ROCKY MOUNTAIN ARSENAL NATIONAL WILDLIFE REFUGE

Commerce City, Colorado

ANNUAL NARRATIVE REPORT

Fiscal Year 2005

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

REVIEW AND APPROVALS

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Refuge Manager_____ Date_____

Refuge Supervisor _____ Date _____

Regional Office Approval_____ Date _____

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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, Colorado, 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

C. CLIMATIC 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 2005 were below normal in precipitation for nine of the twelve months and the month of July setting record breaking highs of 100+ degree weather. The average temperature during the period of October 2004 through September 2005 of 50.96 degrees was a mere 0.51 degree above normal. Precipitation totaled 11.16 inches, -4.65 inches below the normal 15.81 inches. The highest temperature for the year of 105 degrees occurred on July 20th and the lowest temperature of -13 degrees occurred on December 7th, both record setting temperatures for the year. The first freeze of the fall is reported on October 7th within Fiscal Year 2005, although the last freeze of the spring occurred on May 12th. Precipitation (Table C.1) and temperatures (Table C.2) are reported below by month for FY 05.

Table C.1. Monthly Precipitation, FY 2005*

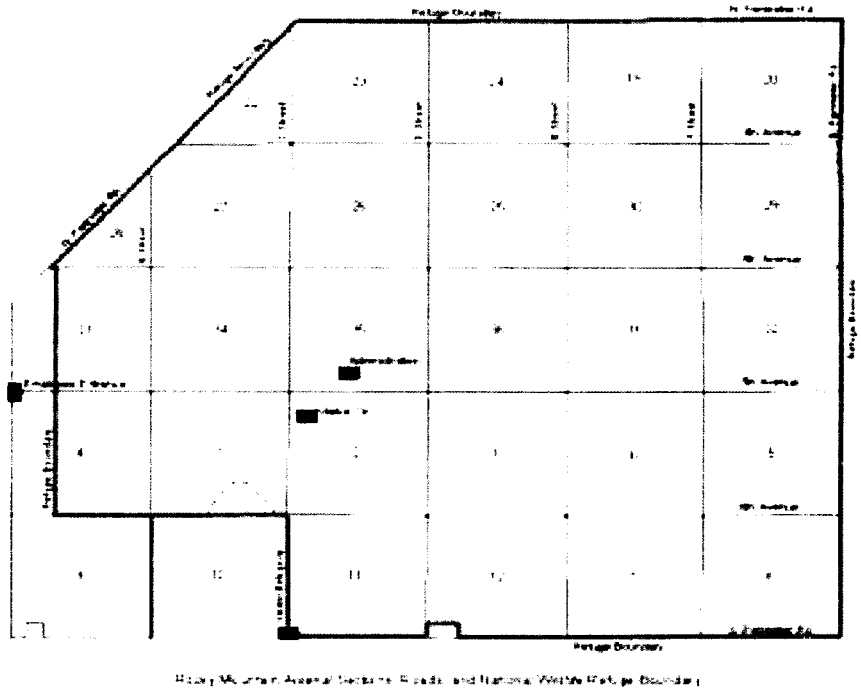
Month	Precipitation Normal (Inches)	Precipitation Actual (Inches)	Departure From Normal
October	0.99	0.86	-0.13
November	0.98	0.45	-0.53
December	0.63	0.04	-0.59
January	0.51	0.37	-0.14
February	0.49	0.02	-0.47
March	1.28	0.59	-0.69
April	1.93	2.45	+0.52
May	2.32	0.71	-1.61
June	1.56	3.99	+2.43
July	2.16	0.27	-1.89
August	1.82	1.34	-0.48
September	1.14	0.07	-1.07
Total 12 Month Precipitation	15.81	11.16	-4.65

Table C.2. Monthly Temperature, FY 2005*

Month	Average Temp. (Normal)	Average Temp. (Actual)	Temperature High (^{0}F)	Temperature Low (^{0}F)
October	50.9	50.9	79.0	24.0
November	37.5	37.1	72.0	-1.0
December	30.3	34.9	67.0	-9.0
January	29.2	32.5	70.0	-3.0
February	33.2	35.7	64.0	13.0
March	39.6	39.4	74.0	14.0
April	47.6	46.4	78.0	24.0
May	57.2	57.0	91.0	27.0
June	67.6	66.0	93.0	39.0
July	73.4	77.7	105.0	50.0
August	71.7	71.6	97.0	48.0
September	67.2	62.4	94.0	39.0
Average Annual Temperature and Temperature Extremes	50.45	50.96	82	20.08

*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

Similar to previous years, the adult eagles that occupied the communal roost during November and December were probably the nesting pair. In January one or both of the adults were roosting on First Creek. From February 9-18, the pair was seen adding sticks to the nest and began incubation on the 19th. This was four days earlier than in 2004. Subsequently, hatching was documented four days earlier than 2004 on March 27. On April 4th, a single chick was seen in the nest. It survived two hail storms on April 18th and 20th. The eaglet was banded on May 16 by retired Colorado Division of Wildlife raptor biologist, Jerry Craig. It branched from the nest on June 20 and was observed flying on June 27th. It was never spotted again until it was found dead at the base of a telephone pole on 7 July. It was decomposed and the necropsy by Madison Health lab could not determine the cause of death.

Throughout Colorado 80 bald eagle nests were active in 2005, 27 in the South Platte River drainage system. Data from twelve nests in this latter group including the RMA nest, revealed two nest failures (i.e. no young produced) resulting in a mean of 1.41 hatches/nest attempt, 1.7/successful nest. Fledged eaglets averaged 1.16/nest attempt and 1.55/successful nest.

Banding nestling eaglets with large colored leg markers assists biologists monitor the Front Range population.

The tree climber, Gary Meinke, was photographed by Josh Barchers taking the following close-up of "Chick P".

"

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. BEMA is instigated annually from October 15 to April 15. Roost counts from 1986 through 1999 were conducted every other night but were reduced to three times a week in 2000. Since 2002 and for this recording period, roost counts were done once a week in October and November and twice a week December through April.

Specific single night roost count data from RMA are incorporated into two expansive cooperative surveys, the Urban Denver Christmas bird count (January 1) and the Bald Eagle Midwinter Survey (the second Friday or Saturday of January). Because of their premature timing, they typically do no represent the highest count of the season. However, the cyclic pattern of eagle use at the refuge roost is apparent (Figure 1a.1).

The highest number of eagles observed on a single roost count since surveys began occurred in 1998 (Figure 1a.2) with a progressive decline through 2003. In 2005, the peak number of 37 was considerably higher than the previous two years and took place a month later than the established trend of occurring the third week of January (Figure 1a.3). The shift was unexpected as alterations in variables such as preybase and local weather were not apparent. The presence of increasing numbers of adults with a relatively constant population of subadults suggests northern birds that had not migrated were forced to do so later in the season to find food. In Minnesota, a northern owl invasion was documented in the same time period suggesting a prolonged decrease in available food supplies. In Colorado, it was not owls but eagles that were creating the media hype at local reservoirs where substantial numbers of eagles frequently were featured newscasts.

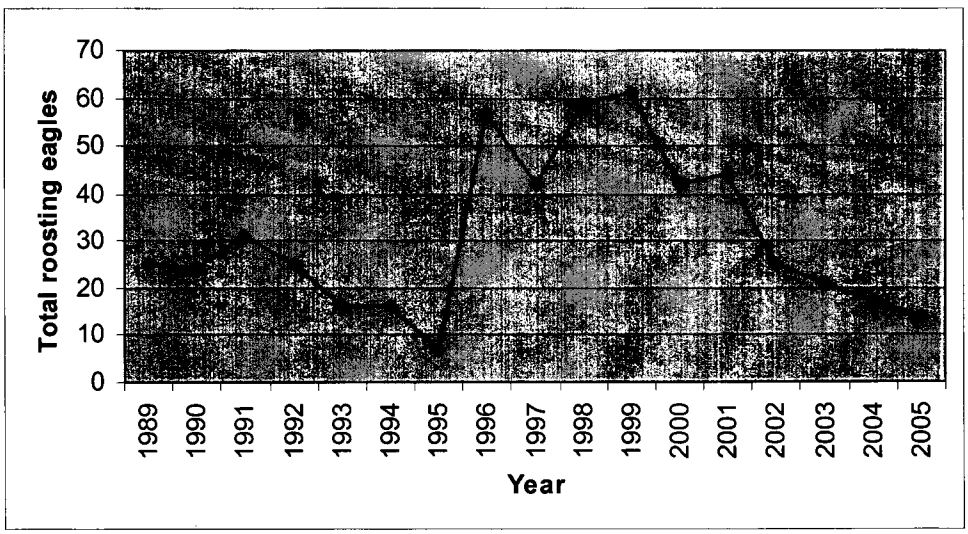


Figure 1a.1. Midwinter Bald Eagle Survey of the communal roost on the Rocky Mountain Arsenal NWR from 1989-2005.

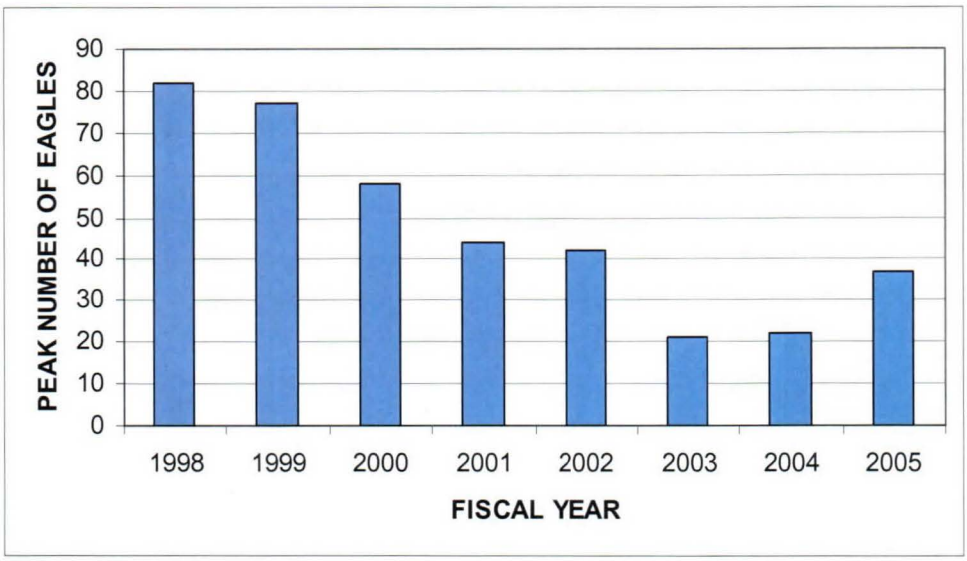


Figure 1a.2. Peak number of bald eagles at a communal roost on Rocky Mountain Arsenal NWR (1998-2005).

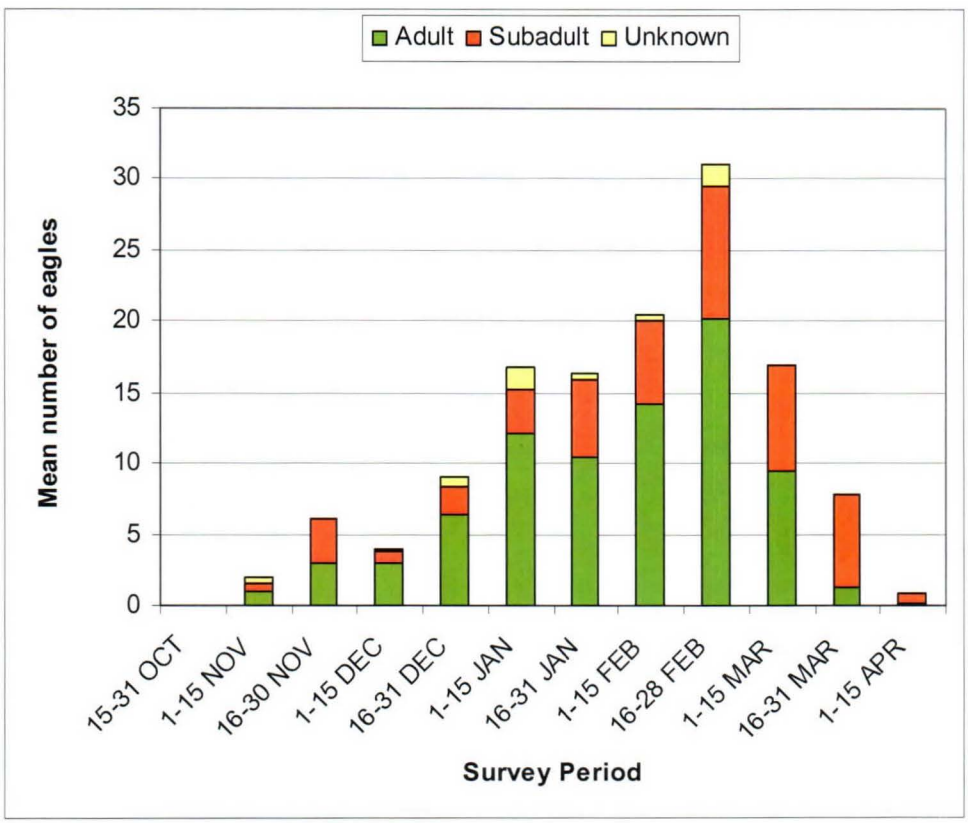


Figure1a.3. Mean number of bald eagles at the communal roost on Rocky Mountain Arsenal NWR from November 2004 through April 2005.

1a.2. Raptor Monitoring

Raptor nest monitoring

Raptors breeding on the Arsenal increased from 2004 both in the number of nests and young successfully fledged (Table 1a.2.1). Nest search efforts were comparable to 2004, but the chronology and final outcome of several nests was unknown. Information below also includes observations of raptors from Christmas and spring counts or observations that were incidental to nest searches or winter raptor surveys. American kestrels, burrowing owls, 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, 2004-2005.

Raptor Species	**Nests Found**		**Minimum young produced**	
	2004	**2005**	**2004**	**2005**
Great Horned Owl	5	9	7	15
Long-eared Owl	3	6	5	8
Short-eared Owl	1	0	?	0
Burrowing Owl	41	85	192	118
Red-tailed Hawk	8	8	7	14
Swainson's Hawk	10	14	17	11

Great horned owls are year round residents at the Arsenal. Although they are the earliest raptor breeders (incubating in February), they do not build their own nests, but occupy structures built by others. Of the nine great horned owl nests used in 2005, four had been used by owl pairs in 2004, and five were previous nest sites of Swainson's and red-tailed hawks. Successful broods ranged from one to four owlets.

Long-eared owls also can occur on the Refuge throughout the year. During the winter, small groups of individuals roost in the locust thickets. A record 42 were seen on the Christmas Bird Count, roosting in several locations. Subsequently, the pair/nest count increased to five with an additional re-nest by the female in Section 20. Three nests were located in Section 12. Two branched owlets were captured and banded. The largest documented brood was 3 owlets.

Red-tailed hawks are the most common buteo seen year-round. Twenty-four were seen on the Refuge portion of the Christmas count. Nine nests were found beginning in early March and tracked through June with two thirds of them being at new sites. Two nests failed and the fate of the nest close to the breeding eagles was not known. Red-tailed hawks fledged 2.0 chicks per successful nest.

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 astonishing fourteen nests used, only two were available to be re-occupied. The rest were

quickly constructed. Despite all the effort, seven nests failed, ten young were fledged from five nests, with the fate of two nests unknown.

A winter roost of at least seven short-eared owls was discovered during routine mowing operations in March. They were originally found in southwest Section 19, but were discovered elsewhere in that vicinity as the vegetation was shortened. Subsequently, a short-eared owl was seen on the Breeding Bird Survey in June in central Section 20. Although a nest was suspected, it was never found.

Photo of long-eared owlets

1a.3 Winter Raptor Population Monitoring 2005

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.3.1). The current survey route was established in 2001. Surveys were conducted once each week by two observers from October 21, 2004 through April 14, 2005. Twenty-six 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 10 using the RMA breeding bird survey route.

There was a mean of 23.6 individual raptors observed per survey (SE = 0.5, Table 1a.3.1). This was twice the mean number seen the previous year. However, similar to the 2003-2004 survey results, red-tailed hawks (*Buteo jamaicensis*) and American kestrels (*Falco sparverius*) were the most frequently observed raptors. Collectively, they represented 58% of the total raptors. The mean number of raptors observed each month ranged from a low of 5.0 in October to a high of 17.0 in March (Figure 1a.3.2). Relative abundance peaked over 100 in December, February and March. The number of different species observed each month ranged from 7 to 9 and remained relatively constant throughout the survey period, with October, March, and April showing the low of 7 (Figure 1a.3.2). Species composition corresponded with expected monthly patterns depending on whether raptors were a resident or migrant with a few notable exceptions (Table 1a.3.2). Four Swainson's hawks *(B. swainsoni)* were seen in late October, well past their typical early September departure. Northern harriers (*Circus cyaneus)* were consistently abundant throughout the fall and winter.

Raptors were observed in a variety of habitat types, ranging from weedy grassland to wooded areas (Figure 1a.3.4). Habitats were categorized into six broad types using a current habitat restoration map. One category that was not mapped but was frequently used and appeared as "other" was bare ground, which represented plowed fields or graded areas without vegetation.

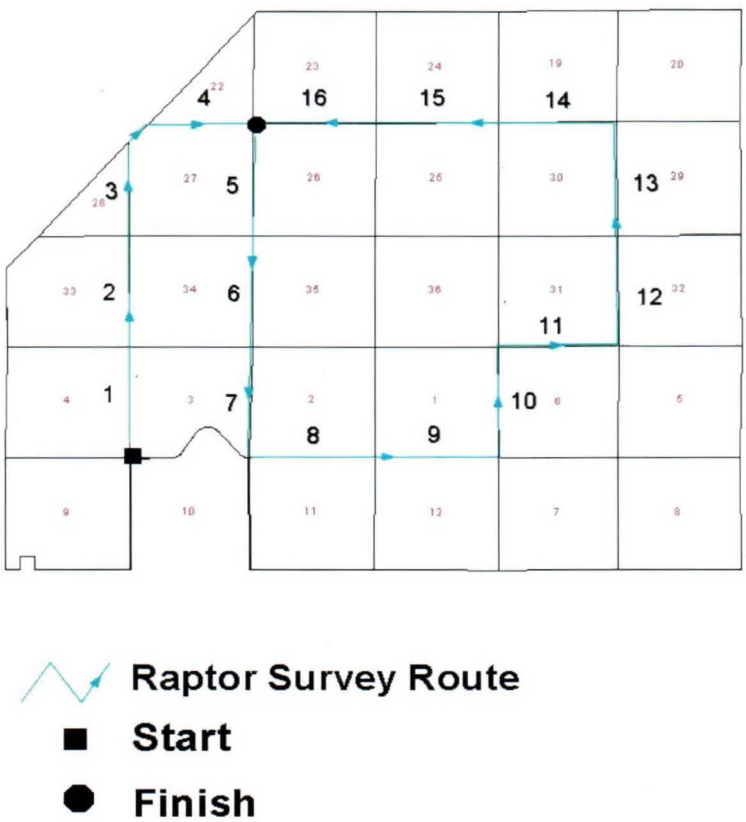


Figure 1a.3.1. Standardized road survey route for monitoring wintering raptor species composition and relative abundance at the Rocky Mountain Arsenal, CO, 2005. One mile sections are numbered.

Table 1a.3.1. Raptor species observed during 26 road surveys conducted from October 21, 2004 to April 14, 2005 at the Rocky Mountain Arsenal NWR, CO.

