

4 Alternatives



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Rolling grasslands overlook Mud Lake.

A challenge for natural resource managers is to find ways to address the sometimes-conflicting goals for various aspects and levels of resource management and protection. For Arrowwood NWR, it is of paramount importance to provide diverse grassland types that emulate the natural variation of the Prairie Pothole Region. This will ultimately benefit trust resources including waterfowl, grassland birds, and songbirds.

Each alternative in this EA has been designed to meet the purposes and goals of the refuge through a unique set of objectives, levels of management, and timeframes. Three alternatives for management of the refuge form options for addressing the ecosystem and resource needs and the public use.

The no-action alternative (alternative 1) portrays current management. Alternative 2 would provide enhanced management with an emphasis on grasslands. The Service's proposed action (alternative 3) describes the draft CCP for the refuge. The proposed action includes not only enhanced management, but also a plan to improve water quality entering the refuge and reduce peak flows in the upper James River watershed during spring runoff and summer rainfall events.

This chapter includes the following sections:

- alternatives considered but eliminated from detailed study
- summary of alternatives
- description of alternatives
- staff and funding to carry out alternatives
- monitoring

ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

The planning team considered other alternatives for management of the refuge, but eliminated them from detailed study. One such alternative was to focus all management efforts on water levels and the wetland units and to minimize or eliminate management activities on the uplands. This alternative would not meet refuge goals for migratory birds, other wildlife, recreation, or interpretation. Without active management on the uplands, invasive plant species would spread unchecked and continue to degrade the remaining tracts of native prairie. Seeded, native plant and DNC tracts would also degrade and not provide optimal habitat for waterfowl or other grassland-nesting birds. There would be no interpretative efforts for the public. The auto tour route, nature trail, Warbler Woodland Watchable Wildlife Area, and observation decks would not be maintained and would be closed to the public. Deer hunting and wildlife viewing from the state highway and county roads would be the only recreation available.

The removal of the Jamestown Dam and Jamestown Reservoir was another alternative that was considered. This alternative was dropped from further consideration (1) due to the social, political, and economical ramifications, and (2) because Reclamation has constructed a bypass channel at the refuge and has lowered the operating level of Jamestown Reservoir by 1.8 feet. The bypass channel along with the lower reservoir levels allow the refuge to manage water levels in each pool independent of each other and independent of the river flow. The increased capability to manage water levels mitigates the past, present, and future impacts of the reservoir at the refuge.

SUMMARY OF THE ALTERNATIVES

Table 3 provides descriptions of management actions by resource and use topics for each of the three alternatives.

Table 3. Summary of the management alternatives for Arrowwood NWR, North Dakota.

ALTERNATIVE 1 Current Management (<i>No Action</i>)	ALTERNATIVE 2 Enhanced Management	ALTERNATIVE 3 Enhanced Refuge and Watershed Management (<i>Proposed Action</i>)
<i>Water Resources</i>		
Manage water as outlined in the long-range water management plan, with the capability to independently manage water levels in each impoundment.	<i>Same as alternative 1.</i>	<i>Same as alternative 1, plus:</i> Improve water quality entering the refuge, and reduce peak flows in the upper James River watershed during spring runoff and summer rainfall events.
<i>Habitat—Native Grassland</i>		
Protect native prairie. Manage with fire and grazing to increase the species diversity of the flora and fauna.	<i>Same as alternative 1.</i>	<i>Same as alternative 1.</i>
<i>Habitat—Tame Grassland</i>		
Apply management that encourages nesting by waterfowl and upland-nesting birds.	Manage uplands to maximize the production of waterfowl and other grassland-nesting species.	<i>Same as alternative 2.</i>
<i>Habitat—Woodland and Shelterbelts</i>		
Passively manage the woodlands.	Remove selected shelterbelts and tree stands. Reduce protection from fire.	<i>Same as alternative 2.</i>
<i>Habitat—Wetland</i>		
Manage to provide abundant aquatic foods for migrating waterfowl.	Manage to provide habitat conditions for migrating waterfowl, migrating shorebirds, and nesting waterbirds.	<i>Same as alternative 2.</i>
<i>Habitat—Invasive Plants</i>		
Apply management practices that follow the IPM Plan (USFWS 2005).	<i>Same as alternative 1.</i>	<i>Same as alternative 1.</i>
<i>Habitat—Cropland</i>		
Phase out croplands unless needed to rehabilitate DNC or other grass plantings.	<i>Same as alternative 1.</i>	<i>Same as alternative 1.</i>

Table 3. Summary of the management alternatives for Arrowwood NWR, North Dakota.

ALTERNATIVE 1 Current Management (<i>No Action</i>)	ALTERNATIVE 2 Enhanced Management	ALTERNATIVE 3 Enhanced Refuge and Watershed Management (<i>Proposed Action</i>)
Wildlife—Threatened and Endangered Wildlife		
Monitor. Consult Ecological Services. Manage Jim Lake for piping plovers during drought years.	<i>Same as alternative 1.</i>	<i>Same as alternative 1.</i>
Wildlife—Predator Management		
Apply management activities through local cooperators in accordance with the predator management plan.	<i>Same as alternative 1.</i>	<i>Same as alternative 1.</i>
Cultural Resources		
Protect known and newly discovered cultural resources.	Expand cultural resource interpretation where compatible and as funding opportunities allow.	<i>Same as alternative 2.</i>
Visitor Services—Hunting		
Manage the hunting program to manage wildlife and provide compatible, priority, wildlife-dependent public use.	Expand upland hunting where compatible and as opportunities allow. Modify refuge-specific regulations where appropriate to enhance the quality of the refuge hunting experience.	<i>Same as alternative 2.</i>
Visitor Services—Fishing		
Manage the fishing program to provide compatible, priority, wildlife-dependent public use. Allow no expansion.	<i>Same as alternative 1, plus:</i> Clarify and modify the regulations about access to fishing opportunities to minimize or eliminate the potential for conflict with other refuge users. Produce new refuge “tear sheets” and informational brochures.	<i>Same as alternative 2.</i>
Visitor Services—Wildlife Observation, Wildlife Photography, Interpretation, and Environmental Education		
Carry out and support the OWLS program. Allow use of the auto tour route to support priority wildlife-dependent use.	<i>Same as alternative 1, plus:</i> Expand wildlife observation and wildlife photography opportunities, and environmental education where compatible and as funding and staffing allow. Actions may include enhancement of the OWLS with interpretive signs or a brochure, development of field study kits for visitors, and construction of an environmental education pavilion in the Warbler Woodland Watchable Wildlife Area.	<i>Same as alternative 2.</i>

Table 3. Summary of the management alternatives for Arrowwood NWR, North Dakota.

ALTERNATIVE 1 Current Management (<i>No Action</i>)	ALTERNATIVE 2 Enhanced Management	ALTERNATIVE 3 Enhanced Refuge and Watershed Management (<i>Proposed Action</i>)
<i>Visitor Services—Public Access</i>		
Provide limited public use opportunities when compatible.	Enhance compatible public access when staffing, funding, and volunteer opportunities occur. Clarify public access opportunities with modified refuge “tear sheets” and informational brochures.	<i>Same as alternative 2.</i>
<i>Partnerships and Other Public Outreach</i>		
Foster existing partnerships.	<i>Same as alternative 1, plus:</i> Develop new partnerships.	<i>Same as alternative 1, plus:</i> Seek new and innovative partnerships to improve the upper James River watershed.

DESCRIPTION OF THE ALTERNATIVES

This section further describes the three management alternatives. Management actions for each alternative are described for water resources, habitat and wildlife, visitor services, and operations. Alternative 3 is the Service’s proposed action and is the basis for the draft CCP (chapter 6).

The following actions relating to the bypass channel apply to all alternatives. The bypass channel and other infrastructure constructed by Reclamation to mitigate the impacts of the Jamestown Reservoir would allow management of refuge water levels in all but the most extreme high water years. Refuge managers would be able to use the bypass channel to move large volumes of water downstream, bypassing all refuge wetlands except Arrowwood Lake. Since water passing through the refuge in the bypass channel would not be filtered through the remaining shallow refuge wetlands, sediment and contaminants gained in the upper watershed would have a greater chance of entering Jamestown Reservoir.

Alternative 1—Current Management (*No Action*)

The no-action alternative would continue the management of habitat, wildlife, programs, and facilities at current levels. Active management would continue as time, staff, and funds allow; in some cases, management would be reactionary to conditions as they present themselves. Interpretation, education, administration, and

facilities would be maintained as is, with minor increases or decreases based on time, funding, and staffing.

Water Resources

Wetland management includes water level manipulations and mechanical treatments of dry pools. Water management would continue as outlined in the wetland management component of the step-down HMP, which would incorporate the improved water control features of the Arrowwood NWR mitigation project. Water elevations would be adjusted to provide quality habitat for migrating and resting waterfowl. The focus on waterfowl would also benefit shorebirds and other waterbirds. Pools would be filled per the water management plan, based on the amount of annual runoff (low, medium, high, and flood). Pools would be drawn down as allowed by downstream conditions to provide pair, brood, and resting habitat. This would also encourage seed-producing vegetation that provides a food source during migration and a substrate for spring production of invertebrates.

Management of the water impoundments would be aimed at providing abundant aquatic foods (mostly sago pondweed), exposed shoreline, and feathered marsh edge for tundra swan, geese, mallard, scaup, and northern pintail. The aquatic foods that have the potential to grow in abundance are sago pondweed, arrowhead plant, smartweed, and wild millet. Production of these aquatic plants generates production of aquatic invertebrates (an important food source for waterfowl).

The attractiveness of these habitats would be further enhanced through timely management of exposed shorelines and by seasonally flooding the

shoreline to produce a vegetated marsh edge. Timely water level manipulation can change the proportion of each of these habitats during different seasons.

Another key to management of refuge impoundments is timing of food production based on the biological need of the birds. There are two critical periods at the refuge when waterfowl energy demands are high—the brood-rearing period (June–August) and the fall migration period (October–November).

