

## 2. VISION AND GOALS

**A**s with all national wildlife refuges that are open to the public, the Rocky Mountain Arsenal National Wildlife Refuge will welcome visitors from every background and interest. Special effort will be made, however, to attract and engage those urban dwellers who might not otherwise visit a wildlife refuge. The goal is to open up the world of nature to persons—particularly those in the immediate neighborhoods of Montbello, Commerce City, and North Aurora—who may have little opportunity to experience nature. Another goal is to help nearby residents feel a sense of ownership and pride for the Refuge.

**The mission of the Rocky Mountain Arsenal National Wildlife Refuge is to enhance and sustain fish and wildlife and their habitat and to provide the public with meaningful opportunities to experience nature near an urban area. In addition, the Refuge will provide urban dwellers with the opportunity to see a variety of wildlife close to home.**



Special attention will be paid to school children in the region, who may have had little opportunity to understand or experience Colorado's plains environment and heritage. Other groups to be accommodated will include civic organizations, wildlife advocacy groups, and photography clubs (Figure 2.1).

Just as residents of the surrounding neighborhoods will be encouraged to visit and enjoy the Refuge, so will the Refuge staff increasingly participate in the neighborhoods. The latter will be accomplished by taking programs into the neighborhoods and by staff participating in neighborhood organizations and activities.

## GOALS AND OBJECTIVES

The process of developing goals and objectives for the Refuge, as well as specifically for the Comprehensive Management Plan as a whole, is a step-down process that goes from the general to the specific. The legislative framework (described in the previous chapter) provides the broadest



**Figure 2.1** The Refuge staff will make a special effort to reach urban youth who might otherwise not visit a wildlife refuge.

context for the Refuge. From this framework, six goals were developed to help guide planning and management of the Refuge (Table 2.1). Presented below are supporting principles and objectives for each of the six. Specific Refuge actions and facilities should each be traceable through the various levels of this step-down process. In this way every-day activities can be kept consistent with the Refuge's broader mission.

**Table 2.1** Six goals were developed to help guide planning and management of the Refuge.

- 1. Manage wildlife and habitat to contribute to ecosystem management using strategies that recognize the Refuge's different resource types and the varying purposes specified in the enabling legislation.*
- 2. Interact with communities and organizations through outreach and cooperative agreements to create mutually beneficial partnerships.*
- 3. Develop environmental education and outreach programs for urban communities to nurture an appreciation of nature which ultimately results in fostering an environmental consciousness which promotes conservation of our natural resources.*
- 4. Provide opportunities for wildlife-oriented recreational activities.*
- 5. Utilize the Refuge for research opportunities compatible with Refuge management.*
- 6. Develop a program support system to provide facilities, funding, and resources necessary to accomplish Refuge purposes.*



## GOAL 1

*Manage wildlife and habitat to contribute to ecosystem management using strategies that recognize the Refuge's different resource types and the varying purposes specified in the enabling legislation.*



An essential part of this goal is that within the 27-square mile Refuge there are two major planning zones and a third less traditional planning zone. To the north, the land is open grassland and it is in this area that most of the major disturbance related to environmental cleanup will occur. The southern zone has human-created lakes and other areas of introduced water sources and diverse plant and animal species. Some of the objectives in support of this goal relate to both northern and southern zones, while others relate to one or the other. The western zone is a much smaller area and was specifically established to facilitate the development of community partnerships.

## Principles for Goal 1

### *Management principles for the northern and southern zones*

- Continue inventories of habitat types and plant and animal species present on the Refuge.
- Preserve, enhance, and augment grasslands for use by songbirds and other grassland-related species.
- Conserve and enhance species listed as threatened or endangered under the Endangered Species Act, species that are candidates for such listing and sensitive or regionally declining species.
- Reintroduce and manage appropriate indigenous species.
- Manage First Creek as an important riparian corridor and restore degraded portions.
- Fulfill international treaty obligations of the United States for the conservation of fish, wildlife, and their habitats.
- Phase the restoration of impacted/degraded habitat and adjust restoration techniques as necessary to achieve desired results.
- Evaluate and monitor the health of fish, wildlife, the success of restoration and remediation efforts, and the overall impact of human activities on wildlife.
- Identify and develop local sources of native grass, shrub, and forb seed.
- Work with the U.S. Army and Shell Oil company (who are responsible for cleanup) to ensure that the process of environmental remediation achieves fish, wildlife, and habitat restoration goals.
- Identify management units within each zone and manage appropriately.

### ***Management principles for the northern zone***

- Manage and restore the northern zone of the Refuge as habitat for indigenous species.
- Promote the preservation and establishment of native plants and animal species to encourage self-sustainable systems.
- Preserve, enhance, restore, and augment prairie dog communities.

### ***Management principles for the southern zone***

- Manage and improve the southern zone of the Refuge to maintain and enhance diverse habitats for wildlife populations at appropriate densities.
- Preserve, enhance, and augment wetlands for use by waterfowl, fish, and shore birds. (Also applies to First Creek in both zones.)
- Promote the preservation and establishment of native plant species to maintain or enhance habitat values for wildlife.
- Encourage sustainable systems where not in conflict with maintaining existing diversity and abundance of wildlife populations.

### ***Principles for the western zone***

- The western zone is the Refuge Gateway and a place for considerable interaction with adjacent communities.
- Environmentally, it is a place to demonstrate how facilities can be sited and maintained in ways that recognize ecological principles.

## **Objectives for Goal 1**

### ***Habitat Management (northern zone)***

#### ***Covered/capped areas***

The Service, U.S. Army, and Shell will revegetate capped/cleanup areas to establish a plant community consisting of 70-100 percent grasses and 0-30 percent forbs and shallow rooted shrubs.

The species composition of the desired plant community will vary with site-specific wildlife management objectives and soil types. For example, if the objective is to exclude most wildlife from a site, such as a landfill, a monoculture of crested wheatgrass or a mixture of crested wheatgrass and pubescent wheatgrass may be selected. On the other hand, if only burrowing animals will be excluded from an area, forbs and shallow-rooted shrubs, such as annual sunflower, blue flax, fringed sage, four-wing saltbush, and rubber rabbitbrush, may be seeded as well to provide cover and forage for other wildlife, such as songbirds and deer.

Revegetation efforts will be initiated the first growing season cover/caps are in place, and will aim to establish the desired plant communities within five years of planting. Additional maintenance after five years may be necessary to control the invasion of undesirable species. This project will retard erosion, discourage use of these areas by certain wildlife, and help to protect human and wildlife health.

#### ***Habitat undisturbed by cleanup***

The Service will reseed and establish a plant community consisting of 70-90 percent native grasses, 10-30 percent native forbs and shrubs, and plant trees both in existing areas and in

appropriate riparian areas as identified on the Refuge's Restoration Priority Areas map to replace trees lost due to age, disease, lightning, etc. Specific areas may vary in composition mix depending on site-specific soil types and management objectives (e.g., shrubland restoration).