Species	Total Observations	Mean/Survey	% of Total Raptors
A. Kestrel	138	5.31	22.5
Bald Eagle	54	2.08	8.8
Burrowing Owl	10	0.38	1.6
Cooper's Hawk	1	0.04	0.2
Ferruginous Hawk	25	0.96	4.1
Great Horned Owl	23	0.88	3.7
Golden Eagle	6	0.23	1.0
Northern Harrier	94	3.62	15.3
Prairie Falcon	27	1.04	4.4
Rough-legged Hawk	7	0.27	1.1
Red-tailed Hawk	220	8.46	35.8
Swainson's Hawk	4	0.15	0.7
Unidentified	5	0.19	0.8
Total Raptors	614	23.62	100.0

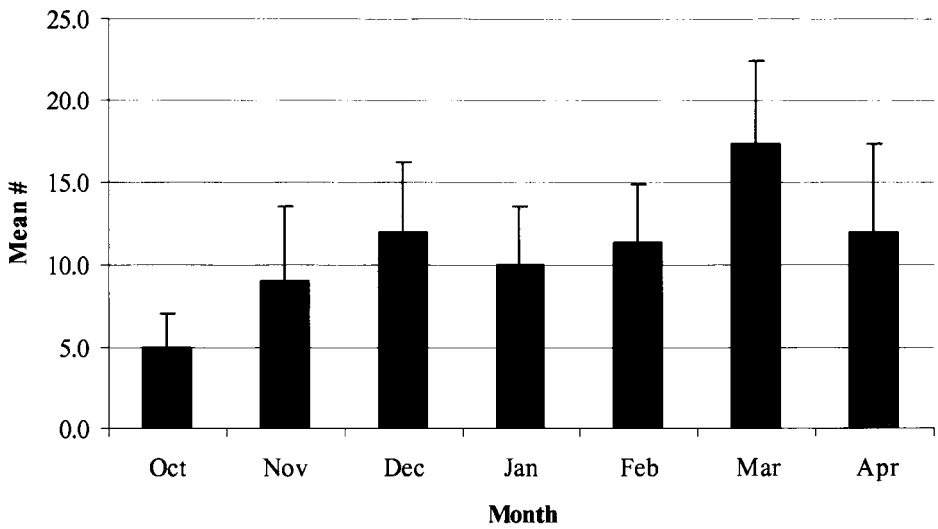


Figure 1a.3.2. The relative mean abundance (± SE) of raptors observed each month during road surveys at the Rocky Mountain Arsenal NWR, CO from October 2004 to April 2005.

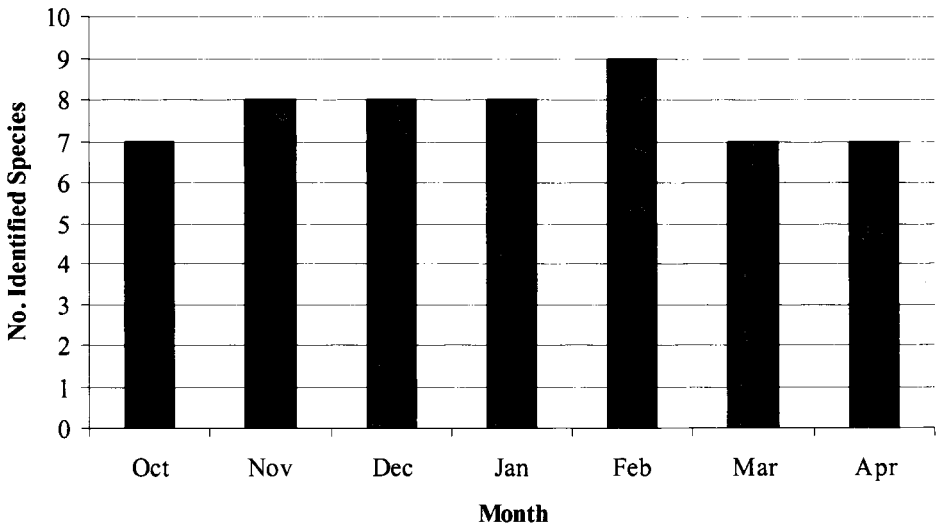


Figure 1a.3.3. The number of different raptor species observed each month during road surveys at the Rocky Mountain Arsenal NWR, CO from October 2004 to April 2005.

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 2004 to April 2005.

	Raptor Observations							
Species	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**Total**
American Kestrel	3	7	16	17	20	35	40	138
Bald Eagle	1	5	5	19	10	14	0	54
Burrowing Owl	0	0	0	0	0	0	10	10
Cooper's Hawk	0	0	0	0	0	0	1	1
Ferruginous Hawk	0	5	9	3	3	5	0	25
Great Horned Owl	0	1	1	2	8	6	5	23
Golden Eagle	1	1	0	0	4	0	0	6
Northern Harrier	10	16	24	7	12	19	6	94
Prairie Falcon	1	4	4	4	8	5	1	27
Rough-legged Hawk	0	0	5	1	1	0	0	7
Red-tailed Hawk	15	43	40	28	36	37	21	220
Swainson's Hawk	4	0	0	0	0	0	0	4
Unidentified	0	1	4	0	0	0	0	5
Total	35	83	108	81	102	121	84	614

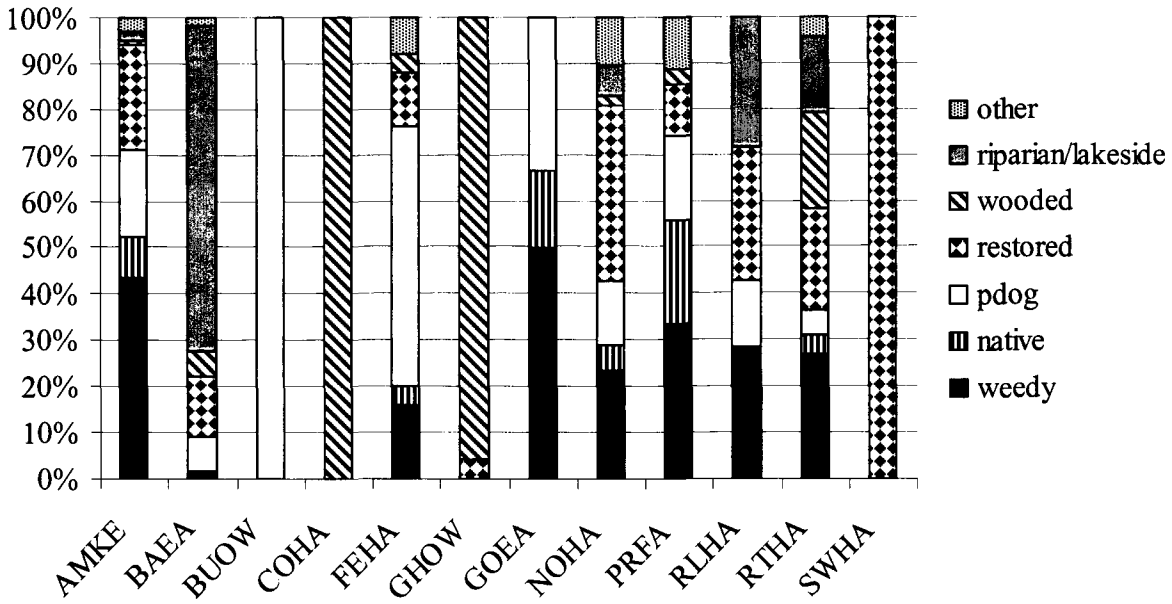


Figure 1a.3.4. The percent of observations of raptor species in different habitat types during road surveys at the Rocky Mountain Arsenal NWR, CO, 2003 to 2004. Raptor species are identified using standard codes: AMKE = American kestrel, BAEA = bald eagle, BUOW = burrowing owl, COHA = Cooper's hawk, 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

1a.4. Prairie Dog Management

A total of 407 hectares or 1006 acres of active prairie dog towns were mapped from April through July, 2005 (Figure 1a.4a). This represents a decrease of 57 acres from the September 2004 distribution (Table 1a4a) and is 22.36% of the target population of 4500 acres, as stated in the Comprehensive Management Plan (CMP). Sylvatic plague was not detected at Rocky Mountain Arsenal in 2005. Prairie dog habitat loss continued in the central sections of RMA where projects including the ELF (Section 26), DREZ and Sanitary Landfill (Section 30), Borrow Area 9C were in full swing. Visual counts were not conducted in 2005.

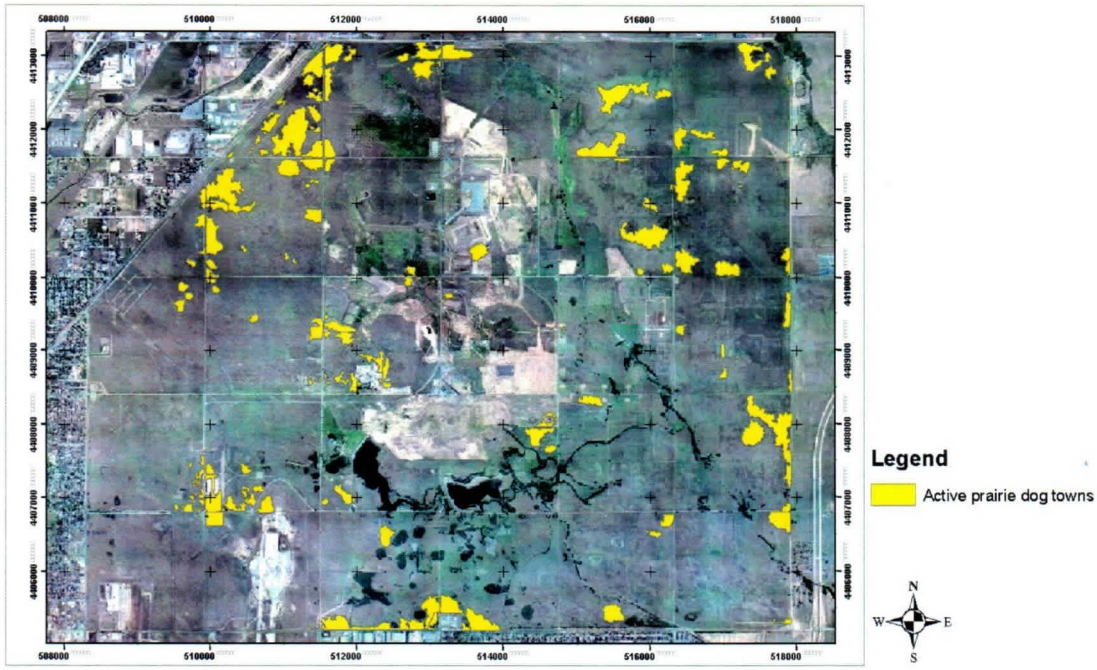


Figure 1a4a. Prairie dog town acreage on the Rocky Mountain Arsenal in 2005.

Table 1a.4a. Summarizes black-tailed prairie dog survey data from 1988 through 2005. Two surveys are given for 1995; one in spring and another in fall.

Table 1a.4a. Prairie dog population fluctuations 1988-2005 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
2005	No Visual Counts	407.12	1,006.0

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-seven bird species were recorded on the Christmas bird count conducted January 1, 2005. This is the highest species detection on the refuge topping the previous record of 54 set in 2004. However the number of individuals (2,940) is the lowest since 1999. No new species were added leaving the cumulative total species detected on the Refuge during Christmas bird count at 81. About half of the Refuge is within the Urban Denver count circle representing approximately 10% of the circle. The total circle recorded 91 species. Greater than fifty percent of the individuals of 14 species were seen on the Refuge (Table 1a.4a). Ironically, only 7% of the total individuals counted in the circle were seen on the Refuge.

Table 2a.4a. Species seen on the Rocky Mountain Arsenal that contributed greater than 50% of the total individuals in the Urban Denver Christmas Count, January 1, 2005 (note the Refuge % of total individuals).

Species	Circle Total	Refuge Total	Refuge %
Cackling Goose	396	222	56
Redhead	175	175	100
Ring-necked Duck	219	110	50
Ring-necked Pheasant	5	5	100
Northern Harrier	22	17	77
Rough-legged Hawk	2	2	100
Merlin	2	1	50
Prairie Falcon	3	2	66
Virginia Rail	4	3	75
Barn Owl	6	6	100
Great Horned Owl	10	6	60
Long-eared Owl	42	42	100
Horned Lark	36	36	100
Western Meadowlark	9	8	89
Total number of species	**91**	**57**	**63**
Total individuals	**43277**	**2940**	**7**

Breeding Bird Survey (BBS)

Forty three bird species and 591 individuals were recorded on the Breeding Bird Survey conducted on June 18, 2005. That is below the average species count of 45 and the

second lowest individual count since the surveys started in 1991. The Western meadowlark remained the most abundant species followed unfortunately by European starlings and mourning dove (Table 1a4.b). Say's phoebe appeared on the list for the first time. Other birds conspicuous by their scarcity were ringed-necked pheasant, (the first time it has not been detected) and lark buntings (9) which were third in abundance in 2004.

Table 1a.4b. Summary of BBS results conducted on RMANWR, 2005.

	2005
Date conducted	June 18
Total species	43
Total individuals	591
Most abundant	Western meadowlark (168)
Second abundant	European starling (51)
Third abundant	Mourning dove (45)

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 2005, the spring count tied with 2000 for highest number of species of 95, had high abundance counts over 100, and added Eastern phoebe (Table 1a4c). Conversely, although the fall count added great egret, both the species count and individuals tallied were low.

Table 3a.4c. Species counts for spring and fall 2005 on the Rocky Mountain Arsenal National Wildlife Refuge.

	Spring 2005	**Fall 2005**
Date conducted	May 8	Sept 10
Total species	95	82
Total individuals	1154	801
Most abundant	Gadwall (156)	Barn swallow (161)
Second abundant	Red-winged blackbird (139)	Canada goose (77)
Third abundant	European starling (82)	Chipping sparrow (51)

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. An adult Little Blue heron

(Egretta caerulea) was seen feeding in the northwest corner of Lower Derby Lake all day on 23 May. This is only the 2nd documentation (5/14/00) of this species on the Refuge.

1a.6. Winter Waterfowl/Waterbird Survey

The Rocky Mountain Arsenal NWR provides waterfowl 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. Surveys are conducted once every two weeks for a total of 1-3 surveys each month. Surveys are started 2 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. The Barrow's Goldeneye survey effort organized by the Rocky Mountain Bird Observatory was not conducted in December 2004 at RMA.

Thirteen surveys were conducted from October 18, 2004 to April 4, 2005 with a sum of 22 different species observed (Table 1a.5a) and a total of 12,914 ducks, geese, and marshbirds counted. Two surveys were conducted each month, with the exception of October and April (1 survey) and November (3 surveys). Canada geese, redheads, and ring-necked ducks were among the most abundant species observed per survey (Table 1a.5a). Waterfowl abundance generally peaks during spring and fall migration. However, the 2004-05 relative abundance pattern was not similar to previous years showing instead a peak of ducks occurring in November and geese in January (Figure 1a.5a).

Table 1a.5a. The total count, mean per survey, standard error per survey and species relative abundance of waterfowl on the Rocky mountain Arsenal NWR, October 2004-April 2005.

Species	Total Count	Mean/Survey	SE/Survey	% of Total
Marshbirds				
Pied-billed Grebe	25	1.9	1.2	0.2
Horned Grebe	1	0.1	0.1	0.0
Double-crested Cormorant	1	0.1	0.1	0.0
Swans, Geese				
Snow Goose	1	0.1	0.1	0.0
Canada Goose	1937	149.0	90.6	15.0
Dabblers				
Wood Duck	4	0.3	0.2	0.0
Green-winged Teal	477	36.7	6.8	3.7
Mallard	743	57.2	8.8	5.8
Northern Pintail	476	36.6	8.9	3.7

Blue-winged Teal	2	0.2	0.2	0.0
Northern Shoveler	522	40.2	14.5	4.0
Gadwall	852	65.5	16.2	6.6
American Widgeon	1020	78.5	24.4	7.9
Divers				
Canvasback	53	4.1	1	0.4
Redhead	1965	151.2	26.3	15.2
Ring-necked Duck	1850	142.3	25	14.3
Lesser Scaup	1316	101.2	43.9	10.2
Common Goldeneye	691	53.2	8	5.4
Bufflehead	164	12.6	4	1.3
Common Merganser	425	32.7	8.1	3.3
Ruddy Duck	12	0.9	0.8	0.1
Rails				
American Coot	377	29.0	10.2	2.9
Total	12914			

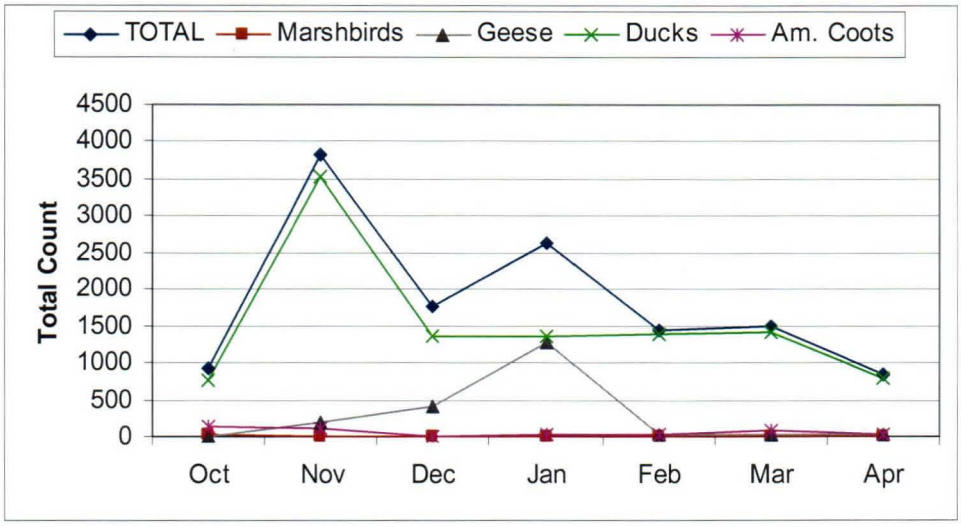


Figure 1a.5a. The total count of waterfowl observed per month on the Rocky Mountain Arsenal NWR from October 2004 – April 2005.

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. Dabblers comprised 39% and divers 61% of the observed duck population on the Refuge during 2004-2005. American widgeon were the most numerous dabbler contributing to the large duck counts in November. Ring-necked ducks and redheads were the most numerous of the divers also peaking in November followed by the third highest specie count of lesser scaup in March. (Table

1a.5b). The lakes at RMA provide important habitat for many waterfowl species with Lower Derby Lake and Lake Ladora the most frequently used by waterfowl (Figure 1a.5b), which is similar to that observed in previous years.

Table 1a.5b. The total number of waterfowl observed each month at the Rocky Mountain Arsenal NWR during surveys, October 2004 – April 2005.

	Total Count/Month						
Species	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Marshbirds							
Pied-billed Grebe	16	6	1	0	0	1	1
Horned Grebe	0	0	0	0	0	0	1
Double-crested Cormorant	1	0	0	0	0	0	0
Swans, Geese							
Snow Goose	0	0	0	1	0	0	0
Canada Goose	0	193	416	1276	18	14	20
Dabblers							
Wood Duck	3	0	0	0	1	0	0
Green-winged Teal	62	175	39	26	44	109	22
Mallard	27	213	160	148	124	47	24
Northern Pintail	75	213	81	66	34	5	2
Blue-winged Teal	0	0	0	0	0	0	2
Northern Shoveler	66	329	28	6	0	19	74
Gadwall	183	335	31	33	80	132	58
American Widgeon	60	620	83	165	56	28	8
Divers							
Canvasback	0	14	0	20	9	10	0
Redhead	65	600	391	415	282	158	54
Ring-necked Duck	200	754	258	175	320	124	19
Lesser Scaup	0	56	8	39	191	545	477
Common Goldeneye	0	85	117	149	141	161	38
Bufflehead	17	105	7	8	6	15	6
Common Merganser	0	14	146	101	104	50	10
Ruddy Duck	11	0	0	0	0	0	1
Rails							
American Coot	128	105	2	14	22	80	26

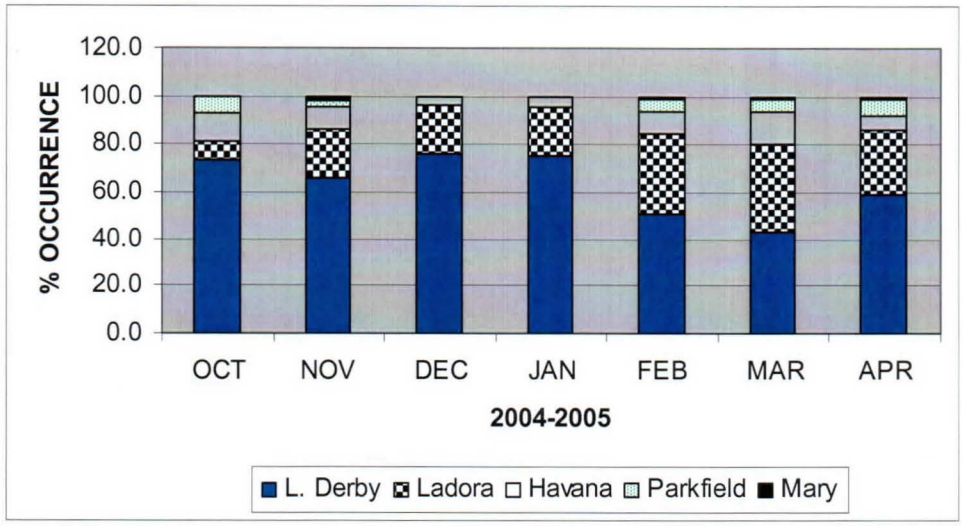


Figure 1a.5b. The monthly distribution of waterfowl, expressed as the observed percentage of use of five water bodies at Rocky Mountain Arsenal NWR during surveys from October 2004 – April 2005.

