ROCKY MOUNTAIN ARSENAL NATIONAL WILDLIFE REFUGE

Commerce City, Colorado

ANNUAL NARRATIVE REPORT

Fiscal Year 2004

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

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REVIEW AND APPROVALS

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Refuge Manager Dean Rundle Date 9/27/06

Refuge Supervisor David Wiseman Date 10/2/06

Regional Office Approval Richard A Coleman Date 10/5/06

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A. Introduction

Rocky Mountain Arsenal (RMA) was established by the U. S. Army in 1942 as a chemical and incendiary weapons manufacturing facility in support of U. S. efforts in World War II. Following the war, the U. S. leased the site's production facilities to private industry for production of pesticides and other chemicals. Weapons production ended in1969, but the Army continue to use RMA for demilitarization of chemical munitions and other defense uses until 1984. Pesticide production by Shell Chemical Co. ended in 1982.

During the military/industrial production years, waste handling practices resulted in contamination of soils, structures and ground water at the site. RMA was added to the National Priorities List (Superfund) list in 1987. In 1992, Congress passed the Rocky Mountain Arsenal National Wildlife Refuge Act of 1992 (P. L. 102-402), designating the future use of the site as a NWR, and mandating the Service to manage RMA "as if it were" a unit of NWRS during the environmental cleanup. All RMA lands were brought into the Refuge System, under a "secondary jurisdiction/overlay" Memorandum of Understanding in 1993.

The Record of Decision (ROD) for the On-Post Operable Unit of RMA was signed in 1996. Shortly following the ROD, the Service joined the Army and Shell in formation of the Remediation Venture Office (RVO), a unique partnership with the dual missions of implementing a safe, cost effective cleanup of RMA and converting the site to its ultimate status as a National Wildlife Refuge.

Just 10 miles from downtown Denver, CO, at a rapidly developing urban interface in Commerce City, Adams County, Colorado, RMA NWR is the largest wildlife habitat area in metropolitan Denver. Located in the heart of Region 6's largest urban area, and with more Americans living within a 1 hour drive than live in all of North and South Dakota, Wyoming and Montana combined, RMA NWR provides an outstanding opportunity for the Refuge System to expose people, particularly urban youth, to the values that wildlife and refuges provide to our society.

Refuge wildlife resources include a significant wintering population of bald eagles, one of the largest burrowing owl breeding populations in Colorado, and a myriad of other migratory birds and resident wildlife. RMA NWR is perhaps the best place in the country for the public to observe mule deer, particularly large, mature bucks. Due to past land uses, including agricultural conversion, military/industrial use, and the cleanup, most native habitats were destroyed or degraded. Weeds are a significant issue. Habitat management is currently focused on restoring native prairie plant communities and emulating natural ecological processes. With over 9,000 acres being restored to native species, RMA NWR is home to one of the largest shortgrass prairie restoration programs in the country.

B. Highlights

1. EPA deleted nearly 5,000 acres of land from the RMA NPL Site in January, 2004. On April 2, 2004, primary administrative jurisdiction over 4,930 acres of land was transferred from the Army to the Service. A ceremony to formally establish RMA NWR was lead by Secretary of the Interior Gayle Norton on April 17, 2004. Other dignitaries attending included: Senator Wayne Allard, U. S. Rep. Bob Beauprez, U. S. Rep. Dianna DeGette, Asst. Secretary of the Army Geoffrey Prosch, and Deputy Administrator of the EPA, Steve Johnson. See Sec. 7a.

2. Refuge biologists initiated management studies to investigate declining deer recruitment at RMA NWR. Biological monitoring studies involved tree swallows, bats and kestrels. See Sections 1a.7; 6c.)

3. This was the first year for a full season of recreational fishing at RMA since the late 1990's. A new Recreation Fee Pilot program was initiated and fishing participation approached record levels. See Sec. 7a.

4. Despite continuing drought conditions, excellent progress was made in restoring the refuge's grasslands. See Sec. 2b.

5. A new seed storage building was constructed with MMS funding. See Sec. 8d.

6. As required by statute, the Comprehensive Conservation Plan for the future Rocky Flats NWR was completed on schedule in December, 2004. See Sec. 10.

C. Climate Conditions

Climate at the Refuge is considered semi-arid, with low relative humidity, intense sunshine, and wide variations in seasonal and daily temperatures. According to National Weather Service summaries, local conditions (as recorded near the former Stapleton International Airport) for Fiscal Year 2004 were below normal in precipitation and slightly above normal in temperature. The average temperature during the period of October 2003 through September 2004 of 50.5 degrees was a mere 0.4 degree above normal. Precipitation totaled 13.57 inches, 2.24 inches below the normal 15.81 inches. The highest temperature for the year of 99 degrees occurred on July 13th and the lowest temperature of minus 11degrees occurred on February 7,th neither of which are new records. The first freeze of the fall is not reported within Fiscal Year 2004, although the last freeze of the spring occurred on May 14th. Precipitation (Table C.1) and temperatures (Table C.2) are reported below by month for FY 04.

Table C.1. Monthly Precipitation, FY 2004*

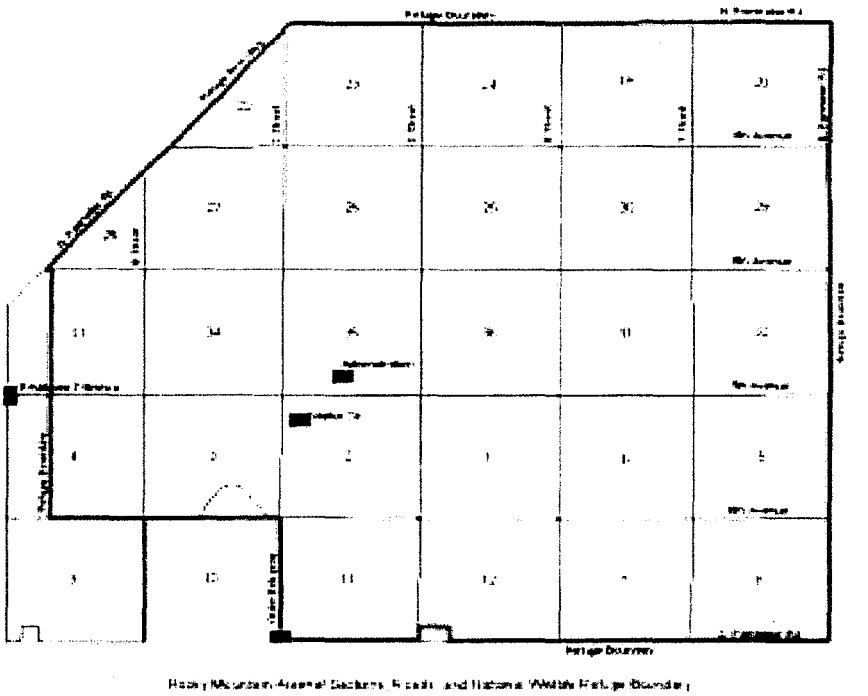
Month	Precipitation Normal (Inches)	Precipitation Actual (Inches)	Departure From Normal
October	0.99	0.08	- 0.91
November	0.98	0.05	- 0.93
December	0.63	0.12	- 0.51
January	0.51	0.23	- 0.28
February	0.49	0.21	- 0.28
March	1.28	0.14	- 1.14
April	1.93	1.76	- 0.17
May	2.32	1.30	- 1.02
June	1.56	2.33	+ 0.77
July	2.16	2.52	+ 0.36
August	1.82	2.84	+ 1.02
September	1.14	1.99	+ 0.85
Total 12 Month Precipitation	15.81	13.57	- 2.24

Table C.2. Monthly Temperature, FY 2004*

Month	Average Temp. (Normal)	Average Temp. (Actual)	Temperature High (^{0}F)	Temperature Low (^{0}F)
October	51.0	55.1	86	23
November	37.5	36.2	69	-3
December	30.3	32.6	63	5
January	29.2	31.9	63	-11
February	33.2	30.9	67	-9
March	39.6	46.4	79	18
April	47.6	47.5	81	23
May	57.2	59.3	88	28
June	67.6	63.7	98	41
July	73.4	70.9	99	49
August	71.7	68.2	96	42
September	62.4	62.7	90	37
Average Annual Temperature and Temperature Extremes	50.1	50.5	99	-11

*Source: Climatological Data, National Weather Service, Denver, Colorado.

D. MAP



1. Monitoring and Studies

1a. Surveys and Censuses

1a.1 Bald Eagle Investigations

Bald Eagle Nesting Activity

As in 2003, the adult eagles that occupied the communal roost from mid-October to mid-December were probably the nesting pair (Figure 1a.1.1). Although they were observed at the nest the first half of February, both at sunset and during the day, incubation did not begin until the 23rd. This was two weeks earlier than in 2003. Hatching occurred on March 31 and April 1. It was not apparent, until April 12, that there were two chicks in the nest. Unlike 2003, when one eaglet died after a snow storm, no weather events occurred during the critical nestling stage. The eaglets were banded on May 11 by Colorado Division of Wildlife raptor biologist, Brent Bibles. They remained in the nest until June 22. Throughout July, both eaglets were observed on First Creek near the nest and on telephone poles on 7th Avenue and the east perimeter.

According to Brent Bibles, fifty bald eagle nests were reported in 2004 throughout Colorado. Twenty-six nests were successful with 44 young produced (1.13 young/ occupied nest, 1.69/successful nest).

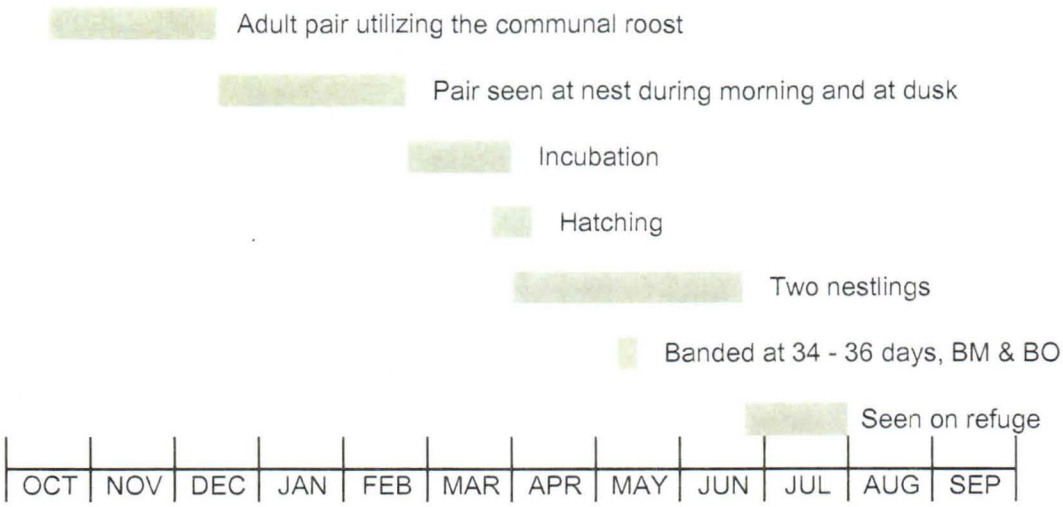


Figure 1a.1.1. Chronology of the nesting bald eagle pair on the Rocky Mountain Arsenal NWR in 2004.

Two eaglets, red BM and red BO, were banded in May of 2004, at approximately 35 days of age. A CDOW volunteer tree climber, Gary Meinke, took the photo when the birds were back in the nest.

Bald Eagle Roost Counts

Bald eagles have utilized the Rocky Mountain Arsenal as a winter communal roost since at least 1986. The Bald Eagle Management Area (BEMA) was established by USFWS for the Army in the early 1990's to allow clean-up to continue while minimizing disturbance to loafing, feeding and roosting eagles. Access to BEMA is controlled annually from October 15 to April 15 by USFWS. Prior to 2000, roost count were performed every other night from October 15 to April 15. Between the years 2000-2003, roost counts were performed 3 days a week from October 15 to April 15. Beginning in FY 2004, roost counts were done once a week in October and November and twice a week December through April.

The highest number of eagles observed on a single roost count occurred in 1998 (Figure 1a.1.2) with a progressive decline through 2003. In 2004, the peak number of 22 was comparable to 2003. However, the mean peak occurred in the latter half of January instead of the prior half and declined more rapidly as the survey progressed (Figure 1a.1.3). The highest mean number of subadults coincided with the peak number of eagles (Figure 1a.1.4).

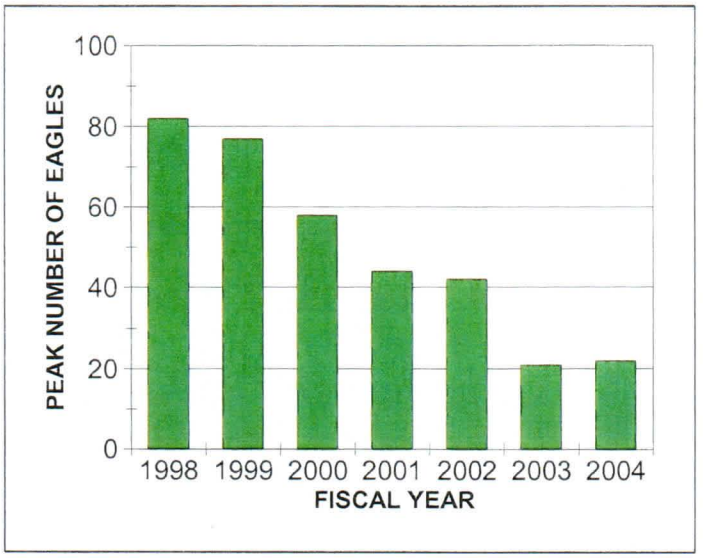


Figure 1a.1.2. Highest number of bald eagles observed at the nightly roost on Rocky Mountain Arsenal NWR from 1998 – 2004.

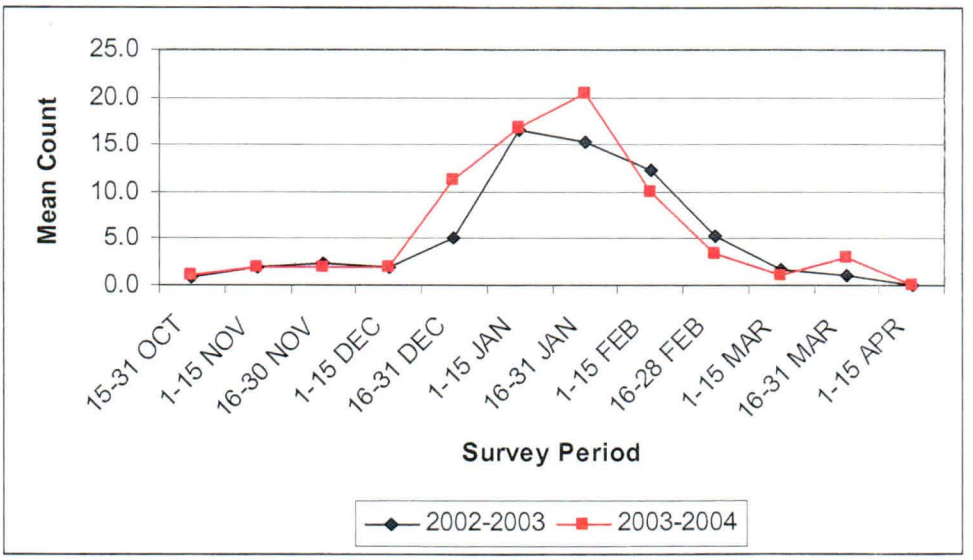


Figure 1a.1.3. Comparison of mean number of eagles using the winter roost during two week survey periods in FY03 and FY04 on the Rocky Mountain Arsenal NWR.

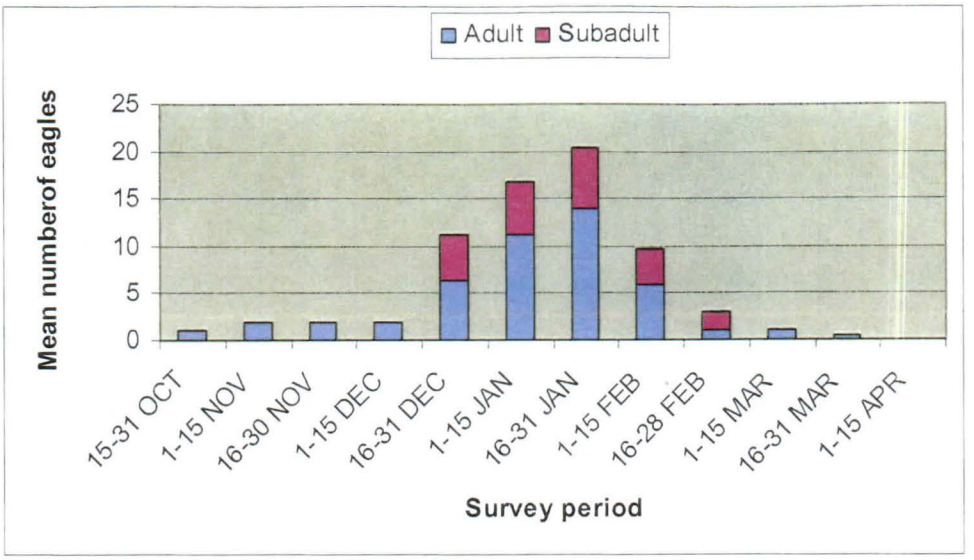


Figure 1a.1.4. Mean number of adult and subadult bald eagles using the winter roost during two week survey periods on the Rocky Mountain Arsenal NWR.

1a.2 Raptor Monitoring

Raptor nest monitoring

Raptor nesting on the Arsenal was considerably more successful both in attempts and fledges than 2003 (Table 1a.2.1). The contrasting prosperity corresponded with a temporary break in recent drought conditions and fewer reports of West Nile virus activity on or around the refuge. Nest searching efforts were of moderate intensity in 2004. Possibly more nests were present, but not located (Figure 1a.2.a). Information in Table 1a.2.1 also includes observations of raptors that were detected incidental to nest searches or winter raptor surveys. American kestrels and bald eagles are addressed in other sections.

Table 1a.2.1. Comparison of raptor nest found and young produced on the Rocky Mountain Arsenal NWR, 2003-2004.

Raptor Species	Nests Found		Minimum young produced	
	2003	2004	2003	2004
Great Horned Owl	9	5	12	7
Long-eared Owl	0	3	?	5
Short-eared Owl	0	1	?	?
Burrowing Owl	28	41	16	192
Red-tailed Hawk	7	8	4	7
Swainson's Hawk	7	10	3	17

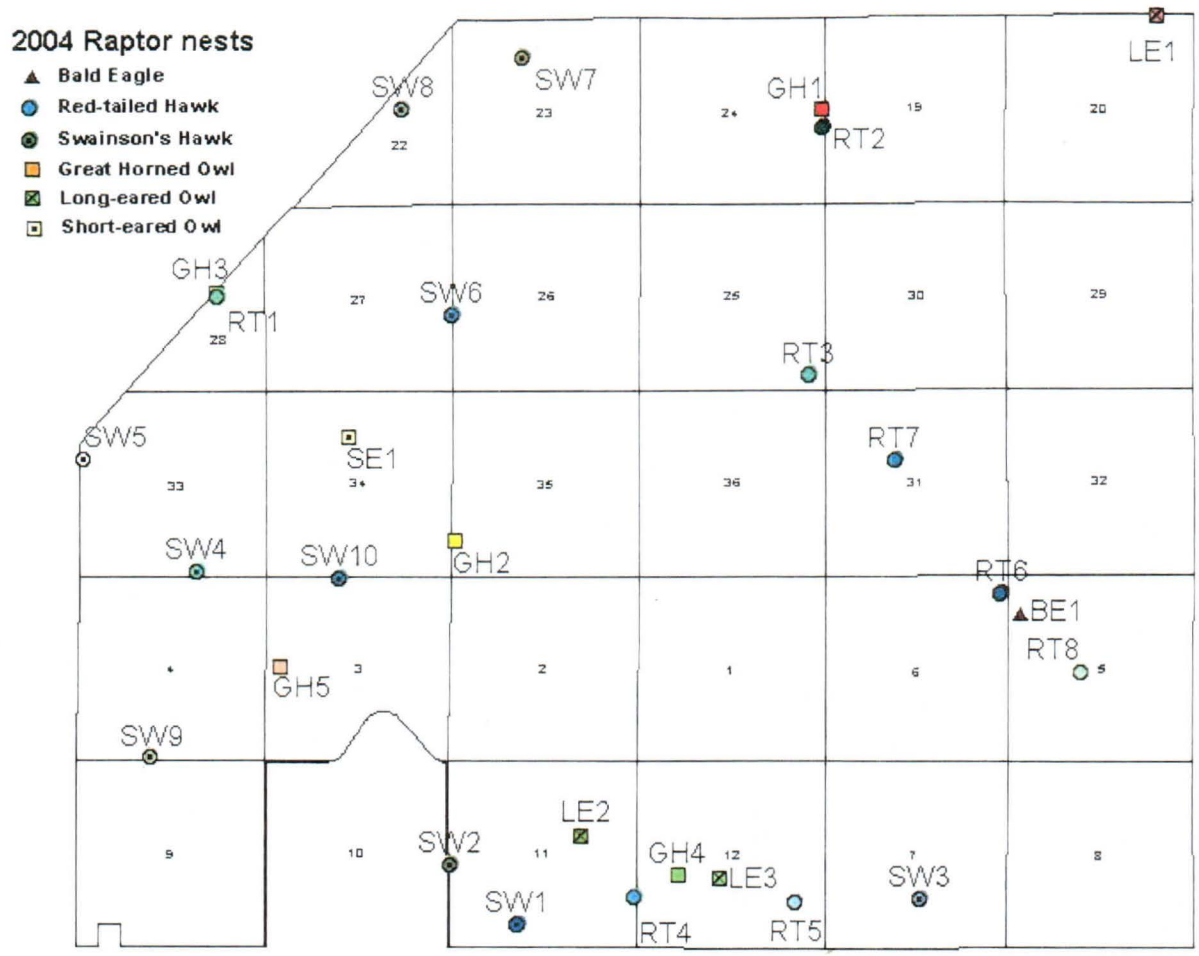


Figure1a.2a Locations of raptors nest found in Fy2004 on the Rocky Mountain Arsenal NWR

Red-tailed hawks utilize the Refuge year-round. Fifty hawks were seen on the Christmas Bird Count. However, it is unclear whether hawks observed in the winter are those breeding in the spring. Eight red-tailed hawk nests were located in 2004, the same ones used in 2003 plus one near the eagle nest (RT6). Two nests failed during incubation and the fate of two others was unknown. Seven young were produced (1.17/monitored nest attempt, 1.75/monitored successful nest).

Swainson's hawk nesting success on the refuge improved from the dismal production in 2003. As long distance migrants from South America, Swainson's hawks are the last refuge raptor to begin breeding in late April. Although there is documented nest site fidelity, they often must build new nests annually when existing ones are unavailable. Of the ten nests monitored in 2004, four were newly constructed, three of which failed during incubation. However, the seven remaining nests produced 18 young with two mortalities in the nestling stage. Nest success was 1.6/nest attempt and 2.29/successful nest. Brood sizes were larger than in past years. Whereas during the recent drought years, broods were composed of one and two nestlings, in 2004, there were three broods with three nestlings and one with four.

Great horned owls fell from their perch as the most abundant resident breeders in 2004. Only five nests were located, with four pair successful at fledging seven young. At a new nest site (GH3), three young were hatched and raised, a rare occurrence on the refuge. However, at two nests (GH 4 and GH 5), carcasses of hatch-year owls were found in the nest vicinity after fledging.

Long-eared owls occur on the Refuge throughout the year. During the winter, small groups of individuals roost in the locust thickets. Six were seen on the Christmas Bird Count, roosting in NE 31. Three nests were found producing no less than five young.

Burrowing owls nest sites and fledge success substantially increased in 2004 compared to 2003. Whereas, nest site availability for most of the Arsenal raptors has remained constant, an increase in prairie dog acreage in 2004 from 660 to 1,063 acres, may have improved the reproductive outcome for burrowing owls (Figure 1a.2b) Forty-one nests were located with a minimum of 192 produced. The average number of young produced per monitored nest attempt was 4.82 (n=39) and 5.69 young/successful nest (n=31). Observed brood sizes ranged from 1 to 11.

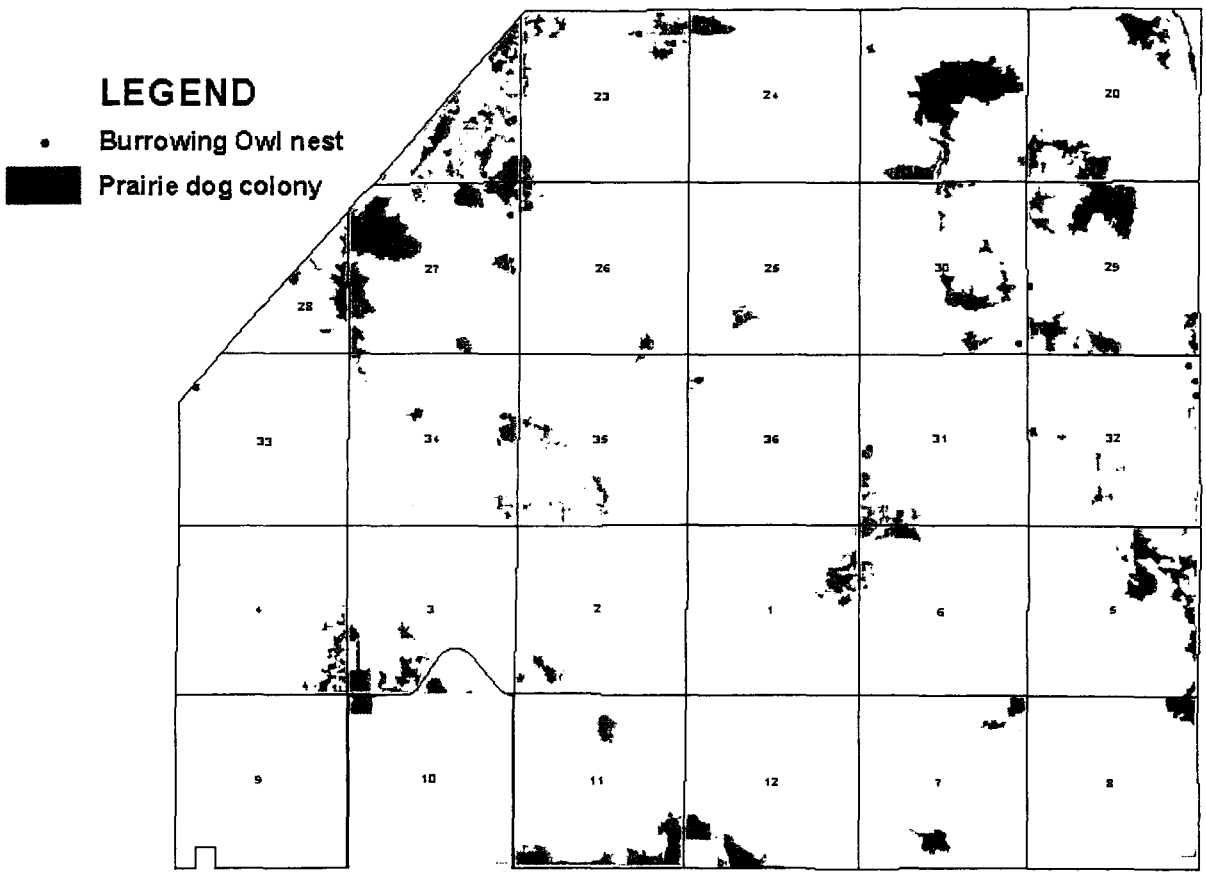


Figure 1a.2b Location of burrowing owl nest and prairie dog colonies on RMANWR for FY 2004

A short-eared owl nest site was discovered in central Section 34. The adult pair was at the nest, but no young were present. Since young move away from the nest almost two weeks before they can fly, they could have been in the area, but not detected.

One barn owl was seen on the Christmas bird count, but no eastern screech or northern saw-whet owls were detected on the Refuge in 2004.

1a.3 Winter Raptor Population Monitoring 2004

Roadside transect surveys have been used to monitor relative abundance and distribution of raptors wintering on the RMA. The survey is conducted along a standardized route on established roads and totals 16 miles (Figure 1a.3a). The current survey route was established in 2001. Surveys were conducted once each week by two observers from October 9, 2003 through April 15, 2004. Twenty-seven surveys were conducted throughout the survey period. Additionally, RMA staff participated in a regional survey effort organized by the Rocky Mountain Bird Observatory that contributed to long-term information on wintering raptor populations; staff conducted the survey on February 12 at RMA.

There was a mean of 11.6 individual raptors observed per survey (SE = 0.2, Table 1a.3.1). Similar to the 2002-2003 survey results, red-tailed hawks (*Buteo jamaicensis*) and American kestrels (*Falco sparverius*) were the most frequently observed raptors. The mean number of raptors observed each month ranged from a low of 3.0 in October and November to a high of 9.0 in January (Figure 1a.3b). Relative abundance was low for the fall months, increased in December and January and remained consistently high through April. The number of different species observed each month ranged from 7 to 9 and remained relatively constant throughout the survey period, with October and April showing the low of 7 (Figure 1a.3c). Species composition corresponded with expected monthly patterns depending on whether raptors were a resident or migrant (Table 1a.3.2).

