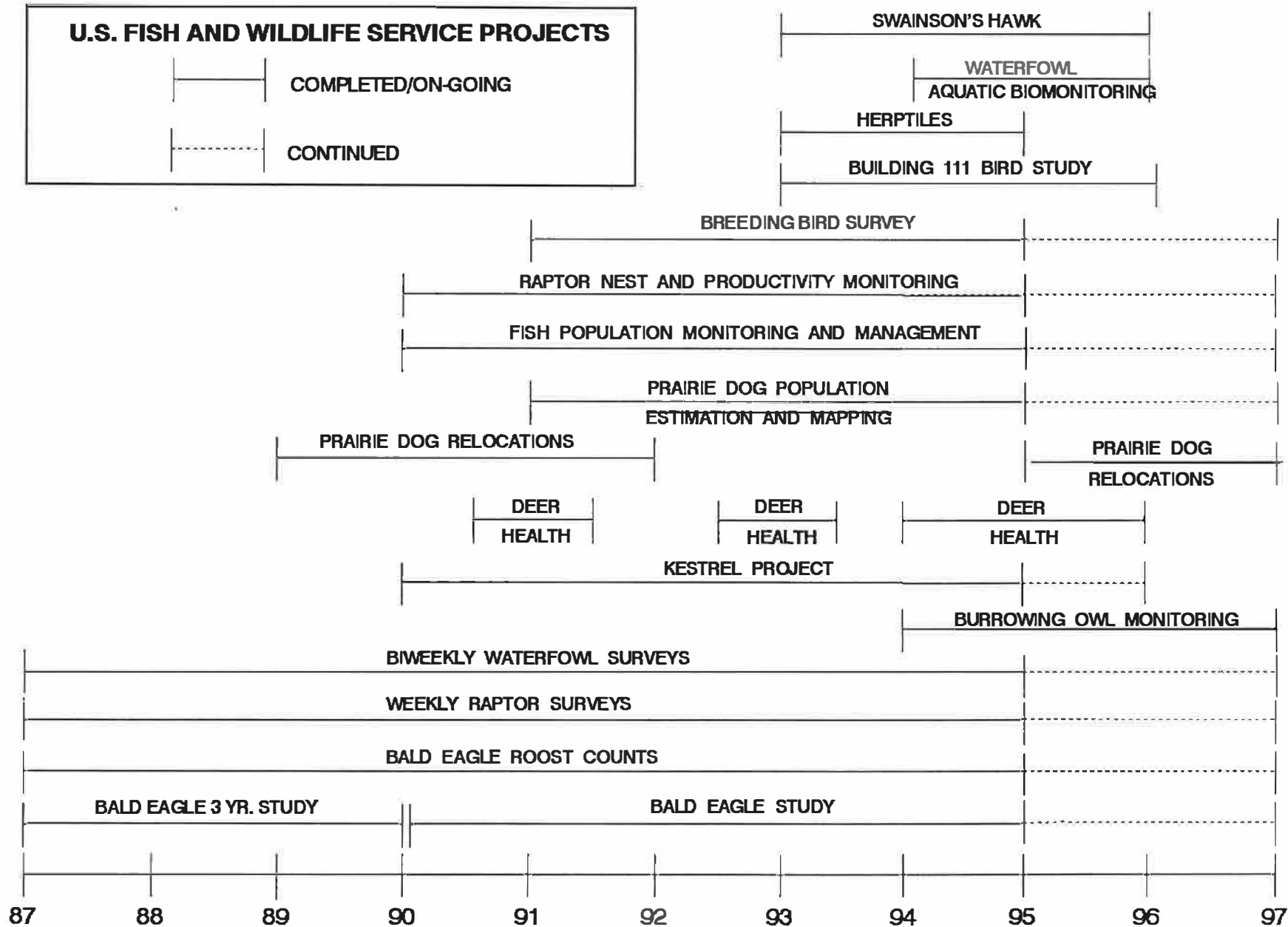


## U.S. FISH AND WILDLIFE SERVICE PROJECTS

COMPLETED/ON-GOING

CONTINUED



**U.S FISH AND WILDLIFE SERVICE  
SPONSORED PROJECTS  
1990 - 1997**

Following is a list of projects which the U.S. Fish and Wildlife Service has sponsored since establishing a field station at Rocky Mountain Arsenal. These projects have been accomplished by experts from various Universities and Agencies. Following is a list of projects and their objectives.

