4.4.3 Grassland Group

4.4.3.1 Overview

Grasslands are characterized by a relative lack of trees and tall shrubs and are dominated by grasses, sedges, and forbs. Grasslands occur on a wide variety of topographies, soil types, and moisture regimes - from water-covered peat to the driest sandy soils. For this report, the term grassland refers collectively to several native vegetation community types including remnant prairie and bracken grassland. Table 4.4.3.1 provides the number of SGCNs estimated to have a high or moderate association with this community group.

Prairies are located mostly in the southern and western parts of the state and are divided into six different types that reflect the varying substrates on which they occur, from dry (sandy or otherwise) to "mesic" (intermediate soil moisture) to wet. Over 400 species of native vascular plants are characteristic of Wisconsin prairies, and most are restricted to prairie and savanna community types.

Bracken grasslands occur as openings on nutrient poor, sandy uplands in the otherwise forested regions of northern Wisconsin. Although similar to prairie in structure, bracken grassland is floristically very different (Curtis 1959), with bracken fern being a dominant species.

Tallgrass prairies are among the most decimated and threatened natural communities in the Midwest and the world. Of the 2.1 million acres (6% of state land area) that were native prairie when Europeans arrived in Wisconsin 150 years ago, less than 10,000 acres of varying quality (<1 % of state land area) native prairie remains today.

The Grassland Group includes the following eight community types:

- Dry Prairie
- Dry-Mesic Prairie
- Mesic Prairie
- Wet-Mesic Prairie
- Wet Prairie
- Sand prairie
- Bracken Grassland
- Surrogate Grassland[1]

Over 400 species of native vascular plants are characteristic of Wisconsin prairies, and most are restricted to prairie and savanna community types. In addition to a varied plant community, prairies have a diverse and specialized fauna, especially among invertebrates, herptiles, and birds.

[1] Surrogate grasslands resemble remnant grasslands in terms of structure, but their origins are anthropogenic. They can include agricultural habitats such as hayfields, old fields, and pastures, as well as young conifer plantations, golf courses, airports, and mossed bogs. Given the importance of unplowed prairie sod to many invertebrates, former cropland that is planted to native prairie plants is also considered Surrogate Grassland.

Descriptions for these community types can be found online.[2]

Table 4.4.3.2 at the end of this Section provides the Natural Community – Ecological Landscape (NC-EL) Opportunity scores for the Grassland Community Group. The key to these scores is provided below.

Key to NC-EL Opportunity Scores

Level of Opportunity	Description
High	A major opportunity for sustaining the natural community in the Ecological Landscape exists, either because many significant occurrences of the natural community have been recorded in the landscape or restoration activities in areas of historical occurrence are likely to be successful maintaining the community's composition, structure, and ecological function over a long period of time.
Moderate	Although the natural community does not occur extensively or commonly in the Ecological Landscape, one to several significant occurrences do occur and are important in sustaining the community in the state. In some cases, important opportunities may exist because the natural community may be restricted to just one or a few Ecological Landscapes within the state and should be considered for management there because of limited geographic distribution and a lack of better opportunities elsewhere.
Low	The natural community occurs in the Ecological Landscape, but better management opportunities appear to exist in other parts of the state.
None	The natural community is not known to occur in this Ecological Landscape.

4.4.3.2 Issues and Associated Conservation Actions for the Grassland Community Group

This Section summarizes issues and conservation actions that are common to all or most of the community types in this group. As much as possible, source of the threat is described as well as the stresses or effects that occur directly or indirectly as a result of the threat. Stresses are generally thought of as loss, conversion and/or degradation of the natural community.

Issue. Cropping, development, and transportation projects can result in outright destruction of native grasslands. A large portion of native grassland loss is due to conversion of mesic prairie to farmland during the late 19th and 20th centuries; only about 100 acres of mesic prairie are known to exist today in Wisconsin. Most of the surviving remnants occur on sites that were too wet or too dry and rocky to plow, and are typically small and isolated. While grazing can be constructive or destructive to native prairies depending on the species of grazer, stocking rate, and length of grazing rotations, they are threatened by grazing when plants are consumed or trampled to such an extent that they can no longer survive. Grazers can also compact soil, especially along consistently used 'cowpaths,' resulting in erosion and loss of grassland sod. Developers often favor sites with beautiful views such as on bluff tops, which frequently coincide with occurrences of remnant bluff prairies. Lastly, Off-Road

[2] http://dnr.wi.gov/topic/EndangeredResources/Communities.asp?mode=group&Type=Grassland (SearchTerms: Grassland Communities Wisconsin DNR)

Vehicles pose a threat to Sand Prairie. These vehicles destroy fragile vegetation, lichens, and biological soil crusts, as well as promote wind erosion of the sandy soils that those species were securing.