Raptors were observed in a variety of habitat types, ranging from weedy grassland to wooded areas (Figure 1a.3d). Habitats were categorized into broad types using a current habitat restoration map. The diversity of raptors observed in the different habitats was evaluated using an index of species richness (anti-log of the Shannon-Weiner index, Table 1a.3.3). Index values are interpreted relative to the other habitat types, with higher values showing greater diversity. The diversity indices should be interpreted with caution as they may be influenced by correlation with acreage of habitat or percent availability. Additionally, observations of raptors within habitats may not correspond with significant use of the habitat by an individual in all situations. Prairie dog colonies had the highest index of diversity which is indicative of the importance of prairie dogs to the ecological community. Many habitat associations were expected. For example, burrowing owls were only observed in prairie dog colonies, prairie falcons were not observed in wooded or riparian/lakeside habitats and, red-tailed hawks were seen in a wide variety of habitats.

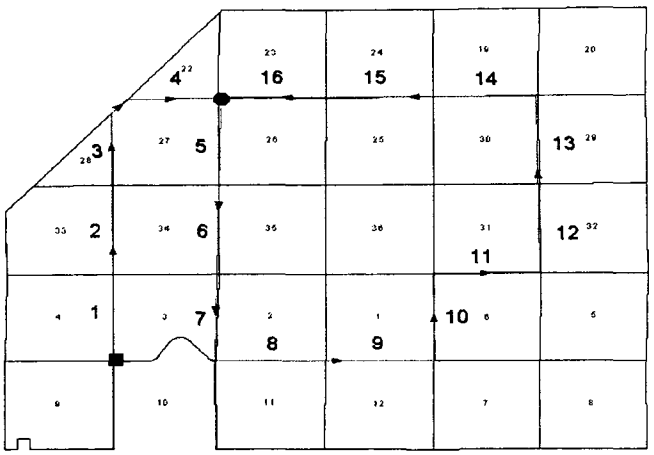


Figure 1a.3a. Standardized road survey route for monitoring wintering raptor species composition and relative abundance at the Rocky Mountain Arsenal NWR, CO, 2004. One-mile survey sections are numbered.

Table 1a.3.1. Raptor species observed during 27 road surveys conducted from October 9, 2003 to April 15, 2004 at the Rocky Mountain Arsenal NWR, CO.

Species	Total Observations	Mean/Survey	% of Total Raptors
A. Kestrel	67	2.48	17.6
Bald Eagle	52	1.93	13.6
Burrowing Owl	13	0.48	3.4
Cooper's Hawk	1	0.04	0.3
Ferruginous Hawk	31	1.15	8.1
Great Horned Owl	26	0.96	6.8
Golden Eagle	12	0.44	3.1
Northern Harrier	40	1.48	10.5
Prairie Falcon	13	0.48	3.4
Rough-legged Hawk	12	0.44	3.1
Red-tailed Hawk	104	3.85	27.3
Swainson's Hawk	1	0.04	0.3
Unidentified	9	0.33	2.4
Total Raptors	381	11.63	100.0

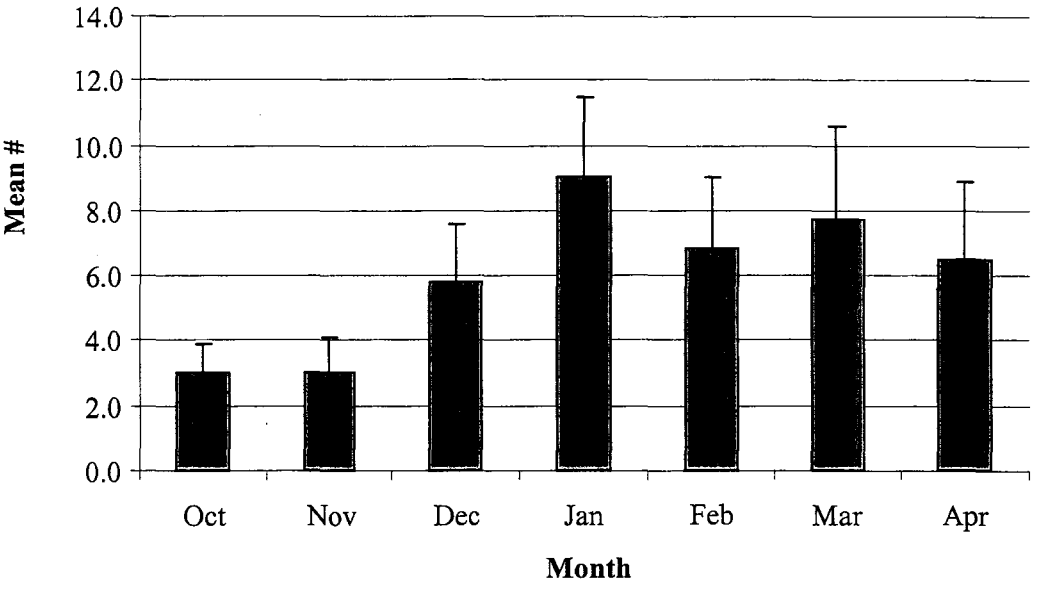


Figure 1a.3b. The relative mean abundance (± SE) of raptors observed each month during road surveys at the Rocky Mountain Arsenal NWR, CO from October 2003 to April 2004.

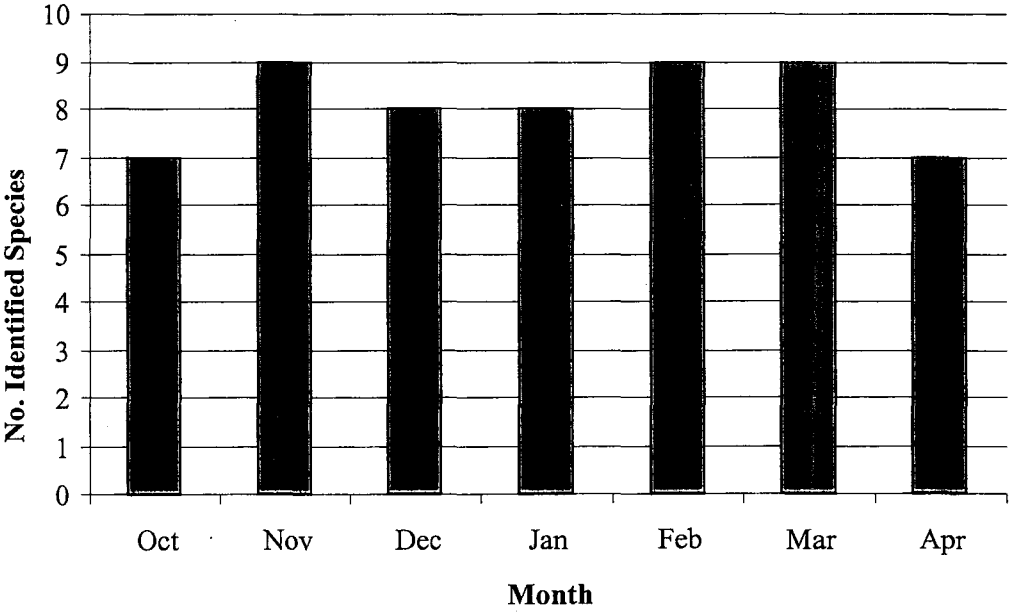


Figure 1a.3c. The number of different raptor species observed each month during road surveys at the Rocky Mountain Arsenal NWR, CO from October 2003 to April 2004.

Table 1a.3.2. Species composition and relative abundance of raptors observed each month during road surveys at the Rocky Mountain Arsenal NWR, CO from October 2003 to April 2004.

	Raptor Observations							
Species	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**Total**
A. Kestrel	2	4	1	6	11	23	20	67
Bald Eagle	1	3	5	28	13	1	1	52
Burrowing Owl	0	0	0	0	0	0	13	13
Cooper's Hawk	0	1	0	0	0	0	0	1
Ferruginous Hawk	2	4	10	10	3	2	0	31
Great Horned Owl	0	1	0	3	8	7	7	26
Golden eagle	3	1	1	4	1	2	0	12
Northern Harrier	3	4	6	10	4	11	2	40
Prairie falcon	1	1	4	4	2	1	0	13
Rough-legged Hawk	0	0	4	5	2	1	0	12
Red-tailed Hawk	8	13	18	15	23	21	6	104
Swainson's Hawk	0	0	0	0	0	0	1	1
Unidentified	0	2	3	1	1	0	2	9
Total	18	30	51	80	57	46	32	314

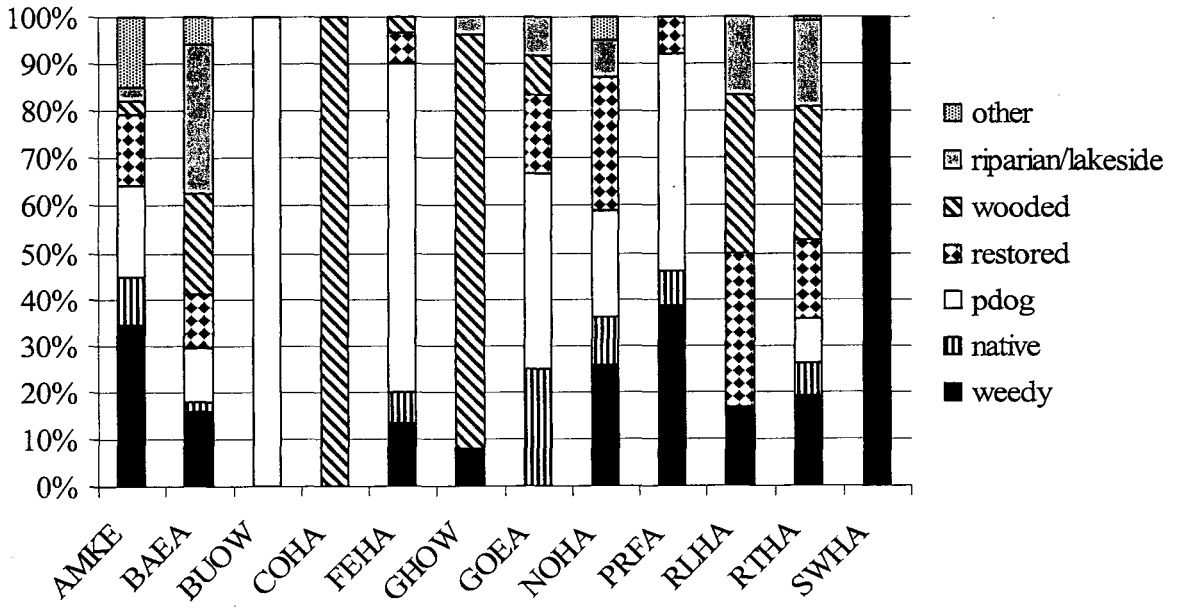


Figure 1a.3d. The percent of observations of raptor species in different habitat types during road surveys at the Rocky Mountain Arsenal NWR, CO, 2003 to 2004. Raptor species are identified using standard codes: AMKE = American kestrel, BAEA = bald eagle, BUOW = burrowing owl, COHA = Cooper's hawk, FEHA = ferruginous hawk, GHOW = great horned owl, GOEA = golden eagle, NOHA = northern harrier, PRFA = prairie falcon, RLHA = rough-legged hawk, RTHA = red-tailed hawk, SWHA = Swainson's hawk.

Table 1a.3.3. The diversity of raptors observed in different habitats during road surveys at the Rocky Mountain Arsenal NWR, CO, 2003 to 2004. Diversity is evaluated using the anti-log of the Shannon-Weiner index, an indication of species richness. Index values are interpreted relative to the other habitat types, with higher values showing greater diversity.

Habitat	Diversity Index
Prairie Dog Colony	7.5
Weedy Grassland	6.6
Restored Grassland	6.2
Native Prairie	5.6
Riparian & Lakeside	4.7
Wooded	4.5
Other	2.8

1a.4 Prairie Dog Management

A total of 430.29 hectares or 1,063.26 acres of active prairie dog towns were mapped from May through August, 2004 (Figure 1a.4a). This represents an increase of 61% from the September 2003 distribution and is 23.6% of the target population of 4500 acres, as stated in the Comprehensive Management Plan (CMP) (Figure 1a.4b). Total prairie dog town area has not approached this goal since 1988 (Table 1a.4.1) Two confirmed sylvatic plague cases were reported at Rocky Mountain Arsenal in 2004, although these were not widespread and involved a single prairie dog in the first instance and two prairie dogs in the second. With a similar year of growth it is predicted that by August of 2005 the total acreage will approximate 1,500 acres. Visual counts were not conducted in 2003.

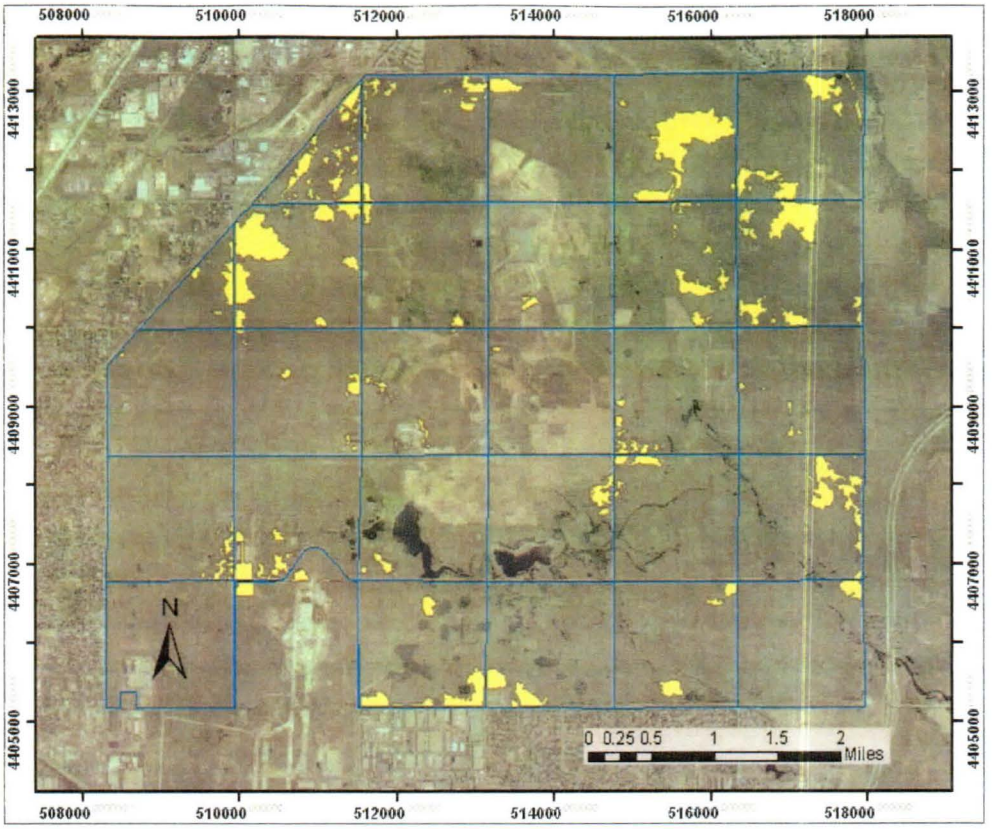


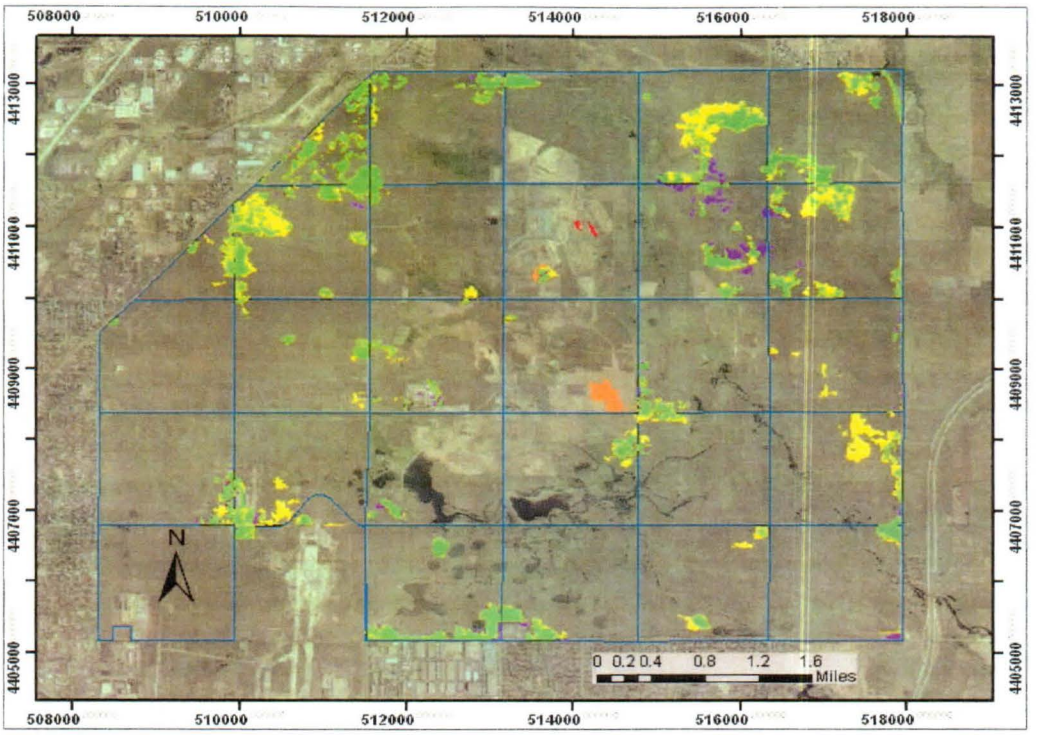
Figure 1a.4a. Prairie dog town acreage on the Rocky Mountain Arsenal in 2004

Growth in RMA's prairie dog population has occurred in three ways, colony expansion, occupation of new colonies, and relocation to once abandonned colonies. Most of the increase has been due to colony expansion into unoccupied areas or into areas where old unoccupied burrows remain from previous plague eppizootics. There were however, some previously occupied areas of RMA from which prairie dogs disappeared in 2004. These losses in the distribution of prairie dogs at RMA between 2003 and 2004 occurred due to 3 factors; relocation, remediation, and normal loss.

Relocations occur when and where remediation of contaminated sites or removal of several feet of soil from borrow areas would result in the destruction of active prairie dog colonies. However, in some cases it may not be possible to relocate prairie dogs in all remediation areas. In addition, prairie dogs are often removed from restoration sites where establishment of native grasslands after reseeding would have a greater opportunity of success without prairie dogs present. In some instances, prairie dogs are a nuisance to operations such as at weather and environmental monitoring stations because of their burrowing activities, resulting in relocation.

Normal loss can occur through a combination of diseases, predation, or the inability of a colony to maintain the vegetation surrounding its boundaries in a "cropped" condition. Above average precipitation during spring and early summer may stimulate high growth rates in vegetation that grow too tall for prairie dogs to graze, thus, shrinking the extent of the colony. 2004 spring and early summer precipitation at RMA was average to slightly above average (National Weather Service, http://www.ncdc.noaa.gov). Curiously, much

of this type of loss occurred in the northeast sections of RMA (19,20,30, and 29; figure 1a.4b). Why it should occur in this area and not others is a matter of speculation.



Occupied Acres	2004	2003
Mean	4.45	1.57
Minimum	0.00	0.003
Maximum	103.47	30.20
Total	1063.26	660.28
Count	239	421

Section Lines
Active in 2003
Activity Added in 2004
Normal Loss
Relocation Sites
Loss Following Remediation

Figure 1a.4b. Changes in RMA prairie dog distributions between 2003 and 2004.

Table 1a.4.1 summarizes black-tailed prairie dog survey data from 1988 through 2004. Two surveys are given for 1995; one in spring and another in fall.

Table 1a.4.1. Prairie dog population fluctuations 1988-2003 at Rocky Mountain Arsenal NWR.

Year		Mean Density (Prairie Dogs/ha)	Study plots (n)	Area (ha)	Area (acres)	Population Estimate
1988	b	20.2 ± 8.00	24	1850.80	4573.43	37,406
1989	b, c	20.2 c	---	99.80	246.61	2,017
1990	b	12.2 ± 4.80	6	232.90	575.51	2,842
1991		14.6 ± 3.57	9	555.60	1372.92	8,134
1992		17.8 ± 6.20	12	608.00	1502.40	10,822
1993		22.6 ± 6.10	12	727.00	1796.46	16,430
1994		23.5 ± 4.13	10	154.00	380.54	3,619

1995	a, b	50.9 ± 28.46	9	72.90	180.14	3,708
1995	b, c	50.9 c	---	9.00	22.24	458
1996		41.1 ± 15.88	8	35.90	88.71	1,478
1997		54.8 ± 26.60	6	139.80	345.45	7,640
1998		32.8 ± 3.78	10	357.77	884.07	11,735
1999		24.5 ± 4.41	10	533.76	1318.95	13,077
2000		No Visual Counts		665.75	1645.10	
2001		No Visual Counts		250.43	618.83	
2002		28.4 ± 4.31	15	127.02	313.87	3,607
2003		No Visual Counts		267.21	660.28	
2004		No Visual Counts		430.29	1,063.26	
a mean density ± one SD						
b 1988-1990 data from Stollar et al. (1992)						
c no density data for this year; density estimated						

1a.5 Passerine Surveys

Christmas Bird Counts (CBC)

Fifty-four bird species were recorded on the Christmas bird count conducted January 1, 2004. This is the highest species detection on the refuge since the counts began in 1989. A trumpeter swan was new to the list increasing the cumulative total species detected on the refuge during this count to 81. About half of the Refuge is within the Urban Denver Christmas count circle representing approximately 10% of the circle. The total circle recorded a record high 92 species. Fifty percent or more of nine species were seen on the refuge (Table 1a.5.1).

Table 1a.5.1. Species seen on the Rocky Mountain Arsenal that contributed greater than 50% of the total individuals in the Urban Denver Christmas Count, January 1, 2004.

Species	Circle Total	Refuge Total	Refuge %
Redhead	99	97	98
Bald Eagle	32	16	50
Rough-legged Hawk	4	3	75
Barn Owl	1	1	100
Great Horned Owl	12	8	67
Long-eared Owl	6	6	100
Horned Lark	123	123	100
American Tree sparrow	415	367	88
Western Meadowlark	91	74	81
Total number of species	92	54	59

Breeding Bird Survey (BBS)

Thirty-seven bird species and 667 individuals were recorded on the Breeding Bird Survey conducted on June 11, 2004. That is the lowest species count and the third lowest individual count since the surveys started in 1991. The numbers have been declining steadily since 2000, which corresponds to intensified cleanup efforts and decreased available breeding habitat. The Western meadowlark remained the most abundant species. (Table 1a.5.2). A large flock of pigeons at one of the few remaining buildings left on the refuge allowed for that exotic species commandeering second over the native lark bunting. Other birds conspicuously scarce were the house wren and black-billed magpie. The latter was a documented casualty of West Nile virus in summer 2003.

Table 1a.5.2. Summary of BBS results conducted on RMANWR, 2004.

	2004
Date conducted	June 11
Total species	37
Total individuals	667
Most abundant	Western meadowlark (181)
Second abundant	Rock pigeon (82)
Third abundant	Lark bunting (73)

Incidental sightings and other surveys

Spring and fall counts have been conducted in May and September annually by the Audubon Society. Variances in numbers for these two counts tend to reflect weather and migration patterns. In 2004, the consistent yearly trends in diversity and abundance were disrupted (Table 1a.5.3). The spring count added two new species, field sparrow *(Spizella pusilla)* and great-tailed grackle *(Quiscalus mexicanus)*, but the most abundant species had barely over 100 individuals. Similarly, the fall count added a new species, the pygmy nuthatch , but had a reduced overall total. Perhaps the weather, a low of 61°F and a high of 89°F in September affected the count. Both counts recorded blue-gray gnatcatchers *(Popioptila caerulea)*(three and five, respectively) in Officer's Row with the speculation that they may be nesting on the refuge.

Table 1a.5.3. Species counts for spring and fall 2004 on the Rocky Mountain Arsenal National Wildlife Refuge.

	Spring 2004	Fall 2004
Date conducted	May 9	Sept 12
Total species	81	92
Total individuals	1154	1292
Most abundant	Mourning dove (127)	Mallard (139)
Second abundant	Red-winged blackbird (84)	Barn swallow (100)
Third abundant	Western kingbird (110)	Wilson's warbler (82)

Great-tailed grackle on Parkfield Ponds. Photo credit: Dave Showalter

Refuge personnel report bird species that are unusual due to their infrequent use of the Refuge or unusual timing of their visit. Unique sightings of raptors and winter waterfowl can be found in those respective sections of this narrative. Yellow-breasted chats (*Icteria virens)*, which have not been recorded on the refuge since 1993, were conspicuously noticeable. No less than three singing males were heard in various bramble patches and willow galleries north and south of 6th Avenue. An American redstart *(Setophaga ruticilla)* was seen in the company of other wood warblers in early Sept. in Section 31 along First Creek. Other birds of interest were a single common loon *(Gavia immer)* seen for two weeks in July on Ladora Lake and twelve snowy egrets *(Egretta thula)* on eastern Lower Derby in late August.

No new nest records were reported in 2004.

1a.6 Winter Waterfowl/Waterbird Survey

The Rocky Mountain Arsenal NWR provides waterfowl and other waterbirds with migratory stopover and wintering habitat. Winter surveys are conducted yearly from October to April to monitor waterfowl relative abundance and distribution. Surveys are conducted at Lake Mary, Lake Ladora, Lower Derby Lake, Parkfield Wetland, and Havana Pond; First Creek and the wetland complex are surveyed during years when there is sufficient water. Surveys are conducted once every two weeks for a total of 1-3 surveys each month. Surveys are started two hours following official sunrise and observations are made at a standard observation point. A spotting scope and binoculars are used to view and count waterfowl. Observation points at survey sites were chosen to maximize visibility of the lake area. Additionally, RMA staff participated in a regional survey effort organized by the Rocky Mountain Bird Observatory (RMBO) that was focused on locating Barrow's goldeneye (*Bucephala islandica*); the survey was conducted on December 1, 2003 at RMA.

There were a total of 15 surveys conducted from October 15, 2003 to April 14, 2004 with a total of 31 different species observed (Table 1a.6.1) and a total of 22,272 ducks, geese, swans, and other waterbirds counted. Two surveys were conducted each month, with the exception of December and March (3 surveys) and April (1 survey). Canada geese, gadwalls, and ring-necked ducks were among the most abundant species observed per survey (Table 1a.6.1). Waterfowl abundance generally peaks during spring and fall migration. There were similar relative abundance patterns as in previous years with peaks occurring in December and March (Figure 1a.6a). Species that were uncommon or notable observations included surf scoter, black scoter, trumpeter swan, tundra swan, Ross's goose, snow goose, and red-breasted merganser. Additionally, a partial albino (the presence of white feathers instead of the usual colors of the species on certain parts of the body) female common goldeneye was seen on Lake Ladora for several weeks in fall/early winter. Few blue-winged teal were seen in 2003-2004 compared to previous years. No Barrow's goldeneye were seen during the RMBO survey effort in December.

Ducks can be classified according to their feeding behavior. Dabblers skim food from the water's surface or feed in the shallows by submerging their head and neck. Diving ducks propel themselves underwater by large feet. For purposes of discussion, ducks, grebes, and sea ducks have been classified here accordingly as a dabbler or diver, though some species (i.e. grebes, sea ducks) are not typically included in these groups. Dabblers comprised 48% and divers 52% of the observed duck population (excluding geese, swans, pelicans, and coots) on the refuge during 2003-2004. Dabblers were primarily found at Havana Pond and Parkfield Wetland while divers were found using all lakes except Lake Mary at a similar frequency (Figure 1a.6b). Lake Mary was used most by Canada geese. The mean number of dabblers and divers per month was highest in April and was consistently similar throughout the survey period (Figure 1a.6c). Gadwalls were the most numerous and frequently observed dabbler and ring-necked ducks and redheads were the most numerous of the divers (Table 1a.6.2). The lakes at RMA provide important habitat for many waterfowl species though Lake Ladora and Lower Derby Lake were the most frequently used by waterfowl (Figure 1a.6.d), which is similar to that observed in previous years.

Species abundance in 2003-2004 was significantly greater than in 2002-2003, with numbers increasing 4-fold. Generally, waterfowl abundance and species composition fluctuates yearly as a result of regional trends, environmental factors such as amount of precipitation, variation in water levels, and the amount of ice-free days. Waterfowl abundance for 2003-2004 was more consistent with those of previous years while the 2002-2003 abundance was exceptionally low. Regional Christmas bird counts noted similarly low waterfowl numbers compared to previous years; cold winter temperatures resulting in more extensive ice cover were speculated to be one potential cause of the low waterfowl abundance.

Table 1a.6.1. The total count, mean per survey, and standard error per survey of waterfowl/waterbirds observed on the Rocky Mountain Arsenal NWR, October 2003 – April 2004.

