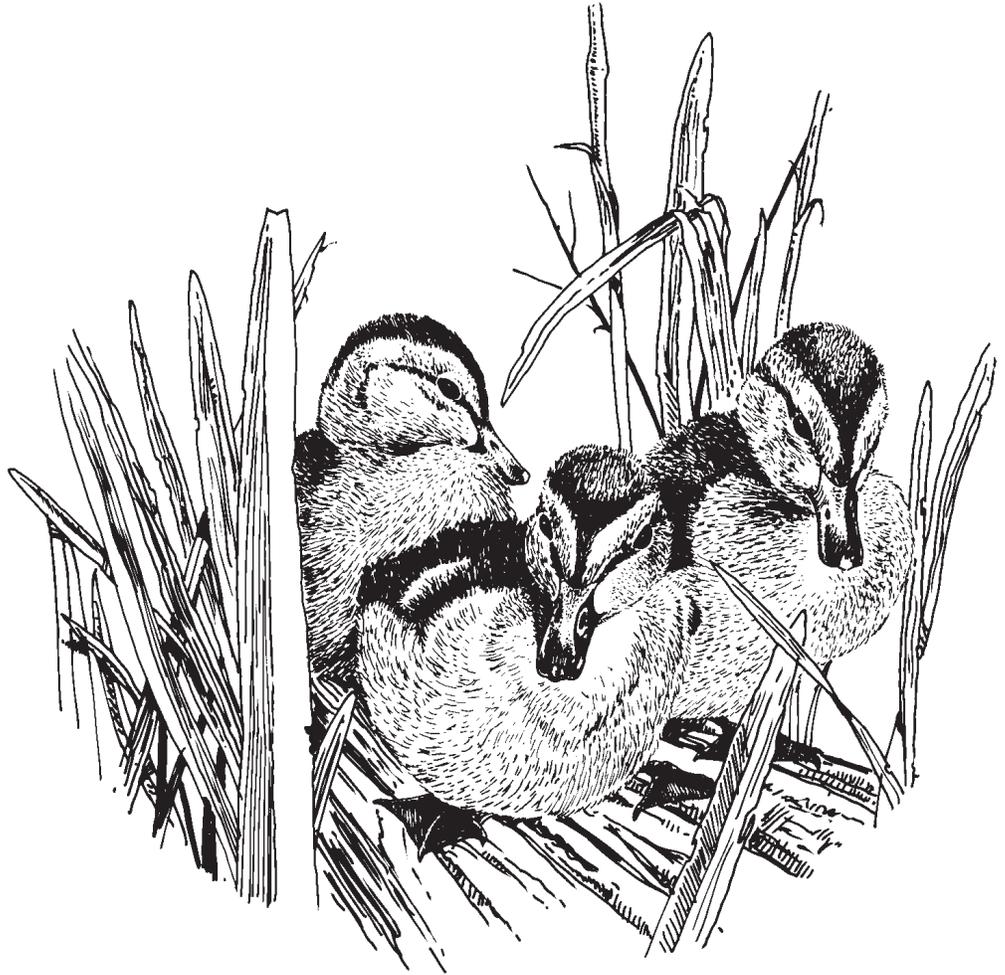


# 5 Environmental Consequences





# 5 Environmental Consequences

The environmental consequences or impacts discussed in this chapter are the potential effects on a resource as a result of carrying out the actions of an alternative. Chapter 2 (alternatives) presents the management scenario for each alternative, which could create the consequences described here. This chapter discusses the effects common to alternatives and provides a summary of the environmental consequences (table 3).

## 5.1 Effects Common to all Alternatives

All alternatives would have the same impacts related to air quality and environmental justice, as described below.

### *Environmental Justice*

None of the alternatives considered would have a disproportionately high or adverse environmental effect on minority or low-income populations. Public use and access to the refuge does not require a fee and is open to all members of the public.



LaCreek refuge sign with fire in background

USFWS, Tom Koerner

### *Air Quality*

No adverse effects on air quality are expected. Short-term effects on air quality from prescribed burning on the refuge should not vary significantly between any of the alternatives. Prescribed burning operations are planned to reduce impacts to neighbors through ignitions that move the smoke up and out of the vicinity quickly. Rapid mop up is completed to reduce overnight impacts to neighbors in the valley. There are no permits required by the State of South Dakota or Bennett County with regards to air quality or smoke management. During periods of high fire danger, Bennett County may issue burn bans to reduce the occurrence of wildfires.

## 5.2 Summary of Effects by Alternative

The following section and table 3 provide an analysis of effects resulting from No Action (alternative A), the Proposed Action (alternative B), and alternative C.

### *Alternative A (No Action)*

#### *Vegetation and Wildlife*

**Upland Habitat:** Under alternative A, upland habitat management practices would not change. Grasslands would continue to be managed using a combination of prescribed fire and prescribed grazing management. Restoration activities would be limited to seedings with a low diversity mix of grasses. Shelterbelts would not be removed; however, deteriorated shelterbelts would not be replaced. Scattered exotic trees (i.e., Russian olive) would continue to be removed as resources permitted. An integrated noxious weed management program using herbicide applications, grazing, prescribed fire, and haying would continue.

