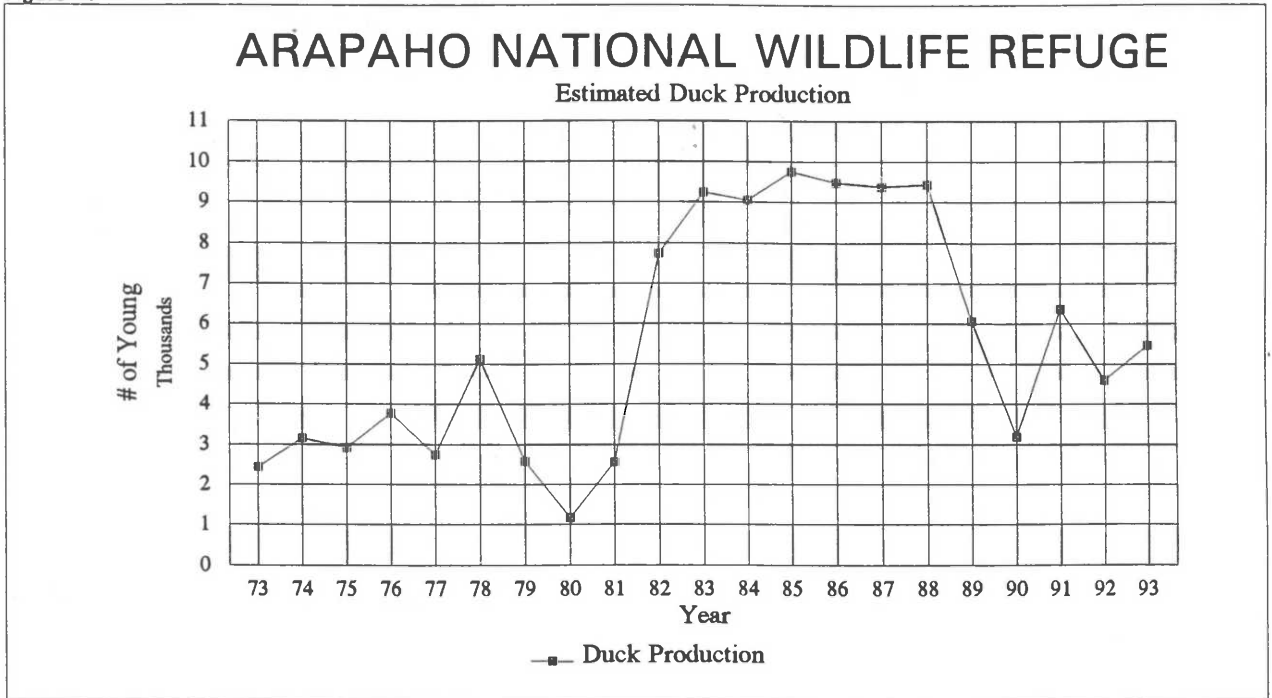
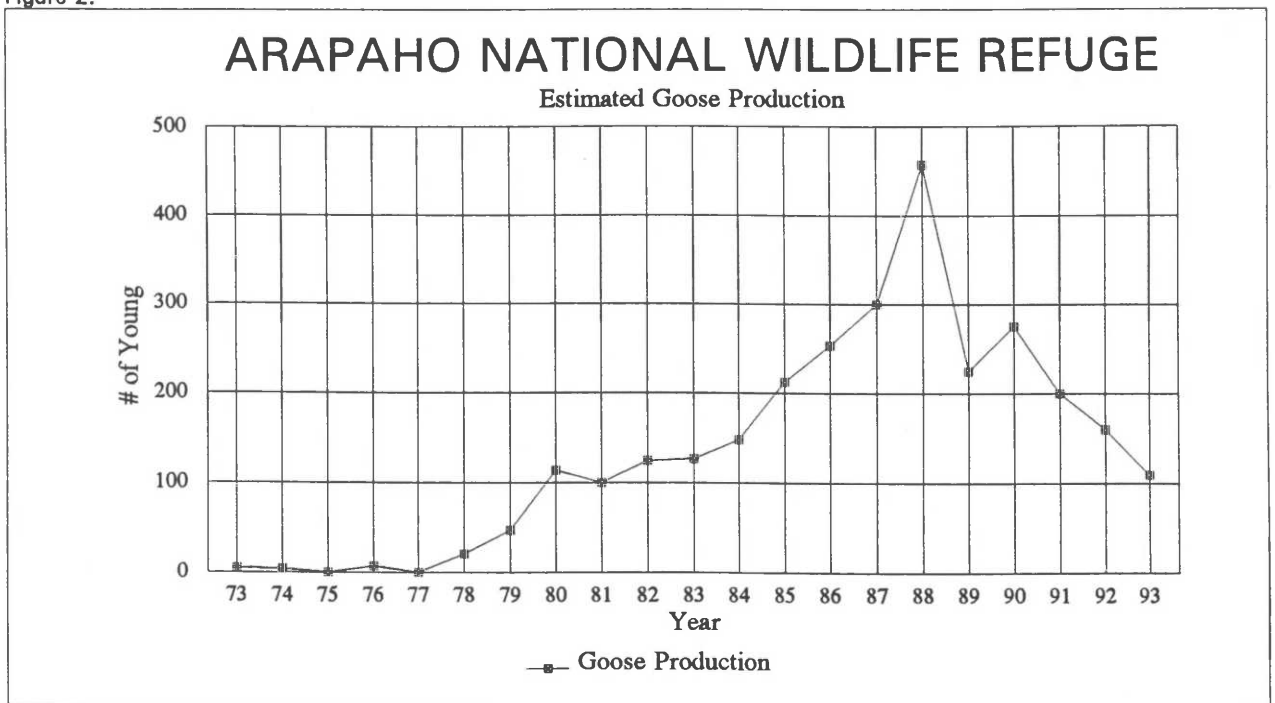


Figure 2:





93 NR18

8/93

BD

Young pintails do a pre-flight wing test.

The refuges' fall population of ducks averaged 6,500 in mid September, dropping to approximately 4,500 in mid October and by early November all water was frozen and the ducks had migrated south.

Two wood ducks were seen this year on the refuge. A drake was sighted on Kitchen Pond in late May and a hen was observed on Home Pond in October.

b. Geese

The first Canada geese were sighted on the refuge March 8. Waterfowl counts showed roughly 300 geese on the refuge in April, peaking in mid June with over 460 birds.

