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FWS No. 14-16-0006-88-900 (R)

COOPERATIVE AGREEMENT

between

U.S. Fish and Wildlife Service

Rocky Mountain Arsenal
Information Center
Commerce City, Colorado

FILE COPY

and

City and County of Denver -
Stapleton International Airport,

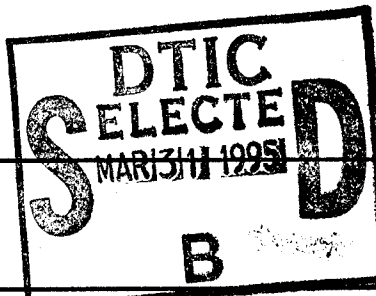
U.S. Department of the Army, and

E-470 Authority

REPORT DOCUMENTATION PAGE

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1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE 00/00/00	3. REPORT TYPE AND DATES COVERED	
4. TITLE AND SUBTITLE COOPERATIVE AGREEMENT BETWEEN U.S. FISH AND WILDLIFE SERVICE AND CITY AND COUNTY OF DENVER, STAPLETON INTERNATIONAL AIRPORT, U.S. DEPARTMENT OF THE ARMY AND E-470 AUTHORITY			5. FUNDING NUMBERS	
6. AUTHOR(S)				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) FISH AND WILDLIFE SERVICE			8. PERFORMING ORGANIZATION REPORT NUMBER 88193R02	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) DENVER (CO.)			10. SPONSORING / MONITORING AGENCY REPORT NUMBER	
				
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12a. DISTRIBUTION / AVAILABILITY STATEMENT APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED			12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) THE ARSENAL AND BARR LAKE MEET CRITERIA ESTABLISHED FOR ESSENTIAL BALD EAGLE HABITAT. THE U.S. FISH AND WILDLIFE SERVICE, STAPLETON AIRPORT, THE ARMY, AND THE E-470 AUTHORITY NEED TO DETERMINE WHAT IMPACTS THE ABOVE PARTIES' PROPOSED* ACTIVITIES MAY HAVE ON THE BALD EAGLE HABITAT WITHIN RMA, BARR LAKE, AND SURROUNDING AREAS. THE PURPOSES OF THIS AGREEMENT ARE TO: 1. DEFINE THE SCOPE OF THE STUDY WHICH WILL BE CONDUCTED BY THE FISH AND WILDLIFE SERVICE 2. ESTABLISH FINANCIAL OBLIGATIONS 3. DETERMINE OTHER RESPONSIBILITIES OF THE PARTIES. ATTACHMENT 1 IS THE PROPOSAL FOR A STUDY ENTITLED "THE POTENTIAL EFFECTS OF RMA CLEANUP ACTIVITIES AND DENVER METROPOLITAN TRANSPORTATION DEVELOPMENT ON BALD EAGLES." THE STUDY WILL EMPHASIZE THE ASSESSMENT OF AREA HABITAT VALUES AND EAGLE ECOLOGY. THIS PROPOSAL OUTLINES THE MEANS BY WHICH THE STUDY OBJECTIVES CAN BE ACCOMPLISHED.				
14. SUBJECT TERMS BALD EAGLES, MAMMALS, BIRDS			15. NUMBER OF PAGES	
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COOPERATIVE AGREEMENT

between

U.S. Fish and Wildlife Service

and

City and County of Denver -
Stapleton International Airport,

U.S. Department of the Army, and

E-470 Authority

**Rocky Mountain Arsenal
Information Center
Commerce City, Colorado**

I. BACKGROUND:

The U.S. Army's Rocky Mountain Arsenal (Arsenal) located near the northeast city limit of Denver, Colorado, contains approximately 17,000 acres of land which supports a large and highly diverse wildlife community. In particular, the Arsenal and nearby Barr Lake meet criteria established for essential bald eagle habitat. The cooperators, defined as City and County of Denver - Stapleton International Airport, the U.S. Department of the Army, and the E-470 Authority, along with the U.S. Fish and Wildlife Service desire to determine what, if any, impacts the cooperator's proposed activities may have on bald eagle habitat within the Rocky Mountain Arsenal, Barr Lake, and surrounding lands.

The bald eagle is classified as endangered in Colorado under the Endangered Species Act (16 U.S.C. 1531 et seq.). Consequently, sponsors of those developments requiring Federal authorizations will have to consider potential project effects to local populations of these birds. Adequate data on bald eagle habitat use and home ranges are however lacking; confounding impact predictive capabilities. In response, the U.S. Fish and Wildlife Service prepared "A Proposal" to address project related bald eagle data deficiencies.

II. PURPOSE

The purpose of this agreement is to define the scope of the study which will be conducted by the U.S. Fish and Wildlife Service, to establish the financial obligations of the cooperators, and to establish any other responsibilities or obligations of the parties.

III. AUTHORITY

This Cooperative Agreement between the U.S. Fish and Wildlife Service and the aforementioned cooperators is hereby entered into under Public Law 95-224, Federal Grant and Cooperative Agreement Act of 1977, and the Fish and Wildlife Coordination Act, 16 United States Code 661 Endangered Species Act, 16 United States Code 1531 et seq.

IV. SCOPE OF WORK (See attached Final Proposal and Annual Work Plan)

For the period established herein, the U.S. Fish and Wildlife and the Cooperators shall jointly contribute to accomplishment of the study effort identified in the attached Final Proposal "The Potential Effects of Rocky Mountain Arsenal Cleanup Activities and Denver Metropolitan Transportation Development on Bald Eagles" dated 1 October 1987 and the Annual Work Plans.