Upland restoration activities would be focused on previously plowed areas with heavy weed infestations. These areas would be cropped for several years prior to reseeded. Farming upland areas would cause decreases in grassland nesting birds in the short term; however, restored grasslands would provide similar quality habitat for upland nesting birds following restoration. While farming would increase pesticide use in the short term, restored fields should reduce noxious

weeds within upland areas, decreasing future pesticide applications.

Overall bird diversity would continue to remain similar because of the presence of shelterbelts. Shelterbelts provide habitat for a number of woodland generalist species such as blue jays, brown thrashers, and gray catbirds. Nesting success of grassland nesting birds would not improve because shelterbelts reduce the size of contiguous blocks of grass and certain grassland nesting birds, such as bobolinks, are sensitive to the block size of habitat. Additionally, scattered shelterbelts provide travel corridors and habitat for predators such as raccoons, skunks, and common crows, further reducing success of grassland nesting birds.

**Sandhills:** Alternative A calls for no change in current management practices within the Nebraska Sandhills. In the past, management within different portions of the sandhills has contrasted greatly depending upon the area. Certain areas of the sandhills have been grazed regularly while other areas have reportedly not been grazed in approximately 30 years, or since the Brown Ranch portion of the refuge was purchased. No efforts have been made to conduct prescribed fires within the sandhills, and wildfires have only burned through small areas of the refuge sandhills.

The effects of reduced grazing and fire activities within the sandhills are not well understood. Wildfires and large ungulate grazing are believed to have been two processes that were critical in the development of sandhills plant communities. Removal of these processes has likely negatively impacted plant community richness and wildlife diversity within the sandhills. The lack of fire and grazing is likely to cause continued decreases in species richness within the grasslands. Certain plants, such as the endangered blowout penstemon, are dependent upon early successional niches created by events, such as heavy grazing or prescribed fire, that lead to the creation of “blow-outs” or eroded soils within the sandhills. Improved soil conservation practices throughout the sandhills has reduced blow-out habitat and is believed to be one reason for population declines in the federally listed blow-out penstemon throughout the sandhills region.

**Wet Meadow Habitat:** Under alternative A, no changes are proposed in the management of wet meadow habitat on the refuge. Grazing and prescribed fire would continue to be used to improve the quality of meadow habitats. The wet meadow habitat has been one of the areas most impacted by Canada thistle. Noxious weed control including grazing, prescribed fire, haying, and pesticide applications would continue within wet meadow habitats. Scattered Russian olive and willow trees would be removed as resources allow.

The use of grazing and prescribed fire would continue to improve habitat quality within wet meadow habitats. Extensive cattail stands are expected to decrease and be replaced by prairie cordgrass and sedge dominated communities. Reduction in cattails would negatively affect certain species such as red-winged blackbirds and marsh wrens; however, wet meadow habitats managed with fire and grazing treatments should benefit other nesting species such as long-billed curlews, willets, and marbled godwits. Reduction in the extent of cattails should also improve migratory habitat for ducks and shorebirds as wet meadow habitats are frequently flooded during spring migratory periods. Improvements in the quality of wet meadow habitats should decrease pesticide use and associated contamination issues within wet meadow habitats.

**Prairie Dogs:** Under alternative A, prairie dogs would be allowed to contract and expand naturally on the refuge. It is expected that current prairie dog town expansion would continue on the refuge if left uncontrolled. About 4,000 acres of refuge uplands are suitable for prairie dog colonization. Expansion of prairie dog communities would benefit a number of species on the refuge. Burrowing owl populations on the refuge are closely tied to prairie dog communities. Surveys of burrowing owls on the refuge have shown increases in burrowing owl numbers with expanding prairie dog communities. It is suspected that burrowing owl numbers would continue to increase as prairie dog communities expanded. Prairie rattlesnakes, killdeer, and other species requiring short vegetative structure also would benefit as prairie dog towns expanded on the refuge.

While grassland nesting species requiring short vegetation would benefit with the expansion of prairie dog towns, other species such as bobolinks, savanna sparrows, and dickcissel, which require taller vegetation, likely would decrease as potential upland nesting cover is reduced with the expansion of prairie dog towns.

Uncontrolled prairie dog expansion on the refuge likely would cause problems associated with refuge infrastructure because prairie dogs burrow into dikes and dams. This could result in dam failure.

Prairie dog towns directly adjacent to private lands pose another problem for the refuge. Prairie dogs are generally poisoned by ranchers because of perceived competition between prairie dogs and cattle or because the mounds created make haying difficult. Poisoning of prairie dogs on private lands adjacent to prairie dog colonies on refuge lands would be minimally effective. Prairie dogs from the refuge would rapidly colonize burrows left vacant on adjacent private land. It would be nearly impossible to control prairie dogs on adjacent

private lands unless the refuge was controlling prairie dogs as well.

**Trumpeter Swan:** Under alternative A, wetlands would be managed at current levels. Under this alternative, the refuge would continue to provide migratory and wintering food for trumpeter swans. Continued drawdowns would provide annual crops of bulrush, arrowhead, and subaquatic vegetation necessary to sustain swans and other migratory birds during fall and winter periods. Subsequent drawdowns on Pool 10 should increase subaquatic vegetation further increasing resources available to migratory swans.

Annual dewatering of most pools would limit resources for nesting swans. This would not negatively impact the High Plains Flock (flock) because nesting success of trumpeter swans at Lacreek would have minimum impact to the continued growth and maintenance of the flock. The flock has continued growth during the past 10 years with limited production at the refuge. Because abundant and high quality nesting habitat for the trumpeter swan is found in sandhill wetlands south of Lacreek, periodic drawdown on the refuge does not affect total flock production.