Native grasses typical of sand prairie communities will be seeded on coarser textured soil types (loamy sand/sandy loam); species include blue grama, western wheatgrass, sand dropseed, needle-and-thread, sand bluestem, Indian ricegrass, prairie sandreed, and side-oats grama. Forbs and semi-shrubs typically found in sandy soils include bush morning glory, blue flax, annual sunflower, prickly poppy, evening primrose, and fringed sage, but the actual percentage of these and other species in the seed mix will also depend upon availability and cost. Shrubs such as rubber rabbitbrush, four-wing saltbush, sand sagebrush, or skunkbush sumac may be included in the seed mix depending upon site-specific management objectives.

Finer textured soils (loam/clay loam) would support a short-grass prairie plant community; blue grama, western wheatgrass, and buffalo grass would be co-dominant grass species, while forbs and shrubs would likely include annual sunflower, blue flax, rubber rabbitbrush, and four-wing saltbush.

Restoration plans to date have expressed a desire to establish plant communities within five years of planting. Additional maintenance beyond five years may be necessary to control the invasion of undesirable species.

### ***Habitat Management (southern zone)***

#### *Restoration/enhancement areas*

The Service and the U.S. Army will restore 1,000-1,500 acres to native grasses, and maintain the remaining habitat in areas as identified on the Service's map of restoration priorities (Map 2.1). Soils in the southern zone generally are coarse textured and would support a typical sand prairie community. Desired native plant species are the same as those described for loamy sand/sandy loam soil types in the northern zone.

The remainder of existing habitat will continue to be dominated by crested wheatgrass, annual weeds, and cheatgrass. The restoration plan identifies the phasing of this project to establish desired plant communities within five years of planting. An additional five years of maintenance may be necessary to control the invasion of undesirable species. This project will restore habitat values lost through cleanup and improve habitat values of weedy areas.

#### *Undisturbed habitat*

The Service will maintain 5000 acres of the existing vegetative composition of 70-90 percent grassland and 10-30 percent woody vegetation in areas identified on the Service's Restoration Priority Areas map. Grasslands will continue to be dominated by prairie sandreed, western wheatgrass, blue grama, and buffalo grass with a 10-20 percent complement of native forbs. Woody vegetation will continue to be dominated by cottonwoods, New Mexico locust, white poplar, sumac, and Chinese elm. This maintenance program is on-going and will sustain current habitat values for existing wildlife species through the 15-year planning horizon

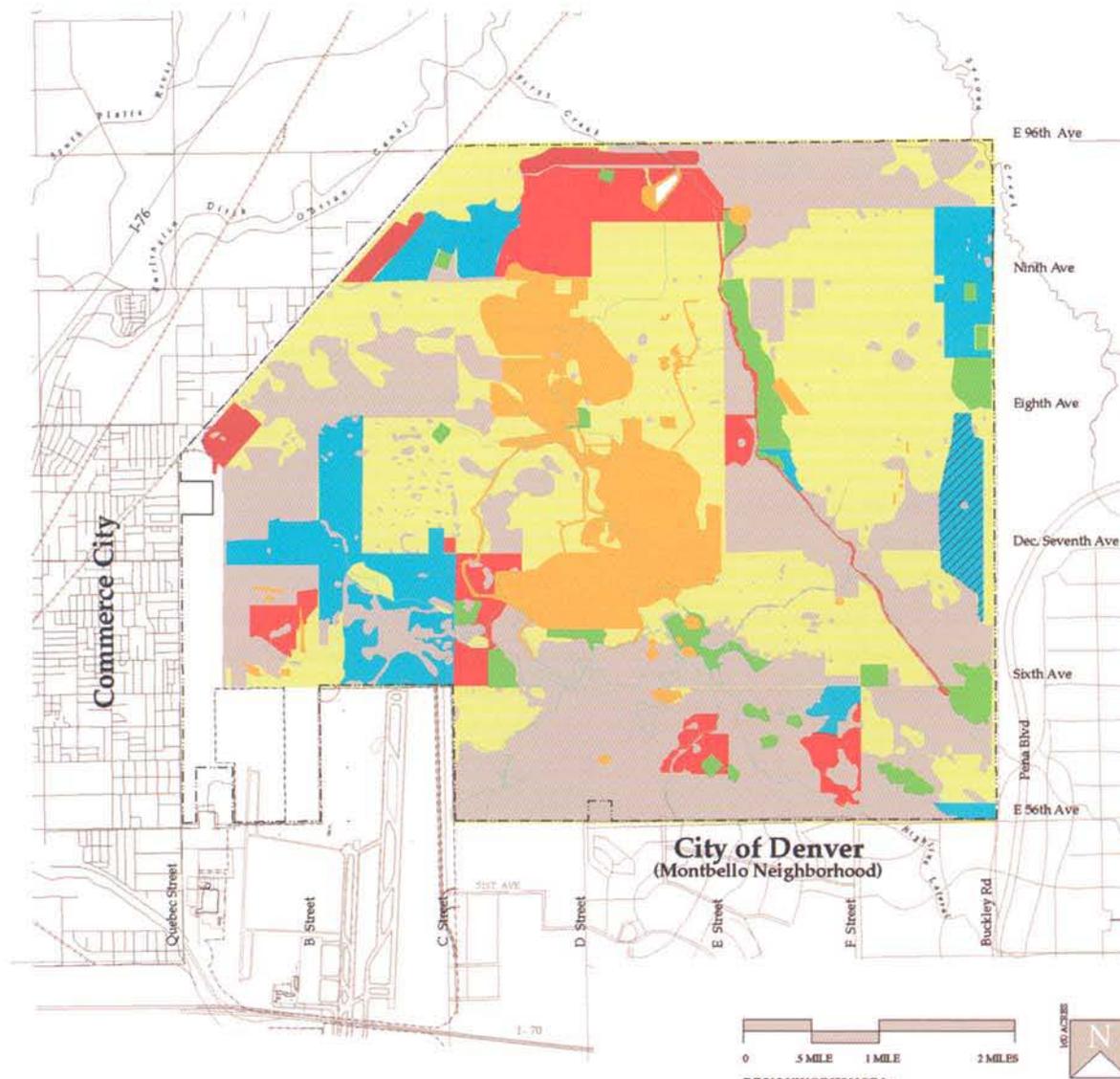
# HABITAT RESTORATION PRIORITIES (Map 2.1)

|   |  |               |
|---|--|---------------|
|  | First Priority--Seeding                | 1505.93 Acres |
|  | First Priority--Shrubs Only            | 211.64 Acres  |
|  | Second Priority                        | 930.42 Acres  |
|  | Third Priority                         | 5691.04 Acres |
|  | Fourth Priority                        | 5313.02 Acres |
|  | Potential Vegetation Maintenance Sites | 559.88 Acres  |
|  | Unclassified                           | 1216.38 Acres |
|  | Remediation Zone                       | 1599.63 Acres |
|  | Interseeding Only                      | 218.76 Acres  |

-  Railroads
-  Streams
-  Section Lines
-  Refuge Boundary

Source:

Morrison Knudsen Corporation, classification boundaries determined by U.S. Fish & Wildlife Service. Updated November 1995.