**U.S. Fish and Wildlife Coop Units/National Biological Service**

**Deer Study - University of Wyoming (UW)**

- 1) Determine inter-specific and intra-specific spatial and habitat relationships between sympatric mule and white-tailed deer on the Arsenal.
- 2) Quantify population characteristics of sympatric mule and white-tailed deer on the Arsenal.
- 3) Compare sympatric deer population statistics from the Arsenal to sympatric and allopatric deer populations from other areas.
- 4) Provide management recommendations and data collection protocols to Arsenal personnel.

**Fish Movement and Structure - Colorado State University (CSU)**

- 1) Develop structural habitat diversity indices for use in three lakes at the Arsenal.
- 2) Develop instrumentation capable of real-time on-board recording of structural diversity indices.
- 3) Evaluate capability of these indices to predict degree of fish use of different habitat types.
- 4) Develop guidelines based on structural diversity and fish use patterns for reconstruction of Arsenal lake basins following their decontamination.

**Burrowing Owl - Texas Tech University (Part 1) (TTU)**

- 1) Determine burrowing owl abundance on the Arsenal.
- 2) Locate areas of burrowing owl use on the Arsenal, and quantify habitat variables in selected and non-occupied habitats.
- 3) Determine productivity of burrowing owls breeding on the Arsenal.
- 4) Determine differences in productivity and density between owl populations subjected to various management treatments.

**Burrowing Owl - Texas Tech University (Part 2)**

- 1) Determine burrowing owl response to prairie dog reintroductions.
- 2) Assess the applicability of the sexually size dimorphic owl to foraging theory.
- 3) Determine nest site fidelity by adults and returning juveniles.

**Prairie dog Barriers and relocation - Colorado State University**

- 1) Determine the effect of group size on survival of prairie dogs transplanted to towns decimated by plague.
- 2.) Determine the effectiveness of barriers for deterring movements by prairie dogs.

3.) Determine overwinter survival of prairie dogs released in fall and winter 1989-90.

**Coyote/Badger - Colorado State University**

- 1) Determine density, age, and sex structure of coyote and badger populations on the Arsenal.
- 2) Determine concurrence of mark-recapture and capture-rate estimates of coyote density.
- 3) Determine food habits of coyotes and badgers in relation to prairie dog densities within their home ranges.

**Ferruginous hawk - University of Minnesota (UM)**

- 1) Determine the age and sex structure of the ferruginous hawk population wintering in and migrating through NE Colorado, and characterize habitat use by sex and age class.
- 2) Determine the extent to which ferruginous hawks exhibit inter-year wintering area fidelity.
- 3) Analyze ferruginous hawk habitat use among habitats altered to varying degrees by human development. Determine the rate at which ferruginous hawk winter habitat is being destroyed in the Denver front range area.
- 4) Investigate the degree to which morphological characteristics may be used to distinguish sex in ferruginous hawks, and the extent to which ferruginous hawks exhibit reversed sexual size dimorphism.

**Wetland - Benthic - Colorado State University**

- 1) Examine colonization of wetlands by benthic organisms and compare structural and functional characteristics of these systems to existing wetlands.
- 2) Monitor change in water quality in the wetlands and in the Highline Canal as these wetlands become established and as increased development occurs in adjacent areas to the Arsenal.
- 3) Identify potential pathways for contaminant transfer within these systems.
- 4) Compare colonization patterns, water quality, and pathways of contaminant transfer in wetlands established with and without the addition of plant propagules.

**Wetland - Vegetation - Colorado State University**

- 1) Examine how the rate and pattern of succession vary along a hydrologic gradient from sites with deep standing water to sites with a water table several inches or feet below the soil surface within the same wetland.
- 2) Determine how the rate of vegetation establishment and the composition of the created wetland community is influenced by the addition of plant propagules.

**Badger - Clemson University (The Institute of Wildlife and Environmental Tox.)**

- 1) Determine an approximate acute toxic dose of dieldrin in badgers.
- 2) Establish a profile of dieldrins toxicological effects occurring in badgers, encompassing low-level, environmental level and worst case scenario-levels in badgers maintained under clean, colony conditions.
- 3) Establish residue excretion patterns in positive control individuals for correlation with data obtained from the field.

- 4) Establish a field collection program with primarily non-lethal and limited lethal collections of badgers inhabiting the Arsenal. Develop techniques for non-lethal collection of tissues and biological fluids.
- 5) Create a GIS which can integrate chemical distribution patterns, badger home ranges and exposure, and effects oriented endpoints.
- 6) Establish a geographical estimation of contaminant severity in terms of location and impact on badger populations.