Conservation Actions. Depending on your overall objectives, the following conservation actions can address habitat destruction and alteration on native grasslands:

- Work with private landowners to help them recognize, protect, and restore their remnant prairies
- Develop and offer cost-share incentives for private landowners to restore and maintain remnant prairies
- Pursue the above actions through partnerships with federal, state and local groups and professional restoration contractors
- Protect Sand Prairies and associated SGCNs from off-road vehicle usage

Issue. Cropping, development, and transportation projects can result in fragmentation of native grasslands. This fragmentation can sever connections that are important to both plants and animals, can limit opportunities for exchange of genetic material among plants, can render sites more susceptible to invasion by non-native invasive plants, and can inhibit the application of prescribed fire at a landscape scale. Fragmentation can be minimized by preserving larger blocks of habitat and/or by buffering them with compatible cover types that together create a matrix of related community types.

Conservation Actions. Depending on your overall objectives, the following conservation actions can address habitat fragmentation as well as the effects that it has on native grasslands:

- Protect and preserve remnant prairies by limiting development on or immediately adjacent to them through education, zoning initiatives, and local/regional land-use planning.
- Connect remnant prairie sites via open grassy corridors, or use a stepping stone approach to designing conservation sites where it is not possible to enlarge or connect disjunct prairie patches.
- Buffer the effects of anthropogenic land uses by maintaining compatible cover types in lands immediately surrounding prairie remnants. The best buffer types include surrogate grassland, open oak savanna, and open/brushy wetland.

Issue. Historically, native grasslands were maintained primarily by frequent fires, either started by lightning strikes or by Native Americans who burned large areas to produce food for game or to aid in hunting and gathering activities. Fire is essential to Wisconsin's native grassland communities for a variety of reasons: 1) It limits woody encroachment; 2) It stimulates early and robust growth of native grassland plants; 3) It can deter growth of some non-native invasive and other problematic species; 4) It stimulates flowering and fruit production of native grassland plants; and 5) It increases plant species diversity. On most soil types and moisture regimes in Wisconsin's climate, grasslands in the absence of regular fire will succeed to woody species and will become less diverse over time. Climate change projections for Wisconsin suggest that

prescribed burning opportunities may change due to extreme drought and heat, earlier spring green-up, and frequent and intense storms (see Climate and Weather section below for more details).

Invasive and other problematic species can also limit the ability of managers to apply fire by reducing the amount of fuel available to carry fire and by creating a moister ground level microclimate. This is particularly true of brushy species.

Conservation Actions. Depending on your overall objectives, the following conservation actions can address the effects that fire suppression has on native grasslands:

- Maintain blocks of related fire-dependent communities that capture a complete gradient from grassland/open wetland to savanna to oak forest.
- Work with Wisconsin's Prescribed Fire Council (prescribedfire.org) to make the use of prescribed fire safe, effective, and more broadly accepted as a management tool.
- Take actions to facilitate rapid mobilization of prescribed burn crews (e.g., prepare units in advance of burn season).
- Maximize impacts of limited burn seasons by burning larger units.
- Evaluating the potential effects to invertebrates should be routinely considered in plans to use fire for restoration or management of this community type. The frequency, intensity and area burned should be planned considering the life history, habitat needs and distribution of fire-sensitive invertebrate species both on the subject property and adjacent habitat. In cases where burning is the preferred community management tool, but invertebrate species impacts are undetermined or potentially significant, the feasibility of creating refugia should be examined as should alternative methods for invasive, shrub and canopy management.
- Quantify and monitor the positive and negative impacts that prescribed burning and other management activities undertaken in grassland, barrens and savanna communities have on SCGN invertebrates to improve management decisions and techniques and improve intended outcomes.