### ***First Creek Restoration***

The Service will restore and improve First Creek (approximately 1000 acres) according to the First Creek restoration plan, including: restore appropriate portions of the old stream channel; install drop structures to prevent further erosion; enlarge/improve Bald Eagle Shallows, if required, by the Urban Drainage and Flood Control District Master Plan (when completed); restore and create wetlands in the First Creek corridor; and restore riparian vegetation and replace upland trees. This task will be initiated within five years and completed within 15 years. It will reduce channel headcutting and soil erosion; protect and replace eagle roost trees; minimize downstream flooding; improve water quality; improve riparian habitat values and replace dead upland trees in the northern zone with trees in riparian areas.

### ***Identify and Develop Seed Sources for Revegetation***

The Service will develop an on-site seed collection program; establish a nursery for the propagation of woody species and for seed cleaning and storage; and develop off-site sources of local provenance. This on-going program will develop the use of local genotypes for revegetation projects and reduce the cost of seed acquisitions.

### ***Manage Prairie Dog Communities***

The Service will strive to maintain 3,500 to 5,000 acres of prairie dog colonies to provide and sustain an important year-round regional prey base and habitat for raptors and other wildlife species. Management of these colonies will include: efforts to control plague and minimize public health risks; control prairie dog use of capped areas and landfills; maintain isolated colonies in selected areas to serve as population

reservoirs in the event of plague episodes; control the introduction/colonization of prairie dogs into selected habitat restoration areas to allow revegetation establishment; and relocate prairie dogs in appropriate areas by trapping.

### ***Deer Management***

The Service's deer management program will contain deer herds within the Refuge boundary through the maintenance of the perimeter fence to minimize deer/vehicle collisions and determine the ultimate carrying capacity of white-tailed and mule deer on the Refuge. The Service will use a variety of management techniques to control numbers including culling/hunting and contraception. Additionally, the Service will determine strategies to maintain a healthy deer population. These efforts are necessary because deer populations have the potential for rapid growth, and large deer populations can have severe impacts on other animal communities which depend on healthy vegetation for food and cover.

### ***Maintain and Enhance Aquatic Communities - Lakes and Wetlands***

The Service, U.S. Army, and Shell Oil Company will continue to maintain the existing lakes and wetlands and/or create new wetlands resulting from cleanup borrow pits. The Service, Army, Denver Water Board, and the Urban Drainage and Flood Control will cooperatively create new/enlarged stormwater detention and water quality ponds on First Creek at Bald Eagle Shallows and along 56th Avenue within the next 15 years. These lakes and wetlands will provide habitat for abundant and diverse terrestrial and aquatic organisms, manage stormwater, and provide environmental education opportunities. The detention basins will help to remove debris, sedi-

ment, and contaminants from urban runoff where it enters the Refuge.

#### ***Maintain Lakes and Wetlands Water Levels***

The Service, Army, and Shell will maintain existing lake and wetland water levels. Maintaining lake levels will help to stabilize contaminant plumes and reduce stream channel/habitat degradation on the Refuge by controlling floods, and benefit Refuge fishery resources.

#### ***Reintroduction of Bison***

Pending approval within the Service, the Service may introduce a herd of 10 to 100 bison in the northern zone within 5 years after cleanup completion. At one time bison were present in the ecosystem, and this species provides a necessary grazing/trampling component in sustaining a short-grass prairie. Additionally, bison would be a major attraction in the urban setting of Denver and would facilitate educating visitors/students in plains ecology and ecosystem management.

#### ***Reintroduction of Pronghorn Antelope***

The Service may reintroduce a herd of 15 to 30 pronghorn antelope which would roam Refuge-wide, within 5 years after cleanup completion. Pronghorn antelope were also an historic component of the grassland ecosystem. Reintroduction of this species would increase wildlife diversity, facilitate educating visitors/students in plains ecology/ecosystem management and provide a major attraction in this urban setting.

#### ***Reintroduction of Greater Prairie Chickens***

The Service may reintroduce a self-sustaining population of prairie chickens within 5 years after cleanup completion. Leks (grounds for breeding

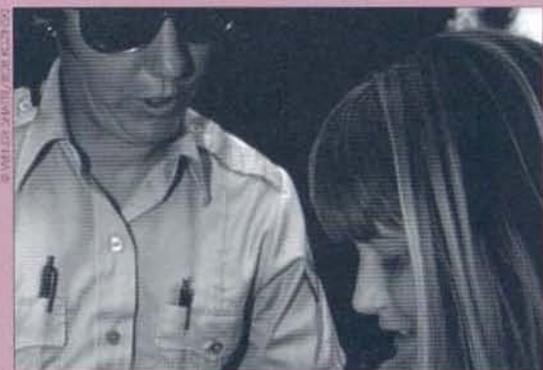
courtship) would be artificially developed and enhanced where necessary. The prairie chickens would increase wildlife diversity on the Refuge and would facilitate educating visitors in plains ecology/ecosystem management.

#### ***Reintroduction of Plains Sharp-tailed Grouse***

The Service may reintroduce a self-sustaining population of sharp-tailed grouse within 5 years after cleanup completion. Leks would be artificially developed and enhanced where necessary. The sharp-tailed grouse would increase wildlife diversity and would facilitate educating people in plains ecology/ecosystem management.

## **GOAL 2**

***Interact with communities and organizations through outreach and cooperative agreements to create mutually beneficial partnerships.***



### **Principles for Goal 2**

- Communicate with and engage communities, neighborhoods, and constituencies in the development and implementation of the

Refuge Comprehensive Management Plan.

- Explore and develop creative partnership opportunities to fund joint facilities and programs and diversify funding sources.
- As part of an ecosystem management approach, develop cooperative agreements with adjacent property owners to manage landscape connections.
- Maintain the boundary fence, but soften its visual impact on adjacent neighborhoods and communities and provide public visual access from overlooks and the perimeter trail.
- Target adjacent communities to participate in Refuge activities and programs so that they develop a sense of ownership, stewardship, and volunteerism which ultimately will help support the Refuge.
- Work with federal, state, and local governments and private interests to protect and enhance the Refuge watershed.
- Inform the public that proposed public uses and activities will occur in areas which pose no human health risks.

