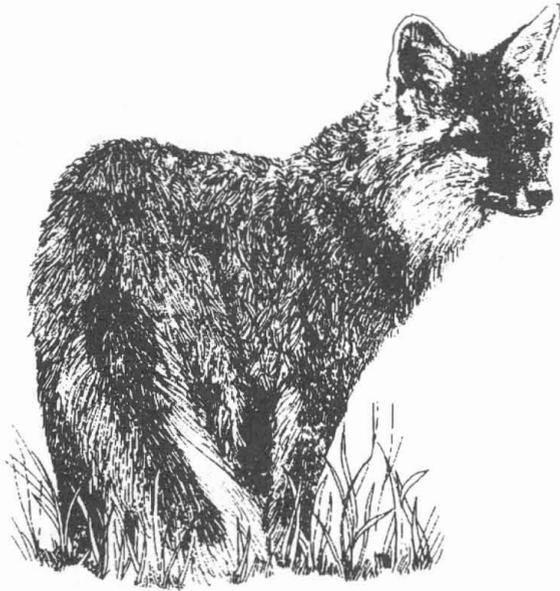

TWO PONDS NATIONAL WILDLIFE REFUGE



COMPREHENSIVE MANAGEMENT PLAN

U. S. FISH AND WILDLIFE SERVICE



Mountain-Prairie Region
Denver, Colorado



Fellow Citizens and Interested Readers:

The U.S. Fish and Wildlife Service is proud to present to you the Comprehensive Management Plan for the Two Ponds National Wildlife Refuge. This plan and supporting documents outlines a vision for the development and management of one of the Nation's smallest urban wildlife refuges.

It is vitally important to develop and manage the Refuge to conserve wildlife and their habitat while providing the public an opportunity to enjoy and learn about wildlife and the environment in an urban setting.

Community involvement is essential to the success of implementing this plan for the Refuge. We invite you to learn more about the purpose and future of the Refuge from this plan and from visits to this unique urban wildlife sanctuary.

The staff at Two Ponds National Wildlife Refuge would like to thank the Two Ponds Preservation Foundation, the management and staff at Lutheran Medical Center, and the City of Arvada, Colorado, for their helpful comments in developing and improving this plan. Thank you also to those volunteers who have assisted with numerous cleanup and construction projects at the Refuge over the past four years.

Sincerely,

A handwritten signature in black ink that reads "Ray Rauch". The signature is written in a cursive style with a large, sweeping initial "R".

Ray Rauch
Project Leader

UNITED STATES FISH AND WILDLIFE SERVICE
Region 6

ENVIRONMENTAL ACTION MEMORANDUM

In accordance with the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act and other statutes, orders, and policies that protect fish and wildlife resources, I have established the following record and have determined that management of Two Ponds National Wildlife Refuge in Arvada, Colorado, according to the Comprehensive Management Plan for the Refuge, is found not to have significant environmental effects, based on the 1992 Environmental Assessment and Finding of No Significant Impact for acquisition of the Refuge, and is therefore authorized to be implemented.

for 
Ralph O. Morgenweck
Regional Director, Region 6

9/30/97
Date

TWO PONDS NATIONAL WILDLIFE REFUGE
COMPREHENSIVE MANAGEMENT PLAN APPROVAL
U.S. FISH AND WILDLIFE SERVICE, REGION 6

SUBMITTED BY:

David A. Jamiel
Park Ranger

5 Sept. 1997
Date

Kay Leach
Project Leader

9/5/97
Date

John Hamill
Refuge Supervisor, Colorado

9/9/97
Date

Wilbur N. Ladd Jr.
Programmatic Assistant Regional Director

9/15/97
Date

Joseph J. Webster
Geographic Assistant Regional Director

9/10/97
Date

Terry T. Terrell
Regional Director, Region 6
DEPUTY

9/30/97
Date

TWO PONDS NATIONAL WILDLIFE REFUGE

COMPREHENSIVE MANAGEMENT PLAN

For more information contact:
U. S. Fish and Wildlife Service
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Commerce City, Colorado
80022-1748
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U. S. FISH AND WILDLIFE SERVICE



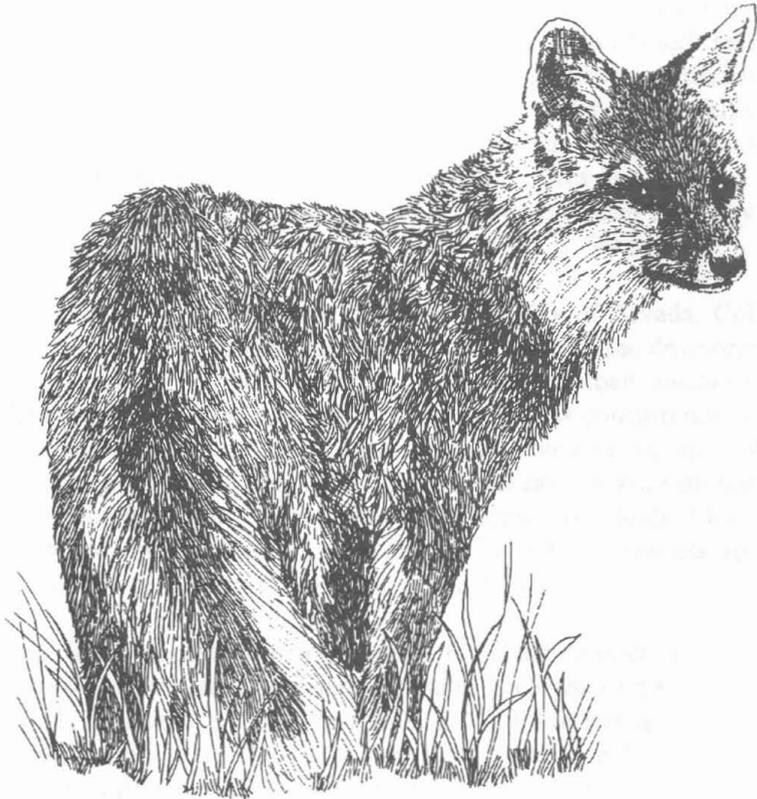
Mountain-Prairie Region
Denver, Colorado



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Introduction



Background

In late 1990, the Two Ponds Preservation Foundation, a nonprofit citizen's group, solicited U.S. Fish and Wildlife Service (Service) involvement in acquiring a small site in Arvada, Colorado (Figure 1). The citizen's group was concerned about a proposed residential development on 13 acres of open space. Service biologists reviewed the site and were impressed with the remnant wildlife populations and education potential of the land. The biologists recommended that the site and adjacent open space totaling over 80 acres be included in the Regional Wetland Concept Plan and be acquired under authority of the Emergency Wetland Resource Act of 1986 (P. L. 99-645).

At the time the Service was contacted, the City of Arvada, Colorado, was considering rezoning the area at the request of the developer, who was acquiring the property from a savings and loan institution. The Service conducted an acquisition planning process concurrently with the City's review of the proposed residential development. In 1991, the developer's purchase contract terminated, the savings and loan institution failed and Resolution Trust Corporation assumed title to the 13-acre tract proposed for development. By the end of 1991, Congress approved \$500,000 for the Service to begin acquisition.

The Regional Director for Region 6 of the Service approved the Environmental Assessment and Finding of No Significant Impact in April 1992. To establish Two Ponds National Wildlife Refuge (Refuge), the Service acquired the first 12.6 acres from Resolution Trust Corporation in May 1992, and acquired another 9.6 acres from the Lighter family immediately thereafter (Figure 2, Parcel 1). An additional 5.9 acres were acquired from Robert Cohen in March 1993 (Figure 2, Parcel 2). In September 1994, the Service acquired 16.5 acres of additional property adjacent to the property from the Lutheran Medical Center (Figure 2, Parcel 3).

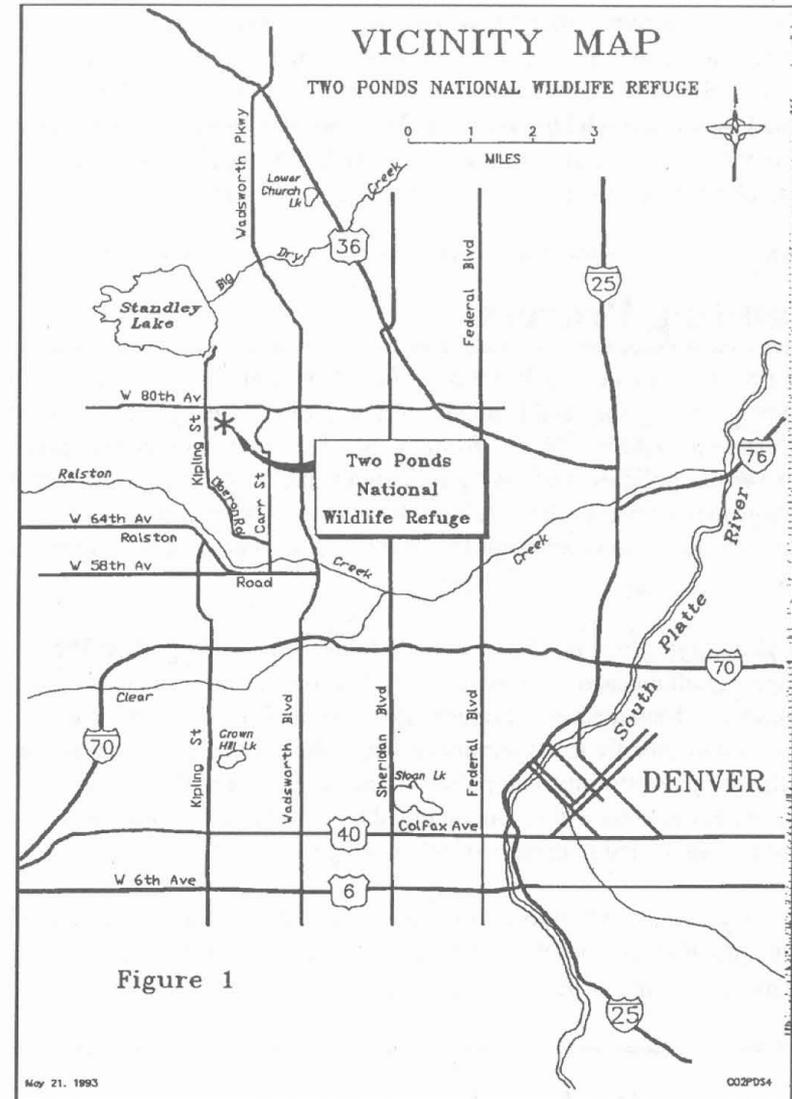


Figure 1

Lutheran will retain ownership of 20 acres of undeveloped land between the Medical Center and the north boundary of the 16.5 acres (Figure 2, Parcel 3). Six of the 20 acres comprise the Oxbow (Parcel 4) that is defined by the Church Ditch (Figure 2). This parcel will be managed by the Service as part of the Refuge for a period of 15 years, beginning in 1994. The Service has first right of refusal for the property.

Planning Process

The Two Ponds National Wildlife Refuge Comprehensive Management Plan is guided by the establishment purposes of the Refuge, the goals of the National Wildlife Refuge System, Service compatibility standards, other Service policies and plans, public input, and the laws directly related to refuge management. The Service will not actively pursue the acquisition of any additional land adjacent to the Refuge, except on a willing seller basis.

This plan establishes the objectives, guidelines, and strategies for the Refuge. It will be used to prepare detailed resource and education plans and budgets. Management or operational planning will be conducted annually and specific management actions adjusted based on monitoring results, fiscal constraints, and policy changes. The effects of major management actions will be documented to provide information to future managers and managers of other refuges.

Due to the size, its urban location, past agricultural use, and irrigation of the site, the Refuge does not meet the criteria for designation as a wilderness area under the Wilderness Act.

Community Involvement

The first public involvement in the property occurred in 1990 with the formation of the Two Ponds Preservation Foundation. It was through their effort that the Refuge was preserved. Since 1990 this group has been very active in working with the Service in acquiring adjacent properties and

reviewing and commenting on Refuge plans.

Beginning in 1990 the Service held several public meetings. These included meetings in February and September 1992 and March and September 1993. Citizens provided comment on Service plans for the Refuge. Their comments were considered in preparing this final Comprehensive Management Plan.

Between 1993 and 1995, Service personnel worked closely with Two Ponds Preservation Board members in reviewing and updating the plans for the physical development of the Refuge. Lutheran Medical Center management staff worked with Service staff to provide public parking facilities at their 80th and Kipling facility for small groups wanting to tour the Refuge. They also were active in obtaining letters of support for a grant application to the Go Colorado Foundation in 1995.

Other community support came from the City of Arvada. They furnished heavy equipment at no cost to assist with the removal of old fence at the Refuge and pledged monetary support for different grant proposals in partnership with the Service. The City also provided meeting space for public meetings concerning Refuge planning and development.

At the 1993 Annual Meeting of the Two Ponds Wildlife Preservation Foundation, a list was compiled of private citizens and organizations that have provided support for the Refuge. (See Appendix J). In addition to the organizations listed, science teachers from three different Arvada Public Schools near the Refuge have volunteered to serve on a committee with Service personnel to draft an environmental education program for use at the Refuge.