Species abundance and richness in 2004-2005 was noticeably less than in 2003-2004. The absence of pelicans, swans, and scoters accounts for the lower species composition. Generally, waterfowl abundance 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. Regional Christmas bird counts detected more waterfowl activity on rivers rather than lakes, possibly indicating open water available for feeding. For example, in the 17 years of counts within the count circle that includes RMA, the highest number of northern shovelers (2,142) were seen on sections of the South Platte River, while a single duck was counted on the Refuge.

1.a.6. Deer Surveys and Management

The Rocky Mountain Arsenal NWR can be considered an island of habitat in a predominantly urban environment. In March of 1990, the Army installed a 2.5-meter-high chain link fence around the entire perimeter of the site, effectively cutting off all migration of deer to or from the Refuge. With the opening of the Denver International Airport and its associated development, the Refuge has become even more biologically isolated. This isolation presents unique challenges for management of deer populations on the Refuge. Deer management efforts during FY 2005 included herd classification counts and a population estimate using mark-resight techniques. Previously, helicopter surveys were used to determine mule and white-tailed deer populations, but due to lack of funding for this endeavor, those surveys have been discontinued. The Colorado Division of Wildlife continued to provide field, data analysis support and advice on the initiation of deer population estimates using collared deer.

The strategy for performing age and classification counts was changed in FY 2005. Adult mule and white-tailed deer does were collared in early spring of 2004. Collars were uniquely marked for each individual and a decision was made to use a mark-resight

population estimate technique to quantify deer numbers on the Refuge. This technique resulted in the addition of three days to the classification count conducted in late November or early December. Six age and sex classification counts were conducted on December 7, 8, 9, 14, 15 and 16, 2004. In addition to the standard protocol for data collection for these classification surveys, information on the sighting of collared deer was noted on survey data sheets. Surveys for both years utilized the existing road system on the Refuge (Figure 1a.6.1). Of note is that as clean-up and restoration progress, the roads available for the survey will be impacted. An effort will be made to include an updated map with the yearly results of the classification count. Classification count results in the form of buck-to-doe and fawn-to-doe ratios for fall of 2004 are listed in Tables 1a.6.1 and 1a.6.2.

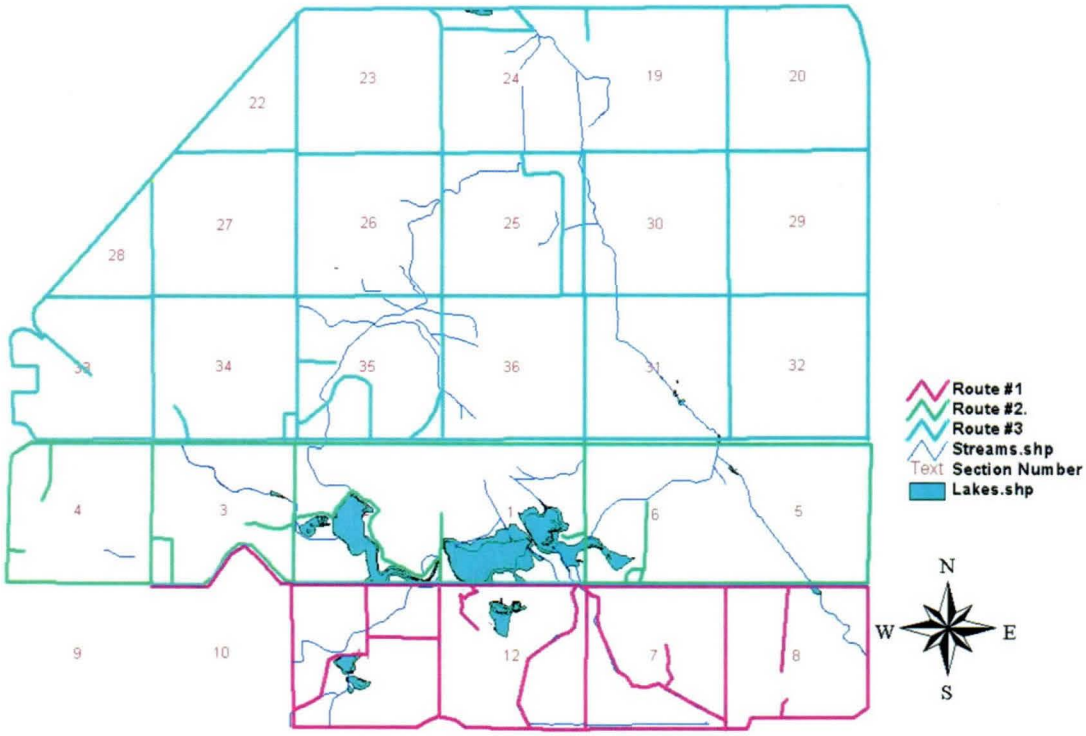


Figure 1a.6.1. Deer Classification Routes

Table 1a.6.1. Bucks per 100 does for mule deer and white-tailed deer at Rocky Mountain Arsenal National Wildlife Refuge 2004.

Species	Year	Bucks / 100 Does	95% Confidence Limit Lower	Upper
Mule Deer	2004	113	94	138
White-tailed Deer	2004	55	45	65

Table 1a.6.2. Fawns per 100 does for mule deer and white-tailed deer at Rocky Mountain Arsenal National Wildlife Refuge in 2004.

Species	Year	Fawns / 100 Does	95% Confidence Limit Lower	Upper
Mule Deer	2004	45	38	51
White-tailed Deer	2004	27	23	31

The following figure (Figure 1a.6.2) presents deer recruitment information for 1996 through 2004. The relative fawn-to-doe ratio shows an increasing trend in both species from a low for both species in 2002. Additionally, data trends for both species between 1996 and 2004 track similarly from year to year, suggesting that conditions causing change in yearly ratios may be Refuge-wide and not species specific. This concept will be revisited when final results from the Fawn and Doe Health Study initiated in 2004 are analyzed.

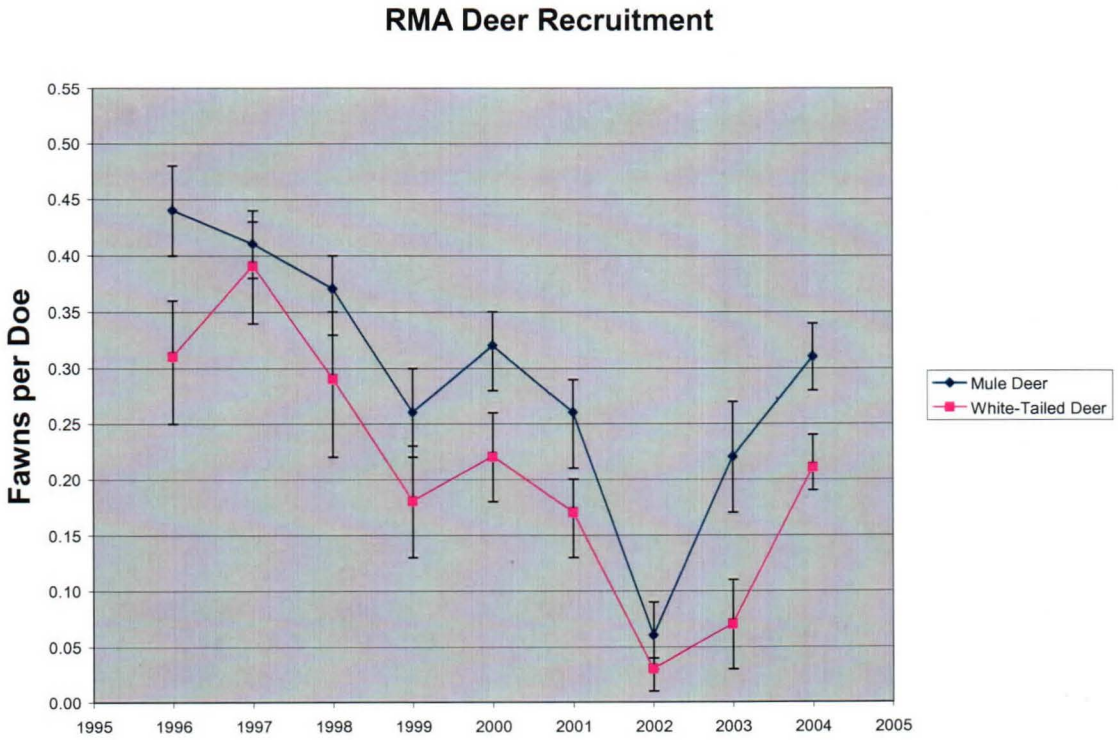


Figure 1a.6.2. RMA deer recruitment in mule and white-tailed deer 1996-2004.

Data was collected during the FY 2004 deer classification count to be used for estimation of populations of both mule and white-tailed deer. Occurrence of marked does was noted on the classification survey data sheet. The program NOREMARK was used to analyze a

subset of data collected during the classification survey. The survey data and results of NOREMARK analysis are summarized in Table 1a.6.3. This technique will be used as long as numbers of uniquely marked deer on the Refuge are sufficient for requirements of the analysis. The most recent population estimate was done using helicopter surveys in March 1998. The total number of deer was estimated to be approximately 950 with 632 mule deer and 318 white-tailed deer. Comparisons of these results with the 2004 estimates using NOREMARK show an overall decrease in total deer numbers (950 for 1998 versus 667 found in 2004). White-tailed numbers were slightly up in 2004 but the most notable result is the decrease in mule deer numbers (632 counted in 1998 versus 303 in 2004) since the 1998 census. Population determination will also occur in FY 2006 based on the November – December 2005 classification survey.

Table 1a.6.3. Mark-Resight Population Estimate for December 2004: Program NOREMARK (using Bowden's Estimator) Analyzed By: Noelle Ronan, USFWS staff member.

	# **Marked in Population**	# **Marked But Unidentified**	# **Unmarked Sightings**	# **Marked Sightings**	**Population Estimate**	**95% Confidence Interval**
All Deer Combined	53	4	2612	221	667	613 - 726
Mule Deer Only	24	0	1377	118	303	274 - 336
White-tailed Deer Only	29	4	1235	103	363	325 - 405

1a.8. Fish Surveys

Aquatic Management

Water quality results for 2005 all fell within State guidelines for RMA designated Class II warm water biota. In addition, water quality results were also well within Class I warm water criteria limits with the exception of pH for Parkfield wetlands and Lower Derby. In general, pH for all three RMA lakes was slightly elevated, but only Lower Derby results exceeded Class I pH recommendations of 6.5-9.0 for warm water biota. Levels in Lower Derby rose slightly above the upper limit (9.0) throughout the summer as water temperatures rose and aquatic plant growth increased.

Dissolved oxygen (DO) in all lakes was well above the warm water minimum standard for biota and spawning in Class I and II warm water. In addition, in all but a few samples, the DO level in all three lakes was also well within the guidelines for cold water biota and spawning. While RMA supports a warm water fishery, northern pike (one of the Refuges premier game fish) thrives in cool water conditions.

Shallow Secchi depths are a sign of increased turbidity, blocking light penetration resulting in less primary production. All three RMA lakes got progressively shallower readings throughout the summer, as would be expected. Lake Mary had the shallowest average Secchi depth readings, both in the spring and throughout the summer. Readings started out an average of 4.5 feet, dropping to less than 2 feet on average by the end of the summer. Readings in Lake Ladora were considerably deeper, with Secchi depths starting out at an average of 10 feet and spiking to 16 feet before decreasing to 4 feet at the end of summer. Lower Derby readings started at 11 feet on average before decreasing to less than 4 feet by the end of the summer.

Lower Derby had the highest average macroinvertebrate relative abundance with 6 subsamples, followed by Lake Ladora with 7 and Lake Mary with 9 subsamples. Relative abundance was estimated as the number of subsamples taken during processing to reach a total of 100 insects. Lake Mary had the highest average diversity with 8 taxa recorded, while both Lake Ladora and Lower Derby recorded 6 taxa each. Lake Ladora had the highest average percent Ephemeroptera (32%), while Lake Mary had 13%, followed by Lower Derby with 10%. Lake Ladora also had the lowest average percent Diptera (17%), followed by Lower Derby with 26% and Lake Mary with 31%. Lake Ladora also had the highest average percent sensitive taxa (32%), while Lake Mary had 14%, followed by Lower Derby with 10%. Conversely, as might be expected Lower Derby had the highest average percent tolerant taxa (90%), while Lake Mary had 86% followed by Lake Ladora with 68%. Lake Mary had the lowest average percent dominant taxa (37%), followed by Lower Derby with 47% and Lake Ladora with 53%.

Fish health assessments were performed on a representative sample of each species collected by gill nets and electroshocking for all three RMA lakes. A numerical score was tallied as a condition factor for each fish based on the total index value of 300. Condition factors with low or no score are indicators of fish in good health, whereas condition factors with higher scores indicate fish in poorer health. In addition, an average index value for each lake was calculated for comparison.

Fish from Lake Mary overall had higher condition factor scores compared with the other lakes. The electrofishing average score for Lake Mary was a 20. Gill net results for Lake Mary revealed an average score of 76, with largemouth bass having the highest condition factor of 88, whereas black crappie had the lowest of 25. Stomach content analysis for electrofishing in Lake Mary revealed that 50% of fish had empty stomachs, 34% contained fish and 16% invertebrates. Gill net results for stomach contents indicated that 58% had invertebrates, 31% were empty, 6% had vegetation and 5% contained fish.

Fish health assessment scores for Lake Ladora were lower overall compared to Lake Mary. The condition factor for northern pike was 41 for gill net samples. The electrofishing condition factor was a 10 overall, with largemouth bass a 0 and bluegill an average of 20. Most notable was the stomach content analysis for gill net samples where 60% of northern pike diet was invertebrates and only 33% fish. For electroshocking samples, largemouth bass stomach contents were 80% invertebrates and 20% empty.

For Lower Derby gill netting, the average condition factor was 27, with a single black bullhead scoring a 50, green sunfish averaging 20 and fathead minnows 27. For electrofishing, a single black bullhead was analyzed with a perfect condition factor of 0. Stomach content analysis revealed fish were feeding on invertebrates or in most cases stomachs were empty.

Fish surveys for Lake Mary reflected a fairly normal distribution of size classes for all species represented. Recruitment was good in all species with the exception of channel catfish, which do not naturally reproduce in lakes. Largemouth bass have fairly normal size distributions, with stock (8"), quality (12") and preferred sizes (15") of fish present. Some stunting may be occurring in the larger bass, as relative weights drop below the 93% standard in fish over 14 inches. The proportional stock density (PSD) for largemouth bass was 30. The generally accepted value for a balanced population is 40-70. Bluegill sunfish population dynamics include good reproduction and recruitment as well as representation by all size classes of fish with relative weights considerably above the standard. The PSD for bluegill was 39. The generally accepted index range for a balanced population is 20-60. While channel catfish were all well above the relative weight standard, the lack of reproduction combined with representation only by quality and preferred size classes of fish indicate stocking will be necessary in the near future to sustain the population. The proportional stock density for channel catfish was 100, indicating an unbalanced population of large fish.

Fish Surveys for Lake Ladora reflect an unbalanced size distribution for all species. The northern pike population is missing both stock (14") and quality (21") size fish with mainly preferred size (28") present. Largemouth bass populations are also missing stock (8") and quality size (12") fish, with mainly preferred sizes (15") present. While reproduction was good for both species, recruitment into stock and quality size classes is poor to nonexistent. Relative weights for northern pike were on average below standard, whereas largemouth bass weights were almost always well in excess of the standard. This is more than likely a reflection of a lack of forage fish for pike, whereas the bass do well feeding on invertebrates. The PSD for northern pike and largemouth bass was 100

for both species. The generally accepted PSD values for a balanced population of northern pike are 30-60, whereas largemouth bass are 40-70. The unusually high PSD value for both species indicates an unbalanced pike and bass population in Lake Ladora. Bluegill sunfish have a fairly normal distribution of size classes, although it is characterized by larger fish. While several of the fish had above average relative weights, about half fell below the standard. PSD values for bluegill in Lake Ladora were 22. Generally accepted PSD values for bluegills in a balanced population are 20-60.

A total of 292 anglers reported catching 1293 fish in Lake Mary for the 2005 creel. The majority of fish caught were largemouth bass (737), whereas 411 bluegill, 43 black crappie, 47 channel catfish, 46 northern pike and 9 unknown fish were also reported caught. The 46 northern pike were most likely a reporting error made by anglers. Overall angler satisfaction based on size of fish caught and the total number caught was 85%, with 1.32 fish being caught per hour. The average RMA angler fished 3.34 hours and classified themselves as experienced. Overall, RMA anglers fished 977 hours on Lake Mary in 2005.

The majority of fish caught in Lake Mary were in the 6"-8.9" range (30%), whereas 21% were caught in the 9"-11.9" range and 17% were caught in the 12"-14.9" range. The average size fish caught in Lake Mary was 10.37 inches long. The average bass was 11.41", average bluegill 6.05", average crappie 7.61" and average channel catfish 23.32" long.

A total of 379 anglers reported catching 1032 total fish in Lake Ladora for the 2005 creel. The majority of fish caught were northern pike (532) and largemouth bass (487), whereas 10 bluegill, 1 channel catfish and 2 unknowns were also caught. Overall angler satisfaction based on size of fish caught was 85%, whereas average overall angler satisfaction based on numbers of fish caught was 88% with an average of 0.8 fish caught per hour. The average RMA angler fished 3.4 hours and classified themselves as experienced. Overall, RMA anglers fished 1290 hours on Lake Ladora in 2005.

The majority of fish caught in Lake Ladora were in the 6"-8.9" range (21%), whereas 19% were in the 24"-27" range and 15% were caught in the 21"-23.9" range. The average size fish caught in Lake Ladora was 16.33 inches long. The average size pike was 23.5", bass 8.7" and bluegill 7.15 inches long.

Service biologists Noelle Ronan and Judson Spicer sample aquatic invertebrates on Lake Ladora, Rocky Mountain Arsenal NWR 2005.

State fish pathologist Pete Walker works with USFWS on fish health assessments at Rocky Mountain Arsenal NWR, 2005.

1a.8 Monitoring of Small Mammal Communities on Restored Grasslands

Small mammal communities at Rocky Mountain Arsenal National Wildlife Refuge (RMA) are monitored via live-trapping every other year as part of the biomonitoring program. Results are used to help determine project success or failure by analyzing data from established native grassland sites and comparing the results to those obtained from restoration sites. Because of RMA's long history as a pesticide and weapons manufacturing facility many areas are heavily contaminated. Therefore, restoration efforts often require drastic alteration to both soil and vegetation in an attempt to reestablish a native short grass and sand prairie ecosystem. Along with continued vegetation monitoring, measures of the functional value of these sites can be based on the knowledge of wildlife habitat relationships. The presence of animal species (in this case small mammals) that are generally regarded to be associated with short grass and sand prairie ecotypes are used as an index of restoration success.

Small mammal sampling periods were conducted biannually, once during mid-June and then again in late August or early September in order to maximize the number of species and individuals captured. Sherman live traps were placed at 10 meter intervals in 100 x 100 meter grids. Two grids, used as controls, were placed in areas with a high native grass component. Of these, one grid is located in the northwestern 1/4 of Section 33 (Control 1) and the second in the northeastern 1/4 of Section 3 (Control 2; Figure 1a.8a).