## Objectives for Goal 2

### ***Cooperative Agreements and Joint Ventures***

The Service will develop cooperative agreements/joint ventures with federal, state, and local officials (particularly Commerce City and the City and County of Denver), educational institutions, and civic and business leaders to develop the western zone and perimeter trail and to build constituencies to help raise funds for Refuge support. This effort will begin now and extend beyond cleanup.

### ***Volunteerism and the Rocky Mountain Arsenal Wildlife Society***

The Service will increase levels of volunteerism proportionate to increased levels of public attendance and will work to support the Rocky Mountain Arsenal National Wildlife Society, which is charged with building constituencies for the Refuge and to communicate the benefits of an urban refuge to the community. These efforts will support the Refuge's public use staff and help engender a sense of ownership of the Refuge.

### ***Buffer Zone and Landscape Connections***

The Service will coordinate planning efforts with Commerce City, Stapleton Redevelopment, Denver International Airport, State Trails Program, Colorado Division of Wildlife, Colorado Department of Natural Resources, Urban Drainage and Flood Control District, Barr Lake State Park, Denver Regional Council of Governments (DRCOG), City and County of Denver, Adams County, and adjacent landowners to manage and promote landscape connections, stormwater management, transportation connections and adjacent development during and beyond cleanup. These actions will help to create a buffer zone between the Refuge boundary and surrounding development, and create connections between the Refuge and other wildlife habitats.

These are in recognition that the Refuge needs to be managed as part of a larger ecosystem that extends beyond its boundaries and to minimize negative impacts of adjacent development on the Refuge. The creation of such synergistic partnerships will be essential in achieving the Refuge goals.

### ***Perimeter Trail***

The Service, in cooperation with other jurisdictions and partners, will develop portions of a perimeter trail and water quality detention area along 56th Avenue by the year 2000, the remainder of which will be completed within 5 years after cleanup. The Service will work with other jurisdictions to raise funds and submit for grant money from the Great Outdoors Colorado Fund, ISTEA (Intermodal Surface Transportation Efficiency Act); and private interests.

The perimeter trail and the strip of land it sits within will aid in buffering the impacts between the Refuge boundary and surrounding development, thus minimizing the negative impacts of adjacent land uses on the Refuge, while promoting wildlife oriented recreation activities through connections with regional greenways.

### ***Public Safety***

The Service will continue to demonstrate the safety of public activities through exhibits, fact sheets, outreach, and educational activities. It will develop a Station Health and Safety plan which specifically addresses the needs of visitors.

## **GOAL 3**

*Develop environmental education and outreach programs for urban communities to nurture an appreciation of nature which ultimately results in fostering an environmental consciousness which promotes conservation of our natural resources.*



### **Principles for Goal 3**

#### ***Environmental education and interpretation principles***

- Create on- and off-site programs and facilities that:
  - build new constituencies for wildlife and habitat conservation,
  - foster an informed citizenry,
  - communicate urban wildlife and habitat issues, and
  - explain the evolution of the Refuge's landscape and its cultural and natural history.
- Target urban dwellers as participants and visitors, especially those who might not otherwise visit a refuge.
- Provide visitors with ideas that they can apply to their own lives which result in environmen-

tally responsible behavior.

- Identify audiences and establish programs specific to the needs of these audiences.
- Use the Arsenal's history, site cleanup, and habitat restoration of the Refuge for environmental education and interpretation opportunities.
- Ensure the compatibility of educational/interpretive activities with the Refuge's purposes, funding, and other legal mandates.

#### ***Environmental Education Principles:***

- Communicate with other regional and state environmental educators and combine resources where possible.
- Use the Refuge to demonstrate how human influences have resulted in a diversity of habitats, which in turn resulted in a diversity of wildlife.
- Promote instructor-led field trips and provide related instructor training.
- Develop partnerships with local school and youth groups.

#### ***Interpretation principles:***

- Develop and promote self-guided interpretive activities.
- Interpretive programs and displays should convey the story of natural and managed ecosystems and the cultural and historical evolution of the Refuge and its surroundings.

### **Objectives for Goal 3**

#### ***Community Relations Plan***

The Service will develop a community relations plan, updated every 5 years, outlining how the

Service can best use its current financial resources and staff to improve communications with neighboring communities, identify potential partnerships, and build a framework for future community activities at the Refuge. These efforts are needed for the Service to build a strong image within the community as a leader in environmental stewardship.

#### ***Business Outreach Plan***

The Service will develop a business outreach plan within 5 years to position the Refuge as an asset to Denver's cultural and economic climate. The business community is viewed as an influential audience and can play a key role in making the Refuge successful.

#### ***Public Needs Assessment***

The Service will conduct a public needs assessment annually to determine the types of activities and programs current and future visitors would be interested in, and assess the quality of existing programs. This assessment will ensure that programs and their messages are modified to meet public needs.

#### ***Special Events***

The Service will develop partnerships with other institutions and organizations to provide a minimum of 12 special events per year. These will provide opportunities for public participation in Refuge activities.

#### ***Public Outreach***

The Service will develop a full range of professional quality but cost effective publications/collateral materials, and a variety of outreach tools in order to generate interest in the Refuge, interpret various aspects of the Refuge and provide an

events calendar. The success of these efforts will be reviewed annually.

### **Public Use Programs**

The Service will develop public use programs which enable people to understand the Refuge's diverse history and the current wildlife and habitat management philosophy. The emphasis of public use will be geared toward environmental education.

The Service will develop formal environmental education programs for schools which will be curriculum-based; organized by appropriate grade level; involve teachers in curriculum development and piloting; relevant to Colorado State Content Standards; coordinated with and designed to complement other State-wide environmental education programs; correlated with Refuge management goals; provide opportunities for hands-on student involvement; result in measurable outcomes; include pre-and post activities, and/or multiple contacts between learner and instructor; designed to be led by teachers, volunteers, youth group leaders, and Refuge staff; enhanced by teacher assistance through training workshops and in-service programs; and accommodate the needs of various school/youth groups and their leaders.

The success of these programs will be reviewed annually with outside educators providing feedback.

## **GOAL 4**

*Provide opportunities for wildlife-oriented recreational activities.*



### **Principles for Goal 4**

- Ensure the compatibility of all wildlife-oriented recreational activities with the Refuge's purpose, funding, and other legal mandates.
- Provide opportunities for the public to engage in wildlife-oriented activities, such as fishing, photography, and bird watching.
- Enter into partnerships with other institutions to enhance wildlife-oriented recreational opportunities offered to the public, particularly the perimeter trail and the western zone.
- Establish trails and observation points for wildlife watching opportunities.

### **Objectives for Goal 4**

The Service will work with adjacent jurisdictions to develop the perimeter trail as part of a regional trail system within 5 years of completion of cleanup; provide a seasonal-use bike trail along the southern tram route after completion of cleanup; manage the fishing program to maxi-

mize fishing opportunities for not more than 700 people per year; and develop partnerships with other institutions and organizations to provide wildlife-oriented recreation program(s) on an annual basis.

