

# Environmental Consequences





# Chapter Four

## ENVIRONMENTAL CONSEQUENCES



THE CEQ REGULATIONS that implement the procedural provisions of the *National Environmental Policy Act* (40 Code of Federal Regulations [CFR] 1502) require that environmental documents discuss the environmental impacts (both adverse and beneficial) of a proposed federal action, feasible alternatives to that action, and any adverse environmental effects that cannot be avoided if a proposed action is implemented. In this case, the proposed federal action would be the adoption of a general management plan for the Ice Age Complex at Cross Plains.

The National Park Service (NPS) Director's Order 12: *Conservation Planning, Environmental Impact Analysis, and Decisionmaking* and its accompanying Handbook require that impacts on park resources be analyzed in terms of their context, duration, and intensity. It is crucial for the public and decision makers to understand the implications of those impacts in the short and long term, cumulatively, and within context, based on an understanding and interpretation by resource professionals and specialists.

This chapter analyzes the environmental impacts of implementing any one of the five alternatives proposed in this document. For each impact topic, there is a description of the methods and assumptions used for the impact analysis. The impact analysis discussions are organized by resource topic, followed by each alternative under each topic. Table 7 in chapter 2 provides a summary of the impacts.



*Bird tracks in the snow.*



## DEFINITIONS FOR EVALUATING EFFECTS

The impact discussion for each resource topic describes the types of impacts (same as the term “effects”) that would result from taking no action or implementing any of the four action alternatives; those effects are described according to the definitions shown below.

### Types of Effects

**Beneficial Effects.** These effects would result in a change that moves a resource toward its desired condition.

**Adverse Effects.** These effects would result in a change that moves a resource away from its desired condition.

**Direct Effects.** These effects would be caused by the action and occur at the same place and time as the action.

**Indirect Effects.** These effects would also be caused by the action, would occur later in time, and would be further removed in distance but would still be reasonably foreseeable; or the response of the target resource would be triggered by the reaction of another resource to the action.

**Cumulative Effects.** These effects would result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions.

### Duration of Effects

**Short-term Effects.** These effects would be temporary, lasting a year or less, such as effects associated with construction.

**Long-term Effects.** These effects would last more than one year and could be permanent.

### Intensity of Effects

“Intensity” refers to the severity of effects or the degree to which an action would adversely or beneficially affect a resource. The intensity definitions are presented in each resource section because they vary by resource topic.

## PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS ON OR IN THE VICINITY OF THE ICE AGE COMPLEX

Cumulative actions are those that have additive impacts on a particular environmental resource. It is irrelevant who takes these actions (that is, they are not confined to NPS or even federal activities), or whether they took place in the past, are taking place in the present, or could take place in the reasonably foreseeable future. The Council on Environmental Quality (CEQ) interprets the *National Environmental Policy Act* (NEPA) and CEQ’s NEPA regulations on cumulative effects as requiring analysis and a concise description of the identifiable present effects of past actions to the extent they are relevant and useful in analyzing whether the reasonably foreseeable effects of the agency’s proposed action and alternatives could have a continuing, additive, and significant relationship to those effects.

The current or reasonably foreseeable future actions considered for the purpose of assessing cumulative effects in this chapter include

agricultural activities

construction of a bike path by the town of Cross Plains along U.S. Highway 14, with a possible decision by NPS staff to provide a route through the complex to connect the city of Middleton to the town of Cross Plains

new residential development

snowmobiling outside the complex boundaries

events, such as the Ford Ironman (whose course currently runs through the complex)

road maintenance activities such as salting for ice melt, which results in runoff and impacts on water quality

## SOIL RESOURCES

### Analysis Methodology

This impact analysis is based on the knowledge of the soil types at the complex and also how development and other land use changes would impact soils. Soils could be adversely impacted by human activity in two ways: either by increased activity, which would cause soil compaction along trails, parking areas, and other developed areas; or by disturbance of vegetation cover and forest duff on the soil surface, which could lead to soil erosion. Disturbance of vegetation is a potential problem, particularly on steep slopes in the Cross Plains gorge and along the edge of Black Earth Creek valley.

“Intensity” refers to the severity of effects or the degree to which an action would adversely or beneficially affect a resource. The intensity levels used to evaluate impacts on soils are listed below. The intensity levels below apply only to adverse impacts. When the term “beneficial” is used in this analysis to describe impacts, those impacts would always be negligible and long term. In this case “beneficial” refers to the avoidance of loss of productive soil as opposed to increasing the amount of soil. The formation of soil is a complex process that can take more than a thousand years to produce just a single inch of soil. During the process rocks, minerals, and other parent materials are weathered. The resulting soil varies, depending on the degree of weathering (a function of climate); the duration of weathering (a function of time); the site-specific biological activity; and landscape position (a function of topography). Because of this long, natural process, the activities that would take place under any of the alternatives would either adversely affect soil in a way that would take generations to reverse or avoid adverse impacts that would otherwise be expected (called “beneficial impacts” in this analysis).

**Negligible.** Soil compaction or vegetation disturbance that creates erosion might occur, but the change would be so small that it would not be measurable.

**Minor.** Soil compaction or vegetation disturbance that creates erosion would occur and would be measurable but would have little consequence.

**Moderate.** Soil compaction or vegetation disturbance that creates erosion would occur and would be measurable, resulting in small-scale consequences that could be remedied.

**Major.** Soil compaction or vegetation disturbance that creates erosion would be substantial at certain locations and would not be easily remedied.

### Alternative 1: No Action, Continuation of Current Management — Direct and Indirect Impacts on Soils

It is expected that alternative 1 would have some beneficial impacts on soils due to conversion of farm land to prairie. Some soils would be removed from cultivation and converted to their presettlement condition (mostly prairie). The ability to farm the prime soils today would be curtailed, and the soils would be retained for the future because the deep roots of prairie grasses are very effective at holding soil.

The intensity of impacts on soils caused by trail construction would be limited to minor ground disturbance within the narrow tread corridor. The potential impacts on soils from constructing and using the trail would be mitigated to a negligible level with proper layout of the trail on the landscape (for example, on slopes less than 10%), erosion control techniques, planking or bridges, and trail monitoring. The proper erosion-control techniques that would be employed, as necessary, include sidehill construction, waterbars, and drainage dips. Soils that are particularly unsuitable, such as in poorly

drained areas, would be avoided. If the trail must cross a wet area, planking or bridges would minimize the negative impacts from this crossing. Volunteer trail maintainers would monitor trails to help identify any cumulative erosion problems so that appropriate erosion-control actions could be taken. The National Park Services, in conjunction with the Wisconsin Department of Natural Resources and the Ice Age Park and Trail Foundation, has developed a handbook on trail design, construction, and maintenance for the Ice Age National Scenic Trail. This handbook is used by all volunteer trail builders. The Ice Age Trail Alliance also has a “mobile skills crew” that trains volunteers to build sustainable trails with minimal environmental impacts.