**American White Pelican:** Under alternative A, Pool 9 would not be dewatered. This would provide a stable, generally predator-free nesting site for American white pelicans. Though water levels on Pool 9 would not be manipulated, dewatering of other pools may potentially adversely affect American white pelicans. Reduced surface water and open water habitats within refuge pools has decreased available food resources such as tadpoles, salamanders, and fish. It is not known what effects this would have on the fledging success of pelicans. Fledging success on the colonies is likely dependent on factors such as weather, food availability, and disease.

**Federally Listed Species:** Under alternative A, no impacts to federally listed species are expected outside those mentioned above regarding blowout penstemon in the sandhills section. It is believed that blowout penstemon is currently not found in refuge sandhills. If impacts of any management actions are expected to affect listed species, additional Section 7 Intra-Service consultations would be conducted and appropriate mitigation efforts would be made.

**Invasive Species:** Under alternative A, invasive species would continue to be managed using an integrated approach. Haying, grazing, mowing, prescribed fire, pesticide applications, and biological controls would all be considered when managing noxious weeds. When possible, pesticide use would be minimized because chemicals used to control noxious weeds have the potential to reduce plant diversity and may produce environmental contamination.

## Water Management

**Wetlands:** Alternative A would maintain the current water management program at approximately the same intensity. During the past 5 to 8 years, a greater emphasis has been placed on providing migratory habitat at the refuge as opposed to providing brood rearing areas within wetland habitats. With the exception of Pool 9, all refuge pools have been partially or fully dewatered at some point during the past 8 years. Continued dewatering within Pools 7, 8, and 10 likely would continue to decrease surface area of pools because channel cutting activities near the outlet structure in each of these pools would continue to lower the surface water elevation within the pools. Subsequent drawdowns would likely result in managed wetlands displaying riparian characteristics. Pool 8, which has been drawn-down most frequently in the past 8 years, has already channelized approximately half of the way

across the pool. It is likely that with continuous summer drawdowns, Pool 7 would resemble Pool 8 more closely. Further channelization in Pools 7 and 8 would reduce the extent of summer water within the pool. This would reduce brood habitat and shorebird habitat, but would improve habitat conditions for species such as rails and soras.

Pools 5 and 6 have stabilized to some degree during past drawdowns. The current elevation of water control structures prevents channelization within extensive areas of Pools 5 and 6. This maintains the pool in a semi-permanent wetland condition. Both pools provide brood water during the nesting season and migratory habitat in the spring and fall. Dramatic vegetative changes are not expected in either Pools 5 or 6 under continued similar management.

Water levels on Pool 9 have remained relatively stable for an extended time because management has focused on the colony of nesting pelicans. Alternative A would continue to provide a relatively safe nesting area for pelicans as well as black crowned night herons, cattle and snowy egrets, great blue herons, and double crested cormorants. While stable water levels on Pool 9 would benefit a number of colonial nesting waterbirds, a stable water regime would be detrimental to migrating waterfowl and shorebirds. Unconsolidated sediments within the pool combined with expansive areas of open water preclude the establishment of subaquatic vegetation, reducing habitat for migrating ducks and swans dependent upon sub-aquatic vegetation. The lack of dewatering also would prevent exposure of mudflats and associated germination sites for moist-soil vegetation. Additionally, recent water quality measurements indicate that there are marked increases in conductivity below the Pool 9 water control structure. It is suspected that the large surface area of Pool 9 causes extensive evaporation during the summer months, increasing the concentration of salts within the pool. Increased salinity may hinder wetland recovery efforts in Pool 10, just downstream of Pool 9.

**Lake Creek Hydrology:** Alternative A does not call for any changes in the Brown Ranch portion of the refuge. Several man-made ditches occur on the south side of Lake Creek on the Brown Ranch Portion of the refuge. Areas on the south side of Lake Creek were likely ditched to dry wet meadow habitats to increase livestock grazing and haying opportunities. Historically, small spring-fed streams on the south side of Lake Creek were likely dammed by beavers, creating open water wetlands. Channelization of the small streams reduced suitable dam sites for beaver and likely drained surrounding wet meadows, reducing habitats for wetland-dependent species. Drainage within the Lake Creek Valley may have benefited certain wildlife such as bobolinks, dickcissels, and

upland sandpipers by increasing dryer upland habitat acreage. Wetland-dependent species such as waterfowl, Wilson's phalarope, common snipe, and rails all likely experienced decreases in migratory and nesting habitats.

## Public Use

Alternative A calls for no change in management strategies. Public use programs would continue at the present level. The refuge would continue to provide quality recreational opportunities to visitors of all ages and abilities.

**Hunting:** Hunting programs on the refuge and at the LWRRA would continue as presently managed under alternative A. The refuge would continue to provide hunting seasons for deer, pheasants, and sharp-tailed grouse in accordance with state and federal laws and regulations. The LWRRA would continue to be open to all species permitted by state and federal regulations. Present management practices would provide high quality recreation. Pheasant and sharp-tailed grouse provide opportunities for harvest of surplus animals and compatible recreation. Impacts to migratory birds are minimized by hunting activities because hunting occurs in areas where the migratory birds are not likely to occur. Impacts to other uses such as wildlife viewing would be minimized.