Two additional grids were established in sites planned for restoration, referring to areas that originally had a high component of non-native vegetation. The first is located in the southwestern 1/4 of Section 2 (Restoration 1) and the second in the southeastern 1/4 of Section 33 (Restoration 2; Figure 1a.8b).

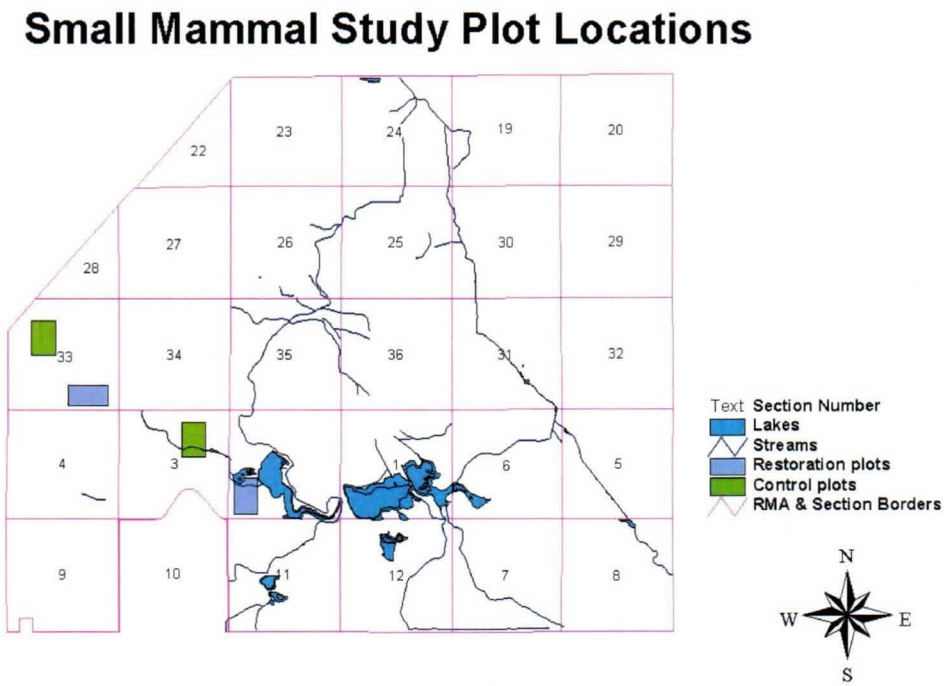


Figure 1b.1a. Map of RMA National Wildlife Refuge and study plot locations. Plots are not shown to scale.

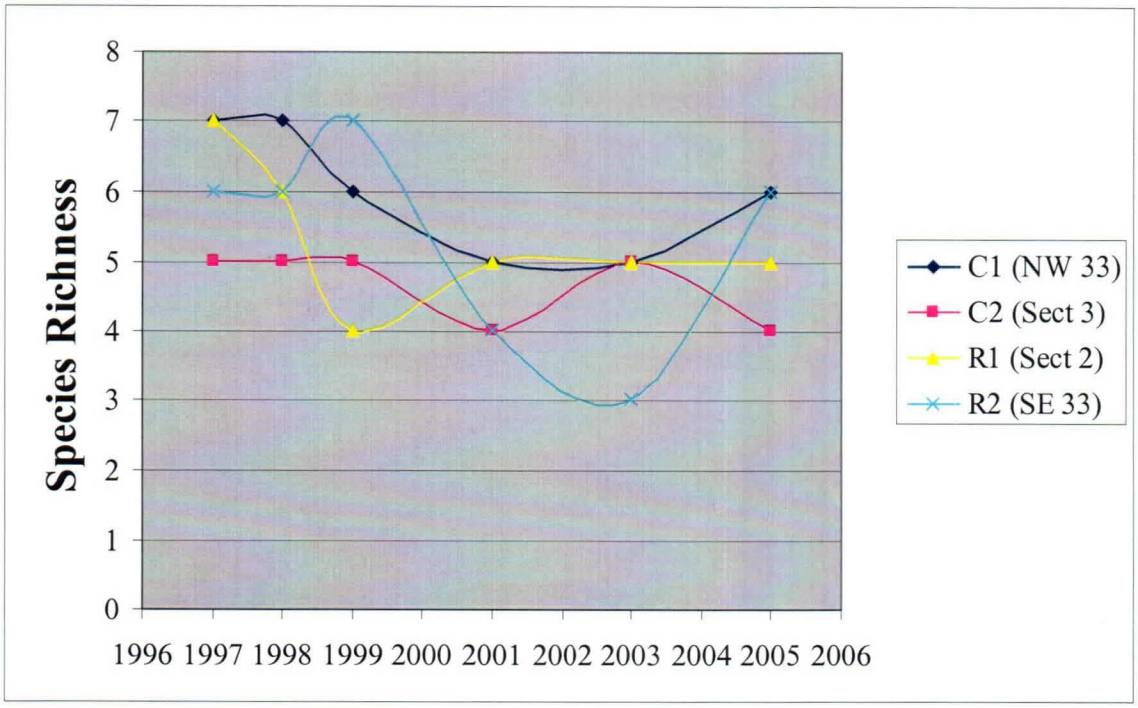


Figure 1a.8b. Fluctuations in small mammal species richness on grassland plots at Rocky Mountain Arsenal NWR, 1997 – 2005.

During each sampling period, live trapping was conducted for five consecutive nights, preceded by two nights of prebaiting. When prebaiting, traps were filled with cotton batting, and a small amount of oatmeal/peanut butter mixture was placed outside of the trap leading to the treadle. The same procedure was used for baiting the traps; however, a small pinch of millet was also placed inside the trap to sustain the mammal overnight if necessary. Traps were set each evening approximately 1-2 hours before sunset, depending on the weather and checked prior to, or immediately following sunrise the following morning. Each animal was identified to species, aged, sexed, individually marked, before being released near the trap in which it was caught. Recaptures were recorded and released.

Analysis of data from this study presented in the 2003 narrative, suggested the local small mammal populations were inherently dynamic. Species richness and abundance were not conclusively affected by restoration efforts and possibly could have been influenced by a prolonged drought from 2001-2004. Data collected in 2005 indicate comparable species were captured (Table 1a.8a), increased species richness (Figure 1a.8b), and amplified species abundance (Figure 1a.8c) might signify increased precipitation affected all plots equally.

Table 1a.8a. Small mammals captured on grassland plots in June and September, 2005 on Rocky Mountain Arsenal NWR.

	Grassland Plot			
Species	*C1 (NW*	*C2 (Sect*	*R1 (Sect*	*R2 (SE*

	33)	3)	2)	33)
Thirteen-lined Ground Squirrel	4	0	0	0
Western Harvest Mouse	22	35	24	46
Deer Mouse	46	52	65	22
Plains Pocket Mouse	52	39	32	19
House Mouse	0	0	0	1
Prairie Vole	1	43	9	6
Ord's Kangaroo	40	0	11	0
Hispid Pocket Mouse	0	0	0	1
Species Richness	6	4	5	6
Totals	165	169	141	95

1b. Studies and Investigations

American Kestrel Population Monitoring 2005

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 2005 included estimation of nest success, productivity and egg collection for contaminant analysis. 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. Nests were monitored approx. 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 33 nest boxes on the Refuge in 2005. Thirty-one nest boxes had kestrel breeding activity, with a total of 36 nest attempts. Eggs were found in boxes from March 18 to July 5 and chick fledging dates ranged from June 22 to August 16 (includes re-nest attempts). Nest success and productivity was high for kestrels at RMA and generally consistent with previous years (Table 1). Twenty-eight nests (77.7%, of 36 attempts) were successful (fledged ≥1 young), which is higher than 2004. Of the 5 re-nest attempts, 20% (n = 1) were successful. There was a total of 165 kestrel eggs laid and clutch size ranged from 2 to 6 eggs ($\bar{x}$ = 4.6, SE = 0.1, n = 36), with a 66% hatching success. Single eggs were collected for contaminant analysis from 25 nest attempts reducing the eggs incubated to 134. A total of 110 young hatched (82%) and 103 (88%) fledged. The sex ratio of young was 53% male and 47% female (n = 109 known sex individuals). The mean number of young fledged per nest attempt was 2.9 (SE = 0.3, n = 36) and the mean number of young fledged per successful nest was 3.7 (SE = 0.3, n = 28).

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 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).

Thirty-four kestrel eggs were submitted for contaminant analysis. Thirty-one eggs were collected from peripheral nestboxes and 3 from core nestboxes. Three of the eggs from the periphery had dieldrin levels over method detection limit; at 0.084, 0.082 and 0.0791 parts per million (ppm). Twelve of the 31 eggs had detection of dichlorodiphenyldichloroethylene (DDE) with a mean of 0.223 ppm and range of values from 0.042 ppm to 0.864 ppm.

Of the three eggs submitted from the core boxes, two had detections of dieldrin at 2.78 ppm and 0.0948 ppm. All three had detections of DDE with a mean value of 0.1 ppm.

Kestrel nestbox monitoring will be a component of the overall biomonitoring plan. A summary of all kestrel nestbox monitoring for the site will be presented in the FY 06 narrative.

Table 1b.1. Reproductive estimates for American kestrels at Rocky Mountain Arsenal NWR, CO from 1999 to 2005.

	Year					
Activity	**1999**	**2001**	**2002**	**2003**	**2004**	**2005**
# Nest Attempts	35	38	32	33	38	36
Mean Clutch Size	4.8	4.8	4.8	4.5	4.6	4.6
% Successful Nest Attempts	51	74	88	90	66	78
Mean # Fledged / Nest Attempt	1.7	2.1	3.9	3.2	3.0	2.9
Mean # Fledged / Successful Nest	3.4	2.9	4.5	3.7	4.1	3.7

Burrowing Owl Reproductive Success and West Nile Virus Monitoring

Burrowing owl nest success and reproduction is monitored each year at RMA but in 2005 efforts involved additional study. In cooperation with USGS Ft. Collins Science Center and USGS National Wildlife Health Center, burrowing owls were monitored as part of an ongoing study to evaluate the potential long-term impacts of West Nile Virus (WNV) on wild raptor populations along the Colorado Front Range (see Section XX, American Kestrels). The study included nest searches, trapping to band owls and collect samples for WNV testing, and nest observations to estimate the number of young fledged at nests. This study provides information on the level of occurrence and potential impacts on reproductive success of WNV on burrowing owls.

Additionally, burrowing owl feathers were collected as part of a collaborative effort to understand burrowing owl migratory linkages. The project is coordinated through the University of Arizona and includes burrowing owl researchers throughout the southwestern U.S. The goal is to use stable isotope ratios in feathers to identify the wintering locations of burrowing owls and determine the amount of exchange among populations throughout the region. This will provide information on movement dynamics among burrowing owl populations which will help in developing informed conservation measures for declining populations.

The study was conducted from April through July 2005. Nests searches began in April and included driving surveys along established roads and area searches around/in prairie dog colonies. We captured adult and young burrowing owls at nests using tomahawk traps, 2-way burrow traps, bow nets, and bal-chatri traps. Once captured, we banded owls with an FWS aluminum band and an alpha-numeric color band (Acraft band), collected approx. 1.0 cc of whole blood (WNV analysis, DNA analysis, and slides for parasite analysis), and an oral swab (WNV analysis) prior to its release. One tail feather was collected from adults and 3-4 body feathers were collected from young burrowing owls. Other body and condition measurements were also recorded. Blood samples were centrifuged, fractionated, and frozen, and oral swabs were put into viral transport media and frozen prior to being sent to the USGS National Wildlife Health Center for WNV determinations. Blood serum and swab samples will be tested to determine WNV status (virus positive, antibody positive and titer, virus and antibody negative) using an epitope blocking WNV ELISA, and rtPCR. To address the potential effects of WNV at the population level, we collected data on nest success and productivity. Because burrowing owls nest underground, obtaining reliable estimates of reproductive rates can be difficult therefore we used standardized observations to determine relative productivity for burrowing owls; (5) 15 min. observations conducted during morning and evenings within a 1 week period. Nest success was determined using regular nest visits and standardized nest observations. In 2006, we will search for banded owls to obtain information on return rates, an index of survival.

We located a total of 85 burrowing owl nests (Fig. 1) which represents approx. twice the average number of nests at RMA in most years. Nests were found from April 4 through June 30, with those found later in the season likely representing re-nest attempts (% of

nests found in April = 41, % of nests found in May = 48, % of nests found in June = 11). All nests were in active prairie dog colonies.

We were able to determine the nest fate (success/failure) at 83 of the 85 nests. Of these known-fate nests, 87% (n = 72) were successful (fledged at least 1 young). Due to the large number of nests, we selected a random sub-sample of nests to conduct observations to estimate productivity (Fig. 1). We were able to successfully complete observations at 26 of the original 30 nests randomly selected for standardized observation. The average number of young fledged per nest attempt was 3.92 (SE = 0.93, range = 0 – 7) and the average number of young fledged at successful nests was 4.64 (SE = 0.37, range = 1 – 7).

We trapped at 64 (75%) of the 85 burrowing owl nests from June 2 through July 18. Capture effort occurred primarily from 1630 – 0030 though some morning trapping was conducted. Because evening trapping took advantage of the burrowing owls' primary hunting and activity periods, generally, trap success was greater. The mean number of times nests were trapped was 1.9 (range = 1 to 4). We captured and banded 30 females and 11 males. Of the 118 burrowing owl young caught, 114 were large enough to band. The average number of young banded at all nests that were trapped was 1.8 (range = 0 - 8) and 2.9 for those nests where at least 1 young was captured (range = 1 – 8). We recaptured 1 adult female that had been banded as a chick in 2002 near her current-year nest (approx. 500 m). During the 2005 season, we had 30 separate resights of banded individuals at 13 different nests. Six owls were recaptured or resighted more than once during the season. We collected feather samples from 54 of the nests where capture efforts were made. We collected feathers from all adults and young captured and sent samples to the University of Arizona for analysis; results of isotope analysis are not yet complete. For analysis of WNV occurrence, parasites, and DNA, we collected a total of 155 whole blood samples, 159 oral swab samples, 157 DNA samples, and 160 slide samples and we were able to resample a total of 5 individual owls (Table 1). Samples are currently being analyzed at the National Wildlife Health Center.

Consistent with published literature, burrowing owls show no sexual dimorphism as indicated by a comparison of mean male and female weight, wing cord and body condition index (mass [g] / wing cord [mm]) which did not differ significantly (t-test P value = 0.33, 0.81, and 0.21, respectively). Also, the mean body condition index did not differ significantly among males, females, and young (Fig. 2) and female body condition (body condition index, fat, and breast muscle) was not a factor affecting the number of young fledged at nests (ANOVA P value = 0.66).

The average number of burrowing owl nests at the Refuge is approximately 40 each breeding season. To date, this year's number of nests is the most documented for the Refuge. Though nest search effort was greater this year compared to recent years, this does not account for all of the large difference in the number of nests. Nests close to the roads (i.e. within 100 m) have a high probability of being detected due to the effectiveness of repeated driving surveys and in 2005 there were more nests in areas close to the roads than in previous years. Nest success and productivity were typical for the species and the Refuge. The number of acres of active prairie dog colonies decreased

slightly from 1,063 acres in 2004 to 1,006 acres in 2005. Therefore, an increase in available habitat in prairie dog colonies does not account for the increase in burrowing owl nests. Other potential factors influencing occupancy include higher return rate of owls from the previous year(s) and a good prey supply. Burrowing owl reproductive success, including large brood sizes (range = 1 – 11), was good in 2004. Finally, burrowing owl populations typically fluctuate yearly and 2005 represents an exceptionally good year for occupancy.

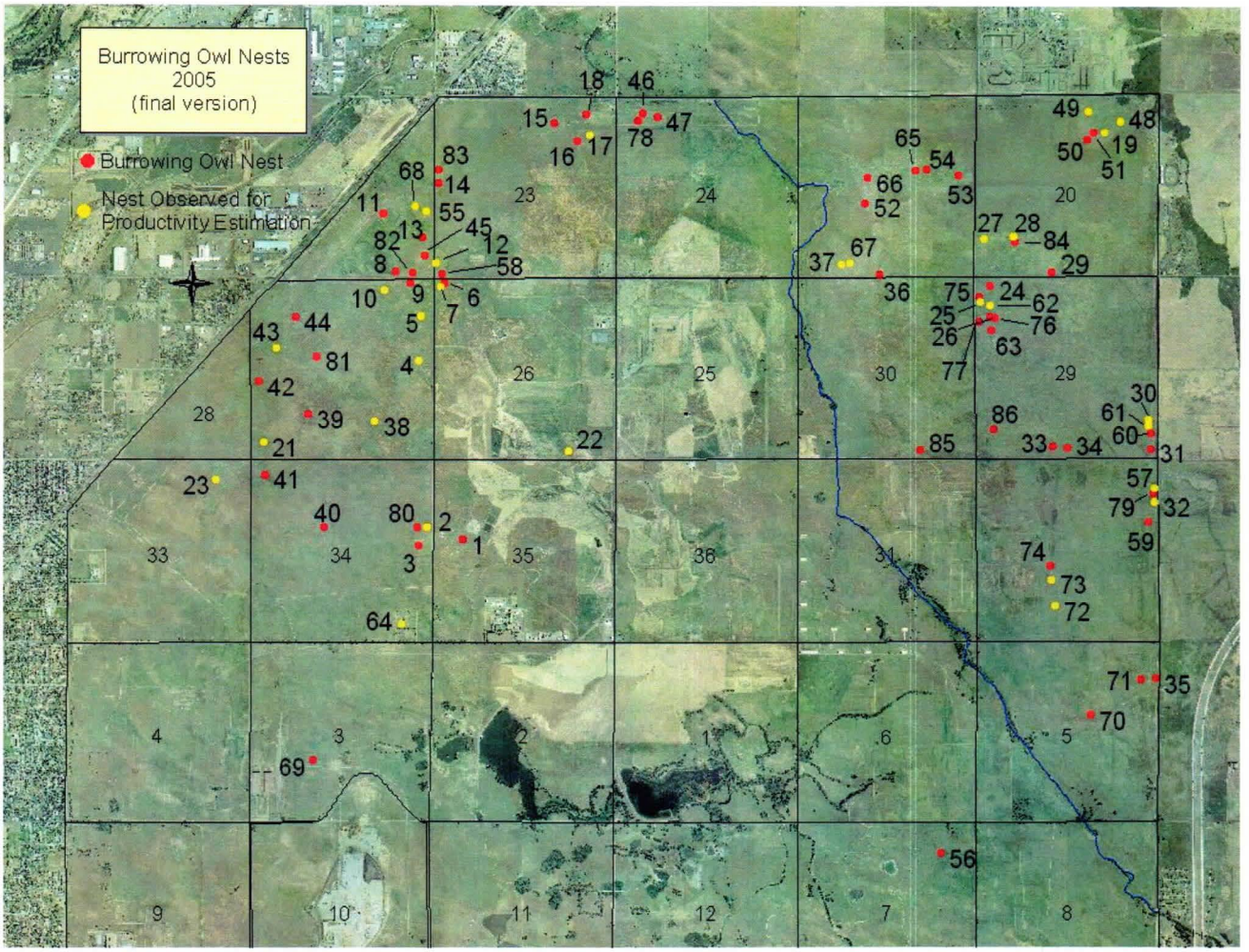


Figure 1. Burrowing owl nests located at the Rocky Mountain Arsenal NWR, CO from April to July 2005. The yellow (light color) nests indicate those randomly selected for standardized observations to estimate productivity (the number of young fledged at nests).

Table 1. Biological samples collected from female, male, and young burrowing owls at the Rocky Mountain Arsenal NWR, CO from April to July 2005 for analysis of West Nile Virus occurrence (whole blood and oral swabs), parasites, and DNA.