#### **Starling - Clemson University (TIWET)**

- 1) Establish European starling nest box colonies in order to enhance the reproductive population of the species in proximity to sites of concern.
- 2) Perform positive control dosing studies with dieldrin in order to determine age-dependent toxicity and biomarker dose-response relationships.
- 3) Determine the role of food item transfer of contaminants to nestling starlings using esophageal constriction techniques.
- 4) Correlate the geographic distribution of chemical exposure and induced effects with known distribution of chemical contaminants as a means of determining bioavailability of contaminants and eventually remediation need and efficacy.

#### **Deer Mouse - Clemson University**

- 1) Evaluate functional relationships between contaminant levels and demographic parameters of populations of deer mice that inhabit the Arsenal.
- 2) Collect a representative samples of wild mice from study sites for determination of concentrations of COCs and biomarkers.
- 3) Establish deer mouse containment enclosure on sites of concern in order to assess bioavailability of and biological responses to site contaminants in clean mice placed on the sites.
- 4) Perform positive control dosing studies with dieldrin in order to determine toxicity and biomarker dose response relationships.
5. Correlate the occurrence and geographic distribution of chemical exposure and induced effects, in wild and enclosed deer mice, to known distribution of chemical contaminants as a means of determining bioavailability of contaminants and eventually remediation efficacy.

#### **Great Horned Owl - Texas Tech University**

- 1) Correlate contaminant exposure levels with great horned owl (GHO) productivity parameters, juvenile survival rates and adult mortality.
- 2) Relate contaminant levels of adult and juvenile owls to their nesting and foraging areas.
- 3) Quantify contaminant levels in GHO prey.

#### **Magpie - Texas Tech University**

- 1) Quantify exposure of dieldrin and other COCs to magpie nestling and adults by analyzing for these contaminants in eggs, nestlings, fledglings, adults, and prey items, and by correlating residues to contaminant levels in home ranges and core use areas.
- 2) Quantify response to exposure by monitoring magpie densities, hatching success, nestling growth and development, nestling survival, fledgling survival, adult survival, and behavior attentiveness of breeding adult magpies.

- 3) Create a GIS integrating contaminant distributions, magpie use areas, exposure levels, and magpie responses.
- 4) Collect baseline data and develop tools to be used in the design and implementation of a long term biomonitoring program that can provide information on contaminant bioavailability and remediation efficacy.

#### **Pocket Gopher - Colorado State University**

- 1) Determine pocket gopher distribution and frequency occurrence at the Arsenal.
- 2) Conduct controlled dosing studies of pocket gophers to determine pathological evaluation, biomarker measurements and chemical residue analyses.

#### **Sediment/Macroinvertebrate and Fish Assemblages - Colorado State University**

- 1) Determine the effects of sediment contaminants on benthic macroinvertebrate assemblages in reservoirs at the Arsenal.
- 2) Assess the effects of nonpoint source pollution on water quality in Havana Ponds and First Creek.
- 3) Monitor demographic and community ecology of fishes in Lower Lakes of the Arsenal.
- 4) Develop specific biomarkers to detect exposure of fish to dielrin and other COCs in reservoirs at the Arsenal.
- 5) Link physiological changes in fish exposed to sediment contaminants to population and community-level endpoints.

#### **Fish Health - Bozeman FTC**

- 1) Determine extent of bacterial and viral disease, parasites, and histological abnormalities in Arsenal fish species.
- 2) Determine if Arsenal fish are being stressed or affected by contaminants in lake sediments or surface water.

#### **Fertility Control of Deer - Colorado Division of Wildlife**

- 1) Develop a practical and acceptable method for controlling mule deer populations using GnRH conjugates as contraceptives.
- 2) Demonstrate the feasibility of such control in a field application.
- 3) Predict population impacts of alternative contraceptive regimes using simulation modeling.

#### **Small Rodents - Denver Museum of Natural History (DMNH)**

- 1) Collect baseline censuses for rodent relative abundance in a variety of habitat types during summer and fall.
- 2) Calculate models for predicting rodent community composition based on a number of vegetation variables.
- 3) Perform habitat alterations at different spatial scales to determine if rodent responses to disturbance are scale dependent.
- 4) Conduct a simulated cleanup treatment in several sites including severe soil disturbance and vegetation removal, followed by reseeding with native grasses, and monitor rodent response.
- 5) Assess the role of competitive interactions between coexisting rodent species in determining their use of altered or disturbed habitat.

#### **Grassland Songbirds - Denver Museum of Natural History**

- 1) Document occurrences, relative density, and species richness of breeding and overwintering songbirds in key grassland and shrubland habitats at the Arsenal.
- 2) Determine the effects of experimental disturbance on breeding songbird assemblages in selected habitats.
- 3) Document distribution and success of Grasshopper Sparrow nesting attempts at the Arsenal.