**Fishing:** Fishing would continue to be permitted on Pools 3, 4, 7, and 10, the LWRRA, and the trout ponds. Frequent dewatering of pools under alternative A would likely prevent Pools 3, 4, 7, and 10 from providing quality fishing opportunities. Fishing opportunities would continue on the LWRRA and should improve following the completion of the LWRRA phase III project. The State of South Dakota has provided little fisheries management effort within the LWRRA reservoir because of the likelihood that the reservoir would be drained for the repair project. Following completion of the proposed construction project on the LWRRA, future water levels should remain more stable, providing more fishing and fisheries management opportunities. The trout ponds would continue to be managed for a put-and-take rainbow trout fishery, with stocking dates and times determined by SDGFP with concurrence by the refuge. Continued stocking of the trout ponds with rainbow trout may negatively impact state threatened fishes such as the pearl and red-belly dace. Rainbow trout likely assume the role of predator with pearl and red-belly dace providing a food source for stocked trout. Disturbance of adjoining wildlife resulting from fishing should be minimal.

**Trapping:** Trapping is currently only used as a management tool. Only nuisance species are trapped as needs are assessed. Dikes and refuge infrastructures are maintained through the

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removal of nuisance species resulting in a reduction in maintenance costs.

**Wildlife Observation, Wildlife Photography, Environmental Education, and Interpretation:**

Current on- and off-refuge opportunities for wildlife viewing, education, and interpretation would continue at existing levels. This includes informational kiosks, an auto tour route, hiking trail, observation tower, and the LWRRA. Disturbance to wildlife is minimal. The public would still have an opportunity for a high quality visitor experience. Staff has an opportunity to educate students about refuge resources fostering an appreciation for the refuge.

**Little White River Recreation Area:** Under alternative A, Phase III of the LWRRA construction project according to the 2005 final design would resume (see project descriptions in chapters 1 and 2). During construction activities, the reservoir would be dewatered. This would temporarily eliminate recreational opportunities for activities such as fishing, boating, and swimming. Once completed, reservoir levels would be maintained at an operating range of 3012 to 3014 feet in elevation, allowing the full complement of recreational activities to resume.

Long-term impacts to other programs and activities allowed at the LWRRA such as fishing, hunting, boating, swimming, camping, and picnicking would not be changed under alternative A. Public facilities such as camping sites, restrooms, and swimming beach, and boat launch would continue to be maintained by the refuge.

## **Alternative B (Proposed Action)**

### **Vegetation**

**Upland Habitat:** Under alternative B, an aggressive upland habitat restoration program would be implemented on the refuge. As part of

upland restoration activities, crop acreage would be increased on the refuge for up to 10 years. Increased farming would require additional pesticide use in the short term; however, pesticide use would decrease following restoration activities. Additionally, restored areas should be more resistant to invasion by exotic species, thus decreasing future pesticide use. Increased plant diversity in restoration units combined with prescribed fire and grazing management should improve structural diversity in grasslands, improving invertebrate communities, and potentially making upland habitats more valuable to grassland-dependent birds and small mammals. Removal of scattered trees would increase patch sizes for grassland nesting birds. Nesting success for grassland nesting birds in these areas would improve because of the resulting increase of contiguous habitat. Nesting success adjacent to remaining shelterbelts would not improve due to the influence of this edge.

**Sandhills:** Alternative B, in addition to alternative A, would use adaptive management from other Nebraska refuges as input for management of sandhills on Lacreek NWR.

**Wet Meadow Habitat:** Under alternative B, additional emphasis would be placed on improving habitat diversity within wet meadow habitats. Improving vegetative diversity would benefit native species by improving structural diversity, insect diversity, and improving food resources within this habitat type. Herbicide applications, which could be used to expedite the restoration process, could have potential short-term effects; however, following restoration activities, herbicide applications are expected to decrease.

### **Species Management**

**Prairie Dogs:** Under alternative B, a viable population of prairie dogs would be maintained within a designated biologically and socially compatible zone. Prairie dog colonies would be allowed to contract and expand within this zone; however, if towns expanded outside this zone, control methods would be considered. Species dependent on the short vegetative communities typical of prairie dog communities, such as burrowing owls, would likely have less habitat availability as compared to alternative A. Other species dependent on taller vegetation, such as bobolinks, would benefit from prairie dog control and the resultant vegetation changes. Identifying compatible zones also would allow for more successful upland restoration activities. Identifying compatible prairie dog areas and controlling prairie dogs outside those areas allows for long-term restoration planning and habitat management on the refuge.

PHOTO OMITTED--COPYRIGHTED

**Trumpeter Swan:** Under alternative B, the primary emphasis of trumpeter swan management would be on providing migratory and wintering food resources. Additionally, nesting and breeding habitat would be made available should a pair display nesting behavior. Reduction of lead would benefit the swans by reducing opportunities to ingest lead and, thereby, reducing poisoning. Under this alternative, restricting public use in key areas would reduce disturbance to swans. Some reduction in opportunities for wildlife viewing would occur. Refuge management changes may increase opportunities for successful breeding attempts. Less open water may impact swans by causing them to migrate.