Wetland management on the larger pools would be mostly reactionary and has been essentially nonexistent for the past 10 years (1993–2003) due to flooding and construction. The Arrowwood NWR mitigation project would allow independent management of each impoundment. Water management would follow the guidelines in the wetland management component of the step-down HMP, which is currently being developed. No management would occur on naturally occurring wetlands located in upland areas except for protection. These wetlands are expected to maintain their natural productivity as they fluctuate in normal wet and dry cycles.

Habitat and Wildlife

Management of upland habitats would continue at current levels to encourage nesting by waterfowl and upland-nesting birds. Tools include mechanical manipulations, grazing, chemical applications, rest, and fire. Invasive plant control would continue at current or lower levels, but would not be expanded. Prescribed fire would be used on established burn units, with minimal monitoring to gauge success or failure. Grazing would probably be reduced as local animals and cooperators become scarce; however, grazing would be the “tool of choice” when good opportunities arose.

The Service has a longstanding policy prohibiting the conversion of native grasslands or unbroken sod to other upland types or conditions such as cropland or “improved” DNC. Native grasslands disturbed as a result of construction or other management actions would be restored using native species. Tools currently used are fire, grazing, mowing, haying, and rest. Monitoring would be limited to current systems to assess the effects of fire, grazing, and rest. Restoration efforts would occur for invasive plant control on currently identified conversion areas.

The estimated 785 acres of woodlands consist of naturally occurring wooded draws along lakeshores, wooded ravines, and shelterbelts. Select woodland tracts would be protected from prescribed fire. No management, surveys, or monitoring would be conducted.

The purpose of cropland management would be to reestablish quality nesting cover and provide

additional winter food and cover. Purposes and objectives of cropland management are listed below:

- Reestablish cover while maintaining refuge soils.
- Break the invasive plant cycle and prepare fields for planting of DNC or native grasses.
- Demonstrate that profitable farming can be accomplished using environmentally sound practices.
- Provide a source of winter feed for wildlife to reduce private landowner depredation complaints.

Invasive plant control efforts would continue as time and funding allow. Herbicides would be judiciously applied to invasive plant infestations and used as field preparation for grass or DNC plantings. Biological control is the preferred method of control; this program continues to expand as insectaries (places for breeding insects) become more productive and insects are moved to more sites within the refuge boundary.

Threatened and endangered species that occur at the refuge include the whooping crane (endangered species) and the bald eagle and piping plover, both listed as threatened species. The eagle and the crane are present during migration periods. Sightings of these species would be noted but no special efforts would be dedicated to inventory or monitoring. However, no actions would be undertaken that would negatively affect these species.

The piping plover has been recorded as nesting at the refuge during years of low water, which exposed the gravel islands and shoreline habitat the bird prefers for nesting. Because of a history of piping plover use, the refuge has designated critical habitat for piping plovers. Piping plovers are not expected to nest regularly at the refuge. However, in years of severe drought when habitat is limited across the state, Jim Lake would be managed to provide access to the gravel islands, shoreline, and gravel side slopes of the dike along the eastern edge of the lake. The refuge would continue to participate in the “International Piping plover Breeding Census” conducted every 5 years.



A marsh drawdown on Jim Lake encourages the growth of wetland plants.

The primary nest predator species targeted under the predator management plan are striped skunk, raccoon, and red fox. Local cooperators in accordance with the plan would conduct predator management activities. Additional control would be conducted within the predator enclosure by refuge staff. The refuge hosts a small, stable population of coyotes. No coyote control would be anticipated or conducted by refuge personnel or trappers. However, the North Dakota Department of Agriculture's Wildlife Services Program responds to landowner complaints in the area. The presence of coyotes appears to preclude the colonization of the refuge by the red fox, a much more effective predator of ground-nesting birds. In addition, nuisance animals such as beaver and muskrat would be removed to prevent damage to dikes and water control structures. This action is normally completed by recreational trappers or opportunistically by staff.



Red Fox

Vernon Burns/USFWS



Raccoon

Dave Menke/USFWS

Visitor Services

Public use and recreation programs would continue to be conducted essentially on a request basis.

Hunting programs would be provided for deer, upland game (late season), fox, and rabbit. Refuge managers would accommodate hunters with special access needs through special use permits.

The fishing program would be allowed under current regulations. Anglers would have access when the fishery was available. The fishing access is primarily at road crossings, where people can fish from the bank. Most fishing has been directed at northern pike. Fishing use has increased in flood years as the upstream movement of game fish from the reservoir has increased.

Refuge fisheries would be temporary and sporadic in nature as winterkill of fish would be common during severe winters with low water levels. Fish confined in refuge impoundments under the ice would die due to lack of sufficient oxygen. Another major factor limiting the fisheries would be the electric fish barrier located between the Jamestown Reservoir and the refuge. The electric barrier installed as part of the Arrowwood mitigation project would prevent carp from moving into the refuge and degrading water quality and habitat for migratory birds. However, in flood years when the Jamestown Reservoir elevation surpasses 1,442 feet mean sea level, water would overtop the electric barrier and both sport and rough fish could move into the refuge. The refuge would issue a special use permit to commercial fishing contractors to net carp and remove them from the river. This would also benefit the fishery in Jamestown Reservoir. The refuge would work closely with NDGF to coordinate the removal.

Boats could be used for fishing. The boating season is from May 1 through September 30. All refuge waters would be open to nonmotorized boating and canoeing. Nonmotorized boats and canoes are estimated at up to 100 visits per season. Boats with motors less than 25 horsepower could be used on Arrowwood and Jim lakes. The current level of boating is low and the use of motorized boats is rare.

Wildlife observation and wildlife photography would be permitted. The nature trail would receive minimal maintenance, as would the OWLS at the Kensal Public School. The auto tour route would remain open and receive maintenance as time and funding allow. No new interpretive signs, exhibits, or viewing opportunities would be developed.

Environmental education and outreach would continue on an as-requested basis with no new efforts initiated. Every effort would be made to maintain existing partnerships; however, new partnerships would only be undertaken if they resulted in a net gain of staff time or funding.

The following additional activities would continue at the present low levels: ice fishing (appendix L); biking (appendix N); gathering of wild foods such as berries, mushrooms, and asparagus (appendix P); recreational trapping (appendix Q); and horseback riding (appendix R).



Great Egret

Lee Karney/USFWS

Alternative 2—Enhanced Management

This alternative would maximize the biological potential of wetland and upland habitats at the refuge, to support a well-balanced and diverse flora and fauna representative of the Prairie Pothole Region. A scientific-based monitoring program would be developed and incorporated in the HMP. Monitoring would measure the habitat and wildlife population response to management activities. Public use opportunities would be expanded with the construction of additional facilities and development of educational programs. Public use regulations would be clarified and modified where appropriate to enhance the quality and quantity of wildlife-dependent recreational opportunities.

Water Resources

Wetland habitats would be managed to provide habitat conditions for migrating waterfowl, migrating shorebirds, and nesting waterbirds. Properly timed water level manipulations would result in the development of various wetland habitats: (1) deepwater, emergent vegetation habitat for black terns, Franklin's gulls, and heron and egret nesting habitat; (2) shallow water with emergent vegetation for pied-billed grebes and rails; (3) open water and submergent vegetation for eared grebes; and (4) annual plants for feeding waterfowl. Acres and location would vary from year to year. A monitoring plan would be developed and carried out to monitor the water manipulations, timing, habitat characteristics and response from the birds. The current long-range water management plan would be rewritten to reflect the habitat benefits to the colonial or overwater-nesting species.

Habitat and Wildlife

Upland habitats would be managed to maximize production of waterfowl and other grassland-nesting species. Areas of tame grass or DNC close to water would be managed primarily for tall DNC for waterfowl. Sharp-tailed grouse, other grassland birds, and small mammals would also benefit from

this habitat type. Areas of native prairie would primarily be managed for ecological integrity, but would also provide important habitat conditions for upland-nesting birds, especially the grassland-endemic songbirds. The Grasshopper Hills area, which is probably the largest contiguous tract of native prairie, would be a priority tract for management.

Upland habitats would be managed with grazing, prescribed fire, mechanical manipulations, chemical applications, biological control, and rest. The treatment applications would vary from year to year and would be applied as habitat objectives dictate. A monitoring plan would be developed and carried out to monitor the habitat characteristics and wildlife population response to management activities.

To reduce the impacts of woody vegetation on grassland-dependent birds, selected sites would be targeted for tree removal; grasslands invaded by trees in areas with populations of priority species would be targeted. Priority would be given to sites with planted tree rows (shelterbelts) within 164 feet of grassland patches greater than 247 acres, and to plantings of single rows and dilapidated stands of trees.



Early morning fog rolls over Arrowwood's uplands.

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Cropping would be used to prepare fields for planting of DNC or native grasses.

Invasive plant control would be carried out as outlined in the IPM Plan (USFWS 2005).

Predator management would remain at the current level unless population monitoring results dictate otherwise.

Visitor Services

Public use would be enhanced with the improvement and expansion of wildlife-dependent recreation. The draft compatibility determinations in appendixes K–R detail the public use programs.

Opportunities to increase hunting and fishing would be reviewed and facilities constructed as funding became available. Due to recent changes made by the state regarding the early Canada goose season and resident-only waterfowl season, the periods for which the refuge is accessible to boats and canoes would be shortened to minimize disturbance and allow waterfowl to use the refuge as a rest area.

Refuge-specific regulations regarding access into the refuge for wildlife observation, wildlife photography, and other wildlife-dependent recreational activities would be clarified and, where appropriate, modified to eliminate or minimize potential conflicts between refuge user groups. For example, biking on vehicle trails would cease when archery deer season begins, and walk-in access for wildlife observation and wildlife photography would not be recommended during the deer gun and muzzleloader seasons.