The present land use in the Ice Age Complex would continue to be a mix of row crop agriculture (corn and soybeans), forest land, and oak savanna. When agricultural fields are plowed, soil surface is disturbed, and there is wind erosion of silt particles and organic particles off those surfaces. There is also water erosion from the fields. There is similar land use throughout Dane County. The impacts of agriculture on erosion would be minor to moderate, depending on numerous factors, such as the amount of tillage and use of grass strips to limit erosion in critical spots.

The Ice Age National Scenic Trail would still be built under this alternative but other trails would not. Over time, unauthorized trails (paths created by visitors, rather than formally planned and constructed) would proliferate. Since there would be no plan providing comprehensive guidance on resource management, resources would likely be managed inconsistently. There is currently minimal impact from erosion and compaction in forest and oak savanna areas under present use, with the exception of the Cross Plains gorge and the moraine between the Cross Plains gorge and Cleveland Road. There is currently minor impact on the trail on the moraine; impact would remain minor if usage

is limited to hiking. If there is no enforcement of restrictions on the use of this trail, and if use by horseback riders were to increase, there would be a moderate impact due to compaction. There is compaction at small parking areas off Mineral Point Road and Timber Lane, but this land has already been disturbed, and there would be minimal further compaction.

The steep walls of Cross Plains gorge attract visitors, and human activity has the potential to damage both forest duff cover and soils, which could lead to substantial erosion problems. While the steep walls of Black Earth Creek valley are also susceptible to erosion if vegetation is disturbed, under present use, the slopes are not visited as much as those of the Cross Plains gorge. As time passes, however, this site could become better known, and residential development might increase in the area. If increased use is not accompanied by measures to protect these areas, such as a designed and delineated trail, damage to the steep walls would be expected. There could potentially be moderate to major erosion impacts if uncontrolled human activity in the vicinity of Cross Plains gorge and Black Earth Creek valley increased.

### Alternative 2: Ecological Restoration Emphasis — Direct and Indirect Impacts on Soils

Alternative 2 would have the same beneficial impacts on soils as expressed in the first paragraph under alternative 1.

This alternative would contribute to increased trail usage, compared to alternative 1 (no action), and would therefore likely have a minor impact on soils from compaction. There would be moderate impact on soils from compaction in parking areas, but these would not be large areas and would likely be in the same places as in alternative 1. Paving the parking lots would contribute to increased runoff and would require proper management.

The installation of trails near, but not in, Cross Plains gorge would minimize impact on the walls of the gorge. Erosion impacts in the gorge itself would be negligible because the public would be directed (with trail design and signage) to stay off the walls of the gorge. Because the complex would be managed from an off-site location, there would be little ability to enforce this direction. If the public does not comply with the direction to stay off the gorge walls, there could be moderate adverse impacts on soil and the forest duff covering the wall until the park has the capacity to stop this from happening, given the minimal off-site staff.

### Alternative 3: Interpretation and Education Emphasis — Direct and Indirect Impacts on Soils

Alternative 3 would have the same beneficial impacts on soils as expressed in the first paragraph under alternative 1.

The construction of buildings and a surfaced trail to Cross Plains gorge could potentially have a temporary moderate adverse impact on soils from erosion and compaction in areas subject to construction. Once construction is completed, there would still be some potential for minor compaction from visitor use, but the minor impacts would be confined to areas around buildings and parking lots. The on-site interpretation and maintenance facilities would potentially focus some visitor foot traffic to the interpretation building and away from the steep walls of Cross Plains gorge and steep slopes at the edge of Black Earth Creek valley. This would reduce the potential for soil compaction and erosion from uncontrolled human activity, resulting in minor to moderate beneficial impacts on those areas.

### Alternative 4: Outdoor Recreation Emphasis — Direct and Indirect Impacts on Soils

Alternative 4 would have the same beneficial impacts on soils as expressed in the first paragraph under alternative 1.

The construction of buildings and a surfaced trail to Cross Plains gorge, as well as a bridge across the gorge, could potentially have a temporary moderate adverse impact on soils from erosion and compaction in areas subject to construction. There would be additional trails across the site that would create moderate compaction in the vicinity of the trail. Once the landscape is stabilized following construction, compaction from visitor foot traffic would be confined to the areas around buildings and parking lots, which could potentially result in minor adverse impacts. The addition of a bicycle trail from the visitor center to a parking lot north of Black Earth Creek would increase visitor activity in a sensitive area, resulting in a moderate adverse impact on the steep slopes facing the creek, especially along the trail. The on-site interpretation and maintenance facilities would potentially focus some visitor foot traffic to the interpretation building and away from the steep walls of Cross Plains gorge and steep slopes at the edge of Black Earth Creek valley. This would reduce the potential for soil compaction and erosion from uncontrolled human activity, resulting in minor to moderate beneficial impacts on those areas.

### Alternative 5: Preferred Alternative — Direct and Indirect Impacts on Soils

Alternative 5 would have the same beneficial impacts on soils as expressed in the first paragraph under alternative 1.

The construction of buildings and a surfaced trail to Cross Plains gorge could potentially have a moderate adverse impact on soils from erosion and compaction during construction. There would be additional trails across the site that would create moderate compaction in the vicinity of the trail. Once the landscape is stabilized following construction, compaction from visitor foot traffic would be confined to the areas around buildings and parking lots, which could potentially result in minor adverse impacts. The on-site interpretation and

maintenance facilities would potentially focus some visitor foot traffic to the interpretation building and away from the steep walls of Cross Plains gorge and steep slopes at the edge of Black Earth Creek valley. This would reduce the potential for soil compaction and erosion from uncontrolled human activity, resulting in minor to moderate beneficial impacts on those areas.

### All Alternatives — Cumulative Impacts on Soils

The soils in much of the Ice Age Complex have likely been altered by past activities (such as agricultural practices). Some soils on lands adjacent to the complex could be lost or modified in the future if the town of Cross Plains builds a bike path along U.S. Highway 14. The decision could be made by NPS staff to provide a route through the complex to connect the city of Middleton to the town of Cross Plains. These actions would result in cumulative effects on soils in localized areas.

**Alternative 1: No Action, Continuation of Current Management.** If impacts of the above-described developments were added to the continuing minor to major adverse impacts under the no-action alternative, there would be a long-term negligible to major adverse cumulative impact on area soils.