V. PERIOD OF PERFORMANCE

- A. The period of this Cooperative Agreement is from October 1, 1987 through September 30, 1990, subject to provisions of Section XI hereof.
- B. See Special Provisions IX.A. for Annual Fiscal Year Renewal provisions.

VI. FINANCIAL ADMINISTRATION (See attached Contribution Plan)

A. Funding:	<u>FY 88</u>	<u>FY 89</u>	<u>FY 90</u>
1. City and County of Denver - Stapleton International Airport			
a. FY 88	<u>\$24,850</u>		
b. FY 89		<u>\$ *</u>	
c. FY 90			<u>\$ *</u>
2. Department of the Army			
a. FY 88	<u>\$12,700</u>		
b. FY 89		<u>\$ *</u>	
c. FY 90			<u>\$ *</u>
3. E-470 Authority			
a. FY 88	<u>\$ 7,600</u>		
b. FY 89		<u>\$ *</u>	
c. FY 90			<u>\$ *</u>
4. Fish and Wildlife Service			
a. FY 88	<u>\$24,850</u>		
b. FY 89		<u>\$ *</u>	
c. FY 90			<u>\$ *</u>

5. Total Funding			
a. FY 88	\$70,000	\$ *	
b. FY 89			\$ *
c. FY 90			

* TO BE DETERMINED IN ACCORDANCE WITH SECTION IX.A. HEREOF.

B. Obligation of Funds.

1. Signatures hereto shall constitute the obligation of funds in the amounts cited in paragraphs VI.A.1., 2., 3., and 4 above for the expenditure of the U.S. Fish and Wildlife Service for Fiscal Year 1988 (October 1, 1987 through September 30, 1988). The obligations of the cooperators to contribute property, services or anything else of value are delineated in the attached Contribution Plan.

2. The obligation of funds, property, services or anything else of value for fiscal years 1989 and 1990 shall be established annually in accordance with the Contribution Plan and the Renewal Provision for each of those years.

3. Unliquidated Obligations. Any unliquidated obligations at the end of each fiscal year shall be equally distributed to the cooperators by crediting each cooperator's subsequent year contribution or by refunds.

C. Payments.

1. Payment requests shall be submitted through the appropriate Cooperator's Project Officer for approval and forwarding to Cooperator's payment office.

2. The U.S. Fish and Wildlife Service shall be responsible for maintaining a detailed record of costs incurred to complete effort under this agreement.

3. Each cooperator shall be billed their share of incurred cost up to the amount of their fund contribution cited in paragraph VI.A.

4. Quarterly payments will be requested from each cooperator in the order set forth below and in the amount of cooperator's fund contribution upon incurrence of costs by the Fish and Wildlife Service in that amount.

- a. City and County of Denver - Stapleton International Airport
- b. Department of the Army
- c. E-470 Authority
- d. U.S. Fish and Wildlife Service

5. The Fish and Wildlife Service shall provide all cooperators with a Quarterly accounting of expenditures and an annual reconciliation of cost incurred.

VII. PROJECT OFFICERS

- A. City and County of Denver - Stapleton International Airport
Attn: Mr. George Doughty
Stapleton International Airport
Denver, CO 80207
Telephone: 303/398-5596

- B. Department of the Army
Captain Andrew Kingery
Office of Program Manager for Rocky Mountain Arsenal
Contamination Cleanup
Attn: AMXRM-EE
Building E 4460
Aberdeen Proving Ground, Edgewood Area, MD 21010-5401
Telephone: 301/671-3261

- C. E-470 Authority
Attn: Mr. Greg Henk
7951 East Maplewood Ave., Suite 126
Englewood, CO 80111
Telephone: 303/773-9588

- D. U.S. Fish & Wildlife Service
Mr. J. Michael Lockhart
Colorado Field Office
529 25-1/2 Road, Suite B-113
Grand Junction, CO 81505
Telephone: 303/243-2778

VIII. DELIVERABLES (See attached Annual Work Plan)

The U.S. Fish and Wildlife Service shall deliver to the cooperators the following:

- A. Annual Study Report
- B. Final Study Report
- C. Financial Report
- D. Monthly Status Reports - at regular monthly meetings between cooperators and project officers.

IX. SPECIAL PROVISIONS

A. Renewal

1. This agreement shall be reviewed annually on or before 1 July of each year. Prior to 1 October of each year an Annual Work Plan and a Contribution Plan for the subsequent fiscal year will be established and mutually agreed upon.

2. Renewal of this agreement shall be definitized October 1 of each year, for a period not to exceed 3 years. Renewal shall be accomplished by the issuance of a modification with an effective date of October 1, signed by all the cooperators, specifying the fund obligations, other obligations under the Contributions Plan and the work to be accomplished under the fiscal year Annual Work Plan.

3. It is mutually agreed that renewals are contingent upon the appropriation of funds by the governing bodies of each cooperator. Failure of any cooperator to receive such appropriations shall release that cooperator from any future liabilities or commitment under this agreement.

B. Novation and Change-of-Name Agreements

1. Federal Acquisition Regulations (FAR), subpart 42.12 is hereby incorporated by reference.

C. Allowable and Allocable Costs.

1. Allowable and allocable costs under this agreement shall include all direct and indirect costs incurred by the Fish and Wildlife Service in the performance and accomplishment of the agreements scope of work. Service overhead costs are predetermined and fixed as stated in the Three Year Budget Plan.

D. Property

1. Property acquired to accomplish the study which is provided in partial fulfillment of funding, shall become the property of the U.S. Fish and Wildlife Service.