	Total Biological Samples				
Owls	Whole Blood	Oral Swab	DNA	Slides	# Individuals Re-sampled
Females	33	31	31	31	3
Males	10	10	10	10	0
Young	112	118	116	119	2

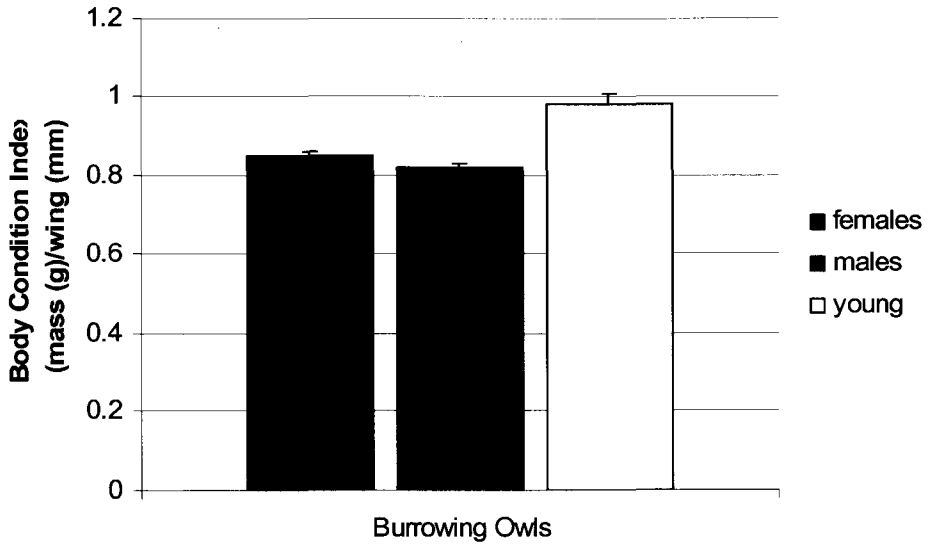


Figure 2. A comparison of the mean (± SE) body condition index (mass [g] / wing cord [mm]) of female, male, and young burrowing owls at the Rocky Mountain Arsenal NWR, CO, 2005.

Field Investigation of Endemic Foci of Plague in the Southwestern United States II – Colorado - Testing of Diagnostic Assays & Archiving of Specimens

PRINCIPAL INVESTIGATOR/DIVISION: MAJ James Koterski / DSD

CO-INVESTIGATOR(S)/DIVISION: Dr. Mark Wolcott / DSD

I. **NON-TECHNICAL SYNOPSIS:** *Yersinia pestis* is the cause of plague, a disease of immense significance historically, and grave potential biostrategically. There are just a

few places within the world where endemic foci of plague are known to exist, and occasional epizootics are known to occur. The principal focus for plague activity in the U.S.A. is in the "four corners" region of the southwest (Arizona-Colorado-Utah-New Mexico). In this study, several sites within this region will be identified for active surveillance for plague activity. This surveillance will take the form of a combined sampling program focusing on known enzootic host species, and the surrounding triad of predators, parasites and environment. Specimens will be analyzed using classical methods such as bacterial culture and developing technologies such as polymerase chain reaction (PCR) & electrochemiluminescence (ECL). The samples will be collected in conjunction with ongoing US Fish & Wildlife Service monitoring of the small mammal communities on restored grassland areas of the Rocky Mountain Arsenal (RMA). Blood, swabs and ectoparasites will be obtained from rodents by wildlife biologists and ecologists during their routine population surveys. The captured animals will be sedated for sample collection, then recovered and released. The scheduled population survey will take place in 4 locations on the RMA in late summer of 2005. In the event that epizootic activity should be observed earlier in the summer or later in the fall, then the schedule would be adjusted. Epizootic activity is generally characterized by a prairie dog or rock squirrel "die-off." In the event that a such an epizootic or die-off should occur, the Field Operations Branch of the Diagnostic Systems Division (DSD) could use this naturally occurring mass casualty scenario as a virtual yardstick to measure the effectiveness of classical, existing and nascent diagnostic systems in an actual field situation.

II. BACKGROUND

II.1.Background:

The intent of this study is three-fold:

1) To procure samples of *Yersinia pestis* from naturally occurring endemic foci of infection.
2) To use these samples to compare the performance of diagnostic assays under field conditions.
3) To archive diagnostic specimens for use in reference laboratory verification of field test results and for ongoing comparison of old, new, and emerging generations of diagnostic assays.

This effort combines the needs and capabilities of all major components of the Diagnostic Systems Division (DSD) of USAMRIID. DSD is comprised of three branches: Systems Development-Molecular Diagnostics (MD), Applied Diagnostics-Immunodiagnostics (ID), and Field Operations & Training (FO&T). Diagnostic platforms that have been created and/or refined by the MD and ID may then proceed on to *in vivo* studies in laboratory animals or to field testing. The FO&T Branch now houses the Animal Studies section, the Field Operations section, and the Field Identification of Biological Warfare Agents (FIBWA) section. The Animal Studies Section has been created to design and perform the experiments necessary to provide the raw materials (bodily fluids, tissues and

swabs) through which the products and components of MD and ID can be tested. Success in intramural studies *in vivo* studies would substantiate the integration of a new or improved diagnostic platform into the next level of testing, the field study (See Research Plan 02-4-8I-047 – Field diagnostics). The data derived from these tissues could then be integrated and used to support diagnostic assay validation by the FDA.

In the past, field studies conducted by the FO&T Branch of DSD have focused on the collection of post-mortem tissue specimens and environmental samples from several study sites: from carcasses of bison suspected to have been infected with anthrax in the Northwest Territories of Canada, and prairie dogs suspected to have been infected with plague in Montana. One limitation of these post-mortem studies was posed by the ability to locate carcasses, and by the freshness and accessibility of the tissues that were found. During the summer of 2004, a live capture and release field study focusing on *Y.pestis* was conducted in northeast Arizona in conjunction with two Native American nations, the White Mountain Apache and the Hopi. In that study, we attempted to conduct a slightly longer and broader survey, incorporating the examination of hosts, parasites, predators and the environment over a time period when a seasonal peak in disease activity was expected to occur. In each location there was serological evidence of disease exposure in the carnivore population but no evidence of active disease in the rodents. There is reason to believe, however, that due to a second consecutive wet winter, that plague activity may be on the rise in 2005 (19, 26). The study site for this fiscal year is the Rocky Mountain Arsenal, in Commerce City, Colorado.

Yersinia pestis, a non-motile, Gram-negative coccobacillus, is the etiologic agent of plague. Plague is a disease which may take a number of forms: bubonic, septicemic, and pneumonic. In humans, the most well known form of plague is the bubonic type, which is spread by the bite of infected fleas from infested rats and is acutely characterized by the painful swelling of regional lymph nodes. Bubonic plague will commonly spread via the blood, leading to the septicemic form. If the infection seeds the lungs, then secondary pneumonic plague may result. If the organism is then shed into the air through coughing and infects another host through the aerosol route, then primary pneumonic plague occurs (1).

Primary pneumonic plague may also result if *Y. pestis* were to be aerosolized intentionally, as a biological warfare or terror agent. The aerosol exposure of a large number of soldiers or citizens to a biothreat agent would certainly be a complex event. Small differences in any one of a multitude of parameters may have a large impact on the effect of the attack. A few examples of the many potential variables would include the following: environmental conditions, the specific bacterial strain, the method by which the aerosol is generated, the particle size achieved, the dose, the distance and the direction from the point of release. The event of aerosol exposure with a biological threat agent may or may not be recognized by the target population, yet for most infectious agents, disease manifestations may not be seen for several days. For *Y. pestis*, it is believed that the incubation period, or the time between an aerosol exposure and the onset of clinical signs, may be as short as 24 or as long as 72 hours. If the disease is diagnosed and treatment is initiated early enough, then patients may be able to eliminate

the organism and survive the infection. Once clinical signs commence, however, treatment with antimicrobials is unlikely to be effective (2, 3, 4). Thus, the early recognition of a biological attack and swift identification of the organism involved is critical to successful medical intervention. Although the passage of plague through a prairie dog colony or other small mammal population would be expected to be very different from an aerosol attack on a military unit, it is likely that significant parallels could be drawn. The data generated from this study will be used to gauge the efficacy and usefulness of DSD diagnostic platforms in a field environment in which plague is known to occur. It is hoped that our findings may shed some light on the application of diagnostic technologies to a human mass casualty scenario.

Although plague is commonly viewed as a disease of historical interest, there is considerable evidence documenting the development of *Yersinia pestis* as a biological weapon by the former Soviet Union (See Section IV. – Military Relevance). Endemic foci of plague are know to exist within the confines of the former Soviet block (Kazakhstan), in Africa (Madagascar) and within the United States. The principal focus for plague activity is in the "four corners" region of the southwestern U.S. (Arizona-Colorado-Utah-New Mexico). It is believed that plague bacteria exists at low levels for prolonged periods among resistant enzootic hosts, such as voles or deer mice. This enzootic cycle can progress to epizootic levels when environmental conditions allow for increased populations of susceptible epizootic hosts, such as the rock squirrel or prairie dog. Intermixing of these populations can result in the introduction of the plague bacterium into these susceptible populations where morbidity and mortality are high. A few of the variables that are believed to contribute to the occurrence of outbreaks are these: above average spring rains, a relatively cool summer, increased quantities of forage for wild rodents, a corresponding increase in wild rodent populations and flea infestation (19, 26). Wherever these conditions coincide with human activities, and especially in areas where the public health infrastructure is sub-optimal, the opportunity for zoonotic disease transmission exists. This spring the southwestern states, for the second year in a row have experienced an increased amount of precipitation, which could set into motion the chain of events described above, leading to an increased incidence of plague.

In many areas in which plague is endemic, active surveillance for plague is conducted by state and local Departments of Health within their respective jurisdictions. On Federal lands, surveillance efforts vary. Due in large part to the drought in the southwest and many years in which there were few case reports involving *Y. pestis*, there is now no ongoing plague surveillance activity being conducted on the RMA. However, plague epizootics have been documented there on a regular basis since the mid-70's (20), and *Y. pestis* infection was identified as the cause of death in two prairie dogs in 2004 (Appendix 5). The concept for this study is to conduct plague surveillance on the wild rodent population in conjunction with ongoing USFWS biodiversity surveillance. See Appendix 4 for full details regarding the ongoing monitoring program for small mammal communities at RMA. The details pertinent to the background of their study are also included here:

"Changes in small mammal abundance and species composition in restoration and control plots have been monitored since 1997 by means of live-trapping with the goal of measuring the effectiveness of these restoration projects. Variation in species richness, total captures, and Shannon diversity appear related to both restoration efforts and interannual variation in weather. RMA has a fairly diverse small mammal community as indicated in previous studies (Boone 1995, Allen 1996). Ten species of small mammals were recorded on the Refuge. Deer Mouse *(Peromyscus maniculatus)*, Western Harvest Mouse (*Reithrodontomys megalotis*), and Thirteen-lined Ground Squirrel (*Spermophilus tridecemlineatus*) being the most abundant. Small mammals were selected as a group because of their importance as a prey base on RMA, and their role in ecological processes such as nutrient recycling (Adler 1988, Clark 1989, Danielson 1995, Chew 1978). The short-term goal (first 5 years) in restored sites is to maintain representative small mammal densities. The long term goal (5-15 years) will be to establish small mammal species diversity and richness that reflects a more established and mature prairie rather than just representative population densities." (31 - Appendix 4)

Some rodents, such as the mouse and the ground squirrel are believed to serve as enzootic hosts for plague, and become chronically infected at low levels, but are relatively resistant to the more severe manifestations of the disease. Others, such as the prairie dog are amplifying or epizootic hosts, and are very susceptible to the disease. We will attempt to obtain a representative sample of rodent species on the arsenal grounds. The rodents will be live-trapped, their signalment will be recorded. They will be sedated, combed for fleas, bled, swabbed and then released. Environmental samples from rodent burrows and carcasses, if encountered, will also be collected (20). The samples will be analyzed by USAMRIID personnel using newly developed diagnostic assays and compared with the gold standard, classical microbiological culture.

The ultimate goal of this study is to improve the accuracy, precision, power and fieldability of diagnostic tests for *Yersinia pestis*. Although diagnostic tests are frequently viewed as giving a definitive, yes or no answer to clinical questions, the reality is somewhat more complicated. Any diagnostic test is subject to a multitude of variables that may alter the clarity of the result. A system offering several complementary or overlapping avenues of approach to agent identification would increase the level of confidence in the final result. The development of such an integrated diagnostic system is predicated upon a thorough understanding of the pathogenesis of threat agent or agents involved. Achievement of this goal would be facilitated greatly by the ready availability of a bank of samples of infected tissues from both laboratory animal studies and endemic foci of natural infection. Both the science of pathophysiology and the FDA approval process for diagnostic devices are dependent upon the integration of statistically significant findings from a variety of sources. The research design described in these experiments focuses on the generation, collection, archiving and analysis of the broadest and deepest range of diagnostic sources possible for pre-validation of diagnostic tests. The availability of this archive will supply the raw material required to compare the diagnostic tools of yesterday with those of today and tomorrow.

Diagnosis of infectious disease may focus either on detection of the invading organism, or on the reaction of the host. The results of any diagnostic test rely heavily upon the quality of the sample – including the exact source, the method and timing of collection, and the care with which a sample is handled and processed. Classical microbiological methods of plague diagnosis, such as culture or microscopic examination of a stained aspirate of a swollen lymph node, would take too long to effectively guide therapeutic decision-making in a battlefield or other mass casualty scenario. The development of a host antibody response would take even more time (3,4). Thus, it is imperative to develop, validate, and field rapid and rugged diagnostic assays for *Yersinia pestis* and other biological threat agents. Two assays that are in advanced stages of development are the real-time polymerase chain reaction (PCR) and the electrochemiluminescence (ECL) assays. An assay in the preliminary stage is the host DNA microarray. The tissues collected in this study will constitute one source for a pre-validation package designed to support eventual FDA licensure of these assays.

III. **OBJECTIVE/HYPOTHESIS:** Current diagnostic platforms can be employed to detect *Yersinia pestis* from naturally occurring cases or environmental specimens collected at endemic foci of disease.

IV. **MILITARY RELEVANCE:** Throughout history, *Yersinia pestis* has been a problem for armies fighting in regions where the disease was endemic. Plague foci still exist throughout the world, principally in Africa, but also in Asia and the Americas (1). It is believed that plague was first used as a biological weapon by the Tatars on the Genoese during the siege of Caffa in 1347 (2). The Japanese are reputed to have used plague against the Chinese in WWII (2). The ecology and epidemiology of plague were studied extensively in the 1960's since plague was endemic in Vietnam (2). Both the U.S. and the former Soviet Union are known to have weaponized *Yersinia pestis* during the Cold War (3). Although the U.S. offensive biological weapons program was terminated and *Y. pestis* stocks were destroyed in the early 1970's, plague continued to be developed by the Soviet Union, and has been reported to have been their number two bioweapon priority, second only to anthrax, with more than 10 institutes devoted to its development (15). The Centers for Disease Control (CDC) classifies potential biothreat agents as Category A-C, with A being the greatest potential for harm. It should be noted that plague, along with smallpox, are the only two agents on the CDC's category A threat list that are contagious (16). Thus, *Y. pestis* may be considered a threat from both the conventional infectious disease perspective and as a biowarfare/bioterrorist threat. Consequently, rapid detection of this organism, after either aerosol or environmental exposure is a significant thrust of USAMRIID's force protection efforts.

V. **MATERIALS AND METHODS**

V.1. Experimental Design and General Procedures:

Experiment 1a: Rocky Mountain Arsenal – Small rodent survey

This study will take place in late summer (Aug-Sep 2005). Four sites on RMA will be studied. Rodents will be trapped at these sites, and identified to species. The rodents will then be sedated, aged, weighed, measured, bled, swabbed, combed, sexed, individually marked, then recovered and released. The trapping will be conducted by USFWS field biologists at RMA. The details pertinent to the experimental design and general procedures are included here:

"Small mammal sampling periods were conducted biannually, once during mid-June and then again in late August or early September in order to maximize the number of species and individuals captured. Sherman live traps were placed at 10 meter intervals in 100 x 100 meter grids. Two grids, used as controls, were placed in areas with a high native grass component. Of these, one grid is located in the northwestern 1/4 of Section 33 (Control 1) and the second in the northeastern 1/4 of Section 3 (Control 2; Figure 1). Two additional grids were established in sites planned for restoration, referring to areas that originally had a high component of non-native vegetation. The first is located in the southwestern 1/4 of Section 2 (Restoration 1) and the second in the southeastern 1/4 of Section 33 (Restoration 2; Figure 1). Plot selection was made on the basis of soil similarity, logistical convenience, and the likelihood that these locations would not be a part of future remediation efforts.

Experiment 1b: Rocky Mountain Arsenal – Prairie dog survey

This study will also take place in late summer (Aug-Sep 2005). Locations of prairie dog towns have been determined by RMA wildlife biologists and mapped via global positioning system (GPS). There will be 3 trapping sessions of 2 days each. Two types of traps will be used. One open wire Tomahawk trap for larger diurnal rodents (>500g) (H. Sherman Traps, Tallahassee FL and Tomahawk Live Trap, Tomahawk, Wisconsin) will be placed in a suitable location near burrow entrances and pre-baited with Sweet-Mix (Purina, St. Louis MO) for 1 day prior to the day the traps are set. On the day the traps are set, they will be baited with Sweet-Mix. The Tomahawk traps (for the diurnal species: rock squirrel and prairie dog) will be placed under shade to prevent hyperthermia. They will be opened at dawn, and checked by noon of the same day. Live-trapped wild rodents will be sedated, aged, weighed, measured, bled, swabbed, combed, sexed, individually marked, then recovered and released. Prairie dogs are the sole intended target. If there are other animals that are caught in these traps, they will be identified and released or handled in accordance with the recommendations of the attending veterinarian. Any endangered species identified will be released. Care will taken to minimize stress, transport times and temperature extremes. Captured rodents will be brought to a shaded central field location for processing at each trapping session and then released at the site of their capture. Fluids will be available for both animals and researchers. All traps will be sprung and removed at the end of each trapping session and transported to the next study location. We will make every attempt to leave the environment undisturbed. According to this schedule there will be 150 (50 traps x 3 trapping sessions) diurnal trapping opportunities over a 10 day period. In the event that dead or inactive colonies are encountered, fleas will be collected by burrow swabbing (20). Soil samples from the burrow entrance will also be collected. Carcasses, if found, will be collected, and a post-

mortem examination will be performed. Tissue samples will be preserved in formalin and/or frozen and returned to USAMRIID. (See Appendices 2 and 3)

Data Analysis:

The primary goal of this protocol is the collection of samples for further study, not testing of a statistical hypothesis. The data gathered in this study will be descriptive in nature. The numbers of animals sampled both at the clinics and in the fields needs to be sufficient to provide adequate samples for subsequent testing. A similar study found a 3:1 ratio in both the number of fleas collected to number of burrows sampled and in the number of fleas collected to the number of prairie dogs trapped. The study also found that approximately 70% of traps were successful in capturing animals. (Seery DB, et al, J Med Entomol. 40(5):718-722 (2003)). Following these findings, the proposed 50 Sherman traps and 50 Tomahawk traps will allow the investigators to obtain samples from approximately 105 animals of each target species and to obtain 630 fleas per experiment.

Animal Model and Species Justification:

As described in the background section, plague exists in endemic foci throughout the southwest, and periodically erupts as an epizootic when conditions are ripe. In this area ground squirrels and deer mice are the most common maintenance or reservoir hosts and prairie dogs are the amplifying host species most likely to be involved in large disease outbreaks. The existence of a sentinel population of animals linked to endemic wildlife foci offers a unique opportunity to examine the usefulness of multiple diagnostic assays under field conditions. Listed below are the common host / flea species pairings implicated in enzootic and epizootic plague in the southwestern U.S.A. (2):

Prairie dogs (*Cynomys* species)	/ *Opisochrostis hirsutus*
13-Lined Ground Squirrel (Spermophilus decemlineatus)	/ Oropsylla bacchi
Rock squirrels (Spermophilus variegates)	/ *Diamanus montanus* *Hoplopsyllus anomalus*
Deer Mice (*Peromyscus maniculatus)*	/ Diverse spp.of fleas, including *Aetheca wagneri, Atyphloceras multidentatus Catallagia spp, Peromyscopsylla spp.,* and *Rhadinopsylla sectilis sectilis.*

Animal Manipulations

Injections:

Anesthetic injections, if needed will be performed in accordance with the guidance given in intramuscularly in the flank of rodents in accordance with the HWCI (22) and in USAMRIID SOP AC-11-11. Gaseous anesthesia is routinely safe, effective and preferred since potentially infectious fleas are anesthetized as well, whereas injectable anesthesia leaves the fleas active, posing a potential health hazard for animal handlers. (Personal communication – Mr Frederick J. Harrison – USACHPPM-West Protocol for Small Mammal Handling).