## GOAL 5

*Utilize the Refuge for research opportunities compatible with Refuge management.*



### Principles for Goal 5

- Wildlife and habitat research should be focused on species currently or historically found on the Refuge or within proximity to the Refuge.
- Research should contribute to the science of prairie restoration and management.
- Research should examine urban wildlife/human interactions research.
- Biomonitoring of contaminated sites or areas adjacent to contaminated area should continue to be a primary emphasis of research.

## Objectives for Goal 5

### *Wildlife-oriented Research*

The Service will continue biomonitoring programs; complete deer population control studies; encourage research with other institutions that is compatible with Refuge goals; use volunteers for data gathering; and maintain relationships with universities, museums, Colorado Division of Wildlife and other state and federal agencies. All research activities will fulfill the requirements of the Refuge Act and provide data necessary for proper management of Refuge habitat and wildlife. The research studies will be reviewed annually with outside representatives to evaluate the effectiveness of Refuge research.

### *Historical and Archaeological Research*

Instigate immediately an artifact protection program in coordination with the National Park Service. Using remaining artifacts and other interpretive media to incorporate history and archeology into the Refuge's interpretive and environmental education programs within the next five years. In cooperation with outside researchers, incorporate archeological digs into environmental education programs.

## GOAL 6

*Develop a program support system to provide facilities, funding, and resources necessary to accomplish Refuge purposes.*



### Principles for Goal 6

- Develop diversified funding sources.
- Establish a priority system to implement Refuge objectives.
- Cluster facilities to minimize the overall impact of development, and restrict these to a small portion of the Refuge. Reuse existing facilities where practicable.

### Objectives for Goal 6

The Service will raise monies through the formation of partnerships with local governments, corporations, institutions and many other entities; through the formation of a foundation by 2001; and by the establishment of an entry/user fee for the tram route. These efforts will enable the Refuge to become more independent of federal budget constraints; will allow for private funding of off-Refuge facilities' construction and maintenance; and will provide subsidies for environmental education programs.

## PUBLIC USE PLAN

The public's future use of the Refuge has been given careful consideration. Public use is mandated by the Act of Congress that created the Refuge, but also mandated is the protection of the Refuge's resources. In order to understand the implications of public use and to plan for it, a separate Public Use Plan (1996) was created. The major points of that plan are presented here.

The following are the general groups of likely Refuge visitors.

- **Urban youth:** Refuge staff have made a special commitment, because of the urban location of the Refuge, to engage and educate those youth and other urban dwellers who may not otherwise ever visit a Refuge.
- **First time/short term (visitor):** These visitors have never been to the Refuge before, may stay a short time, and may never return. On average, they are more likely to go to the visitor center and perhaps ride on the tram, but their (one to two hour) visit may be all they are interested in.
- **Tourists (visitor):** Denver residents welcome entertainment opportunities for their visiting friends and relatives who have to be taken some place. (See Figure 2.2.) Hosts want the visitor to think highly of Denver and enjoy themselves. The host becomes a repeat user by bringing visitors. Some visitors who have lay-overs at Denver International Airport may visit the Refuge, and an exhibit booth at Denver International Airport would encourage these visits. The sign along Peña Boulevard will be an excellent advertisement for the Refuge, for both visitors and residents.
- **School programs** developed for each environmental education area on-site will target



Figure 2.2 Visitors have an opportunity to observe and photograph wildlife

specific grade levels (i.e., wetlands (grades 3-6), Lakes (K-2), Rattlesnake Hill (7-12)). This will provide opportunities for repeat visits.

- School children (may be visitor or user): Individual students may or may not become repeat visitors, but the schools/teachers readily do. Because environmental education objectives will be specific to each grade level, a teacher at that level is likely to bring a class each year. School children in neighboring schools likely have more extensive involvement through partnerships (12 or more visits annually). (See Figure 2.3.)



Figure 2.3 Volunteers and students can help restore the prairie on which wildlife is dependent

- Long term (user): These visitors have returned to the Refuge and, on average, will participate in activities about three to four times a year. Increasing their involvement at the Refuge is easier than other groups because they already relate to the Refuge. These are likely candidates for Wildlife Society membership. Members of environmental/ conservation organizations, like Denver Audubon Society, are likely candidates to become long-term users.
- Perimeter greenbelt users (visitors): These are primarily recreationists along the trails and nature observers at the overlooks and viewing areas. The latter are more likely to become users than the former.

### Uses and Visitation

The public use program is designed to accommodate a broad range of compatible uses and is best explained in terms of the zone concept. The zone concept was developed to create management zones for both habitat/wildlife and public use. The zones include a number of common activities, but where certain public uses are considered incompatible with habitat and wildlife requirements, uses will be restricted.

The likely users of the Refuge are shown in Table 2.2.

Based on visitor levels at related facilities, both in Denver and around the country, and based on the perceived demand for the kinds of experiences the Refuge will offer once cleanup is complete, visitation is projected to be 90,000-150,000 visits, including 40,000 environmental education participants. When the site is fully developed, the Refuge programs will be able to handle 350,000 visitors,

**Table 2.2** Anticipated users of the Rocky Mountain Arsenal National Wildlife Refuge, by management zone.

| <b>NORTHERN ZONE</b>                | <b>SOUTHERN ZONE</b>              | <b>WESTERN ZONE</b>               |
|-------------------------------------|-----------------------------------|-----------------------------------|
| <b>EDUCATIONAL USERS</b>            |                                   |                                   |
| Elementary school students/groups   | Elementary school students/groups | Elementary school students/groups |
| Secondary school students/groups    | Secondary school students/groups  | Secondary school students/groups  |
| College/graduate students/groups    | College/graduate students/groups  | College/graduate students/groups  |
| Adult students/education groups     | Adult students/education groups   | Adult students/education groups   |
| Professional educators              | Professional educators            | Professional educators            |
| Professional education groups       | Professional education groups     | Professional education groups     |
| General public                      | General public                    | General public                    |
| <b>ENVIRONMENTAL INTEREST USERS</b> |                                   |                                   |
| Conservation groups                 | Conservation groups               | Conservation groups               |
| <b>RESEARCHERS (NON-USFWS)</b>      |                                   |                                   |
| Wildlife researchers                | Wildlife researchers              | Wildlife researchers              |
| Ecologists                          | Ecologists                        | Ecologists                        |
| Botanists                           | Botanists                         | Botanists                         |
| Agronomists                         | Agronomists                       | Agronomists                       |
| Historians                          | Historians                        | Historians                        |
| Archaeologists                      | Archaeologists                    | Archaeologists                    |
| Reclamation specialists             | Reclamation specialists           | Reclamation specialists           |
|                                     | Fishery biologists                |                                   |
|                                     | Limnologists                      | Limnologists                      |
| <b>GENERAL INTEREST USERS</b>       |                                   |                                   |
| Local individuals                   | Local individuals                 | Local individuals                 |
| Local families                      | Local families                    | Local families                    |
| Organized groups                    | Organized groups/special events   | Organized groups/special events   |
| Destination tourists                | Destination tourists              | Destination tourists              |
| Drop-in tourists                    | Drop-in tourists                  | Drop-in tourists                  |
| Air travel stop-over visitors       | Air travel stop-over visitors     | Air travel stop-over visitors     |
| <b>RESOURCE MANAGEMENT STAFF</b>    |                                   |                                   |
| Staff                               | Staff                             | Staff                             |
| Volunteers                          | Volunteers                        | Volunteers                        |
| Partners                            | Partners                          | Partners                          |
| Other resource managers             | Other resource managers           | Other resource managers           |
| Trainees                            | Trainees                          | Trainees                          |
| <b>OTHER RECREATION USERS</b>       |                                   |                                   |
| Wildlife watchers                   | Wildlife watchers                 | Wildlife watchers                 |
| Bird watchers                       | Bird watchers                     | Bird watchers                     |
| Hikers                              | Hikers                            | Hikers                            |
| Cyclists — supervised               | Cyclists — supervised             | Cyclists                          |
| Photographers                       | Photographers                     | Photographers                     |
| Non-consumptive hunters             | Non-consumptive hunters           |                                   |
|                                     | Anglers                           | Joggers                           |