E. Project Officers

1. The Project Officers specified herein, shall be responsible for overseeing the performance of the work as contained in the proposal. As representatives of the cooperators, the Project Officers have the authority to approve technical changes within the scope of work, which will not alter the stated objectives and will not obligate any additional funds.

F. This agreement shall be null and void unless signed by all cooperators identified herein.

G. Withdrawal. See paragraph XI, Termination provisions.

H. The U.S. Fish and Wildlife Service will,

a. With 30 days prior notice, provide project data to any cooperator.

b. During the study, participate with cooperators, in Section 7 consultations, under the Endangered Species Act, using the best information available at the time, and following periods prescribed by law.

X. MODIFICATIONS

A. Any changes to this agreement, which are beyond the agreement's technical scope and/or changes which will increase the estimated cost of the agreement shall be made in writing, and signed by all cooperators prior to performance of any work beyond that specified herein.

B. Project Officers. See paragraph IX.E. for authority and responsibilities.

XI. TERMINATION

A. Any cooperator may terminate participation in this agreement by giving written notice to the U.S. Fish and Wildlife Service, and each cooperator, at least 90 days prior to the end of the fiscal year in which the cooperator has incurred an obligation in accordance with the Contribution Plan.

B. Termination (withdrawal) by a cooperator shall not relieve the withdrawing cooperator from any obligations incurred under the definitized Contribution Plan to which the cooperator was a party. Unliquidated obligations shall, however, be distributed to the withdrawing cooperator in accordance with paragraph VI.B.3 of this agreement.


XII. ATTACHMENTS

- One - Final Proposal, dated 1 October 1987
- Two - Three Year Budget Forecast
- Three - Fiscal Year 1988, Annual Work Plan
- Four - Fiscal Year 1988, Contribution Plan

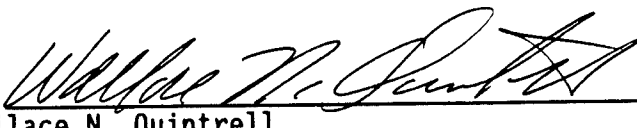
SIGNATURE PAGE

IN WITNESS WHEREOF, the parties hereto have caused this Cooperative Agreement to be executed as of the date therein written.

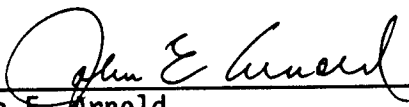
Greiner Engineering Sciences, Inc., a consultant for the City and County of Denver, Stapleton International Airport, in the matter of the environmental assessment for the new Denver Airport,

Signature: 
Name: Wendell P. Palmer
Title: Executive Vice President
Date: December 15, 1987

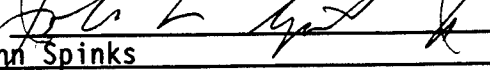
U.S. Army

Signature: 
Name: Wallace N. Quintrell
Title: Colonel, Ordnance Corps and Program Manager, Rocky Mountain Arsenal
Date: December 15, 1987

E-470 Authority

Signature: 
Name: John E. Arnold
Title: Executive Director
Date: December 15, 1987

U.S. Fish & Wildlife Service

Signature: 
Name: John Spinks
Title: Region 6, Deputy Regional Director
Date: December 15, 1987

Attachment 1

THE POTENTIAL EFFECTS OF ROCKY MOUNTAIN ARSENAL CLEANUP
ACTIVITIES AND DENVER METROPOLITAN TRANSPORTATION DEVELOPMENT
ON BALD EAGLES

Final Proposal
October 1, 1987
Presented By:

The U.S. Fish and Wildlife Service,
Colorado Field Office and National Ecology Center

PROBLEM OVERVIEW

Largely undeveloped areas of western Adams County, Colorado, particularly Barr Lake State Park and portions of the Rocky Mountain Arsenal (Arsenal), harbor an extremely rich wildlife community. The significance of wildlife resources on the Arsenal and Barr Lake is largely manifested by the increased presence of bald eagles over recent years. Although only casual winter utilization of Barr Lake by bald eagles was previously documented (Fisher et al. 1981), a pair of these birds established a territory in 1986 and attempted breeding in both 1986 and 1987. Also in 1986, wildlife consultants for the Army discovered a winter communal roost of up to 21 bald eagles on the eastern side of the nearby Arsenal.

The Northern States Bald Eagle Recovery Plan (U.S. Fish and Wildlife Service 1983) defines locales that support nesting bald eagle pairs, or wintering populations in excess of 15 birds for over two weeks, as essential habitats for the species. Consequently, protection of such habitats is a fundamental goal of the Service's bald eagle recovery plan. Within the next decade, wildlife habitat suitability on the Arsenal, Barr Lake and much of surrounding Adams County may be compromised by urban development. In addition to wildlife impact uncertainties associated with cleanup and ultimate disposition of the Arsenal, construction of the proposed Stapleton runway expansion, the new Stapleton Airport, the E-470 beltway, the Fifty Sixth Street expressway and associated secondary development could adversely affect area bald eagles and many other wildlife species.

Although the Fish and Wildlife Service (Service) recognizes and supports the need for Arsenal cleanup and improved transportation facilities in the Denver area, wildlife values must be adequately weighed in project planning processes as mandated by Federal and State statute and regulation. The wildlife of Barr Lake and the Arsenal, with an abundance and diversity perhaps unequalled elsewhere in the state, is a resource of considerable public value. As an example of public interest in local wildlife issues, coverage of Arsenal bald eagle contaminant assessment efforts by a Denver television station in March of 1987 sparked greater public response than any other single story by that station thus far this year (P. Reinertson, KMGH-TV-Denver, pers. comm.).