Species	Total Count	Mean / Survey	SE / Survey
Dabblers			
American Widgeon	719	47.9	16.5
Blue-winged Teal	6	0.4	0.3
Cinnamon Teal	11	0.7	0.4
Gadwall	2449	163.3	74.2
Green-winged Teal	644	42.9	10.1
Mallard	622	41.3	6.1
Northern Pintail	227	15.1	5
Northern Shoveler	493	32.9	21.5
Wood Duck	7	0.5	0.3
Divers			
Black Scoter	1	0.07	N/A
Bufflehead	146	9.7	3.4
Canvasback	56	3.7	0.9
Common Goldeneye	450	30	6
Common Merganser	399	26.6	13.3
Double-crested Cormorant	3	0.2	N/A
Eared Grebe	4	0.3	0.2
Lesser Scaup	1050	70	26.3
Pied-billed Grebe	45	3	1.5
Red-breasted Merganser	1	0.07	N/A
Redhead	1462	97.5	19.6
Ring-necked Duck	1887	125.8	27.9
Ruddy Duck	100	6.7	3.3
Surf Scoter	1	0.07	N/A
Western Grebe	4	0.3	N/A
Other Waterfowl			
American Coot	923	61.5	20.3
American White Pelican	8	0.5	0.3
Canada Goose	10533	702.2	315.7
Ross's Goose	1	0.07	N/A
Snow Goose	11	0.7	N/A
Trumpeter Swan	5	0.3	0.1
Tundra Swan	4	0.3	0.1
Total	22272	-	-

Table 1a.6.2. The total number of waterfowl observed each month at the Rocky Mountain Arsenal NWR during surveys, October 2003 – April 2004.

	Total Count / Month						
Species	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**
Dabblers							
American Widgeon	106	348	212	1	10	38	4
Blue-winged Teal	1	0	0	0	0	1	4
Cinnamon Teal	0	0	0	0	0	5	6
Gadwall	284	120	72	22	15	1603	333
Green-winged Teal	99	81	68	14	31	283	68
Mallard	150	84	162	15	81	108	22
Northern Pintail	94	10	21	1	10	89	2
Northern Shoveler	15	42	26	5	8	66	331
Wood Duck	2	0	0	0	0	4	1
Divers							
Black Scoter	1	0	0	0	0	0	0
Bufflehead	24	45	13	2	0	24	38
Canvasback	14	4	12	0	3	19	4
Common Goldeneye	0	46	82	54	85	180	3
Common Merganser	0	2	16	30	111	240	0
Double-crested Cormorant	0	0	0	0	0	0	3
Eared Grebe	1	3	0	0	0	0	0
Lesser Scaup	3	158	97	2	0	550	240
Pied-billed Grebe	17	18	4	0	0	0	6
Red-breasted Merganser	0	1	0	0	0	0	0
Redhead	110	345	452	24	89	435	7
Ring-necked Duck	385	311	291	57	268	561	14
Ruddy Duck	28	32	2	0	0	0	38
Surf Scoter	1	0	0	0	0	0	0
Western Grebe	0	0	0	0	0	0	4
Other Waterfowl							
American Coot	271	396	197	0	1	29	0
American White Pelican	7	1	0	0	0	0	0
Canada Goose	546	1873	4514	806	2496	267	31
Ross's Goose	0	1	0	0	0	0	0
Snow Goose	0	0	11	0	0	0	0
Trumpeter Swan	0	1	3	1	0	0	0
Tundra Swan	0	1	0	1	1	1	0

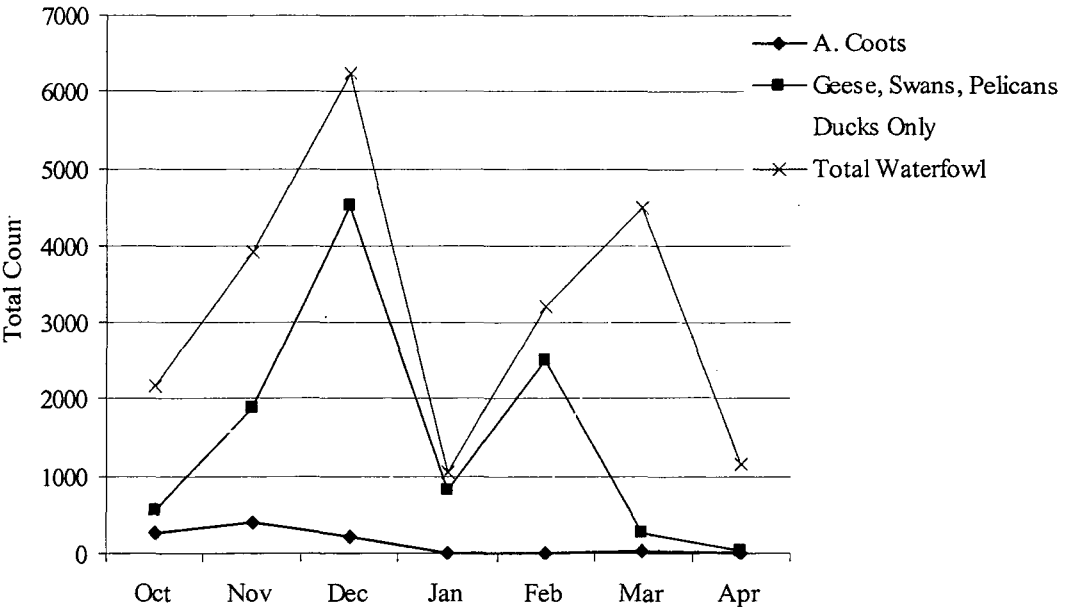


Figure 1a.6a. The total count of waterfowl observed per month on the Rocky Mountain Arsenal NWR from October 2002 – April 2003.

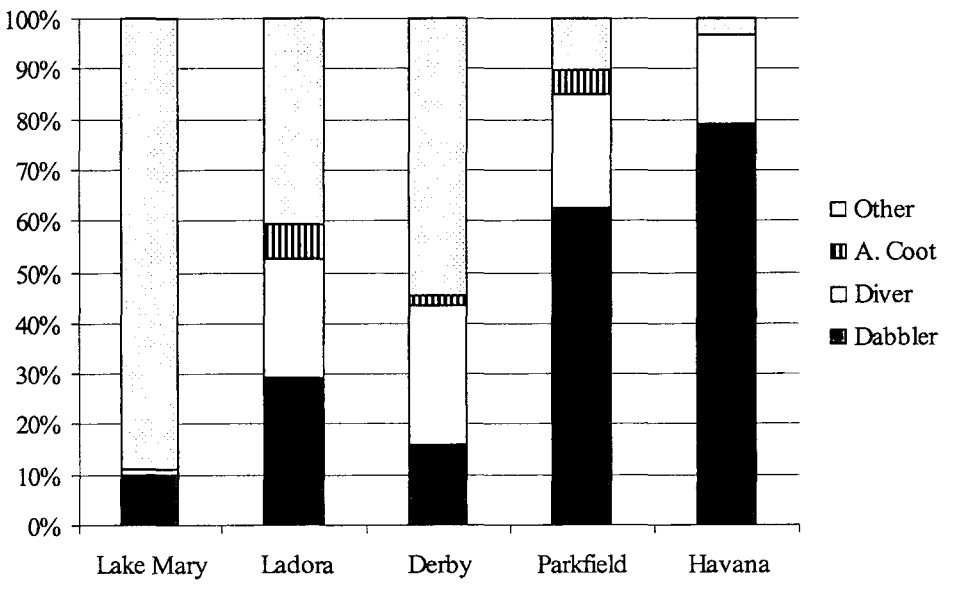


Figure 1a.6b The percent occurrence of dabbling and diving ducks, American coots, and other waterfowl (Canada geese, swans, pelicans) observed at five lakes at the Rocky Mountain Arsenal NWR, October 2003 – April 2004.

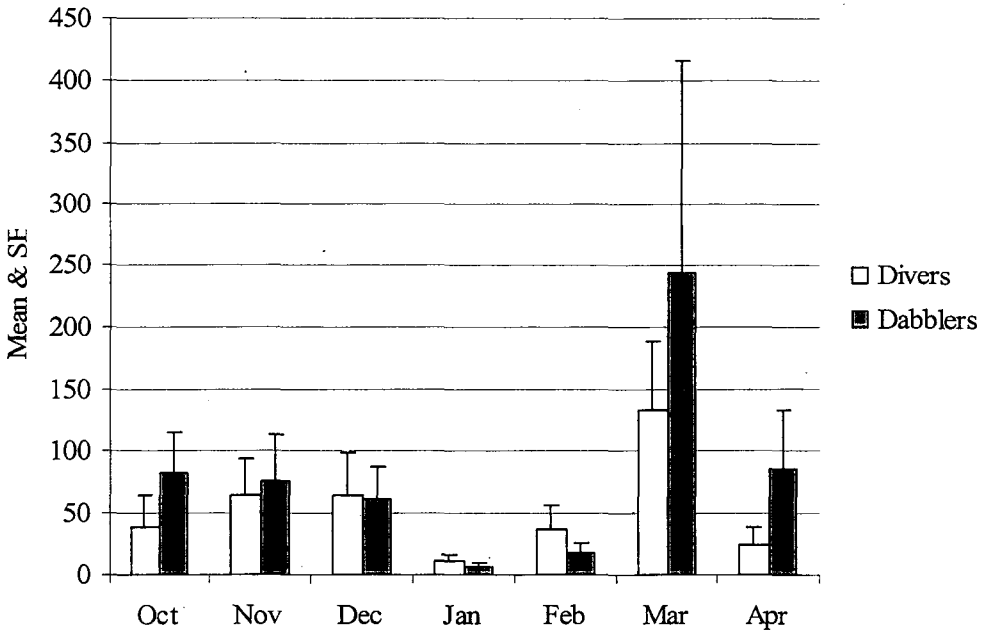


Figure 1a.6c. The mean and standard error of dabbler and diver ducks observed each month during surveys at the Rocky Mountain Arsenal NWR, October 2003 – April 2004.

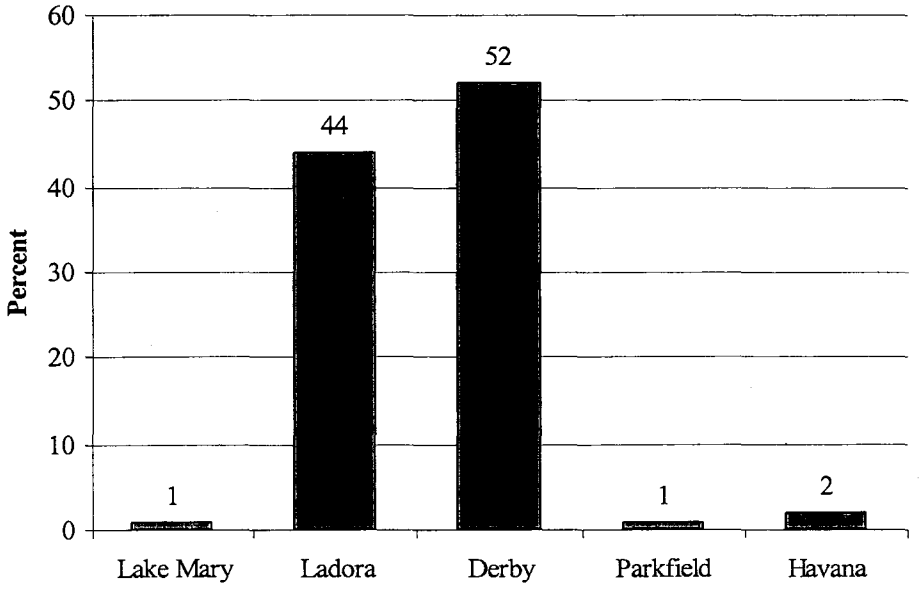


Figure 1a.6d. The distribution of waterfowl, expressed as the observed percentage of use at 5 lakes at the Rocky Mountain Arsenal NWR during surveys from October 2003 – April 2004.

1a.7 Deer Studies and Management/Classification Counts

INTRODUCTION

Deer herds at Rocky Mountain Arsenal National Wildlife Refuge are unusual in several aspects as compared with other herds and populations in Colorado and other Western states. In March of 1990, a 2.5 meter-high chain link fence was constructed that completely surrounded the refuge. While deer have been known to leap over the fence on occasion, the herd has remained isolated from surrounding populations. Deer populations outside the refuge have likely dwindled as habitat has been rapidly converted into urban/suburban housing and industrial development. Thus, for practical considerations, the RMA deer herd can be considered a closed population with no immigration or emigration.

A second consideration is that habitat within the Refuge boundaries has undergone drastic changes. Roughly 10 of the 27 square miles (37%) of Refuge has undergone extensive RCRA & CERCLA Superfund remediation. The result is that at any given time, some amount of suitable habitat has been taken out of production. In addition, ongoing efforts to establish and restore native prairie have altered some of the available forage and temporarily removed some areas from forage production.

At present hunting is not permitted at RMA. However, culling and removal of individuals for sampling of disease and contaminants has occurred periodically. The Refuge also initiated a cooperative agreement with the Colorado Division of Wildlife. This agreement was entered into for assistance with deer management issues on the Refuge and for the completion of testing a non-lethal method for controlling deer populations. As part of these efforts, annual classification surveys have been conducted since 1996 using three teams of two persons driving established routes (see Figure 1a.7a) for three days. Prior to 1995 helicopter surveys also attempted to count and classify deer by species, age and sex.

Recent results of these surveys have revealed a drastic reduction in herd recruitment (Figure 1a.7b). In 2002 for example, fawns per 100 does were as low as 6 and 2 (mule deer and white-tailed deer respectively) compared with an average (1995-2003) of 46 and 30 respectively. In 2003, deer classification surveys were performed on 17, 18, and 20 November. Fawns per 100 does were 22 and 7 (mule deer and white-tailed deer respectively). Although there appears to be an increase over 2002 results for both species, these results represent a continued overall decline in deer populations. There may be several reasons for the decline in recruitment which are not mutually exclusive. One reason may be that nutritional deficiencies during the winter are causing does to have fewer young (DelGiudice et. al 1991; Lesage et. al 2001; Swihart et. al. 1998; White and Lubow 2002). RMA, which is the site of on-going environmental cleanup, has large areas that are temporarily unsuitable deer habitat until native grassland vegetation can be reestablished.

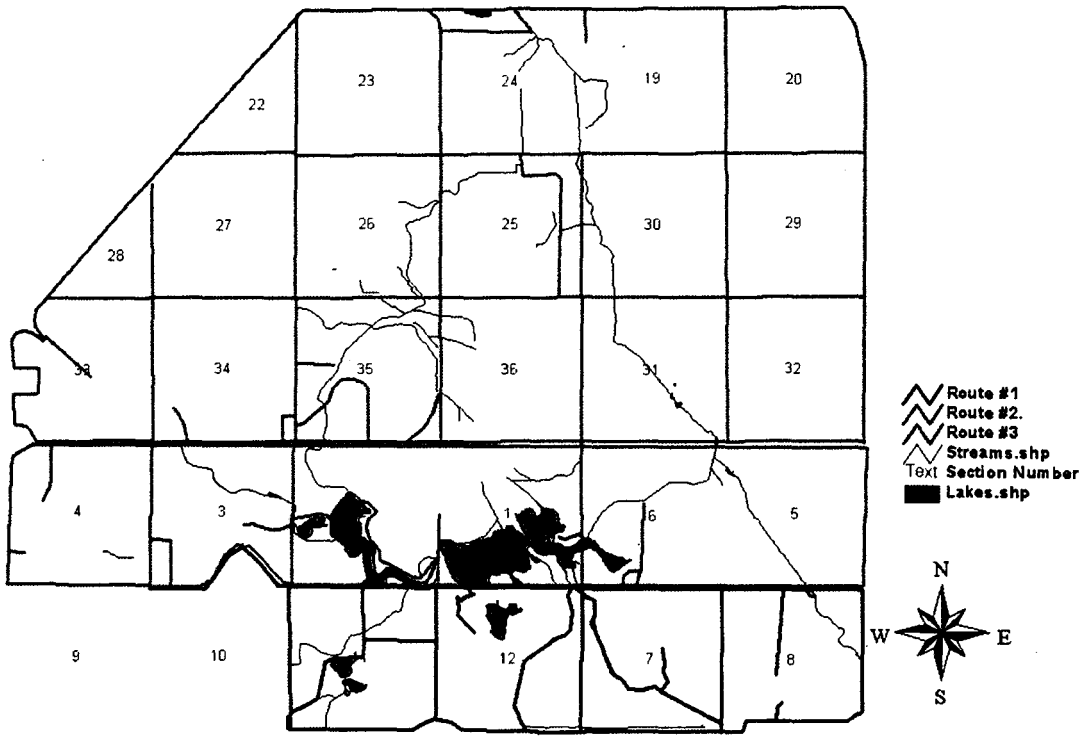


Figure 1a.7a Deer Classification Routes

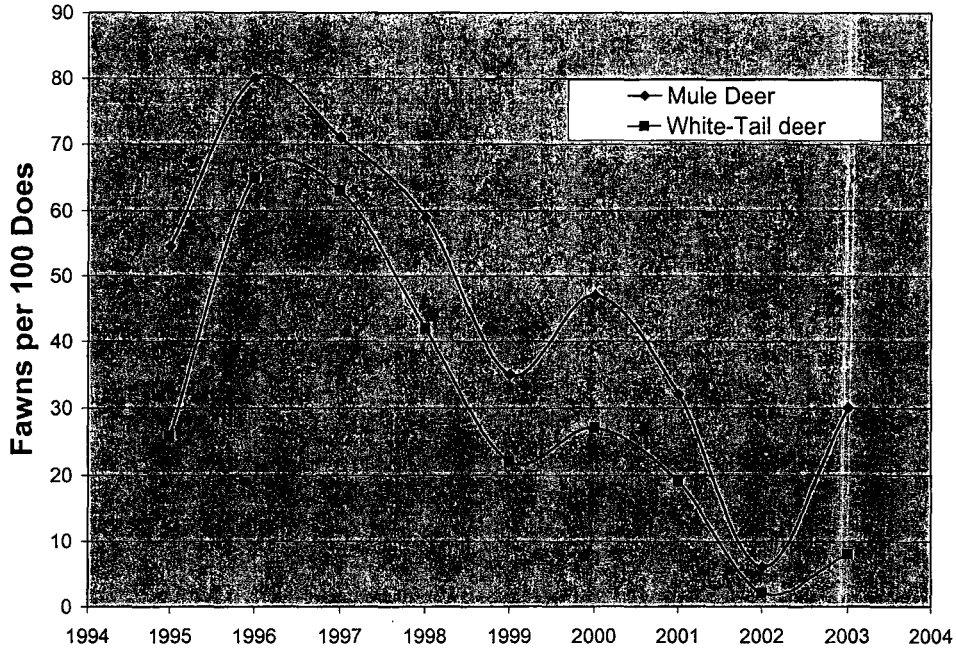


Figure 1a.7b Fawn:Doe Ratios for calendar years 1995-2003

A second possibility is that deer demographics at RMA have affected recruitment rates. The RMA deer herd has aged because older deer have survived longer without hunting. These older deer, both, bucks and does, are perhaps less able to produce fawns (Bowden et. al. 1984). More direct means of examining this possibility will be available in the near future from a study of fertility rates among does. Presently we can examine correlations among Buck: Doe ratios and time series of recruitment rates as a means of indicating whether recruitment is declining due to an aging deer herd.

Still a third possibility is that the coyote population at RMA has grown and is preying more on young fawns, especially as their main prey, black-tailed prairie dogs (*Cinemas ludovicianus*), has declined due to recent outbreaks of plague (Ballard et. al. 2001, Hamlin et. al. 1984, Potvin et. al. 1981). Additive mortality from coyote predation on fawns could be examined simply by correlations of recruitment with coyote relative abundance, alternative prey numbers, or both. There is some indication that coyote populations have increased at RMA. Preliminary results of a scent station study suggests that coyote visitation rates have increased from 2.44% in a 1993-1994 survey to 9.76% in 2003-2004 ($p = 0.04$, Fisher's Exact test).

A fourth possibility is that the recent years of drought in Colorado have taken a toll on young fawns or altered the vegetation so that fawns are more vulnerable. Additional explanations may have something to do with climate or contaminants but clearly further investigation is warranted.

METHODS

As a first step in this process, survey and classification data were examined for correlations to several variables that might explain the recent decline in recruitment. Survey routes roughly divided the refuge into thirds. Three teams of two observers drove each route once on three non-consecutive days during the fall of each year (1996-2003). Records of deer observed were classified by group size (number of deer within 50 meters of each other), species, age, and sex. These records represent the basis for obtaining estimates of bucks per 100 does and fawns per 100 does for each species in each year.

Exploratory data analysis consists of several partial correlation matrices. Caution must be used in the interpretation of these results because of the large number of variables examined. When multiple correlations are made, the likelihood of obtaining a significant correlation by chance alone is greatly increased. Therefore, these analyses are meant only to suggest possible causes of reduced recruitment rather than to test specific hypotheses.

At the time of this report, neither data on the amount of RMA lands taken out of production or the relative number of predators (mainly Coyotes) is available. Herein, analyses are restricted to examining three general factors that may have influenced deer recruitment during the years from 1995 through 2003. These are 1) density-dependence, 2) predation and alternative prey availability, and 3) climate.

1. Density-Dependence

Recruitment may be influenced by density dependent factors such as overcrowding and depletion of resources. This would indicate that the RMA deer herd is at or near its carrying capacity. To examine this possibility three types of variables were used: the total number of deer observed, the number observed in the previous year, and the buck/doe ratio (Table 1a.7.1).

2. Predation & Alternative Prey

The availability of alternative prey ("buffer prey") to predators may reduce predation on fawns by means of a swamping or dilution effect. Black-tailed prairie dogs and small mammals are the most important buffer prey available to coyotes at RMA. Surveys of active prairie dog colonies at RMA yielded annual estimates of the occupied acreage. An unrelated study of small mammal communities associated with restored and unrestored grasslands at RMA provided data on the relative abundance of small mammals in some of the years of the deer surveys (Table 1a.7.1).

3. Climate

Climate data was obtained from the National Weather Service's Forecast Office at http://www.crh.noaa.gov/den/cli/climo.html which reports daily and monthly summaries from a station immediately adjacent to RMA at the former Denver-Stapleton International Airport. The specific data included are summarized in Table 1a.7.1.

Table 1a.7.1. Independent variables that were examined as potential influences on recruitment.

Independent variables that were examined as potential influences on recruitment.		
Variable Abbreviation	**Description**	**Years for which data occurred**
MD Total	Total number of mule deer observed	1995-2003
MD X-1	Total number of mule deer observed in the previous year	1996-2003
MD Buck/Doe	Mule deer bucks per 100 does	1995-2003
WT Total	Total number of white-tailed deer observed	1995-2003
WT X-1	Total number of while-tailed deer observed in the previous year	1996-2003
WT Buck/Doe	White-tailed deer bucks per 100 does	1995-2003
[Monthly} Temp. (dptr)	Mean monthly (January – July) temperature as a departure from the 50 year average.	1995-2003
[Monthly} Temp 32 Max	The number of days in each month (Jan – April) in which the temperature did not exceed 32 degrees F (0 degrees C)	1995-2003
[Monthly] Temp Max 90+	The number of days in each month (June - July) in which the temperature exceeded 90 degrees F (32 degrees C)	1995-2003
[Monthl] HDD (dptr)	Monthly (Jan – April) heating degree days as a departure from the 50 year average	1995-2003
[Monthly] CDD (dptr)	Monthly (May - July) cooling degree days as a departure from the 50 year average	1995-2003
[Monthly] Precip (dptr)	Monthly inches of precipitation as a departure from the 50 year average	1995-2003
Pdog (Acres)	Number of acres of active prairie dog colonies	1995-2003
Sm. Mam. Totals	Total capture from a separate small mammal study	1997, 1998, 1999, 2001, 2003

RESULTS

1. Density-Dependence

Examination of partial correlation coefficients for demographic variables suggest that mule deer recruitment (MD Fawn/Doe) was probably not influenced by any of the demographic factors we studied during the time period of this data set (Table 1a.7.2). Partial correlation examines the influence of each variable after the effects of the other variables has been removed. There were no strongly negative coefficients related to fawn:doe ratios. Mule deer recruitment was positively correlated with the total number of deer observed (MD Total), an indicator of total population size.

Table 1a.7.2. Partial Correlation Matrix for Mule Deer Demographic Variables

Partial Correlation Matrix for Mule Deer Demographic Variables				
		MD Total	MD X-1	MD Buck/Doe
MD X-1		0.042		
MD Buck/Doe		-0.436	-0.260	
MD Fawn/Doe		0.576	0.141	-0.124

On the other hand, white-tailed deer recruitment (WT Fawn/Doe) was negatively related to all three demographic variables (Table 1a.7.3) suggesting that recruitment may be density dependent. This may be the case if the relatively small acreage of white-tailed deer habitat; which at RMA is riparian woodland, is limiting. See conclusions section for further discussion of this possibility.

Table 1a.7.3. Partial Correlation Matrix for White-tailed Deer Demographic Variables

		WT Total	WT X-1	WT Buck/Doe
WT X-1		-0.561		
WT Buck/Doe		-0.707	-0.608	
WT Fawn/Doe		-0.559	-0.786	-0.601

Density dependence can be further examined by performing Correlation Z-tests for significance of the influence of correlation coefficients. While no significant Z-scores were found, mule deer recruitment was again positively correlated with population size (Table 1a.7.4) and white-tailed deer recruitment was negatively correlated with the previous year's population size (WT X-1, Table 1a.7.5).

Table 1a.7.4. Correlation Z-Tests for Mule Deer Demographic Variables

	Corr. Coeff.	n	Z-Value	P-Value
MD Total, MD X-1	0.439	7	0.941	0.3468
MD Total, MD Buck/Doe	-0.582	8	-1.489	0.1365
MD Total, MD Fawn/Doe	0.692	8	1.904	0.0569
MD X-1, MD Buck/Doe	-0.489	7	-1.07	0.2847
MD X-1, MD Fawn/Doe	0.439	7	0.942	0.346
MD Buck/Doe, MD Fawn/Doe	-0.256	9	-0.64	0.5219

Table 1a.7.5. Correlation Z-Tests for White-tailed Deer Demographic Variables

	Corr. Coeff.	n	Z-Value	P-Value
WT Total, WT X-1	-0.105	7	-0.211	0.8332
WT Total, WT Buck/Doe	-0.255	8	-0.583	0.5602
WT Total, WT Fawn/Doe	-0.263	8	-0.602	0.5469
WT X-1, WT Buck/Doe	-0.175	7	-0.353	0.7239
WT X-1, WT Fawn/Doe	-0.644	7	-1.530	0.1260
WT Buck/Doe, WT Fawn/Doe	-0.255	9	-0.638	0.5234

2. Predation & Alternative Prey

Proximate evidence of predation is difficult to separate from more ultimate and general causes of mortality in fawns. A fawn that dies from exposure, malnutrition, or some other reason is likely to be scavenged by predators eventually. Therefore, a hypothesis that predation has resulted in the recent decline in deer recruitment at RMA can be examined in theory by correlations of recruitment with the availability of alternative prey such as black-tailed prairie dogs and other small mammals. While it was mentioned that coyote populations may have increased in recent years, no significant correlations were found between the availability of alternative prey and recruitment (Table 1a.7.6).

Table 1a.7.6. Correlation Z-Tests for Fawn/Doe Ratios and Alternative Prey Availability

	Corr. Coeff.	Count	Z-Value	P-Value
MD Fawn/Doe, Pdog (Acres)	-0.212	9	-0.528	0.5974
MD Fawn/Doe, Sm. Mam. Totals	-0.123	5	-0.175	0.8608
WT Fawn/Doe, Pdog (Acres)	-0.254	9	-0.636	0.5246
WT Fawn/Doe, Sm. Mam. Totals	-0.124	5	-0.177	0.8599

3. Climate

Similar correlation Z-tests were performed on all climate variables. Interestingly, significant negative correlations with recruitment were found for the same variable in both mule and white-tailed deer; that of the number of days in July when temperatures were above 90 degrees Fahrenheit (32 degrees C, Tables 1a.7.7 and 1a.7.8).