#### **Lagomorphs - Denver Museum of Natural History**

- 1) Determine relative occurrence of lagomorphs on the Arsenal.
- 2) Determine habitat use by these lagomorphs.
- 3) Use radio telemetry to evaluate responses of lagomorphs relocated to restoration areas.

#### **Ferruginous Hawk - Denver Museum of Natural History**

- 1) Document relative abundance, distribution, average home range, and habitat use of ferruginous hawks overwintering at the Arsenal.
- 2) Document the year-round abundance and habitat use of all falconiforms at the Arsenal.
- 3) Determine yearly variation in ferruginous hawk diets.
- 4) Identify and characterize ferruginous hawk communal roost sites on the Arsenal.

U.S FISH AND WILDLIFE SERVICE  
PROJECTS  
1987 - 1997

**Swainson's Hawk**

This project identifies nesting and foraging areas used by Swainson's hawks, and identifies prey items, nest site characteristics, reproductive success, and productivity. Blood samples are collected from all captured hawks for contaminant analyses.

**Waterfowl - Aquatic Biomonitoring**

A reproduction survey of waterfowl will be conducted and waterfowl will be collected from lakes for contaminant analyses. Nesting coots will be marked with neck collars and locations of use monitored. These birds will be sacrificed at the end of the nesting season for contaminant analyses.

**Herptiles**

This project provided baseline information on reptiles and amphibians from a variety of habitats across the Arsenal.

**Building 111 Bird Study**

This project was initiated in an attempt to explain the frequent bird deaths around the Building 111 complex. Bird abundance, foraging areas, nesting sites, and bird activity are all monitored.

**Breeding Bird Survey**

The Breeding Bird Survey is a national standardized survey to compare avian population trends across the country.

**Raptor Nest and Productivity Monitoring**

Inventory and monitoring of nesting raptors is conducted each year during the spring and summer. Estimates of raptor reproductive success and productivity enables comparisons between years which can make inferences about population status.

**Fish Population Monitoring and Management**

Objectives of fishery management are to provide high quality sport fishery, and to maintain and enhance the quantity and quality of aquatic resources on the Arsenal. By monitoring fish populations, growth, and health the Service is able to meet these goals.

**Prairie dog Population Estimation and Mapping**

This project allows the Service to continue to monitor changes in prairie dog distribution and abundance across the Arsenal. Litter surveys, visual counts, and detailed mapping occurs each year.

**Prairie Dog Relocations**

Prairie dog relocations continue to re-establish prairie dogs into appropriate areas using nuisance prairie dogs trapped elsewhere on the Arsenal or from off-post locations.



### **Deer Health**

Several deer health studies have been conducted at the Arsenal. These studies determine overall health of the deer populations as well as determine if contaminants are having any impact on the deer.

### **Kestrel Project**

The objectives of this project are to quantify exposure of kestrels to the 7 COCs at the Arsenal. This project involves the use of radio telemetry to determine important foraging areas. Productivity, growth, and fledgling success of young are all monitored.

### **Burrowing Owl**

This monitoring effort essentially picks up where the TTU projects ended. Owls will be trapped and monitored to ascertain nest site fidelity, productivity, and foraging areas.

### **Biweekly Waterfowl Surveys**

These waterfowl surveys enable the Service to monitor waterfowl trends over time and to determine the importance of Arsenal habitats to various species of waterfowl.

### **Weekly Raptor Survey**

Weekly roadside surveys are used to monitor bald eagles and other raptor abundance and distribution across the Arsenal, and to provide an index of raptor habitat use. These surveys allow the Service to monitor trends in raptor populations over time.

### **Bald Eagle Roost Counts**

Every-other-night bald eagle roost counts have been conducted since 1987. By monitoring the number and ages of eagles using the Arsenal roost, the Service is able to monitor changes in eagle population characteristics.

### **Bald Eagle 3 year Study**

This project was initiated to determine the regional significance of the bald eagle population on the Arsenal, and surrounding areas. Also to determine what impact contaminants at the Arsenal may have on eagles, and identify appropriate means of maintaining bald eagle populations and associated high value wildlife habitat.

### **Bald Eagle Study**

This is a continuation of the 3 year study initiated in 1987. Service biologists continue to trap bald eagles for blood and fat collection, attachment of radio transmitters, and for banding. This information allows the Service to monitor changes in activity, contaminant levels, and population levels with dynamic changes in available habitat associated with increased human development and activity.