The Service recognizes that environmental values are properly weighed against other impacts/benefits as part of established Federal and State public interest determinations. However, given the significance of local wildlife resources, it is critical that the best possible baseline data be obtained to facilitate decision making processes and aid in development of responsive mitigation strategies. With this in mind, the Service has prepared this proposal in hopes of securing support for a regional study on potential development impacts to bald eagles in western Adams County.

PROPOSAL

Several major proposed projects on and in the vicinity of the Arsenal and Barr Lake are planned and will require Federal authorizations to proceed. This area is delineated as the central portion of a proposed study area in Figure 1. Consequently, proponents for those projects will be required to evaluate whether or not their actions are likely to affect endangered species. With the extent of bald eagle use over project areas near the Arsenal and Barr Lake, a finding of "may effect" may be unavoidable. Hence, proponents may be required to prepare a biological assessment to identify the effects of their projects on bald eagles (and perhaps other endangered species as well). Should the biological assessment conclude that a "may affect" finding is appropriate, the Service will render a biological opinion on the significance of project impacts to the continued existence of affected species.

It must be pointed out, however, that an adequate evaluation of impacts on bald eagles in the Arsenal/Barr Lake area is impossible to obtain from current information. At this point in time, several proposed projects are in preliminary planning stages. More importantly, there are insufficient data on local bald eagle habitat availability and use, prey availability and home ranges of eagles over potentially affected lands to reasonably assess project effects on these birds. To avoid duplication of effort and facilitate acquisition of a sound, consistent database, the Service proposes to develop and implement an intensive three year investigation on bald eagle ecology in the Arsenal/Barr Lake area. This study is warranted not only to address specific bald eagle impact concerns and aid in agency compliance under section 7 of the Endangered Species Act (16 U.S.C. 1531 et seq.), but to help characterize overall area wildlife habitat significance. Habitats of importance to bald eagles in western Adams County may prove to be of high value to other raptors and a variety of other birds and mammals.

Initiation and success of a regional bald eagle study is dependent on the support of a consortium of entities that may affect (or be affected by) resident and/or wintering bald eagles. Such groups include but are not necessarily limited to: the U.S. Department of the Army, the Environmental Protection Agency, the Federal Highway Administration, the Federal Aviation Administration, the Colorado Department of Natural Resources (Barr Lake State Park), the Colorado Department of Highways, Shell Oil Company, Stapleton Airport, E-470 Authority, the City and County of Denver, Adams County and the City of Aurora.

The proposed study of bald eagles on and adjacent to the Arsenal and Barr Lake would be principally directed toward assessment of area habitat values and eagle ecology. Data on migration and other long range movements will not be emphasized. With the exception of an annual exploratory survey (discussed below), efforts will be limited to western Adams County and, if warranted, lesser portions of Weld and Arapahoe Counties.