Refuge Description

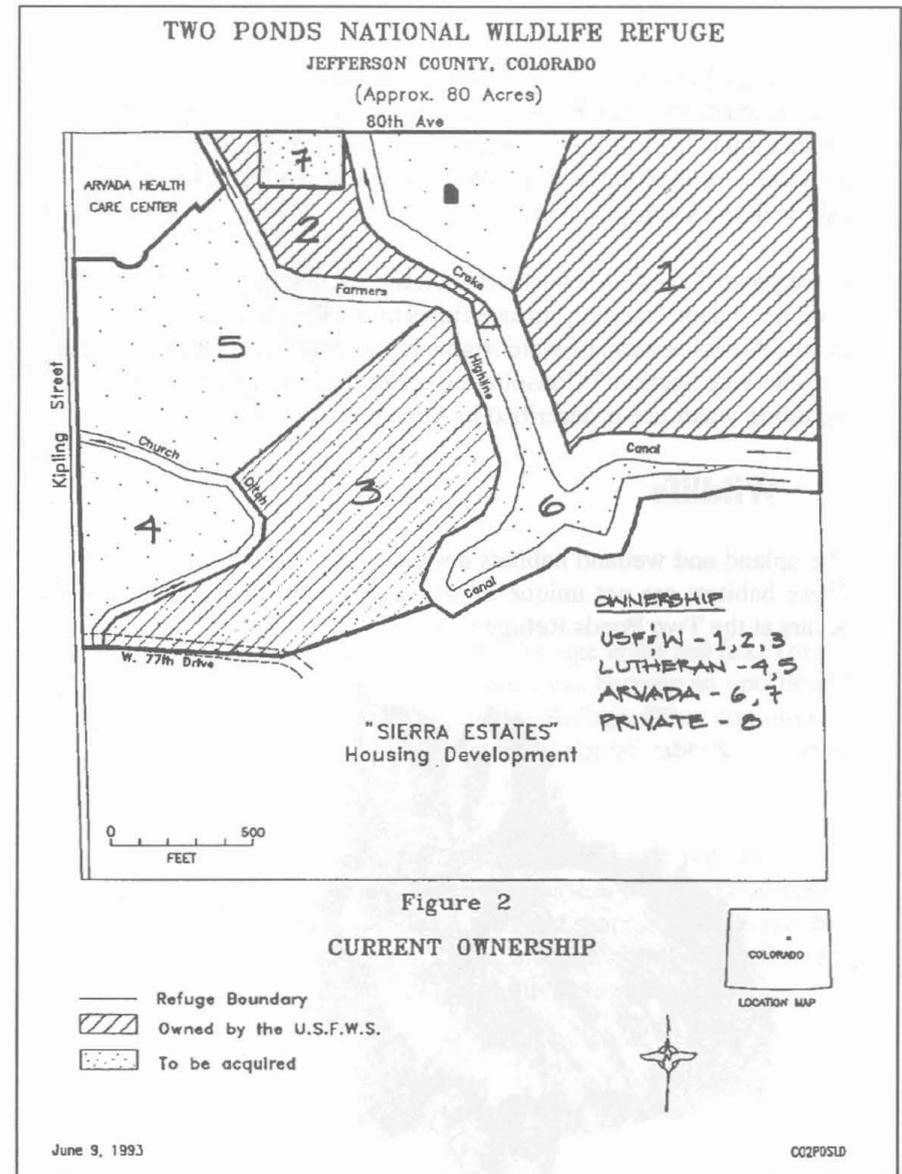
The area around Two Ponds Refuge encompasses a variety of land uses (Figure 3) within a typical suburban setting. Single family residential houses dominate land use along the south, east, and north boundaries. Retail businesses are located to the north and west on the north side of 80th Avenue.

Uplands

Grasses, predominantly brome, are the main ground cover on the Refuge uplands. Alfalfa is common within the brome. Needle-and-thread grass and other mid-grass prairie species are found in greater abundance on hilltops and knolls. Yucca and rabbitbrush are found on the drier sites. Trees, primarily plains cottonwood and Russian olive, are scattered along the canals (Figure 3 and Appendix F).

Wetlands

Two basic types of wetlands occur on the Refuge: open ponds with emergent vegetation around the fringes and moist soils or seepage areas with monotypic stands of cattails (Figure 3). Sandbar willow, Russian olive, and cottonwoods occur along the edges of the cattails.

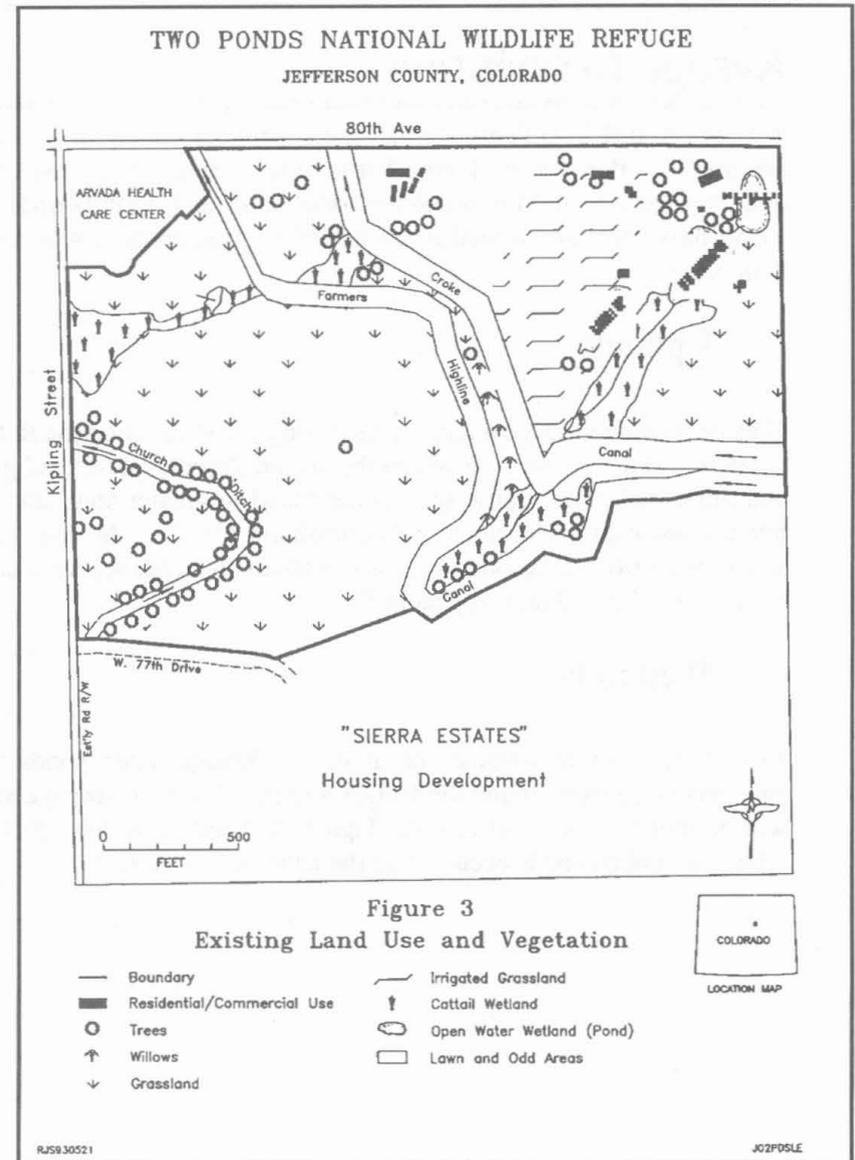


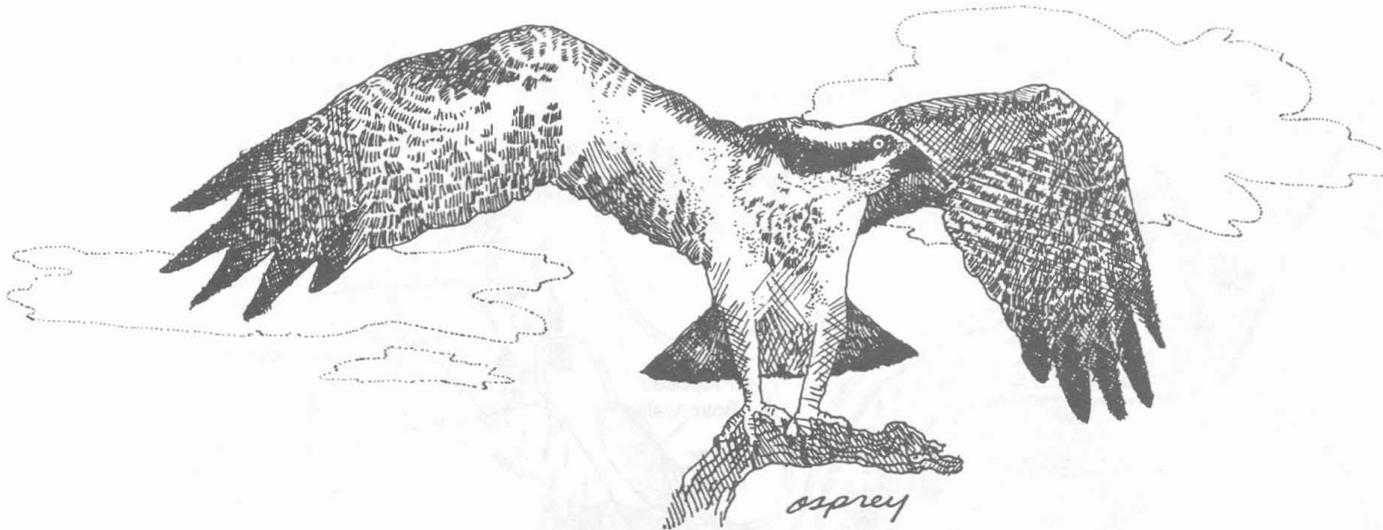
Three irrigation ditches, the Farmers High Line, Croke, and the Church Ditch Canals, cross the Refuge (Figure 3). The Farmers High Line and Croke Canals bisect the site roughly from north to south and also form the southeast boundary of the Refuge. The Church Ditch forms an oxbow in the southwest portion.

Three ponds have been constructed on the site totaling 1.5 acres. Each pond has a dam, trapping surface flows and seepage from the irrigation canals. An assessment of water rights is presented in Appendix G. An Intra-Service Section 7 Consultation under the Endangered Species Act regarding water use is described in Appendix H.

Wildlife

The upland and wetland habitats described support a variety of wildlife. These habitats are not unique to urban areas, but the combination that occurs at the Two Ponds Refuge is rare.



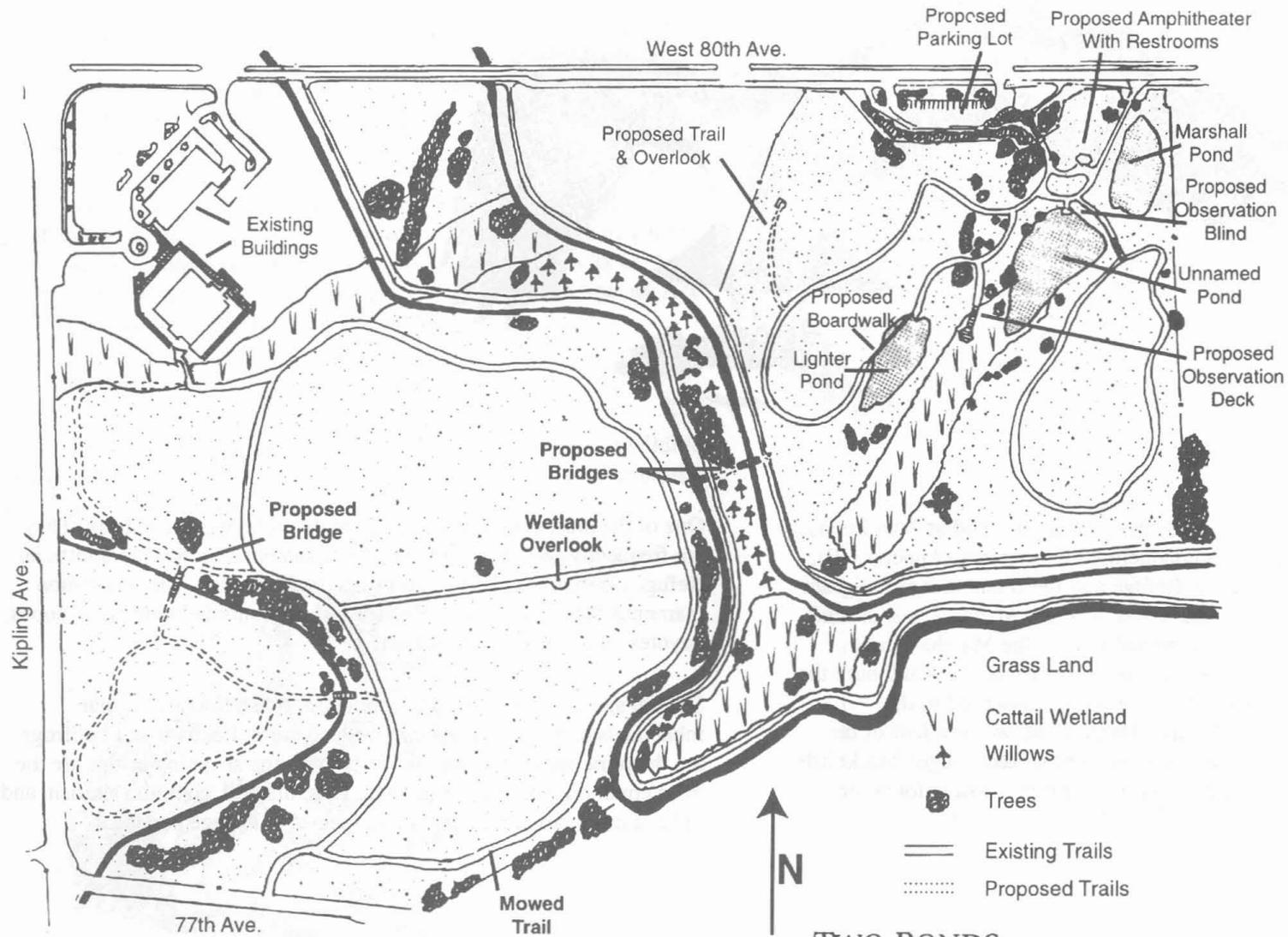


Approximately 94 species of birds have been observed at Two Ponds Refuge by Service volunteers conducting bird surveys (Appendix E). Ten of these species nest at the Refuge and the remainder are migrant species seeking food, cover, and roosting sites. Mallards nest around the ponds; ducks and geese forage and rest on the Marshall Pond (Figure 4) year-round. Hawks and owls roost in the trees and hunt the grasslands. A Swainson's hawk nest has been observed in the cottonwood trees above the Church Ditch in the western half of the Refuge. Muskrats and raccoons use the ponds. Red-winged blackbirds nest in the cattails. A black-crowned night heron roost is found on Marshall Pond.