Table 2.3 **The Refuge's public use storyline has five major themes.**

**A. History:** *The history of the Refuge – the historical interaction between land, people, and technology – offers many lessons for taking responsibility for this and other places.*

**B. Wildlife:** *Wildlife improves everyone's quality of life*

**C. Ecosystem Connections:** *Nature consists of dynamic and interrelated systems*

**D. Consequences and Responsibilities:** *Understanding and working with natural processes is more responsible and efficient in the long run*

**E. Stewardship:** *The U.S. Fish and Wildlife Service, in serving as the Refuge's stewards must carefully manage the resources of the refuge and its visitors*



including 60,000 environmental education participants.

The actual numbers that are realized depend on a very large, unknown factor: the extent of development in the western zone. If substantial partnerships develop in that zone that result in the creation of "attractions," the upper end of the estimate could easily be reached.

Visitation for the Refuge proper (i.e., the southern and northern zones) should be viewed in a different way. Because the Refuge's resources are here, visitation should be carefully monitored to avoid degrading these resources. It may be possi-

ble to attract more visitors to these areas than is desirable for the resources.

In order to meet the demand for environmental education, seven environmental education staff will be needed. This includes an environmental education marketing staff member, three program staff, an environmental education development staff member, a volunteer coordinator, and an environmental education supervisor.

### Storyline

As a means of ensuring that the messages imparted to the public (through education and interpretive programs, as well as all other communication) is focused and appropriate for the Refuge, a storyline was developed that identifies the specific themes and messages that will be given at the Refuge. In addition, the kinds of experiences visitors will likely have, the sites where these messages are best given, and the kinds of media to be used are all presented.

There are five overarching themes that comprise the storyline. (See Table 2.3.)

Fundamental to all of these messages and themes is that they are integral to Refuge management. Thus, the story being communicated to the public is firmly grounded in what is being done to restore and care for the Refuge.

This also suggests that the places where stories are told (or educational activities carried out) are resource-oriented and may be permanent or temporary. The emphasis is on the dynamic nature of the Refuge and biological systems in general, and is in sharp contrast to conventional static exhibits. Seasonal changes will influence the relevance of the messages. The necessity and implications of resource management will be taught, whether it be reclamation associated with cleanup

**Figure 2.4** Trails will allow visitors to experience the Refuge at their own pace.



operations or plague control in prairie dog communities. Neither public use programs nor resource management activities should operate in isolation since environmental education and interpretation programs must stress the relevance of the Refuge, its wildlife and habitat, to the visitor.

The five storyline messages, related sub-themes, visitor experiences, correlated management activities and other information is given in Appendix C.

### Visitor Experiences

The following are a series of scenarios developed to describe the full range of visitor experiences which will be available at the Refuge.

#### **First-Time Refuge Visitor**

- First-time visitors arrive at the Visitor Learning Center by public or private transportation, enter the building to discover a reception area that orients them both to the Center complex and to the Refuge. They discover they have many choices to consider. They can:
  - Spend time reviewing exhibits in the Center or watch a film about the Refuge,
  - Buy tickets for an interpretative tram ride through a large part of the Refuge,
  - Buy a ticket for the universally accessible,



**Figure 2.5** Universal access will be available to all Refuge activities.

“Express Tram” and get on and off at any of the designated stops,

- Sign up for an interpretive program (that may leave by tram, foot, or bicycle),
- Walk around an interpretive trail just out the door of the Center or hike a longer trail to other locations on the Refuge, (See Figure 2.4.)
- Enroll in a class or lecture series that meets at the Center,
- Use the library at the environmental education Center,
- Visit the Eagle Repository and view its exhibits.

#### **Fishing**

- Visitor Learning Center: Visitors who are enrolled in the catch and release fishing program come to the Visitor Center by public or private transportation and take the tram to and from the fishing lakes. The tram could either be the interpretive, guided tour or the “express” tram which just picks up and drops off people along the tram route. The tram has an outside rack for holding fishing equipment (much as ski trams hold skis).
- Private buses/vans: For a few special programs, such as for disabled adults and children, there may be direct access to the lakes, instead of tram use. (See Figure 2.5.)



Figure 2.6 Along the Refuge trails, visitors can observe and photograph nature.

**Nature/History Observation/Photography (self-directed)**

- Visitor Learning Center: Visitors come to the Visitor Learning Center by public or private transportation, board the tram and get off at any stop, where they may follow the trails and observe and photograph nature (Figure 2.6).

**Eagle Watch (Winter)**

- Visitor Learning Center: Visitors arrive at the Visitor Learning Center by either bus or private transportation, and take the tram tour. This could either be the interpretive, guided tour, or the "express" tram which just acts to pick up and drop off people along the tram route. There would be less formal opportunities for interpretation of sights on the express tram. This route

remains within the Refuge fence and stops at the Eagle Watch as part of the tour.

- Tram Ride: On the way to the Eagle Watch, the lakes, wetlands, drainage and irrigation ditches, and First Creek are passed. On the guided tour, these habitats would be described as being important roosting sites for bald eagles and nesting sites for other birds. (See Figure 2.7.)
- Arrival by Private Vehicle: When the Eagle Watch viewing area is open, private groups



Figure 2.7 Some of the best wildlife viewing is available from the tram – a mobile "blind."

could arrive directly by private vehicles via Buckley Road.