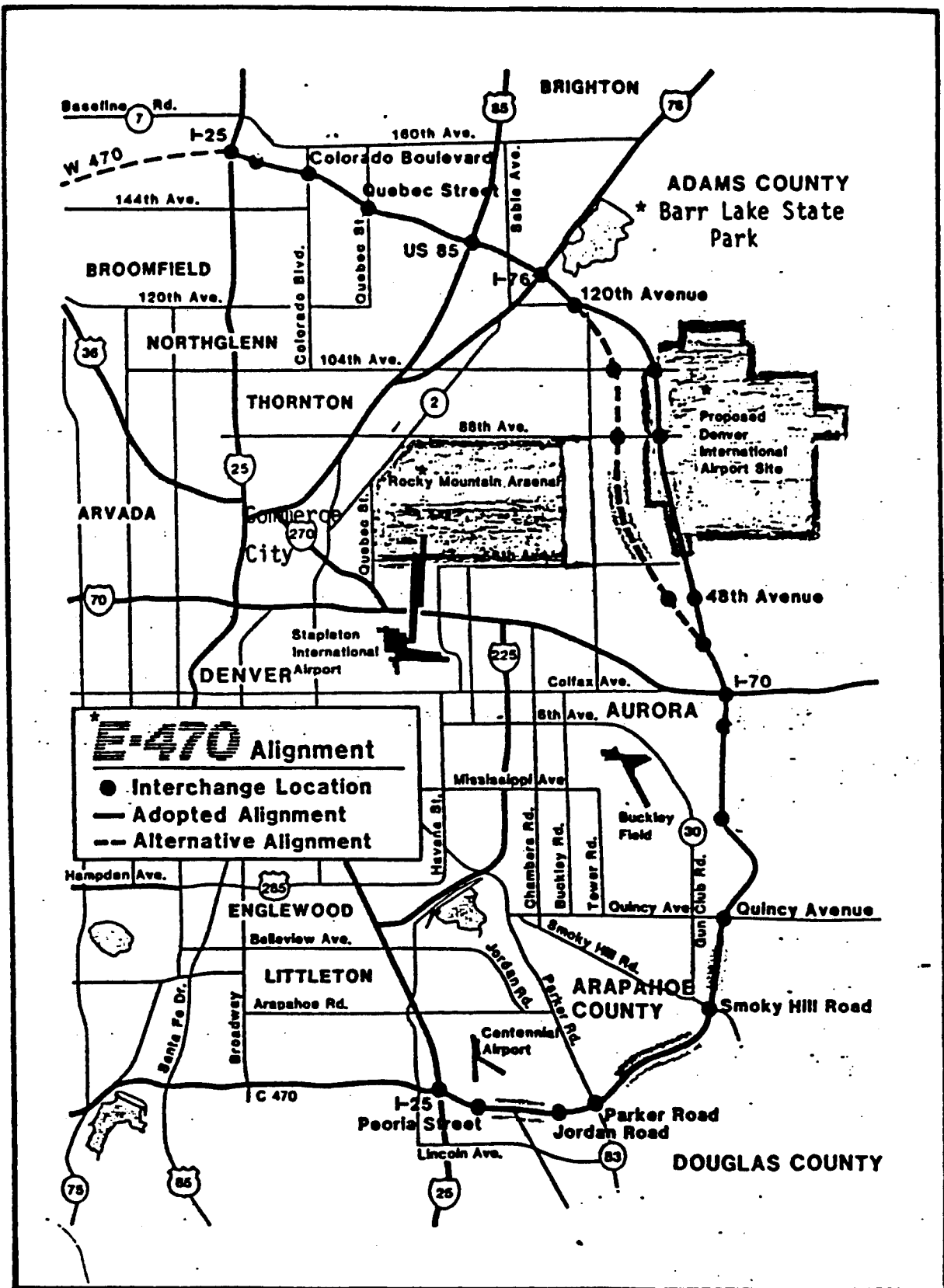


Figure 1. Central portion of study area east of Denver, Colorado referred to in U.S. Fish and Wildlife Service Bald eagle proposal dated October 1, 1987. (From E-470 map)

Study Objectives and Methods

The overriding objectives of the proposed study are:

- A. To determine factors contributing to bald eagle occupation of the Arsenal, Barr Lake and surrounding environs.
- B. To determine the regional significance of the bald eagle population on the Arsenal and Barr lake study area.
- C. To determine the likelihood of proposed area project impacts (both singularly and collectively) on wintering and nesting bald eagles within the project area.
- D. To identify appropriate means of maintaining bald eagle populations and associated high value wildlife habitats in western Adams County.

To accomplish these goals, more specific objectives and the respective means to accomplish each objective are more thoroughly described as follows:

1. To determine bald eagle home range, seasonal key use areas (e.g. high frequency foraging and roost/perch sites), activity patterns and activity relationships between disturbed and undisturbed lands.

Bald eagles will be captured by various techniques. Efforts will be made to capture a bald eagle from the Barr Lake territory (preferably the male). In addition to taking blood samples from eagles, small radio transmitters will be attached to all captured birds to facilitate acquisition of eagle home range, habitat use and activity data. In order to minimize potential adverse effects of telemetry harnesses and visual marking devices on eagles (Lockhart and Kochert unpub. report), captured birds will be fitted with inconspicuous tail-mounted radios as described by Dunstan (1973) and Kenward (1978). In addition, all eagles will be banded with Fish and Wildlife Service pop rivet aluminum bands and if Service Bird Banding Laboratory color schemes are available, eagles may be fitted with individually identifiable color bands. Because bald eagles have a complete molt each year (thereby ensuring loss of transmitters), radios will be designed for maximum power output rather than extended life. A 2.7 volt transmitter will be equipped with a sufficient size battery to last for 9 to 12 months. Total transmitter weight will range from 20 to 30 grams.

Radio telemetry is the principal technique by which study objectives will be met. Telemetry data will be obtained by two means. Because there may be considerable logistical difficulties in accessing private lands around the Arsenal and Barr Lake, we propose to establish up to six null peak, tower receiving stations on strategic hilltops throughout the proposed study area.

Twin, eleven element null peak antenna stations on fixed towers have exceptional receiving accuracy and range. By manning two tower stations, field personnel can simultaneously triangulate on individual eagles at considerable distances. Consequently, large volumes of point location data for several eagles can be generated over short periods of time. To facilitate recording of eagle locations, the Universal Transverse Mercator (UTM) system (displayed on U.S. Geological Survey maps) will be employed to assign x,y coordinates for each observation. At the 1:24,000 scale, UTM map coordinates will be determined to the nearest meter, a level of accuracy which is greater than will be realized with recorded field data. By inputting simultaneous azimuth readings from two towers into a portable computer/data recorder, x,y coordinates of locations will be automatically calculated and stored for later retrieval.

In addition to location, some eagle activities can also be determined by signal characteristics. Because of the rigid attachment of the transmitter antenna to the rachis of a bald eagle tail feather, any movement by the eagle causes considerable variation in antenna polarity, and thus signal reception. Consequently, it is often possible to determine if radio-tagged eagles are perched, soaring or flying from point to point.

Tracking periods will be stratified to ensure equal effort over daylight hours and months of the year. Information obtained from remote tracking will be used to determine bald eagle home ranges, habitat use and key activity areas. To further enhance analyses of principal bald eagle activity areas and habitat use (see objective 2 below) the study area will be computer grided into .1 km UTM blocks. Subsequent analyses of the frequency of telemetry fixes within blocks will reveal patterns of high use areas, both by single birds and the collective bald eagle population. By mapping or identifying blocks with houses, commercial facilities, recreation sites, etc., bald eagle activities may be compared with certain forms of human disturbance (see Harmata 1984).

Although remote tracking from towers has many significant advantages and can generate accurate and continuous data on eagle movements, much of the specific activity that eagles engage in can only be documented through direct observation. To supplement remote telemetry data, individual eagles will be observed over extended predetermined tracking periods. Again, intensive tracking bouts will be stratified to ensure equal attention to all radio-tagged birds over daylight hours and seasons. Radio telemetry will be used to initially locate specific eagles and to locate them throughout specified tracking periods when they are lost from sight.

Observations of radio-tagged eagles will be made on a continuous basis while eagles are in sight. Any change in activity or location will constitute an observation. For each observation, the eagle's location will be plotted and numbered on USGS 1:24,000 scale field maps. Coded field forms will be used to simplify data recording. Associated data that will be recorded will include the eagle's specific activity, time of day and date, presence of other eagles and their ages, presence and kind of food and any related general comments. All field data will be transferred to fortran sheets and prepared for computer storage and analysis.