Biosamples:

Blood: Blood will be collected from the jugular or femoral vein of rock squirrels or prairie dogs (Personal communication – Dr. David Hunter, Turner Endangered Species Fund, Bozeman, Montana) using 1 or 3 cc syringe (based on weight and calculated expected volume) with 23-27 gauge needles in a manner akin to that detailed in USAMRIID SOP AC-13-22 (<7% blood volume calculated from the weight based blood volume estimate). Blood (0.1-0.2ml) will be obtained from anesthetized small rodents either retro-orbitally or via tail clip and collected in a capillary tube or on a Nobuto Strip (Advantec, MFS, Inc.).

Swabs: A rayon-tipped swab will be used to sample each animal in the oropharynx. All samples will immediately be immersed in media, and placed on ice in a portable ice chest. One aliquot will be tested in the field. The other aliquot will be frozen and be returned to USAMRIID and thawed at a later date for repeat culture, PCR and ECL.

Burrow Swabs: Fleas will be collected by burrow swabbing (20). This procedure is performed by attaching a 25cm square flannel cloth to the end of a flexible metal rod and inserting it as deeply as possible (2-5m) into the chamber. After approximately 30 seconds the rod is pulled out and the cloth, with any fleas attached is sealed in a ziplock bag. At the end of the day, fleas will be counted and extracted for analysis by microbial culture, PCR and ECL. Again the extract will be divided into 2 aliqouts. One of these will be analyzed in the field and the other will be frozen for analysis in the laboratory upon return to USAMRIID. In the field, the microbial cultures will be performed on a daily basis, while molecular and immunodiagnostics will be performed at the end of the sampling period.

Tissues: If carcasses of wild rodents are encountered during this field exercise, a full spectrum of post-mortem tissues will be collected using the appropriate personal protective measures. Collected tissues will be divided in 3 components:

1) those to be analyzed in the field via culture, ECL and PCR
2) those to be frozen for transport back to USAMRIID for home laboratory culture, ECL and PCR
3) those to be preserved via formalin fixation for histopathology

Results

Unlike the specified agenda to collect samples in the fall of 2005, 18 small mammals were sampled during the spring trapping session in June. Results were negative for both plague and tularemia in all three species tested (Table 1.b._a) .

Table 4.b._a. Results of small mammals tested for plague and tularemia in June 2005 on the Rocky Mountain Arsenal NWR.

Species	Age	Sex	Negative Plague	Negative Tularemia
Vole spp	Adult	Male	1	1
Deer Mouse	Adult	Male	2	2
	Young	Male	1	1
	Unknown	Female	3	3
Kangaroo Rat	Adult	Male	1	1
	Adult	Female	2	2
	Young	Female	8	8.
Total			18	18

White-tailed and mule deer doe and fawn health study

Study Background

The most recent population study of the two deer populations (*Odocoileus hemionus* and *Odocoileus virginianus*), which occur sympatrically at the Rocky Mountain Arsenal National Wildlife Refuge (RMANWR), was conducted during 1990-1993 (Whittaker 1995). At that time Whittaker conducted a wide-ranging study on the population characteristics of both deer species on the Refuge. Whittaker and Lindzey (2001) found that both populations showed a consistent increase over time while the population growth rate for mule deer was three times that for white-tailed deer. During this research, the mule deer outnumbered the white-tailed deer 4:1. Whittaker (1995) predicted that the mule deer populations would continue to increase until carrying capacity was reached.

Annual deer classification data collected from 1996 to 2004 indicate that overall deer populations have declined since a peak in both species populations in 1997-1998 (Stone & Baker 2004). Additionally, from 1998 to 2002 low fawn-to-doe ratios occurred in both deer populations at RMA (Figure 1). Classification counts, which are conducted annually in October-December, yield information on buck-to-doe and fawn-to-doe ratios by species. Other than these classification ratios, annual survival and recruitment of fawns have not been monitored. Whittaker (1994) monitored fawn survival with ear tag transmitters, but collected data for only approximately 30 days after attaching the transmitter.

In 2004, a study was initiated at RMANWR to gather information about survival and health of does and fawns of both species. Radio collars were placed on mule and white-tailed deer does in order to monitor birthrates, recruitment and adult survival. Radio collars were also placed on neonatal deer to assess survival.

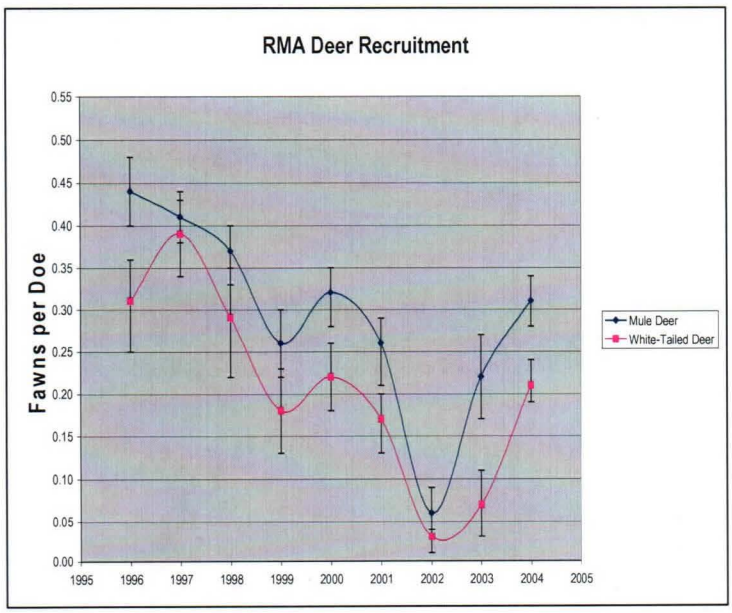


Figure 1. RMA Fawn recruitment.

Mule Deer Doe Collaring

Mule deer does were immobilized using telozol administered via dart guns used by Colorado Division of Wildlife (CDOW) veterinarians during March 8-9, 2004. While under anesthesia, pregnant does were collared with a M2500 Advanced Telemetry Systems collar and fitted with a M3900 vaginal implant transmitter (VIT) (Figures 2 & 6). The collars were marked with unique combinations of colors and numbers, letters or symbols for mark resighting (Figure 2). Thirty mule deer were initially collared during March 2004. There were four mortalities associated with darting and/or handling. Deer were evaluated for general health conditions by CDOW veterinarians and sampling was performed for the RMANWR chronic wasting disease monitoring program. Ultrasound was conducted on 29 of the collared mule deer does to determine pregnancy status (Figure 3). Eight does were determined to be carrying one fetus, 20 were determined to be carrying 2 fetuses, and 1 was determined to have triplets. Before deer were released, atipamazole was administered to counteract the anesthetic effects of the immobilization drug used in darting.

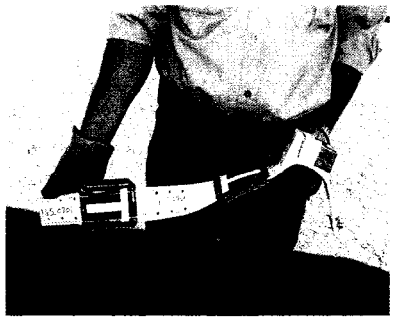
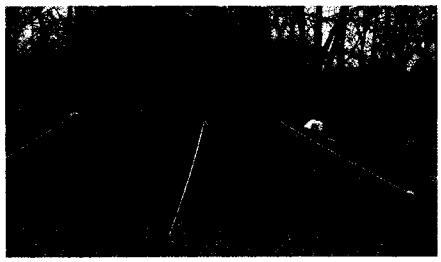


Figure 2. Example of uniquely marked adult collar.

Figure 3. Using ultrasound to check a mule deer doe for pregnancy.

White-tail Doe Collaring

White-tailed does were captured with drop nets and clover traps between April 2-14 of 2004 (Figures 4 & 5). Ketamine was used to anesthetize captured does. Anesthetized white-tailed does were collared and evaluated as described in the previous section for mule deer does. Twenty-nine white-tailed does were collared during April 2004. Ultrasound was performed on 15 of the 29 captured white-tailed does (Figure 3). Of the 15 does examined with ultrasound, 12 were determined to be carrying 2 fetuses and 3 were determined to be carrying only one fetus. The remaining 14 does captured and collared were examined for pregnancy status using palpation only. A single captured doe was determined to be barren and was not collared. Before deer were released, atipamazole was administered to counteract the anesthetic effects of ketamine.



'igure 4. Clover trap used to apture white-tailed does.

Figure 5. Drop net trap used to capture white-tailed does.

Fawn Capture and Collaring

In 2004, collared does with VITs were monitored using radiotelemetry for the purpose of finding newborn fawns. These transmitters utilize a plastic silicon wing that is designed to be expelled immediately prior to parturition. A change in ambient temperature (e.g. from body temperature of a doe to surrounding air temperature) causes a change in the signal pulse rate. A change in the VIT signal pulse rate indicates that the VIT is no longer in the animal and that a birth has possibly occurred. When a change in a doe's VIT signal pulse rate was detected, a search for the VIT and fawn(s) was conducted. In addition, fawns in 2004 were also captured opportunistically by driving the roads on the RMA and observing doe behavior (Downing and McGinnes 1969, Hugel et al. 1985). In 2005, there were no does fitted with VITs and this method was solely used to capture neonate fawns. When a doe was observed exhibiting postpartum behaviors, extended monitoring was done to determine if there was a fawn in the area. Once a fawn was observed, a technician or volunteer would walk out to the general location and look for the fawn. Newborn fawns less than 12 days old lay motionless to camouflage and conceal themselves from predators. Once a fawn was found, the animal was approached from behind and a hand placed over its eyes and one on its back to gently hold it down. Neonates were also captured by quickly walking or running to them. Very young deer undergo alarm bradycardia when disturbed (Jacobson 1979), causing them to remain motionless or only flee short distances. The fawns were aged (in days), sexed, weighed, and assessed for general health. Additionally, a hind foot measurement was taken. Age was determined by hoof growth (Haugen and Speake 1959, Brinkman et al. 2004).

Figure 6. Vaginal implant transmitter

Expandable Fawn Collars

Fawns were fitted with an ATS model m4210 Mammal Expandable Collars. The m4210 consists of an expandable brown stretch elastic band sewn with a cotton thread designed to expand as the fawn grows. Three folds stitched with cotton thread were designed to release sequentially with exposure to ultraviolet light and wet and dry conditions, permitting neck growth of fawns up to approximately one year, at which time the last stitches on the collars are designed to release.

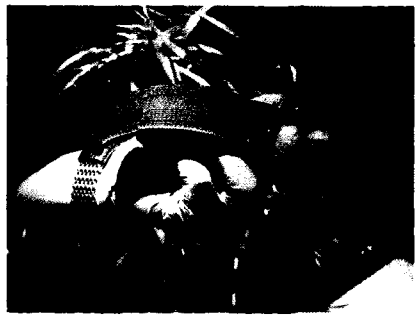


Figure 7. Expandable fawn collar.

Figure 8. Expandable fawn collar.

Fully expanded collars can accommodate the neck of an adult deer. The transmitters were encased in a black epoxy coating, and antennas consisted of 30 cm braided wire encased in black plastic. The total weight of an individual collar was 68 grams. Collar frequencies ranged from 162-165 KHz. The supplied battery was designed to power the transmitter for 12-16 months.

Transmitters emitted 55 pulses per minute in active mode. Transmitters were equipped with an inactivity sensor, which doubled the pulse rate after collars were motionless for 4 hours. These collars also came equipped with a precise event transmitter, which can accurately determine the time of inactivity in ½ hour intervals up to a maximum 127.5 hours.

Several precautions were taken to minimize the effects of marking and the transfer of foreign scent to the fawns. Radio collars were washed in a water-baking soda solution and dried. They were then placed in zipper seal bags to minimize transfer of odors from the environment to the collars. A nylon bag was used to weigh fawns; the bag was filled with surrounding vegetation to mask the scent of the nylon materials prior to the fawn being placed inside. Disposable nitrile gloves were worn while handling fawns.

Upon release, fawn survival was monitored by radiotelemetry using one of three receivers; Teleonics TR-2, Icom IC-R10, or Wildlife Materials TRX-2000S. A handheld Yagi 3 element antenna or truck-mounted antennae was used with these receivers. Fawns were located daily until the end of July, then they were monitored once a week until the first week of next May.

Once a fawn collar emitted an inactivity or mortality signal, technicians attempted to locate the collar to determine if mortality had occurred. If a collar found alone or with a carcass or signs of predation was discovered, the site, collar and remains, if any, were

assessed. Fawns that were found to be whole and non-predated were recovered, put on ice and necropsies were conducted at the Colorado Division of Wildlife Foothills Research Laboratory. Location, description of collar, condition of remains, and predator sign were recorded. Remains of fawns that were found were brought back to the RMA FWS lab and frozen for necropsy. These gross necropsies were performed between May through June 2006 to confirm cause of death. This was done by looking for hemorrhaging under the skin of the fawn, which denotes that a fawn was still alive at the time of mortality (Flindars and Hansen 1973).

In 2004 and 2005, sites at which fawns were collared and the sites at which the collars were recovered after mortality were recorded. Aerial photos overlaid with UTM coordinate system using NAD27CONUS (North American Datum 1927 Continental United States of America) land datum grid systems were used to mark exact points. These same maps were used to determine points of triangulation using two recorded bearings using a hand held Yagi antennae and compass (Grubb and Eakle 1988).

In 2004, a total of 119 fawns were radiocollared. Of these, 56 were white-tailed fawns and 63 were mule deer fawns. Twenty-two fawns were from collared white-tailed does and 29 were from mule deer does (Table 1).

Table 1. Fawn captures by year.

	Fawns Captured	
	2004	2005
Mule Deer	63	62
White-tailed Deer	56	50

In 2005 a total of 112 fawns were radio collared. Of these 50 were white-tailed fawns and 62 were mule deer fawns. Five of these were from collared white-tailed does and 12 were from collared mule deer does (Table 1).

Daily Fawn Survival Monitoring

Fawns collared in 2004 were monitored daily until July 31, 2004. After that date, they were monitored Monday through Friday. Starting November 12, 2004, they were monitored once a week until fawning began again in May of 2005. To determine if a fawn was still alive, technicians and volunteers went to the last known locations with a receiver and antennae and check signals from radiocollars for a normal (active) signal from the collars.

Fawns collared in 2005 were monitored daily until August 20, 2005. After that date, they were monitored Monday through Thursday. Starting on November 12, monitoring occurred once a week until mid May of 2006. As in the previous year, technicians and volunteers

went to the last known location with a receiver and antennae to determine if a fawn was still alive.

Triangulation of Fawns

Triangulation of fawns born in 2004 began on July 19. Fawns were triangulated twice a week until November 12, and then once a week until May 2005. Two compass bearings were taken from known fixed points within 20 minutes of each other to determine the approximate location of each individual fawns. After May 2005, fawns were triangulated approximately once every two weeks. This data is currently being analyzed for future reports and publications.

Triangulation of location of fawns born in 2005 began on July 1st. Fawn locations were triangulated daily until August 20, and four times a week, Monday through Thursday, until mid-November. After mid-November, they were then monitored once a week after until mid-May.

Fawn Survival

Observed fawn survival in 2004, at approximately one year, was 19.6% for white-tailed deer fawns and 20.6 % for mule deer fawns. Causes of mortality were classified as predation, probable predation, non-predation and unknown (Figure 12 & Table 2). In general, we categorized any fawn mortality cause as "predation" if we found any body part that looked to have been partially consumed by a coyote (Flindars and Hansen 1973). Mortality of fawns were classified as "probable predation" if we found blood, hair, and a kill site. The kill site was determined by flattened vegetation. We determined if the fawn was "non-predation" if we found the fawn carcass whole and intact with no signs of predation.

Observed fawn survival in 2005, for one year, was 16.0% for white-tailed deer fawns and 6.5 % for mule deer fawns.

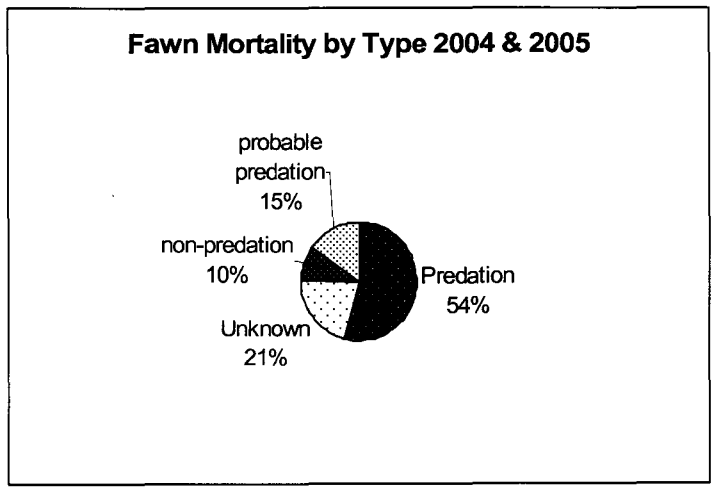


Figure 9. Fawn mortality pie chart 2004-2005.

Table 2. Fawn mortality by species and year.

	Fawn Mortality	
	2004	2005
Mule Deer	20.6%	6.5%
White-tailed Deer	19.6%	16.0%

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Burrowing Owl Reproductive Success and West Nile Virus Monitoring

Burrowing owl nest success and reproduction is monitored each year at RMA but in 2005 efforts involved additional study. In cooperation with USGS Ft. Collins Science Center and USGS National Wildlife Health Center, burrowing owls were monitored as part of an ongoing study to evaluate the potential long-term impacts of West Nile Virus (WNV) on wild raptor populations along the Colorado Front Range (see Section XX, American Kestrels). The study included nest searches, trapping to band owls and collect samples for WNV testing, and nest observations to estimate the number of young fledged at nests. This study provides information on the level of occurrence and potential impacts on reproductive success of WNV on burrowing owls.

Additionally, burrowing owl feathers were collected as part of a collaborative effort to understand burrowing owl migratory linkages. The project is coordinated through the University of Arizona and includes burrowing owl researchers throughout the southwestern U.S. The goal is to use stable isotope ratios in feathers to identify the wintering locations of burrowing owls and determine the amount of exchange among populations throughout the region. This will provide information on movement dynamics among burrowing owl populations which will help in developing informed conservation measures for declining populations.

The study was conducted from April through July 2005. Nests searches began in April and included driving surveys along established roads and area searches around/in prairie dog colonies. We captured adult and young burrowing owls at nests using tomahawk traps, 2-way burrow traps, bow nets, and bal-chatri traps. Once captured, we banded owls with a FWS aluminum band and an alpha-numeric color band (Acraft band), collected approx. 1.0 cc of whole blood (WNV analysis, DNA analysis, and slides for parasite analysis), and an oral swab (WNV analysis) prior to its release. One tail feather was collected from adults and 3-4 body feathers were collected from young burrowing owls. Other body and condition measurements were also recorded. Blood samples were centrifuged, fractionated, and frozen, and oral swabs were put into viral transport media and frozen prior to being sent to the USGS National Wildlife Health Center for WNV determinations. Blood serum and swab samples will be tested to determine WNV status (virus positive, antibody positive and titer, virus and antibody negative) using an epitope blocking WNV ELISA, and rtPCR. To address the potential effects of WNV at the population level, we collected data on nest success and productivity. Because burrowing owls nest underground, obtaining reliable estimates of reproductive rates can be difficult therefore we used standardized observations to determine relative productivity for burrowing owls; (5) 15 min. observations conducted during morning and evenings within a 1 week period. Nest success was determined using regular nest visits and standardized

nest observations. In 2006, we will search for banded owls to obtain information on return rates, an index of survival.

We located a total of 85 burrowing owl nests (Fig. 1) which represents approx. twice the average number of nests at RMA in most years. Nests were found from April 4 through June 30, with those found later in the season likely representing re-nest attempts (% of nests found in April = 41, % of nests found in May = 48, % of nests found in June = 11). All nests were in active prairie dog colonies.