**Alternative 2: Ecological Restoration Emphasis.** If impacts of present or future actions were added to the negligible to moderate adverse impacts under alternative 2, there would be a long-term minor to moderate adverse cumulative impact on area soils.

**Alternative 3: Interpretation and Education Emphasis; Alternative 4: Outdoor Recreation Emphasis; and Alternative 5: Preferred Alternative.** If impacts of present and future actions were added to the minor to moderate adverse impacts under alternatives 3, 4, and 5, there would be long-term minor to moderate adverse cumulative impacts on area soils.

## WATER QUALITY

Groundwater could potentially be contaminated through openings in dolomite rock. Of particular concern is the area of Shoveler Sink and Coyle Pond, which both sit on the surface water divide between Black Earth Creek, Sugar River, and Yahara River basins. The sink and pond are closed basins with no surface water outflow. The closed basins collect water from adjoining hillslopes and are areas of concentrated groundwater recharge. Normally, this takes place slowly through sediment at the bottom of the ponds. At times of high water levels, they drain into a sinkhole in fractured limestone, thus potentially introducing contaminants into the groundwater system. The sinkhole allows surface water to rapidly enter the groundwater system without the benefit of “filtering” out contaminants. There is possibly a small cave system somewhere beneath this part of the complex.

### Analysis Methodology

This impact analysis is based on knowledge of water resources and flow patterns at the Ice Age Complex. The analysis focuses on groundwater impacts because, as described in chapter 3, nearly all of the complex is a groundwater recharge area, meaning surface water goes into the groundwater system. All impacts on groundwater also apply to surface water (such as Coyle Pond, Shoveler Sink, and Black Earth Creek).

The intensity levels used to evaluate impacts on water quality are provided below.

**Negligible.** Changes would be either barely detectable or would have effects that would be considered slight and localized.

**Minor.** An action would have measurable effects on water quality in a localized area.

**Moderate.** An action would have clearly detectable effects on water quality and would potentially affect natural ecological processes.

**Major.** An action would have substantial effects on water quality and would potentially affect natural ecological processes.

### Alternative 1: No Action, Continuation of Current Management — Direct and Indirect Impacts on Water Quality

At this time, the small basin that collects surface water that flows into Coyle Pond is partly used for row crops. Whatever tillage techniques are used, the application of herbicides and fertilizer has the potential to contaminate groundwater by passing through the limestone beneath the sinkhole. At this time land around Shoveler Sink is not in intensive agriculture, and chemicals are not being applied to the fields, so there is currently negligible adverse impact from agricultural runoff.

### Alternative 2: Ecological Restoration Emphasis — Direct and Indirect Impacts on Water Quality

Any adverse impact on groundwater would be negligible because the small basin that collects surface water flowing into Coyle Pond would be put back into presettlement vegetation under this alternative. In fact, over time, agricultural chemicals would not enter the groundwater system through the sink, so this would likely have a beneficial effect on groundwater quality, but the amount of this effect cannot be quantified.

### Alternative 3: Interpretation and Education Emphasis; Alternative 4: Outdoor Recreation Emphasis; and Alternative 5: Preferred Alternative — Direct and Indirect Impacts on Water Quality

These alternatives envision an indoor facility with modern amenities (such as indoor plumbing) for visitors, so there would be a need for a new well and septic system near the core area of the property. These would be built to appropriate codes and would therefore have a negligible impact on groundwater.

### Cumulative Impacts on Water Quality

Water quality in much of the Ice Age Complex is generally in good condition and has not been greatly altered by past activities (such as agricultural practices).

The small basin that collects surface water that flows into the Coyle Pond is partly used for row crops at this time. None of the alternatives would restrict land use in this area, so it could remain in intensive agriculture. Whatever tillage techniques are used, the application of herbicides and fertilizers could result in a moderate potential to contaminate groundwater by passing through the limestone beneath the sinkhole. Land around Shoveler Sink is not in intensive agriculture, and chemicals are not being applied to the fields, so there would be minimal impacts from agricultural runoff. If land use were to remain the same, then any impacts from the alternatives, combined with agricultural activities, would potentially result in negligible cumulative impacts. Impacts on water quality from road maintenance activities, such as road salt runoff, would continue.

Water quality could be adversely affected by potential future new development on adjacent lands. The Ice Age National Scenic Trail would eventually be developed through the complex. The possible future actions outside the complex boundary could affect water quality in Black Earth Creek and possibly Shoveler Sink.

**Alternative 1: No Action, Continuation of Current Management.** If potential impacts from the above activities were added to the continuing negligible adverse impacts under the no-action alternative, there would be long-term negligible adverse cumulative impacts on water quality, depending on the type and quantity of pollutants that enter the waters within the complex. However, the level of impacts added by the no-action alternative would be relatively small compared to the impact from pollutants being added from actions outside the complex boundary.

Alternative 2: Ecological Restoration Emphasis. If impacts from the above activities were added to the negligible adverse impacts on water quality under alternative 2 (negligible because of the conversion of agricultural lands back to presettlement vegetation), there would be long-term negligible to moderate adverse cumulative impacts on the complex's water quality, depending on the type and quantity of pollutants that might enter the waters in the complex. However, the level of impacts added by alternative 2 would be relatively small compared to the impact from pollutants that could potentially be added from actions outside the complex boundary.

**Alternative 3: Interpretation and Education Emphasis; Alternative 4: Outdoor Recreation Emphasis; and Alternative 5: Preferred**

**Alternative.** If impacts from future actions were added to the negligible to moderate impacts under alternatives 3, 4, and 5 (due to no restrictions on land use), there would be negligible to moderate adverse cumulative impacts on water quality, depending on the type and quantity of pollutants that could potentially enter the waters within the complex. However, the level of impacts added by each of the three alternatives would be relatively small compared to the impact from pollutants that could potentially be added from actions outside the complex boundary.

## SOUNDSCAPES

### Analysis Methodology

As mentioned in chapter 3, there is abundant natural quiet in areas of the complex furthest from the roads (U.S. Highway 14, Timber Lane, Old Sauk Pass, and Mineral Point Road) that surround and traverse it. One of the fundamental resources of the complex is “the opportunity for people, particularly those in the adjacent urban area, to experience immersion into a large, natural landscape.” Therefore, in this analysis, activities in the alternatives that would remove or lessen

unnatural sounds would be beneficial to the soundscape, and activities that would add or increase unnatural sounds would result in adverse impacts. Note that traffic noise on U.S. Highway 14, Timber Lane, and Mineral Point Road would likely continue to grow regardless of the future direction of the complex. The volume of traffic on these roads is related much more strongly to land use patterns in the region (suburban and exurban development) than to land use in the complex. The analysis below refers only to the soundscape impacts that might result from the actions that the park would take under each alternative.