Of the 108 elevated nest structures available for geese in 1993, 82 were occupied resulting in a 76 percent utilization rate. Utilization of the structures has fluctuated for the past several years (80 percent plus in '86 and '88; 70 percent or less in 89, 90, 91 and 92), the reasons for the

variations in use are unknown. Nest success rates on the structures used was 77 percent, this rate also fluctuates but has remained between 70 to 85 percent for the last six years. Canada geese used three mallard nesting structures this year, with two successful and one abandoned. Canada geese nesting on islands had a 75 percent success rate while shoreline nests tended to be heavily predated.

The first documented goose brood was observed on May 12th. Actual goose production was estimated to be 110 goslings. (Table XI) Production has been dropping over the last two years, which may be attributed to the unusually cold spring and summer seasons. (Figure 2).

Goose numbers peaked in July at around 500. Fall numbers of geese decreased in September to approximately 360 birds, remaining the same in October through early November when all of the ponds froze over.

4. Marsh and Water Birds

The refuge has one large black-crowned night heron colony located on Smith Pond and two small colonies, one on Marsh Pond and the other on Reservoir #2. These colonies are surveyed once a year to estimate the population. This year 49 active nests were found compared to 42 nests in 1992. The survey continues to show a decline throughout the years in the main nesting colony, but random sightings indicate the herons are nesting in various new sites throughout the refuge.

Numerous eared grebe colonies were located on several ponds. These colonies consisted of small nesting groups, usually under ten nests. Pied billed grebe sightings are on the rise, but no nests have been found to date.

White-faced ibis were seen on five different occasions this summer, in groups of up to 10 birds. No evidence of nesting has been observed on the refuge.

Double-crested cormorants were observed several times this summer. They are not known to nest on the refuge, but do nest on a reservoir close to the refuge's northern boundary. They seem to seek out specific areas on the refuge for feeding.

Over the last several years White pelican sightings have become a common sight on the refuge. This is attributed to the fact that there is a nesting colony on McFarlane Reservoir, just south of the refuge boundary, where the CDOW is monitoring the colony to collect data on its production. The northern area of the refuge appears to be one of their favorite feeding grounds.

A small colony of great blue herons nest on the refuge. The colony is found along the Illinois River in a group of cottonwood trees.

Other marsh and water birds observed included sora and Virginia rails. One western grebe was observed on Home Pond in May.

5. Shorebirds, Gulls, Terns and Allied Species

Among some of the more common members of this group observed during the year were: American avocet, Forster's tern, killdeer, common snipe, long-billed dowitchers, Wilson's phalaropes, yellowlegs and a number of peeps. Nesting of black terns was documented on the refuge for a third year, with a small colony of ten birds found nesting on East Fish Hatchery Pond. Rare sightings during the spring was a snowy egret found on Home Pond and a Long-billed curlew on the tour route.

6. Raptors

The two most common raptors, observed daily in the summer, are Swainson's hawks and golden eagles. Other common raptors found are: northern harriers, American kestrels, short-eared owls, rough-legged hawks, and turkey vultures. Several northern harrier nests were found this summer while nest dragging for waterfowl. Less frequently observed raptors include red-tailed and ferruginous hawks. Four red-tailed hawks were noted, two in the spring and two in the fall. Four ferruginous hawks were sighted, once in the spring and twice in the fall. A first sighting for the refuge was a Sharp-shinned hawk, viewed along the Illinois River in April.

Prairie falcons were sighted occasionally throughout the spring, summer and fall.

The refuge has two known resident great horned owls. These owls live in the Case barn where disturbance is minimal. Great horned owls are seen frequently but the location of their nests is not known. One short-eared owl nest was found during our waterfowl nest dragging operation.

No burrowing owls were observed nesting on the refuge, but one sighting was made in the fall.

7. Other Migratory Birds

Rosy finches, chickadees and dark-eyed juncos take advantage of our bird feeders during the winter months. This year the feeders also attracted several tree sparrows.



93 NR19 7/93 JR
Immature Mountain bluebird.

Mountain bluebirds utilized several of the bluebird nest boxes this year, while tree swallows took up residency in the remainder.

Rufous and broad-tailed hummingbirds are common visitors to the nectar feeders at the headquarters during the summer.

Several uncommon species were sighted this year including: Black-headed grosbeak, Rusty blackbird (a first sighting for Jackson County), Northern oriole, fox sparrow and Belted kingfishers. Three very unique observations for the year included a Magnolia warbler at the Case buildings, a Painted bunting seen in Walden, and a white-throated sparrow at the refuge feeder. Pine siskins arrived in unusually large numbers during the spring at the headquarters feeders.

The refuge participated in the Colorado Breeding Bird Atlas for the fifth year. This year we continued to work in the priority block, up-grading the nesting status of birds which have been observed in previous years. The project divides the state into geographical blocks and seeks to determine what species breed in Colorado, where, in what habitat, and in what numbers. We spent several days searching our priority block this year, updating the breeding status of three species as well as updating several species in two other blocks.

8. Game Animals

Wintering elk herds continue to grow larger each year. In January, approximately 700 animals were found on the refuge, where they remained into early March. A small resident herd of approximately 200 elk remained in the Illinois river bottoms above the headquarters throughout the year. With the opening of the big game seasons the refuge had an unusual influx of elk that were highly visible, sparking many questions from hunters about the fact the refuge is closed to elk hunting. Limited winter feeding, (along with reduced livestock grazing in specific areas), was done on the Anderson, Allard and Case tracts to attract elk onto the refuge from adjoining private lands. This tact has been successful in limiting hay stack damage on adjacent ranches, allowing the refuge to maintain a good raport with the neighbors.



93 NR20

2/93

JR

This is the resident elk herd's idea of a "groomed trail".



93 NR 21

2/19/93

ECP

One of the smaller wintering elk herds on the refuge.



93 NR 22

9/93

JR

"If we hold really still maybe they won't see us."

Seven moose were observed feeding on willows along the Illinois River near the headquarters during an aerial count in January. Various numbers of moose were sighted throughout the year along the entire Illinois River, with one large bull seen north of the refuge headquarters. Moose are a common sight during the summer, attracting many visitors. According to the CDOW, the North Park moose population is healthy and increasing dramatically, with 600-700 animals.

Mule deer were found in the willows along the Illinois River throughout the year. While mule deer are most commonly found on the refuge, white-tailed deer numbers have also increased. Twin fawns were spotted near the refuge headquarters and three large bucks were seen along the abandoned railroad bed.

Approximately 550 pronghorn antelope spent the winter on the Case Flats in numerous large herds. Fawns were visible during the summer in most upland locations.

10. Other Resident Wildlife

The refuge receives many visitors throughout the spring and summer in search of sage grouse. Sage grouse are most visible during the spring on leks. The refuge has no leks but offers the visitors information on several that are close-by. Two large flocks were observed on the Case flats in March with 22 in one group and 81 in the other, but no lek was found. Throughout the summer sage grouse were seen in various sized flocks, but only four broods were observed.