Eastern Bluebird

Dave Menke/USFWS

Environmental education programs would be developed for presentation on and off the refuge. Additional staff would seek out opportunities to share the story of the Refuge System and educate the public about the refuge's natural resources.

Additional wildlife-viewing opportunities

would be explored with the possible development of additional trails, overlooks, and improved interpretive and directional signs. The office entrance would be remodeled to accommodate a small visitor contact area. Outdated and extraneous signs would be removed to enhance the aesthetic beauty of the refuge. The access road to the Warbler Woodland Watchable Wildlife Area would be upgraded, along with the directional signs to the trailhead and interpretive signs on the trail. A covered pavilion at the Warbler Woodland Watchable Wildlife Area is planned to accommodate workshops, group presentations, and environmental education. The refuge would maintain at least one portable observation blind on an active sharp-tailed grouse lek and seek a suitable site for a permanent blind.

Alternative 3—Enhanced Refuge and Watershed Management (*Proposed Action*)

The management of habitat and wildlife, visitor services, and operations would be the same as described for alternative 2. The draft compatibility determinations in appendixes K–R detail the public use programs. Alternative 3's water resource actions are described below.



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Sunrise at the Refuge

Water Resources

In addition to the water resource actions described in alternative 2, this alternative includes a plan to improve water quality entering the refuge and reduce peak flows in the upper James River watershed during spring runoff and summer rainfall events.

In addition to wildlife benefits, the water quality and flood prevention benefits of protecting small streams and wetlands are well documented. Small streams and wetlands provide natural flood control, maintain surface water and groundwater supplies, trap sediment, filter and process natural nutrients and pollutants, and sustain natural biological diversity. Agricultural and other land use changes near small streams and wetlands can impair the natural functions on headwater systems. Removal of natural vegetation, hardening of soil surfaces, removal or straightening of stream channels, and draining of small wetlands greatly reduces the amount of rainfall and snowmelt the watershed can absorb before it floods. This increase in water volume scours stream channels, which promotes additional flooding. The altered channels and lack of wetlands significantly reduce groundwater recharge, sediment retention, and recycling of nutrients. Downstream lakes and rivers have poorer water quality, greater fluctuations in flow, and less diverse aquatic life. Algal blooms and fish kills become more common and recreational uses are adversely affected.

As stated in the UWA (described in chapter 3 under "Water Quality"), the upper James River watershed (including portions of Stutsman, Foster, and Eddy counties) encompasses 1,773 square miles with 70% in cropland. Targeting cropland in key areas and converting it to permanent cover would reduce sedimentation and improve water quality. Restoring wetlands in these key areas would trap sediment, slow runoff, and reduce peak flows entering the refuge, resulting in increased groundwater recharge. Based on interpretation of the National Wetland Inventory maps, more than 7,000 acres of wetlands have been drained in Eddy and Foster counties.

The water quality and water retention capabilities of the upper James River watershed could be improved and the refuge's wetland objectives could be achieved through cooperative efforts. This would include working through existing programs, as well as with the Service's Private Lands Program, the NRCS, county soil conservation districts, water boards, the EPA, Reclamation, and private landowners.

Habitat and Wildlife

Same as alternative 2.

Visitor Services

Same as alternative 2.

STAFFING AND FUNDING TO CARRY OUT THE ALTERNATIVES

Current staffing consists of 10 permanent, full-time employees (table 4). This current staff, plus any additional staff, as shown in table 4 would be required to carry out all aspects of each alternative.

Table 4. Current and additional staff required to carry out the management alternatives for Arrowwood NWR, North Dakota.

ALTERNATIVE 1 Current Management (<i>No Action</i>)	ALTERNATIVE 2 Enhanced Management	ALTERNATIVE 3 Enhanced Refuge and Watershed Management (<i>Proposed Action</i>)
Management Staff		
Project leader GS ¹ -14*	Project leader GS-14*	Project leader GS-14*
Deputy project leader GS-13*	Deputy project leader GS-13*	Deputy project leader GS-13*
Refuge operations specialist GS-7/9/11*	Refuge operations specialist GS-7/9/11*	Refuge operations specialist GS-7/9/11*
	Refuge operations specialist GS-9	Refuge operations specialist GS-9
Biology Staff		
Wildlife biologist GS-9/11*	Wildlife biologist GS-9/11*	Wildlife biologist GS-9/11*
	Biological technician GS-7	Biological technician GS-7
	Biological technician GS-5/6/7	Fish and wildlife biologist GS-5/7/9/11
		Biological technician GS-5/6/7
Visitor Services Staff		
Outdoor recreation planner (assigned to Long Lake NWR) GS-9	Outdoor recreation planner GS-9	Outdoor recreation planner GS-9
	Park ranger GS-7/9	Park ranger GS-7/9
Administrative Staff		
Administrative officer GS-9*	Administrative officer GS-9*	Administrative officer GS-9*
Clerk (office assistant) GS-5*	Clerk (office assistant) GS-5*	Clerk (office assistant) GS-5*

Table 4. Current and additional staff required to carry out the management alternatives for Arrowwood NWR, North Dakota.

ALTERNATIVE 1 Current Management (<i>No Action</i>)	ALTERNATIVE 2 Enhanced Management	ALTERNATIVE 3 Enhanced Refuge and Watershed Management (<i>Proposed Action</i>)
Maintenance Staff		
Engineering equipment operator WG ² -10	Engineering equipment operator WG-10	Engineering equipment operator WG-10
Tractor operator (term ³) WG-6	Tractor operator (term) WG-6	Tractor operator (term) WG-6
	Maintenance worker WG-7/8	Maintenance worker WG-7/8
	Maintenance worker WG-6	Maintenance worker WG-6
Fire Staff		
Fire management officer GS-11*	Fire management officer GS-11*	Fire management officer GS-11*
Fire technician GS-6/7*	Fire technician GS-6/7*	Fire technician GS-6/7*
	Range technician (career-seasonal ⁴) GS-5/6	Range technician (career-seasonal) GS-5/6
Total Cost of Staff Salaries and Benefits		
\$752,993	\$1,029,800	\$1,099,400

¹GS=General pay schedule

²WG=Wage grade pay schedule

³term=temporary time-limited position

⁴career-seasonal=permanent seasonal position

*Staff with responsibilities for the entire Arrowwood NWR Complex

Base operational funding for fiscal year 2004 is \$1,079,900. With additional funds for annual maintenance, deferred maintenance, small equipment, and the fire program, the total is \$1,527,200. This base budget represents the minimum required to maintain existing programs (alternative 1). However, this budget level would not adequately support proposed (alternative 3) habitat management, biological monitoring, public use and education programs, and maintenance of all facilities and structures.

Additional funding to carry out the CCP may be made available through Refuge System funding and the Service Asset Maintenance Management System (SAMMS). The SAMMS is a database that records maintenance and replacement needs for real property. Cost estimates will be developed for projects needed to carry out the final CCP, and then entered into the SAMMS.

MONITORING

Monitoring is essential not only to ensure that approved CCP goals and objectives have been met, but also to assess whether those goals and objectives have achieved the desired effects.

Plan Monitoring

Implementation of the CCP would be monitored throughout its 15-year effective period (2007 through 2022). The supervisor of the project leader for Arrowwood NWR would annually monitor accomplishment of objectives in the CCP. Monitoring of accomplishments would be critical to carrying out the CCP.

It is reasonable to believe that substantial changes could occur within the Service during the next 15

years. The CCP objectives would be examined at least every 5 years to determine if revisions are necessary and to allow the addition or deletion of objectives.

Habitat and Wildlife Monitoring

Habitat management on refuges is an ongoing process, and the Service recommends that planning be conducted within the context of adaptive resource management (USFWS 1995, 1996).

Monitoring is essential to successful implementation of the CCP. Periodic review of the CCP would be required to ensure that established goals and objectives are being met and strategies are being carried out. Many of the objectives have associated monitoring strategies; others remain to be developed. A HMP and wildlife-monitoring plan would be developed with the specific details on monitoring techniques, frequency, and locations.



Big Bluestem

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Donna Dewhurst/USFWS

Redhead

An adaptive resource management approach to monitoring would be used. Adaptive resource management is a flexible management framework in which the success of management strategies can be evaluated. Management techniques for habitat, wildlife, and public use would be periodically evaluated; results would be used to modify or adapt the techniques or objectives to better achieve refuge goals.

Effects of management strategies on habitats and wildlife populations would be evaluated to assess whether the desired effects have been achieved. Baseline surveys would be conducted for wildlife species for which existing data is lacking or not well documented. Monitoring protocols would be developed—cooperatively with the wildlife researchers within the USGS and universities, and with other professionals—to ensure proper data collections and analysis. A habitat-monitoring plan would be written; a wildlife inventory plan would be updated following completion of the CCP.

Habitat and wildlife-related research would be encouraged. Refuge staff would pursue research opportunities related to the refuge's habitat management goals, species of concern, monitoring techniques, and data analysis. All studies would be applicable and compatible with refuge objectives.

Monitoring for wildlife diseases would be limited primarily to the detection of avian botulism outbreaks in waterfowl in the wetlands. New diseases that are causing some concern and that may affect refuge wildlife include the West Nile virus, avian chlamydiosis, avian influenza, and chronic wasting disease.

5 Environmental Consequences

The environmental consequences discussed in this chapter are the potential effects on a resource as a result of carrying out the actions of an alternative. For a better understanding of why these effects may occur, refer to the descriptions of resource conditions and interactions in chapter 3 (affected environment).

This chapter includes the following sections:

- effects common to all alternatives
- description of consequences by alternative
- cumulative impacts
- summary of the effects

EFFECTS COMMON TO ALL ALTERNATIVES

The U.S. Department of the Interior and its representatives are charged with managing archeological and historic sites found on federal land. Prior to all habitat and facility maintenance activities, appropriate efforts would be made to identify known and unknown cultural resources within the area of potential impact. Avoidance of cultural resources would be the preferred treatment. Mitigation of any impacts would be undertaken if impacts could not be avoided. The Service's regional cultural resources manager would be consulted during the planning phase of any proposed activity. The regional cultural resources manager would take the necessary steps to coordinate with the North Dakota State Historic Preservation Officer if needed.