Issue. Non-native invasive plants are prolific reproducers in the absence of their homeland's natural checks and balances, and outcompete native plants by monopolizing light, water and nutrient resources. The most common non-native invasives of grasslands include herbs such as smooth brome (*Bromus inermis*), wild parsnip (*Pastinaca sativa*) and sweet clovers (*Melilotus alba, M. officinalis*), and shrubs such as common buckthorn (*Rhamnus cathartica*) and Eurasian bush honeysuckles (*Lonicera* spp.). Climate change scientists suggest that non-native invasive species may increase in productivity with increasing CO_2, warmer temperatures, earlier springs, and reduced snowpack, and may invade new areas during extreme flood events. With grasslands in lower landscape positions, agricultural runoff can also enhance growth of non-native invasives. Some native woody species are also 'problematic' in grasslands, especially in the absence of fire, and can outcompete native vegetation similarly to non-native invasives; climate change may exacerbate this threat as increased CO_2 and nitrogen deposition further stimulate growth of woody species.

Conservation Actions. Depending on your overall objectives, the following conservation actions can address non-native invasives and other problematic species as well as the effects that they have on native grasslands:

- At the site level, employ an eight-part approach to non-native invasive species: 1) careful planning; 2) prevention; 3) early detection and rapid response; 4) control; 5) slowing the spread; 6) reducing impacts; 7) monitoring; 8) restoration.
- Develop a plan by conducting surveys for invasives and creating maps showing their locations and densities. Set reasonable management objectives based on this information. Consider designating management zones based on degree of infestation and available resources (zero tolerance, acceptable threshold, slow the spread).
- Prevent invasions of non-native plants by limiting human vectors (e.g., install boot brushes at trail heads, clean out seeds from maintenance equipment), minimizing soil disturbance, maintaining healthy and diverse natural communities, conducting periodic inspections of high-risk areas (e.g., trails), and revegetating disturbed sites with native plants.
- Implement an Early Detection-Rapid Response approach by finding new populations of non-native invasives as early as possible when eradication and control are still feasible and less costly.
- Control non-native invasive species and problematic woody species by manual, mechanical, and/or chemical means.
- In areas where eradication and control are not feasible, slow the spread of non-native invasives into adjoining areas by restricting activities during certain seasons, minimizing travel through areas, and inspecting clothing and equipment.
- If eradication, control, and containment methods fail to manage an infestation of non-native invasives, reduce their impact by limiting their dominance (e.g., via mowing or weed-whacking).
- Conduct regular monitoring of sites to detect new invasions and to evaluate the success of pest management plans and control measures.
- Restore sites to confer resistance to infestation by non-native invasives. This may involve restoring system functions (e.g., fire), restoring natural community structure (canopy, mid-story, shrub layer), and ameliorating ground layer species.
- At a landscape or statewide level, enforce and strengthen regulatory mechanisms and voluntary BMPs that address the introduction and spread of non-native invasives.

Issue. Ecological simplification is a legacy of past fire suppression, grazing, and non-native invasive plants. (Grazing can actually be constructive or destructive to native grasslands depending on the species of grazer, stocking rate, and length of grazing rotations.) As a result, most of Wisconsin's native grasslands lack the species and structural diversity needed to support a flourishing community of plant and wildlife species. In addition, ecological simplification renders grasslands more vulnerable to non-native invasive species. In Wet and Wet-mesic Prairies, agricultural and residential runoff can also lead to ecological simplification by enhancing growth of generalist native grassland plants, resulting in a loss of conservative plants and lowering of floral diversity.

Conservation Actions. Depending on your overall objectives, the following conservation actions can address ecological simplification as well as the effects that it has on native grasslands:

- Restore native grassland structure and function by applying techniques such as brushing, prescribed fire, herbicide application, and ground layer enhancement.
- Research the impacts of grazing on grassland and herbaceous wetland communities, including control of invasive species and impacts to SGCNs.
- Maintain and restore savanna and related habitats by rotating management spatially and temporally and using a variety of management techniques, including (where appropriate) timber harvest, prescribed fire, mowing, grazing, and herbicide application to minimize negative impacts from any particular management technique.
- To limit agricultural runoff to lowland grasslands, employ standard soil and water conservation measures (e.g., install grass waterways and buffer strips, or create buffers [e.g., install perennial vegetation between cropland edge and remnant prairie, or retain crop residue in winter]).

Issue. Water, and the hydrologic regime that characterizes each site, is the life blood of wetlands, including those that are dominated by graminoids. Direct hydrologic alteration of wetlands through dams, ditching, draining, or filling causes severe habitat alteration that changes the function and value of a site, often lowering habitat quality for many species. Water levels that are artificially raised can flood out wetlands, causing native plants to be replaced by monotypic stands of cat-tails and reed canary grass or simply open water. Ditches and drain tiles lower the water table, facilitating tree and shrub invasion and loss of open wetland habitat, while filling simply eliminated wetlands altogether. Indirect alteration can occur from things such as the construction of new roads can disrupt hydrology, impounding water on one side of a road while causing drying on the other. Finally, overuse of groundwater resources for agriculture, municipal, or industrial use can cause a lowering of the water table, starving groundwater fed-wetlands of the source of their existence.