**American White Pelican:** Predator trapping and vegetation manipulation would be used under alternative B to improve production on Pelican Islands. Because alternative B calls for periodic dewatering of Pool 9, the nesting colonies of pelicans may be affected during drawdown years. Land bridges would form, allowing ground predators access to the nesting colonies. Without active predator management, nest failure would be likely, and over an extended period, adult birds may not return to the area. Dewatering also would result in the establishment of vegetation around the periphery of the islands, making the site less attractive to nesting pelicans. This vegetation would be removed periodically through mowing, herbicide applications, or burning. Wildlife viewing opportunities of pelicans would be reduced during drawdown years. Management of other pools may increase available food resources for pelicans.

**Federally Listed Species:** Under alternative B, transplanting blowout penstemon would affect this species positively by creating an additional site for it to grow. The Service's blowout penstemon

recovery goal calls for five population groups so that the species could be reclassified as threatened; and 10 population groups with a minimum of 300 plants as recovered. Adjacent landowners would not be impacted by this action because current and future management of their lands would not be affected. Bald eagles would benefit through leaving mature cottonwoods for perch sites and potential nesting locations. If impacts of any management actions are expected to affect listed species, additional Section 7 Intra-Service consultations with Ecological Services would be conducted and appropriate mitigation efforts would be made.

**Invasive Species:** Under alternative B, invasive species management would be similar to that under alternative A; however, due to the emphasis on high diversity restorations it is suspected that plant communities would be less prone to invasions than exotic dominated grasslands. Increased vigor in grassland communities should result in decreased pesticide applications and reduced environmental contamination hazards.

## Water Management

**Wetlands:** Additional emphasis would be placed on brood rearing habitat for waterfowl under alternative B. Brood habitat would be managed for in wetland units in addition to 5 and 6. Higher water levels would benefit species such as muskrat, which may, in turn, produce nesting sites for Canada geese and possibly trumpeter swans. Muskrats build numerous "huts" from wetland vegetation. These are preferred nesting sites, as they rise above the water and reduce the chances of the nest flooding when water levels rise. Ducks also would be provided more brood rearing habitat, particularly if pools were raised after several successive years of dewatering. Newly flooded habitats would initially provide high productivity environments benefiting a number of wetland species. Higher water levels would benefit fish species. Fish populations would likely increase in pools following summer high water management. Higher summer water levels would provide spawning habitat for a number of fish species. Pelicans also may benefit from higher water levels as foraging areas and food resources increase.

**Lake Creek Hydrology:** Filling ditches south of Lake Creek would restore wetland habitats. Beavers may expand, resulting in additional wetland habitat for ducks, geese, and other wetland-dependent wildlife. Habitat for grassland nesting birds would decrease as wetland habitats are restored.

## Public Use

Under alternative B, public use would be expanded to encourage priority public use recreational activities. This would include the improvement of

refuge signage, interpretive trails, and hunting opportunities.

**Hunting:** Under alternative B, increased hunting programs are proposed. This would provide for increased opportunities for the public for certain species. Increased farming activities associated with alternative B would likely concentrate pheasants and deer, allowing increased harvest opportunities while upland restoration activities are underway. Increased hunting programs would increase wildlife disturbance on the refuge. Predator hunting would provide additional recreational opportunities.

Selected road ditches surrounding the refuge would be closed to hunting. This would improve safety for hunters and visitors by shifting hunters away from well-traveled roads adjacent to the refuge (see figure 6, public use map, alternative B). This would provide for a higher quality hunt for individuals adjacent to the refuge hunting in decoys. Discontinued retrieval of waterfowl in closed areas on the refuge and shifting hunters away from the refuge boundary would reduce disturbance to wildlife and improve the quality of visit for other refuge visitors.

**Fishing:** Fishing opportunities and access would remain similar in alternative B as in alternative A. Reduction of lead would benefit the swans, geese, and other wildlife by reducing opportunities for ingesting lead. Because seasonal closures at the trout ponds would be implemented when ice on the shorelines renders fishing nearly impossible, these closures would result in only minimal reductions in fishing opportunities. Improved community relations would occur as a result of refuge support for Youth Fishing Day. Children would benefit from increased fishing opportunities.

**Trapping:** Trapping would be used as a management tool rather than a recreational activity. Its application would be determined on a year-by-year assessment of needs. Trapping of raccoons, skunks, and coyotes around Pelican Islands would increase nesting success and hen survival for pelicans, ducks, geese, swans, and other birds.

**Wildlife Observation, Wildlife Photography, Environmental Education, and Interpretation:** Additional opportunities for wildlife observation, wildlife photography, and hiking, along with improved signing, updated brochures, and restored information kiosks would provide visitors with a higher quality visitor experience. Increased wildlife viewing opportunities would result in greater disturbance to wildlife on the refuge; however, changes in visitation and associated disturbance are expected to be minimal. Increased environmental education would increase the awareness of refuge resources.

**Little White River Recreation Area:** Under alternative B, the current hazard classification of the dam would be reviewed. In addition, the existing dam would be reviewed to determine if it can be changed to a lower hazard classification through modification. If hazard classification remains the same after review, Phase III would be completed according to final design specifications, resulting in short-term economic benefit to the region. If Phase III is completed, short-term impacts would result from dewatering the reservoir and construction activities. Boating, swimming, and fishing would not be available during this period. A short-term improvement in the fishery is likely as emergent vegetation that grew during the drawdown is re-flooded and fish stocking operations resume. Long-term improvements in boating, swimming, and fishing are not expected because the reservoir would continue to silt in. At the current rate of siltation, boating and swimming would be very limited in 10 to 20 years.