One of the most common mammals at the Refuge is the red fox. They are frequently seen by nearby residents and have become an unofficial Refuge symbol. Red foxes build dens on the Refuge. Other common mammals at the Two Ponds Refuge include cottontail rabbits, raccoons, coyotes, muskrats, and mule deer.

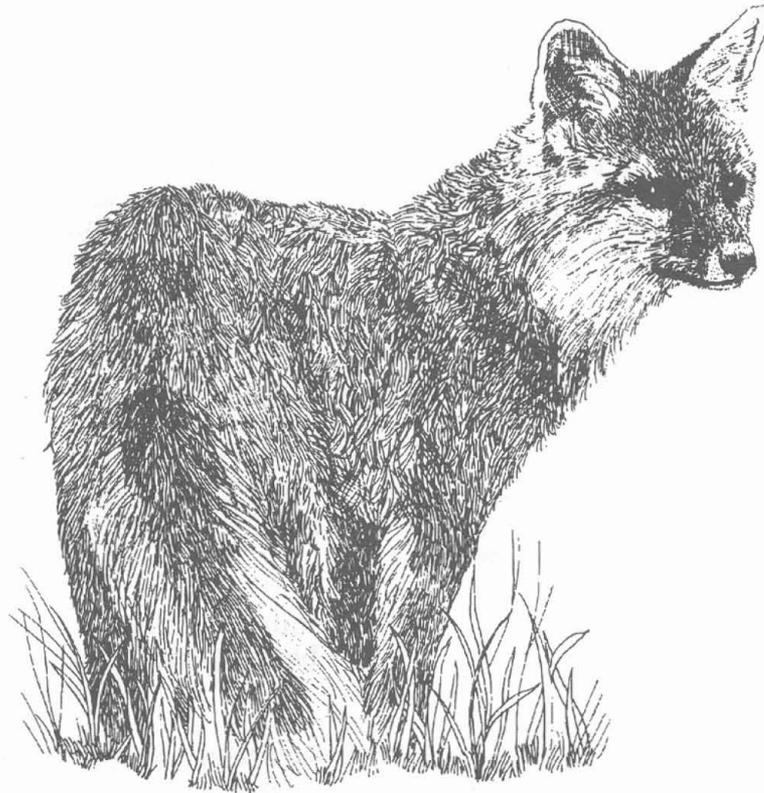
Several species of amphibians, reptiles, and fish also are regular inhabitants in Refuge ponds and wetland areas. Leopard and bullfrogs are the principal amphibians while painted and snapping turtles are the most common reptiles. Largemouth bass, bluegill, common sunfish, and fathead minnows are the main fish species in Refuge ponds.

FIG. 4



TWO PONDS
NATIONAL WILDLIFE REFUGE

Two Ponds Refuge Mission, Goals, and Objectives



Two Ponds Refuge, along with other refuges, contributes to the accomplishment of the goals of the National Wildlife Refuge System (Appendix A). The goals and objectives of Two Ponds Refuge ensure that activities and programs are responsive to Refuge purposes and consistent with the National Wildlife Refuge System goals and policies.

Two Ponds Refuge Mission

Two Ponds Refuge was acquired under the authority of the Emergency Wetland Resource Act of 1986 (P. L. 99-645):

“It is the purpose of this Act to promote, in concert with other Federal and State Statutes and programs, the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions...”

The Two Ponds Refuge mission is to protect and enhance urban wildlife habitat and provide opportunities for environmental education. Specific purposes are:

- To restore, enhance, and preserve a diversity of upland and wetland habitats for migrant and resident wildlife, fish, and invertebrates,
- To provide opportunities for environmental education with emphasis on the inherent values of wetlands and wildlife in an urban environment, and
- To provide interpretive facilities and opportunities related to wildlife such as viewing, study, and photography.



Goals and Objectives

Wildlife Goal

The Two Ponds Refuge will provide breeding, wintering, and migration requirements for waterfowl and other migratory birds within guidelines of the North American Waterfowl Management Plan, in consultation with the Central Flyway and state plans. The Refuge will attract and maintain species representative of the indigenous wildlife community including birds, small mammals, and fish.

Objectives

Upland Management

- The Refuge will restore and manage upland areas for native species for the benefit of endemic bird nesting and other life requirements. Upland areas will be restored to 80 to 90 % native grass to include a mix of western wheatgrass, green needlegrass, and needle-and-thread grass. Blue grama and switch grass will be planted on and just below slopes.

Woodland Management

- The Refuge will maintain a canopy of trees and brush along both sides of the Church Ditch Canal (outside the ditch company easement), on the parcel between the Farmers High Line and Croke Canals, and along pond banks. These trees consist of cottonwood, willow, and various other deciduous species. A stand of pine, spruce, and deciduous trees located between the sites of the former Lighter and Marshall residences, along with the aforementioned trees, will be maintained and managed for resident and migratory bird nesting and other habitat requirements.

Aquatic Resources

- The Refuge will maintain three permanent water bodies (approximately 1.5 acres combined surface area). These ponds will provide a food source for wading and shorebirds, provide educational opportunities for environmental education classes, and will be managed to promote mosquito control on the Refuge.



- The Service will manage wetlands on the Refuge to achieve a 15% vegetation coverage on the surface of all three ponds. A 15% aquatic vegetation level will provide adequate cover for forage fish and will provide easy access to vegetation-free surface water for educational programs.

Public Use and Environmental Education Goal

The Refuge will provide opportunities and physical facilities to support a balanced mixture of environmental education programs and wildlife-oriented activities by the general public.

Objectives

Public Use:

- The Refuge will provide opportunities and facilities for the general public to increase their understanding and appreciation of wildlife resources and their awareness of

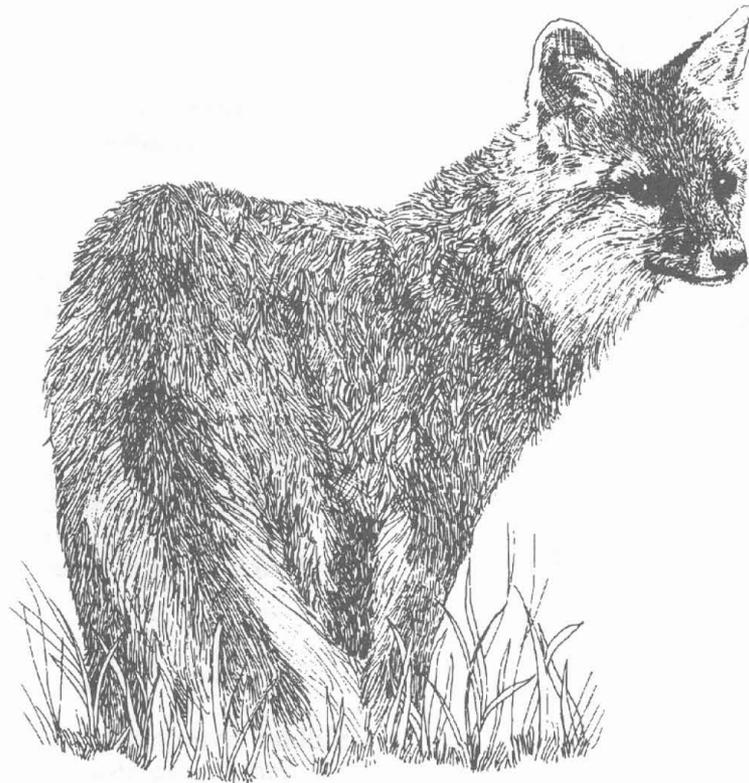
the U. S. Fish and Wildlife Service and the National Wildlife Refuge System, and to make available limited non-consumptive wildlife-oriented activities.

Environmental Education

- The Refuge will provide opportunities and facilities to integrate environmental concepts and concerns and urban wildlife issues into hands-on educational activities and curricula for students, especially those in schools located near the Refuge.



Management Guidelines and Strategies



Federal laws, U. S. Department of the Interior regulations and policies, Service regulations and policies, and Refuge System policies are the basis for the management guidelines. The Refuge's goals and objectives are the basis for the management strategies.

Management Guidelines

Threatened and Endangered Species

There are no known endangered or threatened species on the Refuge. Should any be found, they will be given priority consideration in evaluating any management actions.

Migratory Birds

Waterfowl management will be guided primarily by the provisions of the North American Waterfowl Management Plan. Central Flyway plans and state plans also will be consulted. All waterfowl management will be balanced with other migratory bird management.

The management of other migratory birds will be guided by the Region 6 non-game bird plan and its biodiversity strategies. The guiding principle will be to maintain a diverse, healthy ecosystem to provide the life requirements of migratory birds and related wildlife.

Resident Fish and Wildlife

Emphasis will be placed on production and protection of wildlife to perpetuate a natural diversity of wildlife species and their native habitats.

Congress, in the Refuge Recreation Act, has recognized the authority of the states and territories to manage resident fish and

wildlife. Therefore, the role of the State of Colorado in the management of resident animals is recognized and management actions for those species will be coordinated with the Colorado Division of Wildlife.

Fishery resources will be managed primarily to maintain a forage base for fish-eating birds. Management emphasis will be on species native to Colorado. Introductions of non-native fish may be permitted only if necessary to maintain the aquatic environment. The small size of the ponds may create population imbalances periodically. This may necessitate removing all fish in a pond and restocking. This will be done in cooperation with the Colorado Division of Wildlife.

Haying and Trapping

Haying and trapping are management tools, and may be used to support attainment of Refuge goals and objectives.

Pest Management

Plant and animal pests will be controlled when:

- The organism threatens human health and well-being or private property, the acceptable level of damage has been exceeded, or State and/or local governments have designated the pest as noxious; or
- The pest is detrimental to primary goals of the Refuge.

Education and Public Use

Education and public use facilities and activities will be developed to minimize impacts on wildlife and wildlife habitat. Regulations to protect wildlife and wildlife habitat on the Refuge will be adopted, when necessary.

Education and public use activities will promote an understanding of wildlife and their habitats and the concept of a healthy ecosystem. All public use and education activities will meet Service requirements and will be accessible to the

Archeological Management

No known cultural or historic structures exist on the Refuge. However, prior to any construction, an archeological survey and

physically challenged in accordance with *Uniform Federal Accessibility Standards*.

assessment will be made to make certain that no area of any historical significance will be disturbed.

Strategies

Education and Public Use

Two Ponds Refuge will provide hands-on environmental education on a multitude of subjects to Jefferson County and Denver metro area schoolchildren. In addition, it will be a quiet sanctuary for the general public interested in photography, bird watching, hiking, and other wildlife-oriented activities.

Audiences

The Refuge will be divided into two areas. The Environmental Education Area is Parcel 1. The Prairie Management Area includes Parcels 2, 3 & 4. The north half of Parcel 5 (which is not part of the Refuge) will be accessible by the public via a system of mowed trails that will connect Parcel 5 with Parcels 3 & 4 (See Figures 2 & 4).



Environmental Education Area

The Environmental Education Area will be managed as an environmental education facility with controlled access. All such use will be volunteer or teacher-led. Volunteers and teachers must attend a mandatory Refuge training course before conducting a field trip on the site. Teacher training will be tied to the curriculum currently being developed for the Refuge. Training will be tied to local school curricula to demonstrate to the teachers how this site can be used for those activities (i.e., third grade “Day on the Prairie”).

Prairie Management Area

The Prairie Management Area will be managed to allow for open access for the public. Users will be able to use mowed trails to take part in compatible wildlife-oriented activities such as hiking and wildlife viewing. Mowed trails will be tied into the perimeter of the Prairie Management Area via bridges connecting existing canal service roads.