The intensity levels used to evaluate impacts on the soundscape are provided below.

**Negligible.** There would be no audible impacts on the soundscape. Impacts would be of short duration and well within natural fluctuations. Noise would not affect appropriate transmission of natural sounds.

**Minor.** Impacts on the soundscape would be slight but audible. Impacts would likely not be outside the range of natural variability. Noise would be expected to have short-term impacts on the soundscape or short-term impacts on appropriate transmission of natural sounds.

**Moderate.** Impacts on the soundscape would be clearly audible. Impacts would sometimes be outside the range of natural variability. Noise would not be expected to have long-term impacts on the soundscape or any long-term impacts on appropriate transmission of natural sounds.

**Major.** Impacts on the soundscape would be clearly audible and would be well outside the range of natural variability. Noise would have long-term impacts on the soundscape or long-term impacts on appropriate transmission of natural sounds.

### Alternative 1: No Action Alternative, Continuation of Current Management — Direct and Indirect Impacts on the Soundscape

Due to minimal development of visitor amenities, this alternative would be expected to have the lowest level of visitation out of the five alternatives and therefore the least visitor-created noise. It seems likely that, overall, there would be negligible impacts on the soundscape.

### Alternative 2: Ecological Restoration Emphasis — Direct and Indirect Impacts on the Soundscape

This alternative would increase trail usage over the no-action alternative, which could potentially result in more visitor-generated noise. In the short term, there would be noise generated from the removal of the structures at the core of the property, but those moderate adverse impacts on the soundscape would be temporary. Over the long term, most of the complex would be managed to allow visitors “a direct sensory experience of natural resources” (refer to table 2 in chapter 2 for the natural experience management area description for desired visitor experience), indicating negligible impacts on the soundscape.

### Alternative 3: Interpretation and Education Emphasis — Direct and Indirect Impacts on the Soundscape

Alternative 3 would result in a considerable increase in visitation compared to the no-action alternative, which could lead to more visitor-generated noise. In the short term, there would be noise generated from the renovation of the structures at the core of the property, but these moderate adverse impacts on the soundscape would be temporary. Over the long term, most of the complex would be managed for landscape interpretation, under which the management prescription (refer to table 2 in chapter 2) for visitor experience would concentrate on offering views of the

results of glaciation instead of offering direct sensory experience of natural resources, as the natural experience management area would, indicating the potential for minor adverse soundscape impacts.

### Alternative 4: Outdoor Recreation Emphasis — Direct and Indirect Impacts on the Soundscape

Alternative 4 could result in a considerable increase in visitation, which would lead to considerably more visitor-generated noise. There would be noise generated from the construction of structures at the core of the property, but these moderate adverse impacts on the soundscape would be temporary. The bike path across the complex could generate more visitors and more noise per visitor than the hiking trails under the other alternatives. Most of the complex would be managed for landscape interpretation or for an expanded recreational experience, under which the management prescription for visitor experience would concentrate on offering views of the results of glaciation and the opportunity for low-impact recreation. However, there would also be a large natural experience area at the corner of two of the major roads on the edge of the complex. Overall, adverse impacts on the soundscape would be minor.

### Alternative 5: Preferred Alternative — Direct and Indirect Impacts on the Soundscape

Impacts on the soundscape under the preferred alternative would be very similar to alternative 4, albeit slightly less because there would not be a bike path across the complex under this alternative. Overall, adverse impacts on the soundscape would be negligible to minor.

### Cumulative Impacts on the Soundscape

Noise from outside the complex has minimally affected the complex's soundscape in the past and would continue to affect the soundscape, but perhaps at greater levels as the population continues to grow and traffic increases on roads adjacent to and through the complex. Depending on the location in the complex, common human-caused sounds (such as vehicles on roads, maintenance activities, and agricultural activities) would continue to be heard. In the winter, noise from snowmobiles passing by the complex would also continue to be heard. It is possible that events, such as the Ford Ironman, would continue to occur (the Ford Ironman course currently runs through the complex and generates substantial noise). In addition, new residential development could occur on lands adjacent to the complex, which would result in noise during and after the construction period in these areas.

These activities could produce intermittent to long-term (occurring every year) negligible to moderate adverse cumulative impacts from noise. The adverse impacts would vary depending on the type of noise, duration, and location.

**Alternative 1: No Action, Continuation of Current Management.** If impacts of the above actions were added to the negligible adverse impacts under the no-action alternative, there would be long-term negligible to moderate adverse cumulative impacts on the soundscape. However, the cumulative impacts would primarily occur at certain times of the year — either seasonally or on weekends. The continuation of activities under the no-action alternative would result in a minimal contribution to the overall cumulative impacts.

**Alternative 2: Ecological Restoration Emphasis.** If impacts of the above actions were added to the negligible to moderate adverse impacts under alternative 2, there would be long-term negligible to moderate adverse cumulative impacts on the soundscape. However, these

cumulative impacts would primarily occur at certain times of the year — either seasonally or on weekends. The proposed activities under alternative 2 would result in a minimal contribution to overall cumulative impacts.

**Alternative 3: Interpretation and Education Emphasis and Alternative 4: Outdoor Recreation Emphasis.** If impacts of the above actions were added to the minor to moderate adverse impacts under alternatives 3 and 4, there would be long-term minor to moderate adverse cumulative impacts on the soundscape. However, these cumulative impacts would primarily occur at certain times of the year — either seasonally or on weekends. The proposed activities under alternatives 3 and 4 would result in a minimal contribution to overall cumulative impacts.

**Alternative 5: Preferred Alternative.** If impacts of the above actions were added to the negligible to moderate adverse impacts under alternative 5, there would be long-term minor to moderate adverse cumulative impact on the soundscape. However, these cumulative impacts would primarily occur at certain times of the year — either seasonally or on weekends. The proposed activities under alternative 5 would result in a minimal contribution to overall cumulative impacts.

## VEGETATION AND WILDLIFE

As noted in chapter 3, the Ice Age Complex comprises three ecological landscapes: Western Coulee and Ridges, Central Sand Hills, and Southeast Glacial Plains. Although this combination of landscapes in the complex indicates a variety of native vegetation, southern dry-mesic forest dominated the site before European settlement.

The NPS *Organic Act*, which directs parks to conserve wildlife unimpaired for future generations, is interpreted by the agency to mean that native animal life should be protected and perpetuated as part of the park's natural ecosystem. Natural processes are relied

on to control populations of native species to the greatest extent possible, otherwise, they are protected from harvest, harassment, or harm by human activities. According to *NPS Management Policies 2006* (section 4.1), maintenance of natural ecosystems is a priority in parks. Management goals for wildlife include maintaining components and processes of naturally evolving park ecosystems, including natural abundance, diversity, and the ecological integrity of plants and animals.