## Alternative C

### Vegetation

**Upland Habitat:** As with alternative B, an aggressive upland habitat restoration program would be undertaken under alternative C. Impacts would be similar to those outlined under alternative B. Shelterbelts and scattered trees would be removed throughout the refuge. Removal of shelterbelts on the refuge and scattered trees within riparian areas would reduce avian diversity on the refuge. Species such as ring-necked pheasant, wild turkey, mourning doves, brown thrashers, and other woodland generalists may decrease in abundance on the refuge. Additionally, white-tailed deer may decrease in certain areas on the refuge as a result of brushy habitat removal. Grassland nesting birds likely would benefit if woody vegetation were removed from upland habitats. Woody vegetation provides corridors and habitat for predators and parasitic cowbirds. Removal of shelterbelts and scattered woody vegetation would likely maximize abundance and nesting success of grassland nesting birds on the refuge.

**Sandhills:** Experimental prescribed burning would be implemented within the sandhills. Grazing management also would be expanded. It is likely that properly managed grazing and prescribed fire programs within the sandhills would increase vegetative and wildlife diversity.

**Wet Meadow Habitat:** Under alternative C, management actions and effects would be similar within wet meadow habitat as under alternative B.

## Species Management

**Prairie Dogs:** A viable population of prairie dogs would be maintained under alternative C, but prairie dog control would be less restrictive than alternative B. Prairie dogs would likely occupy the smallest area of refuge under this scenario. Prairie dogs would be controlled on all areas determined to be socially incompatible, including within close proximity of residences or adjacent private rangeland and hayfields. Prairie dogs also would be controlled in areas where they are impacting grassland restorations. Less habitat area would be available for associated species as well, such as burrowing owls. The decrease in prairie dog acreage would reduce impacts to neighboring landowners.

**Trumpeter Swan:** Under alternative C, trumpeter swan management would be similar to alternative B. Additionally, alternative C would strive to maintain wintering habitat on refuge pools. This would be attempted by maintaining high water levels on one or more pools through the winter to keep birds on the refuge. Hypothetically, these practices would reduce migration activities and associated hazards, such as power-line collisions and incidental hunting mortality during migration. While reducing migration distances minimizes associated hazards, artificially short-stopping migrations may have negative effects. Disease outbreaks can be more prevalent in areas where birds are concentrated in high numbers.

**American White Pelican:** Under alternative C, water levels on Pool 9 would be held at or near full-pool levels to minimize predation on the islands with nesting pelicans. Predator trapping on and surrounding the islands, as well as vegetation manipulation on the islands with nesting populations, would be conducted to maximize pelican production. Pelicans and other colonial nesting birds would benefit most under alternative C.

While beneficial to pelicans and other colonial nesting birds, high water levels on Pool 9 would be less beneficial to other migratory birds. High water levels would reduce mudflats and prevent the establishment of vegetation in these areas. This would decrease habitats for shorebirds and waterfowl. Deep water would prevent the establishment of submerged aquatic vegetation and increase turbidity. Increased surface area within the pool also would increase evaporation rates, leading to increased salinity levels. Increased turbidity and salinity within Pool 9 may negatively affect habitat conditions in Pool 10. Increased salinity may prevent the establishment of certain plants within the pool and turbid water releases from Pool 9 may hinder establishment of sub-aquatic vegetation within Pool 10. Carp populations would remain high as a result of continued deep

water. This would result in additional turbidity and prevent the growth of submerged and emergent vegetation on much of the pool.

**Federally Listed Species:** Under alternative C, no impacts to federally listed species are expected outside those mentioned above regarding blowout penstemon in the sandhills. If impacts of any management actions are expected to affect listed species, additional Section 7 Intra-Service consultations with Ecological Services would be conducted and appropriate mitigation efforts would be made.

**Invasive Species:** Under alternative C, invasive species management would be similar to that of alternative B. An integrated approach utilizing prescribed burning, grazing, and herbicide applications would be used to manage noxious weeds.

## Water Management

**Wetlands:** Under alternative C, water management would be similar to alternative A. Additional emphasis would be placed upon providing open water during winter. This would be accomplished by holding higher water levels in certain pools. Higher winter water levels should have minimal impacts on wetland vegetation as long as levels are decreased the following growing season.

Managing to maintain open water during winter periods may have varying impacts on waterfowl. During the winter, open water on the refuge provides secure resting areas for Canada geese and mallards where disturbance is minimal and hazards associated with migration are reduced. Regardless of pool management, open water may not be available during certain periods. This may cause birds to migrate during inclement weather, which may increase mortality. Additionally, artificially maintaining high concentrations of waterfowl may increase disease outbreaks. A reliable and predictable concentration of Canada geese also results in increased hunting opportunities.

**Lake Creek Hydrology:** Under alternative C, wetland restoration activities would proceed on the south side of Lake Creek as in alternative B. Flood irrigation would provide habitat for migrant waterbirds, particularly spring migrating waterfowl. Following successive years of flood irrigation vegetation composition within the valley would likely change. Past objections by neighboring landowners to irrigation practices on the Brown Ranch portion of the refuge resulted in prolonged litigation. There is a condition on water right 2300-2 that may impact the refuge's ability to implement this alternative.

## Public Use

Under alternative C, public use would be expanded

to encourage priority public use recreational activities as in alternative B. This would include the improvement of refuge signage, interpretive trails, and hunting opportunities. Recreational activities on the LWRRA would change due to the proposed breach of the existing dam at the LWRRA.