DESCRIPTION OF CONSEQUENCES BY ALTERNATIVE

This section describes the potential consequences of each alternative's actions on water resources, habitat and wildlife, and visitor services.

Alternative 1—Current Management (No Action)

The anticipated effects of carrying out alternative 1 are described below.

Water Resources

Water management would continue as outlined in the wetland management component of the step-



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The blanketflower is a native prairie plant.

down HMP to be developed. The focus would be to provide quality habitat for migrating and nesting waterfowl, migrating shorebirds, and nesting waterbirds. Migratory birds would benefit through water level controls that encourage (1) seed-producing vegetation during migration and (2) mud flats for invertebrates. In addition, moist soil management would provide nesting habitats for other wetland species.

Habitat and Wildlife

Alternative 1 would maintain the current habitat management program at approximately the same intensity. Management practices would remain the same for uplands—management to encourage nesting by waterfowl and upland-nesting birds. Priority on waterfowl production would benefit waterfowl, but would not provide optimal habitat for migrating shorebirds and other grassland-nesting species. Grassland-dependent bird species would remain at current levels or decline since habitat blocks of contiguous grassland without trees would remain on the landscape.

Woodland-dependent species would remain at current levels because there would not be an expanded program to reduce trees and shrubs.

Through implementation of the IPM Plan (USFWS 2005), control of invasive plants would continue to reduce the acres affected and decrease the rate of expansion.

Native plant species would recover and habitat conditions for upland-nesting migratory birds would improve.

Visitor Services

Public use would continue at the present level, with current management strategies. The refuge would provide quality, universally accessible, recreational opportunities for visitors of all ages and abilities. The draft compatibility determinations in appendixes K–R provide details about these public use programs.

Hunting

Hunting deer, upland game birds, fox, and cottontail would be permitted. Other species could not be hunted. The majority of current and potential hunters would find sufficient opportunities for quality hunts. Hunters seeking opportunities to hunt waterfowl would not be able to hunt on the refuge, but this hunting demand would be met on state and private lands in the area.

Fishing

The refuge fishery is temporary and sporadic in nature and there would be no expansion. Most anglers seeking fishing opportunities are aware of the cyclic nature of the refuge fishery. There are abundant fishing opportunities available on other federal, state, and private waters in the area to satisfy local demands.

Wildlife Observation, Wildlife Photography, Interpretation, and Environmental Education

Current on- and off-refuge opportunities for wildlife viewing, interpretation, and education would be retained. Most current and potential refuge visitors would find satisfactory opportunities for quality wildlife viewing and wildlife photography. Interpretative and environmental education facilities and programs would meet most visitors' expectations.

Other Recreational Opportunities

Refuge visitors would be allowed to collect berries, mushrooms, and asparagus for their own personal use. Recreational trapping would be allowed under special use permit, as would horseback riding.

Alternative 2—Enhanced Management

The anticipated effects of carrying out alternative 2 are described below.

Water Resources

Same as alternative 1.

Habitat and Wildlife

Alternative 2 would be similar to the current habitat management program, but at an increased intensity. Management treatments would increase on upland nesting habitat and would benefit many more upland-nesting species including some of the

nationally declining, grassland-dependent species. Wetlands would be managed to encourage nesting by waterfowl and other wetland-nesting birds. Management of wetlands would focus on waterfowl production, migrating waterfowl, migrating shorebirds, and overwater-nesting species. Nonnative trees and select, planted tree rows (shelterbelts) would be removed, improving nesting success of grassland-nesting birds because of the increased contiguous habitat blocks, less fragmentation, and reduced predator perches.



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Arrowwood Lake

Woodland-dependent species would decrease because there would be an expanded program to reduce trees and shrubs.

Control of invasive plants would decrease the rate of expansion due to enhanced management on greater acreages and monitoring of management actions. Upland habitats would slowly recover to a more native plant species composition as invasive species were controlled. Habitat conditions would improve for many upland-nesting wildlife species, which would increase nesting success.

Visitor Services

Alternative 2 calls for increased management strategies for public use. The refuge would provide quality, universally accessible, wildlife-dependent recreational opportunities for visitor of all ages and abilities. The draft compatibility determinations in appendixes K–R provide details about these public use programs.

Hunting

Hunting deer, upland game birds, fox, and cottontail would continue to be allowed. Other species could not be hunted. Most current and potential hunters would find sufficient opportunities for quality hunts. Clarified regulations, along with limiting other recreational uses during the deer season, would improve the hunting experience for most refuge hunters. Hunters seeking opportunities to hunt waterfowl would not be able to hunt on the refuge,

but this hunting demand would continue to be met on state and private lands in the area.

The quality of the hunting experience would be enhanced through clarified and modified refuge-specific regulations. The risk of injury would be reduced and conflicts between user groups minimized by restricting other refuge uses during the archery, deer gun, and muzzleloader seasons.

Fishing

The refuge fishery is temporary and sporadic in nature; however, opportunities to expand the program would be reviewed. The visitor experience for fishing would be benefited if funding became available for facilities to accommodate users at different locations.

Angling experiences would be enhanced through clarified information about fishing access, as provided in revised “tear sheets” and brochures.

Hunted species would have a safe haven for resting when boating or canoeing ceases prior to the September waterfowl seasons, per revised refuge-specific regulations. Anglers would have a shorter season (than currently) for using boats.

Wildlife Observation, Wildlife Photography, Interpretation, and Environmental Education

Potential conflicts between refuge user groups would be minimized or eliminated based on increased user understanding of access for wildlife observation, wildlife photography, and other wildlife-dependent recreational activities, due to clarified refuge-specific regulations.

Environmental education programs would be developed for presentation on and off refuge. Additional workshops, presentations, and classroom opportunities would be available due to construction of suitable facilities. Wildlife-viewing opportunities would be increased with the development of additional trails and overlooks, and improved signs. The aesthetic beauty of the refuge’s natural areas would be enhanced through removal of unnecessary signs.



Carrington third graders participate in the dedication of the Mud Lake observation deck.

Other Recreational Opportunities

Same as alternative 1.

Alternative 3—Enhanced Refuge and Watershed Management (*Proposed Action*)

The anticipated effects of carrying out alternative 3 are described below.

Water Resources

Same as alternative 1 with the addition of improving the upper James River watershed. Improving the health of the upper James River watershed would improve water quality and reduce peak flows during high-water events. This would improve wetland habitat on the refuge and benefit Jamestown Reservoir and all downstream users.

Habitat and Wildlife

In addition to the benefits described for alternative 2, there would be an increase in wildlife habitat and habitat values due to the watershed management component of alternative 3. Working with private landowners the Service would strive to protect and restore wetlands and grasslands in the watershed. In addition, improved water quality and reduced flood flows would improve habitat for aquatic species and waterbirds throughout the James River watershed.

Visitor Services

Same as alternative 2. The draft compatibility determinations in appendixes K–R provide details about the public use programs.

CUMULATIVE IMPACTS

Cumulative impacts include the incremental effects of the actions for an alternative, when these are added to foreseeable actions of the past, present, and future. These cumulative impacts can be the result of individually minor impacts, which can become significant when added over time.

The NEPA requires mitigation measures when the environmental analysis process detects possible significant impacts to habitat, wildlife, or the human environment.

None of the activities proposed are expected nor intended to produce significant levels of environmental impacts that would require mitigation measures. Nevertheless, the final CCP would contain the following measures to preclude significant environmental impacts from occurring:

- Federally listed species would be protected from intentional or unintended impacts by having activities banned where these species occur.

- Hunting safety regulations would be closely coordinated with and enforced by personnel from the refuge and the NDGF.
- All proposed activities would be regulated to lessen potential impacts to wildlife and plant species, especially during the sensitive reproductive cycles.
- Monitoring protocols would be established to determine goal achievement levels and possible unforeseen impacts to resources, for application of adaptive resource management to ensure wildlife and habitat resources, as well as the human environment, are preserved.
- The CCP could be revised and amended after 5 years of implementation, for application of adaptive resource management to correct unforeseen impacts that occur during the first years of the plan.

SUMMARY OF THE EFFECTS

Table 5 summarizes the estimated effects—impacts and benefits—associated with carrying out each alternative.

Table 5. Comparison of impacts and benefits of management alternatives for Arrowwood NWR, North Dakota.

ALTERNATIVE 1 Current Management (<i>No Action</i>)	ALTERNATIVE 2 Enhanced Management	ALTERNATIVE 3 Enhanced Refuge and Watershed Management (<i>Proposed Action</i>)
Water Resources		
<p>Water quality and quantity entering the refuge would remain at current levels.</p> <p>Target elevations would be achieved 70% of the time.</p>	<p><i>Same as alternative 1.</i></p>	<p>Water quality would be improved and peak flows during high-water events would be reduced.</p> <p>Wetland habitats would be improved and target elevations should be met more often.</p> <p>Water quality leaving the refuge should be improved and benefit Jamestown Reservoir and all downstream users.</p>
Habitat and Wildlife—Upland		
<p>There would be nesting habitat for waterfowl, but there would not be optimal habitat for migrating shorebirds and other grassland-nesting species.</p>	<p>Waterfowl nesting habitat would improve as habitat conditions improve.</p> <p>Nesting success for grassland-nesting birds would improve because of the increased quality habitat and less fragmentation.</p>	<p><i>Same as alternative 2, plus:</i></p> <p>Grassland-dependent species would benefit from increased protection and restoration of off-refuge habitat.</p>
Habitat and Wildlife—Woodland and Shelterbelts		
<p>The gradual decrease in shelterbelts and other planted trees would slowly increase the block size of grassland habitats for grassland-nesting birds, reduce predators, and decrease the woodland species diversity in selected units.</p>	<p>Removal of nonnative trees and shelterbelts would immediately increase the block size of grassland habitats for grassland-nesting birds and reduce predators.</p> <p>Abundance of woodland species would decrease in selected units as the trees were removed.</p>	<p><i>Same as alternative 2.</i></p>

Table 5. Comparison of impacts and benefits of management alternatives for Arrowwood NWR, North Dakota.