- Current Eagle Watch Programs: On arriving and having been oriented, people would engage in current Eagle Watch interpretive and environmental education programs.
- A loop trail close to the Eagle Watch would interpret the prairie dog ecosystem of which Bald Eagles are a part. (See Figure 2.8.)



Figure 2.8 Spontaneous wildlife viewing will be possible along the trails.

**Environmental Education**

- Field Programs: Children arrive by bus at the Visitor Learning Center. After receiving an orientation by staff and viewing exhibits, the children are taken by tram to one of the satellite envi-

ronmental education/interpretive areas with an introductory interpretive talk given on the way. Depending on the site, equipment may or may not be located at the environmental education/interpretive area. Several of these areas which are part of the same theme (e.g., water resources – irrigation, wastewater treatment and wetlands) would be interconnected with trails for an integrated environmental education experience. (See Figure 2.9.) A tram ride back to the Visitor Learning Center could culminate in work in the Environmental Education Center for more detailed examination of what was studied at the environmental education/interpretive area(s).



Figure 2.9 Environmental

education requires hands-on field work.

Schools can enroll their children in a regularly meeting educational program (including ones that pair them with scientists).

- **Volunteer Programs:** As part of the environmental education program there would be opportunities for environmental education through volunteer activities. Monitoring wildlife, seed collecting, seeding, tree and shrub planting, and trash collecting could all become opportunities for combining field activities with environmental education. These groups would arrive at the Visitor Learning Center, be oriented and then be taken to wherever on the Refuge the activity is to take place. Environmental education lessons are learned as part of the process, and then further developed back at the environmental education center. (See Figure 2.10.)
- **Adult environmental education Programs:** These could include teacher training and an

elder hostel program.

- **Indoor Experience:** In addition to using the area adjacent to the Visitor Learning Center as an extension of outdoor programs, particularly in inclement weather, indoor exhibits and lab programs could be used for environmental education.
  - To reduce the need for Service personnel to be with each school group, training courses for educators (recertification credit) would allow teachers to structure and run their own visits.

#### **Special Events**

- **At the Eagle Watch:** In some instances there would be special eagle watch days. Although it is preferable to have people arrive at the Visitor Learning Center, there may be a need to have people have the option to drive directly out to the Eagle Watch via Buckley Road. Refer to the Eagle Watch scenario for the rest of the visitor's experience.
- **At the Visitor Learning Center (See Figure 2.11):** People would arrive by private vehicle,



Figure 2.10 Student groups can participate in Refuge management, learning through action.



**Figure 2.12** Perimeter overlook and interpretive area

public transport, or in the case of well attended events where the paved parking lot and overflow parking area are inadequate, an off-site parking area, such as Stapleton would be used with shuttle buses taking people to the Visitor Learning Center. People could either pass through the Visitor Learning Center straight to the special event area or choose to look at the exhibits first. The outdoor events area and amphitheater would be within walking distance of the Visitor Learning Center. This would be the main gathering area for special events. In certain circumstances it would be necessary to shuttle people out to an area, such as the lakes or Eagle Watch, if it were to be the focus of the special event. People would also have the opportunity to get involved with other normal Refuge activities – tours, hiking, interpretive trails etc.

#### **Perimeter Recreation**

- **Overlook Areas:** There are anticipated to be two perimeter overlook parking areas accessible from outside the Refuge. One would be along 56th Avenue near Havana Pond, and another one located along 96th Avenue near Henderson Hill. The overlooks would include limited parking areas which would occur on Refuge property, outside the perimeter fence, and would be interpretive in nature, and act as trail heads for the perimeter trail and for

regional trails which access the perimeter trail. In addition, there would be one viewing area from the trail along 56th Ave. There would be no parking areas associated with this viewing area, and access would be from the trail. This site would be used to interpret the importance of water quality and the role of wetlands. All the overlooks and viewing areas would be located on the Refuge but outside the perimeter fence.

- The regional trail system would access the perimeter trail at First and Second Creek, the Highline Canal, Stapleton, and at various points from the Montbello and Commerce City neighborhoods. Uses of the perimeter trail would include cycling, jogging, walking, rollerblading, and associated wildlife watching. This would require that the trails be capable of handling both foot traffic and wheeled traffic. Seating areas would occur at interpretive stops and overlook areas. (See Figure 2.12.)

#### **Bicyclists - On Refuge**

- **Arrival:** Bicyclists would arrive, either along regional trails, from the local neighborhoods, or by public or private transport. All access would occur at the Visitor Learning Center.
- **Self-Guided Biking:** This would be confined to the tram route along a designated lane on the side of the road. Cyclists would only be

allowed on paved roads, and signage at trail heads would emphasize this. This use would likely be seasonal in nature.

- Guided Biking Tours: These would occur at specific times during the day and would be confined to the tram route along a designated lane on the side of the road. (See Figure 2.13.)

### LANDSCAPE AND BUILDING PHILOSOPHY: SUSTAINABILITY

During public meetings concern was expressed that new development at the Refuge be carried out in a sustainable way. Specifically, it was mentioned that because of the severe chemical contamination at the Arsenal, the Refuge should be managed, to the degree possible, free of chemicals. As the Refuge's storyline evolved, a management approach that emphasizes sustainability became all the more appropriate.

Sustainability is not an easy concept to define, let alone implement. For discussion purposes here, landscape and building sustainability are discussed separately.



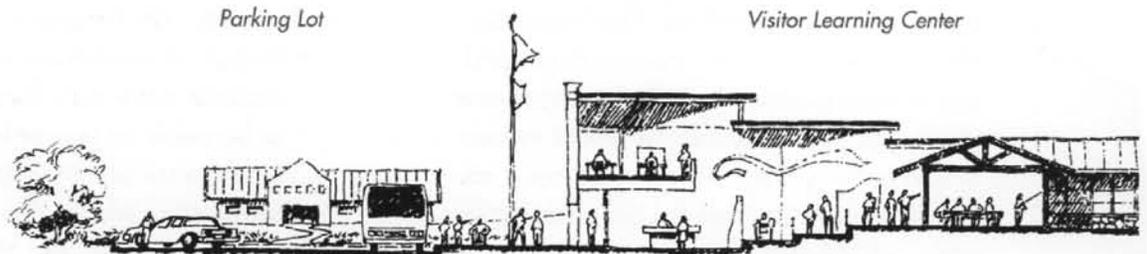
Figure 2.13 Bicycling on the Refuge will be possible on the Southern tram route

### Defining landscape sustainability

The characteristics of a sustainable landscape have been defined by Robert Thayer (1994) as:

- Use primarily renewable, horizontal energy at rates which can be regenerated without ecological destabilization.
- Maximize the recycling of resources, nutrients, and by-products and produce minimum "waste," or conversion of materials to non-usable locations or forms.
- Maintain local structure and function, and not reduce the diversity or stability of the surrounding ecosystem.
- Preserve and serve local human (and wildlife) communities rather than change or destroy them.