The refuge beaver population continues to do well with 42 active dams counted in an August census. In the past, during low water years, beaver have caused problems with our water management program. Moving water downstream through the beaver dams in late summer can be a challenge during most years. Conflicts were limited this summer due to good water levels over the course of the summer.

A predator abundance survey was conducted in September, with three transects of thirty stations set for two nights. A total of 15 predators visited the 30 stations, with 10 coyote sightings leading the list followed by two striped skunks, one feral cat, one badger and one red fox. These numbers show no radical change from the previous years, but using such small sample sizes, no major conclusions can be made.

The refuge porcupine population continues to do well based on observations and willow use. Two rare sightings of mink as well as occasional sightings of weasels and skunks were reported.



93 NR23

2/93

JR

"What do you mean 'your' willows?"



93 NR24

2/8/93

ECP

A jack-in-the-box!



93 NR25

2/93

JR

Peter, scaling the heights.

Other resident wildlife include: white-tailed jackrabbit, Nuttall's cottontail, white-tailed prairie dog, Richardson's ground squirrel, and other small rodents. The cottontail and jackrabbit populations seem to be on an upward swing, while the prairie dog and ground squirrel populations remain stable.

An unusual reptile sighting at Arapaho in August was a wandering garter snake found at Fox Pond dike.

11. Fishery Resource

The Illinois River is the refuge's only fisheries resource. Brown trout are the primary game fish although a few rainbow trout are also present. In low water years the northern section of the river dries up and is unable to sustain a fisheries. Beaver dams in the southern section of the river help maintain a generous population of large brown trout.

15. Animal Control

The refuge issued a special trapping permit again this year to try and keep the beaver population in control. A local trapper was issued the permit and removed eight beaver in the spring. The following animals were removed from the refuge in accordance with the approved Predator Management Plan: twenty one magpies, two crows, and one raven.

H. PUBLIC USE

1. General

Approximately 6,000 people visited the refuge in 1993, down dramatically from the 8,000 people last year. Part of this decline can be attributed to the fact that the tour route traffic counter quit several times during the summer due to battery problems. If the kiosk pamphlet use was any indication of the number of visitors on the refuge, actual visitation was much higher this year than stated above. Most refuge visitors drive the auto tour route, with an increasing number stopping at the office for information or picking up pamphlets from our three kiosk leaflet dispensers or the local Chamber of Commerce office in town. We have also noticed a large influx of public use at the Brocker Overlook, accessible from Highway #14, which is part of the Colorado Scenic Byway Trail. To date we have not installed a traffic counter there, so we have no accurate way of determining public use at this site.

4. Interpretive Foot Trails

Work continued on the refuge 0.5 mile nature trail, accessible by the physically challenged, which was completed in August. The YCC spent several days assisting refuge staff with the construction of hand rails on the two bridges, installing sign posts and constructing a buck and pole fence at the trailhead parking lot. After two years of waiting, the nature trail signs were finally received from Alpha Sign Inc. These signs along with two benches were installed at various



93 NR26

8/03/93

ECP

One of the completed bridges on the interpretive nature trail.



93 NR27

8/03/93

ECP

A close-up view of one of the new signs on the nature trail.

interpretive points along the trail. At years end we were experiencing problems with our hardening compound making the trail, anything but, accessible for the physically challenged. We hope to have this problem rectified in early spring of '94.

5. Interpretive Tour Route

The refuge maintains a six-mile, self-guided auto tour route on the west side of the refuge. Many of the best waterfowl viewing areas are located on the tour route as are interpretive stops relating to white-tailed prairie dogs, pronghorn antelope, and other refuge fauna and flora.

The refuge tour route received a record number of visitors in July with an estimated 1,078 vehicles utilizing the auto tour. This number was obtained from the traffic counter on the tour route road, which quit working several times during the course of the season. Problems can be blamed on the quality of batteries and cold damp weather conditions.



93 NR28

2/93

JR

Cross country skier enjoying the winter wonderland.

6. Interpretive Exhibits/Demonstrations

The refuge's three interpretive kiosks are a popular attraction to refuge visitors. The kiosks have interpretive panels that describe activities from wildlife viewing opportunities to habitat management programs occurring on the refuge. There are also leaflet dispensers at each kiosk.

7. Other Interpretive Programs

The following programs and/or tours were given by refuge personnel during the year:

March - Rizor gave a talk to North Park Stockgrowers at their annual meeting.

April - Patten and Rodriguez gave a talk to seven students and their instructor from the Colorado Mountain College.

May - Thomas and Rizor participated in the Annual Arbor Day Program at the Walden Elementary School, with approximately 183 students, discussing endangered species and wildlife of North Park.

Rizor gave a presentation and tour to ten Cub Scouts and Leaders from the local Boy Scout Troop #146, helping them meet requirements for their Webelo's wildlife badge.

Rodriguez spoke with four members of the Fort Collins Audubon Society.

Patten gave a talk to 24 Colorado State University biology students on refuge management.

June - Refuge staff created a unique float to represent the refuge in the Annual Never Summer Rodeo Parade. The refuge received third place for their efforts.

July- Rizor and DeVries gave a tour to 15 Girl Scouts and five adults from a nearby Wyoming Scout Troop helping them complete several requirements for badges they were working on.

August - Rodriguez gave a tour of the refuge to the employees of the Colorado State Forest.

September- Follett, Rizor and Thomas presented a Project Wild Program at the Colorado State Forest along with various agencies and school personnel. Seventy-eight students, fourth through sixth grade participated in this day long event.

Patten conducted a tour for 55 members of the Society for Range Management. He addressed the refuge's policy on water management, grazing, and big game useage.

October- Thomas and DeVries gave a tour along the nature trail to four Cub Scouts and their leader completing requirements for wildlife badges.

Four news releases were submitted to the Jackson County newspaper during the year as follows: recruitment for the YCC program; an interpretive article on raptors commonly found on the refuge; an article introducing the newborn wildlife on the refuge; announcement of trapping permit availability.

8. Hunting

Duck and coot hunting season ran Oct 2nd - 11th. Habitat conditions were average this year and hunting pressure was similar to that of previous years. Bag check data was collected on the opening weekend, the results are as follows:

Total hunters checked:	059.0
Total hours hunted:	207.0
Hours/hunter:	003.5
Total birds harvested:	085.0
Number of birds/hunter:	001.4
Number of birds/hour:	000.4

Species composition of bag checks:

Gadwall	35	(41%)
L. Scaup	2	(3%)
Wigeon	8	(8%)
Mallard	17	(20%)
Cinn\BWT	6	(7%)
Shoveler	5	(6%)
GWT	7	(8%)
Pintail	3	(4%)
Redhead	2	(3%)
Total	85	(100%)

The refuge Canada goose season ran from October 2 through October 15. Hunting pressure was low the opening weekend with two geese counted in conjunction with the waterfowl bag checks.