ALTERNATIVE 1 Current Management (<i>No Action</i>)	ALTERNATIVE 2 Enhanced Management	ALTERNATIVE 3 Enhanced Refuge and Watershed Management (<i>Proposed Action</i>)
<i>Habitat and Wildlife—Wetland</i>		
There would be nesting habitat for waterfowl. There would be limited habitat for migrating shorebirds and limited nesting habitat for other waterbirds.	There would be nesting and migration habitat for waterfowl, shorebirds, and other waterbirds.	<i>Same as alternative 2, plus:</i> Water quality would be improved. Peak flows entering the refuge would be reduced. The wetlands and riparian habitat in the watershed would be restored and protected.
<i>Habitat and Wildlife—Invasive Plants</i>		
Invasive species should decrease. New infestations would be contained. Upland habitat conditions would slowly improve, which should result in increased nesting of grassland-dependent species.	Invasive species would be significantly reduced. Upland habitats would improve to a more native plant species composition as invasive species were controlled. Habitat conditions would improve for many upland-nesting wildlife species, which would increase the nesting success.	<i>Same as alternative 2.</i>
<i>Habitat and Wildlife—Waterfowl</i>		
Waterfowl breeding and migration numbers would remain constant.	Waterfowl breeding numbers would increase. Waterfowl migration numbers would increase in the fall due to additional undisturbed and “safe haven” habitat in September due to restricted boating.	<i>Same as alternative 2.</i>
<i>Habitat and Wildlife—Predator Management</i>		
Predator populations would fluctuate.	Predator populations would remain at acceptable levels.	<i>Same as alternative 2.</i>
<i>Habitat and Wildlife—Threatened and Endangered Wildlife</i>		
Management of Jim Lake for piping plovers during drought years would maintain or increase the piping plover numbers.	<i>Same as alternative 1.</i>	<i>Same as alternative 1.</i>
<i>Visitor Services—Hunting</i>		
Hunter numbers and satisfaction would remain relatively unchanged.	The quality of the hunting experience would be enhanced through clarification and revision of regulations. Hunters would find it easier to understand the regulations, and potential conflicts with other users would be reduced.	<i>Same as alternative 2.</i>

Table 5. Comparison of impacts and benefits of management alternatives for Arrowwood NWR, North Dakota.

ALTERNATIVE 1 Current Management (<i>No Action</i>)	ALTERNATIVE 2 Enhanced Management	ALTERNATIVE 3 Enhanced Refuge and Watershed Management (<i>Proposed Action</i>)
Visitor Services—Fishing		
Fishing opportunities would continue to be sporadic and anglers would find it difficult to understand the fishing regulations.	Fishing opportunities would be reduced in most years due to the electric fish barrier and lower target water elevations. In high-water years, the quality of the fishing experience would be enhanced through clarification or revision of the fishing access information.	<i>Same as alternative 2.</i>
Visitor Services—Wildlife Observation and Wildlife Photography		
Wildlife observation and wildlife photography opportunities would minimally meet the needs of the public.	Enhanced and expanded wildlife-viewing opportunities may cause additional disturbance to wildlife, especially waterfowl and shorebirds. Uses would be monitored and evaluated to minimize and mitigate any adverse effects. Conflicts with other refuge users would be minimized, as well as safety increased, due to the revised access regulations.	<i>Same as alternative 2.</i>
Visitor Services—Interpretation, Outreach, and Environmental Education		
Interpretation, outreach, and environmental education would minimally meet the public demand.	There would be greater public understanding and appreciation of the refuge resources and issues due to expanded interpretive, outreach, and educational programs.	<i>Same as alternative 2.</i>
Staffing		
With stable staffing levels, the habitat quality and wildlife response would remain constant. Habitat and wildlife populations would be minimally monitored to determine if the goals and objectives were being met. Public use would be provided through adequately staffed programs. Maintenance of facilities would remain constant, with improvements as funding allowed.	Maximum benefits to wildlife would be achieved through full staffing to carry out all management strategies. Habitat and wildlife populations would be effectively monitored to determine if the goals and objectives were being met. Increased public use and visitor satisfaction would be provided through adequately staffed programs. Maintenance of facilities would be enhanced, with improvements as funding allowed.	<i>Same as alternative 2.</i>

6 Implementation of the Proposed Action



Tim McCabe/USFWS

Mallards at Rest

The Service's proposed action (alternative 3) was identified after a determination that it does the following:

- best achieves the refuge's purposes, vision, and goals
- helps fulfill the Refuge System mission
- maintains and, where appropriate, restores the ecological integrity of the refuge and the Refuge System
- addresses the significant issues and mandates
- is consistent with principles of sound fish and wildlife management

The draft CCP described in this chapter presents the details of how the Service would carry out its proposed action (alternative 3) for management of Arrowwood NWR.

The implementation of the final CCP begins once the preferred management alternative has been selected and finalized, the CCP has been approved, and the Service has notified the public of its decision.

If alternative 3 were selected, the objectives and strategies presented in this chapter would be carried out over the next 15 years. The CCP would serve as the primary management document for the refuge until it is formally revised. The Service would carry out the final CCP with assistance from partner agencies, organizations, and the public.

The management direction in this chapter meets the purposes, vision, and goals of the refuge. Objectives and strategies to carry out the goals would provide for resource needs and public use.

- A goal is a descriptive, broad statement of desired future conditions that conveys a purpose, but does not define measurable units.
- An objective is a concise statement of what is to be achieved; how much is to be achieved; when and where it is to be achieved; who is responsible to achieve it.
- Rationale for each objective includes background information, assumptions, and technical details used to formulate the objective. The rationale

provides context to enhance comprehension and facilitate future evaluations.

- Strategies are way to achieve an objective.

NOTE: The overall guidance for use of prescribed fire and management of wildland fire is in the description of the fire management program (appendix E).

UPLAND GOAL

Provide a diversity of grassland types that emulate the range of natural variation characteristic of the Prairie Pothole Region to benefit trust resources including waterfowl, grassland birds, and songbirds.



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Sharp-tailed Grouse

NOTE: Arrowwood NWR contains about 11,340 acres of grassland, of which approximately 6,000 acres are native prairie. The potential natural vegetation of the area is cool-season, needlegrass-wheatgrass, mixed-grass prairie. Vegetation of the mixed-grass prairie is predominantly a mixture of western wheatgrass, needlegrasses, blue grama, little bluestem, and upland sedges. Interspersed within the grasses are numerous species of forbs and patches of shrubs comprised of western snowberry, Woods' rose, silverberry, or mixtures of these species (Kuchler 1964). Long-term management would be to provide pre-1870s vegetation composition and habitat characteristics of the grassland-dependent species currently exhibiting significant population declines. The remaining 5,340 acres are comprised of seeded natives, DNC, or other cool-season introduced grasses.

Upland Objective 1

Provide 4,000 acres of grasslands, on a 5-year average, in blocks of a minimum of 100 acres in size with less than 30% shrub cover and greater than 80% grass cover, located within 300 feet of brood water. Structural characteristics of these grasslands include

variable visual obstruction readings (VORs) greater than 4 inches and variable vegetation heights greater than 6 inches. This would primarily benefit nesting waterfowl such as mallard, gadwall, and blue-winged teal. In addition, these vegetation characteristics would provide the habitat needs for sharp-tailed grouse, dickcissel, sedge wren, and common yellowthroat.

Rationale

The location where this objective is met would change over time as burning, grazing, and mowing are used to manipulate the habitat. Structural characteristics such as litter, grass height, and density would be lowest the first one or two growing seasons following treatment and would increase each year after that. Since treatments would not be applied consistently over the entire landscape, this would result in a mosaic of vegetation structures.

Emphasis would be placed on DNC and other tame grass fields located within 300 feet of permanent and semipermanent water for nesting waterfowl. In addition to providing tall dense cover for nesting waterfowl, tame grass fields generally contain less than 10% shrub canopy. This is necessary for sedge wren habitat. Tracts of native prairie located within 300 feet of permanent water would also be managed to provide tall, dense cover. This tall dense cover also provides optimal habitat for nesting sharp-tailed grouse and common yellowthroat, as well as nesting waterfowl.

Strategies

a. DNC and other tame grass fields would periodically be treated using grazing, prescribed fire, haying, and mowing. Approximately 30% of the 4,000 acres would have periods of 3–5 years rest between treatments for undisturbed nesting habitat. Prescribed fire and grazing would be used to remove excessive litter that is suppressing growth of favorable species such as wheatgrasses and forbs in DNC and native grasses and forbs in native prairie. Burning and grazing would improve nutrient cycling and encourage new vegetation growth and seed production. Haying and mowing would be used primarily for invasive plant control and litter reduction. In native prairie, haying and mowing would be used to reduce or maintain shrub canopy.