### Analysis Methodology

This impact analysis is based on knowledge of native and current vegetative conditions and wildlife habitat at the Ice Age Complex (as described in chapter 3), as well as an understanding of the types of activities (such as visitor activity, construction, and resource management) in parks that affect vegetation and wildlife. This general management plan / environmental impact statement does not include site-specific actions because the desired resource conditions and visitor experience, as described in the management area prescriptions and applied to each alternative, inform the impact assessment.

The intensity levels used to evaluate impacts on vegetation and wildlife are provided below.

**Negligible.** Impacts would have no measurable or perceptible changes in plant community size, integrity, or continuity. There would be no observable or measurable impacts on native species, their habitats, or the natural processes sustaining them. Impacts would be of short duration and well within natural fluctuations.

**Minor.** Impacts would be measurable or perceptible but would be localized within a relatively small area. The overall viability of the plant community would not be affected and, if left alone, would recover. Impacts would be detectable, but they would not be expected to be outside the natural range of variability of key ecosystem processes and would not be expected to have any long-term effects on native

species, their habitats, or the natural processes sustaining them. Population numbers, population structure, genetic variability, and other demographic factors for species might have small short-term changes, but long-term characteristics would remain stable and viable. Sufficient habitat would remain functional to maintain viability of all species.

**Moderate.** Impacts would cause a change in the plant community (such as abundance, distribution, quantity, or quality); however, the impact would remain localized. Animals are present during particularly vulnerable life stages, such as migration, breeding, or juvenile stages. Mortality or interference with activities necessary for survival can be expected on an occasional basis but is not expected to threaten the continued existence of the species in the park unit. Impacts on native species, their habitats, or the natural processes sustaining them would be detectable, and they could be outside the natural range of variability for short periods of time. Population numbers, population structure, genetic variability, and other demographic factors for species might have short-term changes but would be expected to rebound to pre-impact numbers and remain stable and viable in the long term.

**Major.** Impacts on the plant community would be substantial, highly noticeable, and permanent. Impacts on native species, their habitats, or the natural processes sustaining them would be detectable, and they would be expected to be outside the natural range of variability for long periods of time or be permanent. Population numbers, population structure, genetic variability, and other demographic factors for species might have large short-term declines, with long-term population numbers significantly depressed. Key ecosystem processes might be disrupted in the long term or permanently. Loss of habitat might affect the viability of at least some native species.

### Alternative 1: No Action, Continuation of Current Management — Direct and Indirect Impacts on Vegetation and Wildlife

There would be no comprehensive plan to guide management of the complex under alternative 1, so vegetation and wildlife habitat would not be consistently managed. Restoration goals (such as for the oak savanna or prairie) and activities (such as prescribed burning or mechanical invasive removal) would be decided on a case-by-case basis as funding and/or volunteer labor allows. Since there would be few defined trails, there would be a risk of vegetation trampling throughout the site from the creation of social trails. However, since the site would not be advertised, there would be no facilities to accommodate visitors, and user capacity management allows park managers a number of strategies to mitigate this risk; thus, adverse vegetation impacts from trampling would be negligible. It seems likely that, considering the site as a whole, there would be negligible impacts on vegetation and wildlife.

### Alternative 2: Ecological Restoration Emphasis — Direct and Indirect Impacts on Vegetation and Wildlife

Most of the complex would be managed for natural experience, in which “Natural resources are managed to approximate presettlement (circa 1830) conditions. To the extent possible, natural ecological processes sustain the integrity of these resources” (refer to the natural experience management area prescription for desired resource conditions in chapter 2, table 2). This management prescription would have a moderate beneficial impact on vegetation and wildlife.

### Alternative 3: Interpretation and Education Emphasis — Direct and Indirect Impacts on Vegetation and Wildlife

There would still be a significant area managed for natural experience, although most of the complex would be managed for landscape

interpretation, under which the management prescription for resource conditions would include managing natural resources to reveal glacial features. Since there would be a range of ways to reveal glacial features through natural resource management (for example, planting short row crops or short prairie grasses), impacts on vegetation and wildlife would range from negligible to moderately beneficial.

### Alternative 4: Outdoor Recreation Emphasis and Alternative 5: Preferred Alternative — Direct and Indirect Impacts on Vegetation and Wildlife

Under these two alternatives, management prescriptions would be fairly evenly divided between landscape interpretation and expanded recreational experience (which share the same desired resource condition) and natural experience. Additionally, under alternative 5, a wildlife corridor of unbroken habitat would be established in the southern half of the complex. This combination of management prescriptions would result in minor beneficial impacts on vegetation and wildlife.

### Cumulative Impacts on Vegetation and Wildlife

Several potential actions, independent of this plan, could affect the complex’s vegetation and wildlife. As described in the “Affected Environment” chapter, some of the park’s vegetation and wildlife habitat has been altered by past human activities (including agricultural uses and development) and have also been altered due to the absence of fire. The impacts of these past actions far outweigh the impacts of the actions being proposed in the alternatives in this plan.

Residential development could occur in the future on lands adjacent to the complex, which would result in the loss and modification of vegetation, modification or loss of wildlife habitat, and the displacement of wildlife in these areas. This would have a long-term minor adverse impact on natural vegetation and wildlife in the vicinity of the complex.

Hunting has affected wildlife in the past and would continue to affect wildlife as long as it continues to take place in the complex.

The possible development of a bike path along Highway 14 and through the complex would affect vegetation in the area and possibly displace some wildlife, which would add a long-term minor adverse incremental effect to the effects from all alternatives.

As noted in the “Affected Environment” chapter, the spread of nonnative plants is currently a problem in the complex. Nonnative species have been spreading in different locations in the complex, such as around the Cross Plains gorge, in the old field, and in planted prairie areas, due to visitor activities and natural sources like wind and birds. In addition, even with education efforts, some nonnative plants could be introduced or spread by visitors in the park, such as at picnic areas, campsites, and along trails. It is difficult to determine the impact of these nonnative species on native vegetation due to the uncertainties about the type of species that might be introduced in the future and the locations and frequencies of introductions. The adverse effects from the introduction and spread of nonnative species could range from minor to moderate and be long term.

**Alternative 1: No Action, Continuation of Current Management.** If the effects of all the past, present, and future actions were added to the continuing negligible adverse impacts under the no-action alternative, there would be long-term minor to moderate adverse cumulative impacts on vegetation and wildlife in the complex. However, the effects of the no-action alternative would result in a minimal contribution to the overall adverse cumulative impacts.