Pronghorn antelope archery season opened on August 15 and ended September 20. Hunting pressure on the refuge was low with approximately 12 hunter visits and zero animals harvested.

The pronghorn antelope rifle season opened September 25 and extended through October 1. The refuge is in a permit only area and makes up a small portion of the hunting unit. One hundred and thirty five permits were issued for 85 does and 50 bucks in the unit. Approximately five animals were harvested on the refuge, down by one animal from last year.



93 NR29

9/26/93

ECP

Successful pronghorn hunters at the end of a long day.

Sage grouse season ran from September 1 through October 3. The daily bag limit this year was three birds with a possession limit of nine. Hunter bag checks were conducted during the opening weekend with a total of 23 hunters spending 77 hours harvesting seven grouse. The results reflected less hunting pressure and better success than in 1992, with seven fewer hunters taking three more birds.



93 NR30

8/93

JR

A large crowd of fishermen (by Arapaho's standards) at the Fishermen's Parking Lot.

9. Fishing

The Illinois River is open to fishing on the refuge year-round except June and July, when it is closed to limit disturbance of nesting waterfowl. We estimated 100 fishing visits to the refuge in 1993.

Creel checks were conducted throughout the season. Fifty-nine fish were caught by 44 anglers, fishing a total of 125 hours. The average visit was 2.84 hours which is slightly less than last year but near normal for previous years. Several fish over 16" were checked with most of the fish measuring from 12-14 inches. Lure fishing was preferred with 62% of the fisherman using artificial lures. Bait fisherman made up two percent and fly fisherman thirty-six percent of the user group. Brown trout were the predominant fish caught with two rainbow, one brook trout (surprisingly) and a few chubs and suckers.

10. Trapping

In previous years the refuge was divided into two trapping units, Hunting Management Units (HMU), HMU A, and HMU's B. In 1990 due to a general lack of interest and low fur prices, the refuge units were combined and one permit was issued. Again in 1993, only one trapping permit was issued combining both refuge units. The trapper must purchase a \$25.00 refuge trapping permit, keeping all animals harvested. The refuge also issued our first novice youth trapping permit to a local youth, waiving the \$25.00 fee due to his inexperience and allowing him to harvest only muskrat. Project Leader Patten lent his expertise to this inexperienced youth trapper making sure he understood proper trapping procedures. Five coyotes, 107 muskrat (the youth trapper harvested 30 of these), one raccoon, and one striped skunk were removed.

17. Law Enforcement

During the year, Officers Patten and Rodriguez renewed their CDOW commissions allowing all of the year's violations to be processed through the state system. Most of our law enforcement efforts were conducted during the weekends and involved the pronghorn antelope, sage grouse and waterfowl seasons on the refuge, and deer and elk seasons off of the refuge. On the following table is a summary of the penalty assessments issued during the year:

Table XII.

PENALTY ASSESSMENT, ARAPAHO NWR - 1993

<u>Date</u>	<u>Violation</u>	<u>Officer</u>	<u>Disposition</u>
8/28/93	Unlawfully possessed a loaded firearm in motor vehicle.	Rodriguez	\$50 (fine) \$18 (surcharge)
	Unlawfully released arrow from public road		\$50 (fine) \$18 (surcharge)
9/26/93	Unlawfully failed to tag properly	Rodriguez	Warning
9/16/93	Unlawfully trespassed to take wildlife	Rodriguez	Warning
10/02/93	Unlawfully hunted waterfowl after hours	Patten	\$50 (fine) \$18 (surcharge)
10/02/93	Unlawfully hunted waterfowl after hours	Patten	\$50 (fine) \$18 (surcharge)
10/02/93	Unlawfully hunted waterfowl after hours	Patten	\$50 (fine) \$18 (surcharge)
10/03/93	Unlawfully hunted waterfowl in closed area	Patten	\$100 (fine) \$37 (surcharge)
10/03/93	Unlawfully hunted waterfowl in closed area	Rodriguez	\$100 (fine) \$37 (surcharge)
10/03/93	Unlawfully hunted waterfowl in closed area	Rodriguez	\$100 (fine) \$37 (surcharge)
10/03/93	Unlawfully hunted waterfowl in closed area	Rodriguez	\$100 (fine) \$37 (surcharge)
10/03/93	Unlawfully hunted waterfowl in closed area	Rodriguez	\$100 (fine) \$37 (surcharge)
10/17/93	Unlawfully failed to tag properly	Rodriguez	Warning
10/17/93	Unlawfully possessed a loaded weapon in motor vehicle	Rodriguez	Warning
	TOTAL		\$750 (fines) \$275 (surcharge)

I. EQUIPMENT AND FACILITIES

1. New Construction

The 404 Pond, completed last year by a private contractor, was fenced to protect the dike from being grazed while grass was being established. The pond was filled to capacity this spring for the first time.

Fox Pond, also constructed last year by a private contractor, was filled in late March. This spring, the east end of the dike was heightened and a overflow structure installed to create a small wetland in the upland barrow area.

Funded by CDOW Duck Stamp and Ducks Unlimited Marsh monies the construction of four new ponds was initiated this fall by a private contractor, at a cost of \$39,000. The dikes were completed in November but construction was then halted due to winter weather. Water control structures will be installed in the spring of '94.

A private contractor was hired to erect the new equipment storage building with refuge assistance as available. The foundation and frost walls were laid and most of the framework was completed before operations terminated due to a lack of proper equipment (a crane loaned from the County had to be returned). Hopefully the crane can be borrowed again and the building completed early in '94.



93 NR31

5/93

PR

404 Pond filled following last year's completion.



93 NR32

10/6/93

ECP

An overview of Fox Pond.

2. Rehabilitation

A large washout in the Caudle ditch near Smith Pond was repaired with wheelbarrows and shovels. Several small washouts on the Riddle ditch were also repaired.

Several small washouts were patched on the Anderson Drain dike, major repair is needed on the dike when time permits.

The water control structures in Eisemann and Old Road Ponds were taken out, reset and compacted using bentonite to try to eliminate recurring problems with leaking structures.

The bridge on Jackson County Road #32 (refuge headquarters entrance road) had to be rehabilitated by the County after it partially collapsed when the refuge's road grader drove across it.

New track adjustor forks, pistons and a transmission modulator were installed in the Case 1450.