Site Design

Minimum acceptable facilities that will promote a safe learning environment will be a small bus/car parking lot, rest rooms, and mowed trail system. All facilities will be accessible and construction completed as soon as funding is provided. The Environmental Education Area will include a covered amphitheater/pavilion/rest rooms structure and a boardwalk with platforms that will allow groups access to aquatic and cattail areas (Figure 5).

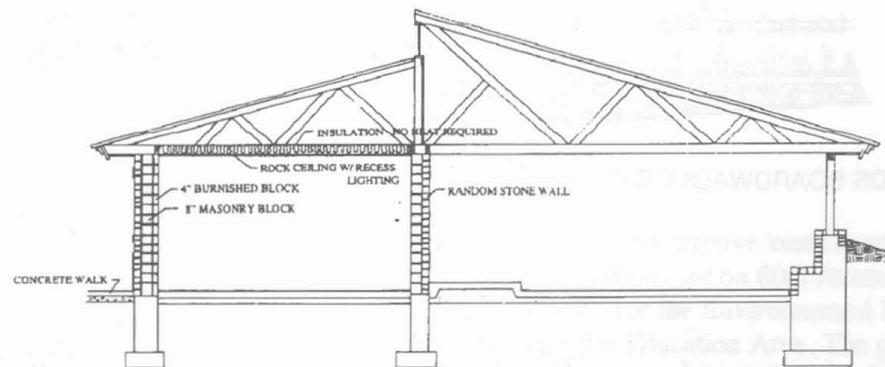
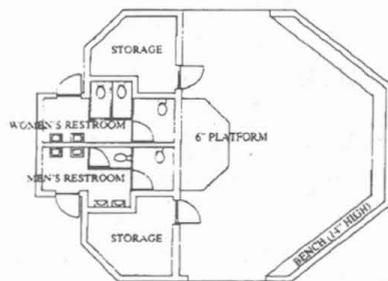
Amphitheater/Pavilion/Rest Rooms

The Service will design and construct an amphitheater/pavilion/rest rooms structure in the open area west of Marshall Pond. This facility will accommodate groups of up

to 60 people, will attract foot traffic away from the parking lot to avoid congestion, and will minimize gathering at informal sites causing trampled habitat. The Pavilion will also provide shade on hot days and cover during rain (Figure 5).

This structure will include space for storage of folding tables that can be used for work stations or for eating lunches. A permanent rest room will be incorporated into the amphitheater/pavilion. This facility will be tied into the City of Arvada water, sewer, and electricity. A lockable storage closet will be designed into the structure so that supplies can be stored on-site.

This structure will be built when funding can be secured through the Service in combination with grants obtained through partnerships with local government and private entities.

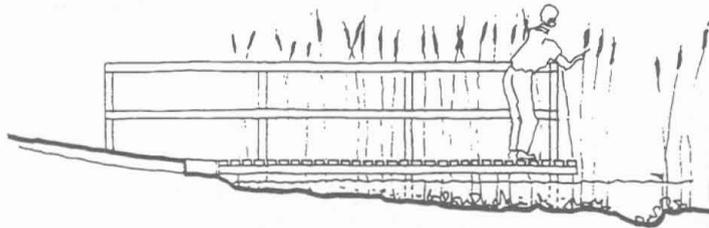


AMPHITHEATER/PAVILION/RESTROOMS - PLAN & SECTION (Figure 5)

Boardwalks/Platforms

The Service will design and construct boardwalks and observation platforms in the wetland areas in the Environmental Education Area. These platforms and boardwalks will be used for studying pond water, microscopic life, and wetland vegetation. The platforms will be large enough to give access to approximately 15 students at a time.

Boardwalks will be constructed along the northeast edge of the Lighter Pond. A platform will be constructed at the end of the boardwalk that extends into the cattail marsh. Another will be constructed at the northeast corner of the Unnamed Pond.



WETLANDS BOARDWALK CONCEPT

Trails

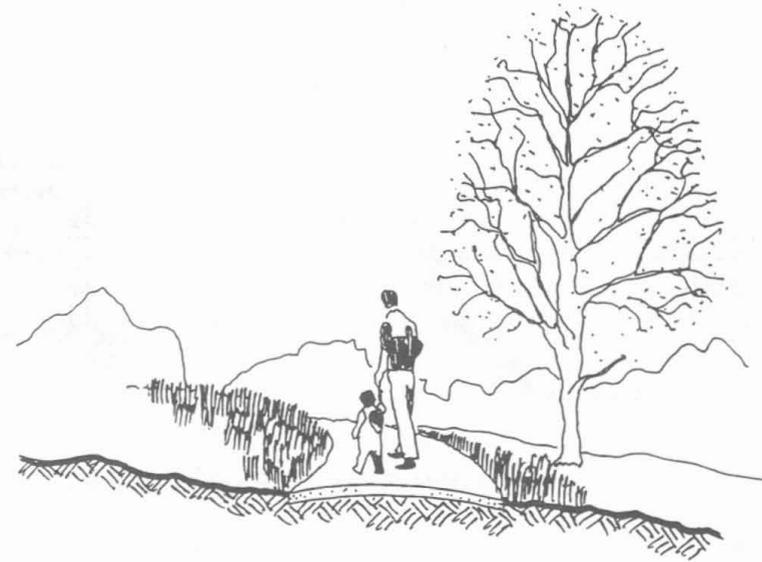
Trails encourage appropriate use and access. If trails take visitors where they would like to go or need to go, less off-trail use will occur with less damage to the habitat. Formal trails will be developed to support the environmental education program and other public use goals (Figure 4).

Trails will tie into the curriculum and will provide access to the appropriate habitats for field studies. All trails (environmental education or other), where possible, will be made accessible to

the mobility impaired. Access will be controlled and limited to staff or volunteer leaders of nature walks or environmental education programs. The Refuge will be open to Service staff involved in biological studies and maintenance activities and will provide access to the ponds and Environmental Education Area, via a gate to be located at the existing road off 80th Avenue, adjacent to the Marshall Pond.

Trail Locations

Two different trails will be constructed within the Environmental Education Area. A short path will connect the parking lot with the Environmental Education Area from which the two interpretive trails will originate.



CROSS SECTION OF TRAIL CONCEPT

Trails/Bridges - Western Loop

ENVIRONMENTAL EDUCATION AREA - WESTERN LOOP

A trail will be mowed to the south and west of the parking lot. This is a relatively flat area that transitions from the ponds up to a grassy area. The grade of this area is such that this trail could eventually be surfaced to accommodate persons with mobility impairments.

ENVIRONMENTAL EDUCATION AREA - EASTERN LOOP

The second trail will be constructed on the east side of the ponds. This trail will pass through an upland grassy area, in which some native plant species exist, and run parallel to the entire cattail marsh area. From the top of the southeast rise, the visitor is provided a panoramic view of the Refuge and surrounding area. Because of the grade, this trail would not be accessible to the mobility impaired. However, a similar view is available from outside the perimeter by using the Croke Canal service road.

PRAIRIE MANAGEMENT AREA TRAILS

The Service will manage the Prairie Management Area with less control than the Environmental Education Area. Users will not have to get clearance from the Service in order to use the property. However, users will be restricted to activities that are compatible with the purpose for which the Refuge was created.

The Service will maintain mowed paths inside the Refuge boundary of the Prairie Management Area. These paths will be tied into the perimeter of the Environmental Education Area via bridges connecting existing canal service roads. These trails will loop along the inside perimeter fence of the 16.5 acres south of the Lutheran Medical Center (Parcels 3 & 5) and onto the 6.5-acre Oxbow (Parcel 4). Trails will

connect these three parcels with the Farmers High Line Canal service road on the northwest via the use of footbridges and the Lutheran Medical Center property on the north.

A third mowed trail will be cut from the Medical Center through the northern portion of Parcel 5 into the Oxbow (Parcel 4) and then back into the southern half of Parcel 3. These trails will provide Lutheran employees and customers with a pleasant area in which they can take walks or runs as part of a health maintenance program. This area may be used by people who have come to visit a hospitalized family member and need to find a quiet place to spend time.

Parking Lot

A parking lot will be constructed between the sites of the former Lighter and Marshall houses and between the existing fence and 80th Avenue. A gate that will be kept locked will be constructed into the fence at the east end of the lot. The lot will have space for 21 cars, including 3 spaces reserved for use by disabled persons, and a space for a school bus.

Gatehouse

A covered gatehouse/interpretive kiosk headgate will be constructed at the parking lot on 80th Avenue and function as the main entry point for the Environmental Education Center in the Environmental Education Area. The gate will be kept locked to prevent access to the Refuge by the public unless accompanied by an authorized Service staff person or volunteer. This gate will provide a safe gathering point for groups with a path that leads to the Environmental Education Area and connects directly to the lot. Interpretive panels will be included in the gatehouse design. Panels will provide information on the resources and history of the Refuge and the process for gaining entry (Figure 6).

The gatehouse/kiosk will be designed during 1997. Funds for construction will be sought from grants and donations through the development of partnerships between the Service, Two Ponds Preservation Foundation, and local governmental and private entities.

Fencing

ALONG 80TH AVENUE

During 1995 a 5-foot chain link and wooden privacy fence was constructed along 80th Avenue the entire length of the Refuge's northern boundary. This fence will prevent vehicles from entering the Refuge except at designated parking areas.

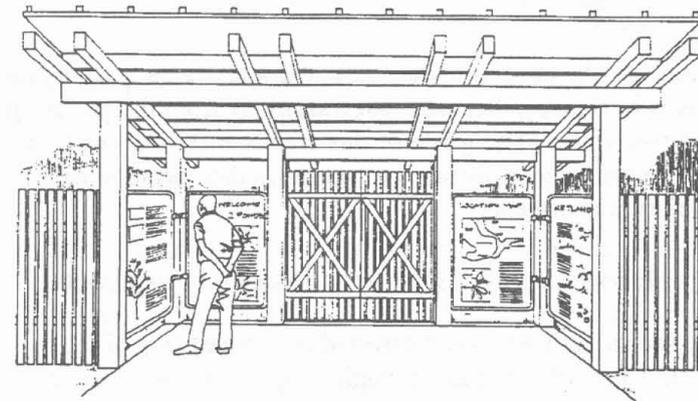
REMAINDER OF THE REFUGE

Sometime in the future, as funds become available, a 5-foot high chain link fence will be constructed around the remainder of the perimeter of the Environmental Education Area. This fence would prevent access by unauthorized motor vehicles, protecting the existing habitat.

Gates

A second gate was constructed in 1995 at the end of the existing road west of Marshall Pond where it connects with 80th Avenue. This road will be retained and improved because it provides access to the ponds and to the Environmental Education Area for maintenance purposes.

An egress gate will be constructed as part of the 5-foot fence that parallels the Croke Canal service road. This gate will allow groups using Environmental Education Area the ability to exit and walk along the canal and into the Prairie Management Area once the bridges across are constructed. A lockable gate will prevent the general public from entering the Environmental Education Area from the canal road.



ENTRY GATE/KIOSK (Figure 6)

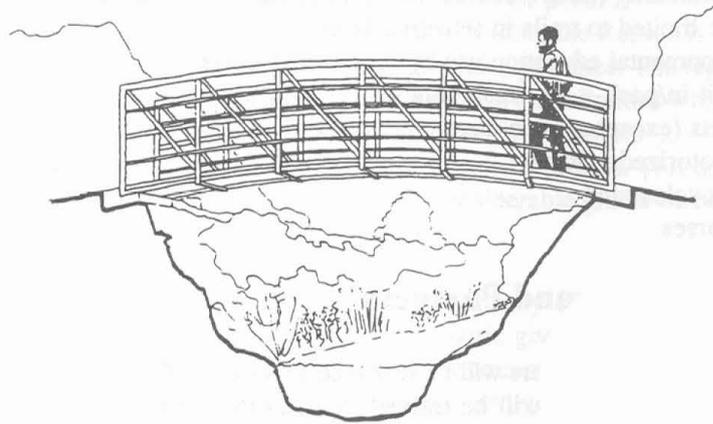
Interpretive Signs

The Service will construct interpretive signs at strategic points along the trail systems. Overlook sites will be maintained as mowed areas until funds can be obtained to develop them with hard surfaces and interpretive signs.

One sign will be located on top of the hill west of Lighter Pond in the Environmental Education Area (Figure 4, Prairie Overlook). This spot also will function as a rest area/scenic overlook and include a permanent bench structure with a panoramic view of the Refuge. A second interpretive overlook will be constructed along the eastern loop of the trail in the Prairie Management Area. This spot overlooks a natural drainage area to the southeast. A sign will be used to interpret the use of canal irrigation in the area (Figure 4, Wetland Overlook).

Bridges Over The Croke, Farmers High Line and Church Ditch Canals

Bridges over the Croke and Farmers High Line Canals would connect the Refuge property with, and provide access to, the 16.5 acres acquired from the Lutheran Medical Center. Two additional footbridges could be constructed across the canal that defines the Oxbow (Parcel 4), providing access to the Medical Center complex and the newly acquired acreage (Figure 4).



BRIDGE CONCEPT

Environmental Education

Environmental education opportunities at Two Ponds Refuge will be targeted primarily, but not exclusively, for Jefferson County schools and other schools in the Arvada area. The curriculum developed for the site will compliment the Jefferson County schools required core curriculum, targeting outdoor studies conducted by the schools each year. Curriculum needs for private schools and other organized groups, such as scouts, will also be taken into consideration.