Table 1a.7.7. Correlation Z-Tests for Climate Variables & Mule Deer Fawn/Doe Ratios

	Corr. Coeff.	n	Z-Value	P-Value
Jan Temp. (dptr)	-0.289	9	-0.728	0.4664
Jan Temp 32 Max	0.240	9	0.600	0.5487
Jan HDD (dptr)	0.155	9	0.382	0.7024
Jan Precip (dptr)	-0.366	9	-0.940	0.3472
Feb Temp. (dptr)	0.168	9	0.415	0.6784
Feb Temp 32 Max	-0.036	9	-0.088	0.9300
Feb HDD (dptr)	-0.120	9	-0.295	0.7678
Feb Precip (dptr)	-0.107	9	-0.262	0.7931
Mar Temp. (dptr)	0.268	9	0.673	0.5009
Mar Temp 32 Max	0.157	9	0.388	0.6982
Mar HDD (dptr)	-0.271	9	-0.682	0.4955

Mar Precip (dptr)	-0.233	9	-0.581	0.5610
Apr Temp. (dptr)	-0.428	9	-1.119	0.2631
Apr Temp 32 Max	0.206	9	0.511	0.6093
Apr HDD (dptr)	0.430	9	1.125	0.2605
Apr Precip (dptr)	-0.082	9	-0.201	0.8404
May Temp. (dptr)	0.175	9	0.434	0.6646
May CDD (dptr)	0.075	9	0.183	0.8544
May Precip (dptr)	0.086	9	0.211	0.8329
Jun Temp. (dptr)	-0.021	9	-0.051	0.9592
Jun Temp Max 90+	-0.414	9	-1.079	0.2807
Jun CDD (dptr)	-0.093	9	-0.228	0.8193
Jun Precip (dptr)	-0.127	9	-0.313	0.7541
Jul Temp. (dptr)	-0.490	9	-1.313	0.1891
Jul Temp Max 90+	-0.67	9	-1.984	0.0472
Jul CDD (dptr)	-0.517	9	-1.401	0.1614
Jul Precip (dptr)	0.275	9	0.692	0.4890

Table 1a.7.8. Correlation Z-Tests for Climate Variables & White-Tailed Deer Fawn/Doe Ratios

	Corr. Coeff.	n	Z-Value	P-Value
Jan Temp. (dptr)	-0.512	9	-1.386	0.1659
Jan Temp 32 Max	0.438	9	1.151	0.2497
Jan HDD (dptr)	0.342	9	0.872	0.3832
Jan Precip (dptr)	-0.212	9	-0.528	0.5975
Feb Temp. (dptr)	0.081	9	0.198	0.8429
Feb Temp 32 Max	-0.069	9	-0.169	0.8655
Feb HDD (dptr)	-0.035	9	-0.085	0.9323
Feb Precip (dptr)	-0.253	9	-0.633	0.5270
Mar Temp. (dptr)	0.202	9	0.502	0.6159
Mar Temp 32 Max	0.220	9	0.549	0.5831
Mar HDD (dptr)	-0.201	9	-0.500	0.6171
Mar Precip (dptr)	-0.362	9	-0.929	0.3531
Apr Temp. (dptr)	-0.549	9	-1.512	0.1304
Apr Temp 32 Max	0.266	9	0.668	0.5041
Apr HDD (dptr)	0.540	9	1.479	0.1391
Apr Precip (dptr)	-0.110	9	-0.269	0.7877
May Temp. (dptr)	0.309	9	0.782	0.4339
May CDD (dptr)	0.081	9	0.200	0.8415
May Precip (dptr)	-0.156	9	-0.386	0.6995
Jun Temp. (dptr)	0.22	9	0.548	0.5835
Jun Temp Max 90+	-0.206	9	-0.512	0.6087
Jun CDD (dptr)	0.132	9	0.325	0.7450
Jun Precip (dptr)	-0.242	9	-0.605	0.5454
Jul Temp. (dptr)	-0.412	9	-1.073	0.2833
Jul Temp Max 90+	-0.696	9	-2.107	0.0351
Jul CDD (dptr)	-0.461	9	-1.220	0.2224
Jul Precip (dptr)	0.374	9	0.962	0.3359

CONCLUSIONS

Inference about what factor or factors have caused the recent declines in deer recruitment at RMA is certainly difficult to come by. From an examination of the available data presented herein, it may be possible to eliminate some factors while at the same time find support for others.

Density-dependent mechanisms that might influence recruitment have been found through several studies. Hobbs et.al. (1983) and Miller and Ozoga (1997) and references therein found evidence that overabundance that leads to habitat degradation may cause a reduction in recruitment through non-retention of the fetus by does, or by does that abandon fawns. We find no such correlation in the data from 1995-2003 at RMA. In fact, mule deer recruitment was positively (though not significantly) related to density.

There is some preliminary evidence that coyote populations have increased at RMA. While we cannot rule out additive mortality from predation as a possible factor that might explain low recruitment rates, there is reason to eliminate lack of alternative or "buffer" prey as a contributing mechanism. No significant relationships were observed between two measures of alternative prey abundance and recruitment for either deer species. Were there evidence to the contrary as in other studies (Hamlin et. al. 1984, Whittaker and Lindzey 1995, Ballard et. al. 2001, McNay and Voller 1995, Potvin et. al. 1981), it still may be unproductive to use predator control to remedy the situation. Until the ultimate rather than proximate causes of fawn mortality becomes known a decision on predator control should be delayed.

Of the possible contributing factors examined, climate, and specifically July warm temperatures appear to hold the greatest promise for further investigation. Many studies have examined the influence of severe winter weather on neonatal mortality, doe physiology, and subsequent recruitment (Bartmann and Bowden 1984, Verme 1968, Verme and Ozoga 1997, Wallmo and Gill 1971). Uncommon are studies that report the negative influence of warm, midsummer weather on recruitment. Yet both mule deer and white-tailed deer recruitment from 1995-2003 were significantly and negatively correlated to the number of days in July when temperatures were above 90 degrees. Heat stress, reduced vegetation cover from drought, or reduced nutritional content from drought-stressed vegetation may be the mechanisms involved. Although, further study is warranted, there may be little that can be done in terms of intervention or management if this is the case.

Our current research focus is the initiation of a two year investigation of reproductive and survival rates of mule and white-tailed does and fawns. Fifty mule and white-tailed does were captured in FY 2004, fertility rates determined and then fitted with uniquely marked radio-collars (if pregnant). Approximately 120 mule and white-tailed deer fawns were captured and radiocollared during the spring and summer of 2004. These radiocollared fawns will be followed up to two years to determine causes of mortality. Radiocollared does will be monitored for survival. In the fall of 2004 (FY 2005), a population estimate will be made based on mark-resight methods using these radiocollared does. This survey will occur as part of the annual classification count. Telemetry efforts, continued annual classification counts, and tracking of climate, predator, habitat, and alternative prey data will lead us to a better

understanding of the factors that contribute to variation in deer demographics at RMA. Detailed methodology and results of the first year of this study will be reported in the FY 2005 Annual Narrative and a final report will be included in the FY 2006 Annual Narrative.

1a.8 Fish Surveys

Fish Health Surveys

In 2004, annual fish surveys were conducted on Lake Mary, Lake Ladora and Lower Derby Lake by RMA personnel with the aid of the Service's Colorado Fish and Wildlife Assistance Office. Gill nets and minnow traps were used to evaluate fish health and diversity. While survey results from Lake Mary indicated good overall diversity, stunting was observed within largemouth bass. Channel catfish appeared to be numerous and in good health, whereas crappie and bluegill were not as abundant. Common carp combined with early stage eutrophication are contributing to deteriorating water quality.

Ladora had not changed much since sampling the previous year. Water clarity was still very good. The majority of fish caught were northern pike and a few largemouth bass. Most of the pike with the exception of one 16 lb fish, were stunted and in poor health. The few bass caught were relatively large (over 3 pounds), consistent with the lake's ongoing trend of "eat or be eaten". Crayfish and other invertebrates appeared to be the main food source, as well as small pike. The lack of suitable habitat and forage fish combined with overpopulation of pike are all factors contributing to the unbalanced fishery in Lake Ladora.

Lower Derby underwent the most changes in 2004. Fat head minnows and green sunfish were abundant in the shallows, whereas last years survey results produced only two Green sunfish. Additionally, seventy three Largemouth bass from Lake Mary were added to Lower Derby for carp control. Different in 2004 was the lack of tiger salamanders, which were abundant during surveys the previous year. Given Lower Derby's constant water fluctuations and proneness to carp infestations, maintaining aquatic health is an ongoing challenge.

Currently, a fisheries management plan is being developed which will address these and other issues for RMA lakes. The plan will be aimed at improving aquatic health and diversity, while at the same time enhancing sport fishing on Lake Mary and Lake Ladora.

1b. Studies and Investigations

1b.1 Continuation of the Use of Scent Stations to Determine Relative Abundance & Distribution of Mammalian Predators at Rocky Mountain Arsenal

Introduction

The use of scent stations to determine trends in furbearer populations has been commonly practiced by wildlife managers and ecologists for many years (Linhart and Knowlton 1975, Connor et al. 1983, Wood 1959, Sumner and Hill 1980, Morrison et al. 1981, Roughton and Sweeny 1982). Refinements have greatly improved these techniques for a

number of species including (but not limited to) coyote (Canis latrans), red fox (Vulpes vulpes), raccoon (Procyon lotor), striped skunk (Mephistis mephistis), and badger (Taxidea taxus); all of which (except red fox) occur regularly on Rocky Mountain Arsenal National Wildlife Refuge (RMA).

A scent station consists of an attractant scent (usually a plaster disc saturated with various synthetic fatty acids) surrounded by an appropriate tracking substrate such as wet sand or soft earth. Stations are widely spaced along a transect of predetermined length in order to minimize multiple visits by the same individuals.

Advantages of using scent stations include cost efficiency, repeatability, applicability to large areas of land, that data are collected on more than one species of animal simultaneously, that the data are robust, and data lend themselves easily to statistical analysis. Disadvantages are that the accuracy of data is subject to variation in weather conditions; scent stations require considerable effort and labor to construct; efficient means of travel to, from, and among stations are required; and stations often have low visitation rates. Furthermore, the effectiveness and reliability of scent stations can be influenced by the type and quantity of scent used (Roughton and Sweeny 1982).

Visitation rates at scent stations are not a direct indication of animal abundance (Caughley, 1977). That is to say a two-fold increase in visitation by a species may not be used to suggest that the abundance of that species has also increased two-fold. Rather, the relationship between visitation and abundance is probably non-linear. An increase or decrease is a relative reflection of the abundance of an animal. These limitations aside, the use of scent stations has the potential to yield an affordable and effective index of animal abundance at RMA.

From 1993 to 1994 scent stations were used at RMA with the objectives of determining the species occurrence, distribution, habitat use, seasonal variation and population trends over time of mammalian predators at RMA. The original goals of this study, which was first implemented initiation date were to guide management strategies aimed at preserving critical habitat for these species. Since 1994, approximately 2140.6 acres of contaminated sites have been remedied. These areas in 1994 would have provided habitat to mammalian predators and may again following restoration, although greatly altered from their pre-remediation condition. In addition, a comparable amount of acreage has been altered by efforts to restore native prairie throughout RMA. This project, to reinitiate the original scent station study from 1993 and 1994 with some modification, will provide FWS the means to compare and monitor population trends of mammalian predators at RMA.

In addition, recent declines in deer (white-tailed and mule) recruitment have led to speculation that increases in predator populations, especially coyote, have resulted in increased mortality of fawns. Thus another goal of this project has become an objective, though relative, measure of mammal population trends especially with regards to coyotes. This study will yield insights into whether remediation and restoration efforts have affected these populations, and whether future activities are likely to do so. Furthermore, since the collection of data is easy and requires very little training, volunteers and RMA visitors can be involved in the study offering an excellent interpretive opportunity.

Methods

In 1993, scent stations were operated according to the recommendations of Roughton and Sweeny (1982) and Connor et al. (1983). The original 1993-94 study consisted of survey lines (transects) with 10 scent stations each, spaced at 0.2 mi. (0.32 km.) intervals, and plans to be operated for one night per month. Modification of the original transects (Figure 1b.1.a) was necessary in 2003 due to remediation activities and other restrictions. Transect A was reused. Transect B was abandoned because the road along the west side of Section 19 has been removed and revegetated. A new transect "B" was located instead along the east and south sides of Section 19. Another new transect "C" was located in the vicinity of "Rattlesnake Hill". Transect C was reused and renamed "D". The old transect D was eliminated from future collection efforts because of its location within the *Bald Eagle Roost Exclusion Zone*. Transect E was rerouted to follow an existing trail near the same location.

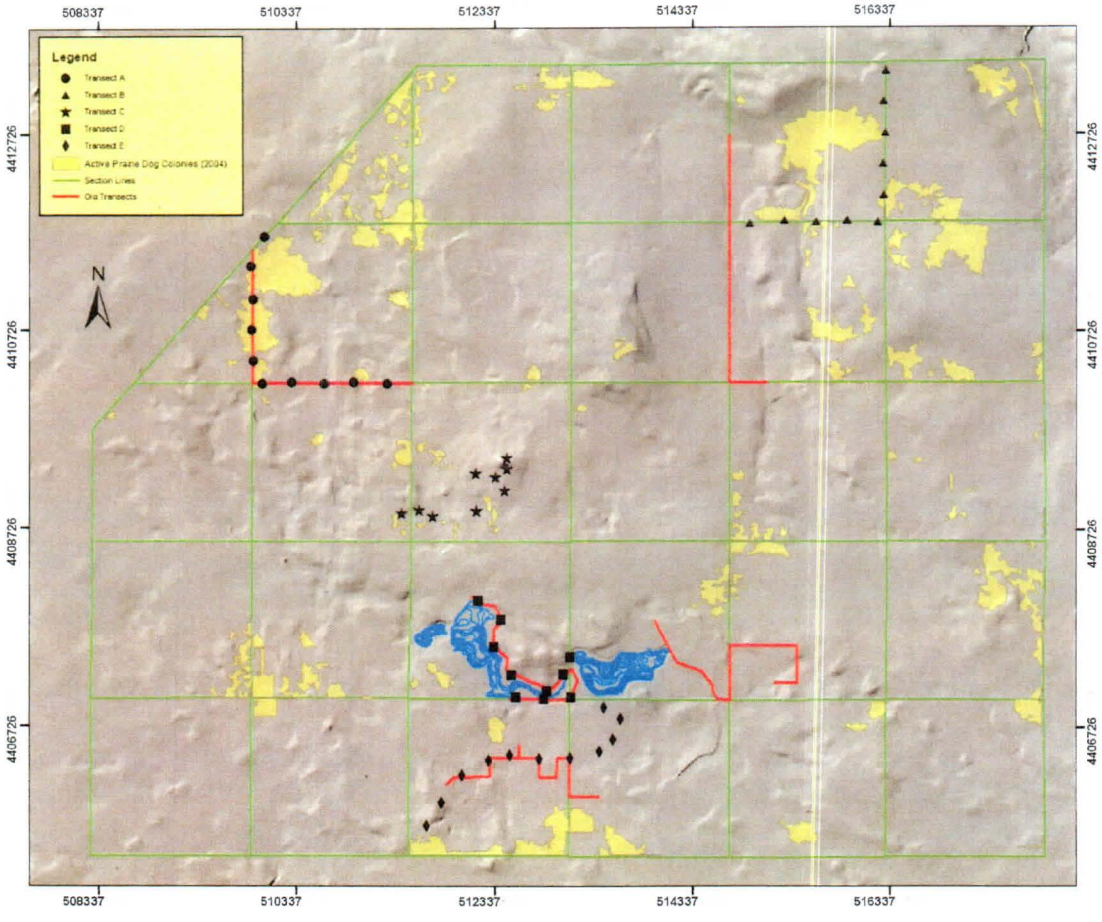


Figure 1b.1.a. Map of original transects and current individual scent stations used in 2004

Data from 1993 and 1994 can be compared to present findings and offer a repeatable means of monitoring these species in the future. As in the original study, spacing between stations was maintained at 0.2 mi. and operated for one night per sample to avoid multiple visits by the same animal. Scent stations consist of a 1 x 1 meter area cleared of all vegetation and debris. Each station was prepared by sifting clean, dry soil over the

area to produce a uniform thin layer from which tracks can be observed and identified. In 1993-1994, a cotton ball soaked with Fatty Acid Scent (FAS) was placed on a stick in the center of the cleared area. Twenty four hours after the station was prepared each station was observed, and date, time, location, weather conditions, and habitat type were recorded. All tracks present within the station were recorded and identified in some cases to species, and the scent and stick were then removed. Identical methods were used in 2003-2004 except that the bait used was a plaster of Paris disc or "predator scent tablet" saturated with the same synthetic fatty acid attractant. The predator scent tablets are available from the USDA Supply Depot, 238 E. Dillon St., Pocatello, ID 83201 (208-236-6920) at a cost of $57 per jar of 110 tablets.

Relative abundance was calculated for each of the species or species groups (e.g. mice) by taking the total number of visits by a species and dividing it by the number of stations that were operated. Nominal Logistic Regression (JMP, SAS Institute) and Chi-square tests were used in comparing relative abundance among years, months, habitat types, or transects. While the locations of some transects changed in 2003 as did the method of presenting the scented bait, it is believed that valid comparisons can be made especially for mammalian predators such as coyotes. All of the animals encountered occur throughout RMA and many have large territories or home ranges that could eclipse both old and new transect locations. If any bias in bait presentation did occur, it would be towards lower detectability when using the newer tablets. The old method of saturating a cotton swab and placing it above the ground surface on a stick would likely have broadcast the attractant farther. In fact the opposite results seemed to have occurred. All species or groups were detected at stations more in 2003-2004 than they were in 1993-1994 (Figure 1b.1.b).

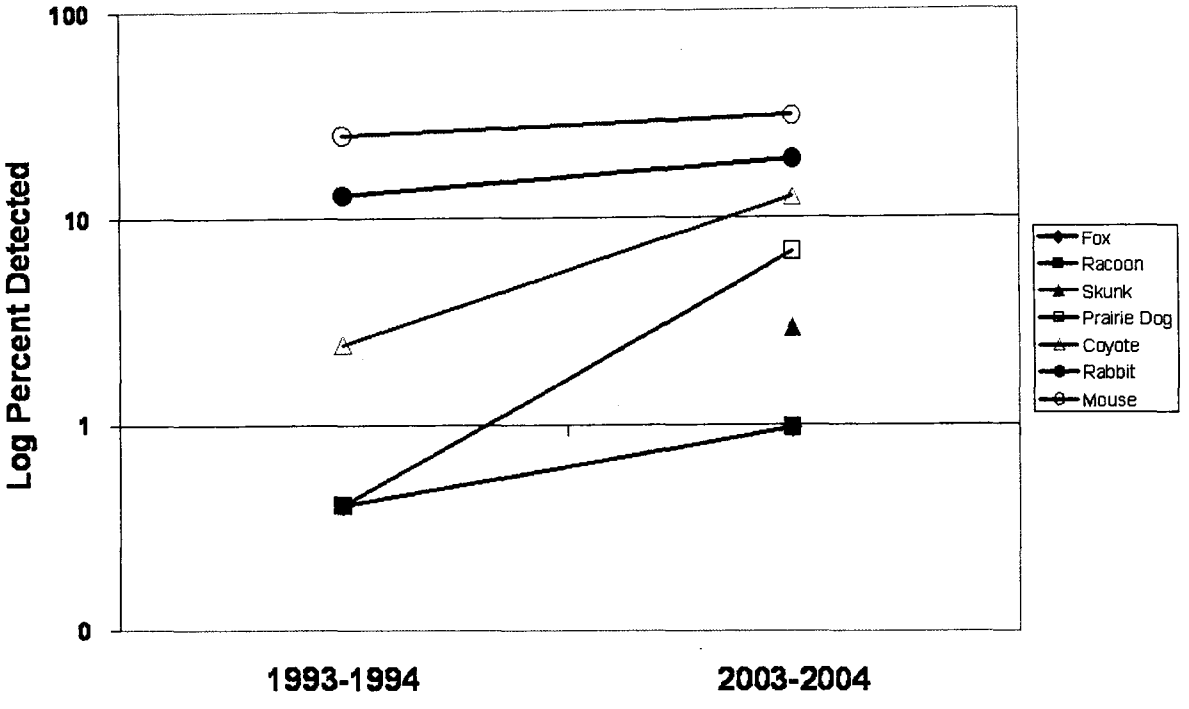


Figure 1b.1.b. Changes in relative abundance of animals detected at scent stations.

Results

Data were collected from a total of 246 scent stations in 1993-1994 and 103 stations in 2003-2004. All species or groups (e.g. mice) exhibited increased detection levels over what they had been in 1993-1994 though some not significantly so (Table 1b.1.a). One species, striped skunk, was not detected in 1993-1994 but was found in the present survey.

Table 1b.1.a. Presents the percent of scent stations in which each species or group was detected in each sample period and chi-square probabilities that the difference between sample periods was by chance alone.

	1993-1994	2003-2004	Chi-square P-Value
Coyote	2.44	12.62	0.0004
Fox	0.41	0.97	NS
Skunk	0.00	2.91	0.0399
Raccoon	0.41	0.97	NS
Rabbit	13.01	19.42	0.1709
Prairie Dog	0.41	6.80	0.0012
Mouse	25.61	31.07	0.361
Kangaroo Rat	0.81	22.33	<0.0001

In general, these results suggest an overall increase in coyote numbers as well as other mammal species at RMA.

Discussion

A comparison of scent station data from 1993-94 and 2003-2004 suggest that populations of both mammalian prey and predators have increased over the past decade. Dramatic increases in prairie dogs are paralleled by similar increases in coyotes. The recent detections of skunk at RMA are also significant. And yet badgers, which were known to be present at RMA from FWS staff observations in the past, were not observed at any scent stations during either time period.

Scent stations are located in areas that should attract badgers such as near prairie dog colonies. However, the scent discs that were used may not be as attractive to badgers as are other types of baits such as suet or carcass baits. Tests of these baits may be attempted in the future. In the meantime, several night and early morning spotlighting drives have also failed to record any sightings of badgers. It could be that badgers are no longer present at RMA. During a recent deer telemetry study, many observations of skunks by FWS staff were made. Skunks now appear to be permanent residents at RMA and may be increasing as well.

Over the decade since the scent stations were first used large areas of habitat have been disturbed in remediation efforts. Significant areas of RMA that were covered by non-native vegetation have also been disturbed, and then restored as native grasslands. These disturbances however, have not lead to a reduction of native mammal species. Instead, the opposite has occurred; all species that were detected in this study increased in relative abundance. The results of this study support the general conclusion that remediation and restoration efforts at RMA have been beneficial to native wildlife.

2. Habitat Restoration

2a. Wetland Restoration

No activity.

2b. Upland Restoration

Service staff conducted fieldwork on 30 upland restoration projects during FY 2004. Service staff also wrote plans and initiated fieldwork on 9 new projects and maintained 21 restoration projects initiated in prior years.

Approximately 338 acres were planted to native grasslands during October 2003 to September 2004 (Table 2b.1.a). Most of this acreage was seeded to native shortgrass and sandhills prairie, including associated grasses, forbs, and shrubs.

Seven projects received some form of irrigation (Table 2b.1.a). Approximately 440 acres of grassland restoration sites were irrigated.

Table 2b.1.a. Fieldwork accomplished on mitigation projects at Rocky Mountain Arsenal National Wildlife Refuge, FY2004 (does not include vegetation monitoring, or prescribed burning activities.)

Project No.	Project Type*	Project Description	Approximate Acreage				Individual Shrubs or Trees Planted
			Natives Planted	Non-Natives Planted**	Irrigated or Hand-Watered	Weed Control	
29-04	GR, SH	Grass and Shrub seeding in sec 29	14.5	0	14.5	14.5	0
41-04	GR	Small area disturbances	32.5	0	31.5	31.5	0
43-02	GR	Seed propagation in SE Sect. 34	0	0	0	6	0
52-04	GR, SH	Grass and shrub seeding in section 20	49.4	0	49.4	49.4	0
53	GR	Reveg. of Ladora Dam and Spillway	0	0	0	4	0
54	GR	Revegetation in east-central Section 12	0	0	0	56	0
55	GR	Revegetation of Misc. Southern Tiers Soils	0	0	0	11	0
58	GR	Control of Russian knapweed	0	0	0	2	0
59	GR	Reveg of Cr. Wheatgrass NW sec 11	0	0	0	40	0
60	GR	Enhancement of SE Section 8	0	0	0	54	0
61	GR	Weed Mngmt	0	0	0	21.8	0
66	GR	Reveg of Cr. Wheatgrass in Sect 6	0	0	0	50	0
67B	GR	Revegetation in EC Section 7	0	0	0	9	0

67C	GR	Revegetation in SE Section 7	0	0	0	10	0
68	GR	Revegetation in NW Section Sect. 8	0	0	0	50	0
69	GR	Restoration of MT Soil Rem. Sites in Sections 19, 20, 29, and 30	0	0	0	75	0
70	GR	Restoration of Misc. Structure Sites in Sect 2,12,30,34,35	0	0	0	7	0
71	GR	Restoration of Central, eastern Sect 24	0	0	0	110	0
72	GR	Restoration of BT Soil Rem. Sites in Section 32	0	0	0	200	0
76	GR	Reveg of basins in SE section 26	160	0	160	160	0
79	GR	Reveg of Cr. Wheatgrass NW sec 6	0	0	0	50	
79-03	GR	Reveg of Cr. Wheatgrass NE sec 6	0	0	103	103	0
79-04	GR	Reveg of Cr. Wheatgrass NE sec 6	47.7	0	47.7	47.7	0
80	GR	Reveg of Cr. Wheatgrass, Sect 5	0	0	0	50	0
80-03	GR	Reveg of Cr. Wheatgrass sect 5 (eagle nest)	0	0	0	10	0

81	GR	Reveg of Disturbed areas in Sec 1	0	0	0	68	0
82	GR	Reveg of Cr. Wheatgrass NW section 2	34	0	34	34	0
83	GR	Reveg of weedy area in central sec 2	0	0	0	13.1	0
85	GR	Reveg of non-native areas in sects 25 and 30	0	0	0	154	0
86	GR	Reveg of Cr. Wheatgrass W. section 35	0	0	0	185	0
		TOTAL	**338.1**	**0**	**440.1**	**1676**	**0**
* **GR** = Grassland Restoration, **SH** = Shrubland & Other Woody Plant Restoration (including subshrubs), **OT** = Other.							
** **Non-Natives** = Temporary cover crops.							

Seed Collection

Approximately 500 pounds of native Blue grama (*Bouteloua gracilis*) seed were collected by Service staff during FY 2004, all of which will be used to augment restoration sites.

Vegetation Monitoring

The Service began vegetation monitoring in 1995 with Morrison Knutson staff, and in 1996 assumed full responsibility for all vegetation monitoring. The service monitors the vegetation on restoration sites after the third and fifth growing season, and every five years thereafter.

In 2004, 200 vegetation monitoring transects were completed in 17 projects. An additional 71 baseline vegetation transects were completed in six new project areas.