**Hunting:** Under alternative C, increased hunting programs are proposed. Increased hunting programs would increase wildlife disturbance on the refuge. Road ditches adjacent to the refuge would not be closed. Additional hunting programs on the refuge would increase disturbance to wildlife; however, this is expected to have minimal effects. Large portions of the refuge would remain closed to hunting, providing adequate rest areas for wildlife.

With the removal of the LWRRA dam, hunting opportunities likely would change at the LWRRA. Reduction in surface water would increase lowland habitats that likely would benefit white-tailed deer and pheasants. Weedy habitats following the dam breach likely would create additional hunting opportunities in the future. Even though the reservoir would not be present, duck hunting on the recreation area may improve if beavers construct dams within the reformed stream channel.

**Fishing:** Removal of the LWRRA reservoir would eliminate most recreational fishing at the LWRRA. Most game fish species would not be present within the river at population levels that support a reliable fishery. Additionally, the composition of fish species on the LWRRA would change as the system is changed from a lake into a stream.

Fishing opportunities on other areas of the refuge would remain the same as in alternative B.

**Trapping:** Trapping would be used as a management tool. Its application would be determined on a year-by-year assessment of needs. In addition to species under alternative B, mink and weasel also would be trapped. Maximizing ground nesting bird and pelican production would be two primary goals of trapping. Additionally, trapping would be used to minimize damage to refuge infrastructure such as dikes.

**Wildlife Observation, Wildlife Photography, Environmental Education, and Interpretation:**

Alternative C is the same as alternative B. Additional opportunities for wildlife observation, wildlife photography, and hiking, along with improved signing, updated brochures, and restored information kiosks would provide visitors with a higher quality visitor experience. Increased wildlife viewing opportunities would result in higher disturbance to wildlife on the refuge. Increased disturbance is expected to have minimal effect on wildlife.

**Little White River Recreation Area:** Breaching of the dam at the LWRRA would eliminate boating and swimming opportunities at the recreation area. Picnicking, camping, and other current uses would continue to be permitted; however, picnicking activities would likely decrease. As a result, wildlife would likely benefit from the removal of the dam. Wildlife disturbance in the recreation area would decrease due to decreased recreational activity.

The created wetlands in Pool 10 would be significantly impacted by this action. Water from the LWRRA could no longer be diverted to this unit. The only way to fill these units would be from runoff from snowmelt or rains. The unit could not be filled reliably for spring or fall migrations and likely would be managed as a wet meadow habitat. Community relations and the partnership with Ducks Unlimited likely would suffer with the abandonment of this created wetland.



Sunset

USFWS, Tom Koerner

## Socioeconomic Impacts

Alternatives A and B likely would have a short-term positive impact on the local economy if Phase III Project on the LWRRA is completed. Alternatives B and C are expected to increase visitation slightly as a result of additional trails, signage, and hunting opportunities. This effect is not expected to significantly impact the local area. Alternative C does call for the addition of three positions to the refuge staff; however, this is expected to minimally affect the local economy.

## 5.3 Cumulative Impacts

Cumulative effects are the potential effects of the Action or No Action alternatives in combination with past, present, and future actions. NEPA regulations define cumulative effects “as the impact on the environment which results from the

incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant actions taking place over time” (40 CFR 1508.7).

The cumulative effects analysis for this project is based on reasonably foreseeable future actions that, if implemented, would contribute to the effects of the Action or No Action alternatives. No reasonably foreseeable actions are anticipated.

Impacts will be monitored during CCP implementation, and implementation over an extended period will reduce the likelihood of negative cumulative impacts.

NEPA requires mitigation measures when the environmental analysis process detects possible significant impacts to habitats, wildlife, or the human environment. All activities proposed under alternative B are not expected nor intended to produce significant levels of environmental impacts that would require mitigation measures. Nevertheless, the CCP will contain the following measures to preclude significant environmental impacts from occurring:

- Federally listed species will be protected from intentional or unintended impacts by having activities banned and/or restricted where these species occur.
- Hunting safety regulations will be closely coordinated with and enforced by personnel from the refuge and SDGFP.
- All proposed activities will be regulated to reduce potential impacts to wildlife and plant species, especially during their sensitive reproductive cycles.
- Monitoring protocols will be established to determine goal achievement levels and possible unforeseen impacts to resources for application of adaptive management to ensure wildlife and habitat resources, as well as the human environment, are preserved.

The CCP can be revised and amended after 5 years of implementation, for application of adaptive management to correct unforeseen impacts that occur during the first years of the plan.