The Site

The capacity of each of the two education loops at the site is 60 students per day. Peak school use will be September-October and April-May. School use is expected to be much lower at other months of the year. While the carrying capacity of the site is 120 students per day, instructors will be encouraged to bring smaller numbers of students to the site.

Site facilities and trails have been divided into two loops (Figure 4). In Jefferson County, each school usually has four classes of the same grade. Thus, it is anticipated that daily use will include the entire grade from one school, approximately 120 students. At Two Ponds Refuge, such large groups will be split into smaller groups, and each smaller group will use one trail loop and pavilion. The loops will be designed so that students on each loop will receive similar experiences. Instructors will be encouraged to break all groups into ratios of no larger than one instructor per 10-12 students with the students rotating through established learning stations.

Anticipated school use per year could be up to 1,500 students.

Curriculum Development

Jefferson County core curriculum includes third grade "Day on the Prairie" and fifth grade "Communities and Small Things," and all students in these grades go through these programs. Two Ponds Refuge is an ideal site for these experiences and others.

Curriculum developed for Two Ponds Refuge will be designed for all grades (K-12) and will fit the Jefferson County core curriculum. Curriculum is currently being developed by teachers from three Arvada public schools and Service staff. The curriculum will be designed similar to two educator's guides developed previously for the Service. Both of these models have been tested at other refuges and found to work quite well.

The educator's guides enable educators to conduct field trips with little or no guidance from Service personnel. The guides contain information on the site and its use, including regulations, maps, background information on the topics to be taught, suggested activities, pre- and post- activities, and much more. Suggested learning stations will be established in the curriculum.

Ideally, educators should be required to complete training through the Service prior to using the site to familiarize themselves with the site and the curriculum. However, this requires that Service staff or volunteers be available to provide this training, an option that the Service may not be able to provide. The educator's guides will be designed to minimize the need for on-site training.

All school use will be by reservation only.

Public Use

It is anticipated that Two Ponds Refuge will be used considerably by the general public, and site design takes this into consideration. Public use will include wildlife watching, photography, hiking, and other wildlife-oriented uses.

Without staff at the Refuge, general public use will be the most difficult to control. Site planning will be designed to take visitors where they want to go and encourage users to stay on the trails.

Interpretation will take place primarily through the use of a kiosk located at the entry gate at the main parking lot on 80th Avenue. Four interpretive panels at the entry gate will provide information about gaining access to the Refuge and the Refuge's mission and history. Small interpretive signs on the trails will be used to interpret site-specific messages.

Public use of the Refuge, particularly the trails along the canals, will be blended with the Jefferson County Open Space trail plan and Arvada Parks and Recreation plans.

Public Use Restrictions

In order to protect the site, it is necessary to put some restrictions in place. These restrictions will be presented through signs, barriers, and the guidance found in the educator's guide. Restrictions include:

- Day use only;
- No hunting;
- No fishing;
- No picnicking (environmental education students excepted);
- Public limited to trails in sensitive areas;
- Environmental education use by reservation only;
- Pack-it-in/pack-it-out trash policy;
- No pets (except service dogs);
- No motorized vehicles;
- No bicycles; and
- No horses.

Volunteers and Partners

Volunteers and partners will be recruited to work at Two Ponds Refuge. Volunteers will be trained to assist with site cleanup, rehabilitation, and maintenance; habitat management; environmental education; teacher training; and much more. Local residents and others have already shown an interest in assisting in many of these areas.

Partnerships will be key to the success of Two Ponds Refuge. The Service has a limited budget available for this site. Financial and service-oriented partnerships would allow much of what has and will be planned for the site to be implemented.

Cooperative Agreements

Cooperative agreements will be negotiated with the local police and fire departments to provide law enforcement and fire protection for the Refuge. Service staff and the Arvada Police

Police Department also will periodically patrol the area. Agreements also will be sought with the canal companies to address access and liability issues.

Landscape

Ecosystem

Two Ponds Refuge lies within the North Temperate Grassland biome (Shelford 1963), which extends from north-central Texas into central Alberta, and from Indiana into portions of California. The specific region surrounding the Refuge is frequently referred to as the High Plains province. The region typically includes a mosaic of grassland communities with a diverse component of perennial forbs (“wildflowers”). Shortgrass species tend to occur in more arid sites. Throughout the region, however, there exists considerable gradation and mixing between the two extremes.

The Refuge itself is located approximately 15 miles northwest of downtown Denver where the prairie gives way to the Rocky Mountains. Here, grassland communities are mixed and variable, owing to the diversity of topography, soils, and climate. Prior to settlement, prairie wildfires and grazing bison, pronghorn, and elk may have played a major role in maintaining the grassland vegetation. In modern times, most of the original vegetation has been destroyed by plowing and overgrazing of domestic livestock. Today the area around the Refuge is highly developed with single and multi-family dwellings, shopping centers, and small industrial businesses. Enclaves of open space and riparian areas that once functioned as agricultural areas exist between the developed areas.

Succession

The highest successional level at the Refuge is grassland. On native prairie tracts, grasses, forbs, and shrubs will

predominately be those perennial species native to the mixed and shortgrass prairies. Former croplands, which now contain several introduced plants, will be restored to permanent native cover. Management actions will favor those taller, broader-leaved grasses and forbs which are known to be most attractive to upland nesting birds. There will be small areas of shrubs and a few scattered trees. Total canopy coverage of shrubs and trees will not exceed 10% of the Refuge.

Water Cycle

In an effective water cycle, plants make maximum use of rainfall or irrigation--little evaporates. Management will strive for an effective water cycle by keeping the soils well covered with vegetation or plant litter and keeping the soils permeable. Run-off of growing season precipitation will be low.

The Refuge has a 3/4 share of water from the Farmers High Line Canal. To fill the ponds and offset evaporation, approximately 2 acre-feet are needed. Therefore, there should be sufficient water to fill the ponds, rejuvenate and maintain native prairie, and maintain the marsh/pond complex based on the water rights analysis in Appendix G.

Mineral Cycle

An active mineral cycle will exist with a minimum of run-off or erosion. Rapid decomposition of surface litter will prevent a build-up of matted, dead vegetation yet preserve a stable level of surface mulch. Substantial amounts of residual standing vegetation will be present each year during winter and early in the growing season for nesting habitat, wildlife cover, and snow catch. The shrub and forb component will promote deeper cycling of minerals from subsoils to the surface. There will be high invertebrate and microorganism activity at and below the soil surface.

Energy flow

The natural living world runs on solar power transformed through the ability of green plants to capture the energy of sunlight and convert it to usable forms. A moderately high energy flow will be present and indicated by a high density of plants on the ground surface. A variety of both warm season and cool season species of grasses, forbs, and wetland plants will be present, resulting in a long season of plant growth.

Vegetation

Many exotic plant species, both trees and grasses, have been introduced to the area under past management practices. Brome has encroached from hay fields into the remnant unbroken native plant community. Approximately 95% of the upland is dominated by brome. Detritus from past run-off has accumulated in the wetlands, changing the substrate to promote a near monotypic stand of cattail. These marsh and upland plants may pose significant management problems.

The potential plant community is about 80 to 90% grasses, 5 to 10% forbs, and 5 to 15% shrubs. This site has a rolling grassland aspect with mid-grasses dominating. Western wheatgrass, green needlegrass, and needle-and-thread grass should dominate the cool season plant community. Blue grama is the dominant warm season grass on the upland, and big bluestem and switch grass will occur toward the toe of the slopes. A number of other grasses occur in smaller amounts.

Several native shrubs—winterfat, fourwing saltbush, fringed sagebrush—were part of this community, and should be restored, along with other native forbs, including:

purple prairie clover;
American vetch;
scarlet globemallow;
drummond milkvetch;

slimflower scurfpea;
hairy golden aster;
orange arnica; and
two-grooved milkvetch.

Re-establishment of Natives

Uplands within the Refuge are dominated by exotic grasses, primarily brome. A native plant community will be re-established. Rejuvenation of the native plant community should proceed by stages. The area that is to be developed for environmental education will be returned to a native prairie plant community first, beginning around Unnamed Pond. All species used will be native grasses adapted to the particular ecological site. The site adjacent to the water will be a mix of tall warm-season grasses. The natural plant community will be developed in stages following the contour of the slopes. The natural progression of plants changes to a greater composition of cool-season mid-grass prairie species as one proceeds up slope.



Forbs/wildflowers native to the site will also be re-established. Some will be seeded in small patches to be more “showy” for interpretive purposes. The rest will be scattered as a natural component of native grasslands.

Forbs will make up 5 to 10 % of the seed mix at a rate of 0.25 to 0.50 lbs. of pure live seed per acre. Around pond margins and in moist bottomland, the seed mix above will be used with the addition of 5 pure live seed lbs. each yellow Indiangrass, prairie cordgrass, slender wheatgrass, and Missouri goldenrod.

Broad leaf plant species in the mix include prairie coneflower, purple prairie clover, Lewis blue flax, Rocky Mountain beeplant, dotted gayfeather, Missouri evening primrose, giant evening primrose, and scarlet globemallow. Shrubs will make up 5 to 15 % of the mix and include yucca and rabbitbrush (Appendix D).

Maintenance of Natives

Native plants on the inter-mountain landscape of North America evolved with light grazing and fire, but grazing and fire will not be used to sustain native plants because of the urban setting of this Refuge. Haying will be used from time to time to promote native vegetation.

Weed Control

Two primary choices exist for weed management - chemical control with herbicides or cultural control using tillage and mulch. Due to the sensitivity of the site, both ecologically and socially, the latter method is preferred. When available, biological control agents such as insects will be used to manage weeds at the Refuge.

Woodland

By the fall of 1997, the Service will survey woodland acreage to determine the current amount of Refuge woodland coverage. Depending upon the result of the survey, Service staff will either maintain the trees in their current location or remove exotic trees beginning with Russian olive. Trees will be replaced as needed to maintain the goal of 10% tree cover.

Wildlife

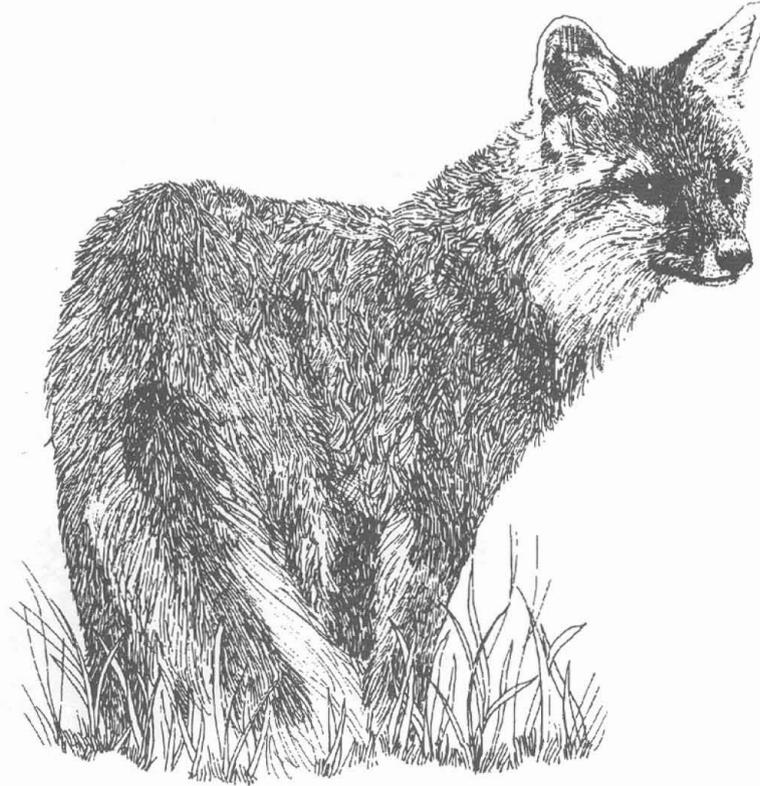
Service staff will determine sensitive wildlife areas and periods of use to minimize disturbances to wildlife. Service staff will also recommend strategies to minimize impacts to wildlife due

to habitat restoration, environmental education, and other public use projects.

Aquatic

The Service staff will maintain pond levels as full as possible based on the availability of water from the Farmers High Line Canal. Staff also will stock fathead minnows as a food source for wading and shorebirds, and to provide opportunities for environmental education classes to view pond life. Grass carp will initially be stocked in the ponds to control aquatic vegetation.

Monitoring and Evaluation



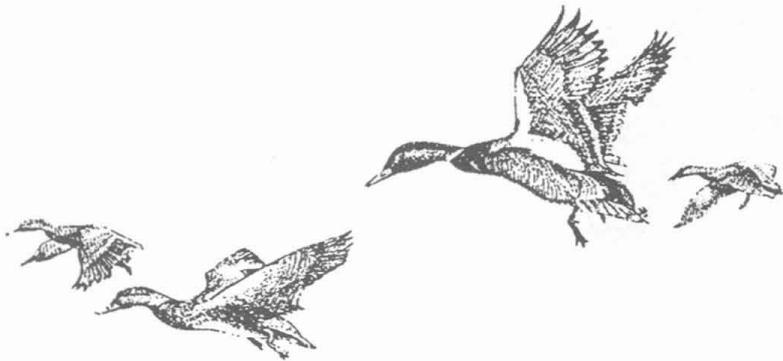
Monitoring

Monitoring activities will be carried out as part of the environmental education programs and will focus on the following:

Wildlife Populations

Birds, reptiles, amphibians, and mammals

- Update and maintain a current species list.
- Monitor population trends, seasonal abundance, and habitat use for groups of species including birds, small mammals, reptiles, and amphibians.
- Initiate reptile and amphibian monitoring in the spring of 1998.