A new fuel injector and seals were installed in the road grader.



93 NR33 2/93
It's amazing more repairs aren't needed...

JR



93 NR34 8/93
... the way people drive around here!

JR

3. Major Maintenance

With over 100 miles of boundary and interior fences on the refuge, we are kept busy repairing and replacing barbed wire and electric fences, gates, river crossings and cleaning cattleguards.

4. Equipment Utilization and Replacement

The refuge received a John Deere 4X4 tractor and a 15 ton low boy trailer in February, purchased with MMS FY92 funds.



93 NR35

1/93

JR

Newly received John Deere tractor.

An electronic postal scale was received in April, meeting the new mailing requirements.

A soil compactor was purchased in June replacing our well worn and much adored "Stompie".

Two 1000 gallon above ground fuel storage tanks were received in October. Plans are to remove the three underground tanks in the spring of '94 and hire an electrician to wire the new tanks making them completely functional.

5. Computer Systems

Several new items were purchased for the office this year. A 486 4DX2-66V Gateway 2000 tower computer with CD ROM, a 250 MB external tape backup, CalComp eight pin plotter, and GIS software PC ArcInfo were delivered in October.

6. Other

The refuge received several truckloads of excess military property including such items as tools, clothing, backpacks, oil, etc. Twenty-four office chairs were picked up from the Regional Office, excessed from one of their previous remodeling sessions, upgrading us from metal folding chairs to plushness, greatly enhancing our conference room.

J. OTHER ITEMS

1. Cooperative Programs

Owl Mountain Partnership

Background

The Owl Mountain Project is a partnership to develop an integrated, prototype, decision making process for resolving a variety of resource conflicts, using the principles of ecosystem management.

The project area lies within North Park and encompasses approximately 375 square miles of which 67 percent is public land and 33 percent is private land. Public lands are administered by the U.S. Forest Service, the Bureau of Land Management, the U.S. Fish and Wildlife Service, the National Park Service, the Colorado State Land Board, the Colorado Division of Wildlife, the Colorado Division of Parks and Outdoor Recreation and the Colorado State Forest Service. There are 25 major ranch operations, two outfitting businesses, a KOA campground, two small communities and Walden, the county seat.

Purpose

The purpose for the Fish and Wildlife Service to enter into a cooperative effort is to promote the concept of ecosystem management on FWS administered lands and adjoining lands referred to as Owl Ridge in the North Park area of Colorado. The objective is to create a partnership with the general public, public land agencies, public land users, and business communities for resolving vegetation resource conflicts using an ecosystem approach to landscape management.

FWS's involvement is to:

- a) Provide a representative on the Project Steering Committee to assist in reviews, site inspections of projects, inventories, studies, and related activities as necessary in providing technical support to the project.
- b) Provide any available support and information.
- c) Provide matching funds and financial administration for cost sharing of GIS mapping, resource inventorying and monitoring of resources and implementing selected ecosystem management practices.

Owl Mountain Partnership involvement is to:

- a) Coordinate the development and implementation of the Owl Mountain Project plan through the project steering committee.
- b) Consult regularly with the FWS in an effort to provide the FWS with GIS mapping of the refuge.
- c) Provide personnel, equipment and support services, to inventory and monitor specific plant communities and their associated wildlife (big game) populations on the refuge and adjacent land areas.
- d) Encourage partners to implement those selected resource management practices that are economical, practical, and consistent with the Owl Mountain ecosystem project plan.

Mission Statement

The mission of the Owl Mountain Project is to serve the economic, cultural and social needs of the community, while developing adaptive long-term landscape management programs, policies and practices that ensure the ecosystem sustainability.

The Owl Mountain Project is a partnership of public land management agencies, landowners and other interests formed to develop an integrated prototype decision making process using the principles of ecosystem management.

Goal #1 - To create partnerships that build trust and teamwork to achieve ecosystem health and resolve conflicts which will serve the economic, cultural and social needs of the community.

Goal #2 - To develop and implement an adaptive ecosystem management plan across political, administrative and ownership boundaries, based on identified issues and needs.

Goal #3 - To document the implementation process of ecosystem management and communicate knowledge gained from the project to partners and the public.



93 NR36

8/93

JR

Sunrise over Owl Ridge.

Owl Mountain Project activities for 1993 were as follows:

- 1) Patten served as a steering committee member to the project.
- 2) Staff contributed many hours to various aspects of the project.
- 3) A cooperative agreement between US FWS and the Colorado Heritage Foundation was completed transferring \$15,000 for cost sharing of GIS mapping, resource inventorying and monitoring of resources and implementing selected ecosystem management practices.
- 4) RO year end funding purchased GIS software and computer equipment to enable Arapaho to be an active participant in the GIS portion of the project. Robert Waltermire, NERC, Fort Collins, CO and Robin

Gebhardt, RO IRM, Denver, CO played key roles in assisting the Owl Mountain Project Manager and refuge staff in choosing and implementing GIS mapping. Waltermire digitized the refuge boundaries, fences, major roads and waterways, along with hosting a half day presentation on GIS using PC ARC Info at NERC to participating agencies in August. Waltermire and Gebhardt traveled to Arapaho in September to install a test copy of PC Arc Info and digitized data for the refuge. Waltermire and Rodriguez attempted to gather GPS data on water control structures but equipment malfunctions prevented completion.

Colorado Division of Wildlife

We have a good rapport and working relationship with the CDOW. Part of the present refuge was once a State Fish Hatchery where a free-flowing spring feeds two small ponds before entering an irrigation ditch and continuing on to other refuge impoundments. During the field season the CDOW parks several travel trailers at the "Fish Hatchery" where their personnel stay for research or law enforcement purposes.

Our staff assists the CDOW with: aerial wildlife surveys, law enforcement, facility use and equipment assistance. Our YCC program also worked with the CDOW's Youth in Natural Resources on various projects.

2. Other Economic Uses

A special use permit was issued in July of 1991 to Dave Farrand owner of Double R Ranch for construction and maintenance of a water line. The water line runs from a spring outlet on the refuge fish hatchery tract to a BLM grazing allotment. The permit allows for the use of the spring water to fill a water trough on the BLM allotment for approximately 30 days during the grazing season. This permit was issued for two years at the cost of \$175 and ended last year. The permit was re-evaluated and re-issued in July 1993 for another two years at a cost of \$110.

3. Items of Interest

Community Involvement

Patten, Rodriguez and Rizer attended numerous Owl Mountain Partnership and Colorado Habitat Partnership Program meetings.

Patten and Curtis continue to support and participate in the Jackson County Lion's Club. Patten is also a member of the North Park Oddfellows Lodge.

Follett was active in the Boy Scout Troop and the Drug Free School and Communities of America Committee.