Existing computer programs, originally from the Cedar Creek Software Library, will be used to calculate bald eagle minimum home ranges by month, season, year and perhaps over years. In addition, computer analyses of bald eagle activities will yield information on the distribution of key eagle activity areas and will provide evidence of any intrinsic relationships on the amount of area that eagles effectively utilize (i.e. whether activity distribution is proportional to home range size).

2. To determine seasonal habitat use and area habitat availability for nesting and wintering bald eagles over the study area.

Several habitat features are known to be important to bald eagles in western Adams County. These include a nest and communal roost site at Barr Lake State Park, as well as foraging locations on the Arsenal. Riparian habitats, isolated trees, prairie dog colonies and water sources are probably important to area bald eagles.

Although information on the frequency of use of elemental habitat types can be drawn from telemetry information, such data only partially addresses the question of overall habitat significance. In order to perform an adequate evaluation of habitat importance, it will be necessary to compare quantified habitat use information with quantified data on habitat availability. Consequently, habitat features will be mapped over a predetermined study area (as may be determined by initial eagle activity data). Habitat features suspected to be of significance to bald eagles be mapped on a scale of 1:24,000 and updated as additional habitats are defined by study progress. Existing or proposed vegetation maps, as well as maps of other biological features (e.g. prairie dog colonies) that are or will be generated as part of environmental review processes for individual projects, would greatly facilitate preparation of a bald eagle habitat base map. Where existing habitat data are unavailable and are deemed necessary, habitat mapping will be accomplished by use of aerial color infrared photography and a stereoscope viewer.

To accommodate assessments of habitat use vs. availability, the base habitat map will be computer grided into .1 km UTM blocks as described above. Map blocks will be "filled" (indicating habitat availability at that location) if any habitat feature is present (e.g. a single perch tree). In this manner, frequency of bald eagle use for grid blocks can be directly compared with the habitats found in those same blocks. Because grid blocks may contain more than one habitat type, data will be available indicating the significance of combined habitat availability (e.g. the importance of isolated perchs vs. ones overlooking prairie dog colonies).

3. To determine bald eagle food habits, annual/seasonal prey population trends and seasonal prey availability.

Brown (1974) and Newton (1976) have stressed the importance of acquiring adequate knowledge of prey resources in ecological studies of raptors. While there is a great deal of literature on the food habits of bald eagles over their range, an understanding of prey use on the study area is fundamental to an assessment of habitat importance and potential project impacts to bald eagles.

Bald eagle prey use in the study area will be determined from direct observations of foraging birds (both casual and telemetry observations) and analyses of prey remains or regurgitated pellets from communal roosts, perches or nest sites. All attempts to recover prey remains will be accomplished in a manner that will minimize or avoid direct investigator disturbance to eagles. It is also important to document changes in prey populations or availability, either natural or man-caused, to substantiate overall habitat significance. Annual and seasonal changes in prey populations on the study area will be investigated by the following means:

Prairie dogs -- Prairie dog activity is heavily influenced by weather conditions. Consequently, specific visual counts of animals between seasons may not yield comparative data. We propose to approach the questions of prairie dog population trends and winter availability to eagles separately. Following procedures outlined by Knowles (1982), Faggerstone and Biggins (1986) and Biggins (National Ecology Center, Service, pers. comm.), annual prairie dog population trends for the project area will be established by counting all observed individuals in several high density prairie dog areas of 7 - 12 hectares. Counts will be made from a central vantage point in early morning and repeated up to three times to obtain a high daily count. This process will be duplicated over a four day period and the mean obtained from each high daily count. Such efforts will be conducted two times per year at pre- and post emergence periods for prairie dog pups (ca. mid to late April and mid to late June).

In addition to determining annual fluctuations of prairie dog populations, prairie dog availability in relation to wintering bald eagle use will be investigated by counting active animals along prescribed vehicle survey routes. In winter months, prairie dog activity is probably greatest during the warmest portion of the day and surveys will be scheduled accordingly. Up to 10 miles of roadway bisecting or abutting prairie dog colonies will be driven at a slow set speed. All animals up to 200 meters from the road will be counted. The survey will be repeated three times to establish a high daily count. Roadside prairie dog surveys will be conducted monthly between October and April of each year that the bald eagle study is in progress.

To determine the stability of overall study area prairie dog distribution, a habitat base map of prairie dog colonies will be annually "ground truthed" to document colony expansions or abandonments. It will be particularly important to monitor local prairie dog distribution changes and resultant bald eagle/raptor responses which result from localized prairie dog control programs within the study area.

Lagomorphs -- With modification of procedures described by Lord (1963) and Schwartz (1975), four 10 to 20-mile-long survey routes will be established and censused by vehicles over three consecutive mornings four times a year (January, April, July and October). Surveys will be performed only on clear or lightly overcast mornings when wind velocity does not exceed 10 mph. Surveys will begin 1 hour before sunrise and will be driven at a speed of 15 to 20 mph. All observed lagomorphs, identified to species if possible, will be counted regardless of distance from vehicle. Relative abundance of lagomorphs will be expressed in miles driven per animal observed. Lightly traveled all-weather roads that are distributed throughout the study area will be selected for census routes. Once routes and sequences of route travel are established, they will be duplicated for the duration of the study.

Other prey -- Waterfowl and shorebirds occur throughout the Arsenal/Barr Lake area wherever water is found. During ice free periods, local lakes and stream/canal channels support substantial populations of ducks and geese. In addition, pheasants are locally abundant over portions of the study area. Investigations are therefore proposed to determine seasonal and annual abundance of large game birds. We propose to inventory waterfowl and pheasant numbers four times per year (in January, April, July and October).