2004 Vegetation Monitoring Data Summary
Range Trend Data by Project and Year (by % Cover)

PROJECT	YEAR	INTRO FORBS	INTRO GRASS	NATIVE CS	NATIVE FORB	NATIVE VEG	NATIVE WS	TOTAL LIVE
3B	**1998***							
Tram loop	1999	1.0	1.0	0.0	45.0	97.85	44.0	93.0
WC 2	2000	0.0	0.0	0.0	7.0	100.0	58.0	69.0
	2002	0.0	0.0	2.0	6.0	100.0	40.0	56.0
Post burn	2004	0.0	0.0	1.0	7.0	100.0	71.0	81.0
5B	**1994***							
SE 34	1995	15.15	2.67	1.17	18.17	58.21	5.83	44.67
Barracks	1996	9.66	1.17	1.17	7.84	58.6	2.51	26.17
area	1997	14.0	2.66	3.33	16.34	71.67	12.49	58.83
	1998	16.5	4.17	5.50	9.33	65.17	17.85	59.33
	2003	12.0	23.0	5.0	5.0	52.7	26.0	74.0
Post burn	2004	9.0	0.0	10.0	2.0	89.66	66.0	87.0
17	**1990***							
Bema 7A,B	1992	18.8	11.7	15.1	4.1	54.87	18.0	67.8
SW 19	1993	15.6	11.2	11.4	4.2	50.09	9.5	53.7
	1994	13.4	12.4	20.2	2.9	55.05	8.5	57.4
	1996	9.7	5.8	16.1	2.4	62.10	6.9	40.9
	2003	11.8	11.8	38.0	2.4	67.04	7.0	71.6
Post burn	2004	19.2	0.00	33.2	0.4	68.63	8.4	61.2
21	1996	2.83	26.5	0.0	.31	22.61	8.25	37.88
SE22	**1998***							
	2000	33.12	.63	1.19	.06	6.9	1.25	36.25
16 transects	2004	57.57	0.00	2.79	0.0	9.74	3.35	63.79
22 Stipa A	**1989***							
SW 5	1992	6.18	5.	30.45	2.62	81.52	16.45	61.0
	1993	3.8	11.4	22.4	2.8	69.60	9.60	50.0
	1994	0.0	38.0	16.0	1.0	42.60	11.0	66.20
	1999	.33	4.67	25.33	9.66	92.92	29.33	70.67
4 transects	2004	2.0	0.33	41.0	2.67	94.96	0.33	46.33
43-02	1997	16.0	0.0	0.0	29.0	71.43	11.0	56.0
SE 34 re-do	2001	0.50	0.0	0.0	6.0	96.30	7.0	13.5
	2002*							
2 transects	2004	4.0	0.0	3.0	0.5	93.28	52.0	59.5
44								
SW 3	**1997***	11.0	6.0	0.0	39.5	70.69	1.5	58.0
	1999	1.0	0.0	0.0	30.0	98.86	57.0	88.0
Post burn	2001	0.0	18.0	0.0	0.50	81.25	77.5	96.0
	2004	1.0	0.0	0.0	1.0	98.77	79.0	81.0
54								
NE 12	1998	14.64	25.91	0.0	14.36	36.29	8.36	63.64
	2000*							
11 transects	2002	7.44	0.89	3.0	4.43	73.96	16.11	32.0
	2004	4.55	1.67	10.22	1.43	86.89	29.45	47.44
*** year seeded 54-04**								
Baseline								
	2004	9.45	48.82	0.18	0.91	4.17	61.0	1.54
55								
Misc So. tier								

PROJECT	YEAR	INTRO FORBS	INTRO GRASS	NATIVE CS	NATIVE FORB	NATIVE VEG	NATIVE WS	TOTAL LIVE
soils	**2000***							
9 transects	2002	20.02	4.25	7.88	5.89	45.04	6.14	44.13
	2004	17.65	2.44	16.66	1.32	57.11	8.77	46.89
56								
Central 4	1999	5.85	14.95	10.9	7.35	62.86	15.9	56.0
	2000*							
20 transects	2002	7.80	0.45	0.0	0.70	58.75	10.75	20.0
	2004	11.10	3.4	5.15	4.05	74.40	31.9	56.65
57								
NW 34	1997	9.90	29.4	1.55	3.45	26.54	8.35	53.50
	1998*							
20 transects	2000	6.35	5.05	1.10	3.15	73.02	26.25	42.25
	2004	2.75	17.5	0.80	1.45	54.75	21.50	44.75
57C								
SW/SC 34	1998	3.35	37.25	0.0	6.45	28.27	9.35	56.60
	2000*							
20 transects	2002	8.10	1.75	0.35	1.40	54.92	10.00	21.85
	2004	3.55	13.20	2.80	0.90	57.11	18.00	39.05
59								
NW 11	1999	2.50	21.85	5.75	10.15	57.76	17.35	57.65
	2000*							
20 transects	2002	3.40	0.30	0.10	1.55	80.42	13.40	18.90
	2004	5.55	3.65	4.35	4.80	85.81	46.25	64.85
63B								
SW 3	1997	0.50	24.0	2.0	1.0	50.51	22.0	49.5
	1998*							
	2000	0.67	0.67	0.0	2.34	97.66	51.33	57.0
Post burn	2002	0.00	0.67	0.0	0.99	96.36	16.66	18.33
	2004	0.00	5.0	17.67	0.99	90.8	30.32	54.33
63N								
EC 3	1996	0.50	5.50	1.50	4.50	77.78	15.00	27.00
	1999*							
3 transects	2002	3.00	0.00	0.00	0.33	89.66	25.32	29.00
	2004	2.34	0.33	6.67	1.00	95.53	49.32	59.67
64								
SW34	**2000***							
3 transects	2002	1.00	0.67	2.00	0.33	91.23	14.67	19.00
	2004	2.67	10.34	6.67	1.33	76.07	30.66	54.33
66								
SE 6	2001	9.31	27.69	3.54	3.25	25.05	5.45	49.38
20 transects	**2002***							
	2004	40.75	4.30	9.50	4.45	37.86	13.45	72.50
67								
Post fire	1993	23.30	11.20	0.00	5.60	14.90	0.60	41.60
Monitoring	1995	0.99	1.14	0.00	7.43	95.85	45.44	55.14
	1996	9.11	0.0	0.11	10.66	60.00	2.67	22.78
	1997*	36.44	1.55	0.00	16.64	43.75	12.45	67.56
	1998	18.33	4.88	0.67	13.44	52.50	11.10	48.89
	1999	9.33	4.22	1.33	21.10	76.67	20.43	58.11
2 transects	2001	2.14	25.14	3.57	3.41	54.09	22.29	59.43
	2004	14.50	1.00	35.00	0.50	78.62	20.50	72.50

PROJECT	YEAR	INTRO FORBS	INTRO GRASS	NATIVE CS	NATIVE FORB	NATIVE VEG	NATIVE WS	TOTAL LIVE
67B								
Post fire								
Monitoring	1997	11.22	27.99	0.56	5.42	37.63	17.00	62.89
	1998*							
	2000	1.92	4.93	2.69	0.85	88.46	47.93	59.31
6 transects								
	2002	0.90	7.27	1.55	0.72	82.25	34.44	46.09
	2004	2.00	10.00	19.34	3.67	80.80	25.17	62.50
67C								
Post fire								
Monitoring	1998	12.61	33.69	1.31	10.63	27.46	4.24	64.15
	1999*							
12 transects	2001	3.17	13.33	6.83	2.33	74.68	39.50	65.17
	2003	11.99	18.11	9.22	8.33	51.87	11.99	62.56
	2004	3.58	18.83	7.59	6.07	65.60	27.83	65.17
70								
Misc. Struc.								
	2001*							
	2004	24.50	0.00	2.00	0.00	56.25	29.50	56.00
71								
SE to WC 24								
20 transects	2001	2.15	66.70	10.75	0.00	16.49	2.85	82.45
	2002*							
	2004	54.80	2.90	4.75	1.05	23.53	11.95	75.45
74								
SE 33								
12 transects	2001	1.75	30.84	2.58	0.91	30.55	10.84	46.92
	2002*							
	2004	1.38	0.46	0.69	0.32	96.20	45.77	48.62
80-04								
Baseline								
	2004	32.85	14.31	0.69	4.40	29.78	14.93	67.15
83								
Baseline								
	2004	12.20	56.00	1.60	0.60	6.06	2.20	72.60
85								
Baseline								
	2004	22.10	17.70	3.20	0.75	19.76	5.65	49.60
86								
Baseline								
	2004	10.68	40.48	5.95	0.79	17.61	4.05	62.16
CSU Research								
Post burn								
	2004	9.0	10.75	4.0	5.0	69.5	35.5	64.75
Rattlesnake								
Hill								
	1992	0.29	1.86	6.28	9.43	94.40	28.00	50.43
	1996	3.17	3.00	3.00	9.51	81.95	10.00	34.17
	1999	6.16	6.50	5.83	22.65	84.27	25.67	80.50

PROJECT	YEAR	INTRO FORBS	INTRO GRASS	NATIVE CS	NATIVE FORB	NATIVE VEG	NATIVE WS	TOTAL LIVE
	2004	14.34	13.50	8.01	5.82	62.97	30.34	75.17
Section 33								
Native								
	1999	2.65	5.25	5.55	17.55	86.58	25.50	58.85
	2004	17.5	6.8	12.75	3.85	67.16	33.05	74.0
*** year seeded**								

Habitat Restoration Photography Program

From October 1, 2003 through September 30, 2004, refuge staff photographed 18 habitat projects using 35mm color slide film and single-lens reflex cameras with interchangeable lenses. A total of 433 images were exposed, developed, and catalogued.

Geographical Data Collection and Analysis

From October 1, 2003 through September 30, 2004, refuge staff mapped 1,036 acres within 8 habitat projects and 8 prescribed burn locations using a Global Positioning System (GPS) receiver and data logger. They also mapped 312 vegetation monitoring transects at 36 project sites, and 14 noxious weed sites within 7 refuge areas.

Project Highlights

The tram loop portion of project 3B in section 2 behind the visitor's center was burned in the spring of 2004. This burn did a tremendous job of cleaning up the litter and stimulating growth of the plants. 100% of the plants in the transects monitored were natives and live cover increased from 56% to 81% from 2002, which was a severe drought year.

Project 5B which is the barracks area in section 34 was also burned in the spring of 2004. The burn had what appears to be a positive effect on the vegetation in the area. Total live vegetation increased from 74% to 87% and native vegetation increased from 53% to almost 90%.

Project 17, BEMA sites 7A and 7B in section 19 also received a burn in the spring of 2004. The fire had the effect of clearing out the litter but changed the composition of the vegetation in the area very little.

Project 21 in south section 22 is a disappointment. For whatever reason the two seeding attempts in this project have failed to fully establish. Introduced forbs have increased to over 57% of total live vegetation.

Project 22 in south west section 5 is doing well. The area was seeded to provide an area for *Hesporastipa comata* collection to augment our native seeding efforts. This species has increased to 41% of total live cover.

Project 43-02 is a *Bouetoula gracilis* propagation area to augment our blue grama in native seedings. The seeding had previously failed and was replanted and irrigated in 2002. The weeds were burned off in the spring of 2004 and the regrowth sprayed with a

broadleaf herbicide. The result is 52% of the live cover is now blue grama. Approximately 500 pounds of seed was harvested from the area and will be used on native restoration sites.

Project 44 in south west section 3 was also burned during the spring of 2004. Native warm season grasses dominate in this area and total native vegetation increased to nearly 99%.

Project 54 in eastern section 12 was irrigated in 2000 and since then has shown a steady increase in percent of native cool season grasses present, native warm season grasses present, and native vegetation present.

Project 55 is called Miscellaneous Southern Tier Soils and is many small projects in several different sections. The data have not been broken out by section so on the whole the project is progressing nicely. However, there are some of the areas that need more attention than others.

Project 56 in central section 4 was planted and irrigated in 2000. Since then it has shown a slight increase in the percentage of native cool season grasses, and a significant increase in native warm season grasses and native vegetation.

Project 57 in northwest section 34 was planted and irrigated in 1998. The dominant native warm season grass has been sand drop seed. Crested wheatgrass, an introduced cool season grass is increasing possibly warranting a more aggressive management strategy. However, nearly 55% of the total vegetative cover is native.

Project 57C in southwest and south central section 34 was planted and irrigated in 2000. Native warm season grasses have increased every year since planting as has native vegetation as a percentage of total vegetation.

Project 59 in northwest section 11 was also irrigated in 2000. Native forbs and grasses have all increased markedly since planting and native vegetation as a percentage of total vegetation reached nearly 86% in 2004.

Project 63B in south west section 3 was burned during the spring of 2004. This area has been occupied by prairie dogs for a couple of years, however, the grasses did get established and the dogs have not had the detrimental effect that they have had in other locations. After the fire total vegetation increased from 18% in 2002 (a drought year) to over 54%. Native warm season grasses increased from 17% to 30%. Overall this project looks good.
Project 63N in section 3 is the north quadrant of project 63 and was planted and irrigated in 1999. This project is doing well with nearly 96% of the total vegetation being native and nearly 50% being warm season grasses.

Project 64 in southwest section 34 was a shrub planting that was planted and irrigated in 2000. This project is also progressing nicely. It takes longer for shrubs to compete well with grasses so the shrub percentages aren't what were planted but they are holding their own. Native warm season grasses are just over 30% of the total and native vegetation is over 76% of the total.

Project 66 in section 6 was planted and irrigated in 2002. It is still early in the process, however, there are some encouraging trends. Currently introduced forbs are the largest component in the system, but that is to be expected. Native plants are nearly 38% of the total and all components are within expected ranges.

Projects 67, 67B and 67C in eastern section 7 were burned in the spring of 2004. The fire cleared litter and stimulated growth of nearly all native vegetation types. The sand sagebrush and rubber rabbit brush were cleared of decadent growth and regrowth was excellent.

Project 70 is the Miscellaneous Structures project from 2001. There are several small sites included in this project. Some of them are doing extremely well while others are lagging behind.

Project 71 in section 24 was planted in 2002 and is progressing. There is still a kochia problem but the native plants are there and we expect them to increase as the weeds are taken care of.

Project 74 in south east section 33 was also planted in 2002. This project is doing extremely well for a third year project. Over 96% of the total vegetation on the project is native while introduced forbs and grasses account for less than 2%.

Base line vegetation monitoring was done in five projects that have not yet been planted. Project 54-04 in section 12, project 80-04 in section 5, project 83 in section 2, project 85 in section 25 and 30, and project 86 in section 35.

Colorado State University had some research plots in section 3 that were burned in 2004. The monitoring indicated that the native plants have held on well in the plots.

Two native areas were also monitored in 2004. Rattlesnake hill native area showed increases in non-native vegetation and a corresponding decrease in total native vegetation and native forbs. However, native grasses did increase. The native area in section 33 showed increases in introduced forbs, introduced grasses, native cool season grasses, and native warm season grasses. Decreases were quite drastic in native forbs and total native vegetation.

3. Habitat Management

3a. Water Level Management

2004 was an improvement over 2003 for water level management at the Refuge because of better snowpack and runoff conditions in the South Platte River basin and because of frequent summer rains. However, Water Year 2004 was again below normal for precipitation along the Colorado Front Range, for the fourth drought year in a row. The Refuge received no water flows from the High Line Canal system in 2004 so the Refuge wetlands supplied by this canal once again had depressed water levels. The High Line Canal, owned and operated by the Denver Water Department, is the primary surface water supply for the Refuge, although active negotiations with Denver are nearing completion to develop alternative supplies less prone to severe drought limitations. The

small amount of water from the High Line Canal coupled with below normal precipitation caused Upper Derby Lake to remain dry, along with all of the constructed wetlands (Wetlands 1-5 and the Ducks Unlimited Wetland) and the Rod and Gun Club Wetland. Most Refuge wetlands retained moist soil conditions in the deepest part of each basin. There was sufficient water from snowmelt runoff, summer thunderstorm runoff and from ground water production (see next paragraph) during the year to keep Lakes Mary and Ladora at or near full pool and Lower Derby Lake at 30-60 percent of full pool. Havana Ponds near the southern Refuge boundary, had highly variable water levels ranging from 10-70 percent of full pool, based on intermittent storm flows reaching the lake from late spring and summer thunderstorms.

Drought conditions continued to require the Refuge and the U.S. Army to pump ground water from the Section 4 (Western Tier) wells in order to maintain water levels in Lake Ladora and Lake Mary. However, water levels in these lakes declined periodically below full pool because the ground water supply (about 2.5 acre-feet per day) was less than the demand for water from Lake Ladora to support irrigation of prairie restoration areas and water needed for dust control and other uses by ongoing contaminant cleanup activities.

The only Refuge wetland that remained at or near full pool during 2004 was the Parkfield II Wetland near the southern Refuge boundary at Chambers Road. This wetland is supplied by shallow ground water flows and surface water runoff in the southeastern third of the Irondale Gulch drainage basin located upstream (southeast) of the Refuge.

The continuing drought also kept water flows to near zero in First Creek, the only natural stream on the Refuge. First Creek is an intermittent stream during normal water years but was nearly dry for most of 2004, with the exception of small flows immediately following summer thunderstorms and sustained flows of almost 1.0 cubic foot per second during the month of December.

3b. Moist Soil Management

Nothing to report.

3c. Grazing/Mowing/Haying

3a.1 Grazing

No Activity.

3a.2 Mowing

Mowing was conducted on approximately 1,676 acres, usually for weed control. Please see Pest Plant Control for more details on mowing.

3a.3 Haying

No activity.

3d. Farming

No activity.

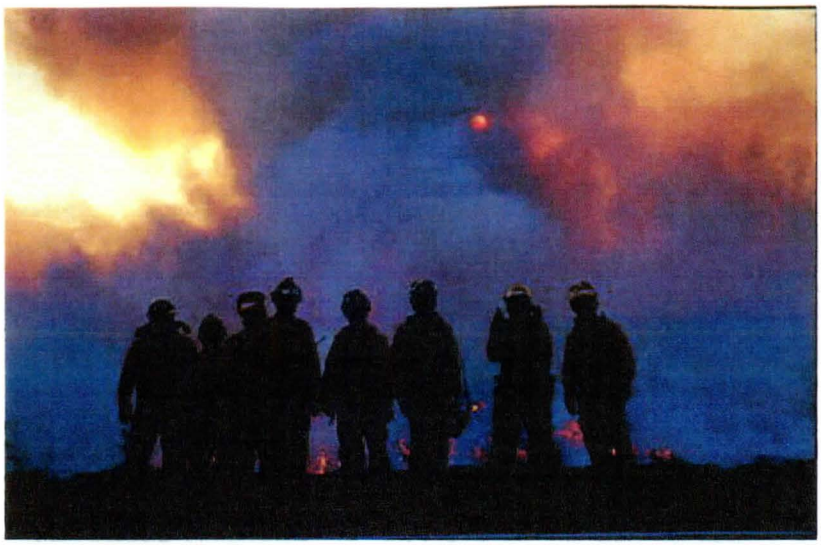
3e. Forest Management

No activity.

3f. Fire Management

Service fire staff is in transition of assuming complete wildfire suppression activities on the Refuge because of the Army Fire Department staff reduction. This event has occurred sooner that was anticipated and will have some new challenges for both agencies to safely overcome. Currently, the Army Fire Department is still the lead for response due to the current communication systems, but Service staff will be notified as quickly as possible. The Service has also begun working with new local partners, particularly South Adam's County Fire Protection District. In early September the refuge was included into the fire protection district's jurisdiction. For CY 04 there were two wildfires for a total of 0.7 acres. One lightning strike in north central section 5 was 0.6 acres and the other in the very northwest corner of section 2 for 0.1 acres was caused by a shorted electrical transformer. The Service continues to conduct prescribed burns to maintain a native prairie habitat with sixteen burns planned for CY 04. Only one, 72 acre burn, was not completed due to green-up. All 613 acres of the remaining units were safely completed. Thirteen burn units were under Hazard Fuel Reduction (HFR) for 402 acres and two burn units under Wildland Urban Interface (WUI) for 211 acres. The HFR had five units in the eastern eighth of section 25 and the southwestern portion of section 30, one unit in the southwest quarter of section 19, two units in the southeastern portion of section 34, 3 units in the southwestern quarter of section 3 and two island units in section 2. The WUI had two units one in the eastern third of section 7 and the second in the central part of section 11.

Nine refuge staff qualified for red cards at the arduous duty level and four more at the moderate duty level to participate in prescribed burns in CY 04. Two wildland fire fighters were dispatched on interagency wildfire assignments in Colorado and California during the summer of 2004. This action included the Refuge fire program participating in the Mid-Plains Interagency Type II handcrew. Fire crew members are working on taskbooks for the following positions above the basic Fire Fighter Type 2; 1 Engine Boss ENGB(T), 1 ICT4 (T) and 3 Squad Boss (FFT1).



Burn at Rocky Mountain Arsenal NWR

Burn at Rocky Mountain Arsenal NWR

3g. Native Pest Plant Control

Nothing to report

3h. Invasive Plant Management

The Service, Army, and contractors currently share pest plant control on the refuge. The Service is responsible for weed control in habitat restoration sites, public use areas, and remnant native sites outside of remediation areas.

Calendar Year (CY) 2004

The Refuge, like many former agricultural sites, is home to a number of noxious weed species. Of the 75 weed species listed in the Colorado Noxious Weed Act, 20 have occurred within the last 3 years on the Refuge. Additionally, ten of the 12 species listed in the Adams County Noxious Weed Management Plan also have occurred in recent

years on the Refuge. Therefore, the Service employs an integrated approach to weed control and uses mechanical, prescribed fire, biological, cultural, and chemical methods to control weeds such as Russian and diffuse knapweed; Canada, musk, and Scotch thistle; leafy spurge; salt cedar; Russian olive; Dalmatian and yellow toadflax; field bindweed; common mullein; and others.

The new three-year Integrated Pest Management Plan was approved by the regional office after review by the public. Fifteen, Pesticide Use Proposals were approved by the Project Leader during CY 2004. Glyphosate (Rodeo™ or Roundup Pro™) or imazapic (Plateau™) was applied to approximately 416.4 acres to control weeds in support of restoration activities on various habitat restoration sites. Clopyrlid (Transline™) was applied to 57.2 acres of Canada and musk thistle, and Russian and diffuse Knapweed. 2,4-D (Weed Killer 64™) was applied on 117 acres to control Russian thistle and kochia in a new restoration site as a chemical mowing treatment. Imazapyr (Arsenal™) was used to stump paint 779 Russian olive, Siberian Elm, and tamarisk trees.

Mechanical (mowing) control treatments were conducted on approximately 1,676 acres. Weeds controlled by this method included kochia, mullein, various thistles, cheatgrass, crested wheatgrass, and other annual weeds in project areas or adjacent to these sites. Russian olive removal continued at the North Bog and parts of First Creek. No tree stumps were pulled as in the previous year. Many other weeds (approximately 757 acres treated) were mechanically removed by spot mowing, hand pulling and swing blading by Service staff and volunteers throughout the refuge.

One-half acre of field bindweed was treated biologically by releasing natural insect enemies to help control their growth and/or reproduction. A bio-control agent was release along two refuge road ways for puncture vine.

4. Fish and Wildlife Management

4a. Bird Banding

According to the biomonitoring schedule, tree swallows were the targeted species for sampling. Besides sample collection, nest success and banding Forty-eight nestlings were banded, with forty-six successful fledges.

Kestrel nest success is monitored annually. However, in 2004, a study on West Nile Virus using the America Kestrel as study subject was begun on the Arsenal. Both adult and nestling American kestrels (127) were banded and marked.

No other birds were fortuitously banded. A great horned owl banded in July 2003 as a fledgling was taken to a rehabilitation center. It took a year of care before it recovered from West Nile Virus. It was released in 2004.

4b. Disease Monitoring and Treatment

Chronic Wasting Disease

In 2004 the Fish and Wildlife Service in cooperation with Colorado Division of Wildlife (CDOW) implemented a new Chronic Wasting Disease (CWD) monitoring program. Tissue samples from road kill, suspect and fortuitous deer were shipped to CDOW's Health Laboratory in Ft. Collins for testing. While past monitoring efforts relied on research projects for testing, the majority of samples in 2004 came from deer hit by vehicles or animals injured during the rut. This new approach to monitoring will allow Service personnel to test animals annually without major cost or time investment.

Five deer were sampled for CWD in 2004, two bucks, two does and a fawn, all of which were negative. An additional 45 samples from mule and white-tailed does were submitted to CDOW during late winter/early spring of 2004. These samples were collected from live animals captured for radio collars, as part of the ongoing investigation of fawn and doe survival on RMANWR. All samples were negative for CWD. Currently, a proposal is being drafted between Service and State personnel to evaluate genetic predisposition to CWD using molecular testing. Pursuant to funding this project will be implemented with the ongoing deer health study at RMA in 2005.

West Nile Virus

The Fish and Wildlife Service, in conjunction with Tri-County Health Department, trapped 4,574 mosquitoes in 2004, of which 821 were tested for West Nile Virus (WNV) as part of the Arsenal's mosquito monitoring program. Mosquitoes selected for testing were those species (*Culex tarsalis* and *Culex pipiens*) known to transmit WNV to humans. Traps were set near the visitor center and at perimeter locations adjacent to Commerce City, Montebello and 96th Avenue (Table 4b.1.1). Results from the 821 mosquitoes tested throughout the summer were all negative for WNV. In addition to trapping, dip counts and larval control were performed on standing bodies of water to evaluate and reduce overall numbers of mosquitoes on the Refuge.

In 2004, the Fish and Wildlife Service, working cooperatively with USGS, began a study to evaluate the occurrence and effects of WNV on reproductive success in American Kestrels nesting at RMA. Kestrels were either actively trapped or captured in nest boxes to monitor for WNV infection through the collection of blood and oral swab samples. Preliminary results indicate the presence of antibodies to WNV in blood taken from adult birds and chicks.

Table 4b.1.1. Mosquito Trap Locations at RMA

Trap #	Trap Location	Section #	UTM Easting	UTM Northing
1	Building 111	35	512273	4408460
2	West Perimeter	27	509998	4410882
3	Lake Mary	2	511769	4407541
4	Parkfield	7	516170	4405222
5	North Perimeter	24	513988	4413162

American Kestrel West Nile Virus Monitoring Study

The American kestrel (*Falco sparverius*) is one of the species monitored for population and wildlife health at RMA. Monitoring occurs at artificial nest boxes and includes yearly estimation of reproductive success. This year also included the first year of a 2 year study to monitor for the occurrence and effects of West Nile Virus (WNV) as a cooperative study with USGS Fort Collins Science Center. The effects of WNV on raptors may be severe, however, to date, there are no field studies assessing the potential impacts of this introduced disease on wild raptor populations. The goal was to establish a monitoring program to assess the level of occurrence and potential effects of WNV on wild raptor populations along the Front Range of Colorado, using the American kestrel as the sentinel species. This collaborative study was initiated by USGS and includes coordinating WNV monitoring efforts with the ongoing kestrel monitoring program at RMA. The study also includes collaboration with various other regional agencies and organizations.

Nests were monitored approximately bi-weekly from March to September 2004. Adults and young were captured to collect samples for WNV testing as well as record body measurements, and band. Trapping methods included capture inside boxes and bal-chatri traps. Methods for WNV monitoring included collecting approximately 1.0 cc of whole blood, and oropharyngeal swabs from adults and young. Blood samples were centrifuged, fractionated, frozen, and brought to the USGS National Wildlife Health Center for WNV determinations. Oral swabs were placed in viral transport media and frozen (-80° C). Blood and swab samples were tested to determine WNV status (virus positive, antibody positive and titer, virus and antibody negative) using an epitope blocking WNV ELISA (enzyme-linked immunosorbent assay), and rtPCR (reverse transcriptase-polymerase chain reaction).

There were a total of 166 individual kestrels that were sampled for the presence of WNV antibodies at RMA. To date, 97% of the blood samples have been analyzed; no oral swab samples have been analyzed. Of the samples analyzed, all adults and 1 young tested positive for the presence of antibodies and most young tested negative for antibodies (Table 4b.1.2). Once results are finalized, we will be able to compare the survival and nest success of WNV-infected and antibody- protected individuals against the survival

and nest success of uninfected individuals. This study will assist the FWS in addressing management issues related to the effects of WNV on indigenous bird populations.

Table 4b.1.2. The number of individual American kestrels captured and tested for the presence of West Nile Virus antibodies at the Rocky Mountain Arsenal NWR, CO, 2004. To date, 97% of blood samples have been analyzed; no oral swab samples have been analyzed.

Kestrels	No. Captured/Tested	No. WNV Positive	No. WNV Negative
Females			
Adult	31	31	0
Young	47	0	47
Males			
Adult	19	19	0
Young	56	1	54
Unknown Sex	13	0	9

Plague

The following chronology details plague occurrence and monitoring events at RMA in 2004

March 24, 2004

1 prairie dog was recovered dying near the east central side of sect. 28. CDC (Center of Disease Control) & Colorado State University Department of Veterinary Science confirmed as plague positive. On 3/30/04 and 3/31/04 approximately 4 acres surrounding the location where the affected animal was found were dusted with deltamethrin. No subsequent prairie dog deaths were recorded in this location.

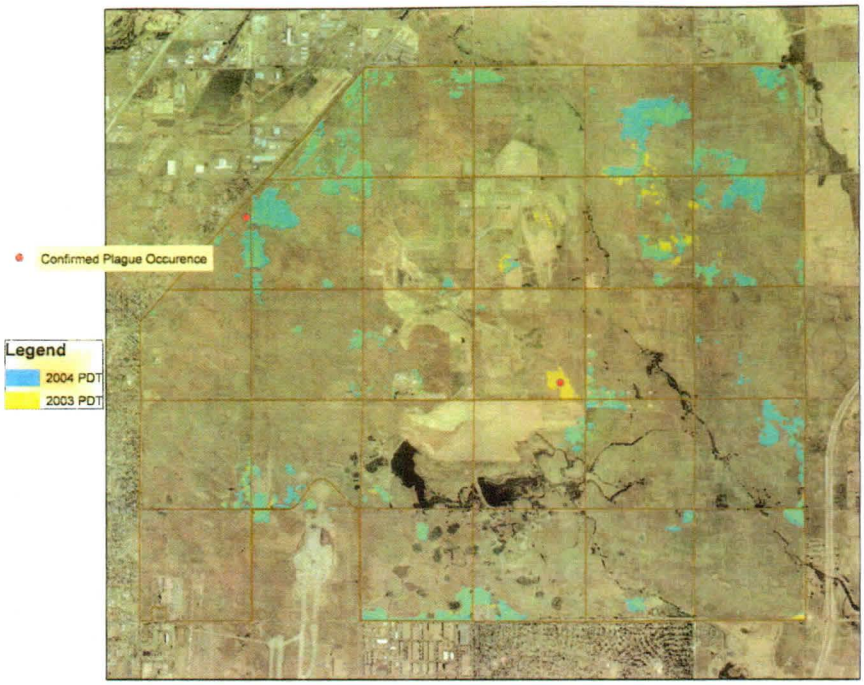
April 15, 2004

An adult female prairie dog was found dead, partially in a burrow on the south side of the USFWS repository. CDC report was negative for plague. No additional actions were taken and no other prairie dog deaths were seen at this location.

August 10, 2004

Clean-up contractors performing UXO surveillance reported a dead prairie dog in central section 36. This area had been trapped in the fall of 2003 in attempts to remove prairie dogs prior to removal of HHE (human health exceedance) soils. Many prairie dogs remained and survived 2-foot soil removal in established burrows. Site inspection revealed two prairie dog mortalities within 50 feet of each other. One was recent, and was sent to CDC and confirmed as plague.

The decision was made not to dust with deltamethrin in section 36 because of residual contamination and ongoing UXO work there. Rather, dusting was planned to occur along the periphery in western section 31 (east side of E Street), northeast section 1, and northwest section 6 to prevent further spread of plague. However, attempts to use the two types of dust dispensers were abandoned when several of the dispensers failed in the field. Malfunctions were caused by failed seals around the cap, failed and clogging wands, wand triggers, and malfunctioning pressure pumps. Four hand-crank dust dispensers were purchased following this incident however, dust was not used in the above locations and no further incidents of plague were observed.



4c. Reintroductions

Prairie Dog Relocations

Service personnel continued to trap prairie dogs from a number of locations where their presence may have interfered or conflicted with remediation, restoration, or monitoring activities. All of the prairie dogs (33) were relocated to areas of former occupation but abandoned due to plague (Table 4c.1.1, Figure 4c.1.a). There were no known trap mortalities recorded during 2004. Two methods were used to capture prairie dogs. The more conventional method was live trapping using bait. A second method, flushing, was used to target specific prairie dogs or at times of the year (spring-summer) when abundant forage was available and bait was not very attractive. A converted hydromulcher was used for this purpose. Soap suds were poured into burrows from which prairie dogs would eventually emerge. Animals were caught by hand, transferred to a pillow case for drying, and then transported to release sites in a cage.

Table 4c.1.1- Prairie dog relocations during 2004 at Rocky Mountain Arsenal NWR, by trap, and relocation site.

	Release Locations			
Capture Locations	**Sect 19 CE**	**Sect 23 NW**	**Sect 29 SC**	**Totals**
Sect 25 Water Tower	0	0	2	2
Sect 30 ESL	0	7	0	7
Sect 34 CE Met Tower	1	7	0	8
Sect 34 SE Ballfield	0	9	0	9
Sect 35 S (bldg 111)	2	3	0	5
Sect 35 S (bldg 112)	0	2	0	2
Totals	3	28	2	33

Table 4c.1.2- Age and sex classifications for relocated prairie dogs

Observed Frequencies for Sex and Age			
	Adult	**Juvenile**	**Totals**
Female	13	0	13
Male	17	3	20
Totals	30	3	33

In addition, captured prairie dogs were injected with a small microchip or PIT (passive induced transmitter) tag. The function of the tag is to be able to relocate prairie dogs after release without having to trap them again. This is accomplished by placing a PIT tag "reader" next to the burrows at which the animals were released. Animals with a PIT tag will leave a record of their unique serial number on the reader that can later be downloaded to a desktop computer. In the future, we hope to better track the survivorship and/or site fidelity of relocated prairie dogs with this technique and to examine the effects of capture methods and seasonality on relocation success.