We were able to determine the nest fate (success/failure) at 83 of the 85 nests. Of these known-fate nests, 87% (n = 72) were successful (fledged at least 1 young). Due to the large number of nests, we selected a random sub-sample of nests to conduct observations to estimate productivity (Fig. 1). We were able to successfully complete observations at 26 of the original 30 nests randomly selected for standardized observation. The average number of young fledged per nest attempt was 3.92 (SE = 0.93, range = 0 – 7) and the average number of young fledged at successful nests was 4.64 (SE = 0.37, range = 1 – 7).

We trapped at 64 (75%) of the 85 burrowing owl nests from June 2 through July 18. Capture effort occurred primarily from 1630 – 0030 though some morning trapping was conducted. Because evening trapping took advantage of the burrowing owls' primary hunting and activity periods, generally, trap success was greater. The mean number of times nests were trapped was 1.9 (range = 1 to 4). We captured and banded 30 females and 11 males. Of the 118 burrowing owl young caught, 114 were large enough to band. The average number of young banded at all nests that were trapped was 1.8 (range = 0 - 8) and 2.9 for those nests where at least 1 young was captured (range = 1 – 8). We recaptured 1 adult female that had been banded as a chick in 2002 near her current-year nest (approx. 500 m). During the 2005 season, we had 30 separate resights of banded individuals at 13 different nests. Six owls were recaptured or resighted more than once during the season. We collected feather samples from 54 of the nests where capture efforts were made. We collected feathers from all adults and young captured and sent samples to the University of Arizona for analysis; results of isotope analysis are not yet complete. For analysis of WNV occurrence, parasites, and DNA, we collected a total of 155 whole blood samples, 159 oral swab samples, 157 DNA samples, and 160 slide samples and we were able to resample a total of 5 individual owls (Table 1). Samples are currently being analyzed at the National Wildlife Health Center.

Consistent with published literature, burrowing owls show no sexual dimorphism as indicated by a comparison of mean male and female weight, wing cord and body condition index (mass [g] / wing cord [mm]) which did not differ significantly (t-test P value = 0.33, 0.81, and 0.21, respectively). Also, the mean body condition index did not differ significantly among males, females, and young (Fig. 2) and female body condition (body condition index, fat, and breast muscle) was not a factor affecting the number of young fledged at nests (ANOVA P value = 0.66).

The average number of burrowing owl nests at the Refuge is approx. 40 each breeding season. To date, this year's number of nests is the most documented for the Refuge.

Though nest search effort was greater this year compared to recent years, this does not account for all of the large difference in the number of nests. Nests close to the roads (i.e. within 100 m) have a high probability of being detected due to the effectiveness of repeated driving surveys and in 2005 there were more nests in areas close to the roads than in previous years. Nest success and productivity were typical for the species and the Refuge. The number of acres of active prairie dog colonies decreased slightly from 1,063 acres in 2004 to 1,006 acres in 2005. Therefore, an increase in available habitat in prairie dog colonies does not account for the increase in burrowing owl nests. Other potential factors influencing occupancy include higher return rate of owls from the previous year(s) and a good prey supply. Burrowing owl reproductive success, including large brood sizes (range = 1 – 11), was good in 2004. Finally, burrowing owl populations typically fluctuate yearly and 2005 represents an exceptionally good year for occupancy.

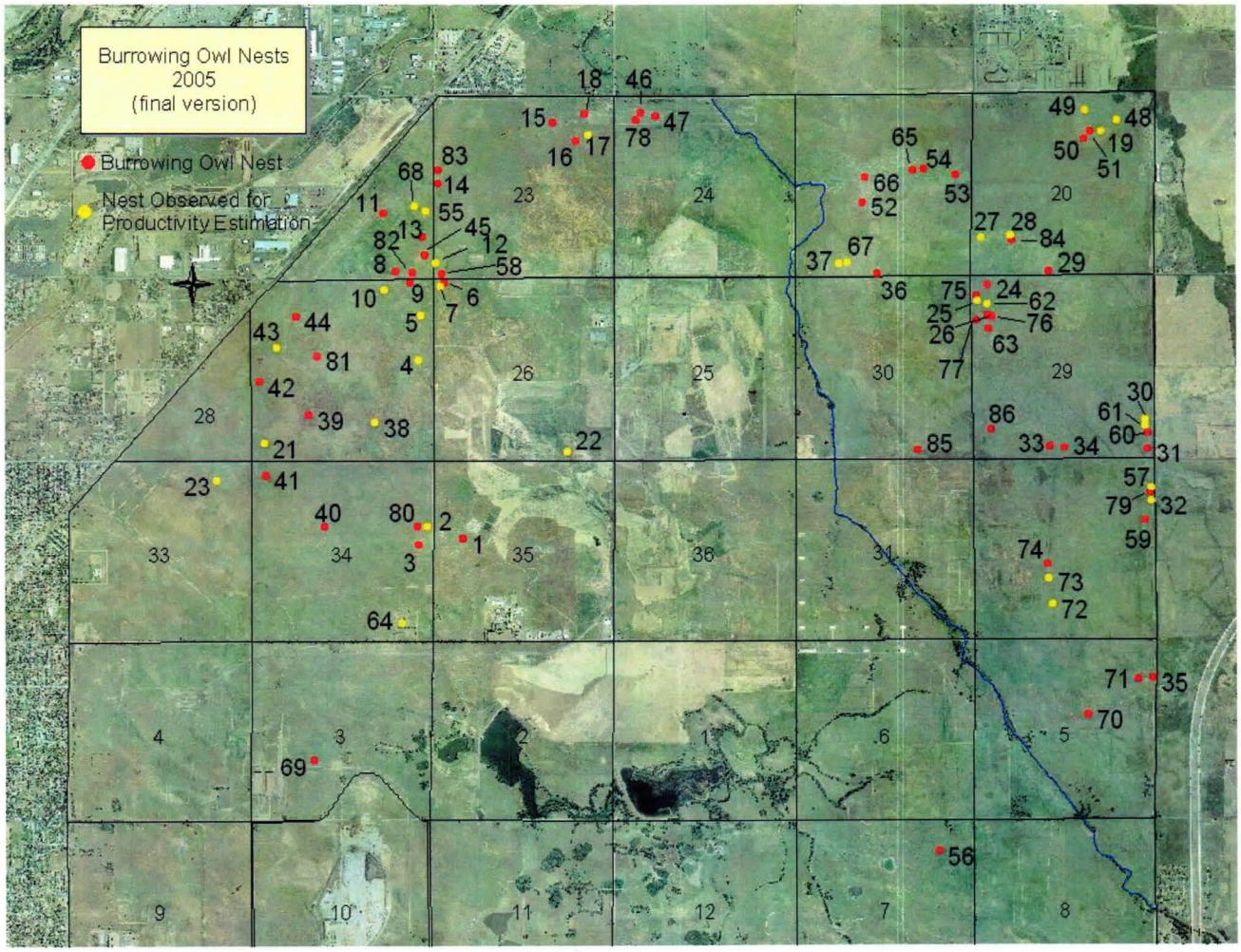

Figure 1. Burrowing owl nests located at the Rocky Mountain Arsenal NWR, CO from April to July 2005. The yellow (light color) nests indicate those randomly selected for

standardized observations to estimate productivity (the number of young fledged at nests).

Table 1. Biological samples collected from female, male, and young burrowing owls at the Rocky Mountain Arsenal NWR, CO from April to July 2005 for analysis of West Nile Virus occurrence (whole blood and oral swabs), parasites, and DNA.

	Total Biological Samples				
Owls	Whole Blood	Oral Swab	DNA	Slides	# Individuals Re-sampled
Females	33	31	31	31	3
Males	10	10	10	10	0
Young	112	118	116	119	2

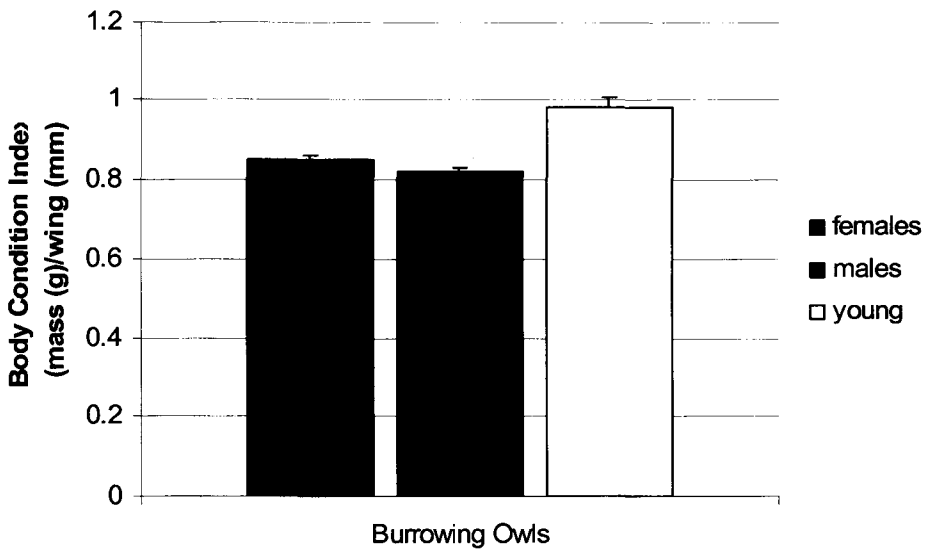

Figure 2. A comparison of the mean (± SE) body condition index (mass [g] / wing cord [mm]) of female, male, and young burrowing owls at the Rocky Mountain Arsenal NWR, CO, 2005.

2. Habitat Restoration

2a. Wetland Restoration

Nothing to report.

2b. Upland Restoration

Service staff conducted fieldwork on 28 upland restoration projects during FY 2005. Service staff also wrote plans and initiated fieldwork on 5 new projects and maintained 23 restoration projects initiated in prior years.

Approximately 212 acres were planted to native grasslands during October 2004 through September 2005 (Table 2.1). Most of this acreage was seeded to native shortgrass and sandhills prairie, including associated grasses, forbs, and shrubs.

Four projects received some form of irrigation (Table 2.1). Approximately 207 acres of large grassland restoration sites were irrigated.

Approximately 1,000 pounds of native grass seed (needle-and-thread, *Hesporostipa comata*), was collected by Service staff during FY 2005. In addition, one pound of purple prairie clover, *Dalea purpurea*, five pounds of bush morning glory, *Ipomoea leptophylla*, two pounds of dotted gayfeather, *Liatris punctata* and two pounds of silvery tansy aster, *Machaeranthera canescens* were collected, all of which will be used to augment restoration sites.

Table 2.1. Fieldwork accomplished on mitigation projects at Rocky Mountain Arsenal National Wildlife Refuge, FY2005 (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	
5B	GR	Revegetation of Barracks area in Section 34	0	0	0	8	0
BEMA 7	GR	Grass Seeding in Section 19	0	0	0	29.5	0
41-04	GR	Small area disturbances	0	0	0	27.8	0
41-05	GR	Small area disturbances	3	0	0	3	0
43-02	GR	Seed propagation in SE Section 34	0	0	0	7.5	0
54-04	GR	West Uvalda Ditch, Section 12	0	64	0	64	0
56	GR	Revegetation in SC Section 4	2	0	0	0	0

Project No.	Project Type*	Project Description	Approximate Acreage				Individual Shrubs or Trees Planted
			Natives Planted	Non-Natives Planted**	Irrigated or Hand-Watered	Weed Control	
66	GR	Revegetation in SE Section 6	0	0	0	73	0
68	GR	Revegetation in NW and WC Section 8	0	0	0	80	0
69	GR	Revegetation I the four corners Sections 19, 20, 29, and 30	0	0	0	72	0
71	GR	SE to WC Section 24	0	0	0	247	0
72	GR	Section 32	0	0	0	212	0
75	GR	North Bog	0	25	0	25	0
76	GR	Revegetation of SE Section 26	0	0	0	159	0
79	GR	Revegetation of Borrow Area 11 in Section 6	0	0	0	2	0
79-03	GR	Revegetation of crested wheatgrass in Section 6	0	0	0	74	0
79-04	GR	Warehouse pads in Section 6	0	0	0	29	0
80	GR	Revegetation in SE Section 5	0	0	0	80	0
80-04	GR	Revegetation east of nest area in Section 5	0	0	0	204	0
81	GR	Restoration north of lake in Section 1	68.8	0	68.8	68.8	0
82	GR	Restoration of around Egli homestead in Section 2	0	0	0	33.7	0
83	GR	Restoration of west end of spillway in Section 2	13.1	0	13.1	0	0
85	GR	Restoration of east North Plants Haul Road in Section 25 and 30	100	0	100	154.7	0
86	GR	Revegetation of west Section 35	0	0	0	144	0
87B	GR	Revegetation of north Section 30	0	0	0	160	0
89	GR	Revegetation of southeast Section 8	0	0	0	108	0
91A	GR	Revegetation in NW Section 12	0	0	0	100	0
96	GR	Revegetation of Sanitary Landfill in Section 30	25	0	25	25	0
		TOTAL	**211.9**	**89**	**206.9**	**2191**	**0**
* **GR** = Grassland Restoration, **SH** = Shrubland and Other Woody Plant Restoration (including subshrubs) **OT** = Other							
** **Non-Natives** = Temporary cover crops							

Habitat Restoration Photography Program

From October 1, 2004 through September 30, 2005, refuge staff photographed 9 habitat projects using 35mm color slide film and single-lens reflex cameras with interchangeable lenses. A total of 106 images were exposed, developed, and catalogued. Thirteen habitat projects were photographed using digital media and digital cameras. A total of 107 digital images were exposed, processed, and catalogued.

Geographical Data Collection and Analysis

From October 1, 2004 through September 30, 2005, refuge staff mapped 1327 acres within 10 habitat projects and 12 prescribed burn locations using a Global Positioning System (GPS) receiver and data logger. They also mapped 167 vegetation monitoring transects at 33 project sites, and 67 noxious weed sites within 13 refuge areas.

3. Habitat Management

3a. Water Level Management

Water level management at the Refuge during 2005 was an improvement over 2003 and 2004 because of improved runoff from late spring snows and periodic summer rains (thunderstorms). However, Water Year 2005 was again below normal for precipitation along the Colorado Front Range, for the fifth drought year in a row. The Refuge received no water flows from the High Line Canal system in 2005 so the Refuge wetlands (Wetlands 1-5) supplied by this canal were generally dry except immediately following summer thunderstorms that produced localized runoff. 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 Water are continuing, to develop alternative water 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. For the first time since 1996, Lower Derby Lake levels increased to full pool by early June, primarily due to increased surface water runoff conditions during late spring/early summer. By the end of 2005, Lower Derby Lake levels declined to 40% of full pool due to significant water demands for prairie restoration and contaminant cleanup activities. Havana Ponds near the southern Refuge boundary, had highly variable water levels ranging from 20-90 percent of full pool, based on intermittent storm flows reaching the lake from late spring and summer thunderstorms.

The Refuge and the U.S. Army continued to pump ground water from the Section 4 (Western Tier) wells in 2005 to maintain relatively constant water levels in Lake Ladora and Lake Mary despite ongoing drought conditions. 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 2005 was the Parkfield II Wetland near the southern Refuge boundary at Chambers Road and 56th Avenue. 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 depressed water flows in First Creek, the only natural stream on the Refuge. First Creek is an intermittent stream during normal water years but was typically dry during the summer of 2005, with the exception of small flows immediately following summer thunderstorms. First Creek had sustained flows of almost 1.0 cubic foot per second during the periods January through May and October through December 2005.

3b. Moist Soil Management

Nothing to report.

3c. Grazing/Mowing/Haying

3c.1. Grazing

Nothing to report.

3c.2. Mowing

Mowing was conducted on approximately 1,352 acres, usually for weed control. Please see Pest Plant Control for more details on mowing.

3c.3. Haying

Nothing to report.

3d. Farming

Nothing to report.

3e. Forest Management

Nothing to report.

3f. Fire Management

Service fire staff continued the transition of assuming complete wildfire suppression activities on the Refuge because of the Army Fire Department staff reduction. The fire department had three individuals working until September 30, 2005. This event has occurred sooner that was anticipated and will have some new challenges for both agencies to safely over come. 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. The refuge was included into the fire protection district's jurisdiction late last year. For CY 05 there were two wildfires for a total of 2.5 acres. One lightning strike in central Section 34 was 1.4 acres and the other, was human caused when a power line lightning arrester shorted in north central Section 3 and burned .1 acres. There was one threat fire across from the east perimeter road on city and county of Denver property. A power line electrical transformer shorted causing the fire to burn 2.7 acres. The Army fire department and FWS assisted the Denver FD to contain and mop up the fire. The Service continues to conduct prescribed burns to maintain a native prairie habitat with fifteen burns planned for CY 05. All 790.5 acres were completed safely. Seven burn units were under Hazard Fuel Reduction (HFR) for 371.2 acres and eight burn units under Wildland Urban Interface (WUI) for 419.3 acres. The HFR units were scattered in several past restoration sites and a few sites that will undergo restoration. This is the first year that major effort was made in the WUI areas identified in a hazard fuel assessment completed by a contractor in 2003. Time was need to prioritize areas and complete and approve the burn plans to treat these areas. The local Denver television media provided coverage on a few units which proved to be very good outreach to the general public on our burn program

Nine Refuge staff qualified for red cards at the arduous duty level and five more at the moderate duty level to participate in prescribed burns in CY 05. The Refuge fire crew continued to provide support to other Colorado refuges with burns at Alamosa, Monte Vista NWR's, and Mortenson Lake which is managed by Arapaho NWR. The crew also assisted the Colorado State Forest Service on a prescribed burn at Staunton State Park. Two wildland fire fighters were dispatched on interagency wildfire assignments in Colorado, Utah and Arizona during the summer of 2005. The Refuge fire program continues to support and participates on the Mid-Plains Interagency Type II IA 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 2 Squad Boss (FFT1).

(Terry Rathill w/mtn Pix) (Crew end of day pix)

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.

CY 2005

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; houndstongue; and others.

Fifteen Pesticide Use Proposals were approved by the Project Leader during CY 05. Glyphosate (Rodeo™ or Roundup Pro™) or imazapic (Plateau™) was applied to approximately 583.5 acres to control weeds in support of restoration activities on various habitat restoration sites. Clopyrlid (Transline™) was applied to 418.6 acres of Canada and musk thistle, and Russian and diffuse Knapweed. 2,4-D (Weed Killer 64™) was applied on 696.5 acres to control Russian thistle and kochia and other broadleaf species in a new restoration sites. Imazapyr (Arsenal™) was used to stump paint 421 Russian olive, Siberian Elm, and tamarisk trees. This year the Refuge received a new 400 gallon spray truck. This equipment is designed to not require the mixing of chemicals in the water tank and therefore better to use in the field. It has many safety features and a calibration unit that accurately measures acreage.

(Spray truck pix)

Mechanical (mowing) control treatments were conducted on approximately 1,352 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.
Many other weeds (approximately 259 acres treated) were culturally removed by hand pulling and swing blading by volunteers and Service staff throughout the Refuge.

No biological control was used in FY 05 but sites from earlier releases were monitored for effectiveness and distribution. Distribution of field bindweed mite continues to spread throughout the Refuge.

4. Fish and Wildlife Management

4. Fish and Wildlife Management

4a. Bird Banding

No MAPS station is run on RMA and hence all bird banding on the refuge is linked either to scheduled biomonitoring projects or fortuitous captures of species of interest. During 2005, the following birds were banded:

Species	# New Birds	# Recaps	Total
American Kestrel	140	15	155
Burrowing Owl	154	2	156
Great Horned Owl	1	0	1
Long-eared Owl	2	0	2
Swainson's Hawk	2	0	2
Tree Swallow	14	0	14
Total	313	17	330

4b. Disease Monitoring and Treatment

Chronic Wasting Disease

In 2004 the Fish and Wildlife Service in cooperation with Colorado Division of Wildlife (CDOW) implemented the Refuges first 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. One mule deer (MD) female, 1 white-tail (WT) male and 1 MD male were tested in 2004. One MD male and 1 MD female were tested in 2005 as part of RMA's CWD surveillance program.