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Unit G21, west Jim Lake, is treated with prescribed fire for brush reduction, litter removal, and grassland rejuvenation for ground-nesting wildlife.

b. Croplands would be eliminated except as a means of rejuvenating DNC and for invasive plant control. Existing cropland within areas designated primarily for waterfowl production management would be planted to a DNC mixture. Currently, approximately 130 acres of cropland are designated to be seeded to DNC. Reduction of cropland would provide larger contiguous grassland tracts. Some existing grassland tracts may need to be cultivated and reseeded or “interseeded” with various grass and forb species to increase the height and density of the cover and provide the necessary structural characteristics for the species of interest. Approximately 2,200 acres of tame grasses would need to be rejuvenated in the next 15 years.

c. Some fields of native prairie would require an aggressive, systematic use of prescribed fire, grazing, haying, and mowing to reduce the brush canopy cover under 30% for sedge wren, Savannah sparrow, grasshopper sparrow, Baird’s sparrow, bobolink and chestnut-collared longspur (Arnold and Higgins 1986, Bakker 2003). The common yellowthroat prefers tall dense cover, but with a higher brush composition of 30–60%. These thicker patches of brush are scattered throughout the fields and would continue to provide the habitat conditions necessary for breeding common yellowthroats.

d. Maintain the 38-acre predator enclosure to provide safe nesting habitat for waterfowl and other grassland-nesting species. The habitat within the fence would be maintained as DNC and periodically treated using prescribed fire or haying following the nesting season to maintain tall dense cover. The fence would be electrified from late March through July each year and the area trapped to ensure a predator-free nesting environment. The surrounding vegetation would be managed to minimize competing vegetation outside the fence and encourage nesting within the boundary of the fence. The fenced area would be monitored annually to determine the nesting success.

e. Invasive plant species such as leafy spurge, wormwood, and especially Canada thistle would continue to be controlled using an integrated approach. Control methods would include mechanical and chemical treatments, but priority would be given to current and emerging biological control methods. Research would be encouraged to investigate improved methods to control invasive plants and analyze the effect of grassland management treatments on invasive plants.

f. Selected planted tree rows (shelterbelts) would no longer be protected from prescribed fire. Decreasing the number of trees would reduce perching sights for predators such as red-tailed hawk and great horned owl. Tree removal would increase field size and eliminate the “hostile” habitat within select grassland tracts. The abandoned firebreaks around

the trees would be seeded to a vegetation mixture similar to the surrounding habitat.

g. Purchase of private inholdings to complete the legislated refuge boundary could provide an additional 3,200 acres of upland and wetland habitat that could be managed to provide the habitat required by many of the grassland-dependent species. The additional upland habitat could increase the field sizes and reduce the habitat fragmentation. In turn, this could increase the nesting success. Also, the addition of 260 acres of wetlands could increase the pair habitat to attract additional waterfowl pairs and other waterbirds.

Upland Objective 2

Provide 5,000 acres of grasslands, on a 5-year average, with less than 30% shrub cover and greater than 25% grass cover, in blocks of a minimum of 75 acres, but preferably greater than 150 acres. Structural characteristics include a variable VOR greater than 4 inches and a variable vegetation height from less than 6 inches to greater than 20 inches. This would benefit nesting grassland Neotropical migrants including Le Conte’s sparrow, clay-colored sparrow, Savannah sparrow, grasshopper sparrow, western meadowlark, and bobolink, in addition to other nesting species such as common snipe, willet, northern pintail, short-eared owl, and northern harrier. This grassland habitat would also support abundant small mammal populations that provide prey for numerous raptor species.



Bobolink

S. Maslowski/USFWS

Rationale

This objective would increase diversity of both flora and fauna and would be mainly applied to the native prairie areas, but also would apply to tame grass fields located away from permanent water. The emphasis would be to return the native prairie areas to conditions that existed prior to European settlement (pre-1870s), which provided the necessary habitat characteristics for many grassland-dependent species that are showing significant breeding

population declines today. This would include reducing brush and exotic, cool-season grasses such as smooth brome and Kentucky bluegrass; and increasing the composition of the native grasses and forbs.

Strategies

a. Brush would be reduced. Currently, approximately 40% of the native prairie acreage has a brush canopy cover greater than 50%. Woody vegetation within or bordering prairie fragments would be reduced because it attracts nest predators and consequently reduces nesting success (Johnson and Winter 1999). These fields would require an aggressive, systematic use of prescribed fire during mid-July to late August to reduce western snowberry stems and increase the composition of native grasses and forbs. Haying and mowing would be used on those areas not conducive to prescribed fire. An integrated approach would be carried out using fire; grazing; and mechanical, chemical, and biological control methods to maintain the brush canopy cover under 30% and encourage native species.

b. Native vegetation composition would be increased. Native prairie areas would be rejuvenated and enhanced using grazing, prescribed fire, haying, and mowing when the native grasses and forbs have less than 50% canopy cover. Prescribed burning and grazing would be carried out during different periods of vegetative growth or, in combination, to attain specific objectives: (1) to remove excessive litter suppressing favorable species such as native grasses and forbs; (2) to reduce the competition between the native and nonnative species; (3) to reduce exotic cool-season grasses when at the 3–5 leaf stage; (4) to increase the native forb composition; (5) to provide nutrient cycling; and (6) to encourage new vegetation growth and seed production. The presence of various native grasses and forbs would provide the structural characteristics required by most grassland nesting species and foraging habitat and habitat needs for various invertebrates such as butterflies and moths. Native prairie areas would be aggressively treated with multiple treatments to reduce brush and increase the native species composition of grasses and forbs.

c. Decrepit DNC stands would be rejuvenated and enhanced using grazing, prescribed fire, haying and mowing when the VORs and vegetation heights fall below 50% of the maximum values. Prescribed fire and grazing would be used to (1) remove excessive litter that is suppressing favorable species growth such as that of wheatgrasses and forbs in DNC, (2) to increase nutrient cycling, and (3) to encourage new vegetation growth and seed production. Haying and mowing would be used primarily in the tame grass fields for invasive plant control and litter reduction and in native prairie fields to reduce or maintain shrub canopy. Tame grass fields with very low

habitat value would require cropping for 2 or 3 years and reseeding with native grasses and forbs. As an alternative to farming, fields may be treated with a nonselective herbicide and then “no-till” seeded with native species.

d. The use of croplands would be eliminated except as a means of rejuvenating old DNC fields and for invasive plant control.



Leafy spurge, a noxious weed, infested this area of the refuge prior to release of flea beetles for biological control in 1995.

e. Invasive plant species such as leafy spurge, wormwood, and especially Canada thistle would continue to be controlled using an integrated approach. Control methods would include mechanical and chemical treatments, but priority would be given to current and emerging biological control methods. Research would be encouraged to investigate improved methods to control invasive plants and analyze the effect of grassland management treatments on invasive plants.

f. Selected planted tree rows (shelterbelts) would no longer be protected from prescribed fire. Decreasing the number of trees would reduce perching sights for predators such as red-tailed hawk and great horned owl. Tree removal would reduce habitat fragmentation and eliminate the “hostile” habitat within select grassland tracts. The abandoned firebreaks would be seeded to a vegetation mixture similar to the surrounding habitat.

g. Purchase of private inholdings to complete the legislated refuge boundary would increase the size of several fields to meet the minimum required habitat size of 25–100 acres for most species.

Upland Objective 3

Provide a minimum of 1,600 acres of grasslands in blocks of at least 75 acres with less than 30% shrub cover and 15–70% grass cover. Structural characteristics include less than 4 inches VOR and variable vegetation heights ranging from 6 to 20 inches to benefit Vesper sparrow, chestnut-collared

longspur, horned lark, upland sandpiper, and marbled godwit (Kantrud and Higgins 1992).

Rationale

This set of grassland habitat characteristics exists off the refuge and in abundance on private lands. Smaller areas are available on refuge hilltops and within the thin upland soil types. In addition, this habitat would be provided at the refuge for one or two growing seasons following management treatments applied to achieve upland objectives 1 and 2.

Strategies

- a. The development of mini-joint-venture grazing systems that encourage rest on adjacent private lands would continue.
- b. The potential for reintroduction of prairie dogs would be evaluated.
- c. Purchase of private inholdings to complete the legislated refuge boundary would increase the size of several fields to meet the minimum required habitat size of 25–100 acres for most species.

Upland Objective 4

Maintain existing wooded ravines and trees in riparian zones that historically supported woody vegetation.

Rationale

The 660 acres of riparian floodplain and wooded ravines are primarily associated with the James River valley and lakeshores within the refuge. These native woodlands provide habitat for many woodland-dependent species. Although these habitats cover less than 1% of the northern Great Plains, wooded ravines can attract a disproportionately rich number of bird species compared to other plains habitats (Dobkin 1992.) These woody habitats increase species diversity by providing the migration and breeding habitats for many migratory land birds. Some of the bird species that use these habitats include Cooper's hawk, black-billed cuckoo, least flycatcher, willow flycatcher, great-crested flycatcher, red-eyed vireo, yellow warbler, and northern oriole.

Strategies

- a. The woody ravines would not be intentionally burned; however, they would not be protected from prescribed fire treatments. Fires historically kept the ravines in early successional plant species, which benefited many birds.
- b. Management treatments to increase bur oak germination in the riparian zones would be investigated.

WETLAND GOAL

Provide a diversity of wetland types that emulate the range of natural variation characteristic of the Prairie Pothole Region to benefit threatened and endangered species, waterfowl, shorebirds, wading birds, and other wetland birds.

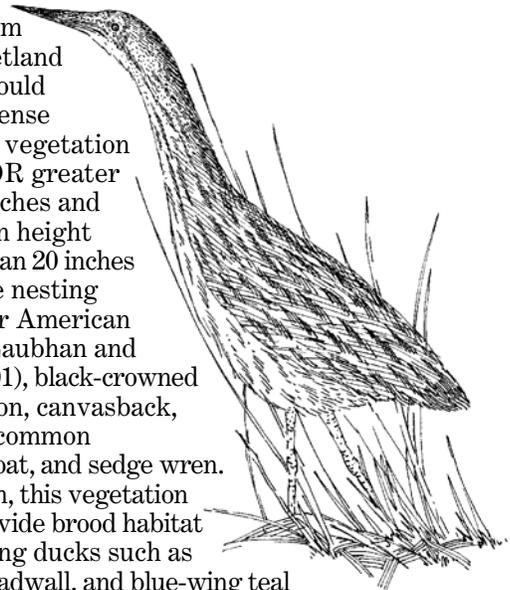
Wetland Objective 1

Provide 1,250 acres (50%) consisting of 30–60% emergent vegetation, primarily bulrushes and cattail, interspersed with 40–70% open water that supports beds of aquatic vegetation, preferably sago pondweed, with water depths of 8–20 inches (stable or slightly declining) between May 1 and August 1.