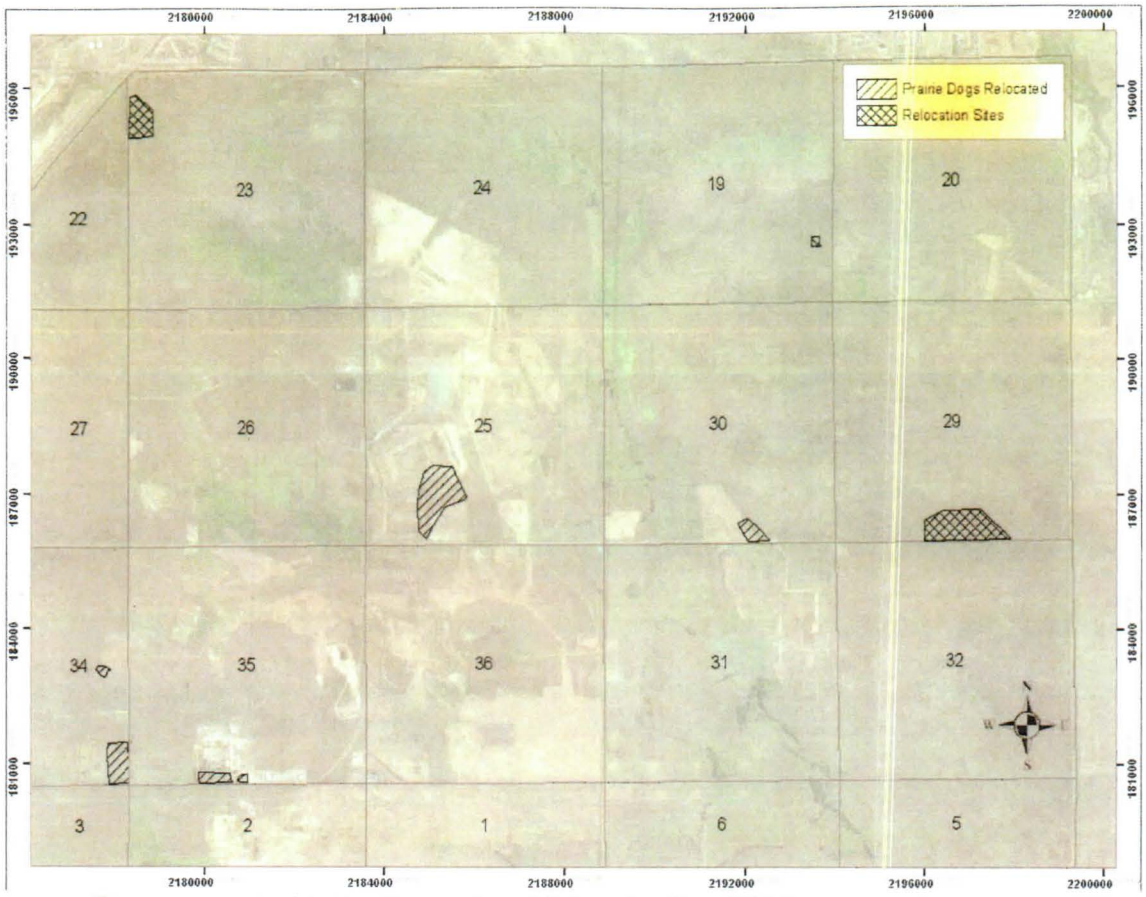


Figure 4c.1.a- Prairie Dog Removals and Relocation Sites (2004).

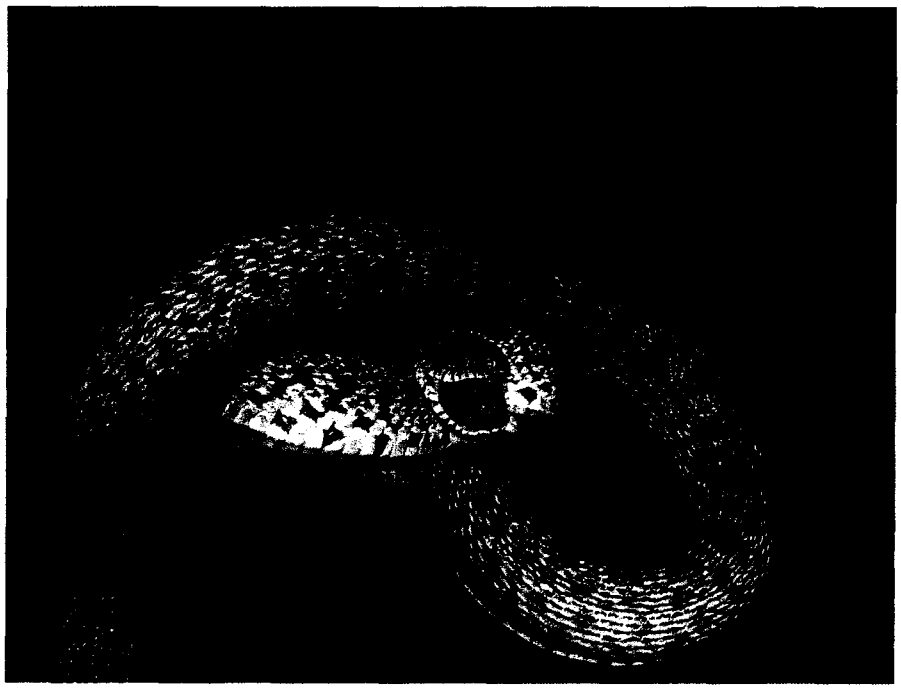
4d. Nest Structures

Sixty-seven American kestrel nest boxes, 34 on the Refuge and 33 off Refuge, and 50 tree swallow nest boxes used in the terrestrial biomonitoring program were maintained throughout 2004. A bat roosting box is located on the south side of Lake Mary.

4e. Native Pest Animal and Predator Control

During the remediation and restoration of the Arsenal, numerous birds, mammals and snakes are relocated from impacted areas to undisturbed habitats. They are native species and are not considered pests. However, their presence is a safety hazard for either themselves or humans. Although many work projects have been timed and designed to limit wildlife encounters, the overlap of occupied space seems inevitable. Safety announcements are repeated seasonally to avoid nest destruction, vehicle strikes of prairie dogs and deer, and unwanted wildlife encounters. Animals and birds listed here are not included in the Fortuitous Sample section. The relocation of prairie dogs from impact areas is addressed in 4b since it involves trapping, tagging and mapping individuals. Vehicle fatalities of prairie dogs were reduced in 2004 in the CRA where the majority of clean-up occurs and prairie dogs have been removed. Heavily traveled gravel perimeter roads with colonies on both sides accounted for the losses. During one month, eight dead prairie dogs were retrieved from Logisitics, Army Reserve Center and the east perimeter with only one found dead on a CRA haul road. Live rattlesnakes and bullsnakes found on worksites in the CRA were handled by a trained contractor. A conservative estimate

of relocated snakes in 2004 would be 25 with three vehicle fatalities. Bird nest removal was limited to starlings. However, three instances of nest protection included Canada geese directly outside the east door of B129 and west of the main entrance door of the visitor center in a raised flowerbed and burrowing owls at the ELF that were in a potential stockpile site. Two mourning dove squabs were removed from a nest on a haul truck and transferred to a rehabilitation center. Five raccoons were removed from dumpsters and one adult male was electrocuted at the substation. Three deer were struck by vehicles. Three rabbit nests with both live and dead bunnies were found in a gravel parking lot, landfill decon pad and the sanitary landfill.



A defensive pose is struck by a gopher snake *(Pituophis melanoleucus)* inside its garbage can transport container from a cleanup site to native prairie.

Once released, this prairie rattlesnake *(Crotalis viridis)* was equally defensive. Photo credit Richard Larson.

4f. Invasive Animal and Other Non-Plant Taxa

Rocky Mountain Arsenal NWR is rapidly becoming surrounded by urban development. Only land on the refuge's eastern boundary is not covered with houses. Despite the perimeter fence, domestic pets frequently are reported on the Refuge, usually on the periphery. In 2004, eight different dogs were sighted and pursued on the Refuge to protect native wildlife. Unfortunately, one had to be removed by lethal means after it bit an employee trying to remove it passively. The collar did not have a rabies tag and the owner was unreachable. The employee only required rabies booster shots. The Siamese cat photographed on the south perimeter in 2003 was resighted in 2004 along Randolf Tributary.

5. Coordination

Coordination within and among Remediation Venture Office (Service, Army, Shell) and the regulatory agencies (EPA, CDPHE, Tri-County Health Dept.) as well as with surrounding local governments and stakeholder groups was continuous on all aspects of the cleanup and conversion of the Arsenal to NWR status. The Service is actively represented at all levels of the Federal Facility Agreement dispute resolution process and participated in hundreds of meetings at the working group, RMA Committee, RMA Council, and Steering and Policy Committee levels. The Refuge Manager and other staff, as appropriate participate in all three citizen advisory boards (Restoration Advisory Board (RAB/Army); Site Specific Advisory Board (SSAB/EPA); and Citizens Advisory Board (CAB/CDPHE)) at all their meeting throughout the year.

6. Resource Protection

Nothing to report.

6a. Law Enforcement (LE)

In conjunction with the transfer of the southern tier of Rocky Mountain Arsenal to the Fish and Wildlife Service, law enforcement on the transferred lands became the sole responsibility of the Service. In anticipation of the transfer, measures were taken to ensure the law enforcement needs of the Refuge would be met in time for the transfer. In June, the law enforcement SCEP position that was hired in 2002 was converted to a full time GS-0025 Park Ranger position; a law enforcement management plan was developed and is under review; a new law enforcement vehicle was ordered, and negotiations began with the Adams County Sheriff's Department and Commerce City Police Department to establish a dispatch and back-up law enforcement for Refuge Officers.

Refuge Officers provided security for several events during the year including the transfer ceremony in April. Interior Secretary Norton and the acting Secretary of the Army, along with several Congressional representatives were present for the event. As a result of the land transfer, Refuge Officers took over primary responsibility for law enforcement, with the Department of Defense Police Officers rescinding their duties on Refuge property. As a result, Officers responded to over 58 incidents that occurred on the Refuge including fishing violations, trespass, and various traffic incidents.

In an effort to provide more of a presence on the Refuge during visitor hours, officers were scheduled to work and provided assistance with the visitor program. Occasionally officers gave fishing orientations and assisted with special fishing events that occurred during the year.

Shortly after the land transfer, the Service officially closed Buckley Road and constructed gates on the entrances to prevent illegal activity on the eastern boundary. Efforts were also made to provide surveillance around the gates to deal with illegal dumping.

The Hanna Easement case, involving a FSA wetland easement in Larimer County, CO, is being resolved through a land exchange. The final paperwork is awaiting Solicitor's approval before final resolution. Officers continue to monitor the easement as well as the Tollison Easement outside of Kersey, in Weld County. Plans have been made to post easement/wildlife conservation signs on both easements.

Refuge Officers

In March, Officers Noel, Johnson and Elam attended the annual Law Enforcement In-service at Marana, Arizona. Johnson participated in a security detail to Mount Rushmore National Memorial over the 4th of July. In May, Noel accepted a position as a U.S. Fish and Wildlife Service Special Agent. Johnson and Elam attended the LE refresher at Arapaho NWR in September.

Shortly after the Park Ranger position was filled, the new officer was sent to training at the Federal Law Enforcement Training Center in Georgia, attended Refuge Officer Basic

School at NCTC, and began the Field Training Experience Program at Charles M. Russell National Wildlife Refuge in Montana. The officer is expected to complete training next year and return to the Arsenal.

6b. Permits and Economic Uses

Nothing to report.

6c. Contaminant Investigations

There are no "refuge contaminants" program investigations at RMA. All cleanup activities at RMA are the responsibility of the Army and Shell Oil Co. Refuge staff, including biologists and engineers work on all RVO teams implementing the CERCLA remediation of RMA.

6c.1 Bat Population Monitoring and Conservation

A study of the bat populations at RMA was conducted by USGS Fort Collins Science Center from 1997–1998, which provided basic population and contaminant level information. In 2004, a follow-up monitoring study was conducted which provided information on current species composition and relative abundance, and contaminant levels for male big brown bats (*Eptesicus fuscus*) at RMA. Additionally, bat conservation measures including a public education event and installation of artificial bat houses was conducted.

To determine species composition and relative abundance, we used a standardized sampling protocol at 7 (3 primary sites, 4 supplemental sites) lake and riparian habitats in the southern portion of the Refuge (Table 6c.1.1). Capture and acoustic detection survey techniques were used. Bats were surveyed from May to September for 4 hours each night beginning at sunset. Sites were surveyed 1-2 nights/month throughout the survey period. To capture bats, mist nets (6-18 m in length) were placed where bat activity is likely to be highest (i.e. over and along a water source, in a flight corridor). Species, age, sex, and reproductive status was determined and mass and other body measurements were recorded. Anyone handling bats was vaccinated for rabies. An ultrasonic bat detector (AnaBat II) was used for acoustic detection; surveys were conducted concurrently at mist net capture sites. Bat detectors helped identify bats that fly outside the sampling ability of nets, provided a more robust assessment of species composition, and enabled comparison of relative differences in bat activity among sites. We used mist nets to collect adult and juvenile male big brown bats for contaminant analysis. Brain, carcass, and stomach contents were evaluated for dieldrin, DDT, DDE, and mercury because these were found in concentrations indicative of heavier contamination in 1997 and 1998.
There were a total of 291 bats of 4 different species captured during 21 survey nights from May 17 to September 23, 2004 (Table 6c.1.2). Big brown bats were the most abundant species captured and females were caught more frequently than males for all species. Juveniles represented a smaller proportion of captures in part because they do not become volant until late June/July. We caught the first juvenile of the season, a big brown bat, on July 19 at Section 31 Pond. Relative abundance and species composition corresponded with migratory patterns of bats and was highest in June (Fig 6c.1.a). Silver-haired bats (*Lasionycteris noctivagans*) use RMA as a migratory stopover while big brown bats and hoary bats (*Lasiurus cinereus*) are present throughout the spring and

summer. Though weather in September was unfavorable for bat capture, information from local researchers indicated a similar trend in declining abundance as bats began to migrate to hibernacula. Big brown bats were caught more frequently at Lake Ladora while hoary bats were more frequent at Section 31 Pond (Fig. 6c.1.b). We captured 1 little brown bat (*Myotis lucifugus*) in August at Lake Ladora which represented the first documented capture for this species at RMA (the previous study reported a possible acoustic detection only). Most bats of both sexes were reproductive (i.e. females were pregnant, lactating, or post-lactating; males were scrotal; Table 6c.1.3).

A total of 22 acoustic surveys were conducted at 8 sites, though survey effort was focused at the 3 primary sites. Analysis of acoustic data includes identifying species and foraging behavior and is currently ongoing therefore preliminary results are reported here. The number of acoustic files collected during a 4 hour sampling period provides a relative index of bat foraging activity; typically 1 file represents 1 bat pass. A bat pass is defined as a continuous series of ≥ 1call notes with no pauses greater than 1second between call notes. A total of 3060 acoustic files (i.e. bat passes) were recorded throughout the season. A comparison of activity among the 3 primary survey sites showed that Lake Ladora and Section 31 Pond were similar in use, as indicated by the mean number of bat passes recorded (Fig. 6c.1.c).

A total of 27 big brown bats were collected for contaminant analysis; 23 adult males, 3 juvenile males, and 1 adult female that was injured. Samples are currently being analyzed at the National Wildlife Research Center and at the Army Laboratories therefore only preliminary results are available. To date, all brain ($n = 27$) and stomach content samples analyzed ($n = 13$) are below detection limits for organochlorines. No results for carcass samples are currently available.

We conducted a public education event on July 17 involving a mist netting demonstration at Lake Ladora which allowed visitors the opportunity to see bats and learn about their ecology and natural history. The event was very successful and attracted a large group of approximately 20 people who were able to see many big brown bats.

This study provided an indication of the effectiveness of remediation in reducing contaminant exposure to bats, contributed to more effective conservation and management of the local population, and will be important in providing a qualitative assessment of population trends. Preliminary results reinforce previous information suggesting the importance of Lake Ladora and the Section 31 Pond as bat habitat, particularly for reproductive females. Additional analyses are planned and will compare the 1997-1998 survey data with our 2004 abundance and contaminant results.

Table 6c.1.1. Capture and acoustic survey locations for bats from May – September 2004 at the Rocky Mountain Arsenal NWR, CO.

		UTM (NAD27)	
Survey Site	**Type**	**Easting**	**Northing**
Section 31 Pond	Primary	515805	4408813
Ladora Arm	Primary	513021	4406863
Havana Pond	Primary	511916	4405565
Section 31 Pond 2	Supplemental	515793	4409045
Lake Mary	Supplemental	511886	4407452
First Creek at 7th Ave	Supplemental	516260	4408389
First Creek at 6th Ave	Supplemental	517307	4406795

Table 6c.1.2. Species composition and relative abundance of bats captured using mist nets at the Rocky Mountain Arsenal NWR from May – September 2004. Unknown individuals are those that were released prior to determining age and sex.

Species	**Age**	**Sex**	**Total**
Big Brown Bat	Adult	Female	196
Big Brown Bat	Adult	Male	25
Big Brown Bat	Juvenile	Female	6
Big Brown Bat	Juvenile	Male	4
Big Brown Bat	Unknown	Unknown	11
Subtotal			**242**
Hoary Bat	Adult	Female	23
Hoary Bat	Adult	Male	16
Hoary Bat	Juvenile	Male	2
Hoary Bat	Unknown	Unknown	1
Subtotal			**42**
Silver-haired Bat	Adult	Female	4
Silver-haired Bat	Adult	Male	2
Subtotal			**6**
Little Brown Bat	Adult	Female	1
Subtotal			**1**

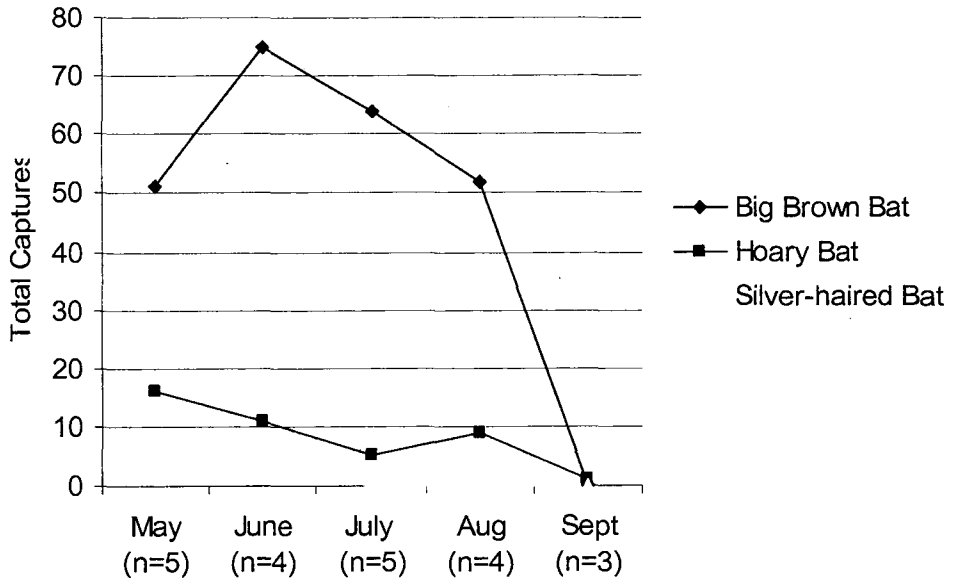


Figure 6c.1.a. Seasonal variation in species composition and relative abundance of bats captured from May – September 2004 at the Rocky Mountain Arsenal NWR. Numbers in parentheses indicate the number of surveys conducted each month. Not included in the graph is the 1 little brown bat that was captured in August.

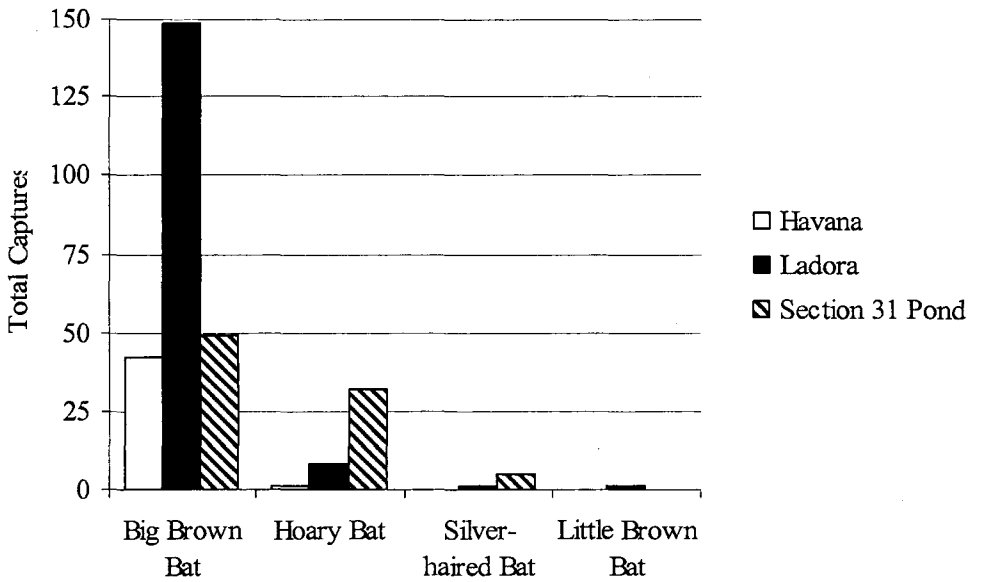


Figure 6c.1.b. Species composition and relative abundance of bats captured from May – September 2004 at the three primary survey locations, Rocky Mountain Arsenal NWR.

Table 6c.1.3 Reproductive status of bats captured from May – September 2004 at the Rocky Mountain Arsenal NWR. Reproductive status for females included pregnant, lactating, or post-lactating and males were scrotal.

Species	Non-reproductive	Reproductive	Total of Known Sex	% Reproductive
Big Brown Bat				
Female	17	161	178	90.4
Male	5	20	25	80.0
Hoary Bat				
Female	2	21	23	91.3
Male	9	7	16	43.8
Silver-haired Bat				
Female	2	2	4	50.0
Male	2	0	2	0.0
Little Brown Bat				
Female	0	1	1	100.0
Male	0	0	0	0.0

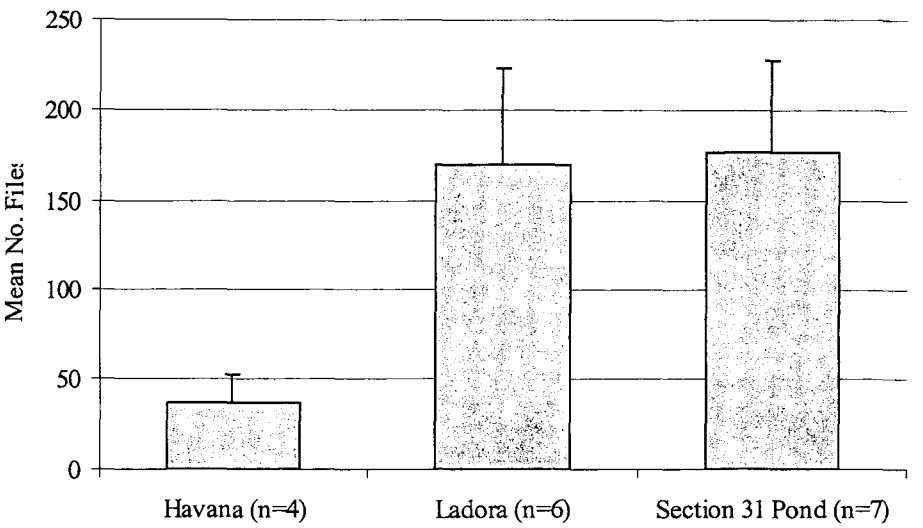


Figure 6c.1.c. Acoustic activity of bats compared among the three primary survey locations from May – September 2004 at the Rocky Mountain Arsenal NWR. Acoustic activity was determined using AnaBatII bat detectors. The relative index of bat activity is the mean number of acoustic files collected during a 4 hour sampling where typically 1 file represents 1 bat pass. A bat pass is a continuous series of ≥ 1call notes with no pauses greater than 1second between call notes. Numbers in parentheses indicate the total number of surveys conducted. These data are preliminary.

6c.2 American Kestrel Population Monitoring 2004

The American kestrel (*Falco sparverius*) is one of the indicator species for population and wildlife health monitoring at RMA. Monitoring occurs at artificial nest boxes that are at the juncture of major road intersections. Kestrel population monitoring in 2004 included estimation of nest success and productivity. This year also included monitoring for the occurrence and effects of West Nile Virus (WNV) as a cooperative study with USGS Fort Collins Science Center (see section 4.b for discussion). Nests were monitored approximately bi-weekly from March to September and included determining nesting stage, the number of eggs, hatchlings, and fledglings. Adults and young were trapped to record body measurements, band (FWS aluminum band and color bands), and collect samples for WNV testing. Trapping methods included capture inside boxes and bal-chatri traps.

There were 34 nest boxes on the Refuge in 2004. Thirty-one nest boxes had kestrel breeding activity, with a total of 38 nest attempts. Eggs were found in boxes from March 1 to July 6 and nest completion dates ranged from April 12 to September 1 (includes re-nest attempts). Nest success and productivity was high for kestrels at RMA and generally consistent with previous years (Table 6c.2.1.1). Twenty-five nests (65.8%, of 38 attempts) were successful (fledged ≥1 young), which is lower than the previous 3 years. Of the 7 re-nest attempts, 43% ($n = 3$) were successful. There was a total of 176 kestrel eggs laid and clutch size ranged from 1 to 6 eggs ($\bar{x} = 4.6$, SE = 0.2, $n = 38$), with a 66% hatching success. A total of 116 young hatched and 102 (88%) fledged. The sex ratio of young was 54% male and 46% female ($n = 103$ known sex individuals). The mean number of young fledged per nest attempt was 3.0 (SE = 0.4, $n = 38$) and the mean number of young fledged per successful nest was 4.1 (SE = 0.3, $n = 25$).

Kestrel adults were banded with a FWS band and a unique color band sequence. Kestrel young were banded with a FWS band prior to fledging. At least one adult was banded at all nest attempts and a pair was banded at 19 (50%) of the nest attempts. Fifty adults were banded; 31 (62%) were females and 19 (38%) were males. Ninety kestrel young were banded; 43 (48%) females and 47 (52%) males. There were 3 recaptures of adults that were banded as young from previous years. One male previously banded in 2001 at RMA was recaptured approximately 6 miles from the natal nest, a second male previously banded in 2003 at RMA was recaptured approximately 7 miles from the natal nest, and a female banded in 2003 at RMA was recaptured at Cherry Creek State Park. There were 4 known adult mortalities, all of which were females found near the nest, and 8 chick mortalities that were found in the nest box.

To evaluate potential differences in contaminant exposure and reproductive success based on proximity of nesting pairs to higher or lower levels of contaminants, estimates were compared between spatially different nest locations. There were 9 nest boxes located in more contaminated areas (Core nests; sections 25, 26, 35, 36, 1, 2) and 22 nest boxes in the surrounding buffer areas (Periphery nests). Kestrels initiated 13 breeding attempts at Core nests and 25 Periphery nests. Nest success differed between these areas with 31% of Core nests succeeding and 84% of Periphery nests being successful. Productivity per nest attempt did differ significantly between the areas though productivity at successful nests was not significantly different (Fig. 6c.2.a). The mean number of young per nest attempt at Core nests was 1.6 (SE = 0.7, $n = 13$) and 3.8 (SE = 0.4, $n = 25$) at Periphery nests.

The mean number of young per successful nest was 4.8 (SE = 0.25, n = 4) at Core nests and 4.1 (SE = 0.3, n = 21) at Periphery nests. Differences in reproductive success may be due to variation in disturbance of habitat due to clean up operations as well as potential differences in contaminant exposure between Core and Periphery areas.

Table 6c.2.1.1. Reproductive estimates for American kestrels at the Rocky Mountain Arsenal NWR, CO from 1998 to 2004.