**Alternative 2: Ecological Restoration Emphasis; Alternative 3: Interpretation and Education Emphasis; Alternative 4: Outdoor Recreation Emphasis; and Alternative 5: Preferred Alternative.** If the impacts of all past, present, and future actions were added to the impacts of alternatives 2, 3, 4, and 5, there would be long-term, minor to moderate adverse cumulative impacts on vegetation and wildlife in the

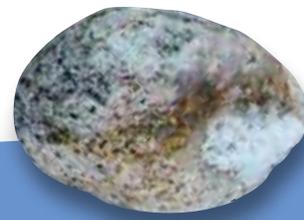
complex. However, the effects of alternatives 2, 3, 4, and 5 would not add to the overall adverse cumulative impacts because their actions would all be beneficial.

## SOCIOECONOMICS

Social and economic goals are closely related and are therefore generally grouped together in this analysis as “socioeconomic impacts.” In this analysis, social impacts were determined by considering the goals that have been set by the local community and by judging the extent to which the alternatives would meet these goals. Economic impacts were determined by considering the impacts of each alternative on funding that would be available to the local government through tax receipts.

The Village Board of Cross Plains, Wisconsin, adopted a new comprehensive plan on June 9, 2008. Although the boundary of the village of Cross Plains is 1 mile from the northwest corner of the Ice Age Complex boundary, the comprehensive plan covers the extraterritorial boundary of the village, which includes unincorporated areas and overlaps with the complex on the northern end. The village’s comprehensive plan states the following vision for the planning area:

For the lands that comprise the Ice Age Complex, the comprehensive plan described most of the future land use as either agricultural/rural or woodlands/open space. The exception to these two designations is for the lots that are currently residential. These current residential lots are zoned as “single-family exurban.” All of the alternatives in this general management plan / environmental impact statement are consistent with these zones for future land use, and therefore, all of them would have beneficial impacts on social goals because the Ice Age Complex would comprise a large open area for the town of Cross Plains. Preserving the natural state of this area would amount to a long-term moderate beneficial impact on social goals established for the village. There are differences, however, in how the alternatives would impact economic goals — these are discussed below.



### Village of Cross Plains Overall Vision

“LOOKING FORWARD TO 2025 AND BEYOND, the Village desires a safe, clean, attractive and prosperous community that residents of all ages are proud to call home. There will be available a range of housing choices by price and features and a sustainable business environment. The rich natural resources of the Village and surrounding countryside and the Black Earth Creek in particular, will continue to be a defining feature of the community due to careful preservation efforts. Residents and visitors alike will be able to travel freely throughout the community by car, bike, or foot, and commuter transit service to Madison will reinforce the strong economic relationship with the metropolitan area. Though ties with Madison will strengthen, the Village will retain its character and identity.”

### Analysis Methodology

Property sales and income taxes are a large part of the economies of local governments. In order to determine the impacts on economic goals, it is necessary to consider the likely direction of the lands that comprise the Ice Age Complex if no alternatives were implemented and then compare that to the vision of each alternative. Under all alternatives, the National Park Service, the Wisconsin Department of Natural Resources, and their partners would seek to preserve as much open land as possible throughout the complex. This would mean that most potential for residential development would be removed, along with the property taxes these private residences would have paid. The extent to which payments in lieu of taxes would be made for publically owned lands depends on which of the project partners owns the land.

The potential for property tax payments would be lost over the long term if the land were owned federally. Although local governments are eligible for federal payments in lieu of taxes to help offset losses in property taxes due to nontaxable federal property within their boundaries, historically, these payments have not kept pace with lost potential property tax revenue. However, for all new properties purchased, the Wisconsin Department of Natural Resources makes an annual payment in lieu of real estate taxes that would have been paid had the property remained in private ownership. The payment is made to the local taxing authority where the property is located.<sup>1</sup>

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<sup>1</sup> Information on how the Wisconsin Department of Natural Resources pays property taxes can be found in a publication titled “Public Land Property Taxes” (publication number PUB-LF-001), available from the DNR.

The issue in determining the economic impacts of the alternatives is whether or not the potential loss of property tax would be offset by the economic benefits of visitation. The National Park Service uses an economic model called the “Money Generation Model” to estimate economic benefits of parks in terms of visitor spending (Stynes 2009). Unfortunately, data to feed into this model is not gathered for the Ice Age National Scenic Trail or for any other national trail. The analysis for the Ice Age Complex uses data from parks that are comparable in size and demographics to estimate potential economic benefits to the area around the complex.

The intensity levels used to evaluate impacts on economic conditions are provided below. All impacts were compared to the most likely future for the complex over the 15- to 20-year term of this plan if none of the proposed alternatives were implemented. In that case (without implementation), as much as half of the land currently publically owned would potentially be developed as residences, while the other half would likely remain in agriculture.

**Negligible.** No measurable effect on the economic environment.

**Minor.** Only a very small sector of the local and regional economies would be affected and would not be readily apparent.

**Moderate.** A small sector of the economic environment, or the relationship between sectors of the local and regional economies, would be measurably affected but would not alter basic economic functions and structure.

**Major.** Changes to the local and regional economies would occur and would become readily apparent in the form of shifts in economic functions and structure. In certain cases, entirely new economic sectors would be created or established sectors eliminated.

**Geographic Area for Socioeconomic Analysis.** The regional study area for the purpose of this socioeconomic impact analysis is Dane

County, Wisconsin. Dane County is about 1,200 square miles centered around the city of Madison. The Ice Age Complex is located in the northwestern part of Dane County. The west and northern county boundaries are roughly 10 miles from the complex, the southern boundary is roughly 20 miles away, and one would travel about 40 miles before crossing the eastern boundary of Dane County (refer to figure 13 in chapter 3).

### All Alternatives — Direct and Indirect Impacts on Socioeconomics

All of the alternatives would produce beneficial impacts by increasing the value of adjacent lands. Similarly, all alternatives would have adverse impacts on the local tax base if lands were federally owned because federally owned land is exempt from property tax, and the payments in lieu of tax program historically has not fully compensated for this loss. However, these adverse impacts might be smaller than for similar areas of the National Park Service because the land would also be owned by the Department of Natural Resources, which would offset local property tax losses, so this potential tax loss would be mitigated. The impacts of land use changes were not considered separately in this analysis.