Appropriate roadside visual counts or crow counts of pheasants will be undertaken from one half hour before to one hour after sunrise. Surveys will be conducted over three days to establish a mean, daily seasonal count. Waterfowl will be inventoried on the same days but will follow pheasant surveys to allow time for foraging ducks and geese to return to water sources. Four or five major water bodies within the study area, which afford adequate viewing of all or the majority of surface acreage, will be visited to obtain visual counts of waterfowl. Cold weather in January may preclude waterfowl inventories over the study area. If ice-up occurs, waterfowl counts will be performed at such time that significant portions of survey lakes/streams reopen.

In addition to bird and mammal prey surveys identified above, casual sightings of any other potential bald eagle prey species (e.g. skunks, weasels, chukar, etc.) will be recorded during established inventories in an attempt to ascertain gross population changes of those species over the course of the study.

4. To determine the distribution, size and species structure of raptor populations on the study area and evaluate the regional significance of the Arsenal/Barr Lake raptor community.

The potential value of the Arsenal and Barr Lake to area raptor populations is demonstrated by: 1) the presence of an active bald eagle nest at Barr Lake (one of only 10 sites in the state), 2) a sizeable population of wintering bald eagles on a relatively confined area on and adjacent to the Arsenal, 3) large numbers of breeding Swainson's Hawks (a candidate species for Federal listing), and 4) a perhaps unprecedented winter population of ferruginous hawks (another candidate species).

In order to investigate the local importance and uniqueness of the Arsenal/Barr Lake study area, we propose to inventory winter raptor distribution and presence of other bald eagle communal roosts over a larger portion of central Colorado. A roadside raptor survey circuit(s) of approximately 50 miles will be established on the study area and surveys conducted over three consecutive days monthly from October through April. Surveys will be performed during early to mid morning periods. In addition, an extensive exploratory aerial survey will be conducted East of Denver over an area circumscribed by State Highway 86 (Castle Rock to Limon), State Highway 71 (Limon to Brush) and Interstate 76 (Brush to Denver).

Three flights by slow flying, fixed wing aircraft will be conducted one hour before sunrise to two hours after sunrise (or two hours before to one half hour after sunset) for three consecutive days. Three flights will ensure coverage of large areas at times of the day when roosting bald eagles are likely to be discovered. The survey would concentrate in upland areas that have not been previously inventoried. Most winter bald eagle investigations to date have concentrated on major river corridors and lakes. We hope to determine whether upland bald eagle concentrations or general raptor population levels similar to that found on the Arsenal occur nearby on similar habitat.

The survey would be performed annually to coincide with anticipated peak concentrations of bald eagles and other raptors on the Arsenal. Total counts of species will be recorded as will the locations, number of birds observed and habitat features of any discovered bald eagle or raptor concentrations.

5. To determine proposed project effects on bald eagles and representative wildlife habitats.

The results of this study will reveal area lands of high, moderate and little value to bald eagles. The investigation will also provide a relative regional comparison of the significance of study area raptor populations. With details of project plans, this study will be used to predict the direct and indirect effects of proposed developments on high value eagle habitats and ultimately bald eagles themselves over the study area.

Perhaps the greatest value of the study would be a vastly improved ability to evaluate management options. We will be able to more accurately determine precisely where conflicts between development and bald eagles will result and whether those conflicts would be negligible or considerable. With a better understanding of bald eagle habitat composition and activity patterns, more accurate determinations may be made as to whether impacts are irreconcilable or can be mitigated through project modifications or habitat manipulation. In the event that significant, unavoidable impacts to bald eagles occur with project developments, we could accurately evaluate the feasibility of duplicating habitat conditions to enhance bald eagle use of off-site lands. These are important considerations that will be addressed in the proposed study and, in our opinion, are essential to governmental permitting decisions regarding proposed developments in the Arsenal/Barr Lake area.

STUDY RESPONSIBILITY AND FUNDING

The proposed study will be supervised and/or conducted by the Service. A Service principal investigator will be assigned to coordinate all aspects of eagle capture, radio instrumentation, data gathering, data analyses and reporting. Because of the level of expertise in design and use of radio telemetry systems and telemetry data analyses, personnel from the Service's National Ecology Center will share principal responsibility for study design and data evaluation.

Study progress and major findings will be reported annually. On request, all information will be made available to sponsoring agencies to facilitate their project planning processes. Annual progress reports, final reports and obtained data may be used by sponsoring agencies to aid in development of related environmental impact reports. The Colorado Division of Wildlife and Colorado Department of Highways will receive copies of all project reports. Appendices A and B to this Attachment provide the general form of annual and final project reports.

Since major objectives of the proposed study include a determination of specific project effects on area bald eagles and associated secondary and cumulative impacts, generated information will also aid in the preparation of Section 7 biological assessments. However, to adequately evaluate specific project effects, detailed project plans must be provided by the proponent or representative agency. An annual work plan is provided in Attachment 3.