Rodriguez was active in the Boy Scout Troop and agreed to act as Assistant Scoutmaster.

The refuge staff participated in the Colorado 'Adopt-A-Highway' program. Once during the year, members of the staff picked up litter along a six mile stretch of Highway #125.

Patten, Rodriguez and Rizer attended various interagency meetings during the year to inform the other agencies what was going on at the refuge and to keep abreast of what other agencies were doing.

Rodriguez attended several Forest Service Action Team Committee meetings.

Personnel Training/Meetings Attended

January

- Rodriguez - traveled to Alamosa NWR to attend a 32 hours introductory HRM course.
- Rizer - attended a 24 hour HRM Biological Monitoring course in Cheyenne, WY.
- Patten - traveled to RO for a meeting regarding the Stelbar acquisition land exchanges and grazing management options.
- Patten, Rizer, Rodriguez - hosted a meeting with the CDOW, BLM and SCS concerning a proposed sage grouse study.

February

- Rodriguez, Patten - completed Compatibility Determination and Media Training in Denver.
- Patten, Rodriguez - attended 40 hour Law Enforcement in-service refresher at Marana, AZ.

March

- Rodriguez, Patten - attended CDOW meeting concerning sage grouse study proposal.

April

Follett - traveled to Fort Niobrara NWR to assist with the BTS and reconciled their budget with the Finance Center.

Curtis, Follett,
Rodriguez - attended 8 hour Workforce Diversity training in Denver.

May

Patten - traveled to Minneapolis, MN for a 28 hour Fire Management for Line Officers course.

Thomas - traveled to Jamestown, ND to attend 20 hours of Basic Fire Training.

June

Curtis, Follett,
Patten, Rizer,
Rodriguez - participated in a round table meeting at the RO.

July

Patten, Rizer - attended a BLM Vegetation Monitoring Field Training session in Kremmling, CO.

Patten, Rodriguez,
Rizer - hosted a meeting with RO personnel and the BLM concerning the Stelbar property exchanges.

August

Rodriguez, Follett - attended a GIS informational meeting at NERC in Fort Collins, CO.

Patten, Rodriguez - traveled to Brown's Park NWR for firearm requalification.

September

Rizer, Rodriguez,
Patten - attended a workshop on Habitat Monitoring at Delaney Butte Lakes, CO hosted by Colorado State University Extension Office.

December

Patten, Rizer - attended a Jackson County Revitalization Committee Meeting in Walden, CO concerning interpretive signs for the town's kiosk.



93 NR37

4/93

TLF

Patten received his Special Achievement Award.

Awards

Patten received an award in April for his ingenious methods of maintaining his sanity with such a wild work crew. Rodriguez, Follett, Curtis and Rizer received Special Achievement Awards in September for their fine work in coercing the Project Leader into giving them the award.

4. Credits

Follett and Rizer - All Sections, Satellite refuges, Word Processing, Editing and Assembly.

Patten and Rodriguez - Editing.

Photos - As noted.



93 NR38

2/93

JR

The largest moon of the century.

BAMFORTH NATIONAL WILDLIFE REFUGE WYOMING

Administered by Arapaho NWR Complex
PO Box 457, Walden, Colorado

Introduction

Bamforth National Wildlife Refuge, located in the southern part of Albany County, Wyoming is small; the total number of acres is 1,166 consisting of 960 acres of grassland and 206 acres of marsh and water areas. A maximum of 206 acres of marsh and water areas is possible only under excellent runoff conditions during years when precipitation in the watershed is high.

The principal use of the refuge and surrounding lands is grazing of cattle. There is no possibility of growing grains for waterfowl food because of the high alkalinity of the soil and undependable water supply.

The refuge is broken up into three disconnected parcels of land, which would make posting costs high, enforcement of hunting regulations impractical, and effective management almost impossible.

No development of the area has been done in the past, nor is any planned for the future, because of the lack of an adequate water supply.

Waterfowl use of Bamforth NWR is sporadic, with only limited production.

1993 Activities

One grazing permit for 99 AUM's at a rate of \$2.00/AUM is issued on an annual basis to a neighboring rancher. In exchange for the reduced grazing fee, the permittee is responsible for irrigating refuge lands when the water is available (which, due to a poor water right, is not much).

The refuge issued a special use permit to Dr. Pugesek to continue his study, at Bamforth NWR, of California gulls during the 1993 season. The Wyoming Game and Fish also issued a special use permit for the study as it encompasses state lands. Due to a complaint received in 1989, that Dr. Pugesek's research was disturbing white pelicans and other nesting water birds, permits have been granted with the stipulation that all means necessary are taken to protect other nesting species. With this in mind Dr. Pugesek changed the protocols for the study, dramatically reducing disturbance to other colonial nesting birds. Future permits will continue to be issued only after a review has been made of the field seasons impact on other nesting birds.

Dr Pugesek submits an annual report providing information about all observed wildlife on the refuge. The following is a brief synopsis of this report: There were 3,860 California gull nests monitored with 75 percent of these nests failing. White pelicans continued to nest, with approximately 490 adults producing between 200 to 300 young. Double-crested cormorants had 75 active nests but only two fledglings were noted, several young were found dead but the cause was unknown. Five adult Snowy egrets with three nests produced two young. Six black-crowned night heron nests were sighted and two young were observed. Other birds noted include: Caspian terns, long-billed curlews, American avocets, marbled godwits. American kestrels, Northern harriers and golden eagles. Badger and canine tracks were frequently seen in the study area.

An inquiry was received from two adjacent landowners, concerning the possibility of using a portion of the refuge for a vehicle crossing during heavy snow when their regular access becomes impassable. The refuge granted them permission for the 1993-1994 season only and suggested that a better solution be found for the future. In conjunction with this request the refuge will try to fence and post that boundary in the summer of 1994.

A check in the amount of \$648.00 was presented to Albany County for the 1992 revenue sharing funds.

HUTTON LAKE NATIONAL WILDLIFE REFUGE WYOMING

Administered by Arapaho NWR Complex
PO Box 457, Walden, Colorado

Introduction

Hutton Lake National Wildlife Refuge is in Albany County, southeastern Wyoming, 12 miles southwest of Laramie, Wyoming. Established in 1932 primarily as a resting and breeding ground for migratory birds and to provide haven for other indigenous wildlife, the refuge is a satellite of Arapaho National Wildlife Refuge.

Situated in the southern part of the Laramie Plains, a montane, park-like geographic entity surrounded by mountains, the refuge is at an elevation of 7,150 feet. The area embraces 1,968 acres, consisting of 1,408 acres of upland and 560 acres of open water and marsh. The five small lakes on the refuge (Hutton, Creighton, George, Rush and Hoge) are arranged in a half-moon and were developed from natural sumps by private, and later, wildlife interests.