Aquatic Wildlife

- Monitor the ponds to evaluate the success of grass carp stocking to meet the 15% vegetation goal.
- Conduct periodic surveys of the population status of invertebrates and fish.

Water

Water Quantity

- Maintain pond levels as full as possible based on the availability of water from the Farmers High Line Canal.
- Prepare annual report of water use, anticipated use, and general water supply status.

Water Quality

- Conduct an annual evaluation of water quality.

Vegetation

- Monitor reseeded areas and manage to prevent weed growth. Once these areas have been re-established, Service staff will manage to maintain the species ratios previously stated.
- By the fall of 1997 survey woodland acreage to determine the current amount of Refuge woodland coverage. Depending upon results of the survey, Service staff will develop and implement a plan to achieve the stated 10% goal for woodland vegetative cover.

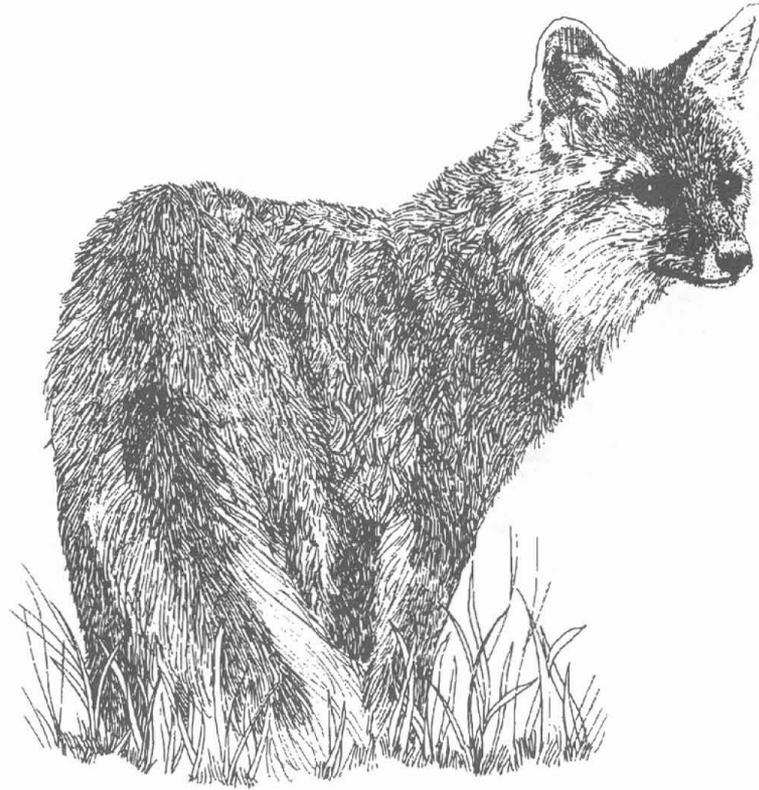
Public Use

- Measure public satisfaction after site use for environmental education and interpretation.
- Observe general public use of the area to determine if the trail

Evaluation

Results obtained from monitoring will be used to evaluate the effectiveness of management practices toward the achievement of goals and objectives. Annual management plans will be developed that reflect these evaluations.

Appendices



Appendix A—National Wildlife Refuge System Mission and Goals

The mission of the National Wildlife Refuge System is to preserve a national network of lands and waters for the conservation and management of fish, wildlife, and plant resources of the United States for the benefit of present and future generations.

Four broad goals are:

- To preserve, restore, and enhance in their natural ecosystems (when practicable), all species of animals and plants that are endangered or threatened with being endangered;
- To perpetuate the migratory bird resource;
- To preserve a natural diversity and abundance of fauna and flora on refuge lands; and
- To provide an understanding and appreciation of fish and wildlife ecology and man's role in his environment, and to provide refuge visitors with high quality, safe, wholesome, and enjoyable recreational experiences oriented toward wildlife to the extent that these activities are compatible with the purposes for which the refuge was established.



Appendix B—Legislation

Migratory Bird Treaty Act (1918)

Designates the protection of migratory birds as a Federal responsibility in concert with other nations.

Migratory Bird Conservation Act (1929)

Establishes procedures for acquisition by purchase, rental, or gift of areas approved by the Migratory Bird Conservation Commission.

Refuge Recreation Act (1962)

Allows the use of refuges for recreation when such uses are compatible with the refuges' primary purposes.

National Wildlife Refuge System Administration Act (1966)

Defines the National Wildlife Refuge System and authorizes the Secretary of the Interior to permit any use of an area provided such use is compatible with the major purposes for which such area was established.

National Historic Preservation Act (1966)

Expands the Federal mandates to preserve cultural resources found on the refuges.

National Environmental Policy Act (1969)

Requires the disclosure of the environmental impacts of any major Federal action significantly affecting the quality of the human environment.

Endangered Species Act (1973)

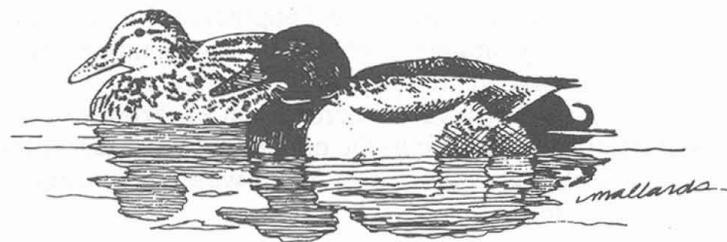
Requires all Federal agencies to carry out programs for the conservation of endangered species and threatened species.

Game Range Act (1976)

Requires all National Wildlife Refuges under the Secretary of the Interior to be administered by the Fish and Wildlife Service.

Emergency Wetlands Resources Act (1986)

The purpose of the act is "To promote the conservation of migratory waterfowl and to offset or prevent the serious loss of wetlands by the acquisition of wetlands and other essential habitat, and for other purposes."



Appendix C—Project Cost Estimates

Phase I—Environmental Education Study Area

| | |
|---------------------------|-------------------|
| Refuge sign | \$ 3,000 |
| Entry gate/kiosk | \$ 12,500 |
| Habitat restoration | \$ 43,200 |
| Parking lot | \$ 82,500 |
| Fence remainder of Refuge | \$ 23,000 |
| Subtotal | <u>\$ 164,200</u> |

Phase II & III

| | |
|--|-------------------|
| 40'X40' restrooms/pavilion/amphitheater | \$ 200,000 |
| 2 (200 sq. ft.) platforms @ \$8.00/sq. ft. | \$ 3,200 |
| 200 ft. of boardwalks @ \$8.00/linear ft. | \$ 1,600 |
| 2 miles of trails @ \$4.00/linear ft. | \$ 42,250 |
| Subtotal | <u>\$ 247,050</u> |

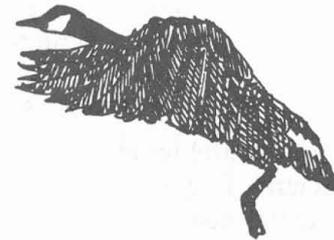
Phase II & III

| | |
|--|-------------------|
| 4 bridges @ \$30,000 | \$ 120,000 |
| 2 interpretive overlooks (including signs) | \$ 31,620 |
| Subtotal | <u>\$ 151,620</u> |

Total **\$562,870**

| | |
|-----------------------------|-----------|
| 15% for planning and design | \$ 84,450 |
| 10% for contingencies | \$ 56,287 |

Grand Total **\$703,607**



Appendix D—Re-establishment of Native Plants

The Refuge has a 3/4 share of water in the Farmers High Line Canal that may be used to supplement natural rainfall to reestablish native plants. Ten miners inches of water is one full share. One cubic foot per/second equals 38.4 inches of water.

The following forbs/wildflowers will be reintroduced to the area:

- prairie coneflower
- purple prairie clover
- Lewis blue flax
- Rocky Mtn. beeplant
- dotted gayfeather
- Missouri evening primrose
- giant evening primrose
- scarlet globemallow

Chemical control with herbicides and cultural control using tillage and mulch are the two main choices for weed control. Due to the ecological and social sensitivity of the site, the cultural control methods are preferred.

Fall plowing, followed by a second plowing operation in the spring, two disking operations, and at least one harrowing will do the best job of eliminating brome as a weed problem. All land preparation will be on the contour in 50-100-foot strips.

A grass drill should be used to plant the grass seed. The Colorado Division of Wildlife has a grass drill that might be used for this purpose.

The grass seed can be planted after November 1, as a dormant seeding, or in the spring before April 30, planting no deeper than 1/2 inch into ground that is not frozen or wet.

A mulch of long-stemmed, weed- and seed-free grass hay should be used to protect the site after grass seed is planted by applying 1.5 to 2 tons of hay per acre (approximately one standard rectangular bale per 1000 sq. ft. area). Fifty percent of the mulch, by weight, should be stems at least 10 inches long. After spreading the mulch, a crimping machine should be used to anchor the grass stems about 4 inches deep. This should be done perpendicular to the prevailing wind direction or, on sloping ground, on the contour.

After planting, the only maintenance required will be occasional mowing at a 6-8-inch height for weed control.

If a volunteer or partner can be found, it may be possible to prepare the seedbed, buy and drill the seed, and buy and apply the mulch for about \$300 per acre. (The mulch accounts for about 2/3 of this cost.) It's worth trying to locate a "farmer", because a contractor's charges will more likely run into the \$1200-\$1500 per acre range.

Good soil preparation and weed control are key to revegetation success. Some supplemental irrigation may speed germination and establishment, but it is not necessary, as long as people are patient. The irrigation water which is available for at least part of this site may be applied after seedlings have established.

Around the pond margins and in the moist bottomland, yellow Indiangrass, prairie cordgrass, slender wheatgrass, and Missouri goldenrod may be used.

Once native vegetation is established, the primary management tools will be rest from cultivation and use, and reestablishment of healthy living organisms. Grazing will not be used as a control method. Fire will not be used because of the urban setting of this Refuge. Although not considered a tool, haying may be employed from time to time.

Appendix E—Wildlife Observed at Two Ponds

Birds

| | | | |
|--------------------------------|-----------------------------------|----------------------------|--------------------------------|
| Great blue heron | <i>Ardea herodias</i> | Northern flicker | <i>Colaptes auratus</i> |
| Black-crowned night heron | <i>Nycticorax nycticorax</i> | Dark-eyed junco | <i>Junco hyemalis</i> |
| Canada goose | <i>Branta canadensis</i> | Western kingbird | <i>Tyrannus verticalis</i> |
| Mallard (nest) | <i>Anas platyrhynchos</i> | Cliff swallow | <i>Hirundo pyrrhonota</i> |
| American wigeon | <i>Anas americana</i> | Barn swallow | <i>Riparia riparia</i> |
| American white pelican | <i>Pelicanus erythrorhynchos</i> | Black-billed magpie (nest) | <i>Pica pica</i> |
| Double-crested cormorant | <i>Phalacrocorax pelagicus</i> | American crow | <i>Corvus brachyrhynchos</i> |
| Blue jay | <i>Cyanocitta cristata</i> | Black-capped chickadee | <i>Parus atricapillus</i> |
| Gadwall | <i>Anas strepera</i> | American pipit | <i>Anthus rubescens</i> |
| House sparrow | <i>Passer domesticus</i> | House wren | <i>Troglodytes aedon</i> |
| Prairie falcon | <i>Falco mexicanus</i> | American robin | <i>Turdus migratorius</i> |
| European starling (nest) | <i>Sturnus vulgaris</i> | Red-tailed hawk | <i>Buteo jamaicensis</i> |
| California gull | <i>Larus californicus</i> | Northern shrike | <i>Lanius excubitor</i> |
| Franklin's gull | <i>Larus pipixcan</i> | Yellow-rumped warbler | <i>Dendroica coronata</i> |
| Red-winged blackbird (nest) | <i>Agelaius phoeniceus</i> | Common nighthawk | <i>Chordeiles minor</i> |
| Brewer's blackbird | <i>Euphagus cyanocephalus</i> | Common yellow-throat | <i>Geothlypis trichas</i> |
| Common grackle | <i>Quiscalus quiscula</i> | Rock dove | <i>Columba livia</i> |
| Northern oriole (nest) | <i>Icterus galbula</i> | Lark sparrow | <i>Chondestes grammacus</i> |
| House finch | <i>Carpodacus mexicanus</i> | Chipping sparrow | <i>Spizella passerina</i> |
| American goldfinch | <i>Carduelis tristis</i> | American tree sparrow | <i>Spizella arborea</i> |
| Downey woodpecker | <i>Picoides pubescens</i> | American bittern | <i>Botaurus lentiginous</i> |
| Swainson's hawk (nest) | <i>Buteo swainsoni</i> | Wood duck | <i>Aix sponsa</i> |
| Rough-legged hawk | <i>Buteo lagopus</i> | Lark bunting | <i>Calamospiza melanocorys</i> |
| American kestrel | <i>Falco sparverius</i> | Olive-sided flycatcher | <i>Contopus borealis</i> |
| Killdeer (nest) | <i>Charadrius vociferus</i> | Yellow warbler | <i>Dendroica petechia</i> |
| Northern rough-winged swallow | <i>Stelgidopteryx serripennis</i> | Song sparrow | <i>Melospiza melodia</i> |
| Violet-green swallow | <i>Tachycineta thalassina</i> | White-crowned sparrow | <i>Zonotrichia leucophrys</i> |
| Ring-billed gull | <i>Larus delawarensis</i> | Western meadowlark | <i>Sturnella magna</i> |
| Mourning dove (nest) | <i>Zenaida macroura</i> | Northern harrier | <i>Circus cyaneus</i> |
| Orange-crowned warbler | <i>Vermivora celata</i> | Brown-headed cowbird | <i>Molothrus ater</i> |
| Wilson's warbler | <i>Wilsonia pusilla</i> | Eastern kingbird | <i>Tyrannus tyrannus</i> |
| Grey catbird | <i>Dumetella carolinensis</i> | Osprey | <i>Pandion haliaetus</i> |
| Belted kingfisher (year round) | <i>Ceryle alcyon</i> | Say's phoebe | <i>Sayornis saya</i> |
| | | American redstart | <i>Setophaga ruticilla</i> |
| | | Lesser scaup | <i>Aythya affinis</i> |
| | | Loggerhead shrike | <i>Lanius ludovicianus</i> |