	Year					
Activity	**1998**	**1999**	**2001**	**2002**	**2003**	**2004**
# Nest Attempts	31	35	38	32	33	38
Mean Clutch Size	4.7	4.8	4.8	4.8	4.5	4.6
% Successful Nest Attempts	81	51	74	88	90	66
Mean # Fledged / Nest Attempt	3.0	1.7	2.1	3.9	3.2	3.0
Mean # Fledged / Successful Nest	3.6	3.4	2.9	4.5	3.7	4.1

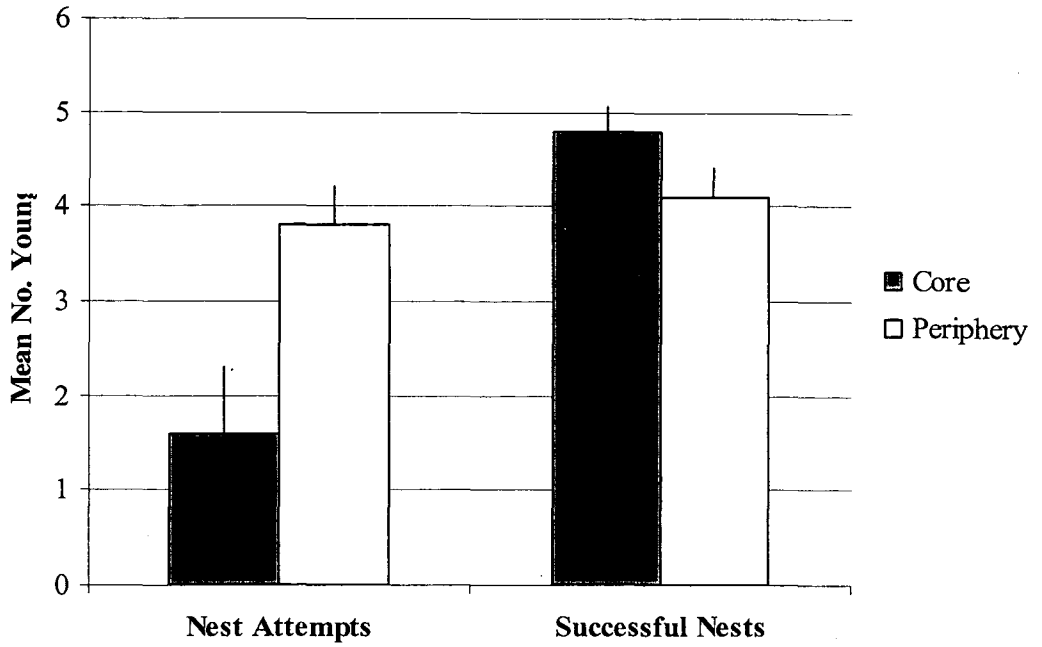


Figure 6c.2.a. The mean number of American kestrel young fledged per nest attempt and per successful nest at Core nests (centrally located within more contaminated areas) and Periphery nests (located in surrounding buffer areas) at the Rocky Mountain Arsenal NWR, CO in 2004.

6c.3 Fortuitous Specimen Program

Since 1993, the Service has been investigating causes of mortality of fortuitous specimens. Causes of death include dieldrin poisoning, electrocution and trauma.

For FY 2004, Service personnel continued to collect dead or dying wildlife throughout the Refuge. Routine, detailed searching of the Building 111 lawn was suspended in FY2004 due to the conversion of the mowed and watered grass lawn to a native prairie planting. The Service continued to follow the 1994 fortuitous specimen protocol for handling dead animals. The National Wildlife Health Center (NWHC) and Colorado State University continued to provide necropsy support. Refuge biologists now recognize typical signs of dieldrin poisoning, including posture at death, emaciation, and convulsions; therefore, not all specimens are submitted for necropsy. Refuge biologists removed brains and livers from birds in which poisoning was suspected, and submitted them to Army contract laboratories for organochlorine pesticide analyses.

Brain tissue is used to determine lethal concentrations. The criteria developed by the Service for assigning cause of death as dieldrin poisoning is greater than nine parts per million (ppm) in the brain, or greater than four ppm in the brain with supporting necropsy (emaciation, no other lesions). Endrin is considered to be lethal at 0.8 ppm in the brain. However, liver tissue may have some diagnostic value and can be useful when brain tissue is not available because of scavenging, decomposition, etc. In 1996 analytical data from tissues of raptors and songbirds tentatively diagnosed with dieldrin poisoning shoed a high correlation between brain and liver residue concentrations for raptors, but not for songbirds.

For FY 2004, a total of 55 fortuitous specimens were recovered. The majority of dead animals recovered continue to be from the central "core" sections (26, 25, 35, 36, 1 and 2) of the Refuge (Table 6c.3.1). This is likely a function of historical higher levels of soil contamination in the core, as well as the higher probability of carcass detection due to the concentration of staff working in these areas. Fortuitous specimens found in the core sections of the Refuge accounted for approximately 71 percent of all specimens found and those found in the Building 111 area accounted for 46 percent of specimens found in the core sections and 33 percent of the total specimen count (Table 6c.3.2). Brain tissues from 23 specimens were collected for submission to Army contract laboratories for analysis of organochlorine pesticides. Six of the 23 brain tissue samples analyzed were above laboratory method detection limits (Table 6c.3.3)

Table 6c.3.1. Summary of species and numbers collected fortuitously during FY2004.

Species	N	Species	N
American Kestrel	1	House Finch	4
American Robin	2	Killdeer	3
American Tree Swallow	2	Mourning Dove	2
Bald Eagle	1	Mule Deer	2
Black-billed Magpie	1	Prairie dog	3
Canada Goose	1	Prairie Vole	1
Cliff Swallow	1	Swainson's Hawk	1
Cooper's Hawk	1	Western Kingbird	3
Cottontail Rabbit	8	Western Meadowlark	3
Double-crested Cormorant	1	White-crowned Sparrow	1
European Starling	10	White-tailed Deer	1
Great Horned Owl	2	Total	55

Table 6c.3.2. Fortuitous samples found per section of RMANWR

Section	number of samples
1	3
2	7
3	2
5	1
12	3
25	4
26	4
28	1
30	4
31	4
33	1
35	18
36	3

Table 6c.3.3. Chemical concentration results above laboratory detection limit for brain tissues submitted in FY2004.

Fortuitous sample number	Collection Date	Chemical concentrations in brain tissue (µg/g)			
		Dieldrin	p,p'-DDT	p,p'-DDE	Endrin
04FWM025	6/8/2004	0.668	n.d.*	0.151	n.d.
04FHP028	6/23/2004	n.d.	n.d.	2.46	n.d.
04FCH031	7/3/2004	0.229	n.d.	2.71	n.d.
04FAR033	7/27/2004	0.132	0.159	12	n.d.
04FKD038	9/6/2004	7.53	n.d.	n.d.	0.0797
04FKD039	9/9/2004	5.11	n.d.	1.52	n.d.

*result less than laboratory detection limit for this analyte

Laboratory results showed no brain tissue above the lethal thresholds established for dieldrin and endrin (>9 ppm and 0.8 ppm, respectively) (Table 6c.3.3). Two brain tissues, both recovered from killdeer found in the core area, had dieldrin concentrations between 4 and 9 ppm. According to field notes, these birds showed no visible trauma and some effect of brain concentrations of dieldrin is suspected in their mortality. Five of the six brain samples submitted showed concentrations of p,p'-DDE above laboratory detections limits, however, there has been no site-specific effect criteria developed for DDE levels in brain tissue.

No mammalian deaths were directly attributable to organochlorine poisoning for FY 2004 as determined by Refuge biologists' evaluation. Mammals generally do not exhibit effects from organochlorine contamination in soil to the same degree as birds. However, data gathered in past years from dead coyotes and cottontail rabbits indicate these species do, at times, accumulate significant amounts of organochlorines.

6d. Water Rights Management

Primary water supplies (both potable and nonpotable) for the Refuge are based on 1998 Lease Agreements (contract rights) with the Denver Water Board. The Potable Water Lease Agreement provides a perpetual contract right for up to 50 acre-feet of potable water per year supplied through Denver's potable water system. For nonpotable water there are two lease agreements – a temporary lease agreement through October 2011 for up to 2,800 acre-feet of High Line Canal Water per year, and a permanent lease agreement for up to 1,200 acre-feet of Denver's new reuse (recycled) water beginning no later than October 2011. None of these lease agreements convey any adjudicated water rights to the Refuge. However, these agreements are legally binding contracts with the Denver Water Board to supply the type and annual amount of water specified to the Refuge. There were no changes to these lease agreements during 2004, but negotiations with Denver are continuing as a method to develop relatively drought proof water supplies to replace the High Line Canal. These alternative supplies should be available in 2006.

As a secondary nonpotable water supply for the Refuge, the U.S. has decreed water rights for 466 acre-feet of shallow ground water from three water production wells located in Section 4 of the Rocky Mountain Arsenal. These wells were operated in 2004 based on a Substitute Water Supply Plan approved by the Colorado State Engineer, with an associated Plan for Augmentation approved by the Colorado Water Court. During 2004, over 700 acre-feet of water was pumped from these wells into Lake Ladora to maintain lake water levels against water supply demands for irrigation and ongoing contaminant cleanup activities. Augmentation was provided by the South Adams County Water and Sanitation District and the Denver Water Board for this depletion of ground water that is tributary to the South Platte River.
The Refuge has minor water rights for several small water wells located in the eastern tier Sections of the Rocky Mountain Arsenal. These wells were originally decreed as agricultural wells for stock watering and minor irrigation uses. The Refuge rehabilitated the Section 20 well with new casing and a solar powered pump in 2004 to provide a wildlife watering point because the Section 20 well decree requires no augmentation for depletions of ground water tributary to the South Platte River (due to the small flows available from this well).

6e. Cultural Resources

During the period 1 October 2003 – 30 September 2004, compliance with the *National Historic Preservation Act of 1966* was achieved primarily by management of the Refuge under the provisions of a Programmatic Agreement (PA) with the Advisory Council on Historic Preservation (ACHP), which was originally signed in November 1998.

On 1 May 2004, an annual report was submitted to the ACHP and the Colorado State Historic Preservation Officer (SHPO) on implementation of the terms of the PA during the preceding 12-month period, as required by the PA.

The terms of the PA are implemented in accordance with an Integrated Cultural Resources Management Plan (ICRMP), which was originally prepared in October 1999. During FY 04, the ICRMP was revised to reflect changes in the inventory of cultural resources, reporting of new sites, and treatment of historic properties. Further revisions are in progress, due to additional changes in the management of cultural resources at the Refuge, and the final revised ICRMP is scheduled for completion by May 2005.

Field monitoring of two prehistoric archaeological sites (5AM185 & 5AM718) and a Cold War era buried vault complex constructed by the U.S. Air Force (5AM1463) that have been determined eligible for the *National Register of Historic Places* (NRHP) was performed on 13 April 2004. Annual monitoring of these historic properties is undertaken in accordance with a stipulation in the PA (in the case of the prehistoric sites) and a separate MOA with the Colorado SHPO (in the case of the buried vault complex) by a person or persons meeting at a minimum the *Secretary of the Interior's Professional Qualifications Standards* for archaeologists.

The Service performed an assessment of potential impacts of a proposed Refuge tram route that would be constructed in an area in Section 30 designated as sensitive with respect to cultural resources in the PA. On 20 April 2004, a field assessment of the route was conducted by a professional archaeologist.

Seven previously unknown archaeological finds were encountered during FY 04 and each was inventoried and evaluated for the Colorado SHPO in accordance with the PA. The new discoveries included six historic sites and one prehistoric isolated find: a U.S. Army training area in Section 26 (5AM1720); a U.S. Army guard tower foundation in Section 3 (5AM1791); two irrigation features in Section 35 (5AM1726); one isolated prehistoric projectile point in Section 30 (5AM1728); an irrigation feature in Section 22 (5AM1729); a U.S. Army guard tower foundation in Section 2 (5AM1730); and an irrigation feature in Section 26 (5AM1761). Three new features were reported from a previously recorded historic site (5AM1145). All new discoveries were determined not eligible for the NRHP in consultation with the Colorado SHPO.

Two previously reported sites were re-evaluated following the discovery of features that had not been reported earlier: a concrete basin associated with former farmstead in Section 3 (5AM796), and a former railroad bridge on First Creek in Section 31 (5AM464.8). Both sites were determined not eligible for the NRHP in consultation with the Colorado SHPO.

Prehistoric and historic artifacts were accessioned and curated in a collections center that is maintained on the refuge in accordance with 36 CFR 79 under the terms of the PA. During FY 04, artifacts from historic properties on another Region 6 refuge (Browns Park National Wildlife Refuge) were also accessioned at the RMA collections center.

Electronic monitoring of field activities with the potential to affect cultural resources was performed with the use of the SafeRAC system. A GIS database of all cultural resources on the Refuge is maintained for the Service to assist with their management.

The Service continued to work closely with the Remediation Venture Office's Cultural Resources Team (CRT), which included representation from Planning, Habitat Restoration, and Public Use sections of the USFWS.

7. Public Education and Recreation

7a. Provide Visitor Services

During FY04, the Refuge continued to provide weekend visitation for wildlife-dependent recreation and education including opportunities for wildlife observation, wildlife photography, fishing, and interpretation. Weekday visitation remained suspended due to scheduling conflicts with intrusive remediation projects. It is anticipated that weekday visitation and programs will be resumed by fall 2005. The total visitation for FY04 was 9,937.

7a.1 Interpretation

Drop-In

Refuge drop-in weekend visitation reached 4,420 people during FY04. Visitors viewed the exhibits in the Visitor Center, participated in hands-on learning activities in the Wildlife Learning Lab, and were provided opportunities for wildlife observation and photography from the trails. Visitors attending nature programs and tours also had the opportunity to spend time in the Visitor Center and/or walk the trails. Drop-in hours were from 8:00 a.m. until 4:30 p.m. on Saturdays and Sundays.

Visitor Center

The carpet was replaced in the Visitor Center. Service staff moved the exhibits from the middle of the room to accommodate the installation of the carpet, and the installers cut around the exhibits that could not be moved. Carpet was purchased and installed by Colorado Carpet at a cost of $9,387.00.

In April 2004, a flagpole was purchased and installed in front of the building prior to the land transfer ceremony at a total cost of $4,341.98 including the purchase of 2 American all-weather flags.

Nature Programs

Weekend interpretive and recreational programs reached 4,940 people during FY04. Programs and topics were developed and scheduled according to the season and included popular programs such as Bike the Refuge, Where Eagles Soar, Evening Under the Stars, Birding and Photo tours, and evening hayrides.

Interpretive Tour Routes

Refuge staff and volunteers conducted vehicle tours year-round on Saturdays and Sundays. Tours were scheduled to accommodate the change of the seasons. Reservations were required for the tours; however, visitors were welcome to drop-in and participate if there was space available. A 54 passenger trolley-tram and a 36 passenger school bus were used as tour vehicles. In FY04 a total of 94 tours were offered and 1,590 people participated in the tour program.

The tour script was revised during the year to provide visitors with updated wildlife and remedy information. A new video, "Conserving the Future, Remembering the Past," was developed for the land transfer event highlighting the history of the site and will continue to be shown as an introduction for the tour. Tours include an 8 mile route in the southern tier of the Refuge.

Fishing

The 2004 fishing season was from April 18 through October 10. Fishing was permitted on Saturdays and Sundays, from 8:00 a.m. until sunset. Fishing orientations were provided for all anglers 18 years of age and over. Orientations covered fishing rules and regulations, Refuge access, and other fishing procedures. A total of 1,150 anglers received fishing permits.

A fishing recreational fee demonstration program began on May 8, 2004. The fee was set at $3.00 per angler (18 years of age and older) per day. The total amount generated from the collection of fishing recreational fees for the 2004 season was $5,465.

Angler visits totaled 3,361 for FY04 (highest recorded since 1989), including 2,702 adults and 659 children. Fishing nature programs, clinics, and Scout fishing programs reached 200 adults and 169 children out of the total number of anglers for FY04.

Fishing program partnerships between the Service and Children's and Craig Hospitals resumed in May 2004. The programs were scheduled on Fridays for both Hospitals. Patients from Children's Hospital and their families fished at the Refuge once a month from May to September 2004 at Lake Mary, totaling 5 fishing programs. Twenty three Children's Hospital patients also participated in 5 programs. Craig Hospital patients and their families only fished twice at the Refuge in the months of May and June. Only 7 Craig Hospital patients participated in the 2 programs offered. Thirteen patients from Aurora and Denver schools for the visually impaired participated in the fishing partnership program by joining Craig Hospital during one evening program at Lake Mary.

Interpretive Foot Trails

In FY04, approximately 8 miles of trail in the southern tier and Rattlesnake Hill were maintained using round-up for weed control, mowing, tilling, dragging, and filling with crusher fines.

Maintenance projects at the Wetlands Trail and the Lake Mary floating boardwalk were completed by 8 Mile High Youth Corp volunteers. The volunteers cleared vegetation from the trail, the stepping stones and under bridges at the Wetlands Trail and replaced all 6 metal core support ropes with new nylon ropes on the Lake Mary floating boardwalk.

Puncture vine was removed along the Lake Ladora Trail. The trail also was sprayed with Plateau as a control measure for cheat grass and puncture vine.

During the summer, heavy rains caused erosion damage to the following five trails: Lake Mary, Prairie, Rod and Gun Club, Lake Ladora and the Woodland trails. The southwestern corner of the Woodland Trail, including the trail connecting the Lake Mary and the Prairie trails were the most severely damaged. The trails were completely repaired in August with exception of the Woodland Trail where a culvert needs to be replaced along with adding more crusher fines.

The current lengths of all ten Refuge trails are listed below. Trails vary in width between 5 to 6 feet.

1. Lake Mary Trail (including floating boardwalk): 7154'
2. Lake Ladora Trail (including Lake Ladora Connector): 3021'
3. Wetland Trails (including boardwalk and Tram Loop): 15848'
4. Locust Loop Trail: 4906'
5. Rattlesnake Hill Trail: 946'
6. Rattlesnake Hill Trail (ADA): 1263'
7. Woodland Trail (including Woodland Trail Connector): 4755
8. Prairie Trail (including Sections 11 and 2 plus Prairie Trail Connector): 5736'
9. Rod & Gun Club Trail: 3580'
10. Wildlife Watch Trail: 1137'

Rod and Gun Club Viewing Blind

An interpretive exhibit was designed and installed in 2004 in the Rod and Gun Club viewing blind (Figure 7a.1.a). The exhibit included three panels with text and illustrations interpreting the ecology of a wetland, animals of the wetland, and plants of the wetland. Cattail cutouts were installed along the railing leading up to the blind. The project was funded by the Service using contributed funds and Eye Candy Graphics designed, fabricated, and installed the interpretive panels (Figure 7a.1.b) at a total cost of $10,160. All three panels have a removable, protective and weather-proof acrylic cover.

Figure 7a.1.a Rod and Gun Club viewing blind

Figure 7a.1.b Rod and Gun Club viewing blind interpretive panels

Cultural Resources

A locking wall case with tempered glass shelving and lighting was purchased for the Visitor Center to display cultural resource and historical artifacts found on the Refuge.

Figure 7a.2.a ACSD 14 conducting prairie dogs observations.

Figure 7a.2.b ACSD 14 investigating macroinvertebrates

All field trips were conducted at the South Platte River between the confluence of Clear Creek and 74th Avenue in Commerce City.

Partnership staff spent time researching, evaluating, and revising the program's curriculum, meeting with teachers and the District supervisor to asses the programs' effectiveness, participating in monthly staff meeting at each middle school and attending a week-long District 14 Teacher Induction and Professional Development Program. Staff also participated in an interdisciplinary five-day outdoor education experience at Mesa Verde National Park with 90 8th graders from Adams City Middle School by acting as a chaperon and group leader.

Adams City and Kearney Middle School exemplified an increase in their 8th grade science CSAP (Colorado Student Assessment Program) results for FY04. Adams City Middle School (ACMS) students' documented an increase of 2% for proficiency in science (Figure 7a.2.c) and Kearney Middle School (KMS) documented a 6% increase (Figure 7a.2.d). Refuge staff concluded that the increased results are an indirect result of the cooperative agreement.

The use of the programs' activities provided to be an effective behavioral and academic motivational tool for the classroom science teacher. Another accomplishment was classroom science teachers were able to participate in field trips with their students so that they were able to learn how to incorporate experiential learning and outdoor education into their classroom science content.

ACMS

A	B	C	D	F
50	54	17	2	1

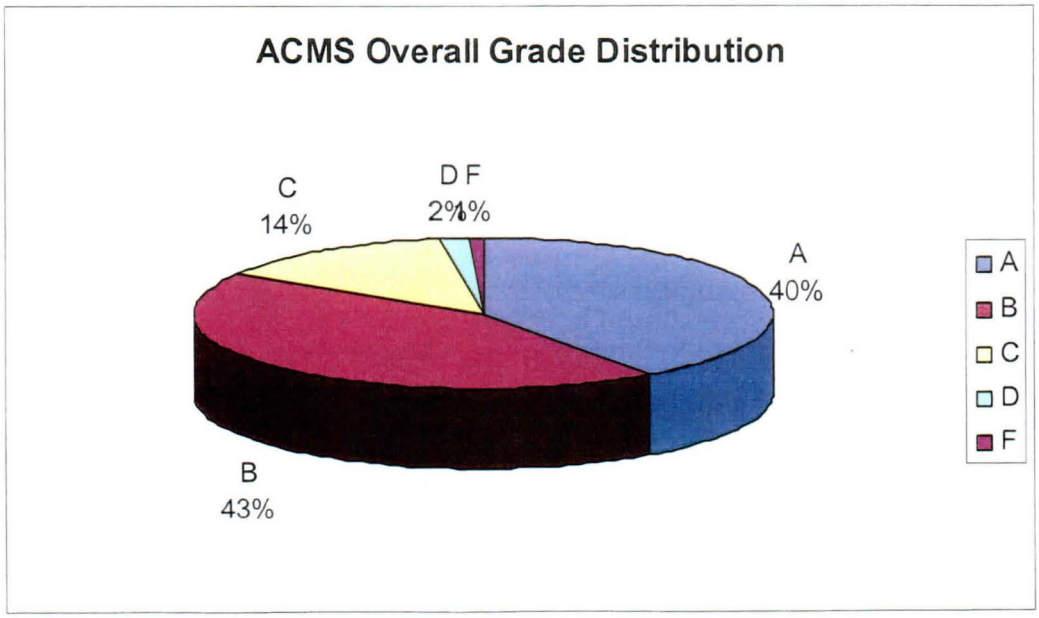


Figure 7a.2.c ACMS Grade Distribution for school year 2004-2005

KMS

A	B	C	D	F
40	34	12	1	1

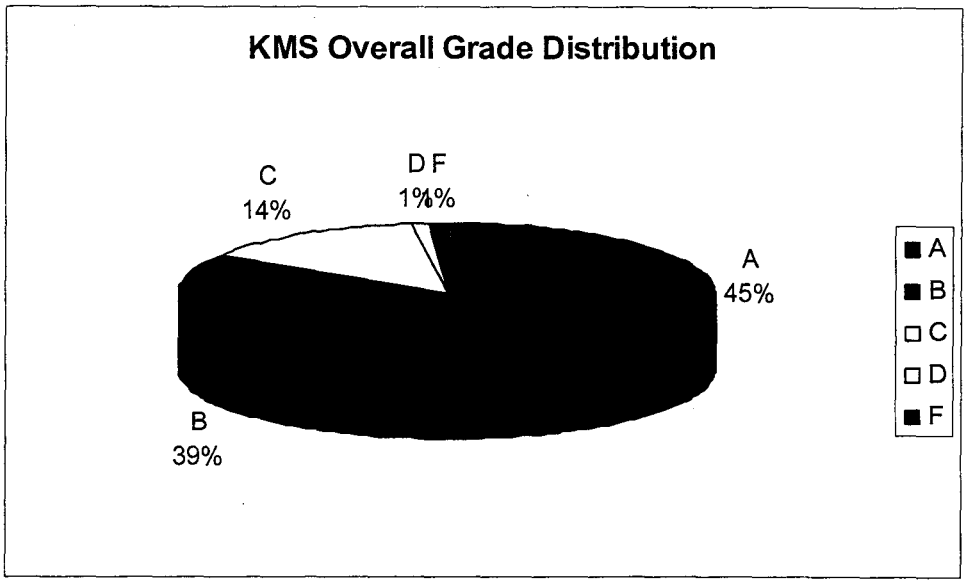


Figure 7a.2.d KMS Grade Distribution for school year 2004

For FY05, recommendation have been made to begin working with 8th graders at Adams City Middle School rather than 7th graders to capitalize on relationships with students and teachers that were established at the end of the 2003/2004 school year and to implement a peer-mentoring and service-learning component into the program. The program sessions will also be increased from seven weeks to a full semester with one 80-minute class meetings each week. Recommendations also have been made to work more closely with Kearney Middle School classroom science teachers resulting in six-weeks of team-teaching. This format change is due to the school discontinuing block scheduling and returning to a more traditional 45-minute class period. At both schools it is recommended to decrease the number of field trips and to increase the time of each field trip (from 90 minutes to 180 minutes).

This cooperative partnership will continue through FY05, at which time new funding will need to be secured if the program is to continue.

Colorado Alliance for Environmental Education (CAEE)

In FY04, Refuge staff actively participated in CAEE workshops, seminars, Advisory Council meetings, monthly meetings and assisted with reassessing and redeveloping the Colorado Environmental Education Master Plan. Refuge staff also attended CAEE's 3 day workshop, "Teaching OUTSIDE the Box."

Grassland Biodiversity Blitz (BioBlitz)

Refuge staff partnering with at least 8 additional natural resource agencies participated in a 24-hour special community event to discover the diversity of plants and animals on approximately 6000 acres of public-owned and managed grasslands near the border of Jefferson and Boulder counties including the northeast corner of Rocky Flats. The Grassland BioBlitz took place June 25-26, 2004. Refuge staff attended all media/outreach and education working group meetings.

All Species Count BioBlitz

Refuge staff partnered with the Colorado Urban Wildlife Partnership and 21 additional natural resource organizations to coordinate a region-wide 24-hour bioblitz inventory of all living wild things within 20 miles of the Colorado Capitol Building. The event took place September 10-11, 2004. Refuge staff attended all planning meetings and participated in the event by conducting a Refuge volunteer onsite all species count.

Staff-led Programs

No on-site staff-led programs were conducted during this period.

Teacher-led Programs

In FY04, Refuge staff conducted one "Home is Habitat" teacher training workshop for a total of 17 teachers. The training, also offered through the Colorado School of Mines for ½ re-certification credit, educated teachers about the Refuge and how to lead the field programs in the guide. However, site closure prevented staff from permitting teachers to bring their students to the Refuge to conduct teacher-led programs.

Classroom Presentations

As a result of the Refuge closure to all weekday public use, Refuge staff continued conducting classroom programs in FY04. A total of 93 children and 8 adults were reached by these programs. The Refuge's captive live animals - bullsnake, tiger salamander, and screech owl were used in the programs.

Time Capsule

A total of 4 Rocky Mountain Arsenal National Wildlife Refuge Time Capsules were checked out for 4 adults and 80 students during FY04.

Scouts

Eighteen on-site Scout programs were offered in FY04. Out of the 18 programs, only 2 were Girl Scout programs. 57 Girl Scouts and 21 adults attended an event in April called, Arsenal Adventures. This program consisted of the following activity booths: raptors, mammals, and a bird activity called 'Fill the Bill'. The other Girl Scout program was a guided hike attended by 1 adult and 7 girl scouts..

Ten of the 16 Boy Scout programs were fishing programs; all met fishing badge merit standards. The other six Boy Scout programs included: self guided hikes (using the Audubon Society Scout Packs), interpretive walks, trail maintenance (weed control), trash pick-up, and a Scout tram tour. A total of 167 Boy Scouts along with 106 adults attended the on-site programs.

Two different scout groups assisted with trail maintenance during FY 2004. A group of 15 scouts along with their parents helped remove tumble weeds at the north side of Lake Mary. Another scout group helped collect trash and tumble weeds along Lake Ladora and Mary trails.

7a.3 Volunteer Program

During FY04, 55 volunteers contributed a total of 7,140 hours, equivalent to 3.5 FTEs compared to FY03 with 71 volunteers contributing 8,091 hours.

The volunteer budget decreased $1000 to $2200 in 2004. New recognition awards were purchased for the program.

Volunteers were recruited via websites including Refuge website, www.volunteer.gov, Metro volunteers, Army's website, at public programs, special-events, and off-site programs. Recruiting articles were submitted to other websites, newspapers, Refuges, and employee newsletters. A total of 124 volunteer inquiries were received in FY04.

Training classes and workshops were scheduled to coincide with fieldwork or seasonal activities. Refuge staff and volunteer supervisors conducted job specific training during 2004. New volunteer orientation was held in February for 10 volunteers, including 2 students. The three-hour orientation consisted of a Fish and Wildlife Service overview, health and safety protocol, environmental cleanup updates and volunteer policies and procedure.

The Refuge celebrated Volunteer Appreciation Week on April 22, 2004 on-site in Building 129 to recognize volunteers for their dedication and achievements over the past year. More than 60 volunteers along with their family's members and six Service staff attended the event.

July 31 through August 3, 2004, 1 Refuge staff and 2 Refuge volunteers traveled to Boyer Chute National Wildlife Refuge in Ft. Calhoun, Nebraska to assist with the Lewis and Clark Bicentennial event on and off the Refuge. The Refuge had approximately 9,000 visitors 30,000 visitors to the main event.

7b. Outreach

Community Events

Refuge staff participated in 9 presentations and 15 outreach events in FY04 including all Commerce City picnics, the Rocky Mountain Elk Foundation at Galyans, and the Commerce City Kids Health Fair. Participation in these events reached 4,463 people.

A portable floor display was developed to help provide information about the Refuge and to recruit volunteers. It consists of a light-weight frame making it easier to transport and set-up. The display was designed and fabricated by Skyline Display at a total cost of $5,595. The Rocky Mountain Arsenal Wildlife Society applied for a grant from National Fish and Wildlife Foundation and received $3,900 to purchase three fabric banner stands to compliment the floor display. Two banner stands highlight volunteers in action and scenic shots of the Refuge, and the third stand was used as assistance for the Society to solicit new members at community events.