Sand Creek, spawned in Colorado and seasonal nourisher of refuge lakes, snakes a northward course through the west portion of the refuge. Meadowlands, lush with a wide variety of semiaquatic plants, are situated to the west and north, while native grass rangelands, interspersed with greasewood-dominated alkali flats and draws, lie to the east and south.

Efforts were made at Hutton Lake to save and enhance the endangered Wyoming toad (*Bufo hemiophrys baxteri*) population in 1991. A pair of toads (captured from Mortenson Lake NWR) were caged together at Lake George but this breeding venture was unsuccessful. In 1992, fifteen toads from a captive population at Sybille Wildlife Research Unit were confined in several cages on the edge of Lake George. Breeding was successful with two egg masses of approximately 5000 eggs each produced. The adult toads and 46 toadlets were placed back in captivity, with the remaining toadlets left in hopes of creating another wild population.

1993 Activities

Hutton Lake NWR was visited regularly during the year. Water management activities, waterfowl and shorebird censuses and facilities maintenance activities were a few of the projects undertaken.

For the first time in many years the Sand Creek headgate was opened in January and left open throughout most of the year. Approximately 2,200 acre feet was diverted, resulting in the largest influx of water in many years. Water flowed into Rush Lake with a large portion being diverted into Lake George to maintain Wyoming toad habitat, and then into Creighton Lake greatly enhancing this wetland. Excess water from Rush was diverted to Hoge Lake in an effort to refill this wetland which has been low for many years.

Refuge staff met with the Albany County Water Commissioner to discuss future water management plans and to give recommendations on the replacement of the existing flume at Sand Creek.

A field inspection of the irrigation system was done by RO Realty Office personnel, Paul Hartmann and Ginger Cheseby in July.

Three special use permits were issued to students at the University of Wyoming. A brief synopsis of each follows:

- a) A permit was issued for Hutton and Bamforth NWR to sample and measure invertebrates and their habitat, to compare the phenology and abundance of major macroinvertebrates and to determine the effect of habitat type on invertebrates in wetlands with higher versus lower salinity. No work was performed but several visits were made to the refuge this field season.
- b) A second permit was issued for Hutton and Bamforth to collect invertebrates and algae to compare macro-invertebrate communities within an impacted site and a reference site. Upon further consideration the student decided to focus on logging as an impact on forest wetlands, thus no collections took place.
- c) A two year permit was issued to study the dispersal and social structure of white-tailed prairie dogs, as it relates to the distribution and maintenance of prairie dog populations. During the spring, two study sites were established and used as replicated sub-populations of the white-tailed prairie dog colony on the refuge. Animal movements and dispersal were monitored through a combination of trapping, dye marking, and radio telemetry. Sixty-nine individual prairie dogs were marked with fingerling ear tags as well as with a unique dye marking pattern. These animals' behavior patterns and locations were documented using thirty minute direct observation surveys. Ten young-of-the-year prairie dogs were radio collared and monitored daily for two months. Information gathered from the study is being used to access home range size and to estimate daily activity patterns. The final component of the first season was to determine if the quality and/or quantity of food available to prairie

dogs varied spatially as distance increased from the colony. Thirty-nine permanent forage plots were established and sampled four times throughout the spring and summer with results pending analysis of forage quality. The winter will be spent analysing existing data and periodically monitoring marked animals as they emerge from hibernation.

The second year of this project will use the existing data collected on social interactions and focus primarily on better understanding of how social interactions potentially influence population dynamics both in terms of emigration and immigration.

One grazing permit was issued during the year, allowing 424 cattle on the refuge after July 15 for two weeks, using 250 AUM's at \$3.49/AUM.

Waterfowl censuses were conducted at various times during the year. Approximately 3000 ducks and 70 Canada geese were counted during the waterfowl census in mid April. Waterfowl numbers stabilized in mid May with 600 ducks and 130 Canada geese. These numbers remained steady until mid September when duck numbers jumped to 2,100 and 180 Canada geese, remaining constant until early November. Based on a mid-July brood count, duck production was calculated at 400 and goose production at 40.

Two volunteers from the Wyoming Game and Fish were at Hutton Lake NWR for two weeks banding waterfowl. One member of the staff gained experience by spending a day banding with the volunteers.

Electric fence was again installed around Lake George to protect emerging Wyoming toads from being trampled by cattle.

Seventeen Wyoming toads from Sybille Research Center and seven toads from the Cheyenne Mountain Zoo were placed in two separate cages. No egg masses were laid in the wild, although some clasping was observed. All of the toads were returned to captivity, except for two females (one missing, one dead). Within one week of return to Sybille, several toads started laying eggs producing four egg masses but only a small portion of two egg masses were fertile. These eggs were returned to Lake George and placed in small pools to develop with fifty-six toadlets surviving into the fall. They were then divided into two groups and placed back at Sybille and Cheyenne Mountain Zoo.

In July, members of the Wyoming Toad Recovery Team counted approximately forty toads in brief survey. Refuge staff participated in a thorough census in August, finding only two of the 1992 cohort.

Two bald eagles and three golden eagles were observed on the refuge in during the year.

A total of nine white pelicans were observed on the refuge at various times during the summer. An unusually large flock of five hundred and fifty phalaropes were seen in the spring. Several unusual species observed on the refuge include: Franklin gull, black tern, snowy egret, and white-faced ibis.

With MMS funding, much needed water management facilities were rehabilitated. A new parshall flume, and gates for the headgate, replaced existing structures at Spring Creek, and a new water control structure replaced the old structure between Rush and Lake George Ponds. Rip-rap was placed along high erosion areas and a new culvert was installed in a gully making the south entrance to the Spring Creek's headgate accessible.



93 NR39

12/93

PR

The new flume in Sand Creek.

The refuge experienced vandalism when a lock was broke off the door in the old shop building. This building stores various supplies for the refuge, and motor boats, traps, etc. for the University of Wyoming's Cooperative Wildlife and Fishery program. As far as the staff could determine nothing of any value was taken and a new latch and lock were installed.

A check in the amount of \$1,219.00 was presented to Albany County in April for the 1992 revenue sharing funds.

MORTENSON LAKE NATIONAL WILDLIFE REFUGE WYOMING

Administered by Arapaho NWR Complex
P.O. Box 457
Walden Colorado 80480

INTRODUCTION

Mortenson Lake NWR, established in May 1993, is 1,776 acres and located approximately 15 miles southwest of Laramie Wyoming. The refuge consists of three wetlands; Mortenson, Little Mortenson, and Soda Lakes. These are associated with many other lakes, the "Laramie plains lakes", a series of high elevation lakes in a short grass prairie ecosystem.