Conservation Actions – Hydrologic alteration (Wet and Wet-mesic prairie only)

Depending on your overall objectives, the following conservation actions can address soil disturbance and hydrologic alteration and the effects that it has on wet and wet-mesic prairie:

- Follow Forestry BMPs for water quality in forested lands adjacent to Wet and Wet-mesic Prairie, and consider adding additional buffers around sensitive wetland habitats.
- Limit hydrological alteration to wetlands as an unintentional consequence of development/road building.
- Identify priority groundwater recharge areas that supply (even indirectly) water to wet and wet-mesic prairies, and conduct groundwater quality and quantity monitoring in regions with high demand on groundwater resources.

Issue: Nutrient enrichment and sedimentation are one of the leading causes of wetland degradation, including for wet and wet-mesic prairie. Excess nutrients, usually in the form of nitrogen and/or phosphorus, favor non-native invasive species (e.g., reed canary grass) and aggressive native species (e.g., cat-tails) which displace native plants. Nutrients can come from a variety of sources, ranging from agricultural fields to lawns. In addition, nitrogen accumulates through atmospheric deposition, mainly due to the burning of fossil fuels. Sedimentation is also problematic, and can arise from unsustainable agricultural practices on steep slopes or near waterways, land-clearing activities, unsustainable timber harvest operation, and poorly designed road crossings at streams or wetlands. Overall, sedimentation increases water turbidity and can cover low-lying plants in silt. Following water quality BMPs greatly reduces the risk from these activities; however, climate change may add complexity to this issue as severe precipitation events are projected to increase and the season of frozen ground conditions grows shorter.

Conservation Actions. Depending on your overall objectives, the following conservation actions can address soil disturbance and hydrologic alteration and the effects that it has on wet and wet-mesic prairie:

- Work with municipal planners, developers, businesses, and local zoning boards to increase groundwater infiltration practices and decrease stormwater input and nutrient enrichment of water from impervious surfaces (parking lots, etc.) through techniques such as the installation of bioswales, etc.
- Implement Wisconsin's Nonpoint Source Program Management Plan FFY 2011-2015 and subsequent updates, which addresses impacts from non-point source pollution and provides direct and indirect benefits to SGCNs and their habitats. Work with NRCS Conservationist or follow NRCS guidelines to develop a 'cropland conservation management system' for water quality and water quantity that holistically considers the effects of planting design, crop selection, discontinuous vegetative cover, tillage practices, nutrient management, pest management, and irrigation.

Issue. Projections for vulnerability of grassland communities to climate change range from moderately low to high, with most at the moderate level (Climate Change Vulnerability Assessment Workshops 2014). Vulnerability is strongly influenced by soil type and landscape position. Native grasslands may have natural resistance to climate change due to the fact that associated plant species are strongly adapted to extreme heat and drought. Resilience is also conferred by typically high diversity of species and species guilds (annuals, perennials, forbs, grasses, etc.). Adaptive capacity can be lower if sites are small and isolated, and if there are few opportunities for shifting of plants to microsites with more favorable conditions. Their vulnerability primarily stems from the exacerbation of threats that are already significant, especially non-native invasive species and woody invasion. Lower winter snow depths may also render some prairie plants more susceptible to frost and drought damage. Furthermore, prescribed burning opportunities may change due to extreme drought and heat, earlier spring green-up, and frequent and intense storms. The exact nature of these potential changes is currently unclear: windows of opportunity for burning may become narrower or they may shift to different seasons, they may actually increase with warmer drier

conditions, or conditions may become more volatile and trigger more regulatory constraints. Managers may wish to adopt a proactive approach that offers them the most flexibility in the face of changing and unpredictable conditions.

Mesic Prairie is considered to have the highest vulnerability to climate change due to the amplified threats of non-native invasive species, woody invasion, and nutrient run-off from adjacent agricultural fields; the extreme rarity of Mesic Prairie and the small size and isolation of remnants further contribute to the vulnerability of this community type. Sand Prairies may fair the best in the face of climate change: associated plants are already exceptionally well-adapted to extreme heat, drought, and (in many cases) lower snow depths, while woody species and non-native invasive species may be less able to gain purchase in this relatively inhospitable environment.