### Alternative 1: No Action, Continuation of Current Management and Alternative 2: Ecological Restoration Emphasis — Direct and Indirect Impacts on Socioeconomics

These two alternatives would only provide an outdoor experience in which activities for visitors would be limited to hiking and other low-impact activities on a minimal trail system and rare interpretive tours. The visitation level under these alternatives could be compared to the most sparsely visited parks (10,000 visitors per year or less) in the national park system. These parks, on average, contribute about \$350,000 value-added annually to their communities (value-added is the sum of labor income, profits, rents, and indirect business taxes; see Stynes

2009, p. 6). Without knowing what type of housing would have been built if neither of these alternatives were implemented, it is impossible to know what the tax receipts would have been. If net property tax receipts from residential development (after the costs of improving infrastructure to accommodate these residences, such as schools and roads are taken into account) were to exceed \$350,000 annually, then the economic impacts of the no-action alternative and alternative 2 would be adverse. If, on the other hand, net property taxes were less than the estimated \$350,000 that visitation economic benefits would bring, the impacts of these two alternatives would be beneficial.

### Alternative 3: Interpretation and Education Emphasis — Direct and Indirect Impacts on Socioeconomics

This alternative would not only offer an outdoor experience, but also a place to stop and rest indoors, view some exhibits, and talk with park staff. Visitors would also benefit from regular interpretive programming provided by rangers. These elements would attract more visitors to the complex, but overall, the estimated visitation would still be relatively low. Visitation under this alternative could be compared to parks with low visitation (50,000–100,000 visitors per year) in the national park system. These parks, on average, contribute about \$2.5 million value-added annually to their communities. It is not possible to know what the tax receipts would have been if this alternative is not implemented. If net property tax receipts from residential development (after the costs of improving infrastructure to accommodate these residences such as schools and roads are taken into account) were to exceed \$2.5 million annually, then the economic impacts of alternative 3 would be adverse. If, on the other hand, net property taxes were less than the estimated \$2.5 million that visitation economic benefits would bring, then the impacts of this alternative would be beneficial.

### Alternative 4: Outdoor Recreation Emphasis and Alternative 5: Preferred Alternative — Direct and Indirect Impacts on Socioeconomics

These alternatives would offer a broader outdoor experience in a variety of ways, such as more trails, limited primitive camping, picnic areas, and for alternative 4, a bridge across the gorge and a bike path. The two alternatives would also offer a place to stop and rest indoors; view extensive exhibits, including a film; and talk with park staff. There would be space to accommodate visitors who come in a group, such as school groups. Visitors would also benefit from regular interpretive programming provided by rangers. These elements would attract more visitors to the complex, and overall, the estimated visitation would fall in the moderate range for visitation (150,000–200,000 visitors per year) in the national park system (see the “Visitor Use and Experience” section for an explanation of expected visitation). These parks, on average, contribute about \$5 million value-added annually to their communities. It is not possible to know what the tax receipts would be if these alternatives were not implemented. If net property tax receipts from residential development (after taking into account the costs of improving infrastructure, such as schools and roads, to accommodate the new residences ) were to exceed \$5 million annually, then the economic impacts of these alternatives would be adverse. If, on the other hand, net property taxes were less than the estimated \$5 million that visitation economic benefits would bring, then the impacts of these alternatives would be beneficial.

### Cumulative Impacts on Socioeconomics

Residential and commercial growth and development could gradually increase in Dane County — this is according to the county population projections discussed in the “Affected Environment” chapter. Given the exurban nature of the lands surrounding the complex, much of the population

increase would likely be absorbed by existing communities / employment centers with established infrastructure. The rate of growth would likely be slow but could result in new construction- and real estate-related jobs and new property tax revenue. If population growth were to occur, the addition of taxable property and consumer spending would likely have a beneficial impact on the socioeconomic environment over the long term.

**All Five Alternatives.** If the likely effects of each of the five alternatives were combined with the potential effects of present and reasonably foreseeable future actions, there would be either long-term beneficial or long-term adverse cumulative impacts on the socioeconomic environment, depending on the nature and scope of any development on adjacent lands and the level of visitation to the complex. All five alternatives would contribute a very small increment to this cumulative impact.

## VISITOR USE AND EXPERIENCE

As mentioned in chapter 3, the action alternatives were designed to respond, in various ways, to demand for low-impact passive recreational activities, as well as the opportunity to learn about glaciation of the area. An assumption of the planning team, based on a wealth of experience in park management, is that the greater the variety of things to do at a park, the more visitors it would attract. Therefore, it is expected that each alternative might attract a different number of visitors.

### Analysis Methodology

In order to estimate the number of expected visitors at the Ice Age Complex, the GMP/EIS planning team identified established comparable parks and researched their visitation counts. This comparison took into account state and local parks that are similar in theme and in size, as well as national parks in close proximity and in areas with similar demographics. Parks with similar themes used for comparison were

the interpretive centers for units of the Ice Age National Scientific Reserve. While hiking the Ice Age National Scenic Trail is a popular activity in the state of Wisconsin, especially in densely populated areas like the city of Madison and vicinity, there are few destination areas along the trail where visitors can learn more about the unique geology and no learning opportunities in the Madison area. The Ice Age National Scenic Trail passes through two units of the Ice Age National Scientific Reserve. The two units have interpretive centers: Interstate State Park and Chippewa Moraine, which are both about 200 miles from Madison. The Reserve Center at Interstate Park benefits from being part of a well-visited park and estimates 250,000 visitors a year. The Reserve Center at Chippewa Moraine, on the other hand, estimates only 20,000 visitors to its center per year, although staff there estimate higher visitation to the property.

There are four parks within 20 miles of the Ice Age Complex that are about the same size as the complex; those four parks are Blue Mounds State Park, Governor Nelson State Park, Lake Kegonsa State Park, and the University of Wisconsin Arboretum. Visitation counts at these parks range from 150,000 to 600,000. Lastly, the two units of the national park system used to estimate visitation were Effigy Mounds National Monument, the closest unit, and Wilsons Creek National Battlefield, which is similar demographically in that, like the Ice Age Complex, it is in the outskirts of a city (Springfield, Missouri) about the size of Madison. Effigy Mounds counts about 88,000 visitors a year; Wilsons Creek counts about 200,000.

Considering all of the comparable estimates for visitation, the GMP/EIS planning team estimated that, if the Ice Age Complex were minimally developed with little interpretation (as in the no-action alternative and alternative 2), the complex might attract only 10,000 visitors per year. Those visitors would essentially be hikers on trails and participants in occasional programming.

On the other hand, if the complex were developed to offer a wider range of interpretive and recreational opportunities (as in alternatives 3, 4, and 5), the complex might attract as many as 200,000 visitors per year. Among these 200,000 would be groups of visitors, such as school groups, for whom special programming would be provided, as well as more casual visitors taking short hikes along well-developed trails. These visitation estimates were used in the analysis of socioeconomic impacts above, as well as in this analysis of visitor experience.