Mortenson Lake is approximately 80 acres and has a well developed wetland complex of hardstem bulrush (Scirpus acutus) and Baltic rush (Juncus balticus). Little Mortenson Lake is approximately 20 acres and has an unstable water level that is alkaline. The fluctuating water level has limited wetland vegetation development to a narrow band of Baltic rush. Nebraska sedge (Carex nebrascensis) and saltgrass (Distichlis stricta) occur on seasonally flooded areas adjacent to both lakes. Soda Lake is approximately 70 acres with minimal wetland vegetation and very alkaline. The previous land owner claims that sodium bicarbonate was historically mined from this lake.

Mortenson Lake NWR was established to protect the last known breeding population of Wyoming toads (Bufo hemiophrys baxteri). The Wyoming toad, confined to the Laramie plains in southeastern Wyoming is related to the Manitoba toad (Bufo hemiophrys hemiophrys) of northcentral North America. The Wyoming toad was first reported to occur in Wyoming in 1946. By the mid to late 1970's, the population drastically declined and by 1980 was thought to be extinct. In 1984 the Wyoming toad was listed as a Federally endangered species. In 1987, a small population was discovered within the historical range at Mortenson Lake and in 1988, the Wyoming Toad Recovery Team was established hoping to prevent the toad extinction by addressing toad habitat, reproduction and human impact.

The population has been steadily declining over the years with contributing factors thought to be a fungus disease, combined with red leg, a bacterial disease that has been documented to kill toads in the wild. In 1990, a captive population of toads was initiated using young-of-the-year from Mortenson Lake. Initially, the captive population was sent to Sybille Research Center, north of Laramie, Wyoming. The population was later separated and sent to two additional sites to prevent a major loss from destroying the entire captive population. The Cheyenne Mountain Zoo of Colorado Springs, Colorado

and the Henry Doorly Zoo of Omaha, Nebraska were the additional sites selected and are hoping to use their captive population to augment and maintain the wild population.

The Refuge's management objectives is as follows:

Primary Objectives:

- 1.) To preserve, restore, and enhance the population of Wyoming toads.

Secondary Objectives:

- 1.) Provide habitat for migratory waterfowl, colonial nesting birds, shorebirds, and raptors. Management for these species will only occur if it is compatible with efforts to protect the toad.
- 2.) Maintain natural diversity of plants and animals native to the Laramie plains.

1993 Activities

Refuge staff met with FWE personnel throughout the year to discuss water management/facilities and habitat improvement projects.

Four Wyoming Toad Recovery meetings were attended by refuge staff during the year. Highlights of the topics discussed included: capture of all adult toads from Mortenson Lake NWR; an aggressive captive breeding program; breeding protocol at Hutton Lake NWR; and protocol for searching for Wyoming toads to declare an area clear. A workshop held in December, included two experts in the captive breeding process of amphibians to share "their experience" with workshop participants

There was zero reproduction of Wyoming toads during the year at Mortenson Lake, very disappointing along with the fact that only a few toads were found during counts in June and August. In accordance with the Environmental Assessment, the Recovery Groups' contingency plan to prevent the extinction of the Mortenson Lake toad population was put into action with a portion of the adult toads being removed from Mortenson Lake in late August.

The following is a summary of the Wyoming toad population:

<u>YEAR</u>	<u>EST. POPULATION</u>
1989/90	275 - 677
1991	100 - 373
1992*	24 - 210
1993*	87 - 110

* No reproduction occurred during the year at Mortenson Lake.



93 NR40 9/29/93 ECP
New ditch check between Little Mortenson and Mortenson Lakes.



93 NR41 9/29/93 ECP
Refuge staff installing outlet at Little Mortenson.

Several waterfowl counts along with one brood count were conducted on the refuge during the season.

A field inspection of the irrigation system was done by RO Realty Office personnel, Paul Hartmann and Ginger Cheseby in July.

Patten and Art Anderson, FWE, met with the Mortenson Lake Fishing Club to discuss changes and annual renewal of their fishing lease. This fishing lease was a condition of sale on the Mortenson Lake property by the original landowner, and may continue until January 23, 1999.

The refuge grazing permittee used 358 AUM's of the 450 allotted. The permittee's livestock entered the Meeboer Lake Unit on May 16 using 106 AUM's over a two week period. From September 3rd until September 21st, the Soda Lake Unit utilized 92 AUM's while the Mortenson Lake Unit used 161 AUM's from September 21 to November 2.

All water management activities were performed by the grazing permittee. On May 14, the south ditch headgate was opened, receiving 240 acre feet of water, prior to closure on September 10. A majority of the water was used to fill wetlands on the eastern section of the refuge.

An electric fence was installed around the outlet portion of the Mortenson Lake dike to protect prime toad habitat from being destroyed by cattle.

With MMS funding, refuge staff installed a water control structure in Little Mortenson and a ditch check near the Mortenson Lake outlet. This enabled water to be controlled and flushed through the pond, helping to control the alkalinity level in Little Mortenson.

**PATHFINDER NATIONAL WILDLIFE REFUGE
WYOMING**

Administered by Arapaho NWR Complex
PO Box 457, Walden, Colorado

Introduction

Pathfinder National Wildlife Refuge is an overlay on part of the Bureau of Reclamation's Pathfinder Reservoir in south-central Wyoming. This isolated refuge is 50 miles southwest of Casper and 20 miles from the small settlement of Alcova, Wyoming. Refuge headquarters for Pathfinder Refuge is at Arapaho NWR, about 200 miles to the south.

The refuge was established on August 1, 1936, as an overlay on the entire reservoir, but it was reduced to its present four small units containing 16,807 acres, to facilitate more intensive management by Public Land Order in 1965. The largest unit of the refuge lies astraddle of what is known as the Sweetwater Arm of the reservoir. The three smaller units are to the south, at Goose Bay, DeWeese Creek and at the junction of Sage Creek and the North Platte River.

Pathfinder Refuge is an established feeding, resting and nesting ground for both ducks and Canada geese, providing for as many as 8,500 ducks and 500 geese on their annual migrations.

In addition to migratory birds, the refuge provides habitat for hundreds of pronghorn antelope, cottontail rabbits, a few mule deer and sage grouse. It is typical of much of the semi-desert lands of Wyoming, except that the reservoir furnishes more water. Since the reservoir fluctuates as much as 50 feet per year, it is difficult to provide food and cover for waterfowl near the water line.

1993 Activities

A check for \$155.00 was presented to Carbon County as revenue sharing payment for FY93.