Certain climate change-related factors currently remain unpredictable in grassland settings, and warrant further research and observation:

- Effects of changing precipitation patterns, extreme heat, seasons, and drought on opportunities to conduct prescribed burning.
- Impact of changing precipitation patterns on groundwater levels (Wet Prairie, Wet-mesic Prairie, Sand Prairie).
- Impact of lower snow depth on winter annuals (Sand Prairie) and other grassland species, particularly as it pertains to vulnerability to frost and drought. Related topic: Potential for prescribed burning to confer frost- and drought-resistance to plants.
- Potential for extreme hot and droughty conditions to cause mortality of plant species or shifting of competitive relationships, especially if these conditions immediately follow prescribed fire.
- Impact of elevated atmospheric CO_2, changing temperatures/precipitation, drought, and soil type/landscape position on plant species that use C3 (e.g., cool-season grasses and forbs) versus C4 (e.g., big bluestem, Indiangrass) photosynthetic pathways. Dramatic shifts in the competitive balance of these two suites of species may create a cascade of changes in grassland ecosystems.
- Impact of climate change on frost pockets, an important ecosystem driver for Bracken Grassland.

Conservation Actions. Depending on your overall objectives, the following conservation actions can encourage climate change adaptation for grassland communities:

- Promote drought- and frost-tolerant species and plant morphologies through regular prescribed burning.
- At the site level, employ an eight-part approach to non-native invasive species: 1) careful planning; 2) prevention; 3) early detection and rapid response; 4) control; 5) slowing the spread; 6) reducing impacts; 7) monitoring; 8) restoration.
- Restore degraded open wetlands through the control of invasive species, shrubs, and restoration of ecological process such as hydrology and fire.
    - Increase groundwater infiltration practices and decrease stormwater input and nutrient enrichment of water from impervious surfaces (parking lots, etc.) through techniques such as the installation of bioswales, rain gardens, etc.

  - Work with agricultural stakeholders to balance water quality and water quantity with planting design, crop selection, discontinuous vegetative cover, tillage practices, nutrient management, pest management, and irrigation.
- Take actions to facilitate rapid mobilization of prescribed burn crews (e.g., prepare units in advance of burn season).
- Maximize impacts of limited burn seasons by burning larger units.
- See other conservation actions under the following issue sections above because they can be adapted to consider the effects of changing temperature and precipitation:
  - Fire suppression
  - Non-native and native invasive and problematic plants
  - Ecological simplification
  - Nutrient enrichment and sedimentation.

Estimated Vulnerability of Grassland Communities to Climate Change under Low and High Change Scenarios

Community type	Vulnerability under Low degree of climate change	Vulnerability under High degree of climate change
Dry Prairie	Moderate	Moderate
Dry-mesic Prairie	Moderate	Moderate
Mesic Prairie	High	High
Wet-mesic Prairie	Moderate	Moderate
Wet Prairie	Moderate	Moderate
Bracken Grassland	Moderately low	Moderate

Source: WDNR Climate Change Vulnerability Assessment Workshops 2014.

Table 4.4.3.1 Number of Species of Greatest Conservation Need Highly or Moderately Associated with Grassland Communities

SGCN Species Group	Grassland Community Group
Birds	25
Fish	
Herps	20
Mammals	6
Insects - Aquatic	
Insects - Terrestrial	92
Invertebrates - Crustacea	1
Invertebrates - Mussels	
Invertebrates - Terrestrial Snails	4
Total SGCN (H/Moderate Association)	**148**

Table 4.4.3.2 Natural Community – Ecological Landscape Opportunity Scores for the Grassland Community Group

Community	Central Lake Michigan Coastal	Central Sand Hills	Central Sand Plains	Forest Transition	North Central Forest	Northeast Sands	Northern Highland	Northern Lake Michigan Coastal	Northwest Lowlands	Northwest Sands	Southeast Glacial Plains	Southern Lake Michigan Coastal	Southwest Savanna	Superior Coastal Plain	Western Coulee and Ridges	Western Prairie
Bracken Grassland						H	M									
Dry Prairie		M	M								H		H		H	M
Dry-mesic Prairie		L	M								H	L	H		H	M
Mesic Prairie		L	L								H	M	H		M	H
Sand Prairie	L	M	H							L	L		L		H	M
Surrogate Grasslands	M	M	H	M	L	L		M	L	H	H	M	H	M	H	H
Wet Prairie		M	L								H	M	L		L	L
Wet-mesic Prairie		H	L								H	H	M		M	

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