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**Table 3. Comparison of impacts and benefits of management alternatives**

<i>Issue</i>	<i>Alternative A Current management— no action</i>	<i>Alternative B Integrated Restoration proposed action</i>	<i>Alternative C Comprehensive Restoration</i>
Habitats and Wildlife	<p><i>Waterfowl:</i> No change to habitat dominant focus would remain on migratory habitats; and grasslands managed for upland nesting at current level.</p> <p><i>Uplands:</i> Management activities would continue at current levels. Migratory birds benefit from improved habitat and invasive plant control at current levels.</p> <p><i>Nebraska Sandhills:</i> No change. Understanding the ecological processes that make up the sandhills would not receive the highest priority. Species diversity would remain the same.</p> <p><i>Wet Meadows:</i> Improved habitat for migratory birds.</p> <p><i>Prairie dogs:</i> Maximum benefit to prairie dogs and burrowing owls. A limited amount of prairie restoration is completed.</p> <p><i>Trumpeter swan:</i> No change. Current levels of swan populations would remain the same and management activities would focus on migratory habitat.</p> <p><i>American white pelican:</i> No change. Maintain colonies through high water management in Pool 9.</p>	<p><i>Waterfowl:</i> Increased waterfowl numbers during spring and fall migrations due to increased food resources and more acres of shallowly flooded wetlands.</p> <p><i>Uplands:</i> Improved habitat for grassland-dependent species. Nesting success for grassland nesting birds would improve because of increased contiguous habitat.</p> <p><i>Nebraska Sandhills:</i> The resources would benefit from increased knowledge gained from other Nebraska Sandhills refuges. Improved species diversity.</p> <p><i>Wet Meadows:</i> Improved habitat for water birds and other migratory birds.</p> <p><i>Prairie dogs:</i> Control outside of socially and biologically compatible zones. Large-scale prairie restoration is conducted, benefiting grassland species. Less habitat for species dependent of short vegetative communities typical of prairie dog communities.</p> <p><i>Trumpeter swan:</i> Increased habitat for nesting. Reduction of lead would benefit the swans by reducing opportunities for ingestion.</p> <p><i>American white pelican:</i> Pelicans benefit from increased pelican production by maintaining colonies through water and predator management.</p>	<p><i>Waterfowl:</i> Localized increase in habitat would be managed to achieve waterfowl numbers resulting in less food sources and areas of shallowly flooded wetlands.</p> <p><i>Uplands:</i> Reductions in woodland-dependent species. Maximum benefit for grassland-dependent species.</p> <p><i>Nebraska Sandhills:</i> Improved species diversity as a result of increased grazing and fire management activities.</p> <p><i>Wet Meadows:</i> Same as B.</p> <p><i>Prairie dogs:</i> Prairie dogs would be controlled on all areas of refuge deemed socially incompatible with area residences and adjacent private rangelands resulting in a decrease in prairie dog acreage. Large-scale prairie restoration is conducted, benefiting grassland species.</p> <p><i>Trumpeter swan:</i> Water management would emphasize deep water in several units to maximize open water available in winter.</p> <p><i>American white pelican:</i> The birds benefit from maximized pelican production through water level management and predator management.</p>

**Table 3. Comparison of impacts and benefits of management alternatives**

<i>Issue</i>	<i>Alternative A Current management— no action</i>	<i>Alternative B Integrated Restoration proposed action</i>	<i>Alternative C Comprehensive Restoration</i>
	<p><i>Invasive plants:</i> Continue to decrease as IPM practices provide control. Continued increase of invasive plants in grasslands.</p> <p><i>Threatened and Endangered Species:</i> All threatened and endangered species would be surveyed for and if detected protection measures implemented.</p> <p><i>Predators:</i> No change in predator populations.</p>	<p><i>Invasive plants:</i> Continue to decrease as IPM practices provide control. Control provided through farming in exotic grass stands. Reseeding of high diversity grassland along with continued IPM reduces chance for re-invasion.</p> <p><i>Threatened and Endangered Species:</i> Same as alternative A, plus active restoration of blowout penstemon would be pursued.</p> <p><i>Predators:</i> Reduction in coyote, striped skunk, and raccoon populations in developed wetlands during the nesting season.</p>	<p><i>Invasive plants:</i> Same as alternative B.</p> <p><i>Threatened and Endangered Species:</i> Same as alternative B.</p> <p><i>Predators:</i> Same as alternative B, plus weasel and mink populations also would be reduced in developed wetlands.</p>
Water Management	<p><i>Water levels:</i> No change. Drawdowns of most units through the summer. Raise water levels fall through spring. Emphasis placed on migratory habitat for shorebirds and waterfowl.</p>	<p><i>Water levels:</i> Higher water levels in some units would benefit species such as muskrats and increase wetland birds and fish habitat.</p>	<p><i>Water levels:</i> Same as alternative B, plus increasing open water during winter in some units would reduce available migratory bird habitat and increase wintering habitat for species such as trumpeter swans and Canada geese. Minimal impacts on wetland vegetation and wildlife.</p>
Lake Creek Hydrology	<p>No change.</p>	<p>Wetlands south of Lake Creek are restored, benefiting wetland species.</p>	<p>Coordination with adjacent landowners needed to prevent impacts to haying or grazing operations.</p>
Public Use	<p><i>Hunting:</i> No change to current levels, seasons, and locations.</p> <p><i>Fishing:</i> No change to current levels, seasons, and locations.</p>	<p><i>Hunting:</i> Increased opportunities for hunting as additional species are opened to hunting. Initial increases in white-tailed deer and pheasant numbers as fields are farmed for grassland restoration. Decreased opportunities adjacent to the refuge as a result of road closures and not allowing retrieval of game on the refuge. Increased quality and safety for hunters as a result of same.</p> <p><i>Fishing:</i> Same as A. Use of lead sinkers banned.</p>	<p><i>Hunting:</i> Increased opportunities as in B. Road ditches would not be closed and unarmed retrieval would be allowed.</p> <p><i>Fishing:</i> Reduction in fishing due to breaching of LWRRA dam.</p>