Figure 2.11 The Visitor Learning Center and the Refuge's Gateway will have much to offer visitors.



- Incorporate technologies that support these goals. In the sustainable landscape, technology is secondary and subservient, not primary and dominating.

These characteristics should be evidenced in the ways that the Refuge's landscape is developed and managed.

The regional landscape types should be expressed visually, physically and dynamically. This means, for example, that where shortgrass prairie is the dominant vegetation type, trees should be confined to riparian areas, and an open landscape should predominate. The prairie should be sustained through grazing, and, if possible, fire.

Landscape type is affected by aspect, topography, soils, drainage, climate, habitat management, and human intervention.

- Revegetation planning has identified a number of different plant communities, and combining these community types with soil and drainage characteristics has resulted in identifiable seed and plant mixes for different areas. The Refuge should aim to become self-sufficient in seed and plant materials so that they are of a local provenance and acclimated to local conditions. Aspect, topography and microclimate will, over time, influence the development of the restored landscapes. The aim is to restore the Refuge to as close to a self-sustaining state as possible, with the

associated benefits of creating plant and habitat diversity, and visual appropriateness. The following have been identified as distinct native plant communities on the Refuge:

- Shortgrass prairie
- Sandhills prairie
- Riparian vegetation
- Wetland vegetation
- Cobble soil vegetation
- Shrublands and succulents

The revegetation plan, in combination with the zone management plan, will combine natural factors with human historical artifacts and influences to produce a landscape which is diverse, provides rich habitat, recognizes natural systems and yet preserves memories of people's historical affects on the land. Thus, within one area, which overall may be managed as shortgrass prairie may also be overlaid artificial riparian and wetland systems, a capped contamination mound and upland trees associated with old homesteads. The shortgrass prairie should require little human intervention, yet all of the latter features will require management to retain them.

The larger context beyond the Refuge boundary should be recognized. Buffer areas will be increasingly important in order to retain visual and physical continuity with surrounding areas. The prairie relies upon large open vistas as part

*Outside Exhibit Area*

*Tram to Refuge*



of its identity. Habitat should not end at artificial political boundaries.

### Vegetation Management

Where native plant communities exist or become established, management should aim to mimic natural systems as closely as possible. In the prairie landscape this means grazing and fire. During establishment of restored areas, mowing and herbicides may need to be employed. However, in keeping with lessons learned from the history of the Arsenal, the use of potentially polluting management strategies should be avoided. (See Figure 2.14.)

Where plant communities have developed through human intervention, such as wetland mitigation sites, new communities should be established only where most sustainable. New wetlands should be restricted to re-establishment of historic ones, trees should be planted in riparian areas, and the form that tree and shrub plantings take should be as natural as possible, and sensitive to landform, soil type, moisture, and aspect.

### Human Intervention

New construction and disturbance which results in vegetation destruction, soil compaction, erosion and silt laden runoff should be minimized. Some of the techniques employed should include:

- Restrict construction damage to delineated areas;
- Define construction roads, and confine to existing or proposed permanent roadways;
- Windrow stripped soil to preserve its biological health; and

- Implement erosion control plans. Employ construction and design techniques which result in minimum impact on the land, and maximize benefits:

- Design only surface drainage systems;
- Harvest runoff from impermeable surfaces

to avoid erosion and irrigate vegetation, or create special habitats;

- Allow runoff from buildings and parking areas to disperse and infiltrate in accepted ways to deal with non-point source pollution; and

- Design plantings to provide windbreaks, reduce heating and cooling buildings, and to harvest.



Figure 2.14 Restoration of the prairie will be a lengthy, slow process

The following generalized criteria should be considered for each project at the Refuge. The visual experience of the Refuge landscape and its wildlife and supporting facilities should include components of sufficient interest to invite people to visit and return for further exploration several times. Whenever possible, trails should provide short, long, enclosed, and open views.

Opportunities for viewing wildlife with minimum disturbances should be utilized, taking advantage of topography, vegetation, and other natural features. The emphasis should be on design which reflects stewardship of the land, including project locations, structures, materials use, and respect for historical (natural and artificial) artifacts.

Construction techniques should minimize disturbance of the land, and materials choice combined with maintenance practices should limit post-construction impacts. Both the natural and artificial elements associated with the project can potentially be interpreted.

## Cleanup

Environmental cleanup will affect large areas of the Refuge. The result will be a loss of habitat and topsoil in many areas, the creation of capped mounds and landfills with engineered profiles which will limit vegetation establishment, and artificial landforms.

In the long-term the aim should be to minimize loss of habitat, integrate the landfills and capped areas into the landscape, and retain physical aspects of the cleanup areas which will serve as interpretive prompts for visitors in the future. The cleanup areas by their nature will never be able to function as natural systems, and a conscious attempt should be made to balance the need for them to serve the Refuge's wildlife needs with their role as reminders of the history of the place.

## Introduced Materials in the Landscape

Roads, trails, signage, fencing, gates, and other remote structures should be vernacular (i.e., common to this region) in form and use of materials. The vernacular can include any aspects of the historical past including the native Americans, settlers and weapons and chemical production facilities.

Sustainable design concepts as described for new buildings should also be used to guide design of introduced elements in the landscape.

## NEW BUILDINGS PHILOSOPHY

### Defining Factors

Recognize the relationship between the building and its site, including:

- The sun

- Prevailing winds
- Topography
- Contextual features – buildings and infrastructure, if new buildings are located at the Refuge perimeter.

Recognize the history of the Refuge through:

- Building form
- Building materials
- Building layout, and the relationships between groups of buildings

Buildings should not only express a sense of place and its history, but should function well and be environmentally responsible. Buildings also should provide examples of how, through expressing unseen phenomena, visitors can understand human impacts on the landscape and how, through good design, these impacts can be minimized.

Sustainable design elements should be explained to the visitor. Energy use can be interpreted. Habitat damage and creation as a result of development should be defined and interpreted. Artists can be used to reinterpret and present what might otherwise not be interesting so that a fresh understanding of these places can be gained through the combination of the pragmatic with the poetic.

### Relationship Between Program Elements and their Enclosure

Determine whether the building should have an inward or an outward focus. Determine whether there should be separation or connection between building elements

### **Sustainable Design Practices**

Many clues can be taken from homestead siting and design. Windbreaks provided shelter from wind, snow and sun. Aspect could take advantage of passive solar gain. Proximity to water provided access for irrigation and domestic water needs. Wastewater can be used, through its treatment, to create wetlands and thus habitat.

New buildings can also take advantage of many of these natural amenities. Building materials should be chosen with these criteria in mind:

- Low embodied energy
- Recycled and recyclable components
- Non-toxic components
- Local origin
- Energy efficient electrical/mechanical systems i.e., heating, lighting, plumbing
- Maintenance considerations