Townsend's solitaire
 Clay-colored sparrow
 Chimney swift
 Western tanager
 Swainson's thrush
 Spotted towhee
 Solitary vireo
 MacGillivray's warbler
 Northern waterthrush
 Cedar waxwing
 Sharp-shinned hawk
 Pied-billed grebe
 Ring-necked duck
 Blue-gray gnatcatcher
 Broad-tailed hummingbird
 Ruby-crowned kinglet
 Red-breasted nuthatch
 Redhead
 Sora
 Red-eyed vireo
 Rufus-sided towhee
 Bald eagle
 Lincoln's sparrow

Mammals

Red fox
 Muskrat
 Beaver (lodge on Croke Canal)
 Raccoon
 Vole
 Coyote
 Mule deer

Myadestes townsendi
Spizella pallida
Chaetura pelegica
Piranga ludoviciana
Catharus ustulatus
Pipilo erythrophthalmus
Vireo solitarius
Oporornis tolmiei
Seiurus noveboracensis
Bombycillia cedrorum
Accipiter striatus
Podilymbus podiceps
Aythya collaris
Polioptila caerulea
Selasphorus platycercus
Regulus calendula
Sitta canadensis
Aythya americana
Porzana carolina
Vireo olivaceus
Pipilo erythrophthalmus
Haliaeetus leucocephalus
Melospiza lincolnii

Vulpes fulva
Ondatra zibethica
Castor canadensis
Procyon lotor
Microtus ssp.
Canis latrans
Odocoileus hemionus

Reptiles and Amphibians

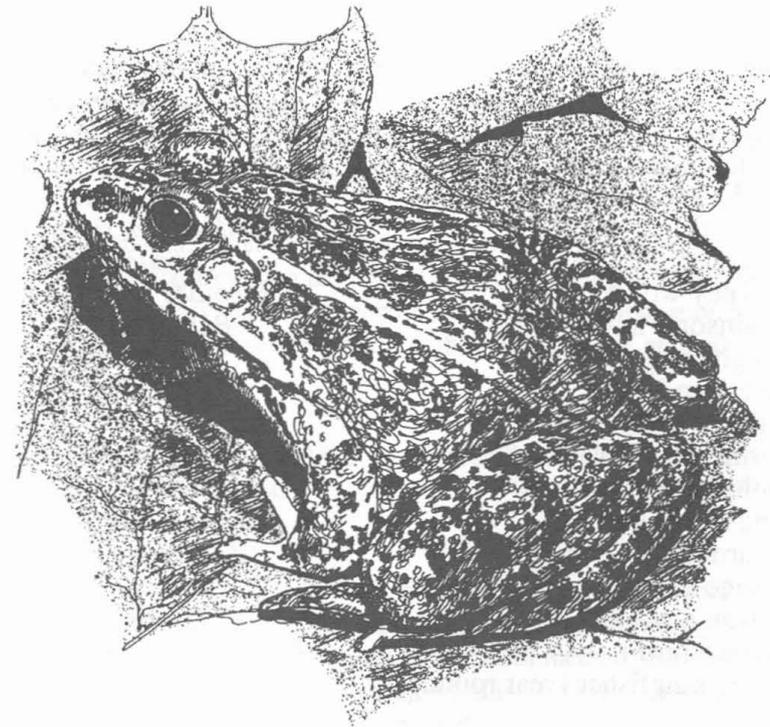
Painted turtle
 Snapping turtle
 Bullfrog
 Leopard frog

Chrysemys picta
Chelydra serpentina
Rana catesbeiana
Rana pipens

Fish

Bluegill
 Largemouth bass
 Grass carp

Lepomis macrochirus
Micropterus salmoides
Ctenopharyngodon idellus



Appendix F—Two Ponds Tree Inventory

| <u>Species</u> | <u>Number</u> | <u>Percent</u> | <u>Diam. Breast Ht.</u> |
|--------------------|---------------|----------------|-------------------------|
| Siberian elm | 47 | 5.5 | 4.5 |
| American elm | 3 | 1.0 | 7.3 |
| Common cottonwood | 17 | 5.6 | 17.3 |
| Juniper | 12 | 3.9 | 3.7 |
| Honey locust | 3 | 1.0 | -5.3 |
| Russian olive | 41 | 13.0 | 3.1 |
| Silver maple | 1 | 0.3 | 20.0 |
| Blue spruce | 5 | 1.6 | 11.6 |
| Siberian crabapple | 4 | 1.3 | 9.0 |
| Domestic apple | ? | 9.7 | 6.8 |
| American linden | 1 | 0.3 | 2.0 |
| Pine Pond/Aust | 10 | 3.3 | 11.4 |
| Pine other | 3 | 1.0 | 4.0 |
| Black walnut | 6 | 1.9 | 7.0 |
| Tree-of-heaven | 1 | 0.3 | 2.0 |
| Catalpa | 5 | 1.6 | 8.0 |
| Weeping willow | 26 | 8.4 | 12.2 |
| Douglas fir | 1 | 0.3 | 4.0 |
| Mountain ash | 2 | 0.6 | 8.0 |
| Hawthorn | 1 | 0.3 | 2.0 |
| Silver poplar | 6 | 1.9 | 6.0 |
| Aspen | 5 | 1.6 | 2.8 |
| Fruit other | 27 | 8.7 | 2.7 |
| Sumac | 4 | 1.3 | 2.5 |
| Other | 45 | 14.9 | 6.7 |
| Total | 360 | 100.00 | 6.1 |



Appendix G—Water Rights Assessment

There are three ponds located on the Refuge in Parcel 1, (Figure 2). Each pond has a dam and is supplied by seepage from irrigation canals diverting from Clear Creek. Two of the ponds are spring-fed. Three irrigation ditches also are located on the area. The Farmers High Line Canal, operated by the Farmers High Line Canal and Reservoir Company (FHL), has first priority on Clear Creek (1860) and supplies one-half its flow to Standley Lake for municipal water supplies for the cities of Westminster and Thornton. It continues onto Farmers' Reservoir for irrigation use, and at 123rd and Washington Streets, it falls under different management and becomes Signal Ditch supplying Signal Reservoir, also for irrigation purposes.

Croke Canal, owned and operated by the Farmers' Reservoir and Irrigation Company, supplies Standley Lake. According to Mr. Ed Ziegler, Superintendent of FHL, there are no headgates with the exception of one at or near Alkire Street west of subject area. (The ditch apparently intercepted a spring, so the ditch company had to replace that source.) Croke Canal also captures seepage from Farmers High Line Canal.

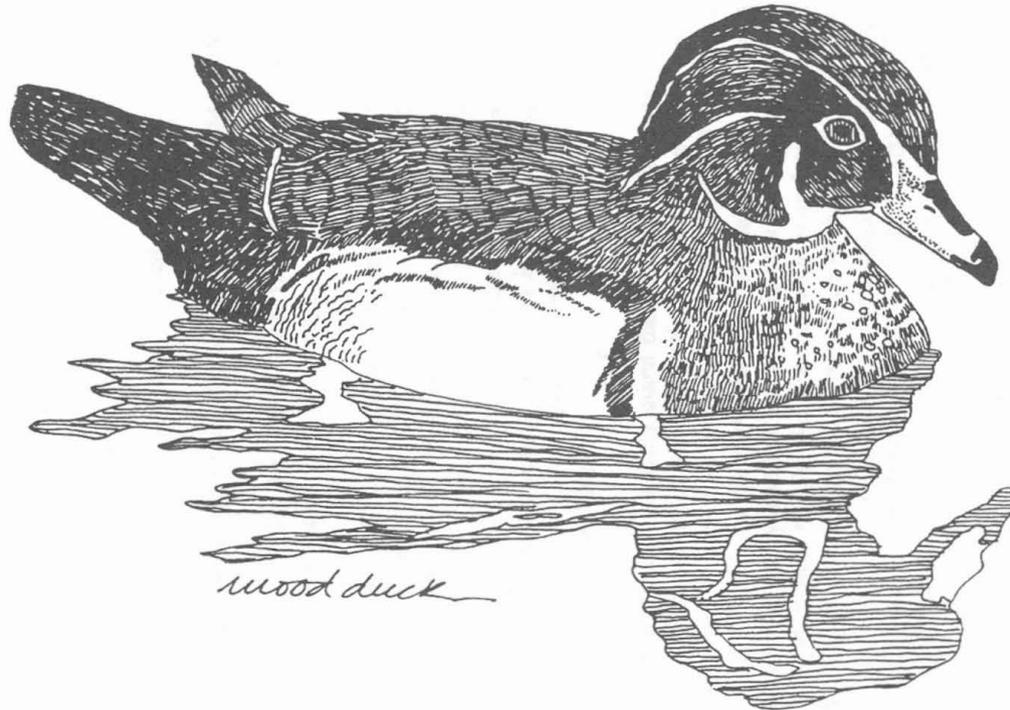
Church Ditch, operated by the Church Ditch Company, holds decreed absolute priorities to 113.03 cfs (cubic feet per second) of water from Clear Creek. The headgate is also located in Golden, and the canal runs for 26 miles through Jefferson County, including portions of the City of Arvada, until it ends near the intersection of 100th Avenue and Simms Street at the Ketner flume. The Church Ditch Company and all of its assets and priorities are owned by the Cities of Northglenn and Broomfield. The correspondence from the Farmers' Reservoir and Irrigation Company, the Church Ditch Company and the Farmers High Line Canal and Reservoir Company, responding to Service (Harvey Wittmier's) inquiries, specifically refer to the need for mutual agreements between the Service and the companies covering liability and conflicts with maintenance operations of these canals. Most importantly, they maintain that Refuge ponds are probably entirely supplied by seepage from the ditches, and the companies cannot guarantee that this seepage will not be prevented by future conservation measures, i.e., lining the ditches. Only the FHL has stated a willingness to work with the Service to offset the loss of such water by agreeing to allow the bypass of natural drainage that enters the FHL. However, FHL also states in their letter, "The FHL Canal is under no obligation to continue to intercept the natural drainage water, and in order to protect the water quality in Standley Lake, may undertake responsibility for construction of this bypass. During acquisition negotiations for this property, the Service representative should attempt to get a commitment for use of this storm water run-off to supply the ponds."

Since the seepage waters cannot be guaranteed, in addition to the stormwater run-off, the only other means of protecting the Two Ponds Refuge water supply is the acquisition of available shares in the FHL Canal Company. Ms. Evelyn Lighter owns 1/2 share of FHL. Home Federal S&L also has a headgate and 1/4 share of FHL, although Service staff were advised that this headgate has not been used for some time and would require a measuring flume estimated at \$500. These particular shares are not attached to the lands and can be sold separately with the current value estimated to be between \$108,000 and \$112,000 per share.

These FHL shares provide water for 7-1/2 months, April 1 through November 15 each year, with the possibility of additional water during free water conditions. FHL delivers 100 % when 206 cfs is taken from Clear Creek. Any decrease in that amount results in the prorating of the amount delivered per share. Mr. Ziegler advises that it is rare to receive less than 200 cfs, and the amount will never go below 48 cfs with users receiving no less than 20%. Service staff had further discussions with Mr. Kelly DiNatelli of the City of Westminster (the largest FHL shareholder) who stated that in an average year, FHL supplies 22 acre-feet per share and only 10 acre-feet per share

in a dry year. However, there is a pending lawsuit (Schedule Water Suit) between the City of Arvada and FHL, and if Arvada wins, a dry year supply will be reduced to about 3 acre-feet per share. That reduced amount would not be sufficient to maintain the ponds. Both the Division Water Commissioner and Mr. DiNatelli have stated that the FHL's water rights are for a multitude of uses.

The mean annual precipitation of 15.97 inches and the mean annual evaporation of 40 inches results in a loss of 24.03 inches per year. Over the 1.238 surface acres impounded at the Refuge this results in a net loss of 2.478 acre-feet annually.