8. Planning

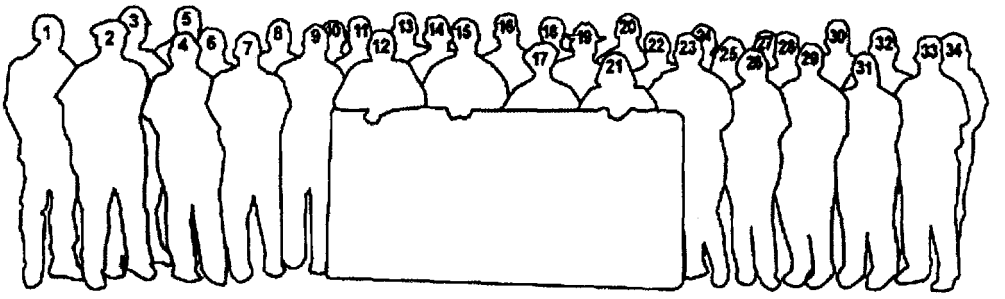
8a Comprehensive Conservation Planning

Nothing to report.

8b General Administration

8b.1 Personnel

Staff Photo



1. Sollmann, Lorenz
2. Brunotte, Richard
3. Rundle, W. Dean
4. Kimble, Jeannine
5. Young, H. Chris
6. Echelberger, Susan
7. Garay, Luis
8. Blankenship, Robert
9. Johnson, Bradley
10. Jackson, U. Thomas
11. Gleim, Peter
12. Hastings, Bruce
13. Plaster, Gaylord
14. Noel, Ryan
15. Smith, Stephen
16. Ronning, Thomas
17. Taylor, Beverly
18. Whiteaker, Scott
19. Janda, Walter
20. Beres, Michael
21. Shannon, Laura
22. Morehouse, Jerry
23. Wendell, Foster
24. Armitage, Stacy
25. Ursini, Annette
26. Rodriguez, Ruby
27. Elam, Victor
28. Lindgren, Kevin
29. Krampetz, Frederick
30. Wright, Terry
31. James, Sherry
32. Cargile, Scott
33. Colvin, Joel
34. Thornburg, Amy

Staff Members

Armitage, Stacy, Education Specialist, GS-1701-9, EOD 01/11/04, PFT
Beres, Michael, Park Ranger, GS-025-9, PFT
Blankenship, Robert, Maintenance Worker, WG-4749-8, PFT
Brunotte, Richard, Biological Science Tech (W/L), GS-404-8, PFT
Cargile, Scott, Park Ranger, GS-404-4, Appointment Exprired 08/19/04, FTSTEP
Colvin, Joel, Biological Science Tech (W/L), GS-404-7, Returned to Duty 03/07/04, FT Term
Echelberger, Susan, Park Ranger, GS-025-7, PFT
Elam, Victor, Supervisory Refuge Operations Specialist, GS-485-9, PFT
Estes, Oran, Security Guard (Gates), GS-085-4, PT Term
Flavin, John, Security Guard, GS-085-4, Appointment Expired 08/04/04, FT Temp
Garay, Luis, Park Ranger, GS-025-7, PFT
Gleim, Peter, Electrical Engineering Technician, GS-802-9, PFT
Harper, Lorri, Environmental Engineer, GS-819-13, PFT
Hastings, Bruce, Supervisory Fish and Wildlife Biologist, GS-401-12, PFT
Henry, Barbara, Information Technology Specialist, GS-2210-11, Retired 12/31/2003, PFT
Hetrick, Melinda, Fish and Wildlife Biologist, GS-401-11, PFT

Jackson, U. Thomas, Natural Resource Manager, GM-401-13, PFT
James, Sherry, Supervisory Park Ranger, GS-025-12, PFT
Janda, Walter, Security Guard, GS-085-4, Appointment Expired 09/06/04 FT Temp
Johnson, Bradley, Supervisory Refuge Operations Specialist, GS-485-11, PFT
Kimble, Jeannine, Outdoor Recreation Planner, GS-023-7, PFT
Krampetz, Frederick, Wildlife Biologist, GS-486-11, PFT
Landolt, Stephanie, Park Ranger (LE/Refuge), GS-025-5, PFT
Lindgren, Kevin, Telecommunication Specialist, GS-391-11, PFT
Logan, Scott, Park Ranger (Gates), GS-025-5, FT Term
Morehouse, Jerry, Security Guard, GS-085-4, PT Term
Noel, Ryan, Deputy Refuge Manager, GS-485-13, transferred 05/15/2004, PFT
Plaster, Gaylord, Engineer Equipment Operator, WG-5716-9, PFT
Richason, Austin, Assistant Park Ranger, GS-025-2, PT STEP
Rinker, Aaron, Biological Science Technician, GS-404-6, FT Term
Rios, Melinda, Clerk, GS-303-1, EOD 01/11/04. Terminated 5/29/04, PT STEP
Rodriguez, Ruby, Civilian Payroll Clerk, GS-544-7, PFT
Ronan, Noelle, Wildlife Biologist, GS-486-9, FT Term
Ronning, Thomas, Rangeland Management Specialist, GS-454-9 PFT
Rundle, W. Dean, Refuge Manager, GS-485-14
Sattelberg, R. Mark, Fish and Wildlife Biologist, GS-401-13, PFT
Sayers, Frank, Security Guard, GS-085-4, FT Temp
Shannon, Laura, Outdoor Recreation Planner, GS-023-12, PFT
Skipper, Sherry, Fish and Wildlife Biologist, GS-401-12, PFT
Smith, Stephen, Highway engineer, GS-810-12, PFT
Sollmann, Lorenz, Refuge Operations Specialist, GS-485-9, PFT
Spicer, Judson, Fish and Wildlife Biologist, GS, GS-401-9, FT Term
Steinshouer, Stacy, Clerk, GS-326-4, FT Temp
Stone, Eric, Wildlife Biologist, GS-486-11, PFT
Sumner, Stanley, Park Ranger, GS-025-5, Resigned 03/19/04, PFT
Tagliente, Edward, Park Ranger (Gates), GS-025-5, FT Term
Taylor, Beverly, Administrative Support Assistant, GS-303-5, PFT
Taylor, Jennifer, Biological Science Technician (General), GS-404-6, EOD 5/24/04, 1040 appt
Thornburg, Amy, Supv Refuge Operation Specialist, Reassigned to Rocky Flats, GS-485-9, PFT
Todd, Andrew, Fish and Wildlife Biologist, GS-401-9, EOD 11/30/03, FT Term
Torrez, Paul, Painter, WG-4102-9, Retired 4/3/04, PFT
Tracy, Jason, Biological Science Technician, GS-404-4, Resigned 2/13/04, PT STEP
Trapp, David, Carpenter, WG-4607-9, Retired 7/31/03, PFT
Ursini, Annette, Administrative Officer, GS-341-9, PFT
Vicente, Ivan, Outdoor Recreation Planner, GS-023-7, PFT
Vigil, Christine, GS-023-9, Outdoor Recreation Planner, PFT
Wendell, Foster, GS-085-4, Security Guard (Gates), PT Temp
Whiteaker, Scott, Biological Science Technician (W/L), GS-404-6, FT Term
Woods, James, Biological Science Technician (W/L), GS-404-6, 1040 appt
Wright, Terry, Range Management Specialist, GS-454-11, PFT
Young, H. Chris, Safety and Occupational Health Specialist, GS-18-11, PFT

Stacy Armitage reported to duty on January 11, 2004 as an Education Specialist.

Andrew Todd reported to duty on November 30, 2003 as a Fish and Wildlife Biologist for Rocky Flats. Amy Thornburg was reassigned to Rocky Flats from Rocky Mountain Arsenal.

Austin Richason and Melinda Rios both reported to duty on January 11, 2004 to assist with weekend Visitor Services programs. Austin continued to work full time throughout the summer and then was place on Intermittent Status while he attended college. Melinda's appointment expired upon her graduation from High School on 5/29/04.

Seth Beres, Fred Krampetz, Thomas Ronning, and Judson Spicer all successfully competed for new positions at RMANWR.

Jeannine Kimble, Aaron Rinker and Lorenz Sollmann all received career ladder promotion's.

Luis Garay was detailed to Administration to administer computer support upon Barbara Henry's retirement from Federal Service on December 31, 2004.

Stan Sumner resigned on March 19, 2004. Paul Torrez retried on April 3, 2004. Ryan Noel transferred from RMA to Division of Law Enforcement as a Special Agent.

Stephanie Landolt was converted from a SCEP appointment to a career conditional appointment. Stephanie is the first full-time Law Enforcement Officer employed at the Rocky Mountain Arsenal NWR complex. She started her initial 16 week training course at FLETC on July 2, 2004.

Aaron Rinker, Noelle Ronan, Scott Cargile, were extended for an additional year on their Term appointments.

Joel Colvin was detailed from Arapaho NWR to RMA on December 15, 2003 through March 6, 2004 at which time Joel was converted back to his "old" Term position as Biological Science Technician of which was extended for an additional year.

Petro (Tino) Segura was detailed from Alamosa to RMANWR starting November 16 through February 21, 2004.

Jennifer Taylor reported to work under a new 1040 appointment on May 24, 2004.

Stephen Smith was converted from Civil Engineer to Highway Engineer to work on the Transportation Issues involving RMANWR. This is a two year funded position.

Gates:

John Flavin and Walter Janda's temporary positions expired on August 4 and September 6, 2004.

Scott Logan's LWOP was effective August 22, 2004 for approximately six months to allow him to attend Boot Camp for the Reserves.

Oran Estes's appointment was extended for a third year on March 11, 2004.

Jerry Morehouse received a promotion on March 21, 2004 and his appointment was extended for the third year on January 13, 2004.

Frank Sayers entered on duty on December 14, 2003 to assist with Gate coverage.

Stacy Steinshouser started assisting Gate staff and Visitor Services weekend staff with a wide variety of duties. Stacy's temporary appointment was extended for the second and final year.

Edward Tagliente's appointment was extended for third year. Ed started assisting Adminstration and Visitor Services on April 18, 2004.

Chris Young returned to duty from "Operation Enduring Freedom' on May 2, 2005.

8b.2 Budget Review FY 2004

Resource Management Fund

Base Service Funding (1261-0000)		
Base	1,120,500	
Increase for position	10,000	
Increase for LE vest	650	
Increase for Cultural Resc	360	
Return funds to RO	-10,000	
Total.....		$1,121,510
Volunteer Service Funding (1261-6003)		
Rocky Mountain Arsenal NWR	$1,700	
Two Ponds NWR	$ 500	
Total.....		$2,200
Cultural Resources Service Funding (1261-60AA)		
Funding	$2,000	
Total.....		$2,000
Challenge Cost Share Funding (1261-C66F)		
Restoration of the Native Forb Component (Two Ponds)	$2,500	
Total.....		$2,500
Challenge Cost Share Funding (1261-C67U)		
Wetland Restoration Flood Protection Farmers Highline Canal/Two Ponds	$68,000	
Total.....		$68,000

Deferred Maintenance Force Account (1261-6401)		
Project #1001 Replace Bldg 788		
(Farmers Highline Canal)	$258,515	
Total.....		$258,515
Annual Maintenance (1262-A6RM)		
SAMMS	$40,000	
Fuel (1/2)	$ 9,251	
Amount based on RPI	$21,821	
Regional Reduction	$-1,072	
Total.....		$70,000
Small Equipment Maintenance (1262-B6RM)		
Project #01105 Replace '94 Vehicle	$23,000	
Total.....		$23,000
Reimburseable Funds		
REFUGE ROADS (8555-64RM)		
Funded	$12,000	
Total.....		$12,000

FIRE PROGAM

Wildfire Suppression travel/training(9131-PROG)		
Funded	$5,600	
Total.....		$5,600
Wildfire Suppression travel/training(9131-TNTV)		
Funded	$1,500	
Increase	$ 500	
Total.....		$2,000
Wildland FIRE support		
9140-A4UJ	$337	
9141-A9KY	$197	
9141-AAD0	$4,265	
9141-AVN0	$5,495	
9141-BC5H	$403	
HFR Buffer Zone (9263-H405)		
Hazardous Fuels Treatment		
HFR Grasslands - Funded	$1700	
Total.....		$1,700
Prescribed Fire Training/Travel (9263-TNTV)		
Hazardous Fuels Treatment	$1,500	
Total.....		$1,500

Fire – HFR Buffer Zone (Section 11) (9264-W404)		
Hazardous Fuels Treatment	$429	
Total.....		$429
Fire – HFR Buffer Zone (Waterways) (9264-W405)		
Funded	$100	
Returnded	-$100	
Total.....		$0
Fire – WUI Buffer Zone (9264-W406)		
Wildland Urban Interface Project		
WUI Grasslands (217)	$2,371	
Increased	$1,407	
Total.....		$3,778
Fire – WUI Buffer Zone (9264-W426)		
Funded	$250	
Returned	-$250	
Total.....		$0

Environmental Management System Implementation (EMS)
GREEN MONEY 98540-2809-E9WA

Funded 2003	$5,000	
Total.....		$5,000

Contributed Funds

Land Title Guarantee (7201-0560)	$12,250
Egli House – Walter Hyte Sr. Memorial (7201-0677)	$ 565
Fishing Fee Funds (6351-0000)	$ 4,952

Reimburseable Funds

U.S. Department of Army – Rocky Mountain Arsenal Support

Cleanup/Remedy (1971-6036)		
Funded	$1,407,980	
Returned September	$- 27,980	
Total.....		$1,380,000
Mitigation/Restoration (1971-6037)		
Funded	$952,590	
Returned September	-$138,000	
Total.....		$814,590

Access Control (1971-6038)		
Funded	$263,290	
Returned September	$ -45,000	
Total.....		$218,290

U.S. Department of Energy – Rocky Flats Support

(1971-6005)		
Roll-Over from FY2002	$169,716	
Funded 9/02 for FY2003	$190,000	
Funded 11/02 for FY2003	$190,000	
Funded 5/03 for FY2003	$849,000	
Funded 2/04 for FY2004	$600,000	
Total.....		$1,998,716**

**Roll over to FY2005 $1,090,623

U.S. Department of Energy – Rocky Flats Ranch

(1971-6005)		
Roll-Over from FY2002	$50,000	
Total.....		$50,000

8b.2a Administrative

The Overhead rate stayed at 13% on reimbursable funds.

Travel Allowance for Rocky Mountain Arsenal NWR complex was $21,067.29 (service dollars) which was an additional reduction of 7% from FY03 and an overall reduction of 14% reduction from our base year FY02. We spent $20,713.35.

Additional $40,000 to implement SAMMS was funded in Annual Maintenance account. Four employees traveled to NCTC to attend SAMMS training. All travel costs where paid for by the Regional Office.

Implementation of Activity Based Costing Management began January 2004, which included four characters.

MMS:

Construction of Seed Storage building, SAMMS #10049099, which was funded in the amount of $258,515 by Regional Office and was erected during FY2004.

Purchased and installed Best Locks in all FWS buildings and facilities. Installed base station unit at Visitor Center as well as replaced inside carpet.

Had the Rover rewrapped with new art work.

Completed the septic system at visitor center.

Proceed of Sales funds of $8,921 was applied to the Law Enforcement Ford Explorer.

We traded in our old Guardian, video surveillance equipment for new unit costing $3000.

New F150 alternative fuel vehicle was purchased with MMS Small equipment funds with application of $3450 for FY2003 Proceed of Sales funds.

1261:

Purchased a new panel for the sign located at the Rod and Gun Club Wetland for $10,160. Also purchased display from Skyline Design.

Purchased materials for the Fawn Project in the amount of $26,000, include expandable breakable radio collars.

Obligated final two years of the Adams County School District 14 agreement, in the amount of $80,000.
Funded the Wetland Restoration for Floor Protections and Improved Water Quality project at Two Ponds NWR, with the Farmers High Line Canal Company, in the amount of $68,000.

Purchased three, 12 x 20 A shed's, one located by the lakes and the other two behind building 120.

Rocky Flats:

Completed renovation of Lindsey Ranch project.

Completed title opinion.

Printed Planning Update #5 and #6 as well as CCP EIS draft.

Negotiated final contract with Shapins for Rocky Flats CCP, in the amount of $300,000. Also, completed deer tissue analysis contract.

Purchased Geo Explorer unit.

Rocky Mountain Arsenal:

Leased copier and BlueBird bus in support of Cleanup/Remedy and Restoration/Mitigation in the amounts of $5311 and $8366.

Purchased GEO standalone system. Purchased 8 new Dell computers.

Purchased herbicide and native seed for Restoration/Mitigation projects in the amount of $47,180 and $52,367.

Purchased an F550 chassis and installed platform and spray unit on vehicle. For a cost of $53,261.

8b.3 Computers

In October 2004, the Information Technology duties consist of the troubleshooting problems of computers on a regular basis. Problems with software, printers, and e-mails are most of the common issues related to troubleshooting computers. Guiding RMANWR staff to activate Active Directory passwords required to access USFWS security sites. The replacements of new computers took place and the donation to Sharing Electronic Equipment District and Statewide (SEEDS), which is a non-profit organization. Extracurricular tasks include help with Refuge Day activities taking digital pictures of the all guest with USFWS mascots. Completed the first part of the Computer Technician (A+) training course on Red Rocks Community College.

Following the months from November to January, 25 new computers arrived. The new computers are to replace the old computers that are not in compliance with the new Department of the Interior (DOI) standards and regulations. We started the preparations for the migration to Army Active Directory, including the renaming of computers and printers. In the following months more compliance will take part to complete the migration. Installing new Geographic Information System (GIS) software and updates in certain computers that are in need to perform work. Troubleshooting computers is a major part of the job which is taking part in an every day basis. Assisting the USFWS staff answering questions and helping with issues related to computers. In January help finalized the Rocky Mountain Arsenal National Wildlife Refuge Spanish website. In February, the Web base Region 6 (R6) Staff directory and the Corporate Master Table (CMT) were updated. Attending meetings to consult with other Information technology (IT) personnel in RMANWR where we share and interchange new computer information concerning IT security and internal issues.

Other matters are the reconstruction of the Site History for the Visitor Center Computer Information Center which with the help of Rich Keen we will re-master in a DVD. The technology that we used to load operating systems and software call imaging is used with an equipment call Logicube which was updated at the Regional Office and use to clone hard drives. In the month of March, the IT Security Awareness mandatory training for DOI employees was already in place and assisted staff with any issues with the online security training. This training is mandatory and everybody who uses a DOI computer most complies. To finalized the migration to the Army Active Directory we were ask to comply with ACK Acknowledgement receipt of alerts send by Gary Weekland , network administrator of DPRA. These are notifications send via e-mail which advice us to comply with a security update send by Department of Defense (DoD). Everyday we have to keep inform of any news that involved computers, security, networks, etc. reading computer magazines, researching the internet, via e-mails is part of the learning process. One of the major troubleshooting problems is the TRS (Trimble Reference System) located in Bldg. 129 where the information transmitted by the antenna goes to a temporary file on the hard drive and will not transfers to a folder already define in the system. The problem stills a troubleshooting in progress. All computers and laptops were connected to the network in the middle of March to finalize the migration of the Army Active Directory and be connected to different domains.

8b.4 Youth Programs

Nothing to report.

8b.5 Other Manpower Programs

Nothing to report.

8b.6 Volunteer Programs

Nothing to report.

8b.7 Expenditures

Nothing to report.

8b.8 Funding

Nothing to report.

8c. Communications

The Telecommunication Support is a function which has been a transfer from the Army to USFW and the task is providing communications to all government and contractor personnel at RMA. The Telecommunications Specialist is integrated with the Army & RVO functions and is the liaison with the Army Resource & Management Group, Remedy & Support Group and the RVO Infrastructure Team. Some the functions consist of providing telephone, voice mail to new employees, support the continuous personnel moves, provides initial maintenance and troubleshooting support, and the expansion of service to new construction locations.

Major projects:

Installation and setup of an internet WEBCAM at a wildlife viewing location that has become part of the USFW website.a

Upgrade the telephone switch/PBX with a major software to enable future vendor maintenance support.

Planning and installation of a major internet access upgrade from 1 to 3 MB through a new point to point circuit with Ft Carson with RMD.

Relocation of the West Gate and the transition of Building 135 for use by Commerce City Police with the coordination with Commerce City engineers.
Installation and line transfers to support the automated gate functions and camera surveillance.

Long range planning included the project of removing mechanical splices in the fiber optic cable plant in outlying areas and changed to fusion splices. This action eliminates

light signal db loss from the mechanical splice that was standard practice during the initial installation in 1995. The introduction of the fusion splices produced an immediate effect on the automated links to the South Gate and the USFW Visitor Center with a dramatic increase of connection speed.

Although RMA has seen a slow process of workforce reduction during the last few years, 2004 saw the first major impact with diminished Army Fire Department support. The FD building was provided with enhanced telephone and communication support to ensure the same support with fewer personnel. The RMA Central Dispatch function is housed with the Fire Department, 7 day/24 hour support was maintained though extension of fire alarm, telephone, and radio capabilities to the living quarters.

8d. Major Construction and Maintenance

Construction of a new Seed Storage building, SAMMS #10049099, was accomplished during FY 2004 at a cost of $258,515. Funding was provided from subactivity 1262 as a Deferred Maintenance project. We appreciate the good work of the Division of Engineering and CGS in accomplishing this project. The 6,200 sq. ft. Butler building replaced an old concrete block Army warehouse in the 700 area of RMA. That building had been available to the refuge for storing seed for the grassland restoration program, but was demolished in the Phase II Miscellaneous Structures remedy project in the fall of 2003.

9. Remedy Coordination

9a. Engineering

The Refuge continued to provide technical engineering support to the Remediation Venture Office (RVO) during CY04. Two Service engineers participated on RVO engineering teams, one on the Remedy Execution Team, and one on the Water Treatment and Monitoring Team. They also served as liaison between the Army and the Service to facilitate a smooth transition to a refuge. The primary objective of engineering support is to assist the RVO with site-wide remediation pursuant to the Record of Decision (ROD). In CY 04, Service engineers provided technical assistance, project management, contract oversight, and operations oversight.

For the Remedy Execution Team, the Service engineer managed the following remediation projects: Basin F Exterior, Basin F Wastepile, Basin F Solidification, Lime Basins, Secondary Basins, Section 35, Section 36 Existing (Sanitary) Landfills, Section 30 Existing (Sanitary) Landfills as well as the site wide management of borrow soil. The Service engineer also managed the removal of additional soils identified in previously closed remedy locations per request/direction of the RMA Committee. In addition, the Service engineer manages remedy and tracking of residual ecological risk (RER) soils. The Service engineer maintains a link between the Remedy Execution Team and the RMA Biological Advisory Subcommittee in order to manage RER soil remedy. Also in CY04, the Service engineer was instrumental in working on a proposed ROD Amendment for RVO. The Service engineer serves as a Technical Representative to the Army Contracting Officer on the RMA Program Management Contract.

For the Water Treatment and Monitoring Team, the Service engineer, in conjunction with a Shell engineer and an Army engineer, managed the Rocky Mountain Arsenal's network of five groundwater treatment systems and two batch treatment wastewater plants as well as management of the site wide monitoring program for groundwater. The Service engineer participated in RMA surface water management, including both urban generated storm water and remedy water supply. Groundwater bioremediation projects for RMA contaminants through use of anaerobic biodigestion and phytoremediation were also used in selected sites and managed by the Service's engineer.

Beginning in August 2004, the Service engineer assigned to the Water Treatment and Monitoring Team was moved to duties as the Highway Engineer / Transportation Planner for the RMANWR. These duties encompassed coordinating road and trail actions (both replacement and removal) interior to RMANWR, transportation coordination with surrounding municipalities, and some activities as the Service representative to a statewide Colorado trails symposium and coordination working group.

9b. Safety

The RMA National Wildlife Refuge along with its partners (U.S. Army, Shell Oil Company, Washington Group International, and TETRA TECH EC, INC., maintained an excellent occupational health and Safety record for 2004. RMA occupational health and safety programs remained nationally recognized for excellence because of the on going commitment to worker health and safety by all organizations on site.

For 2004 two organizations at RMA maintained their Star Status rating in the Occupational Safety and Health Administration's (OSHA) Voluntary Protection Program (VPP). Washington Group International along with its partner TETRA TECH EC, INC. maintained OSHA Star Status certification at RMA by actively promoting a site wide safety culture where safety is every person's responsibility. This culture environment at RMA also helped the Refuge achieve an excellent safety record for 2004.

From January 1, 2004 through December 31, 2004 the OSHA Recordable Rate for safety incidents among all 600-800 workers at the Rocky Mountain Arsenal was 0.3, with a Lost Workday Rate of 0.0. The Refuge's safety program included occupational health and safety statistics, continues to be integrated with those of the RMA Remediation Venture Office (RVO) Health and Safety program. During 2004 the Refuge staff logged 73,580 work-hours with no Days Away incidents or cases. This was significant contribution to the outstanding safety success at RMA during this time frame. However, the Service had one Recordable Incident for the year 2004. A field employee sustained a laceration to the left shin while cleaning out the disks on a plow. The Employee required three stitches as a result of the injury, and was treated and reported back to work the same day. There was no lost time or days away recorded due to the injury.

Safety training remains a big part of routine operations at the Refuge, both now and into the future. U.S. Fish and Wildlife Service personnel completed the 8-hour annual OSHA refresher certification for Hazardous Waste Operations. Recertification in CPR was also completed on site. Regularly scheduled safety briefings and tailgate meetings were held with Service employees prior to the start of any field work activities.

10. **Annual Narrative for the Future Rocky Flats National Wildlife Refuge**

Section 1. Monitoring and Studies – Since the Service is not actively managing the Rocky Flats Property, most monitoring and studies are conducted by a DOE contractor.

1a. Surveys and Censuses – Service staff have participated in site-wide wildlife surveys, however, the DOE contractor is responsible for getting the surveys completed and recorded.

1a.3 Prairie Dog Management – Active prairie dog towns were mapped using a GPS unit and transferring the data to a GIS system. A total of approximately 10 acres of active prairie dog towns were mapped. Additional acres of prairie dog towns are found adjacent to the Rocky Flats property.

Section 2. Habitat Restoration – Work being done by DOE contractor with limited input from Fish and Wildlife Staff.

Section 3. Habitat Management - Work being done by DOE contractor with limited input from Fish and Wildlife Staff.

Section 4. Fish and Wildlife Management – No work being done.

Section 5. Coordination – Service staff have been giving DOE, and their contractor, technical expertise in several areas. Staff has been assisting and reviewing Endangered Species Act, Section 7 consultations for activities on the site; assisting with wetland delineation and assessments; reviewing cleanup design documents; reviewing and assisting revegetation efforts; and assisting with the ecological risk assessment and natural resource damage assessment documents.

Section 6. Resource Protection

6c. Contaminant Investigations - Draft Level III contaminant survey sampling and analysis plan was written for the Rocky Flats property. Sampling of the property will occur after a laboratory has been contracted and the sampling and analysis plan is finalized. Deer tissue samples that were collected during a State lead investigation for chronic wasting disease were taken for a contaminant investigation. Limited hunting of deer at the future Refuge has been proposed in Fish and Wildlife planning documents as a compatible, wildlife-dependent public use. Historical Rocky Flats site activities resulted in the contamination of surface environmental media with actinides, including isotopes of americium, plutonium, and uranium. In the study, measurements of actinides (^{241}Am, ^{238}Pu, ^{239,240}Pu, ^{233,234}U, ^{235,236}U and ^{238}U) were completed on select liver, muscle, lung, bone, and kidney tissue samples harvested from resident Rocky Flats deer (26) and control deer (1). In total, only 17 of the more than 450 individual isotopic analyses conducted on Rocky Flats deer tissue samples measured actinide concentrations above method detection limits. Of these 17 detects, only 2 analyses, with analytical uncertainty values added, exceeded threshold values calculated around a 1×10^{-6} risk level. Subsequent, conservative risk calculations suggest minimal human risk associated with ingestion of these edible deer tissues. The maximum calculated risk level in this study (4.73×10^{-6}) is at the low-end of the U.S. Environmental Protection Agency's acceptable risk range.

Section 7. Public Education and Recreation

Nothing to report.

Section 8. Planning

8a. Comprehensive Conservation Planning – The planning process for the Comprehensive Conservation Plan/Environmental Impact Statement (CCP/EIS) officially began August 2002, when a Notice of Intent to prepare the CCP was published in the Federal Register. The draft CCP/EIS was available for public review from February 19, 2004 to April 25, 2004. In March 2004, the Service held four public hearings on the draft in Westminster, Boulder, Arvada, and Broomfield. In addition to the public testimony, comments were also received in the form of letters, emails, form letters, and petitions. During the draft CCP/EIS comment period, the Service received over 5000 comments from 251 individuals, 34 agencies/organizations, and 933 form letters. The most significant issue raised was public access. Due to the history of contamination and the ongoing cleanup efforts, members of the public were concerned about plans for public access and very interested in how the DOE retained lands should be demarcated. Other issues included public hunting, prescribed fire and grazing, prairie dog management, water rights, Lindsay Ranch, cumulative impacts of adjacent mining, and nearby transportation improvements. As a result of public comments and concerns about the draft CCP/EIS, several changes were made to the Final CCP. The final CCP was released to the public in December of 2004.

Section 9 Remedy Coordination

9a. Engineering – Service staff review and comment on many remedy documents.

9b. Safety

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