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Appendix A to Attachment 1

OUTLINE OF ANNUAL PROGRESS REPORT
COVERING U. S. FISH AND WILDLIFE SERVICE
DENVER AREA BALD EAGLE STUDY
INITIATED OCTOBER 1, 1987

- A. Bald eagle home range and local movements
 - 1. telemetry results
 - 2. direct observations
- B. Bald eagle habitat use
 - 1. telemetry results
 - 2. direct observations
- C. Raptor inventories
 - 1. ground censuses
 - 2. extensive aerial surveys
- D. Bald eagle prey use
 - 1. prey numbers and distribution
 - 2. inferred use by habitat selection
 - 3. direct observations of capture, feeding, etc.
 - 4. casting analyses
 - 5. other reports
- E. Other wildlife
- F. Development and contaminant status
- G. Discussion
- H. Future level of effort

Appendix B to Attachment 1

OUTLINE OF FINAL REPORT COVERING
U. S. FISH AND WILDLIFE SERVICE
DENVER AREA BALD EAGLE STUDY
INITIATED OCTOBER 1, 1987

- A. Bald eagle home range analyses
 - 1. telemetry results
 - a. monthly home range
 - b. seasonal home range
 - c. yearly home range
 - 2. direct observations
 - 3. key use areas - (home range overlap between individuals)
- B. Bald eagle habitat use
 - 1. telemetry results
 - 2. direct observations
 - 3. habitat significance (use vs. availability)
 - 4. habitat use in relation to human disturbance
- C. Raptor inventories
 - 1. ground censuses
 - 2. extensive aerial surveys
- D. Bald eagle prey use
 - 1. prey numbers and distribution
 - 2. inferred use by habitat selection
 - 3. direct observations of capture, feeding, etc.
 - 4. casting analyses
 - 5. other reports
- E. Other wildlife
- F. Development and Contaminant Status
- G. Discussion and recommendations
- H. Conclusion

Attachment 2

THREE YEAR BUDGET PLAN

	Yr 1	Yr 2	Yr 3
<u>Salaries</u>			
U. S. Fish and Wildlife Biologist (part time, GS-11)	8,815	12,341	12,958
U. S. Fish and Wildlife Research Biologist (part time, GS-12)	6,215	6,526	6,582
U. S. Fish and Wildlife Biologist (full time, GS-9)	25,714	26,999	28,348
Biological Assistant seasonal	14,250	11,878	12,471
Biologist - eagle trapping specialist (1 month)	2,593	2,723	2,859
<u>Equipment -(expendable)</u>			
Two portable data recorders	1,228	0	0
Data cassette recorder	60	0	0
Portable two-way radio use	2,000	0	0
Twenty 2.7 volt radio transmitters	3,500	3,500	3,500
Two omni-directional antennas	100	0	0
Three folding yagi antennas	270	0	0
One null peak box	55	0	0
Coax leads	10	0	0
Equipment sheds (1)			
Two receivers (1)			
Six null peak towers (1)			
One Bushnell Spacemaster I spotting scope	125	0	0
One 22WH telescope lens	44	0	0
One Bushnell Binocular	80	0	0
One window mount for scopes	40	0	0
One tripod	80	0	0
Maps (mylars)	500	0	0
Maps (USGS quads)	100	0	0
35-mm film and processing	100	100	100

Batteries	50	50	50
Miscellaneous	500	500	500

Vehicles

Two 4wd full size pickup trucks (at \$140/mo each vehicle)	3,360	3,530	3,707
Gasoline and maintenance (at \$250/mo each vehicle)	6,000	6,300	6,615

Travel

\$75.00 per day (includes travel to site and meetings)	6,000	6,000	6,000
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Aircraft Rental

\$90.00 per hour for 20 hours	1,800	1,890	1,995
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Services

Computer keypunching	500	500	500
Computer analysis	500	500	5,000

SUBTOTAL	84,589	83,337	91,185
Administrative Overhead (2) (@ 17.5%)	10,427	14,584	15,957
TOTAL	\$95,016	\$97,921	\$107,142

(1) Equipment, value of \$5,975, donated by U. S. Army for duration of study.

(2) \$25,011 of contributed labor and equipment from study cooperators in Year 1 not subject to Administrative Overhead

Attachment 3

FY 88 Annual Work Plan

Work Planned(x)	O	N	D	J	F	M	A	M	J	J	A	S
Proposal	x	x	x									
Budget	x	x	x							x	x	x
Agreements	x	x	x							x	x	x
Correspondence	x	x	x	x	x	x	x	x	x	x	x	x
Meetings (1)	x	x	x	x	x	x	x	x	x	x	x	x
Eagle trapping		x	x	x	x	x	x					
Telemetry technical review		x	x									
Telemetry tracking (2)x		x	x	x	x	x	x	x	x	x	x	x
Grand raptor survey(3 -		-	x	x	x	x	x					
Aerial raptor survey				x								
Prairie dog counts (2)-		-	x	x	x	x	x					
Lagomorph counts(2) -				x			x			x		
Upland bird counts (2)-				x			x			x		
Waterfowl counts (2) -				x			x			x		
Habitat/development mapping (2)								x	x	x	x	x
Food habits data collection (2)		x	x	x	x	x	x	x	x	x	x	x
Data analysis							x	x	x	x	x	x
Report preparation							x	x	x			
Annual study reports delivery									x			
Financial reports delivery (4)	x			x			x				x	

- (1) monthly meetings with study cooperative to be arranged by USFWS, site to rotate among study participants.
- (2) labor partially provided by E-470 Authority or U. S. Army
- (3) data to be acquired from previous studies where denoted by -
- (4) quarterly reports provided in month following calendar quarter, last quarter to provide reconciliation of previous year.

Attachment 4

Fy 88 Contribution Plan, Study Cooperators

Study Cooperator	Funds	Equipment	Manpower	Total Contribution
U. S. Army	\$12,707	\$3,660	\$6,673	\$23,040
U. S. Fish and Wildlife Service	24,848	0	0	24,848
City and County of Denver, Stapleton International Airport	24,848	0	0	24,848
E-470 Authority	7,602	4,528	10,150	22,280