Rationale

The beds of aquatic vegetation provide foraging habitat for breeding dabbling ducks, herons, egrets, grebes, canvasback, and tundra swan (Earnst 1994, Kantrud 1990) in the fall. This objective would be applied to Arrowwood and Jim lakes.

A minimum of 25% wetland habitat would support dense emergent vegetation with a VOR greater than 12 inches and vegetation height greater than 20 inches to provide nesting habitat for American bittern (Laubhan and Roelle 2001), black-crowned night-heron, canvasback, redhead, common yellowthroat, and sedge wren. In addition, this vegetation would provide brood habitat for dabbling ducks such as mallard, gadwall, and blue-wing teal and foraging habitat for migrating diving ducks and tundra swan.



American Bittern
© Cindie Brunner

A minimum of 25% wetland habitat would support sparse emergent vegetation with a VOR ranging from 4 to 12 inches and vegetation height ranging from 6 to 20 inches to provide nesting habitat for black tern (Bergman 1970, Naugle et al. 2000), Franklin's gull (Du Mont 1940), and pied-billed grebe (Naugle et al. 1999).

Strategies

- a. After ice out, maintain or raise water depths to 3–5 feet, with clear water for adequate light penetration during the critical sago pondweed-germination period, March through April.

Slowly raise the water level from mid-June through September, and then slowly draw down the water level through October, to develop 3- to 5-foot bands of seasonally flooded emergent vegetation. Emergent vegetation establishment may take several years of low water levels. A fringe of emergent vegetation around the shoreline would reduce wind erosion and re-suspension of sediments. Reflood the emergent vegetation the following spring to provide nesting and brood cover.

b. Reduce sedimentation rates by working with other federal and state programs to improve the upper James River watershed. Conserve, restore, enhance, and create habitat resources in watersheds to influence the quality and quantity of water flowing into rivers and streams.

c. Control rough fish by reducing water levels enough to result in fish kills during winter months, as conditions dictate.

d. Use Arrowwood Lake to store water for management of other pools as long as sago production is unimpeded.

Wetland Objective 2

Provide 300 acres consisting of greater than 80% emergent vegetation (such as bulrushes and cattail) and 0–20% open water with depths ranging from moist to 8 inches, between May 1 and August 1, in patches greater than 25 acres.



Tim McCabe/USFWS

Western Grebe

Rationale

Thick stands of bulrushes and cattails provide nesting habitat for black tern, eared grebe, western grebe, Franklin's gull, sora, and Virginia rail. This objective would target Arrowwood and Jim lakes.

Strategies

a. Control rough fish by reducing the water level enough to result in fish kills during winter months.

b. Raise water levels slowly until late summer, to depths of 1–4 feet, then maintained at stable or slightly declining levels between May 1 and August 1 to favor emergent vegetation growth along edges. Emergent vegetation establishment may take several years of low water levels. A fringe of emergent vegetation around the shoreline would reduce wind fetch and re-suspension of sediments. Reflood the emergent vegetation the following spring to provide nesting and brood cover.

c. Reduce sedimentation rates by working with other federal and state programs to improve the upper James River watershed. Conserve, restore, enhance, and create habitat resources in watersheds to influence the quality and quantity of water flowing into rivers and streams.

d. Use Arrowwood Lake to store water for management of other pools as long as sago production is unimpeded.

e. When expanses of emergent vegetation exceed 150 acres, draw down the lake and disturb with prescribed fire or disking to set back plant succession.

Wetland Objective 3

Provide 500 acres of open-water habitats consisting of 20–100% submergent aquatic vegetation (such as pondweed, bladderwort, and coon's tail) in patches greater than 8 acres, with depths ranging from moist to 8 inches, between May 1 and August 1.

Rationale

Patches of submergent aquatic vegetation provide habitat conditions for nesting black tern, eared grebe, western grebe, Franklin's gull, sora, and Virginia rail. In addition, this vegetation provides foraging habitat for breeding dabbling ducks, herons, egrets, grebes, canvasback, and tundra swan in the fall. This objective would target Arrowwood and Jim lakes.

Strategies

a. After ice out, maintain or raise water depths to 3–5 feet, with clear water for adequate light penetration during the critical submergent vegetation germination period, March through April.

b. Beginning in July, slowly draw down water levels in selected pools to 8 inches, through July.

Wetland Objective 4

Provide 300–600 acres of less than 12 inches tall emergent vegetation (such as rushes, sedges, and spikerush) that is flooded with less than 8 inches between April 1 through June 1, and between July 15 through November 30 with a VOR of less than 4 inches (or approximately less than 1.4 stems per square foot).

Rationale

This objective would provide nesting habitat to benefit foraging waterfowl and migrating shorebirds. This objective would target the Mud Lake and Depuy Marsh subimpoundments and Stony Brook. Approximately one-third of the units would be managed to achieve this objective on an annual basis.

Strategies

- a. In the early spring, draw down selected ponds to initiate new growth of spikerushes and expose old clumps of rushes, bulrushes, grasses, and sedges for rail habitat (Fredrickson and Taylor 1982).
- b. In the fall, slowly draw down selected ponds to concentrate foods for migrating waterfowl and other waterbirds.

Wetland Objective 5

Provide annually approximately 300–600 acres of greater than 80% cover of seed-producing vegetation (such as smartweeds, millet, beggarticks, and sedges) flooded to depths less than 8 inches, between April 1 and November 30.

Rationale

Annual seed-producing vegetation would provide habitat for foraging waterfowl and shorebirds. This objective would target the subimpoundments; approximately one-third of the units would be managed to achieve this objective on an annual basis.

Strategies

- a. Periodically flood nine moist soil units to depths less than 12 inches. Every third year or as conditions dictate, completely draw down the units in the spring and early summer, then dry, and disturb and reseed the soil surface to increase the sprouting of seeds within the soil.

Use early drawdowns to stimulate germination of smartweeds. Mid-season drawdowns would result in millets and late-season drawdowns would produce beggarticks. Once plants reach 6–8 inches in height,

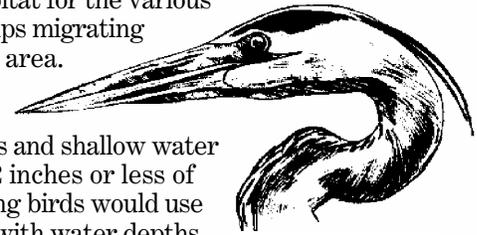
shallowly (1–2 inches) flood them. As the perennials increase, so do the invertebrates that provide foraging habitat for waterfowl, rails, and herons. The uneven topography of pools would provide foraging habitat for the various wildlife groups migrating through the area.

Shorebirds

would use

the mud flats and shallow water areas with 2 inches or less of water, wading birds would use those areas with water depths from 3 to 5 inches deep, and

waterfowl would have areas available with water depths ranging from 5 to 10 inches deep.



Great Blue Heron

Time to shorebird migration the early spring drawdowns with shallow water zones interspersed with mud flats. The new growth of spikerushes and old clumps of rushes, bulrushes, grasses, and sedges provide concealment for rails (Fredrickson and Taylor 1982).

Wetland Objective 6

During years of severe drought in the region, maintain low water levels in Jim Lake to provide exposed gravel islands and shoreline habitat during piping plover nesting season.

Rationale

The piping plover has been recorded nesting at the refuge during years of low water that exposed the gravel islands and shoreline habitat the bird prefers for nesting. Because the refuge has a history of piping plover use, it has designated critical habitat for piping plovers. Piping plovers are not expected to nest regularly at the refuge. However, in years of severe drought when habitat is limited across the state, Jim Lake would be managed to provide access to the gravel islands and gravel side slopes of the dike along the eastern edge of the lake.

Strategies

- a. Draw down Jim Lake to maintain exposed gravel islands and shorelines from mid-May through mid-July.
- b. Participate in the International Piping Plover Breeding Census at the refuge every 5 years.

Wetland Objective 7

Improve water quality in the watershed upstream of the refuge and also water leaving the refuge. Reduce peak flows entering the refuge during spring snowmelt and summer rainfall events to reduce flooding and improve water management capability.

Rationale

During high-water events, most water entering the refuge would be diverted into the bypass channel at the southern end of Arrowwood Lake. This practice would limit opportunities to improve the quality of water leaving the refuge. However, managing water levels in Arrowwood Lake to promote emergent vegetation growth along the shoreline and other shallow areas would improve water quality by increasing plant uptake of nitrogen and phosphorous.

Another water quality problem that has existed for many years is lack of dissolved oxygen during periods of low flow and under ice (Reclamation 1992). To help alleviate this problem, water released from Arrowwood Lake into other impoundments and the bypass channel would be from the top of the water column, which usually has higher dissolved oxygen levels. Furthermore, as water drops over the water control structure and mixes with air, dissolved oxygen levels would be increased.

When water is diverted from Arrowwood Lake or the bypass channel into other wetland units, there would be additional opportunities for improving water quality. Sedimentation rates would increase as water levels are maintained to provide migratory bird habitat. Water levels would be managed to promote growth of desirable aquatic vegetation, which would greatly increase plant uptake of organic nutrients. Wetland units would be periodically drawn down and burned or disked to recycle nutrients and set back succession. As part of the Arrowwood NWR mitigation project, fish barriers were installed to prevent carp from entering the bypass channel and the wetland units. Excluding carp would also benefit water quality by reducing turbidity. As with Arrowwood Lake, water released from these units would be from the top of the water column and dissolved oxygen levels would be increased when the water drops over the structure.