The intensity levels used to evaluate impacts on visitor experience are provided below. The baseline against which these impacts were evaluated are the current conditions in which visitors are only aware that the complex contains publically owned parkland if they read the small signs at the boundary areas. The Ice Age National Scenic Trail is not constructed through the complex at this time, and the only existing trails are visitor-created social trails. Also, there is no interpretation. This baseline is different from the no-action alternative, which describes the future for the complex as it would evolve over the next 15–20 years under current management strategies.

**Negligible.** Visitors likely would not be aware of any additional opportunities to experience park resources.

**Minor. Beneficial.** Visitors would likely be aware of some additional opportunities to experience park resources but not a wide variety of different types of opportunities. They would be satisfied with the changes.

**Adverse.** Visitors would likely be aware of a decrease in opportunities to experience park resources and would be dissatisfied with the changes.

**Moderate. Beneficial.** Visitors would definitely be aware of additional opportunities to experience park resources in a variety of new ways. They would be very satisfied with the changes.

**Adverse.** Visitors would definitely be aware of a decrease in opportunities and/or diversity in opportunities and would be very dissatisfied with the changes.

**Major. Beneficial.** Visitors would be highly aware of additional opportunities to experience park resources in a wide variety of new ways. They would be so satisfied with these changes that most new visitors would make the trip due to referrals from past visitors.

**Adverse.** Visitors would be highly aware of a decrease in opportunities and/or diversity in opportunities and would be so dissatisfied with the changes that they would tell other potential visitors and visitation numbers would drop.

### Alternative 1: No Action, Continuation of Current Management and Alternative 2: Ecological Restoration Emphasis — Direct and Indirect Impacts on Visitor Experience

These alternatives would only provide an outdoor experience in which activities for visitors would be limited to hiking and other low-impact activities on a minimal trail system and rare interpretive tours. While they activities would offer some beneficial experience for visitors over the current conditions, the benefits would likely range from negligible to minor.

### Alternative 3: Interpretation and Education Emphasis — Direct and Indirect Impacts on Visitor Use and Experience

This alternative would not only offer an outdoor experience, but also a place to stop and rest indoors, view some exhibits (not extensive given space limitations), and talk with park staff. Visitors would also benefit from regular interpretive programming provided by rangers. For visitors interested in the human history of the site, the ability to view and interpret the Wilkie house and barn would provide a pleasant variety of experience. However, visitors who might

want to view a film in a theater or arrive in groups and gather in one indoor spot might be disappointed by the indoor space limitations. Overall, this alternative would offer beneficial visitor experience at a minor level.

#### Alternative 4: Outdoor Recreation Emphasis — Direct and Indirect Impacts on Visitor Use and Experience

This alternative would offer a broad outdoor experience in a variety of ways (more trails, limited outdoor camping, picnic areas, a bridge across the gorge, and a bike path). It would also offer a place to stop and rest indoors; view extensive exhibits, including a film; and talk with park staff. There would be space to accommodate visitors who come in group, such as school groups. Visitors would also benefit from regular interpretive programming provided by rangers. However, visitors seeking solitude and a quiet nature immersion experience might be disappointed to have to travel far from the core of the site to find this. Overall, this alternative would have a minor to moderate beneficial impact on visitor experience.

#### Alternative 5: Preferred Alternative — Direct and Indirect Impacts on Visitor Use and Experience

This alternative would offer a broad outdoor experience in a variety of ways (more trails, including a half-day-long loop trail; limited outdoor camping; and picnic areas). It would also offer a place to stop and rest indoors; view extensive exhibits, including a film; and talk with park staff. There would be space to accommodate visitors who come in group, such as school groups. Visitors would also benefit from regular interpretive programming provided by rangers. Various attractions (such as a bike path traversing the site and a pedestrian bridge across the gorge) are not proposed in this alternative (as they are in alternative 4) because those amenities were not widely supported by the public when they commented on the preliminary alternatives.

Therefore, it seems like not many benefits to visitor experience were lost with the removal of those elements. Because the sensitive resources management area was enlarged, visitors seeking solitude and a quiet nature immersion experience would not have to travel far from the core of the site to find this. Overall, this alternative would have a moderate beneficial impact on visitor experience.

#### Cumulative Impacts on Visitor Use and Experience

There are no foreseeable actions in the complex or surrounding area that would likely cause adverse effects on visitor use and experience. There is the possibility of development on adjacent lands, which could affect viewsheds. Traffic volume could increase due to a slight increase in visitation or a change in visitor interests and demand due to potential changes in regional populations or national recreation trends. The likelihood of these changes is unknown at this time. If they were to occur, they could cause a slight increase in visitor use concerns, such as crowding and conflicts at high-use areas or attraction sites, or have adverse effects on the visitor experience commensurate with the extent to which developments would be visible and traffic would be audible from various visitor use areas within the complex.

**All of the Alternatives.** The beneficial impacts on visitor experience from each of the five alternatives, when combined with other present and reasonably foreseeable future actions, would result in long-term negligible to minor adverse cumulative impacts, depending on the amount and location of development and level of increase in traffic volume. However, the development of the bike path would add a moderate beneficial increment to the overall cumulative impact.

## UNAVOIDABLE ADVERSE IMPACTS

Unavoidable adverse impacts are defined here as major impacts that cannot be fully mitigated or avoided. No major adverse impacts are expected under any of the alternatives. It is expected that the development of trails and visitor, staff, and maintenance support areas at the core of the site would cause some impact. Those impacts, however, would be minimized through best construction practices, and any unexpected major adverse impacts would be mitigated. For example, if archeological resources were encountered during construction activities, mitigation measures would be implemented to protect those resources.

## IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Implementing alternatives 3, 4, and 5 would likely result in the consumption of some nonrenewable natural resources in the form of construction materials and fuels that would constitute an irretrievable commitment of resources. There is also the potential for loss of archeological resources during construction projects. Future planning would examine this potential and would avoid or, if avoidance is not feasible, mitigate any loss.

## RELATIONSHIP OF SHORT-TERM USES OF MAN'S ENVIRONMENT AND LONG-TERM PRODUCTIVITY

The first purpose of the Ice Age Complex at Cross Plains is to ensure protection, preservation, and interpretation of the nationally significant values of continental glaciation in Wisconsin. All five alternatives would achieve this purpose, and thus all of them would ensure long-term productive use of the complex. The only substantive development (“use of man’s environment”) would occur in a previously disturbed area. Outside the developed area, under all alternatives, productive ecosystem function would be maintained or restored throughout most of the complex, and where this is not feasible, the productivity of agricultural fields would remain.