Appendix H—Intra-Service Section 7 Consultation on Water Use

On October 3, 1996, the Service initiated and completed an informal Section 7 Consultation under the Endangered Species Act on the proposed operation of the Refuge (attached). The result of this consultation identified an annual depletion of 2 acre-feet of water to both the central and lower reaches of the Platte River. The Service has agreed to the reasonable and prudent alternative of utilizing the National Fish and Wildlife Foundation account to offset the project-related impact to Platte River fish and wildlife resources. Therefore, \$70.00 will be debited annually from the Foundation account for use in restoring Platte River habitat for threatened and endangered species.



BS/CO: BS:ESA:Sect 7:
Small Depletion BO

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
Colorado Field Office
730 Simms Street, Suite 290
Golden, Colorado 80401

RECEIVED

OCT 17 1996

U.S. FISH & WILDLIFE SERVICE
ROCKY MOUNTAIN ARSENAL NWR

Memorandum

OCT 03 1996

TO: Project Leader, Rocky Mountain Arsenal National Wildlife Refuge

FROM: Colorado Field Supervisor, Ecological Services, Golden, CO *Rey W. Curtis*

SUBJECT: Biological Opinion for Minor Water Depletions to the Platte River System at Two Ponds National Wildlife Refuge

In accordance with section 7 of the Endangered Species Act of 1973 (Act), as amended (16 U.S.C. 1531 et seq.) and the Interagency Cooperation Regulations (50 CFR 402), the U.S. Fish and Wildlife Service (Service) has reviewed your September 17, 1996, correspondence regarding the impacts from the operation of the Two Ponds National Wildlife Refuge on Federally listed species and designated critical habitat occurring along the Platte River. It has been determined the proposed action, located in Jefferson County, Colorado, pertains to an existing project which results in an annual depletion of 2 acre-feet (af) to both the central and lower reaches of the Platte River.

Since 1978, the Service has consistently taken the position in its section 7 consultations that Federal agency actions resulting in water depletions to the Platte River system are likely to jeopardize the continued existence of one or more Federally listed threatened or endangered species and adversely modify or destroy designated critical habitat. Consequently, the Service has adopted a jeopardy standard for all such actions requiring formal section 7 consultation. In light of this, the Service concurs with your determination that the proposed project is likely to jeopardize the continued existence of the following Federally listed species: whooping crane (*Grus americana*), least tern (*Sterna antillarum*), piping plover (*Charadrius melodus*), and pallid sturgeon (*Scaphirhynchus albus*). This project may also result in adverse modification or destruction of designated critical habitat of the whooping crane.

During the course of informal consultations with a number of Federal agencies, the Service learned that there are over 1,000 proposed projects which will deplete water from the Platte River system and require formal section 7 consultation. It was also determined that the vast majority of these projects would likely result in individual depletions of 25 af or less per year. To effectively deal with such an anticipated large workload, it was necessary for the Service to develop a stream-lined approach which meets the requirements of section 7 for offsetting the adverse effects of each Federal agency action resulting in a minor water depletion.

An intra-Service section 7 consultation was conducted in coordination with those Federal agencies whose actions may result in minor water depletions of 25 af or less per year to the Platte River system. This led to the issuance of a biological opinion by the Service on June 13, 1996, which provides reasonable and prudent alternatives to avoid the likelihood of jeopardy to Federally listed species and adverse modification or destruction of designated critical habitat occurring along the Platte River. To satisfy the requirements of the Act, Federal action agencies and project proponents (i.e., both Federal and non-Federal) are provided reasonable and prudent alternatives described in the aforementioned biological opinion furnished to your agency.

As a result of informal section 7 consultation with your agency on the proposed Federal action described above in the first paragraph, it is the Service's understanding that you intend to take advantage of the reasonable and prudent alternative authorizing the availability of funds in a National Fish and Wildlife Foundation account for use in off-setting the project-related impacts to Platte River fish and wildlife resources. Therefore, it has been calculated that \$70.00 will be debited from the Foundation account for use in restoring Platte River habitat as described in the referenced biological opinion.

The Service hereby agrees that the process described above will serve to offset the project related impacts and avoid the likelihood of jeopardy to Federally listed species and adverse modification or destruction of designated critical habitat. Any need for reinitiation of formal consultation on this proposed action will be as outlined in the CONCLUSION section of the referenced biological opinion.

Questions or need for additional information regarding this matter may be referred to Clay Ronish within our office by calling (303) 231-5280.

CC: FWS/NE Field Office (Attn: Wally Jobman)
FWS/COKANUT (Attn: Mike Stempel)
Project File
Reading File



IN REPLY REFER TO:

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Rocky Mountain Arsenal National Wildlife Refuge
Building 111
Commerce City, Colorado 80022-1748
Telephone (303) 289-0232
Fax (303) 289-0579

September 17, 1996

MEMORANDUM

TO: Field Supervisor, Colorado Field Office, Ecological Services

FROM: Project Leader, Rocky Mountain Arsenal National Wildlife Refuge

SUBJECT: Intra-Service Section 7 Consultation for Minor Water Depletion to the Platte River System at Two Ponds National Wildlife Refuge

This memorandum responds to stipulated procedures for required Intra-Service Section 7 consultation related to minor water depletion (less than 25 acre-feet per year) to the Platte River system resulting from management of aquatic habitats at Two Ponds National Wildlife Refuge in Arvada, Colorado. This response complies with guidance contained in the Regional Director's memorandum of June 13, 1996, concerning Intra-Service consultation for minor water depletions to the Platte River system.

Management of aquatic habitats at Two Ponds National Wildlife Refuge results in a water depletion to the Platte River system totaling 2.0 acre-feet per year. At this time, the Refuge has no means to replace this water so funding for aquatic and terrestrial habitat restoration is the reasonable and prudent alternative required to avoid jeopardizing listed species in the Platte River system from this water depletion. The attached table includes calculations used to determine the required dollar amount from the Refuge to be provided for habitat restoration in the Platte River system. Beginning in FY 1997, the Refuge will provide an annual transfer of funds in this amount to the proper account for habitat restoration.

With this memorandum, I am requesting your concurrence with the above approach for completing Section 7 requirements related to existing water depletions at Two Ponds National Wildlife Refuge. Please contact me at 303-289-0232, extension 117 at any time if you have questions or recommendations regarding this issue.

Formula for Calculating the Aquatic and Terrestrial Habitat Restoration and Maintenance Costs for Management of TWO PONDS NATIONAL WILDLIFE REFUGE Resulting in an Annual Water Depletion of 2.0 acre-feet (af) to the Platte River System Upstream from Chapman, Nebraska.

| | | | | | |
|---|-----------------|---|---|---|--|
| Two Ponds NWR Depletion in AF per year | | 2 AF | = | 0.0000007 | |
| Total Estimated Annual Depletion in Basin | | 2,650,000 AF | | Two Ponds NWR Share | |
| 417,000 AF X | 0.0000007 | X | \$37/AF | = | \$10.80 |
| Annual Streamflow Shortfall | Two Ponds Share | | Water Acquisition Cost | | Two Ponds Cost for Water Acquisition |
| 29,000 X | 0.0000007 | X | \$2,500/acre | = | \$50.75 |
| Acres of Habitat Needed | Two Ponds Share | | Habitat Restoration, and Maintenance Cost | | Two Ponds Cost for Habitat Restoration and Maintenance |
| \$10.80 | + | \$50.75 | = | \$61.55 | |
| Two Ponds Cost for Water Acquisition | | Two Ponds Cost for Habitat Restoration and Maintenance | | Total Two Ponds Cost for Aquatic and Terrestrial Habitat Restoration and Maintenance | |

Appendix I—Step-down Objectives

Natives

The Service will survey the Refuge in the spring of 1996 and mark the areas to be plowed and reseeded. A fall plowing in 1996 followed by a second plowing operation in the spring of 1997, two disking operations, and at least one harrowing will be applied to eliminate the existing brome grass.

All preparation will be on the contour in 50-100-foot strips. The grass seed should be planted after November 1, as a dormant seeding, or in the spring after April 30.

Trees

By the fall of 1997, the Service will survey woodland acreage to determine the current amount of Refuge woodland coverage. Depending upon results of this survey, Service staff will develop and implement a plan to achieve the goal of 10% tree cover on the Refuge.

Wildlife

A number of point count stations were established in 1994 to monitor bird use of the Refuge. Bird species and numbers are monitored year-round to add to the species list and determine seasonal abundance. A special effort will be made each spring to monitor breeding bird populations. Additional stations were added in 1996 to include recently acquired land.

Three small mammal trapping grids were established in 1994. Small mammals will be live trapped and marked annually to determine species

presence or absence and habitat use. An additional grid will be established in 1997 to include recently acquired land.

The Service will conduct surveys during 1997 to determine sensitive wildlife areas and periods of use to minimize disturbances to wildlife. From these surveys, strategies will be implemented to minimize impacts to wildlife due to potential habitat restoration and environmental education/public use projects.

Drift fences with pit-fall and funnel traps will be placed in various habitats during 1997 to trap reptiles and amphibians. Wetlands will be monitored for salamander larvae and tadpoles. Reptile hiding places, such as brush piles, rocks, and logs will be overturned and checked incidentally.

Aquatic

During 1997, grass carp will be stocked initially at a rate of 15 per surface acre to control aquatic vegetation. The Service will stock fathead minnows at a rate of 500 per surface acre during the spring of 1997. Stocking fatheads will provide a food source for wading and shorebirds and provide opportunities for environmental education classes.

To control mosquito numbers, the Service will stock 500 mosquito fish in Marshall Pond, 500 mosquito fish in Unnamed Pond and 200 mosquito fish in the Lighter Pond per season beginning in spring 1997. During 1998, mosquito fish will be stocked in the spring (mid-April) after the first mosquito larvae are detected in the ponds.

Environmental Education Curriculum Development

| | |
|--|-----------------|
| Begin planning EE curriculum with local teachers | March 1996 |
| Test curriculum with local school | April-May, 1996 |
| Draft EE curriculum outlines | June-July 1996 |
| Recruit and train volunteer leaders and teachers | July-Aug. 1997 |
| Begin EE classes at Refuge | Sept.-Oct. 1997 |

THE FOLLOWING FACILITIES WILL BE DEVELOPED TO SUPPORT ENVIRONMENTAL EDUCATION AND PUBLIC USE PROGRAM GOALS AND OBJECTIVES.

1997 Schedule

| | |
|--|------------|
| Design gate house interpretive panels | January |
| Hold public meeting on Refuge plan | March |
| Construct gatehouse/entry gate/kiosk | April |
| Design pavilion | April-June |
| Mow trails in Environmental Education and Prairie Management Areas | May |

| | |
|---|-----------|
| Identify possible funding sources for construction of Refuge facilities | June |
| Draft specs for parking lot | July |
| Complete fence around Environmental Education Area | Sept. |
| Construct parking lot (contingent on funding) | Nov.-Dec. |
| Stripe parking lot (contingent on funding) | Nov.-Dec. |

Phase III 1998

| | |
|---|-----------|
| Prepare specs for pavilion, platforms, and boardwalks | Jan.-Feb. |
| Apply for assistance from previous funding sources | Mar.-Apr. |
| Reseed disked areas | Apr.-May |
| Construct restrooms/pavilion/amphitheater | |

Phase IV 1999

Convert mowed trails and interpretive overlooks to hard surface.

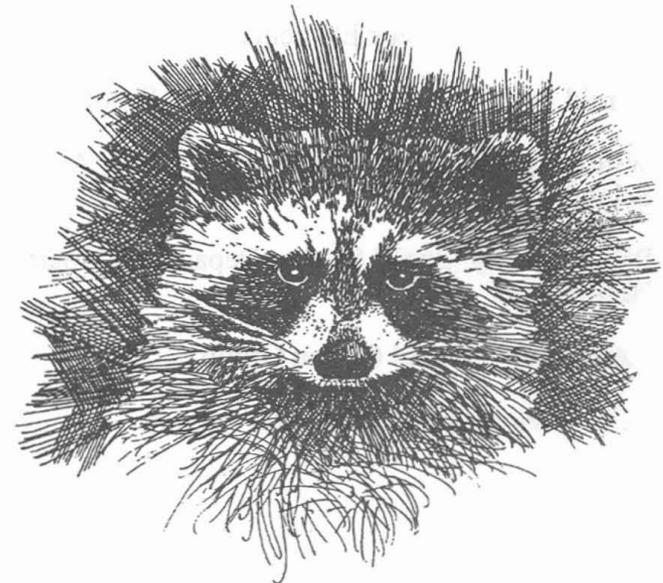
Construct interpretive overlooks.

Design bridges over the Croke, Farmers High Line, and Church Ditch Canals.

Phase V 2000

Construct bridges over Croke, Farmers High Line, and Church Ditch Canals.

Complete interpretive signage at overlooks.



Appendix J—Letters of Support

Congressman David Skaggs, Colorado 2nd District

City Council of the City of Arvada

Neighbors of the Two Ponds National Wildlife Refuge

North Jeffco Park and Recreation District

Colorado Wildlife Federation

Lutheran Medical Center

Dudley Weiland, Peck Elementary School

Harold Pratt, Jefferson County Public Schools

William Jones, Science Department Chair, Arvada West High School

Richard Feely, Social Studies Department Chair, Arvada West High School

Sierra Club - Rachel Carson Group

U. S. Environmental Protection Agency