Strategies

- a. Use stream-gauging data in conjunction with water quality models to calculate a mass nutrient balance for the refuge. The Water Resources Division of the USGS maintains stream gauging stations on the James River, both upstream and downstream of the refuge. Data collected at these gauging stations include streamflow and water chemistry. This data, when combined with water quality models, can be used to calculate a mass nutrient balance for the refuge. A mass nutrient balance assesses nutrient load entering and leaving the refuge, providing insight into the refuge's role as a nutrient source or nutrient "sink" for downstream water users.
- b. Work with the watershed managers from county soil conservation districts to use the agricultural nonpoint source (AGNPS) model. The AGNPS

model predicts soil erosion and nutrient transport and loadings from agricultural watersheds for real or hypothetical storms. It can be used in evaluating the effect of management decisions impacting a watershed. It can also be used to target areas in the upper watershed for "best management practices" such as minimum tillage, grass waterways, filter strips, green belts, and grazing systems that would provide the greatest water quality benefit to the refuge.

- c. Achieve the goals of the Federal Water Pollution Control Act by developing partnerships with county, state, and federal agencies. In cooperation with the state health department and the EPA, identify potential projects in the upper watershed that qualify for Clean Water Act funding.

- d. Use "thunderstorm maps" to determine priority areas within 1 mile of the James River and significant tributaries to protect and restore wetlands and to prevent further loss of native or naturalized cover. In these same priority areas, the proportion of perennial cover would be increased; where permanent cover restoration was not possible, annual cover such as winter cereals for nesting waterfowl would be increased.

- e. Calculate a mass nutrient balance to determine if the refuge is functioning as a nutrient source or nutrient "sink."

VISITOR SERVICES GOAL

Visitors of all abilities would enjoy a refuge visit and increase their knowledge and appreciation of the prairie ecosystem and the refuge's history by participating in compatible wildlife-dependent activities.

NOTE: Appendixes K–R contain draft compatibility determinations for the public uses at Arrowwood NWR.

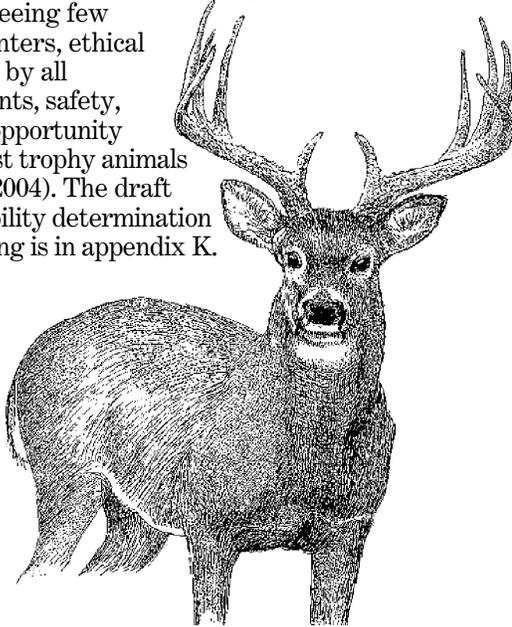
Visitor Services Objective 1—Hunting

Continue to provide and increase opportunities as compatible and appropriate for accessible hunting of big game, upland birds, small game, and fox.

Rationale

Current refuge-specific regulations are designed to provide opportunities for a quality hunt within the laws imposed by the state. The definition of a quality hunt is completely determined by the individual participating in the activity. In a survey of 10,000 hunters conducted by the Wisconsin Department of Natural Resources in 2000, hunters were asked to rate the factors having the most influence on their perception of a quality hunt. The most important factor indicated by the respondents was seeing game. The second most frequent answer

was spending time with friends and family, and the least important factor in determining a quality hunt was the weather. Successful hunters (harvest of game pursued) rated their hunt quality as very high or fairly high 22% of the time, while unsuccessful hunters (no game harvested) rated their hunt quality as very high or fairly high only 7% of the time. Other factors determined to be integral to a quality hunt include seeing few other hunters, ethical behavior by all participants, safety, and the opportunity to harvest trophy animals (Dhuey 2004). The draft compatibility determination for hunting is in appendix K.



White-tailed Deer

Strategies

- Revise the current hunting brochures and “tear sheets” that provide information on refuge hunting regulations, and access.
- Continue to work cooperatively with the NDGF to conduct law enforcement patrols to ensure compliance with regulations.
- Increase opportunities accessible hunting on the refuge.
- Continue to limit hunting to walk-in-only access.

Visitor Services Objective 2—Fishing

Continue to provide public opportunity for accessible fishing, including bow fishing for rough fish during high-water years and ice fishing when conditions permit.

Rationale

Fishing is a compatible priority public use and would continue to be supported. See the draft compatibility determination in appendix L.

Strategies

- Update and revise brochures that provide information on refuge fishing opportunities, regulations, and access.

- Use local media to promote fishing opportunities during high-water years when the fishery is active.
- Permit fishing, in accordance with state regulations, year-round except during the deer gun and muzzleloader seasons.
- Allow boats from May 1 through August 31.
- Allow, on Arrowwood and Jim lakes, boats with less than 25 horsepower motors.

Visitor Services Objective 3—Wildlife Observation and Wildlife Photography

Provide the public opportunities for accessible wildlife/wildland observation and photography for at least 10,000 visitors per year.

Rationale

The refuge’s auto tour route and locations around Jim Lake and the Depuy pools provide excellent opportunities for viewing and photographing wildlife. These are compatible priority public uses (see the draft compatibility determination in appendix N).

Strategies

- Continue to maintain the refuge’s 5.5-mile auto tour route to provide a safe and enjoyable experience for visitors.
- Update and revise the interpretive brochure. Clarify and revise regulations regarding access into the refuge for walk-in access, biking on refuge trails, and horseback riding.
- Upgrade the access road to the Warbler Woodland Watchable Wildlife Area.
- Improve and maintain the nature trail in the Warbler Woodland Watchable Wildlife Area by adding directional signs to the trailhead and replacing the interpretive signs.
- Maintain at least one observation blind located near an active sharp-tailed grouse lek. Locate a suitable site for installation of a permanent, accessible blind.
- Investigate new opportunities for compatible wildlife viewing, with the possible development of additional trails and overlooks.
- Develop and upgrade wildlife and bird lists as new information becomes available.
- Allow boats from May 1 through August 31.
- Allow, on Arrowwood and Jim lakes, boats with less than 25 horsepower motors.

Visitor Services Objective 4—Interpretation

Increase public awareness and advocacy by reaching 10,000 people annually using accessible programs, exhibits, signs, and pamphlets that interpret refuge management activities, and the natural, cultural, and historic resources.

Rationale

By expanding the interpretive and public outreach activities at the refuge, the public would be made aware of the Refuge System and Arrowwood NWR and the benefits it provides to wildlife and the local community. This is a compatible priority public use (see the draft compatibility determination in appendix O).

Strategies

- a. Remodel the office entrance to include a visitor contact station containing interpretive exhibits and a cooperative association store.
- b. Develop permanent exhibits at local community locations to increase awareness of national wildlife refuges in North Dakota.
- c. Widely disseminate informational leaflets to libraries, local businesses, chambers of commerce, recreational groups, local lodging, and designated rest areas along interstates.
- d. Develop a portable travel exhibit interpreting the refuge and its key resources.
- e. Develop a professional-quality presentation on Arrowwood NWR and the Refuge System.
- f. Create a native grass and forb demonstration plot, complete with interpretive signs and identification markers for each species.
- g. Work with tourism division of the North Dakota Commerce Department, and North Dakota



Prairie Lily

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Department of Transportation to install directional signs off Interstate 94 and state highways.

- h. Maintain existing interpretive panels.
- i. Develop and place new entrance signs at each main refuge access road.
- j. Interpret the cultural history including the Fort Totten Trail, the story of Limpy Jack, and the legend of Grasshopper Hills.
- k. Interpret the geology of the refuge and surrounding area.

Visitor Services Objective 5—Partnerships and Other Public Outreach

Foster advocacy and develop public awareness of refuge resource issues and management practices through accessible public outreach.

Rationale

Fostering relationships within the community would help the refuge open the lines of communication, build support for the refuge, and provide an avenue for discussion. The Service recognizes that communication is vital to the Service mission. Refuge staff would continue to seek out new opportunities and foster existing relationships to help with achieving mutually beneficial goals and objectives.

Strategies

- a. Pursue development of a “friends group.”
- b. Develop partnerships to increase volunteer opportunities at the refuge.
- c. Annually update the refuge website.
- d. Send out monthly news releases to communities regarding refuge events and management activities. Conduct radio and television spots on request.
- e. Attend local wildlife and community group meetings on a regular basis to provide information on refuge activities, management, and other issues.
- f. Continue to work with the nonprofit organization, Birding Drives Dakota, on the annual “Potholes & Prairie Birding Festival” and visits to the refuge.
- g. Annually participate in at least five outreach programs such as holding events for National Wildlife Refuge Week and International Migratory Bird Day, or staffing a booth at a local event.
- h. Work with congressional offices and external affairs to keep them informed of refuge activities and management issues. Build and maintain relationships with county officials.

Visitor Services Objective 6— Environmental Education

Promote the Refuge System and Arrowwood NWR by conducting or hosting at least 10 environmental education programs per year to local schools and groups on the wetlands and grasslands within the Prairie Pothole Region.

Rationale

By expanding the environmental education activities at the refuge, the public would be made aware of the Refuge System and Arrowwood NWR and the benefits it provides to wildlife and the local community. This is a compatible priority public use (see the draft compatibility determination in appendix O).

Strategies

- a. Enhance the OWLS, located at the Kensal Public School, with interpretive signs or a brochure describing the native vegetation.
- b. Develop environmental education trunks complete with hands-on items such as mammal skins and skulls, to be used during presentations and tours with various school groups and organizations.
- c. Develop field study equipment kits to be checked out by visitors or organized groups. Include a

backpack with binoculars, field guides, hand lenses, dip nets, tweezers, ruler, pen, vials, and other supplies.

d. Construct an environmental education “learning pavilion” in the Warbler Woodland Watchable Wildlife Area.

e. Involve local schools to develop an education program that can be used to explain the refuge management practices, and the wildlife and habitats found at the refuge.



Prairie Smoke in Winter

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