Also in 2005, research was done in support of a $7,500 grant to study CWD genetic resistance. A total of 112 deer fawns were captured and collared at RMANWR in 2005; this sample included 51 white-tailed and 61 mule deer fawns. Useable samples were analyzed from all 51 white-tailed deer fawns, and 57 of 61 mule deer fawns.

Fawn survival was remarkably poor for both species. Tracking by radio telemetry revealed only 12 of the 112 marked fawns still alive as of 30 September 2005; of these, 3 were mule deer fawns (Table 4a.1) and 9 were white-tailed deer fawns (Table 4a.2).

Mortality among mule deer fawns (58/61; 95%) was higher than mortality among white-tailed deer fawns (42/51; 82%) (Fisher exact test P = 0.036).

Genetic analysis revealed that 46 of 57 (81%) mule deer fawns genotyped were 225SS, 10 (18%) were 225SF and 1 (1%) was 225FF. Although CWD does not occur at RMANWR, these patterns are similar to those reported for other mule deer herds in Colorado and Wyoming where CWD is endemic, suggesting that forces other than CWD may influence variation in abundance of the three codon 225 genotypes. Fawn survival did not differ among individuals of the three genotypes (Fisher exact test P ~ 1.0).

Based on available genetic data and existing knowledge about genetic influences on susceptibility of mule deer to CWD, findings suggest there is no reason to believe the mule deer herd inhabiting RMANWR is "resistant" to CWD. It follows that strategies for minimizing opportunities for introduction of CWD should be emphasized in management planning, and that surveillance should continue.

Plague

West Nile Virus

In 2005, the WNV monitoring program was discontinued after consultation with Tri-county Health Department. Because the perceived risk to human health was considerably less than in 2004, and none of the mosquitoes tested from RMA were positive, monitoring on the Refuge was discontinued. In the event WNV again becomes a serious threat to both human and animal health, monitoring may resume.

4c. Reintroductions

4c.1 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 (75) were relocated to areas of former occupation but abandoned due to plague (Table 4c.1.a). 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.1a. Prairie dog trap and relocations during 2005 at Rocky Mountain Arsenal NWR.

	Release Locations				
Capture Locations	**Sect 19 NW**	**Sect 20 NE**	**Sect 23 NW**	**Sect 28 EC**	**Totals**

Sect 3 Biota haul Road	0	0	0	25	25
Sect 9 (Prairie Gateway)	0	0	0	28	28
Sect 31 WC	0	9	2	0	11
Sect 35 WC Sewage Ponds	5	0	0	0	5
Sect 35 SC (Building 112)	6	0	0	0	6
Totals	**11**	**9**	**2**	**53**	**75**

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 2005. A bat roosting box is located on the south side of Lake Mary. Two more were built and installed by a Scout troop on the west side of Havana Ponds and north of Lake Ladora Arm.

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. Wildlife vehicle fatalities included: one mule deer, one white-tailed deer, one coyote, two black-tailed jackrabbits, one desert cottontail, one deer mouse, one black-tailed prairie dog, one yellow-bellied racer, and one bullsnake Live rattlesnakes and bullsnakes found on worksites in the CRA were handled by a trained contractor. One hibernating bullsnake was removed from Building 619. Two instances of nest protection included a Canada goose west of the main entrance door of the Visitor Center in a raised flowerbed and a mallard nest in the DREZ. Death from unknown causes included one raccoon and two coyotes.

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, neighboring escaped pets frequently are reported on the Refuge. They quickly can become detrimental to native wildlife. In 2005, several free-roaming dogs were removed from the Refuge. Also, seven domestic rabbits that were dropped off at the West Gate were recaptured and taken to an animal shelter.

INSERT PICTURE

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

6a. Law Enforcement

Over the course of 2005, Rocky Mountain Arsenal Refuge Officers were able to begin coordinating with other agencies to begin stabilizing the law enforcement program at the Refuge. A meeting/tour was held with the Colorado Division of Wildlife Area 5 District Wildlife Managers, and an open invitation to join Refuge patrols, surveys and studies was given. Another tour was given to the Commerce City Police Detectives Division, and Building 619 was used for Adams County Sheriff's training exercises that Refuge Officers participated in. More meetings are planned for 2006.

September 30, 2006 will be the last day for emergency response operations to be conducted at Rocky Mountain Arsenal NWR by the Army Fire and Emergency Services. All future emergency response in the area will be handled by the Fish and Wildlife Service and the South Adams County Fire District. In anticipation of the transfer, Refuge Officers contracted a company to outfit a 2005 Ford Explorer as a law enforcement vehicle.

During FY 05, the Regional Law Enforcement Chief designated the Rocky Mountain Arsenal NWR as a field station for a new Region 6 Zone Law Enforcement Officer. The officer reported for duty in October of FY 06.

In the end of August, tragedy struck many of the Refuges on the gulf coast when two hurricanes, only weeks apart, landed on shore in Louisiana and Texas. The first, named Hurricane Katrina was classified as a category 4 hurricane made landfall just east of New Orleans, Louisiana, leveling Biloxi, Mississippi, and nearby Refuges. Unfortunately, the storm surge was strong enough that the several of the levees in New Orleans broke and the majority of the city fell under 5-25 feet of water. Two weeks after Katrina hit, Region 6 officers were called to assist with Rescue operations. Shortly thereafter, a second

hurricane, Hurricane Rita, made land fall in Texas and another group of officers were sent to assist with law enforcement on and around Anawac NWR.

Refuge Officers

The Refuge's two dual function officers attended the Firearms Requalifications Training at Arapaho NWR and Inservice at Marana, Arizona. The Refuge's full time officer completed the Field Training and Experience Program after training at Charles M. Russell NWR, Montana, Fort Niobrara/Valentine NWRs, Nebraska, Wichita Mountains NWR, Oklahoma, and National Elk Refuge NWR, Wyoming. The full time officer also completed MOCC training in Manhattan, Kansas, as well as the S-190 and S-130 Firefighter training provided at the Arsenal. The full time officer was also able to work opening day duck season at Monte Vista NWR in southern Colorado.

As a result of the Hurricane Katrina and Rita disasters, one of the dual function officers was appointed as the Region 6 Law Enforcement Specialist to assist with coordinating law enforcement response and relief efforts to the areas and Refuges hit by the hurricanes. The full time officer volunteered to join the Region 6 team of 10 officers that were called to New Orleans to perform Search and Rescue Operations in conjunction with other Regional Law Enforcement Teams, FEMA, the National Guard, the Coast Guard, Texas Search and Rescue teams, Nevada Search and Rescue Teams, and California Search and Rescue Teams. The full time officer was also later deputized as a U.S. Marshal to further assist with rescue and clean up efforts in the gulf coast.

6b. Permits and Economic Uses

6c. Contaminant Investigations

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 2005, 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 2007.

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 2005 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 2005, 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). During 2005, the Refuge made several improvements to the Section 20 well to improve sustainable ground water production.

6.e Cultural Resources

During the period October 1, 2004 – September 30, 2005, compliance with the *National Historic Preservation Act of 1966* was achieved primarily by management of RMA NWR under the provisions of a Programmatic Agreement (PA) with the Advisory Council on Historic Preservation (ACHP), which was originally signed in November 1998.

On May 1, 2005, 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 FY05, the ICRMP was revised to reflect changes in the inventory of cultural resources, reporting of new sites, and treatment of historic properties.

Field monitoring of two prehistoric archaeological sites (5AM.185 & 5AM.718) 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 April 13, 2005. 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 Gottlieb and Rose Egli House (5AM.1145), which represents the last remaining pre-World War II building on RMA NWR and also is determined eligible for the NRHP, was monitored and was secured from potential wildlife damage during FY05. The Egli House is managed in accordance with a separate MOA negotiated with the Colorado SHPO during FY05.

Two previously unknown archaeological finds were encountered during FY05 and each was inventoried and evaluated for the Colorado SHPO in accordance with the PA. The new discoveries included a prehistoric isolated find in Section 34 (5AM.1766) and a former historic homestead in Section 27 (5AM.1768). These new discoveries 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. Artifacts from historic properties on other Region 6 refuges are also accessioned at the RMA NWR collections center.

The Service designed and constructed a cultural resources exhibit that is located in the Visitor Center for public education.

The Service continues to work closely with the Remediation Venture Office's Cultural Resources Team (CRT), which includes representation from Planning, Habitat Restoration, and Visitor Services.

7. Public Education and Recreation

7a. Provide Visitor Services

During FY05, Refuge weekday visitation was suspended from October 2004 through March 2005 for a remediation project. Visitation resumed in April 2005 for wildlife-dependent recreation including opportunities for wildlife observation, wildlife photography, fishing, environmental education and interpretation. The total visitation for FY05 was 9,748.

7a.1 Interpretation

Drop-In

The Refuge was open for drop-in visitors for 97 weekend days for a total of 2,979 people dropping in. The Refuge was open for drop-in visitors from 8:00 am to 4:30 pm; the Refuge was open until sunset on the first Saturday and third Sunday throughout the summer months.

Visitor Center

The Visitor Center was used for various meetings throughout the reporting period. The most notable meeting was the Directorate Meeting that was held in June of 2005. New blinds were purchased for the Tram Room to darken the room for slide presentations. Window shade type blinds were constructed to cover two windows at a time lowering the cost considerably than custom sizing for each window. A new vertical blind of the same material was purchased for the back door and window panels. There were problems ordering the correct color and an acceptable substitution was made. These blinds may need replacing sooner than anticipated due to the construction of the material. Budget Blinds was the vendor and it is not recommended to use them again. The blinds cost $2,297.00.

The Denver Museum of Nature and Science removed a rabbit specimen from the prairie dog display because it was infested with dermesteds. The hand receipt will continue for the other items on loan from the Museum. The Museum is looking into transferring the property permanently to the Service.

Normal maintenance including carpet cleaning continued throughout the reporting year.

Nature Programs

Interpretive Nature Programs

Forty-four interpretive nature programs reached a total of 935 people during the reporting period. A new addition to the schedule was a Refuge campfire where songs, stories and games were enjoyed by the participants. Eighty-three adults and children participated in these events. Hayrides, raptor and deer programs continue to be well received by the public. Eight additional nature programs for scouts reached another 136 people.

Recreational Nature Programs

Popular recreational programs continue to be offered such as Bike the Refuge, Friends of a Feather, and photo tours. Nineteen of these programs were offered reaching 177 people. An additional 62 public fishing programs were offered reaching 2,568 people.

Interpretive Tour Routes

Wildlife viewing tours continued to be offered on Saturdays and Sundays to the public on a reservation basis. Tours during the week were limited to VIP groups. Nine VIP tours were offered throughout the reporting period. In FY 2005, a total of 143 tours were provided to 1,792 people.

Fishing

The 2005 fishing season was from April 16 through October 16. Fishing was permitted on Saturdays and Sundays, from 8:00 a.m. until 4:00 pm. Anglers were permitted to fish until sunset on the first Saturday and third Sunday of each month. 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 877 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 2005 season was $5,538.86 representing 1,846 anglers.

Fishing program partnerships between the Service and Children's and Craig Hospitals continued in 2005. Fourteen special fishing programs were offered to Scout groups and the general public to teach fishing techniques. These programs reached 451 people.

Interpretive Foot Trails

Trail maintenance consisting of spraying, mowing, and minor repairs was continued during this reporting period. The culvert on the Woodland Trail was not replaced; however, a Texas Crossing was put in to allow the trail to be re-opened.

The Locust Loop Trail remained closed in FY 05 due to an on-going remediation project.

Special Events

Wild Things 2004

National Wildlife Refuge Week was held on October 16, 2004 from 12:30 – 8:00 pm. All sections had a hand in setting up displays in their field of expertise. Participants for this event totaled 207 people. Acquisition costs for the event not including salaries was $2,067.00. Further information about the event is available in a report entitled Refuge Week 2004.

Fishing Fever

Fishing Fever was held for the first time on May 14, 2005 from 9:00 am to 3:00 pm. Local sporting goods stores, Colorado Division of Wildlife, and Birds of Prey Foundation had booths for the event.

Colorado Division of Wildlife donated 100 rods and reels for the Refuge to use for this event and for the summer. Two hundred eight-three visitors participated in this event.

Due to limited parking at the Visitor Center, additional parking was allowed along 6th Avenue with shuttle service to the lake and Visitor Center. Further information is available in a report entitled, Fishing Fever 2005.

7a.2 Environmental Education

In FY05, all site-based environmental education programs continued to be suspended October through March with the exception of Adams County School District 14 programs, which were conducted off-site. On-site environmental education programs resumed in April.

PARTNERSHIPS

Adams County School District 14 – Fourth Year Over-view

The school year began in August 2004 and concluded June 2005. The program consisted of four 6-week sessions working with 7th grade students from Kearney Middle School and two 10-week peer-mentoring sessions working with 8th grade students from Adams City Middle School. A total of 120 students from Kearney Middle School and a total of 60 students from Adams City Middle School participated in the program.

Staff worked closely with Kearney Middle School classroom science teachers resulting in six weeks of team-teaching. There were 6 individual projects that focused on strengthening the students' scientific inquiry skills and improving their awareness of environmental issues. The students were granted opportunities to improve their observation and communication skills, to conduct wildlife inventories, to collect various biotic samples including macroinvertebrates, to interpret data, graph results, and draw conclusions. The format change was due to the school discontinuing block scheduling and returning to a more traditional 45 minute class period.

Through teacher support, a new peer-mentoring and service-learning component was implemented at Adams City Middle School. The focus of the curriculum continued to include activities to strengthen students' scientific inquiry skills and awareness of environmental issues. Other activities were added to capitalize on the longer field trips such as comparing and contrasting a variety of local ecosystems, a Refuge deer study, and a local land development design project. The concepts of service-learning and peer-mentoring were also introduced. The program sessions were increased from seven weeks to a full semester with one 80 minute class meeting each week.

At both schools the number of field trips was decreased to increase the time of each field trip (from 90 minutes to 180 minutes). Due to the on-going Refuge closure, the September through March field trips were conducted at the South Platte River between the confluence of Clear Creek and 74th Avenue in Commerce City. April and May field trips were conducted at the Refuge.

Partnership staff spent time researching, evaluating, and revising the program's curriculum, meeting with teachers and the District supervisor to assess the program's effectiveness, participating in monthly staff meetings at each middle school and attending a week-long District 14 Teacher Induction and Professional Development Program.

Adams City and Kearney Middle School exemplified an increase in their 8th grade science CSAP results for FY05. Adams City Middle School students documented an

increase of 2% for proficiency in science and Kearney Middle School documented a 7% increase. Refuge staff believes the increased results are an indirect result of the Cooperative Agreement.

The use of the program's activities provided to be an effective behavioral and academic motivational tool for the classroom science teacher. Another accomplishment was that 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.

This cooperative partnership will continue through FY06, at which time new funding will need to be secured if the program is to continue.

Colorado Alliance for Environmental Education (CAEE)

In FY05, Refuge staff actively participated in CAEE workshops, seminars, Advisory Council meetings, and monthly meetings.

STAFF-LED PROGRAMS

From April to September 2005, staff conducted environmental education programs on-site for a total of 764 students and 119 teachers.

TEACHER-LED PROGRAMS

In FY05, "Home is Habitat" teacher training workshops were not scheduled. The curriculum is under revision to be more user friendly and to better align with the Colorado Model Content Standards.

OFF-SITE PROGRAMS

As a result of the Refuge closure to all weekday visitation October through March 2005, Refuge staff and partnership staff continued conducting classroom programs. A total of 2,723 students and 135 teachers were reached through these programs.

TIME CAPSULE

Nothing to report.

7a.3 Volunteer Program

During FY05, 65 volunteers contributed a total of 10,897 hours, equivalent to 5.2 FTE compared to FY04 with 71 volunteers contributing 8,091 hours. Twenty-eight volunteers were recruited into the program at RMANWR.

The volunteer budget increased $500 in FY05 to $2700, versus $2200 in FY04. This covered the Volunteer Appreciation Event, volunteer brochures, volunteer recognition items, and new volunteer uniforms.

On Saturday, October 22, 2004, Metro volunteers participated in Denver Day of Impact at RMA NWR, contributing 85 hours of service. On Friday, September 16, 2005, students from Johnson and Wales University participated in Courage to Care Day at RMA NWR, contributing 100 hours of service. On Saturday, July 30, 2005, staff of the Department of Regulatory Agencies participated in a volunteer day at RMA, contributing 40 hours of service with projects focusing on habitat restoration. In FY05, three scout troops contributed 250 hours of service at RMA NWR with projects focusing on maintenance and habitat restoration.

On Sunday, June 5, 2005, RMA NWR staff hosted an on-site volunteer open house to recruit volunteers. Volunteers were also recruited at off-site community events, special events, through websites including the Refuge website, www.volunteer.gov/gov, Metro Volunteers, and the Army's website. Recruiting articles were submitted to local media outlets including the Commerce City Beacon, Commerce City Gateway, Stapleton Front Porch and Metro West Newspapers. One hundred and fifty-five volunteer inquiries were received in FY05.

Training classes were scheduled to coincide with fieldwork or seasonal activities. During FY05 Refuge staff and volunteer supervisors conducted five job specific trainings: waterfowl identification training, Recreation Program Leader training, Tour Guide training, Arsenal Ambassador training, Roving Interpreter and Visitor Center Assistant job specific trainings. New volunteer orientations were held in May for 8 student-interns. The orientations consisted of a Fish and Wildlife Service overview, health and safety protocol, environmental cleanup updates and volunteer policies and procedures. Volunteer work sessions were held in December, February, June, and August to inform volunteers on the status of environmental cleanup and general Refuge update.

On Thursday, April 21, 2005, 14 Service staff hosted the 16th Annual Volunteer Appreciation Event to show appreciation for all the dedication and achievements the Refuge volunteers accomplished over the past year. The evening consisted of a dinner prepared by staff with a menu of hard and soft-shelled tacos, entertainment from Adams City High School choir, all volunteer recognition, and special volunteer recognition awards from supervisors for their hard work. More than 40 volunteers along with their family members attended the event in Building 129.

7b. Outreach

Community Events

Staff participated in 22 community outreach events including Commerce City Picnics, various service organizations such as Rotary Clubs, Montbello's Salsa and Soul, and the

Colorado RV Sportshow. These events reached over 3,000 people. The Service may not be participating in the RV show in the future; it is a very labor intensive event.

8. Planning and Administration

9. Remedy Coordination

9a. Engineering

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 2005. 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 2005, 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 safety culture environment at RMA also helped the Refuge achieve an excellent safety record for 2005.

From January 1, 2005 through December 31, 2005, the OSHA Recordable Rate for safety incidents among all 600-800 workers at the Rocky Mountain Arsenal was 0.6, with a Lost Workday Rate of 0.2. The Refuge's safety program included occupational health and safety statistics and continues to be integrated with those of the RMA Remediation Venture Office (RVO) Health and Safety program. During 2005, the Refuge staff logged 45,834 work-hours with 1 recordable incident where an employee sustained an umbilical hernia while transporting and lifting four boxes of wasp spray. The employee was off work for 45 days due to medical treatment and bed rest. This was a significant contribution to the outstanding safety success at RMA during this time frame.

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 and First Aid was also completed on site. Also as part of the CPR training was the introduction and use of the Automated External Defibrillator (AED). Tailgate briefings were held with Service employees prior to the start of any field work activities.

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 has 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.

2. Habitat Restoration

Work being done by DOE contractor with limited input from Fish and Wildlife Staff.

3. Habitat Management

Work is being done by DOE contractor with limited input from Fish and Wildlife Staff.

4. Fish and Wildlife Management

No work being done.

5. Coordination

Service staff has 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.

6. Resource Protection

6a. Law Enforcement

Nothing to report.

6.b. Permits and Economic Uses

Nothing to report.

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.

7. Public Education and Recreation

Nothing to report.

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.

9. Remedy Coordination

9a. Engineering

Service staff review and comment on many remedy documents.

9b. Safety

8. Planning

8a. Comprehensive Conservation Planning

Does not apply

8b. General Administration

8b.1 Personnel

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 Expired 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-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 Rocky Mountain Arsenal NWR complex. She started her initial 16 week training course at FLETC on July 2, 2004.

Aaron Rinker, Noelle Ronan, and 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
Reimbursable 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

Budget Review FY 2004
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 Reimburesable 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: