

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act¹ and the Bald and Golden Eagle Protection Act².

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described [below](#).

1. The [Migratory Birds Treaty Act](#) of 1918.
2. The [Bald and Golden Eagle Protection Act](#) of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern <http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php>
- Measures for avoiding and minimizing impacts to birds <http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php>
- Nationwide conservation measures for birds <http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf>

The birds listed below are birds of particular concern either because they occur on the [USFWS Birds of Conservation Concern](#) (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ [below](#). This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the [E-bird data mapping tool](#) (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found [below](#).

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME

BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)

Bald Eagle *Haliaeetus leucocephalus*

Breeds Dec 1 to Aug 31

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

<https://ecos.fws.gov/ecp/species/1626>

Black Tern *Chlidonias niger*

Breeds May 15 to Aug 20

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

<https://ecos.fws.gov/ecp/species/3093>

Franklin's Gull *Leucophaeus pipixcan*

Breeds May 1 to Jul 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Lesser Yellowlegs *Tringa flavipes*

Breeds elsewhere

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

<https://ecos.fws.gov/ecp/species/9679>

Semipalmated Sandpiper *Calidris pusilla*

Breeds elsewhere

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is $0.25/0.25 = 1$; at week 20 it is $0.05/0.25 = 0.2$.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (I)

Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

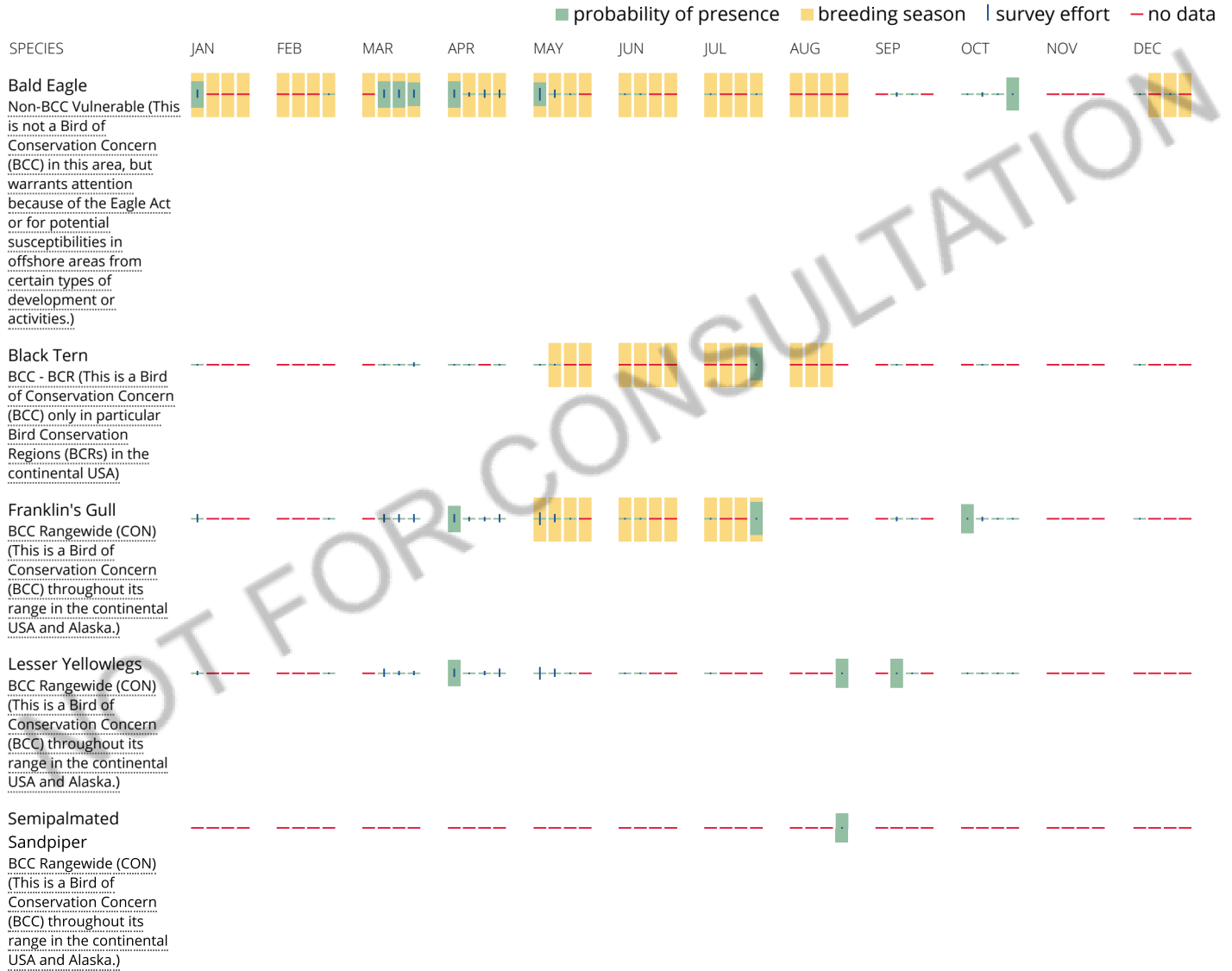
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (-)

A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

[Nationwide Conservation Measures](#) describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. [Additional measures](#) and/or [permits](#) may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS [Birds of Conservation Concern \(BCC\)](#) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the [Avian Knowledge Network \(AKN\)](#). The AKN data is based on a growing collection of [survey, banding, and citizen science datasets](#) and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle ([Eagle Act](#) requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the [AKN Phenology Tool](#).

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the [Avian Knowledge Network \(AKN\)](#). This data is derived from a growing collection of [survey, banding, and citizen science datasets](#).

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go to the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: [The Cornell Lab of Ornithology All About Birds Bird Guide](#), or (if you are unsuccessful in locating the bird of interest there), the [Cornell Lab of Ornithology Neotropical Birds guide](#). If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are [Birds of Conservation Concern \(BCC\)](#) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the [Eagle Act](#) requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the [Northeast Ocean Data Portal](#). The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the [NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf](#) project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the [Diving Bird Study](#), and the [nanotag studies](#) or contact [Caleb Spiegel](#) or [Pam Loring](#).

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to [obtain a permit](#) to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the [National Wildlife Refuge](#) system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to [NWI wetlands](#) and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local [U.S. Army Corps of Engineers District](#).

WETLAND INFORMATION IS NOT AVAILABLE AT THIS TIME

This can happen when the National Wetlands Inventory (NWI) map service is unavailable, or for very large projects that intersect many wetland areas. Try again, or visit the [NWI map](#) to view wetlands at this location.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tubercid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

NOT FOR CONSULTATION

Jennie Geiger

From: Joyal, Lisa (DNR) <lisa.joyal@state.mn.us>
Sent: Monday, December 18, 2017 5:51 PM
To: Jennie Geiger
Subject: Big Bend Wind
Attachments: 20180221-1ad.pdf; 20180221-1ai.pdf; 20180221-1amap.pdf; 20180221-1a.pdf; Explanation of Fields.pdf; DNR Best Practices Erosion Control and Mesh Netting.pdf; Ebfactsheet2008.pdf; Ebflyer 2012.pdf; 2015 Rare Plant Guidance.pdf; 2016 Rare Species Survey Process.pdf; 2016 Rare Species Survey Proposals and Reports.pdf; Evaluating and Mapping Native Prairie in Minnesota.pdf; Upland Prairie System_ranking guidelines_25Sept2014.pdf; Wetland Prairie System_ranking guidelines_30May2014.pdf

I have attached the reply letter and database reports regarding the above project. The Index Report and Natural Heritage letter may be included in any public environmental review document. Please note that **the Detailed Report is for internal use only** as it may contain specific location information that is considered nonpublic data under *Minnesota Statutes*, section 84.0872, subd. 2. It is not for public distribution, and should not be published or copied (including electronically) for others.

Thank you,

Lisa Joyal

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**Lisa Joyal**  
Endangered Species Review Coordinator | EWR  
NHIS Data Distribution Coordinator | EWR

**Minnesota Department of Natural Resources**  
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St. Paul, MN 55155  
Phone: 651-259-5109  
Email: [lisa.joyal@state.mn.us](mailto:lisa.joyal@state.mn.us)  
[mndnr.gov/eco](http://mndnr.gov/eco)





Minnesota Department of Natural Resources  
Division of Ecological & Water Resources  
500 Lafayette Road, Box 25  
St. Paul, MN 55155-4025

December 18, 2017

Correspondence # ERDB 20180221

Ms. Jennie Geiger  
Apex Clean Energy  
310 4th Street NE, Suite 200  
Charlottesville, VA 22902

RE: Natural Heritage Review of the proposed Big Bend Wind; Brown, Cottonwood, Martin, & Watonwan Counties

Dear Ms. Geiger,

As requested, the Minnesota Natural Heritage Information System has been queried to determine if any rare species or other significant natural features are known to occur within an approximate one-mile radius of the proposed project. Based on this query, rare features have been documented within the search area. Please note that the proposed project has the potential to negatively affect the following rare features:

*Ecologically Significant Areas*

- The proposed project boundary contains a Prairie Core Area and Prairie Corridor as identified in the Minnesota Prairie Conservation Plan, a twenty-five year strategy for accelerating prairie conservation in the state. The Plan's strategies include protection, enhancement, and restoration of grassland and wetland habitat. To meet the Plan's goals, approaches within Prairie Core Areas will need to include restoration while approaches within the Prairie Corridors will need to include conservation of grassland habitat. Toward that end, we recommend that the project avoids the Prairie Core Area and minimizes impacting grasslands within the Prairie Corridor (see enclosed map). In addition, any efforts toward prairie restoration or grassland conservation after project construction are encouraged.
- The Minnesota Biological Survey (MBS) has identified several Sites of Biodiversity Significance within the project boundary (see enclosed map). Sites of Biodiversity Significance have varying levels of native biodiversity and are ranked based on the relative significance of this biodiversity at a statewide level. Factors taken into account during the ranking process include the number of rare species documented within the site, the quality of the native plant communities in the site, the size of the site, and the context of the site within the landscape. **Almost all of the Sites within the project boundary contain known occurrences of rare native plant communities, state-protected animals and plants, and/or federally protected butterflies and plants.**



Along with many MBS Sites of *Moderate* or *High* Biodiversity Significance, the following MBS Sites of *Outstanding* Biodiversity Significance are within the project boundary:

- Rock Ridge Scientific and Natural Area (T107N R25W Section 3): This Site contains Dry Hill Prairie with scattered outcrops of Sioux Quartzite and supports state-protected plants and animals. Scientific and Natural Areas (SNA) are legally designated public nature preserves established to protect the state's rarest natural features and sensitive resources. These natural areas are given the highest level of protection and the utmost consideration in assessing potential impacts from nearby projects. It is the SNA policy not to allow new utility crossings on SNAs and not to allow any new above ground utilities in existing below ground utility crossings. It should be determined whether the project as proposed has the potential to impact the SNA, the rare features the SNA supports, or public use of the SNA. If so, avoidance and protection measures must be proposed.
- Jeffers Petroglyphs Minnesota Historical Society Site (T107N R35W Section 9): This Site contains numerous Sioux Quartzite outcrops and associated state-protected plants; one of the largest populations in the country of prairie bush clover (*Lespedeza leptostachya*), federally and state listed as threatened; and state and federally protected butterflies.
- The Nature Conservancy's Red Rock Preserve (T107N R35W Section 11): This Site contains native prairie with scattered Sioux Quartzite outcrops and supports state-protected plants, including a large population of prairie bush clover.

Over 2000 acres of the following rare native plant communities (listed with their conservation status rank) are within the project boundary:

- |                                           |                                       |
|-------------------------------------------|---------------------------------------|
| ➤ Dry Sioux Quartzite Cliff (Southern)    | S1 – <i>critically imperiled</i>      |
| ➤ Basswood – Bur Oak – (Green Ash) Forest | S3 – <i>vulnerable to extirpation</i> |
| ➤ Prairie Mixed Cattail Marsh             | S1 – <i>critically imperiled</i>      |
| ➤ Bulrush Marsh (Prairie)                 | S1 – <i>critically imperiled</i>      |
| ➤ Calcareous Fen (Southwestern)           | S2 – <i>imperiled</i>                 |
| ➤ Cystalline Bedrock Outcrop (Prairie)    | S2 – <i>imperiled</i>                 |
| ➤ Dry Hill Prairie (Southern)             | S2 – <i>imperiled</i>                 |
| ➤ Mesic Prairie (Southern)                | S2 – <i>imperiled</i>                 |
| ➤ Prairie Meadow/Carr                     | S3 – <i>vulnerable to extirpation</i> |
| ➤ Seepage Meadow/Carr                     | S3 – <i>vulnerable to extirpation</i> |
| ➤ Basin Meadow/Carr                       | S2 – <i>imperiled</i>                 |
| ➤ Wet Prairie (Southern)                  | S2 – <i>imperiled</i>                 |

**Given the ecological significance of the rare species and native plant communities within the MBS Sites, the DNR recommends that all of the MBS Sites be considered avoidance areas within the permitting boundary. Please note that rare species surveys will likely be required if there will be any disturbance within MBS Sites and/or native plant communities.** GIS shapefiles of MBS Sites of Biodiversity Significance and DNR Native Plant Communities can be downloaded from the MN Geospatial Commons at <https://gisdata.mn.gov/>.

As activities in adjacent areas can negatively affect the habitats and species within the MBS Sites, indirect impacts should be considered during project design and implementation. Actions to minimize disturbance include, but are not limited to, the following recommendations:

- Increase the distance between turbines and the MBS Sites;
  - Do not park equipment or stockpile supplies in MBS Sites;
  - Do not place spoil within MBS Sites;
  - Inspect and clean all equipment prior to construction activities to prevent the introduction and spread of invasive species;
  - Use effective erosion prevention and sediment control measures;
  - As soon as possible after construction, revegetate disturbed soil with native species suitable to the local habitat (see [http://www.bwsr.state.mn.us/native\\_vegetation/](http://www.bwsr.state.mn.us/native_vegetation/) and <http://www.dot.state.mn.us/environment/erosion/seedmixes.html>);
  - Use only weed-free mulches, topsoils, and seed mixes. Of particular concern are birdsfoot trefoil (*Lotus corniculatus*) and crown vetch (*Coronilla varia*), two invasive species that are sold commercially and are problematic in prairies and disturbed open areas, such as roadsides;
  - Ideally, do not bring in topsoil to this site, as this introduces invasive species.
- There are areas within the project boundary that the Minnesota Biological Survey considered for Sites of Biodiversity Significance, but these areas were determined to be below the minimum biodiversity threshold for statewide significance. These sites, however, may have conservation value at the local level as habitat for native plants and animals, corridors for animal movements, buffers surrounding higher quality natural areas, or as areas with high potential for restoration of native habitat.

#### Native Prairie

- As noted above, the Minnesota Biological Survey has identified several native prairie remnants within the project boundary. State-listed birds, butterflies, mammals, and plants have been documented within these prairies. In the mid-1800's, Minnesota had eighteen million acres of prairie. Less than 1% remains. Given that more than 99% of Minnesota's prairies have been destroyed, and more than one-third of Minnesota's endangered, threatened, and special concern species are now dependent on the remaining small fragments of Minnesota's prairie ecosystem, we feel that all prairie remnants merit protection. We also recommend that turbines and other infrastructure be distant enough from native prairies as to allow for prairie management, such as prescribed burning.

Additional prairie remnants may exist in the area, including within the areas that MBS determined to "below" statewide significance for biodiversity. To ensure the avoidance of prairie and the rare species dependent upon prairie, I recommend that a desktop analysis of historical aerial photos and applicable GIS layers (see attached guidance) be conducted for any grassland areas that have the potential to be impacted by the project. Any on-site prairie surveys should be conducted by a qualified surveyor (see attached list) following the attached guidance.

- The prairie remnants in the SW ¼ of T108N R33W Section 18 and the W ¼ of T106N R35W Section 5 are enrolled in Minnesota's Native Prairie Bank Program. This program protects prairie through conservation easements, which prohibit the construction or placement of structures or devices whether permanent or

temporary on the premises without written authorization from the DNR Commissioner. In addition, no conveyance of any other easement for any other purpose including, but not limited to, road or utility is permitted upon or within the premises without authorization.

### Rare Wetlands

- Calcareous fens have been identified in the SE ¼ of T107N R35W Section 20. A calcareous fen is a rare and distinctive peat-accumulating wetland (please see the attached fact sheet) that is legally protected in Minnesota. The Wetlands Conservation Act, authorized by Minnesota Statutes, section 103G.223, states that calcareous fens may not be filled, drained, or otherwise degraded, wholly or partially, by any activity, except as provided for in a management plan approved by the commissioner of the Department of Natural Resources. Many of the unique characteristics of calcareous fens result from the upwelling of groundwater through calcareous substrates. Because of this dependence on groundwater hydrology, calcareous fens can be affected by nearby activities or even those several miles away.

The DNR would have concerns regarding any activities that might affect groundwater flows, including groundwater pumping or discharge. Otherwise, impacts to a fen are unlikely if the fen is avoided. If you have any questions about fen regulations, please contact Doug Norris, DNR Wetlands Program Coordinator, at 651-259-5125 or [Doug.Norris@state.mn.us](mailto:Doug.Norris@state.mn.us).

- If the Wetland Conservation Act (WCA) is applicable to this project, please note that the wetlands listed above and Crystalline Bedrock Outcrops (of which jurisdictional wetlands are a part) may qualify as “rare natural communities” under this Act. Minnesota Rules, part 8420.0515, subpart 3 states that a wetland replacement plan for activities that modify a rare natural community must be denied if the local government unit determines that the proposed activities will permanently adversely affect the natural community. If you have any questions regarding this provision of the WCA, please contact Doug Norris, DNR Wetlands Program Coordinator, at 651-259-5125. By avoiding the MBS Sites, the proposed project avoids all delineated native plant communities.

### *Plants*

- As mentioned above, several state-listed threatened and endangered plants have been documented within the project boundary (see enclosed database reports). Minnesota’s endangered species law (*Minnesota Statutes*, section 84.0895) and associated rules (*Minnesota Rules*, part 6212.1800 to 6212.2300 and 6134) prohibit the taking of threatened or endangered species without a permit. By avoiding the MBS Sites, most impacts to rare plants will be avoided. **If there will be any proposed impacts within MBS Sites or other suitable habitat, rare species surveys will be required.** We will need to discuss potential surveyors, survey protocol, and other requirements before any survey work for rare species is initiated. Project planning should also take into account that surveys (if needed) will need to be done during the appropriate time of the year, which may be limited. For your information, I have attached a document outlining the Rare Species Survey Process.

## Reptiles and Amphibians

- Blanding's turtles (*Emydoidea blandingii*), a state-listed threatened species, have been documented in the northern portion of the project boundary and may potentially be found throughout the boundary. Blanding's turtles will use the streams and wetlands in the area, as well as upland areas up to and over a mile distant from wetlands/streams. Uplands are used for nesting, basking, periods of dormancy, and traveling between wetlands. Because of the tendency to travel long distances over land, Blanding's turtles regularly travel across roads and are therefore susceptible to collisions with vehicles. Any added mortality can be detrimental to populations of Blanding's turtles, as these turtles have a low reproduction rate that depends upon a high survival rate to maintain population levels. Other factors that contribute to the decline of this species include wetland drainage and degradation, and the development of upland habitat.

This project has the potential to impact this rare turtle through direct fatalities or habitat disturbance/destruction due to dewatering, excavation, fill, or other construction activities associated with the project. Actions to avoid or minimize disturbance to this state-protected turtle may include, but are not limited to, the following recommendations:

- Avoid Type 2 & 3 wetlands,
- To avoid any incidental takings, avoid filling or dewatering wetlands during the winter,
- Use oversized culverts (minimum 36") between wetlands or on streams,
- Implement stringent sediment and erosion control methods,
- Use wildlife-friendly erosion control (see enclosed fact sheet),
- Monitor for turtles during construction and report any sightings to the DNR,
- Please refer to the first list of recommendations in the enclosed Blanding's Turtle Fact Sheet. If greater protection for turtles is desired, the second list of recommendations can be implemented as well.
- For specific recommendations pertaining to transportation projects, please refer to Curb Design and Small Animals, Preventing Entanglement, & Reducing Wildlife Vehicle Collisions in Chapter One of the Minnesota Department of Transportation's Best Practices Manual ([http://www.dnr.state.mn.us/waters/watermgmt\\_section/pwpermits/gp\\_2004\\_0001\\_manual.html](http://www.dnr.state.mn.us/waters/watermgmt_section/pwpermits/gp_2004_0001_manual.html)).
- For further assistance regarding the Blanding's turtle, please contact Lisa Gelvin-Innvaer, DNR Regional Nongame Specialist, at 507-359-6033.

The attached flyer should be given to all contractors working in the area. If Blanding's turtles are encountered on site, please remember that state law and rules prohibit the destruction of threatened or endangered species, except under certain prescribed conditions. If turtles are in imminent danger they should be moved by hand out of harm's way, otherwise they should be left undisturbed.

- The Great Plains toad (*Anaxyrus cognatus*), state-listed as special concern, and the western foxsnake (*Pantherophis ramspotti*), a Species in Greatest Conservation Need as identified in Minnesota's State Wildlife Action, have been documented within the project boundary. While the Great Plains toad was formerly associated with prairie and other grasslands, it also uses agricultural areas. Nearly all of the recent breeding choruses of this rare toad have been found in flooded agricultural fields. Most sightings

of the foxsnake in this area are of dead snakes killed along the roads. Measures to minimize disturbance to the Blanding's turtle should benefit these species as well.

### *Birds*

- The Natural Heritage Information System contains breeding season observations of several rare birds (see enclosed database reports) including Henslow's sparrow (*Ammodramus henslowii*) and loggerhead shrikes (*Lanius ludovicianus*), both state-listed as endangered. The Henslow's sparrow nests on the ground in grasslands and old fields while the loggerhead shrike nests in small trees or shrubs in grasslands, old fields, shelterbelts, orchards, or farmyards. Please contact me if there will be any disturbance within suitable habitat from April through July, as surveys for active nests may be required prior to any construction activities.
- There are two Important Bird Areas (IBA), Heron Lake IBA and Des Moines River IBA, to the southwest of the proposed project boundary. Important Birds Areas, identified by Audubon Minnesota in partnership with the DNR, are part of an international conservation effort aimed at conserving critical bird habitats. They are voluntary and non-regulatory, but the designation demonstrates the biological value of this surrounding area and indicates potentially higher bird numbers and diversity passing through the project boundary. The Des Moines River IBA forms an important corridor of native habitats through an otherwise heavily cultivated portion of Minnesota.

Within the Coteau Moraines and Minnesota River Prairie Ecological Subsections (where the project is located), a minimum of 34 SGCN\* bird species use prairie and nonforested wetland habitat such as that found within the project boundary. It should be noted that many SGCN\* are not tracked in the Natural Heritage Information System (NHIS), and the NHIS does not include records of migrating birds.

Wind farms can affect birds due to collision fatality, displacement due to disturbance, habitat fragmentation, and habitat loss. Potential impacts to grassland birds are a concern because many of these species are declining in number nationwide. Even if collision mortality rates are low, the additional fatalities may be significant for rare species. We recommend post-construction avian fatality monitoring to provide information regarding unexpected impacts, if any, to rare birds. Knowledge of these types of extraordinary events would allow for the implementation of additional measures to minimize disturbance, such as the curtailment of turbine operations during certain conditions.

### *Prairie-dependent Butterflies*

- The Poweshiek skipperling (*Oarisma poweshiek*), a federally and state listed endangered butterfly species, and the Dakota skipper (*Hesperia dacotae*), federally listed as threatened and state-listed as endangered, were documented in the immediate vicinity of the proposed project in the 1970's. Although recent surveys have failed to find the above species, the phlox moth and regal fritillary, both state-listed as special concern, have been documented more recently. To protect these prairie obligate species, **it is imperative that the destruction and disturbance of native prairie be avoided. Please contact me if this is not feasible.**

### *Caddisflies*

- A caddisfly (*Ironoquia punctatissima*), state-listed as threatened, has been documented within the project boundary. The larvae of this species are dependent on small cold water streams and are extremely sensitive to changes in the riparian corridor or forest canopy adjacent to streams.

### *Bats*

- The Natural Heritage Information System (NHIS) tracks bat roost trees and hibernacula plus some acoustic data, but this information is not exhaustive. Although there are no NHIS records for bats in the vicinity of the proposed project, all seven of Minnesota's bats can be found throughout Minnesota. The northern long-eared bat (*Myotis septentrionalis*), tricolored bat (*Perimyotis subflavus*), big brown bat (*Eptesicus fuscus*), and little brown bat (*Myotis lucifugus*) are all state-listed species of special concern. Actions to minimize impacts include, but are not limited to, the following recommendations:
  - Place turbines an adequate distance from stream corridors and forested areas,
  - Feather turbine blades below cut-in speeds, and
  - Conduct post-construction fatality monitoring.

As the U.S. Fish and Wildlife Service (USFWS) has listed the northern long-eared bat as threatened under the Endangered Species Act, please coordinate with the USFWS regarding this species.

### *Environmental Review and Permitting*

- The PUC Site Application should clearly document the potential impacts to the above rare features, and identify specific measures that will be taken to avoid or minimize disturbance. The Avian and Bat Protection Plan should also include measures to minimize impacts to rare birds and bats.
- **Given the many rare features within the project boundary, further Natural Heritage Review will be needed after preconstruction surveys have been completed and project details have been finalized.** Sufficient information should be provided to allow the DNR to concur that the above protected species will be avoided. Minnesota's endangered species law (*Minnesota Statutes*, section 84.0895) and associated rules (*Minnesota Rules*, part 6212.1800 to 6212.2300 and 6134) prohibit the taking of threatened or endangered species without a permit.
- Given the federal status of several of the above species, I recommend that you coordinate with the U.S. Fish & Wildlife Service's Twin Cities Field Office (612-725-3548) regarding this project.
- Please include a copy of this letter in any state or local license or permit application. **To the extent applicable, measures to avoid or minimize disturbance to the above rare features should be included as restrictions or conditions in any required permits or licenses.**

The Natural Heritage Information System (NHIS), a collection of databases that contains information about Minnesota's rare natural features, is maintained by the Division of Ecological and Water Resources, Department of Natural Resources. The NHIS is continually updated as new information becomes available, and is the most complete source of data on Minnesota's rare or otherwise significant species, native plant communities, and other

natural features. However, the NHIS is not an exhaustive inventory and thus does not represent all of the occurrences of rare features within the state. Therefore, ecologically significant features for which we have no records may exist within the project area. **If additional information becomes available regarding rare features in the vicinity of the project, further review may be necessary.**

The enclosed results include an Index Report and a Detailed Report of records in the Rare Features Database, the main database of the NHIS. To control the release of specific location information, which might result in the destruction of a rare feature, both reports are copyrighted.

The Index Report provides rare feature locations only to the nearest section, and may be reprinted, unaltered, in an environmental review document (e.g., EAW or EIS), municipal natural resource plan, or report compiled by your company for the project listed above. If you wish to reproduce the index report for any other purpose, please contact me to request written permission. **The Detailed Report is for your personal use only as it may include specific location information that is considered nonpublic data under *Minnesota Statutes*, section 84.0872, subd. 2. If you wish to reprint or publish the Detailed Report for any purpose, please contact me to request written permission.**

For environmental review purposes, the results of this Natural Heritage Review are valid for one year; the results are only valid for the project location (noted above) and the project description provided on the NHIS Data Request Form. Please contact me if project details change or for an updated review if construction has not occurred within one year.

The Natural Heritage Review does not constitute review or approval by the Department of Natural Resources as a whole. Instead, it identifies issues regarding known occurrences of rare features and potential effects to these rare features. If you have not done so already, please contact your DNR Regional Environmental Assessment Ecologist to determine whether there are other natural resource concerns associated with the proposed project (contact information available at [http://www.dnr.state.mn.us/eco/ereview/erp\\_regioncontacts.html](http://www.dnr.state.mn.us/eco/ereview/erp_regioncontacts.html)). Please be aware that additional site assessments or review may be required.

Thank you for consulting us on this matter, and for your interest in preserving Minnesota's rare natural resources. An invoice will be mailed to you under separate cover.

Sincerely,



Lisa Joyal  
Endangered Species Review Coordinator  
[lisa.joyal@state.mn.us](mailto:lisa.joyal@state.mn.us)

\*Species in Greatest Conservation Need as identified in the State Wildlife Action Plan

enc. Rare Features Database: Index Report  
Rare Features Database: Detailed Report  
Rare Features Database Reports: An Explanation of Fields  
Map  
Blanding's Turtle Fact Sheet and Flyer  
Rare Species Survey Process

cc: Cynthia Warzecha, Kevin Mixon, Lisa Gelvin-Innvaer, DNR  
Richard Davis, DOC

Links: DNR Rare Species Guide  
[www.dnr.state.mn.us/rsg/index.html](http://www.dnr.state.mn.us/rsg/index.html)  
Provides information on the biology, habitat use, and conservation measures of rare species

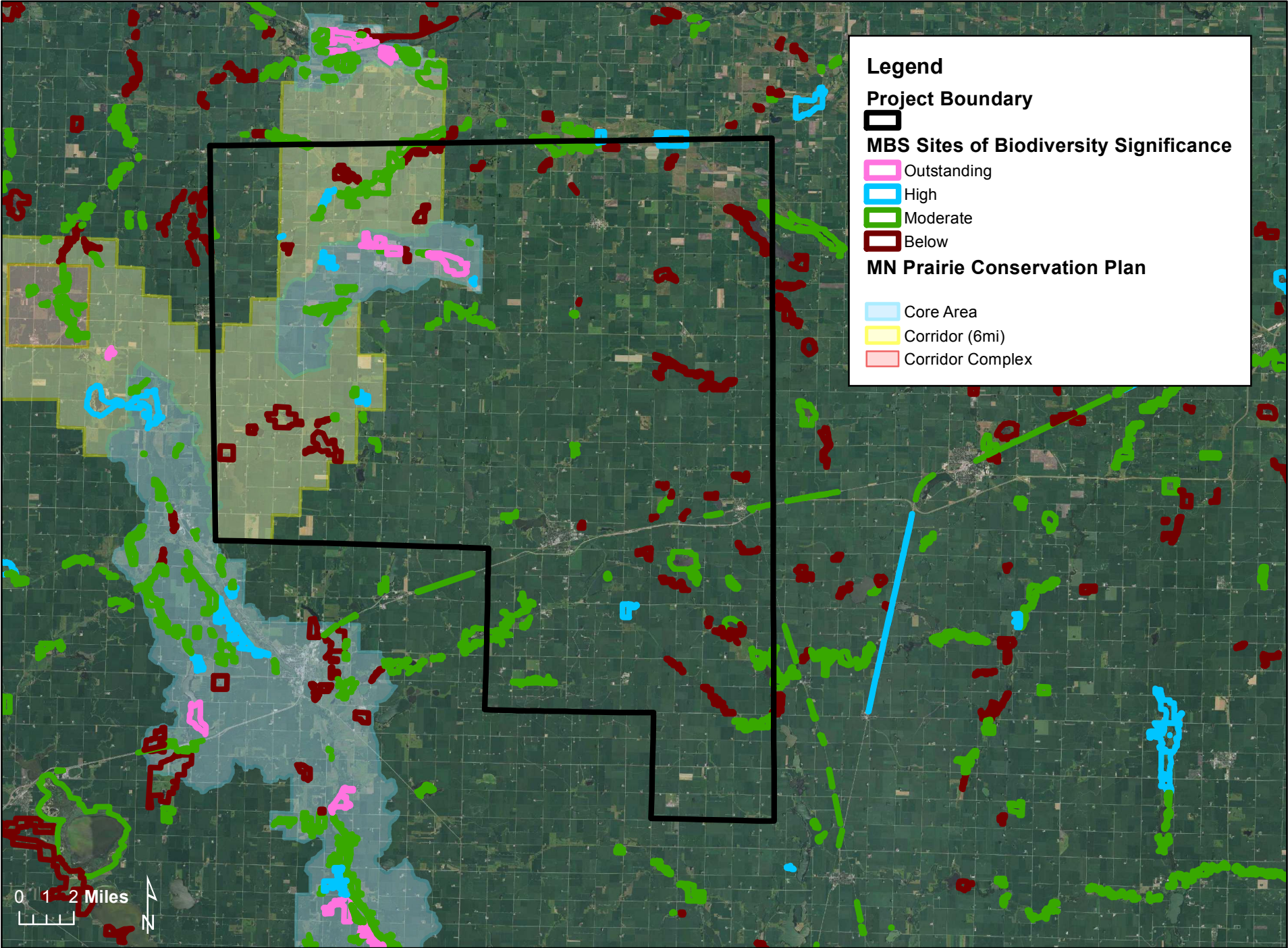
Minnesota Prairie Conservation Plan  
[http://files.dnr.state.mn.us/eco/mcbs/mn\\_prairie\\_conservation\\_plan.pdf](http://files.dnr.state.mn.us/eco/mcbs/mn_prairie_conservation_plan.pdf)  
Landowner Incentive Programs to Protect Prairie & Restoration Guidance  
<http://www.dnr.state.mn.us/prairierestoration/index.html>

MBS Sites of Biodiversity Significance  
[http://www.dnr.state.mn.us/eco/mcbs/biodiversity\\_guidelines.html](http://www.dnr.state.mn.us/eco/mcbs/biodiversity_guidelines.html)  
DNR Native Plant Communities  
<http://www.dnr.state.mn.us/npc/index.html>

USFWS Key to the Northern Long-Eared Bat 4(d) Rule for Non-Federal Activities  
<http://www.fws.gov/midwest/angered/mammals/nleb/KeyFinal4dNLEB.html>  
USFWS Key to the Northern Long-Eared Bat 4(d) Rule for Federal Actions  
<http://www.fws.gov/midwest/angered/mammals/nleb/KeyFinal4dNLEBFedProjects.html>  
USFWS Northern Long-eared Bat Website  
<http://www.fws.gov/midwest/angered/mammals/nleb/index.html>  
USFWS Northern Long-eared Bat Fact Sheet  
<http://www.fws.gov/midwest/angered/mammals/nleb/nlebFactSheet.html>



# Big Bend Wind



# Rare Features Database Reports: An Explanation of Fields

Revised August 2012

The Rare Features Database is part of the Natural Heritage Information System, and is maintained by the Division of Ecological and Water Resources, Minnesota Department of Natural Resources (DNR).

*\*\*Please note that the database reports are copyrighted and may not be reproduced without permission\*\**

**Field Name:** [Full (non-abbreviated) field name, if different]. Further explanation of field.

## **-D-**

**Draft Status:** Proposed change to the legal status of the plant or animal species under the Minnesota Endangered Species Law: END = endangered; THR = threatened; SPC = special concern; Watchlist = tracked, but no legal status.

## **-E-**

**Element Name and Occ #:** [Element Name and Occurrence Number]. The Element is the name of the rare feature. For plant and animal species records, this field holds the scientific name followed by the common name in parentheses; for all other elements (such as native plant communities, which have no scientific name) it is solely the element name. Native plant community names correspond to Minnesota's Native Plant Community Classification (Version 2.0). The Occurrence Number, in combination with the Element Name, uniquely identifies each record.

**EO Data:** [Element Occurrence Data]. For species elements, this field contains data collected on the biology of the Element Occurrence\* (EO), including the number of individuals, vigor, habitat, soils, associated species, peculiar characteristics, etc. For native plant community elements, this field is a summary text description of the vegetation of the EO, including structure (strata) and composition (dominant/characteristic species), heterogeneity, successional stage/dynamics, any unique aspects of the community or additional noteworthy species (including animals). Note that this is a new field and it has not been filled out for many of the records that were collected prior to conversion to the new database system. Some of the information meeting the field definition may be found in the General Description field.

**EO ID#:** [Element Occurrence Identification Number]. Unique identifier for each Element Occurrence record.

**EO Rank:** [Element Occurrence Rank]. An evaluation of the quality and condition of an Element Occurrence (EO) from A (highest) to D (lowest). Represents a comparative evaluation of: 1) quality as determined by representativeness of the occurrence especially as compared to EO specifications and including maturity, size, numbers, etc. 2) condition (how much has the site and the EO itself been damaged or altered from its optimal condition and character). 3) viability (the long-term prospects for continued existence of this occurrence - used in ranking species only). EO Ranks are assigned based on recent fieldwork by knowledgeable individuals.

**Extent Known?:** A value that indicates whether the full extent of the Element is known (i.e., it has been determined through field survey) at that location. If null, the value has not been determined.

## **-F-**

**Federal Status:** Status of species under the U.S. Endangered Species Act: LE = endangered; LT = threatened; LE,LT = listed endangered in part of its range, listed threatened in another part of its range; LT,PDL = listed threatened, proposed for delisting; C = candidate for listing. If null or "No Status" the species has no federal status.

**First Observed Date:** Date that the Element Occurrence was first reported at the site in format YYYY-MM-DD. A year followed by "Pre" indicates that the observed date was sometime prior to the date listed, but the exact date is unknown.

## **-G-**

**General Description:** General description or word picture of the area where the Element Occurrence (EO) is located (i.e., the physical setting/context surrounding the EO), including a list of adjacent communities. When available, information on surrounding land use may be included. Note that the information tracked in this field is now more narrowly defined than it was in the old database system, and some of the information still in this field more accurately meets the definition of the new EO Data field. We are working to clean up the records so that the information in the two fields corresponds to the current field explanations described herein. Also note that the use of uppercase in sentences in this field is not significant but rather an artifact of transferring data from the old database system to the new system.

**Global Rank:** The global (i.e., range-wide) assessment of the relative rarity or imperilment of the species or community. Ranges from G1 (critically imperiled due to extreme rarity on a world-wide basis) to G5 (demonstrably secure, though perhaps rare in parts of its range). Global ranks are determined by NatureServe, an international network of natural heritage programs and conservation data centers.

## **-L-**

**Last Observed Date:** Date that the Element Occurrence was last observed to be extant at the site in format YYYY-MM-DD.

**Last Survey Date:** Date of the most recent field survey for the Element Occurrence, regardless of whether it was found during the visit. If the field is blank, assume the date is the same as the Last Observed Date.

**Location Description:** County or Counties in which the Element Occurrence was documented followed by Township, Range, and Section information (not listed in any particular order). Each unique Township, Range, and Section combination is separated by a comma. In some cases, there are too many Township, Range, and Section combinations to list in the field, in which case, the information will be replaced with, "Legal description is too lengthy to fit in allotted space".

**-M-**

**Managed Area(s):** Name of the managed area (e.g., federal, state, local, or private park, forest, refuge, or preserve) containing the occurrence, if any. If this field is blank, the element probably occurs on private land. If "(Statutory Boundary)" occurs after the name of a managed area, the location may be a private inholding within the statutory boundary of a state forest or park.

**MN Status:** The legal status of plant or animal species under the Minnesota Endangered Species Law: END = endangered; THR = threatened; SPC = special concern; NON = tracked, but no legal status. Native plant communities, geological features, and colonial waterbird nesting sites do not have any legal status under the Endangered Species Law and are represented by a N/A.

**MN Statute Name:** The name of the species as identified under the Minnesota Endangered Species Law. This name may differ from the scientific name due to changes in the scientific nomenclature since 1996, when the Minnesota List of state-listed species was last revised.

**-N-**

**NPC Classification (v1.5):** Native plant community name in Minnesota's Native Vegetation: A Key to Natural Communities (Version 1.5). This earlier classification has been replaced by Minnesota's Native Plant Community Classification (Version 2.0).

**-O-**

**Observed Area:** The total area (acres), measured or estimated during fieldwork, of the Element Occurrence. If null, the value has not been determined.

**-S-**

**SGCN Status:** SGCN = The species is a Species in Greatest Conservation Need as identified in Minnesota's State Wildlife Action Plan (<http://www.dnr.state.mn.us/cwcs/index.html>). This designation applies to animals only.

**Site Name:** The name of the site(s) where the Element Occurrence is located. Sites are natural areas of land with boundaries determined and mapped according to biological and ecological considerations.

**Survey Site #/Name:** The name of the survey site, if applicable, where the Element Occurrence is located. Survey sites are sites that provide a geographic framework for recording and storing data, but their boundaries are not based on biological and ecological considerations. Minnesota County Biological Survey site numbers, if applicable, are also listed in this field.

**Survey Type:** Information on the type of survey used to collect information on the Element Occurrence.

**Surveyor(s):** Name(s) of the person(s) that collected survey information on the Element Occurrence.

**State Rank:** Rank that best characterizes the relative rarity or endangerment of the taxon or plant community in Minnesota. The ranks do not represent a legal status. They are used by the Minnesota Department of Natural Resources to set priorities for research, inventory and conservation planning. The state ranks are updated as inventory information becomes available. S1 = Critically imperiled in Minnesota because of extreme rarity or because of some factor(s) making it especially vulnerable to extirpation from the state. S2 = Imperiled in Minnesota because of rarity or because of some factor(s) making it very vulnerable to extirpation from the state. S3 = Vulnerable in Minnesota either because rare or uncommon, or found in a restricted range, or because of other factors making it vulnerable to extirpation. S4 = Apparently secure in Minnesota, usually widespread. S5 = Demonstrably secure in Minnesota, essentially ineradicable under present conditions. SH = Of historical occurrence in the state, perhaps having not been verified in the past 20 years, but suspected to be still extant. An element would become SH without the 20-year delay if the only known occurrences in the state were destroyed or if it had been extensively and unsuccessfully looked for. SNR = Rank not yet assessed. SU = Unable to rank. SX = Presumed extinct in Minnesota. SNA = Rank not applicable. S#S# = Range Rank: a numeric range rank (e.g., S2S3) is used to indicate the range of uncertainty about the exact status of the element. S#B, S#N = Used only for migratory animals, whereby B refers to the breeding population of the element in Minnesota and N refers to the non-breeding population of the element in Minnesota.

**-V-**

**Vegetation Plot:** Code(s) for any vegetation plot data that have been collected within this Element Occurrence (i.e., either Releve Number or the word "RELEVE" indicates that a releve has been collected).

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\* Element Occurrence – an area of land and/or water in which an Element (i.e., a rare species or community) is, or was, present, and which has practical conservation value for the Element as evidenced by potential continued (or historical) presence and/or regular recurrence at a given location. Specifications for each species determine whether multiple observations should be considered 1 Element Occurrence or 2, based on minimum separation distance and barriers to movement.

## Data Security

Locations of some rare features must be treated as sensitive information because widespread knowledge of these locations could result in harm to the rare features. For example, wildflowers such as orchids and economically valuable plants such as ginseng are vulnerable to exploitation by collectors; other species, such as bald eagles, are sensitive to disturbance by observers. For this reason, we prefer that publications not identify the precise locations of vulnerable species. We suggest describing the location only to the nearest section. If this is not acceptable for your purposes, please call and discuss this issue with the Endangered Species Review Coordinator at 651- 259-5109.

# MBS Recommendations for Evaluating and Mapping Native Prairie in Minnesota

DRAFT: 4 May, 2016

1. Please refer to the Field Guide to the Native Plant Communities of Minnesota for information on the composition of different native prairie community types in Minnesota. For information on assigning condition ranks to prairie communities, please refer to the Minnesota Biological Survey (MBS) Condition Ranking Guidelines (attached and on the DNR website at <http://www.dnr.state.mn.us/npc/classification.html> – under the Field Guide tab). When mapping prairies, map the areas that meet the conditions for Ranks A through D. If a prairie is dominated by natives, then rank it at least C rank. If it is dominated by non-natives but has enough natives to be clearly a prairie remnant, then rank as CD or D.
2. The following GIS resources for prairie identification and delineation are very useful:
  - a. Aerial photography:
    1. Historical photos (1930s, 1950s) available from the DNR website are very useful for identifying areas that were cultivated in the past.
    2. The 1991 NAPP photography was a color infrared layer taken in spring 1991 that is excellent for detecting dry and mesic prairies with standing dead prairie grasses (bluish grey signature). This is not totally reliable, as smooth brome can also have this signature. DNR does not have a digital version of this layer in the original color, but does have a black and white version in which the prairies are a somewhat lighter shade than adjacent areas dominated cool-season grasses.
    3. The FSA 2008 color-infrared cover taken in August, shows dry prairies as bluish-grey areas, in contrast to reddish areas dominated by invasives. This is not totally reliable, as areas dominated by smooth brome can also have a dark bluish signature. Mesic prairies can be a bluish-grey color or can be fairly reddish colored. Reed canary grass typically shows up as a bright hot pink. All signatures identified from photos must be visited in the field to verify what they are.
  - b. Topography: Recently developed Lidar data are being used to create 2-foot elevation contours and 3-foot hillshade layers. These are excellent for identifying the steeper slopes or swales in landscapes with subtle relief.
  - c. Soils: Soil survey polygons obtainable from NRCS are useful for delineating specific native plant communities that are strongly influenced and classified by substrate characteristics, such as dry prairie. Soil survey polygons have been useful as a preliminary step for locating some calcareous fens in some counties, but must always be confirmed by field visits.
  - d. CRP layer: Very useful for quickly identifying areas that have previously been cultivated.

3. There are conditions that can make it very difficult to determine whether or not prairie is present.

a. Time of year:

1. March - May: Early in the year, some prairies may be dominated by cool season, non-native grasses. Warm season natives may be difficult to see at this time, especially if they were clipped off the previous fall. In pastures that were not grazed late in the year and had good development of warm season natives in August – October, then the standing dead natives may be easily seen early the following spring. Visits to early season sites can confirm the presence of native prairie but they are not reliable times to assess species diversity and condition rank.
2. June: good for viewing early season flora, sedges.
3. July through mid-September would be the best time to assess the warm season component and rank the condition of prairies.
4. Rare species: different species are detectable at different times of year. Some species have a very short window of opportunity, such as *Botrychium campestre* which is visible for just a couple of weeks typically in late May and early June. Collection records obtained on-line from the University of Minnesota herbarium can help identify times of year to search for specific species.

b. Management conditions:

1. Grazing: Some areas that are undergoing heavy grazing can appear to not be prairies. Some of these sites look from the road like they are destroyed but one does find a native component in them once you walk into the site. It is challenging but possible to identify natives that have been clipped off to a height of a few inches. The best approach is to return to the site at a different time when the pasture is being rested. In heavily grazed pastures, steep slopes where cows spend less time typically have the best diversity – a common pattern in heavily grazed pastures is native prairie on steep slopes with non-native species dominating shallower toe slopes and level hilltops.
2. Herbicide: Some landowners treat pastures with broadleaf herbicide to kill thistles, with severe impacts on floristic diversity. Diversity is often much better on steep slopes that they cannot access. Diversity can rebound in later years in pastures that have light, infrequent herbicide treatment.

# Minnesota Biological Survey

## Upland Prairie System – Condition Ranking Guidelines

(This is a working document that is periodically revised as new information is available)

September 2014 version

### Condition Ranks for Native Plant Communities

Condition Ranks for native plant communities reflect the degree of ecological integrity of a specific occurrence of a native plant community. Condition Ranks are assigned by considering species composition, vegetation structure, ecological processes and functions, level of human disturbance, presence of exotic species, and other factors. Condition Ranks are assigned on a scale of A to D.

- A-rank occurrences have excellent ecological integrity. They have species composition, structure, and ecological processes typical of the natural or historic range of the community and have been little degraded by recent human activity or invasive species.
- B-rank occurrences have good ecological integrity. They include plant communities with modest degradation or that were degraded in the past but have recovered and now have relatively natural composition and structure. B-rank occurrences normally will return to A-rank condition with protection or appropriate management.
- C-rank occurrences have fair ecological integrity. They show strong evidence of human-caused degradation, but retain some characteristic species and have some potential for recovery with protection and management.
- D-rank occurrences have poor ecological integrity. The original composition and structure of the community have been severely altered by human-caused degradation or invasion by exotic species. They have little chance of recovery to their natural or historic condition.

- 
- The Upland Prairie System contains the following native plant community classes and types:
    - UPn12 Northern Dry Prairie
      - UPn12a Dry Barrens Prairie (Northern)
      - UPn12b Dry Sand – Gravel Prairie (Northern)
      - UPn12c Dry Sand – Gravel Brush Prairie (Northern)
      - UPn12d Dry Hill Prairie (Northern)
    - UPn13 Northern Dry Savanna
      - UPn13a Dry Barrens Jack Pine Savanna (Northern)
      - UPn13b Dry Barrens Oak Savanna (Northern)
      - UPn13c Dry Sand-Gravel Oak Savanna (Northern)
      - UPn13d Dry Hill Oak Savanna (Northern)
    - UPn23 Northern Mesic Prairie
      - UPn23a Mesic Brush-Prairie (Northern)
      - UPn23b Mesic Prairie (Northern)
    - UPn24 Northern Mesic Savanna
      - UPn24a Mesic Oak Savanna (Northern)
      - UPn24b Aspen Openings (Northern)
    - UPs13 Southern Dry Prairie
      - UPs13a Dry Barrens Prairie (Southern)
      - UPs13b Dry Sand – Gravel Prairie (Southern)
      - UPs13c Dry Bedrock Bluff Prairie (Southern)
      - UPs13d Dry Hill Prairie (Southern)
    - UPs14 Southern Dry Savanna
      - UPs14a Dry Barrens Oak Savanna (Southern)
        - UPs14a1 Jack Pine Subtype

- UPs14a2 Oak Subtype
      - UPs14b Dry Sand-Gravel Oak Savanna (Southern)
      - UPs14c Dry Hill Oak Savanna (Southern)
    - UPs23 Southern Mesic Prairie
      - UPs23a Mesic Prairie (Southern)
    - UPs24 Southern Mesic Savanna
      - UPs24a Mesic Oak Savanna (Southern)
- For information on the plant community classes, types, and subtypes in this System, please refer to the Upland Prairie System in the *Field Guide to Native Plant Communities of Minnesota: The Prairie Parkland and Tallgrass Aspen Parklands Provinces* (MNDNR 2005) or the *Field Guide to Native Plant Communities of Minnesota: The Eastern Broadleaf Forest Province* (MNDNR 2005). Native plant community class fact sheets from the field guides are available on-line at: <http://www.dnr.state.mn.us/npc/classification.html>
- For checklists and distribution maps of native plant species in Minnesota, refer to the MNDNR's State Checklists on the MNDNR website at: [http://www.dnr.state.mn.us/eco/mcbs/plant\\_lists.html](http://www.dnr.state.mn.us/eco/mcbs/plant_lists.html)

### 1) What is an A-rank Occurrence?:

- Site has structure and composition free of human-caused degradation, including overgrazing, poorly-timed haying, fire suppression and forest/woodland succession, herbicide application/drift, invasive species invasion, fertilizer drift, tree planting, excessive burning, and ATV use. A-rank occurrences are considered high-quality prairie and typically have the following conditions:
  - A diverse assemblage of native species is present, including “decreaser” species (see Weaver 1954) that decline with persistent moderate to heavy grazing (Table 1).
  - A-rank prairies properly managed with light or periodic grazing for conservation, in combination with controlled burns and rest, will likely have greater overall species richness (number of species) than ungrazed sites, but will also contain a full complement of decreaser species appropriate for the prairie type and geographic region. Though species richness is high, many decreaser and increaser species are naturally not abundant. Some decreaser species increase in abundance with light grazing (e.g., prairie plum [*Astragalus crassicaarpus*]) but decrease with heavier grazing.
  - The vegetation often has heterogeneous patterns of species composition and structure, typically including distinct patches or zones that correlate with variation in microenvironmental conditions, fire frequency, or other disturbances such as grazing. Different dominant species and floras will occur in wet-mesic, mesic, dry-mesic, and dry microhabitats. Vegetation structure and species abundances may also vary from year to year, due to variation in management practices and weather conditions.
  - Non-native, invasive species are absent or are minor components. Kentucky bluegrass (*Poa pratensis*) and/or Canada bluegrass (*Poa compressa*) are present in nearly all prairies and savannas remaining today but in high-quality prairies are sparse and do not displace native species.
  - For prairies, overall tree cover is generally <10% and limited to fire-tolerant species. Fire-sensitive woody species are restricted to naturally fire-protected microsites.
  - For savannas, total tree cover averages 10 to 70%, with trees scattered and/or in small to large clusters. Trees have open-grown growth form and are fire-tolerant/dependent species, such as bur oak and northern pin oak.

## 2) What is a B-rank Occurrence?:

- Site has structure and composition similar to that of an A-rank occurrence, but has altered species abundances and richness due to moderate levels of degradation from overgrazing, poorly-timed haying, woody plant invasion, minor wetland drainage, fertilizer drift, minor herbicide exposure, invasive species, tree planting, or low to moderate ATV use. B-rank occurrences are considered high-quality prairie and typically have the following conditions:
  - Site has high native species richness but some decreaser species appropriate to the site are missing, and other decreaser species are much more uncommon than in A-rank sites (Table 1).
  - Some prairies are in this condition as a result of past land use and not present management.
  - In savannas, total tree cover averages 10 to 70%, with trees in scattered and/or clumped patterns. Fire-tolerant/dependent species with open-grown growth form predominate, but fire-sensitive native woody species have become well-established.
  - Low to moderate levels of invasive species may be present.
  - In sites that have been grazed, compaction and hummocking of the ground surface is minimal to moderate.

## 3) What is a C-rank Occurrence?:

- Site is still dominated by native species, but has undergone moderate to heavy degradation from overgrazing, wetland drainage, fire suppression, repeated herbicide treatment, siltation, invasive species invasion, or tree planting. C-rank occurrences are considered fair-quality prairie and typically have the following conditions:
  - Native graminoids and shrubs still dominate throughout most of the site, but overall plant species richness and diversity is low due to loss of most decreaser and many increaser species (Tables 1 and 2). Portions of the site (such as mesic toe slopes on hillsides) may be dominated by exotic species.
  - In persistently heavily grazed prairies and savannas, dominance shifts to native graminoids that are more resilient to heavy grazing, including species of grama grass (*Bouteloua* spp.), three-awn (*Aristida* spp.), Scribner's panic grass (*Dichanthelium oligoanthes*), Wilcox's panic grass (*Dichanthelium wilcoxianum*), western wheatgrass (*Pascopyrum smithii*), purple lovegrass (*Eragrostis spectabilis*), and, in shaded areas, Pennsylvania sedge (*Carex pennsylvanica*). Grass species that are less resilient to persistent heavy grazing may be somewhat sparse, including prairie dropseed (*Sporobolus heterolepis*), big bluestem (*Andropogon gerardii*), Indian grass (*Sorghastrum nutans*), switchgrass (*Panicum virgatum*), junegrass (*Koeleria pyramidata*), and Canada wild rye (*Elymus canadensis*).
  - In savannas, enough structure remains so that the community is still recognizable as savanna. In most cases, succession to woodland/forest is progressing, and often is quite far along, although some patches still retain the native prairie flora of open savanna.
  - Invasive species are often abundant, including smooth brome (*Bromus inermis*), Kentucky bluegrass, Canada bluegrass, timothy (*Phleum pratense*), black medic (*Medicago lupulina*), red clover (*Trifolium repens*), or redtop (*Agrostis gigantea*) (Table 3).
  - In persistently overgrazed sites, the ground surface is compacted and slopes are terraced.



#### 4) What is a D-rank Occurrence?:

- Site has been highly degraded and the native vegetation has been severely altered, but enough native species are present that the occurrence can still be recognized as the community type it was prior to being degraded. D-rank occurrences are considered poor-quality prairie and typically have the following conditions:
  - Open areas in the site are dominated by exotic species, typically smooth brome, Kentucky bluegrass, Canada bluegrass, quackgrass (*Elymus repens*), and/or redtop (Table 3), but native graminoids are common enough for the occurrence to be recognized as native prairie or savanna and not old field. Buckthorn (*Rhamnus cathartica*) may be abundant in shaded portions of savannas.
  - Overall native species richness is very low.
  - Generally a few, highly disturbance-tolerant increaser species, such as Canada goldenrod (*Solidago canadensis*), wolfberry (*Symphoricarpos occidentalis*), or rough fleabane (*Erigeron strigosus*) are highly abundant (Table 2). Pennsylvania sedge and armed shrubs often dominate shaded areas in savannas.
  - In overgrazed sites, the ground surface is often highly compacted and slopes are often highly terraced.
  - D-rank occurrences include sites dominated by native grasses where herbicide has repeatedly been applied and all forbs and shrubs are absent.

#### 5) Mapping notes:

- Mesic Oak Savanna: map all occurrences, as this community is all but extirpated from the state.
- All other communities:
  - Map A- to D-rank occurrences that are 5 acres or larger.
  - Map smaller occurrences if they meet one of the following exceptions:
    - It is within a larger area of native plant communities important for conservation action.
    - It is part of a series of small occurrences—such as numerous small dry prairies along a valley slope.
    - It is habitat for a rare species.
    - It is one of very few occurrences of the type in an LTA.
    - It is A- or B-rank.
- On rare occasions, a reconstructed or restored prairie may be sufficiently diverse—consisting of species and ecotypes appropriate for its location—to be ranked as a native plant community. If such a site is virtually indiscernible from a native occurrence, it may be mapped and ranked according to the criteria in these guidelines, but polygon attributes and other database entries should note that it is restored/reconstructed.
- Generally, small (2-acre) dry prairie openings in savanna-dominated landscapes are mapped as savanna, though larger areas of prairie have been mapped as dry prairie apart from adjacent savanna.

#### Reference:

Weaver, J.E. 1954. North American Prairie. Johansen Publishing Co., Lincoln, NE.

**Table 1. Examples of grazing decrease<sup>1</sup> in Upland Prairie System communities:**

| Common Name                      | Scientific Name                      | Limited Distribution                     |
|----------------------------------|--------------------------------------|------------------------------------------|
| Glaucous false dandelion         | <i>Agoseris glauca</i>               | Western MN                               |
| Prairie wild onion               | <i>Allium stellatum</i>              |                                          |
| Leadplant                        | <i>Amorpha canescens</i>             |                                          |
| Fragrant false indigo            | <i>Amorpha nana*</i>                 | Rarely seen in SW MN                     |
| Big bluestem                     | <i>Andropogon gerardii</i>           |                                          |
| Bearberry                        | <i>Arctostaphylos uva-ursi</i>       | Dunes, sand-gravel                       |
| Woolly milkweed                  | <i>Asclepias lanuginosa</i>          | Dry prairie                              |
| Oval-leaved milkweed             | <i>Asclepias ovalifolia*</i>         |                                          |
| Showy milkweed                   | <i>Asclepias speciosa</i>            | Wet to mesic prairie, Western MN         |
| Prairie milk-vetch               | <i>Astragalus adsurgens</i>          |                                          |
| Canada milkvetch                 | <i>Astragalus canadensis</i>         |                                          |
| Ground plum                      | <i>Astragalus crassicaulus</i>       |                                          |
| False boneset                    | <i>Brickellia eupatorioides</i>      |                                          |
| Toothed-leaved evening primrose  | <i>Calylophus serrulatus</i>         |                                          |
| American New Jersey tea          | <i>Ceanothus americanus</i>          | Southern MN                              |
| Irish moss                       | <i>Cetraria arenaria (a lichen)*</i> |                                          |
| Reindeer lichens                 | <i>Cladina spp.*</i>                 |                                          |
| Bird's foot coreopsis            | <i>Coreopsis palmata*</i>            | Southern MN & S end of NW MN             |
| White prairie clover             | <i>Dalea candida var. candida*</i>   |                                          |
| Purple prairie clover            | <i>Dalea purpurea</i>                |                                          |
| Silky prairie clover             | <i>Dalea villosa*</i>                | Dunes                                    |
| Canada tick trefoil              | <i>Desmodium canadense</i>           |                                          |
| Leiberg's panic grass            | <i>Dichanthelium leibergii*</i>      |                                          |
| Narrow-leaved purple coneflower  | <i>Echinacea angustifolia</i>        | Western MN                               |
| Canada wild rye                  | <i>Elymus canadensis</i>             |                                          |
| Rattlesnake master               | <i>Eryngium yuccifolium*</i>         | Southeastern MN                          |
| Blanket-flower                   | <i>Gaillardia aristata</i>           | Sand-gravel prairie in NW MN             |
| Bottle gentian                   | <i>Gentiana andrewsii</i>            |                                          |
| Downy gentian                    | <i>Gentiana puberulenta</i>          |                                          |
| Stiff gentian                    | <i>Gentiana quinquefolia</i>         | SE MN                                    |
| Canada frostweed                 | <i>Helianthemum canadense*</i>       | SE MN, sand-gravel savanna               |
| Stiff sunflower                  | <i>Helianthus pauciflorus</i>        |                                          |
| Ox-eye                           | <i>Heliopsis helianthoides</i>       |                                          |
| Porcupine grass                  | <i>Hesperostipa spartea</i>          |                                          |
| Alumroot                         | <i>Heuchera richardsonii</i>         |                                          |
| Long-bearded hawkweed            | <i>Hieracium longipilum</i>          | SE MN sand-gravel prairie                |
| Rough blazing star               | <i>Liatris aspera</i>                |                                          |
| Cylindric blazing star           | <i>Liatris cylindracea</i>           | SE MN & Ordway Prairie                   |
| Northern plains blazing star     | <i>Liatris ligulistylis*</i>         | Wet-mesic prairie                        |
| Wood lily                        | <i>Lilium philadelphicum*</i>        |                                          |
| Plains muhly                     | <i>Muhlenbergia cuspidata</i>        | Dry hill prairie                         |
| Rhombic-petaled evening primrose | <i>Oenothera rhombipetala</i>        | SE MN dunes                              |
| Silver-leaved scurfpea           | <i>Pedimelum argophyllum</i>         |                                          |
| Prairie turnip                   | <i>Pedimelum esculentum</i>          |                                          |
| Prairie phlox                    | <i>Phlox pilosa*</i>                 | Southern MN & southern end of UPn23      |
| Tall cinquefoil                  | <i>Potentilla arguta</i>             |                                          |
| Smooth rattlesnakeroot           | <i>Prenanthes racemosa*</i>          |                                          |
| Little bluestem                  | <i>Schizachyrium scoparium</i>       |                                          |
| Rock spikemoss                   | <i>Selaginella rupestris*</i>        | Dunes, rock outcrops                     |
| Compass plant                    | <i>Silphium laciniatum*</i>          | Southernmost 2-3 tiers of counties in MN |
| Upland white aster               | <i>Solidago ptarmicoides</i>         |                                          |
| Showy goldenrod                  | <i>Solidago speciosa</i>             |                                          |
| Indian grass                     | <i>Sorghastrum nutans</i>            |                                          |
| Prairie dropseed                 | <i>Sporobolus heterolepis*</i>       |                                          |
| Western spiderwort               | <i>Tradescantia occidentalis</i>     | Dunes, sand-gravel prairie               |
| Heart-leaved alexanders          | <i>Zizia aptera*</i>                 |                                          |

<sup>1</sup> species that appear to decrease in abundance with persistent moderate to heavy grazing

\* species that appear to be the most sensitive to grazing

**Table 2. Examples of grazing increasers<sup>2</sup> in Upland Prairie System communities:**

|                        |                                           |                            |                                              |
|------------------------|-------------------------------------------|----------------------------|----------------------------------------------|
| Yarrow                 | <i>Achillea millefolium</i>               | Fall witch grass           | <i>Digitaria cognata</i> (E MN)              |
| Rough false foxglove   | <i>Agalinus aspera</i>                    | Ridge-seeded spurge        | <i>Euphorbia glyptosperma/geyeri</i>         |
| Ragweed species        | <i>Ambrosia spp.</i>                      | Grass-leaved goldenrod     | <i>Euthamia graminifolia</i>                 |
| Western androsace      | <i>Androsace occidentalis</i>             | Western sunflower          | <i>Helianthus occidentale</i> (SE MN)        |
| Pasqueflower           | <i>Anemone patens var. multifida</i>      | Hairy golden aster         | <i>Heterotheca villosa</i>                   |
| Pussytoes species      | <i>Antennaria spp.</i>                    | Baltic rush                | <i>Juncus arcticus v. balticus</i> (w.mesic) |
| Three-awn species      | <i>Aristida spp.</i>                      | Eastern red cedar          | <i>Juniperus virginiana</i>                  |
| Sage species           | <i>Artemisia spp.</i>                     | Stiffstem flax             | <i>Linum rigidum</i>                         |
| Whorled milkweed       | <i>Asclepias verticillata</i>             | Green-flowered peppergrass | <i>Lepidium densiflorum</i>                  |
| Sideoats grama         | <i>Bouteloua curtipendula</i>             | Skeletonweed               | <i>Lygodesmia juncea</i> (W MN)              |
| Blue grama             | <i>Bouteloua gracilis</i>                 | Wild bergamot              | <i>Monarda fistulosa</i>                     |
| Hairy grama            | <i>Bouteloua hirsuta</i>                  | Horsemint                  | <i>Monarda punctata</i> (dunes SE MN)        |
| Threadleaf sedge       | <i>Carex filifolia</i> (dry prairie)      | Green needle grass         | <i>Nasella viridula</i>                      |
| Sun-loving sedge       | <i>Carex inops</i>                        | Common evening primrose    | <i>Oenothera biennis</i>                     |
| Pennsylvania sedge     | <i>Carex pensylvanica</i> (shade)         | False gromwell             | <i>Onosmodium molle</i>                      |
| Dry spike sedge        | <i>Carex siccata</i> (dunes, sand-gravel) | White beard tongue         | <i>Penstemon albidus</i> (W MN)              |
| Spikerush sedge        | <i>Carex duriuscula</i> (dry prairie)     | Slender beard tongue       | <i>Penstemon gracilis</i>                    |
| Field chickweed        | <i>Cerastium arvense</i>                  | Pennsylvania cinquefoil    | <i>Potentilla pensylvanica</i> (W MN)        |
| Nuttall's groundrose   | <i>Chamaerhodos erecta</i> (NW MN, snd-g) | Virginia mountain mint     | <i>Pycnanthemum virginianum</i>              |
| Toadflax               | <i>Comandra umbellata</i>                 | Prairie coneflower         | <i>Ratibola columnifera</i> (W MN)           |
| Slender nut-sedge      | <i>Cyperus lupulinus</i> (dunes)          | Gooseberry species         | <i>Ribes spp.</i> (shade)                    |
| Schweinitz's nut-sedge | <i>Cyperus schweinitzi</i> (dunes)        | Blackberry species         | <i>Rubus spp.</i> (shade)                    |
| Scribner's panic grass | <i>Dichanthelium oligoanthes</i>          | Canada goldenrod           | <i>Solidago canadensis</i>                   |
| Wilcox's panic grass   | <i>Dichanthelium wilcoxianum</i> (sand)   | Missouri goldenrod         | <i>Solidago missouriensis</i>                |
| Yellow whitlow grass   | <i>Draba nemorosa</i>                     | Gray goldenrod             | <i>Solidago nemoralis</i>                    |
| Carolina whitlow grass | <i>Draba reptans</i>                      | Stiff goldenrod            | <i>Solidago rigida</i>                       |
| Western wheatgrass     | <i>Pascopyrum smithii</i> (W MN)          | Rough dropseed             | <i>Sporobolus compositus</i>                 |
| Field horsetail        | <i>Equisetum arvense</i>                  | Sand dropseed              | <i>Sporobolus cryptandrus</i> (dunes)        |
| Daisy fleabane         | <i>Erigeron strigosus</i>                 | Wolfberry                  | <i>Symphoricarpos occidentalis</i>           |
| Flowering spurge       | <i>Euphorbia corollata</i> (SE MN)        | Heath aster                | <i>Symphytotrichum ericoides</i>             |
| Ridge-seeded spurge    | <i>Euphorbia glyptosperma/geyeri</i>      | Hoary vervain              | <i>Verbena stricta</i>                       |
| Grass-leaved goldenrod | <i>Euthamia graminifolia</i>              | Ironweed                   | <i>Vernonia fasciculata</i> (wet-mesic)      |
| Prairie smoke          | <i>Geum triflorum</i>                     | Prairie bird's foot violet | <i>Viola palmata var. pedatifida</i>         |
| Mock pennyroyal        | <i>Hedeoma hispida</i> (SE MN)            | Prickly ash                | <i>Zanthoxylum americanum</i> (shade)        |
| Giant sunflower        | <i>Helianthus gigantea/grosseserratus</i> |                            |                                              |

<sup>2</sup>species that appear to increase in abundance with persistent moderate to heavy grazing

**Table 3. Examples of invasive species in Upland Prairie System communities:**

|                        |                                       |                       |                                |
|------------------------|---------------------------------------|-----------------------|--------------------------------|
| Redtop                 | <i>Agrostis stolonifera/ gigantea</i> | Curly cup gumweed     | <i>Grindelia squarrosa</i>     |
| Absinthe wormwood      | <i>Artemisia absinthium</i>           | Stickseed species     | <i>Lappula spp.</i>            |
| Hoary alyssum          | <i>Berteroa incana</i>                | Butter-and-eggs       | <i>Linaria vulgaris</i>        |
| Smooth brome           | <i>Bromus inermis</i>                 | Tartarian honeysuckle | <i>Lonicera tatarica</i>       |
| Japanese brome         | <i>Bromus japonicus</i>               | Black medic           | <i>Medicago lupulina</i>       |
| Cheatgrass             | <i>Bromus tectorum</i>                | Sweet clover species  | <i>Melilotus spp.</i>          |
| Plumeless thistle      | <i>Carduus acanthoides</i>            | Wild parsnip          | <i>Pastinaca sativa</i>        |
| Nodding (musk) thistle | <i>Carduus nutans</i>                 | Timothy               | <i>Phleum pratense</i>         |
| Spotted knapweed       | <i>Centaurea maculosa</i>             | Common plantain       | <i>Plantago major</i>          |
| Canada thistle         | <i>Cirsium arvense</i>                | Pursh's plantain      | <i>Plantago patagonica</i>     |
| Bull thistle           | <i>Cirsium vulgare</i>                | Canada bluegrass      | <i>Poa compressa</i>           |
| Horseweed              | <i>Conyza canadensis</i>              | Kentucky bluegrass    | <i>Poa pratensis</i>           |
| Crown vetch            | <i>Coronilla varia</i>                | Buckthorn             | <i>Rhamnus cathartica</i>      |
| Orchard grass          | <i>Dactylis glomerata</i>             | Russian thistle       | <i>Salsola iberica/ tragus</i> |
| Wild carrot            | <i>Daucus carota</i>                  | Dandelion             | <i>Taraxacum spp.</i>          |
| Russian olive          | <i>Eleagnus angustifolia</i>          | Clover species        | <i>Trifolium spp.</i>          |
| Quack grass            | <i>Elymus repens</i>                  | Stinging nettle       | <i>Urtica dioica</i>           |

# Minnesota Biological Survey

## Wetland Prairie System – Condition Ranking Guidelines

(This is a working document that is periodically revised as new information is available)

May 2014 version

### Condition Ranks for Native Plant Communities

Condition Ranks for native plant communities reflect the degree of ecological integrity of a specific occurrence of a native plant community. Condition Ranks are assigned by considering species composition, vegetation structure, ecological processes and functions, level of human disturbance, presence of exotic species, and other factors. Condition Ranks are assigned on a scale of A to D.

- A-rank occurrences have excellent ecological integrity. They have species composition, structure, and ecological processes typical of the natural or historic range of the community and have been little degraded by recent human activity or invasive species.
- B-rank occurrences have good ecological integrity. They include plant communities with modest degradation or that were degraded in the past but have recovered and now have relatively natural composition and structure. B-rank occurrences normally will return to A-rank condition with protection or appropriate management.
- C-rank occurrences have fair ecological integrity. They show strong evidence of human-caused degradation, but retain some characteristic species and have some potential for recovery with protection and management.
- D-rank occurrences have poor ecological integrity. The original composition and structure of the community have been severely altered by human-caused degradation or invasion by exotic species. They have little chance of recovery to their natural or historic condition.

- The Wetland Prairie System contains the following native plant community classes and types:
  - WPn53 Northern Wet Prairie
    - WPn53a Wet Seepage Prairie (Northern)
    - WPn53b Wet Brush-Prairie (Northern)
    - WPn53c Wet Prairie (Northern)
    - WPn53d Wet Saline Prairie (Northern)
  - WPs54 Southern Wet Prairie
    - WPs54a (Wet Seepage Prairie (Southern))
    - WPs54b (Wet Prairie (Southern))
    - WPs54c (Wet Saline Prairie (Southern))
- For information on the plant community classes and types in this System, please refer to the Wetland Prairie System in *Field Guide to the Native Plant Communities of Minnesota: The Prairie Parkland and Tallgrass Aspen Parklands Provinces* (MNDNR 2005) or *Field Guide to the Native Plant Communities of Minnesota: The Eastern Broadleaf Forest Province* (MNDNR 2005).
- For checklists and distribution maps of native plant species in Minnesota, refer to the MNDNR's State Checklists on the MNDNR website at: [http://www.dnr.state.mn.us/eco/mcbs/plant\\_lists.html](http://www.dnr.state.mn.us/eco/mcbs/plant_lists.html)

### 1) What is an A-rank Occurrence?

- Site has structure and composition free of human-caused degradation from overgrazing, draining, flooding, poorly-timed haying, siltation, herbicide application/drift, invasive species invasion, fertilizer drift, fire suppression, tree planting, and ATV use. A-rank occurrences are considered high-quality prairie and typically have the following conditions:
  - A diverse assemblage of native species is present, including “decreaser” species (see Weaver 1954) that decline with persistent moderate to heavy grazing (Table 1). Note that Wet Saline Prairies (WPn53d, WPs54c) typically have low diversity and abundance of forb species.

- The vegetation composition shows little evidence of degradation in the form of increased relative abundances of grazing increasers (Table 2).
- Non-native, invasive species (Table 3) are absent or barely present with the exception of Kentucky bluegrass (*Poa pratensis*), which is almost universally present today in wet prairies. Kentucky bluegrass is at most a minor constituent of A-rank prairies.
- Site has a natural water regime (hydrology), such as no evidence that natural water table levels have been altered by ditching, irrigation pumping, upslope gravel mining, water impounding, etc.

## 2) What is a B-rank Occurrence?

- Site has structure and composition similar to that of an A-rank occurrence, but has altered species abundances and richness due to moderate levels of degradation from overgrazing, poorly-timed haying, woody plant invasion, minor wetland drainage, fertilizer drift, minor herbicide exposure, invasive species, tree planting, or low to moderate ATV use. B-rank occurrences are considered high-quality prairie and typically have the following conditions:
  - Native species richness is high but some decreaser species appropriate to the site are missing, and other decreaser species are much less common than in A-rank sites (Table 1).
  - Species that increase in response to human-caused degradation are more abundant than in A-rank occurrences (Table 2). Examples include grazing increasers due to grazing or woody species due to fire suppression.
  - The invasive species Kentucky bluegrass and redtop (*Agrostis gigantea*) may be present at moderate levels of infestation, but other invasive species are absent or barely present. Reed canary grass (*Phalaris arundinacea*), if present, is confined to narrow zones on the margins of the wetland.
  - In sites that have been grazed, the ground surface may have minor compaction and hummocking from livestock.

## 3) What is a C-rank Occurrence?

- Site is still dominated by native species, but has moderate to heavy degradation from overgrazing, wetland drainage, haying, fire suppression, moderate herbicide exposure, siltation, significant invasive species invasion, or tree planting. C-rank occurrences are considered fair-quality prairie and typically have the following conditions:
  - Native graminoids still dominate throughout the site or co-dominate with shrubs, but overall plant species diversity is low due to loss of species that decrease in abundance with persistent moderate to heavy grazing (Table 1).
  - On sites degraded by grazing, heavy livestock traffic on wet soils breaks up the prairie turf and creates exposed bare soils prone to the invasion of invasive plant species. Native plant species that increase with grazing pressure are highly abundant (Table 2).
  - Invasive species are moderately abundant, including Kentucky bluegrass, field sow thistle (*Sonchus arvensis*), timothy (*Phleum pratense*), black medick (*Medicago lupulina*), white clover (*Trifolium repens*), red clover (*T. pratense*), Alsike clover (*T. hybridum*), Canada thistle (*Cirsium arvense*), or redtop (Table 3). Reed canary grass may be present as discrete patches covering no more than 20% of the site or is confined to zones on the margins of deeper wet depressions.
  - In sites grazed by cattle, the ground surface may be moderately compacted and hummocky.

#### 4) What is a D-rank Occurrence?

- Site has been highly degraded and the native vegetation has been severely altered, but enough native species are present that the occurrence can still be recognized as the community type it was prior to being degraded. D-rank occurrences are considered poor-quality prairie and typically have the following conditions:
  - Site is dominated by exotic species, typically Kentucky bluegrass, quackgrass (*Elymus [Agropyron] repens*), and/or redtop, but native graminoids are common enough for the occurrence to be recognized as native prairie and not old field. The invasive species reed canary grass covers no more than 50% of the site.
  - Overall native species richness is low, as sensitive species such as grazing decreaseers are absent.
  - Disturbance increaseers are highly abundant.
  - In grazed sites, the ground surface is highly compacted and/or hummocky.
  - In sites where herbicide has been applied repeatedly native forbs are absent.

#### 5) Mapping notes:

- Polygon sizes:
  - Map A-D rank occurrences that are 5 acres or larger.
  - Map smaller occurrences if they meet one of the following exceptions:
    - It is within a larger area of native plant communities important for conservation action.
    - It is habitat for a rare species.
    - It is one of the very few occurrences of the type in an LTA.
    - It is A- or B-rank.
- If a large prairie has a dense area of reed canary grass at one end but the rest is in good condition, map the intact prairie and not the reed canary grass-dominated areas unless native species are present within the reed canary grass-dominated zone, in which case map it all. If the reed canary-dominated zone is at least 2 acres in size, consider mapping it as a separate polygon.
- On rare occasions, a reconstructed or restored prairie may be sufficiently diverse—consisting of species and ecotypes appropriate for its location—to be ranked as a native plant community. If such a site is virtually indiscernible from a native occurrence, it may be mapped and ranked according to the criteria in these guidelines, but polygon attributes or other database entries should note that it is restored/reconstructed.
- On some landforms, wet prairies may occur in a complex mosaic with other communities such as mesic prairie, related to variation in microtopography. In such cases, where individual occurrences of wet prairie cannot be mapped separately, the occurrence may be mapped as part of a native plant community complex.

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Revised by Fred Harris and Robert Dana

30 May 2014

#### Reference:

Weaver, J.E. 1954. North American Prairie. Johansen Publishing Co., Lincoln, NE.

**Table 1. Examples of species that decrease with overgrazing<sup>1</sup> in Wet Prairie communities:**

| Common Name                  | Scientific Name                            | Limited Distribution           |
|------------------------------|--------------------------------------------|--------------------------------|
| Fragrant false indigo        | <i>Amorpha nana</i> *                      |                                |
| Big bluestem                 | <i>Andropogon gerardii</i>                 |                                |
| Sweet grass                  | <i>Anthoxanthum hirtum</i>                 |                                |
| Swamp milkweed               | <i>Asclepias incarnata</i>                 |                                |
| Showy milkweed               | <i>Asclepias speciosa</i>                  |                                |
| Canada milk-vetch            | <i>Astragalus canadensis</i>               |                                |
| Buxbaum's sedge              | <i>Carex buxbaumii</i>                     |                                |
| Wood-sedge                   | <i>Carex tetanica</i>                      |                                |
| Indian paintbrush            | <i>Castelja coccinea</i>                   |                                |
| Swamp thistle                | <i>Cirsium muticum</i>                     |                                |
| Small white lady-slipper     | <i>Cypripedium candidum</i>                |                                |
| White prairie clover         | <i>Dalea candida</i> var. <i>candida</i> * |                                |
| Purple prairie clover        | <i>Dalea purpurea</i>                      |                                |
| Canadian tick-trefoil        | <i>Desmodium canadense</i> *               |                                |
| Flat-topped aster            | <i>Doellingeria umbellata</i>              |                                |
| Spotted Joe-pye weed         | <i>Eupatorium maculatum</i>                |                                |
| Northern gentian             | <i>Gentiana affinis</i>                    | Northwestern MN saline prairie |
| Bottle gentian               | <i>Gentiana andrewsii</i>                  |                                |
| Autumn sneezeweed            | <i>Helenium autumnale</i>                  |                                |
| Yellow star-grass            | <i>Hypoxis hirsuta</i>                     |                                |
| Junegrass                    | <i>Koeleria pyramidata</i>                 |                                |
| Marsh vetchling              | <i>Lathyrus palustris</i>                  |                                |
| Rough blazing star           | <i>Liatris aspera</i>                      |                                |
| Northern plains blazing star | <i>Liatris ligulistylis</i>                |                                |
| Gayfeather                   | <i>Liatris pycnostachya</i>                |                                |
| Michigan lily                | <i>Lilium michiganense</i>                 |                                |
| Wood lily                    | <i>Lilium philadelphicum</i> *             |                                |
| Kalm's lobelia               | <i>Lobelia kalmii</i>                      |                                |
| Great lobelia                | <i>Lobelia siphilitica</i>                 |                                |
| Pale-spiked lobelia          | <i>Lobelia spicata</i>                     |                                |
| Prairie loosestrife          | <i>Lysimachia quadriflora</i>              |                                |
| Switchgrass                  | <i>Panicum virgatum</i>                    |                                |
| Swamp lousewort              | <i>Pedicularis lanceolatus</i>             |                                |
| Prairie phlox                | <i>Phlox pilosa</i> *                      | Southern MN                    |
| Smooth rattlesnakeroot       | <i>Prenanthes racemosa</i> *               |                                |
| Virginia mountain mint       | <i>Pycnanthemum virginianum</i>            |                                |
| Gray-headed coneflower       | <i>Ratibida pinnata</i>                    | Southern MN                    |
| Little bluestem              | <i>Schizachyrium scoparium</i>             |                                |
| Marsh skullcap               | <i>Scutellaria galericulata</i>            |                                |
| Cup-plant                    | <i>Silphium perfoliatum</i>                | Southern MN                    |
| Upland white aster           | <i>Solidago ptarmicoides</i>               |                                |
| Riddell's goldenrod          | <i>Solidago riddellii</i>                  |                                |
| Indian grass                 | <i>Sorghastrum nutans</i>                  |                                |
| Alkali cord-grass            | <i>Spartina gracilis</i>                   | Northwestern MN saline prairie |
| Prairie cord-grass           | <i>Spartina pectinata</i>                  |                                |
| Prairie dropseed             | <i>Sporobolus heterolepis</i> *            |                                |
| Bog aster                    | <i>Symphyotrichum boreale</i>              |                                |
| Panicled aster               | <i>Symphyotrichum lanceolatum</i>          |                                |
| New England aster            | <i>Symphyotrichum novae-angliae</i>        |                                |
| Glossy-leaf aster            | <i>Symphyotrichum firmum</i>               |                                |
| Germander                    | <i>Teucrium canadense</i>                  |                                |
| Tall meadow-rue              | <i>Thalictrum dasycarpum</i>               |                                |
| Culver's root                | <i>Veronicastrum virginicum</i>            |                                |
| Golden alexanders            | <i>Zizia aurea</i>                         |                                |

<sup>1</sup>species that appear to decrease in abundance with persistent moderate to heavy grazing

\*species that appear to be the most sensitive to grazing

**Table 2. Examples of species that increase with overgrazing<sup>2</sup> in Wet Prairie communities:**

| Common Name            | Scientific Name                                        |
|------------------------|--------------------------------------------------------|
| Common yarrow          | <i>Achillea millefolium</i>                            |
| Ragweed                | <i>Ambrosia</i> spp.                                   |
| Clasping dogbane       | <i>Apocynum sibiricum</i>                              |
| Heath aster            | <i>Aster ericoides</i>                                 |
| Sartwell's sedge       | <i>Carex sartwellii</i>                                |
| Spotted water-hemlock  | <i>Cicuta maculata</i>                                 |
| Field horsetail        | <i>Equisetum arvense</i>                               |
| Grass-leaved goldenrod | <i>Euthamia graminifolia</i>                           |
| Giant sunflower        | <i>Helianthus giganteus</i>                            |
| Sawtooth sunflower     | <i>Helianthus grosseserratus</i>                       |
| Foxtail barley         | <i>Hordeum jubatum</i>                                 |
| Baltic rush            | <i>Juncus arcticus</i> var. <i>balticus</i>            |
| Rough bugleweed        | <i>Lycopus asper</i>                                   |
| Silverweed             | <i>Potentilla anserina</i>                             |
| Seaside crowfoot       | <i>Ranunculus cymbalaria</i>                           |
| Swamp buttercup        | <i>Ranunculus fascicularis</i>                         |
| Golden ragwort         | <i>Senecio aureus</i>                                  |
| False golden ragwort   | <i>Senecio pseudoaureus</i>                            |
| Late goldenrod         | <i>Solidago altissima</i> subsp. <i>gilvocanescens</i> |
| Canada goldenrod       | <i>Solidago canadensis</i>                             |
| Giant goldenrod        | <i>Solidago gigantea</i>                               |
| Rough dropseed         | <i>Sporobolus asper</i>                                |
| Blue vervain           | <i>Verbena hastata</i>                                 |
| Bunched ironweed       | <i>Vernonia fasciculata</i>                            |

<sup>2</sup>species that appear to increase in abundance with persistent moderate to heavy grazing

**Table 3. Examples of invasive species in Wet Prairie communities:**

| Common Name           | Scientific Name             |
|-----------------------|-----------------------------|
| Redtop                | <i>Agrostis gigantea</i>    |
| Spreading bentgrass   | <i>Agrostis stolonifera</i> |
| Smooth brome          | <i>Bromus inermis</i>       |
| Canada thistle        | <i>Cirsium arvense</i>      |
| Bull thistle          | <i>Cirsium vulgare</i>      |
| Horseweed             | <i>Conyza canadensis</i>    |
| Quackgrass            | <i>Elymus repens</i>        |
| Black medick          | <i>Medicago lupulina</i>    |
| Sweet clover          | <i>Melilotus</i> spp.       |
| Reed canary grass     | <i>Phalaris arundinacea</i> |
| Timothy               | <i>Phleum pratense</i>      |
| Common plantain       | <i>Plantago major</i>       |
| Kentucky bluegrass    | <i>Poa pratensis</i>        |
| European alkali grass | <i>Puccinellia distans</i>  |
| Common buckthorn      | <i>Rhamnus cathartica</i>   |
| Field sow thistle     | <i>Sonchus arvensis</i>     |
| Dandelion             | <i>Taraxacum</i> spp.       |
| Alsike clover         | <i>Trifolium hybridum</i>   |
| Red clover            | <i>Trifolium pratense</i>   |
| White clover          | <i>Trifolium repens</i>     |
| Stinging nettle       | <i>Urtica dioica</i>        |





DATE: February 8, 2016  
TO: Rare Species Surveyors  
FROM: Lisa Joyal, Endangered Species Review Coordinator  
RE: Rare Species Survey Proposals and Reports

The Minnesota Department of Natural Resources' Division of Ecological and Water Resources (DNR) relies upon the results of endangered and threatened species surveys to conserve these species through its conservation, management, environmental review, and permitting responsibilities. When surveys for rare species are requested as part of the environmental review process, the DNR makes every effort to coordinate closely with surveyors to ensure that survey results are reliable. High quality survey data enables the DNR's to uphold Minnesota's endangered species law (*Minnesota Statutes*, section 84.0895) and associated rules (*Minnesota Rules*, part 6212.1800 to 6212.2300 and 6134).

As such, for projects associated with environmental review or the Natural Heritage Review process, we request that survey proposals be submitted to the DNR before any survey work is initiated. This process is an attempt to avoid any potential delays or other problems due to incomplete list of target species or inappropriate survey protocol. Surveys should primarily target the species mentioned in the Natural Heritage Review letter, but should also target any other state-listed species that are likely to be found in the habitat in question. Please refer to the [DNR Rare Species Guide](#) for further information on the rare species that can be found in a particular habitat, and for the habitat and phenology of each target species. The DNR Rare Species Guide is the state's authoritative reference for Minnesota's state-listed species. It is a dynamic, interactive source that can be queried by ECS subsection, watershed, or habitat.

Rare species data should be submitted electronically using the rare species data spreadsheet templates available at [Submitting Data to the NHIS](#). Please review these templates before any field surveys are conducted to become familiar with the type of information that should be collected.

As applicable, please include the following information in any rare species survey proposals or survey reports:

- Purpose of the survey
- List of the target species
- Qualifications of the surveyor(s) and his or her experience working with the target species
- A copy of the collection permit issued by the DNR.
- Survey date(s) and methodology
- Map and GIS shapefile depicting the areas (to be) surveyed or assessed for habitat suitability
- Locations and number of individuals for any state-listed species
- State type of documentation for each listed species (e.g., photograph or collected specimen)
- Photographic vouchers, if any, and a statement why a specimen was not collected
- Any associated specimens and electronic data should be submitted with the Survey Results

For any surveys associated with environmental review or requested through the Natural Heritage Review process, please submit survey proposals and survey reports to my attention at:

DNR Division of Ecological and Water Resources  
500 Lafayette Road, Box 25  
St. Paul, MN 55155  
Email: [lisa.joyal@state.mn.us](mailto:lisa.joyal@state.mn.us)

Thank you for your interest in conducting rare species surveys in Minnesota.



## NATURAL HERITAGE REVIEW: A RARE SPECIES SURVEY IS REQUESTED. NOW WHAT?

Questions? Contact Lisa Joyal, Endangered Species Review Coordinator  
[Lisa.Joyal@state.mn.us](mailto:Lisa.Joyal@state.mn.us) or 651-259-5109

Minnesota's endangered species law (*Minnesota Statutes*, section 84.0895) and associated rules (*Minnesota Rules*, part 6212.1800 to 6212.2300 and 6134) prohibit the taking of threatened or endangered species without a permit. Given the potential for the proposed project to negatively impact a state-listed threatened or endangered species, a rare species survey has been requested. The Minnesota Department of Natural Resources' Division of Ecological and Water Resources (DNR) relies upon the results of endangered and threatened species surveys to conserve these species through its conservation, management, environmental review, and permitting responsibilities. When surveys for rare species are requested as part of the environmental review process, the DNR makes every effort to coordinate closely with surveyors to ensure high quality survey results and to avoid any potential project delays due to miscommunication, inappropriate survey protocol, or misidentified threatened or endangered species.

### WHAT NEEDS TO BE DONE PRIOR TO THE SURVEY?

#### CHOOSE A SURVEYOR

The DNR maintains a List of Surveyors (attached) that are considered qualified to conduct rare species surveys in Minnesota. Using a surveyor from this list minimizes the time needed to obtain a collection permit and the time needed to review survey proposals.

► *Documents to send to the Endangered Species Review Coordinator* ► If you would like to choose an individual that is not on the attached list, the DNR would like to review his/her qualifications prior to any survey work. Please see the attached Surveyor Criteria document for details.

#### DETERMINE IF A PERMIT IS REQUIRED TO CONDUCT THE SURVEY

A permit is required to collect specimen vouchers of state-listed threatened or endangered species. All plant surveyors should have a collection permit prior to conducting any survey work. A permit is also required to survey for bats, turtles, mussels, or butterflies. Please contact Richard Baker, Endangered Species Coordinator, at [Richard.Baker@state.mn.us](mailto:Richard.Baker@state.mn.us) to request a permit.

#### PREPARE A SURVEY PROPOSAL

- Refer to the attached Rare Species Survey Proposals and Reports for information to include in the survey proposal.
- Refer to the DNR Rare Species Guide for suitable habitat and appropriate survey periods for the target species.
- Review the rare species data spreadsheet templates for [Submitting Data to the NHIS](#).
- For plant surveys, follow the procedures in the attached Rare Plant Guidance.
- For mussel surveys, follow the procedures in the attached Mussel Survey and Relocation Protocol.

► *Documents to send to the Endangered Species Review Coordinator* ► Please submit the survey proposal for DNR review. Please anticipate an approximate two week turnaround for DNR comments.

## WHAT NEEDS TO BE DONE DURING THE SURVEY?

- For plant surveys, follow the procedures in the attached Rare Plant Guidance.
- For mussel surveys, follow the procedures in the attached Mussel Survey and Relocation Protocol.
- Identify any suitable habitat for target species within the potential project footprint.
- Survey for target species within any suitable habitat that may be impacted by the project.
- If any threatened or endangered species are found, delineate extent of population or at least extent of population within the potential project footprint. Consider flagging the population for avoidance purposes. If you are considering applying for a takings permit, conduct a count of individual plants that you are proposing to take.

## WHAT NEEDS TO BE DONE AFTER THE SURVEY IS COMPLETED?

### COMPLETE A REPORT ON THE RESULTS OF THE SURVEY

Refer to the attached Rare Species Survey Proposals and Reports for information to include in the survey report. The survey report should include detailed information for any state-listed species that are found during the survey.

► *Documents to send to the Endangered Species Review Coordinator* ► Please submit survey report, specimens, GIS shapefile, and spreadsheet (see templates for [Submitting Data to the NHIS](#)) for DNR review.

### WHAT IF A THREATENED OR ENDANGERED SPECIES IS FOUND?

The project proposer should consider project alternatives that would avoid impacting these species. If there are any questions as to what constitutes avoidance, please contact the Endangered Species Review Coordinator.

► *Documents to send to the Endangered Species Review Coordinator* ► Please submit an avoidance plan for DNR review. The plan should identify measures that will be taken to avoid and minimize disturbance.

### WHAT IF A THREATENED OR ENDANGERED SPECIES CANNOT BE AVOIDED?

The project proposer will need to apply for a takings permit. For more information on the endangered species permitting process, please visit the [DNR Endangered Species Permits website](#) or contact Rich Baker, Endangered Species Coordinator, at [Richard.Baker@state.mn.us](mailto:Richard.Baker@state.mn.us) or 651-259-5073.



**GUIDANCE ON DOCUMENTING & COLLECTING RARE PLANTS**  
**DNR Division of Ecological and Water Resources**  
**July 2015**

Please refer to the following guidance if you will be submitting records for entry into the DNR's Rare Features Database in the Natural Heritage Information System (NHIS). These procedures should also be followed for botanical surveys conducted for environmental review purposes.

**Before going in the field:**

- Review the current list of state-listed species (at <http://files.dnr.state.mn.us/eco/nhnrp/endlist.pdf>) so you will know which species are rare.
- Check the Rare Features Database ([http://files.dnr.state.mn.us/eco/nhnrp/natural\\_heritage\\_data.pdf](http://files.dnr.state.mn.us/eco/nhnrp/natural_heritage_data.pdf)) and, if applicable, the records of other public land managers to see if there are known occurrences of rare plants within your work or study area.
- Familiarize yourself with critical identifying features of species likely to be collected. This might include a visit to a herbarium to review previous collections of a plant species.
- Obtain the plant spreadsheet template for data entry purposes. Review this spreadsheet to familiarize yourself with the type of information that should be collected. The Rare Plant Observations spreadsheet template is available under "Submitting Data" at <http://www.dnr.state.mn.us/eco/nhnrp/nhis.html>.
- Obtain a permit if you plan to collect specimen vouchers of state-listed endangered or threatened species. Minnesota's endangered species law (*Minnesota Statutes*, section 84.0895) and associated rules (*Minnesota Rules*, part 6212.1800 to 6212.2300 and 6134) prohibit the taking of threatened or endangered species without a permit. Please contact Richard Baker, Endangered Species Coordinator, at [Richard.Baker@state.mn.us](mailto:Richard.Baker@state.mn.us) to request a permit.
- When required, obtain permits for collecting on public lands such as Scientific and Natural Areas, State Parks, and National Forests.
- Respect property owners' rights. Obtain permission from the private landowner or public land manager to 1) go on the land and 2) to collect plants.
- **Any surveys required through the DNR environmental review process must follow the standards contained in this *Guidance*.** Before initiating any such survey, the surveyor must receive approval of a project-specific survey plan from Lisa Joyal, Endangered Species Review Coordinator. Any proposed departure from the standards in the *Guidance* must be identified in the project-specific plan.

**Specimen Collection:**

- Most rare plant records in the DNR's Rare Features Database are documented with collected specimens deposited in credible herbaria. Records documented by standard herbarium collections in museums are strongly preferred over all other forms of documentation. A specimen of a rare plant often is sufficient if it includes a portion of the plant that allows positive identification of the species.

***Under what circumstances should I collect a herbarium specimen?***

- Collect state-listed endangered or threatened plants only if you have a permit. If you have unintentionally collected an endangered or threatened plant without a permit, the specimen should be submitted to the DNR as soon as is practical following the procedures described below, with a brief note attached that explains the circumstances.
- For new locations of a species, collect a specimen; in general, make no more than one collection of a particular species per 40 acres of habitat.
- For previously known populations of an endangered or threatened plant, consider collecting a new voucher if the DNR's Rare Features Database indicates that it has been more than thirty years since the last voucher was collected from the population.
- For any given species, collect only when distinguishing characters are present (usually flowers and/or fruits are necessary); if key characters are not present, mark the location and return at the appropriate time for collecting a specimen with distinguishing characteristics.
- For endangered or threatened vascular plants, collect a complete specimen (which includes roots) only when the population has more than 100 individuals.
- For populations of endangered or threatened vascular plants with fewer than 100 individuals, collect only the distinguishing portion of the plant (e.g., a portion of the inflorescence that has one or more flowers or a portion of the stem that has one or more leaves). A partial specimen might be inadequate to confirm the identification. In this case, supplement the partial collection with a close-up photograph that clearly shows the diagnostic features. Please note that in many cases photographs are not sufficient to confirm identification.

- For aquatic plants, collect a portion of the stem with leaves and fruits or flowers. Do not collect the roots. If you are unsure whether you have found a rare species, collect several specimens. Please note that in most cases photographs are not sufficient to confirm the identification of aquatic species. If your target search area is aquatic, please contact Welby Smith, DNR Botanist, at [Welby.Smith@state.mn.us](mailto:Welby.Smith@state.mn.us) for additional guidance.
- For *Botrychium* spp., **always** collect a specimen of the above-ground portion of the plant, regardless of the apparent population size or the state status of the species.
- For mosses, liverworts, fungi and lichens, collect such that the viability of the population is maintained.

**How do I make a proper collection?** See [General Guidelines for Collecting Vascular Plant Specimens](#) on page 3.

#### Specimen Submission:

- For quality control purposes, the identification of the specimen must be confirmed by a qualified second party before a record can be entered into the Rare Features Database.
- If the botanical survey was conducted for environmental review purposes, please submit the survey results and any associated specimens or electronic data to Lisa Joyal, Endangered Species Review Coordinator. Otherwise, send specimen directly to Welby Smith, DNR Botanist, for verification. Please remember that a herbarium label must accompany each specimen. If you are unsure of the species' identification, you can leave the space for the scientific name blank. Send specimens to Lisa Joyal (if related to environmental review) or to Welby Smith at:

Minnesota Department of Natural Resources  
Division of Ecological Resources  
500 Lafayette Road, Box 25  
St. Paul, MN 55155

- DNR staff will complete verification or submit the specimen to an outside expert for annotation. Following verification, the DNR will donate specimens to the University of Minnesota Herbarium, a division of the Bell Museum of Natural History ([www.bellmuseum.org](http://www.bellmuseum.org)).

#### Data Submission:

- Submit data electronically as a spreadsheet with an accompanying shapefile. The Rare Plant Observations spreadsheet template is available under "Submitting Data" at <http://www.dnr.state.mn.us/eco/nhnrp/nhis.html>.
- Document *all* endangered, threatened, special concern, or other species tracked by the DNR that were encountered. Include type of documentation for each record (e.g., photograph or specimen).
- If the botanical survey was conducted for environmental review purposes, please submit the survey results and any associated specimens or electronic data to Lisa Joyal, Endangered Species Review Coordinator. Otherwise, submit electronic data to Karen Cieminski, NHIS Data Manager, at [Karen.Cieminski@state.mn.us](mailto:Karen.Cieminski@state.mn.us).

#### How will my records be used to protect rare plants?

- Conservation planning at local, state and regional levels.
- Environmental review of development projects.
- Research about life history.
- Revisions to the state list of endangered, threatened and special concern species.
- Legal challenges related to protected species locations are possible. Properly vouchered specimens are often critical in the protection of rare plant populations in these cases.

#### Questions?

- **Regarding permits:** Contact Rich Baker at [Richard.Baker@state.mn.us](mailto:Richard.Baker@state.mn.us) or 651-259-5073.
- **Regarding specimens:** Contact Welby Smith at [Welby.Smith@state.mn.us](mailto:Welby.Smith@state.mn.us) or 651-259-5142.  
or Hannah Texler at [Hannah.Texler@state.mn.us](mailto:Hannah.Texler@state.mn.us) or 651-259-5048.
- **Regarding data submittal:** Contact Karen Cieminski at [Karen.Cieminski@state.mn.us](mailto:Karen.Cieminski@state.mn.us) or 651-259-5081.
- **Regarding environmental review process:** Contact Lisa Joyal at [Lisa.Joyal@state.mn.us](mailto:Lisa.Joyal@state.mn.us) or 651-259-5109.

## **General Guidelines for Collecting Vascular Plant Specimens\***

1. **Equipment:** Plant press, straps (2), felt blotters, ventilators (corrugated boards), and newspaper. Also, a knife or other tool for cutting and digging and a notebook of standardized form for recording field data. The press can be made from  $\frac{3}{4}$ " plywood cut 12" x 18" (2 pieces); the ventilators can be cut from discarded "cardboard" boxes, also 12" x 18" (the corrugations should run the short direction). The blotters can be obtained from a stationery store.
2. **Preparation:** Once the specimen is found, it is necessary to determine what portion of the plant will be collected. A complete collection includes the entire plant with roots, but for purposes of conservation, the roots of rare species should not be collected if the population consists of fewer than 100 individuals. For most species, such as orchids, a single flower is enough for purposes of identification. Other species, e.g., sedges, usually require the complete aboveground stem with mature fruit. Specimens of trees and shrubs should include a twig with mature leaves and flowers and/or fruit. Specimens that do not show diagnostic features cannot be identified and are worthless. If only a portion of the plant is collected, it is important to record a description of the entire plant.

Before collecting plants, it is a good idea to check with the curator of the herbarium where the specimen will be deposited. Some herbaria may not accept a partial specimen unless it has special significance (e.g., a new location for an endangered species).

3. **Pressing and processing specimens.** The freshly collected specimen is placed within the sheet of folded newspaper with the leaves, flowers, etc. in a natural position, but clearly showing the diagnostic features. The paper is placed between two sheets of felt blotters, which are themselves placed between two corrugated ventilators. It is then put within the press, which is tightened with the straps (or ropes). Several specimens can be put in a single press by layering the blotters and ventilators. Commercial plant presses are slightly larger than herbarium paper so the specimens should not fill the plant press side to side. Also, be sure to leave room for a label in the lower right portion. The press must then be put in a warm dry place until the plants are dry. A simple plant drier that uses heat rising from a light bulb works well, but is not essential. The blotters should be changed every day until the specimen is dry. If a specimen does not dry within 4-5 days, it will likely begin to decompose. When the specimen is dry, it should be taken from the press, but kept within the folded newspaper for protection.

A label (see example below) must be prepared before the specimen can be sent to a herbarium. The label should be on acid-free, archival quality paper. We suggest that you use labels that are 2  $\frac{3}{4}$  x 4  $\frac{1}{4}$  inches in size, but other labels not to exceed 3 x 5 inches will be acceptable. At a bare minimum, the label must contain the name of the species, location of collection, description of habitat, name of collector, and date of collection. The label should also include latitude and longitude coordinates and/or UTM coordinates, and, if a permit was required, the permit number. Providing a label is the responsibility of the collector, not the herbarium or the DNR. A specimen without a label will not be accepted by a herbarium.

After the label is prepared, it should be put with the specimen inside the folded newspaper, which may be held between two corrugated ventilators for rigidity. The herbarium will mount the specimen and label on a stiff sheet of paper and accession it into their collection.

The University of Minnesota Herbarium, a division of the Bell Museum of Natural History, houses the largest collection documenting Minnesota's plant diversity and is the primary repository for the DNR's Minnesota Biological Survey. Guidance for collecting rare plants for museum specimens can be found on the University of Minnesota Herbarium website at: [http://www.bellmuseum.org/plants/collecting\\_guidelines.html](http://www.bellmuseum.org/plants/collecting_guidelines.html).

### **Plants of Scott County, Minnesota, USA**

*Silphium integrifolium* Michx. var. *integrifolium*

3 miles west of Jordan in north half of quarter-quarter section. Approximately 100 plants in wet to wet-mesic prairie on terrace within the Minnesota River Valley. In heavily grazed pasture dominated mostly by *Spartina pectinata* and *Agrostis stolonifera*. Soils range from black muck with marl concretions to silt loam. Site has been compacted by grazing. Glacial erratics common. Associated with *Carex stricta*, *Pycnanthemum virginianum*, *Lobelia siphilitica*, *Lysimachia quadriflora*, *Aster puniceus*.

T 114N R 24W NW  $\frac{1}{4}$  of SE  $\frac{1}{4}$  of Sec 27

Fred S. Harris 96235

MNDNR Permit # 1996

September 3, 1996

**MINNESOTA COUNTY BIOLOGICAL SURVEY  
MINNESOTA DEPARTMENT OF NATURAL RESOURCES**

\*For mosses, liverworts, algae, fungi and lichens, please contact the University of Minnesota Herbarium ([http://www.bellmuseum.org/plants/general\\_information.htm](http://www.bellmuseum.org/plants/general_information.htm)) for collection guidelines.

# Preventing Entanglement by Erosion Control Blanket

Plastic mesh netting is a common component in erosion control blanket. It is utilized to hold loose fibrous materials in place (EG straw) until vegetation is established. Erosion control blanket is being utilized extensively and is effective for reducing soil erosion, benefitting both soil health and water quality. Unfortunately there is a negative aspect of the plastic mesh component: It is increasingly being documented that its interaction with reptiles and amphibians can be fatal (Barton and Kinkead, 2005; Kapfer and Paloski, 2011). Mowing machinery is also susceptible to damage due to the long lasting plastic mesh.

## Potential Problems:

- Plastic netting remains a hazard long after other components have decomposed.
- Plastic mesh netting can result in entanglement and death of a variety of small animals. The most vulnerable group of animals are the reptiles and amphibians (snakes, frogs, toads, salamanders, turtles). Ducklings, small mammals, and fish have also been observed entangled in the netting.
- Road maintenance machinery can snag the plastic mesh and pull up long lengths into machinery, thus binding up machinery and causing damage and/or loss of time cleaning it out.

## Suggested Alternatives:

- Do not use in known locations of reptiles or amphibians that are listed as Threatened or Endangered species.
- Limit use of blanket containing welded plastic mesh to areas away from where reptiles or amphibians are likely (near wetlands, lakes, watercourses, or rock outcrops) or habitat transition zones (prairie – woodland edges, rocky outcrop – woodland edges, steep rocky slopes, etc.)
- Select products with biodegradable netting (preferably made from natural fibers, though varieties of biodegradable polyesters also exist on the market). Biodegradable products will degrade under a variety of moisture and light conditions.
- DO NOT use products that require UV-light to degrade (also called “photodegradable”) as they do not degrade properly when shaded by vegetation.

**Solution:** Most categories of erosion control blanket and sediment control logs are available in natural net options.

- Specify ‘Natural Netting’ for rolled erosion control products, per MnDOT Spec 3885. See Table 3885-1.
- Specify ‘Natural Netting’ for sediment control logs, per MnDOT Spec 3897



The plastic mesh component of erosion control blanket becomes a net for entrapment.

## Literature Referenced

Barton, C. and K. Kinkead. 2005. Do erosion control and snakes mesh? *Soil and Water Conservation Society* 60:33A-35A.  
Kapfer, J.M., and R.A. Paloski. 2011. On the threat to snakes of mesh deployed for erosion control and wildlife exclusion. *Herpetological Conservation and Biology* 6:1-9.

**Endangered, Threatened, and Special Concern Species of Minnesota**

**Blanding's Turtle**  
*(Emydoidea blandingii)*

Minnesota Status: Threatened  
Federal Status: none

State Rank<sup>1</sup>: S2  
Global Rank<sup>1</sup>: G4

**HABITAT USE**

Blanding's turtles need both wetland and upland habitats to complete their life cycle. The types of wetlands used include ponds, marshes, shrub swamps, bogs, and ditches and streams with slow-moving water. In Minnesota, Blanding's turtles are primarily marsh and pond inhabitants. Calm, shallow water bodies (Type 1-3 wetlands) with mud bottoms and abundant aquatic vegetation (e.g., cattails, water lilies) are preferred, and extensive marshes bordering rivers provide excellent habitat. Small temporary wetlands (those that dry up in the late summer or fall) are frequently used in spring and summer -- these fishless pools are amphibian and invertebrate breeding habitat, which provides an important food source for Blanding's turtles. Also, the warmer water of these shallower areas probably aids in the development of eggs within the female turtle. Nesting occurs in open (grassy or brushy) sandy uplands, often some distance from water bodies. Frequently, nesting occurs in traditional nesting grounds on undeveloped land. Blanding's turtles have also been known to nest successfully on residential property (especially in low density housing situations), and to utilize disturbed areas such as farm fields, gardens, under power lines, and road shoulders (especially of dirt roads). Although Blanding's turtles may travel through woodlots during their seasonal movements, shady areas (including forests and lawns with shade trees) are not used for nesting. Wetlands with deeper water are needed in times of drought, and during the winter. Blanding's turtles overwinter in the muddy bottoms of deeper marshes and ponds, or other water bodies where they are protected from freezing.

**LIFE HISTORY**

Individuals emerge from overwintering and begin basking in late March or early April on warm, sunny days. The increase in body temperature which occurs during basking is necessary for egg development within the female turtle. Nesting in Minnesota typically occurs during June, and females are most active in late afternoon and at dusk. Nesting can occur as much as a mile from wetlands. The nest is dug by the female in an open sandy area and 6-15 eggs are laid. The female turtle returns to the marsh within 24 hours of laying eggs. After a development period of approximately two months, hatchlings leave the nest from mid-August through early-October. Nesting females and hatchlings are often at risk of being killed while crossing roads between wetlands and nesting areas. In addition to movements associated with nesting, all ages and both sexes move between wetlands from April through November. These movements peak in June and July and again in September and October as turtles move to and from overwintering sites. In late autumn (typically November), Blanding's turtles bury themselves in the substrate (the mud at the bottom) of deeper wetlands to overwinter.

**IMPACTS / THREATS / CAUSES OF DECLINE**

- loss of wetland habitat through drainage or flooding (converting wetlands into ponds or lakes)
- loss of upland habitat through development or conversion to agriculture
- human disturbance, including collection for the pet trade\* and road kills during seasonal movements
- increase in predator populations (skunks, raccoons, etc.) which prey on nests and young

\*It is illegal to possess this threatened species.



## RECOMMENDATIONS FOR AVOIDING AND MINIMIZING IMPACTS

These recommendations apply to typical construction projects and general land use within Blanding's turtle habitat, and are provided to help local governments, developers, contractors, and homeowners minimize or avoid detrimental impacts to Blanding's turtle populations. **List 1** describes minimum measures which we recommend to prevent harm to Blanding's turtles during construction or other work within Blanding's turtle habitat. **List 2** contains recommendations which offer even greater protection for Blanding's turtles populations; this list should be used *in addition to the first list* in areas which are known to be of state-wide importance to Blanding's turtles (contact the DNR's Natural Heritage and Nongame Research Program if you wish to determine if your project or home is in one of these areas), or in any other area where greater protection for Blanding's turtles is desired.

| List 1. Recommendations for all areas inhabited by Blanding's turtles.                                                                                                                                                                                                          | List 2. Additional recommendations for areas known to be of state-wide importance to Blanding's turtles.                                                                                                                                                                                                                                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| GENERAL                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                           |
| A flyer with an illustration of a Blanding's turtle should be given to all contractors working in the area. Homeowners should also be informed of the presence of Blanding's turtles in the area.                                                                               | Turtle crossing signs can be installed adjacent to road-crossing areas used by Blanding's turtles to increase public awareness and reduce road kills.                                                                                                                                                                                     |
| Turtles which are in imminent danger should be moved, by hand, out of harms way. Turtles which are not in imminent danger should be left undisturbed.                                                                                                                           | Workers in the area should be aware that Blanding's turtles nest in June, generally after 4pm, and should be advised to minimize disturbance if turtles are seen.                                                                                                                                                                         |
| If a Blanding's turtle nests in your yard, do not disturb the nest.                                                                                                                                                                                                             | If you would like to provide more protection for a Blanding's turtle nest on your property, see "Protecting Blanding's Turtle Nests" on page 3 of this fact sheet.                                                                                                                                                                        |
| Silt fencing should be set up to keep turtles out of construction areas. It is <u>critical</u> that silt fencing be removed after the area has been revegetated.                                                                                                                | Construction in potential nesting areas should be limited to the period between September 15 and June 1 (this is the time when activity of adults and hatchlings in upland areas is at a minimum).                                                                                                                                        |
| WETLANDS                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                           |
| Small, vegetated temporary wetlands (Types 2 & 3) should not be dredged, deepened, filled, or converted to storm water retention basins (these wetlands provide important habitat during spring and summer).                                                                    | Shallow portions of wetlands should not be disturbed during prime basking time (mid morning to mid- afternoon in May and June). A wide buffer should be left along the shore to minimize human activity near wetlands (basking Blanding's turtles are more easily disturbed than other turtle species).                                   |
| Wetlands should be protected from pollution; use of fertilizers and pesticides should be avoided, and run-off from lawns and streets should be controlled. Erosion should be prevented to keep sediment from reaching wetlands and lakes.                                       | Wetlands should be protected from road, lawn, and other chemical run-off by a vegetated buffer strip at least 50' wide. This area should be left unmowed and in a natural condition.                                                                                                                                                      |
| ROADS                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                           |
| Roads should be kept to minimum standards on widths and lanes (this reduces road kills by slowing traffic and reducing the distance turtles need to cross).                                                                                                                     | Tunnels should be considered in areas with concentrations of turtle crossings (more than 10 turtles per year per 100 meters of road), and in areas of lower density if the level of road use would make a safe crossing impossible for turtles. Contact your DNR Regional Nongame Specialist for further information on wildlife tunnels. |
| Roads should be ditched, not curbed or below grade. If curbs must be used, 4 inch high curbs at a 3:1 slope are preferred (Blanding's turtles have great difficulty climbing traditional curbs; curbs and below grade roads trap turtles on the road and can cause road kills). | Roads should be ditched, not curbed or below grade.                                                                                                                                                                                                                                                                                       |

| ROADS cont.                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Culverts between wetland areas, or between wetland areas and nesting areas, should be 36 inches or greater in diameter, and elliptical or flat-bottomed.                                                                                                                                          | Road placement should avoid separating wetlands from adjacent upland nesting sites, or these roads should be fenced to prevent turtles from attempting to cross them (contact your DNR Nongame Specialist for details).                                                                                                                   |
| Wetland crossings should be bridged, or include raised roadways with culverts which are 36 in or greater in diameter and flat-bottomed or elliptical (raised roadways discourage turtles from leaving the wetland to bask on roads).                                                              | Road placement should avoid bisecting wetlands, or these roads should be fenced to prevent turtles from attempting to cross them (contact your DNR Nongame Specialist for details). This is especially important for roads with more than 2 lanes.                                                                                        |
| Culverts under roads crossing streams should be oversized (at least twice as wide as the normal width of open water) and flat-bottomed or elliptical.                                                                                                                                             | Roads crossing streams should be bridged.                                                                                                                                                                                                                                                                                                 |
| UTILITIES                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                           |
| Utility access and maintenance roads should be kept to a minimum (this reduces road-kill potential).                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                           |
| Because trenches can trap turtles, trenches should be checked for turtles prior to being backfilled and the sites should be returned to original grade.                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                           |
| LANDSCAPING AND VEGETATION MANAGEMENT                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                           |
| Terrain should be left with as much natural contour as possible.                                                                                                                                                                                                                                  | As much natural landscape as possible should be preserved (installation of sod or wood chips, paving, and planting of trees within nesting habitat can make that habitat unusable to nesting Blanding's turtles).                                                                                                                         |
| Graded areas should be revegetated with native grasses and forbs (some non-natives form dense patches through which it is difficult for turtles to travel).                                                                                                                                       | Open space should include some areas at higher elevations for nesting. These areas should be retained in native vegetation, and should be connected to wetlands by a wide corridor of native vegetation.                                                                                                                                  |
| Vegetation management in infrequently mowed areas -- such as in ditches, along utility access roads, and under power lines -- should be done mechanically (chemicals should not be used). Work should occur fall through spring (after October 1 <sup>st</sup> and before June 1 <sup>st</sup> ). | Ditches and utility access roads should not be mowed or managed through use of chemicals. If vegetation management is required, it should be done mechanically, as infrequently as possible, and fall through spring (mowing can kill turtles present during mowing, and makes it easier for predators to locate turtles crossing roads). |

**Protecting Blanding's Turtle Nests:** Most predation on turtle nests occurs within 48 hours after the eggs are laid. After this time, the scent is gone from the nest and it is more difficult for predators to locate the nest. Nests more than a week old probably do not need additional protection, unless they are in a particularly vulnerable spot, such as a yard where pets may disturb the nest. Turtle nests can be protected from predators and other disturbance by covering them with a piece of wire fencing (such as chicken wire), secured to the ground with stakes or rocks. The piece of fencing should measure at least 2 ft. x 2 ft., and should be of medium sized mesh (openings should be about 2 in. x 2 in.). It is *very important* that the fencing be **removed before August 1<sup>st</sup>** so the young turtles can escape from the nest when they hatch!

## REFERENCES

- <sup>1</sup>Association for Biodiversity Information. "Heritage Status: Global, National, and Subnational Conservation Status Ranks." NatureServe. Version 1.3 (9 April 2001). <http://www.natureserve.org/ranking.htm> (15 April 2001).
- Coffin, B., and L. Pfannmuller. 1988. Minnesota's Endangered Flora and Fauna. University of Minnesota Press, Minneapolis, 473 pp.

### **REFERENCES (cont.)**

- Moriarty, J. J., and M. Linck. 1994. Suggested guidelines for projects occurring in Blanding's turtle habitat. Unpublished report to the Minnesota DNR. 8 pp.
- Oldfield, B., and J. J. Moriarty. 1994. Amphibians and Reptiles Native to Minnesota. University of Minnesota Press, Minneapolis, 237 pp.
- Sajwaj, T. D., and J. W. Lang. 2000. Thermal ecology of Blanding's turtle in central Minnesota. *Chelonian Conservation and Biology* 3(4):626-636.

# CAUTION



## BLANDING'S TURTLES MAY BE ENCOUNTERED IN THIS AREA

The unique and rare Blanding's turtle has been found in this area. Blanding's turtles are state-listed as Threatened and are protected under Minnesota Statute 84.095, Protection of Threatened and Endangered Species. Please be careful of turtles on roads and in construction sites. For additional information on turtles, or to report a Blanding's turtle sighting, contact the DNR Nongame Specialist nearest you: Bemidji (218-308-2641); Grand Rapids (218-327-4518); New Ulm (507-359-6033); Rochester (507-206-2820); or St. Paul (651-259-5772).

**DESCRIPTION:** The Blanding's turtle is a medium to large turtle (5 to 10 inches) with a black or dark blue, dome-shaped shell with muted yellow spots and bars. The bottom of the shell is hinged across the front third, enabling the turtle to pull the front edge of the lower shell firmly against the top shell to provide additional protection when threatened. The head, legs, and tail are dark brown or blue-gray with small dots of light brown or yellow. A distinctive field mark is the bright yellow chin and neck.

**BLANDING'S TURTLES DO NOT MAKE GOOD PETS  
IT IS ILLEGAL TO KEEP THIS THREATENED SPECIES IN CAPTIVITY**

## **SUMMARY OF RECOMMENDATIONS FOR AVOIDING AND MINIMIZING IMPACTS TO BLANDING'S TURTLE POPULATIONS**

*(see Blanding's Turtle Fact Sheet for full recommendations)*

- This flyer should be given to all contractors working in the area. Homeowners should also be informed of the presence of Blanding's turtles in the area.
- Turtles that are in imminent danger should be moved, by hand, out of harm's way. Turtles that are not in imminent danger should be left undisturbed to continue their travel among wetlands and/or nest sites.
- If a Blanding's turtle nests in your yard, do not disturb the nest and do not allow pets near the nest.
- Silt fencing should be set up to keep turtles out of construction areas. It is critical that silt fencing be removed after the area has been revegetated.
- Small, vegetated temporary wetlands should not be dredged, deepened, or filled.
- All wetlands should be protected from pollution; use of fertilizers and pesticides should be avoided, and run-off from lawns and streets should be controlled. Erosion should be prevented to keep sediment from reaching wetlands and lakes.
- Roads should be kept to minimum standards on widths and lanes.
- Roads should be ditched, not curbed or below grade. If curbs must be used, 4" high curbs at a 3:1 slope are preferred.
- Culverts under roads crossing wetland areas, between wetland areas, or between wetland and nesting areas should be at least 36 in. diameter and flat-bottomed or elliptical.
- Culverts under roads crossing streams should be oversized (at least twice as wide as the normal width of open water) and flat-bottomed or elliptical.
- Utility access and maintenance roads should be kept to a minimum.
- Because trenches can trap turtles, trenches should be checked for turtles prior to being backfilled and the sites should be returned to original grade.
- Terrain should be left with as much natural contour as possible.
- Graded areas should be revegetated with native grasses and forbs.
- Vegetation management in infrequently mowed areas -- such as in ditches, along utility access roads, and under power lines -- should be done mechanically (chemicals should not be used). Work should occur fall through spring (after October 1<sup>st</sup> and before June 1<sup>st</sup>).

## Jennie Geiger

---

**From:** Jennie Geiger  
**Sent:** Thursday, November 02, 2017 7:53 AM  
**To:** 'Review.NHIS@state.mn.us'  
**Cc:** Brenna Gunderson (brenna.gunderson@apexcleanenergy.com); Dave Phillips (dave.phillips@apexcleanenergy.com)  
**Subject:** Request for Information - Business Confidential  
**Attachments:** Big Bend Wind Project Area of Interest.zip; Big Bend Wind Project TRS Info.xlsx; Big Bend Wind Project Location Map.pdf; Big Bend Wind Project\_nhis data request form.pdf

Hi Lisa –

Attached is the NHIS data request form and requested attachments for our proposed Big Bend Wind Project. Please let me know if there is any additional information that is needed at this time. Once you have a chance to review the information, is it possible to provide a specific date as to when we can expect a response?

Thanks,  
Jennie

JENNIE GEIGER  
Environmental Permitting Manager

Apex Clean Energy, Inc.  
310 4th St NE, Suite 200, Charlottesville, VA 22902  
office: 434-260-6982 | cell: 720-320-9450 | fax: 434-220-3712  
[jennie.geiger@apexcleanenergy.com](mailto:jennie.geiger@apexcleanenergy.com) | [www.apexcleanenergy.com](http://www.apexcleanenergy.com)





|      |                                                     |                                  |
|------|-----------------------------------------------------|----------------------------------|
| 2012 | <b>For Agency Use Only:</b>                         | #Sec _____ Contact Rqsted? _____ |
|      | Received _____ Due _____ Inv _____                  | #EOs _____ Survey Rqsted? _____  |
|      | Search Radius _____ mi. L / I / D EM Map'd _____    | #Com _____                       |
|      | NoR / NoF / NoE / Std / Sub Let _____ Log out _____ | Related ERDB# _____              |

## NATURAL HERITAGE INFORMATION SYSTEM (NHIS) DATA REQUEST FORM

Please read the instructions on page 3 before filling out the form. Thank you!

### WHO IS REQUESTING THE INFORMATION?

Mr. \_\_\_\_\_  
 Ms. \_\_\_\_\_

Name and Title \_\_\_\_\_

Agency/Company \_\_\_\_\_

Mailing Address \_\_\_\_\_

(Street) (City) (State) (Zip Code)

Phone \_\_\_\_\_ e-mail \_\_\_\_\_ Responses will be sent via email.   
 If you prefer US Mail check here:

### THIS INFORMATION IS BEING REQUESTED FOR A:

- Federal EA     State EAW     PUC Site or Route Application     Watershed Plan     BER  
 Federal EIS     State EIS     Local Government Permit     Research Project  
 NEPA Checklist     Other (describe) \_\_\_\_\_  
 Check here if this project is funded through any of the following grant programs: Lessard-Sams Outdoor Heritage Council (L-SOHC), Conservation Partners Legacy (CPL), or Legislative-Citizen Commission on Minnesota Resources (LCCMR).

### INFORMATION WE NEED FROM YOU:

- 1) **Enclose a map** of the project boundary/area of interest (topographic maps or aerial photos are preferred).
- 2) Please **provide a GIS shapefile\*** (NAD 83, UTM Zone 15N) of the project boundary/area of interest.
- 3) List the following locational information\* (attach additional sheets if necessary):

| For Agency Use:<br>Region / MBS<br>Status | <table border="1"> <thead> <tr> <th>County</th> <th>Township #</th> <th>Range #</th> <th>Section(s) (please list <b>all</b> sections)</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table> | County  | Township #                                   | Range # | Section(s) (please list <b>all</b> sections) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | For Agency Use:<br>TRS Confirmed <input type="checkbox"/> |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|----------------------------------------------|---------|----------------------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------------------------------------------------|
| County                                    | Township #                                                                                                                                                                                                                                                                                                                                                                                  | Range # | Section(s) (please list <b>all</b> sections) |         |                                              |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                                                           |
|                                           |                                                                                                                                                                                                                                                                                                                                                                                             |         |                                              |         |                                              |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |                                                           |
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- 4) Please provide the following information (attach additional sheets if necessary):

Project Name: \_\_\_\_\_

Project Proposer: \_\_\_\_\_

Description of Project (including types of disturbance anticipated from the project): \_\_\_\_\_

Describe the existing land use of the project site. What types of land cover / habitat will be impacted by the proposed project? The project area primarily consists of agricultural and pasture lands, with minimal forested areas and wetland/water bodies.

List any waterbodies (e.g., rivers, intermittent streams, lakes, wetlands) that may be affected by the proposed project, and discuss how they may be impacted (e.g., dewatering, discharge, riverbed disturbance).

Facilities will be designed to avoid wetlands/waterbodies to the extent practicable.

Does the project have the potential to affect any groundwater resources (e.g., groundwater appropriation, change in recharge, or contamination)?

No

To your knowledge, has the project undergone a previous Natural Heritage review? If so, please list the correspondence #: ERDB # \_\_\_\_\_. How does this request differ from the previous request (e.g., change in scope, change in boundary, project being revived, project expansion, different phase)?

No previous natural heritage review has been conducted.

To your knowledge, have any native plant community or rare species surveys been conducted within the site? If so, please list: No species surveys have been conducted to date.

List any DNR Permits or Licenses that you will be applying for or have already applied for as part of this project: We are not aware of any permits or licenses that will be needed at this time.

#### INFORMATION WE PROVIDE TO YOU:

1) The response will include a Natural Heritage letter. If applicable, the letter will discuss potential effects to rare features.  
 Check here if you are interested in a list of rare features in the vicinity of the area of interest but you do **not** need a review of potential effects to rare features. Please list the reason a review is not needed:

2) Depending on the results of the query or review, the response may include an Index Report of known aggregation sites and known occurrences of federally and state-listed plants and animals\* within an approximate one-mile radius of the project boundary/area of interest. The Index Report and Natural Heritage letter can be included in any public environmental review document.

3) A Detailed Report that contains more information on each occurrence may also be requested. Please note that the Detailed Report may contain specific location information that is protected under *Minnesota Statutes*, section 84.0872, subd. 2, and, as such, the Detailed Report may not be included in any public document (e.g., an EAW).

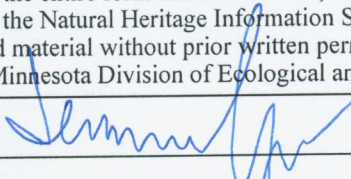
Check here if you would like to request a Detailed Report. Please note that if the results of the review are 'No Effects' or a standard comment, a Detailed Report may not be available.

#### FEES / TURNAROUND TIME

There is a fee\* for this service. Requests generally take **3-4 weeks** from date of receipt to process, and are processed in the order received.

I have read the entire form and instructions, and the information supplied above is complete and accurate. I understand that material supplied to me from the Natural Heritage Information System is copyrighted and that I am not permitted to reproduce or publish any of this copyrighted material without prior written permission from the DNR. Further, if permission to publish is given, I understand that I must credit the Minnesota Division of Ecological and Water Resources, Minnesota Department of Natural Resources, as the source of the material.

Signature (required)



Note: Digital signatures representing the name of a person shall be sufficient to show that such person has signed this document.

Mail or email completed form to:  
Lisa Joyal, Endangered Species Review Coordinator  
Division of Ecological and Water Resources  
Minnesota Department of Natural Resources  
500 Lafayette Road, Box 25  
St. Paul, Minnesota 55155  
[Review.NHIS@state.mn.us](mailto:Review.NHIS@state.mn.us)

[Online version of the form](#)

Revised March 2, 2012

\* Please see the instructions on page 3.



# Instructions for the Natural Heritage Information System (NHIS) Data Request Form

The Division of Ecological and Water Resources maintains the Natural Heritage Information System (NHIS), a collection of databases that provides information on Minnesota's rare plants and animals, native plant communities, and other rare features. The NHIS is continually updated as new information becomes available, and the Minnesota County Biological Survey (MBS) is a major source of this information.

- Use this form to request information on rare features within an approximate one-mile radius of an area of interest. You may reproduce this form for your own use or to distribute. An [electronic copy of the form](#) is available at the DNR's web site.
- If you are interested in obtaining the Rare Features Database electronically as a GIS shapefile, do not fill out this form. Please see [this Natural Heritage Data document](#) for more information on this option.

## WHO IS REQUESTING THE INFORMATION?

- The person whose name is entered on the form under the "Who is Requesting the Information" section must sign the form as an acknowledgment of the State of Minnesota's copyright on all generated reports. All correspondence and invoices will be sent to this person. Please do not ask us to send this information to a different party.
- Please include a complete mailing address. Responses will be sent via email unless you specify differently.

## INFORMATION WE NEED FROM YOU:

- Include a legible map (topographic maps or aerial photographs are preferred) clearly showing:
  - 1) location and boundaries of the project,
  - 2) associated infrastructure, and
  - 3) any waterbodies that may be affected by the proposed project.
- If the project boundary is large **or** complex, please provide a **GIS shapefile** (NAD 83, UTM Zone 15) of the project boundary/area of interest. Do not include any buffers. An additional "digitizing fee" may be charged for projects that require a substantial amount of time to digitize.
- Provide a complete list of sections that the proposed project or area of interest falls within. Do not include any buffer area. Please double-check this information. Incorrect sections can delay the processing of your request, and may result in an invalid review.
- Please provide a detailed **project description**, attaching separate pages to the form if necessary. Identify the type of development (e.g., housing, commercial, utility, ethanol facility, wind farm) being proposed, the size and # of units (if applicable), construction methods, and **any associated infrastructure** such as access roads, utility connections, and water supply and/or discharge pipelines.
- We cannot begin processing data requests until we receive all parts of the request, including a map and a completed, signed form.

## INFORMATION WE PROVIDE TO YOU:

- The Natural Heritage review and database reports are valid for environmental review purposes for one year, and they are only valid for the project location and description provided on the form. Please contact Lisa Joyal at [lisa.joyal@state.mn.us](mailto:lisa.joyal@state.mn.us) if project details change or if a data update is needed.
- Please note that the Natural Heritage review and database reports do not address/contain locations of the gray wolf (*Canis lupus*), state-listed as special concern, or Canada lynx (*Lynx canadensis*), federally-listed as threatened, as these species are not currently tracked in the Natural Heritage Information System. See page 4.

## FEES / TURNAROUND TIME:

- There is a fee for this service. All fees are subject to change. The [current fee schedule](#) is available online. The minimum charge is \$90.00, and increases based on the time it takes us to process the request (dependent upon project size and the results of the query). Please do not include payment with your request; an invoice will be sent to you.
- There is generally a **3-4 week turn-around time** to process requests.

PLEASE SEE NEXT PAGE FOR ADDITIONAL SOURCES OF INFORMATION

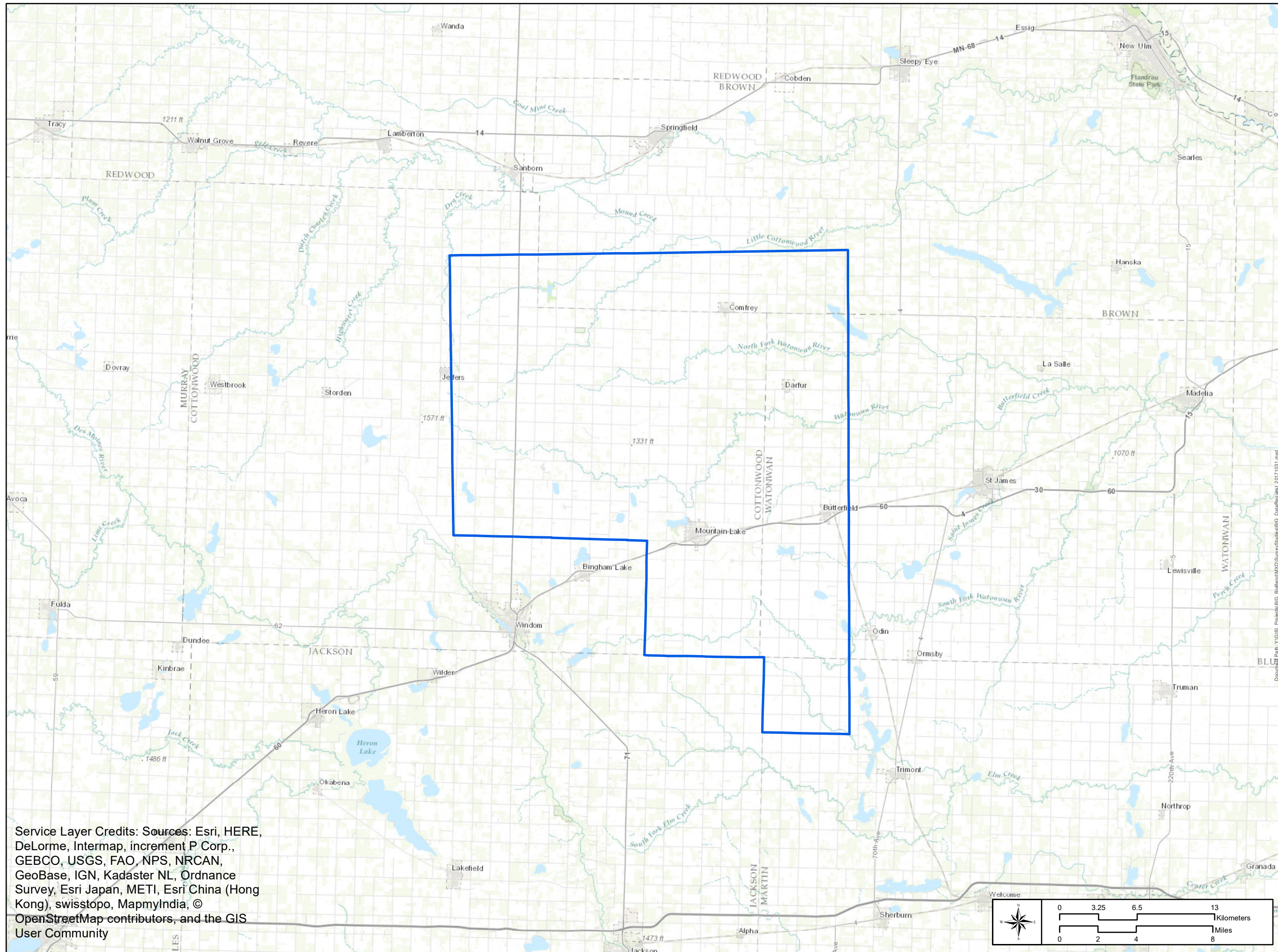
#### ADDITIONAL SOURCES OF INFORMATION:

- The DNR [Rare Species Guide](#) is the state's authoritative reference for Minnesota's endangered, threatened, and special concern species. It is a dynamic, interactive source that can be queried by county, ECS subsection, watershed, or habitat.
- Information on the gray wolf (*Canis lupus*):  
[DNR website gray wolf Species Profile](#)  
[USFWS website Monitoring Report](#)
- Information on the Canada lynx (*Lynx Canadensis*):  
[DNR website Canada Lynx Species Profile](#)  
[USFWS website Canada Lynx profile](#)
- [Minnesota's Comprehensive Wildlife Conservation Strategy](#) is an action plan focused on managing Minnesota's native animals whose populations are rare, declining, or vulnerable to decline. It identifies Species in Greatest Conservation Need and the Key Habitats that support them.
- [The Minnesota Geospatial Commons](#) allows users to download GIS shapefiles of MBS Sites of Biodiversity Significance, MBS Native Plant Communities, MBS Railroad Rights-of-Way Prairies, and Scientific and Natural Area Boundaries.
- Information on [MBS Site Biodiversity Significance Ranks](#)
- Information on [MBS Native Plant Communities](#)
- Questions? Please contact Lisa Joyal at 651-259-5109 or [lisa.joyal@state.mn.us](mailto:lisa.joyal@state.mn.us).



# BIG BEND WIND PROJECT

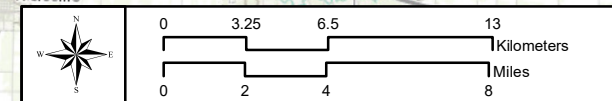
 Project AOI



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Date: 11/1/2017 Author: SML  
Coordinate System: NAD 1983 UTM Zone 15N  
Projection: Transverse Mercator  
Datum: North American 1983  
Units: Meter

CONFIDENTIAL



| FID | State | Meridian      | Township | Range | Section | TwnRng     | TwnRngSec           | SHAPE_STAr  | SHAPE_STLe  |
|-----|-------|---------------|----------|-------|---------|------------|---------------------|-------------|-------------|
| 0   | MN    | 5th Principal | T107N    | R033W | 31      | T107NR033\ | <b>T107NR033W31</b> | 4952035.832 | 8895.595557 |
| 1   | MN    | 5th Principal | T107N    | R035W | 28      | T107NR035\ | <b>T107NR035W28</b> | 4997270.363 | 8942.363132 |
| 2   | MN    | 5th Principal | T106N    | R036W | 32      | T106NR036\ | <b>T106NR036W32</b> | 4980360.996 | 8920.951487 |
| 3   | MN    | 5th Principal | T104N    | R033W | 21      | T104NR033\ | <b>T104NR033W21</b> | 4832464.207 | 8789.650619 |
| 4   | MN    | 5th Principal | T107N    | R033W | 23      | T107NR033\ | <b>T107NR033W23</b> | 5047195.957 | 8987.121587 |
| 5   | MN    | 5th Principal | T106N    | R035W | 21      | T106NR035\ | <b>T106NR035W21</b> | 5005947.238 | 8950.104532 |
| 6   | MN    | 5th Principal | T107N    | R035W | 23      | T107NR035\ | <b>T107NR035W23</b> | 4899231.563 | 8856.064084 |
| 7   | MN    | 5th Principal | T106N    | R034W | 36      | T106NR034\ | <b>T106NR034W36</b> | 5158579.625 | 9085.147812 |
| 8   | MN    | 5th Principal | T107N    | R035W | 26      | T107NR035\ | <b>T107NR035W26</b> | 4920101.109 | 8874.506129 |
| 9   | MN    | 5th Principal | T108N    | R036W | 21      | T108NR036\ | <b>T108NR036W21</b> | 5047273.387 | 8986.783178 |
| 10  | MN    | 5th Principal | T107N    | R034W | 27      | T107NR034\ | <b>T107NR034W27</b> | 5080122.953 | 9016.275606 |
| 11  | MN    | 5th Principal | T108N    | R036W | 33      | T108NR036\ | <b>T108NR036W33</b> | 5094753.27  | 9030.012364 |
| 12  | MN    | 5th Principal | T107N    | R035W | 35      | T107NR035\ | <b>T107NR035W35</b> | 4870812.668 | 8958.095556 |
| 13  | MN    | 5th Principal | T107N    | R036W | 20      | T107NR036\ | <b>T107NR036W20</b> | 5056537.676 | 8994.637408 |
| 14  | MN    | 5th Principal | T106N    | R034W | 5       | T106NR034\ | <b>T106NR034W05</b> | 4889381.859 | 8845.164719 |
| 15  | MN    | 5th Principal | T106N    | R033W | 4       | T106NR033\ | <b>T106NR033W04</b> | 4963484.504 | 8913.306822 |
| 16  | MN    | 5th Principal | T107N    | R035W | 11      | T107NR035\ | <b>T107NR035W11</b> | 4928922.887 | 8881.394625 |
| 17  | MN    | 5th Principal | T108N    | R033W | 28      | T108NR033\ | <b>T108NR033W28</b> | 4980449.215 | 8927.306811 |
| 18  | MN    | 5th Principal | T106N    | R033W | 7       | T106NR033\ | <b>T106NR033W07</b> | 4831443.32  | 8844.164896 |
| 19  | MN    | 5th Principal | T107N    | R036W | 26      | T107NR036\ | <b>T107NR036W26</b> | 4927487.645 | 8880.342207 |
| 20  | MN    | 5th Principal | T104N    | R033W | 7       | T104NR033\ | <b>T104NR033W07</b> | 4865298.047 | 8825.039856 |
| 21  | MN    | 5th Principal | T108N    | R033W | 16      | T108NR033\ | <b>T108NR033W16</b> | 5150016.871 | 9079.085753 |
| 22  | MN    | 5th Principal | T107N    | R033W | 3       | T107NR033\ | <b>T107NR033W03</b> | 4786264.543 | 8764.298518 |
| 23  | MN    | 5th Principal | T104N    | R033W | 3       | T104NR033\ | <b>T104NR033W03</b> | 5001728.543 | 8951.321738 |
| 24  | MN    | 5th Principal | T104N    | R033W | 5       | T104NR033\ | <b>T104NR033W05</b> | 4909644.184 | 8876.148568 |
| 25  | MN    | 5th Principal | T108N    | R034W | 15      | T108NR034\ | <b>T108NR034W15</b> | 5155616.32  | 9082.088443 |
| 26  | MN    | 5th Principal | T107N    | R033W | 21      | T107NR033\ | <b>T107NR033W21</b> | 4976269.941 | 8922.810657 |
| 27  | MN    | 5th Principal | T105N    | R034W | 28      | T105NR034\ | <b>T105NR034W28</b> | 5030682.57  | 8984.906096 |
| 28  | MN    | 5th Principal | T105N    | R033W | 27      | T105NR033\ | <b>T105NR033W27</b> | 5039264.48  | 9001.738787 |
| 29  | MN    | 5th Principal | T106N    | R034W | 25      | T106NR034\ | <b>T106NR034W25</b> | 5106998.551 | 9039.156876 |
| 30  | MN    | 5th Principal | T107N    | R033W | 18      | T107NR033\ | <b>T107NR033W18</b> | 4911734.246 | 8872.884115 |
| 31  | MN    | 5th Principal | T108N    | R033W | 22      | T108NR033\ | <b>T108NR033W22</b> | 5156286.695 | 9083.46594  |
| 32  | MN    | 5th Principal | T108N    | R033W | 23      | T108NR033\ | <b>T108NR033W23</b> | 5086928.199 | 9023.701379 |
| 33  | MN    | 5th Principal | T107N    | R033W | 9       | T107NR033\ | <b>T107NR033W09</b> | 5026402.488 | 8970.17634  |
| 34  | MN    | 5th Principal | T108N    | R035W | 29      | T108NR035\ | <b>T108NR035W29</b> | 5009746.535 | 8953.097181 |
| 35  | MN    | 5th Principal | T107N    | R035W | 32      | T107NR035\ | <b>T107NR035W32</b> | 5016948.922 | 8960.046598 |
| 36  | MN    | 5th Principal | T105N    | R034W | 5       | T105NR034\ | <b>T105NR034W05</b> | 4794766.391 | 8773.808618 |
| 37  | MN    | 5th Principal | T107N    | R034W | 25      | T107NR034\ | <b>T107NR034W25</b> | 5008588.531 | 8952.726432 |
| 38  | MN    | 5th Principal | T106N    | R035W | 5       | T106NR035\ | <b>T106NR035W05</b> | 5010365.875 | 8954.488476 |
| 39  | MN    | 5th Principal | T107N    | R035W | 9       | T107NR035\ | <b>T107NR035W09</b> | 4997150.125 | 8942.357372 |
| 40  | MN    | 5th Principal | T107N    | R033W | 20      | T107NR033\ | <b>T107NR033W20</b> | 5067703.914 | 9005.841442 |
| 41  | MN    | 5th Principal | T106N    | R035W | 9       | T106NR035\ | <b>T106NR035W09</b> | 4970811.43  | 8957.665269 |
| 42  | MN    | 5th Principal | T106N    | R036W | 16      | T106NR036\ | <b>T106NR036W16</b> | 5010906.078 | 8954.936847 |
| 43  | MN    | 5th Principal | T106N    | R035W | 34      | T106NR035\ | <b>T106NR035W34</b> | 5095745.645 | 9030.041074 |
| 44  | MN    | 5th Principal | T107N    | R035W | 7       | T107NR035\ | <b>T107NR035W07</b> | 4919074.422 | 8873.01462  |
| 45  | MN    | 5th Principal | T106N    | R034W | 27      | T106NR034\ | <b>T106NR034W27</b> | 5029731.863 | 8972.155832 |
| 46  | MN    | 5th Principal | T106N    | R036W | 1       | T106NR036\ | <b>T106NR036W01</b> | 5038160.766 | 8978.446701 |
| 47  | MN    | 5th Principal | T106N    | R034W | 23      | T106NR034\ | <b>T106NR034W23</b> | 4913870.848 | 8878.679661 |
| 48  | MN    | 5th Principal | T108N    | R034W | 21      | T108NR034\ | <b>T108NR034W21</b> | 5008817.219 | 8962.585068 |
| 49  | MN    | 5th Principal | T106N    | R034W | 6       | T106NR034\ | <b>T106NR034W06</b> | 5046752.629 | 8986.661071 |
| 50  | MN    | 5th Principal | T107N    | R034W | 10      | T107NR034\ | <b>T107NR034W10</b> | 5026956.012 | 8969.664131 |
| 51  | MN    | 5th Principal | T107N    | R035W | 17      | T107NR035\ | <b>T107NR035W17</b> | 5050559.754 | 8989.050794 |
| 52  | MN    | 5th Principal | T106N    | R035W | 3       | T106NR035\ | <b>T106NR035W03</b> | 5073460.508 | 9010.609889 |
| 53  | MN    | 5th Principal | T107N    | R033W | 19      | T107NR033\ | <b>T107NR033W19</b> | 4882938.133 | 8835.363985 |
| 54  | MN    | 5th Principal | T106N    | R036W | 28      | T106NR036\ | <b>T106NR036W28</b> | 5024511.402 | 8964.898513 |
| 55  | MN    | 5th Principal | T107N    | R034W | 4       | T107NR034\ | <b>T107NR034W04</b> | 5040307.379 | 8981.737048 |
| 56  | MN    | 5th Principal | T107N    | R035W | 16      | T107NR035\ | <b>T107NR035W16</b> | 4986096.953 | 8924.645987 |
| 57  | MN    | 5th Principal | T107N    | R035W | 31      | T107NR035\ | <b>T107NR035W31</b> | 4910292.637 | 8863.496848 |
| 58  | MN    | 5th Principal | T107N    | R033W | 11      | T107NR033\ | <b>T107NR033W11</b> | 5131490.09  | 9063.306157 |
| 59  | MN    | 5th Principal | T106N    | R034W | 33      | T106NR034\ | <b>T106NR034W33</b> | 5065019.363 | 9001.671747 |
| 60  | MN    | 5th Principal | T106N    | R035W | 8       | T106NR035\ | <b>T106NR035W08</b> | 5114966.637 | 9056.882782 |
| 61  | MN    | 5th Principal | T106N    | R033W | 33      | T106NR033\ | <b>T106NR033W33</b> | 5016477.105 | 8969.041102 |
| 62  | MN    | 5th Principal | T105N    | R034W | 3       | T105NR034\ | <b>T105NR034W03</b> | 4888230.566 | 8846.936803 |
| 63  | MN    | 5th Principal | T107N    | R034W | 12      | T107NR034\ | <b>T107NR034W12</b> | 5121169.66  | 9054.175384 |
| 64  | MN    | 5th Principal | T105N    | R033W | 18      | T105NR033\ | <b>T105NR033W18</b> | 4846843.938 | 8837.561603 |
| 65  | MN    | 5th Principal | T106N    | R034W | 15      | T106NR034\ | <b>T106NR034W15</b> | 5060195.426 | 8997.075008 |
| 66  | MN    | 5th Principal | T108N    | R033W | 27      | T108NR033\ | <b>T108NR033W27</b> | 5022714.773 | 8965.008092 |

|        |               |         |       |    |            |                     |             |             |
|--------|---------------|---------|-------|----|------------|---------------------|-------------|-------------|
| 67 MN  | 5th Principal | † T106N | R036W | 9  | T106NR036\ | <b>T106NR036W09</b> | 5080307.121 | 9057.518914 |
| 68 MN  | 5th Principal | † T106N | R036W | 23 | T106NR036\ | <b>T106NR036W23</b> | 5060463.066 | 8999.971361 |
| 69 MN  | 5th Principal | † T107N | R034W | 8  | T107NR034\ | <b>T107NR034W08</b> | 4978865.262 | 8926.86586  |
| 70 MN  | 5th Principal | † T106N | R036W | 20 | T106NR036\ | <b>T106NR036W20</b> | 5023133.211 | 8967.015689 |
| 71 MN  | 5th Principal | † T105N | R033W | 17 | T105NR033\ | <b>T105NR033W17</b> | 5008275.855 | 8951.311855 |
| 72 MN  | 5th Principal | † T104N | R033W | 22 | T104NR033\ | <b>T104NR033W22</b> | 4958207.645 | 8911.871597 |
| 73 MN  | 5th Principal | † T106N | R035W | 23 | T106NR035\ | <b>T106NR035W23</b> | 4937532.219 | 8943.891285 |
| 74 MN  | 5th Principal | † T104N | R033W | 15 | T104NR033\ | <b>T104NR033W15</b> | 5132704.074 | 9063.695801 |
| 75 MN  | 5th Principal | † T105N | R033W | 4  | T105NR033\ | <b>T105NR033W04</b> | 4580845.059 | 8546.994143 |
| 76 MN  | 5th Principal | † T108N | R035W | 13 | T108NR035\ | <b>T108NR035W13</b> | 4935830.41  | 8888.328898 |
| 77 MN  | 5th Principal | † T107N | R034W | 23 | T107NR034\ | <b>T107NR034W23</b> | 5074089.785 | 9013.076127 |
| 78 MN  | 5th Principal | † T105N | R034W | 30 | T105NR034\ | <b>T105NR034W30</b> | 4899900.211 | 8865.574952 |
| 79 MN  | 5th Principal | † T105N | R034W | 22 | T105NR034\ | <b>T105NR034W22</b> | 5070313.914 | 9009.158794 |
| 80 MN  | 5th Principal | † T107N | R035W | 34 | T107NR035\ | <b>T107NR035W34</b> | 5023558.57  | 8968.463194 |
| 81 MN  | 5th Principal | † T105N | R034W | 4  | T105NR034\ | <b>T105NR034W04</b> | 4807741.688 | 8764.512282 |
| 82 MN  | 5th Principal | † T107N | R034W | 2  | T107NR034\ | <b>T107NR034W02</b> | 4903663.789 | 8858.418996 |
| 83 MN  | 5th Principal | † T107N | R036W | 3  | T107NR036\ | <b>T107NR036W03</b> | 5057398.422 | 8996.114671 |
| 84 MN  | 5th Principal | † T106N | R034W | 10 | T106NR034\ | <b>T106NR034W10</b> | 4991743.816 | 8978.74534  |
| 85 MN  | 5th Principal | † T106N | R034W | 18 | T106NR034\ | <b>T106NR034W18</b> | 4961585.402 | 8913.73812  |
| 86 MN  | 5th Principal | † T105N | R034W | 8  | T105NR034\ | <b>T105NR034W08</b> | 4976928.758 | 8926.390725 |
| 87 MN  | 5th Principal | † T106N | R034W | 29 | T106NR034\ | <b>T106NR034W29</b> | 4992120.488 | 8949.713859 |
| 88 MN  | 5th Principal | † T107N | R033W | 27 | T107NR033\ | <b>T107NR033W27</b> | 5081604.52  | 9017.469502 |
| 89 MN  | 5th Principal | † T105N | R033W | 20 | T105NR033\ | <b>T105NR033W20</b> | 5072512.289 | 9009.572632 |
| 90 MN  | 5th Principal | † T106N | R035W | 29 | T106NR035\ | <b>T106NR035W29</b> | 5068122.238 | 9006.910778 |
| 91 MN  | 5th Principal | † T105N | R033W | 14 | T105NR033\ | <b>T105NR033W14</b> | 4961092.965 | 8907.869938 |
| 92 MN  | 5th Principal | † T107N | R033W | 35 | T107NR033\ | <b>T107NR033W35</b> | 5018435.691 | 8960.997789 |
| 93 MN  | 5th Principal | † T108N | R033W | 19 | T108NR033\ | <b>T108NR033W19</b> | 5132203.27  | 9057.886413 |
| 94 MN  | 5th Principal | † T108N | R036W | 34 | T108NR036\ | <b>T108NR036W34</b> | 5177517.664 | 9102.428599 |
| 95 MN  | 5th Principal | † T106N | R033W | 5  | T106NR033\ | <b>T106NR033W05</b> | 5059398.566 | 8998.36097  |
| 96 MN  | 5th Principal | † T105N | R033W | 8  | T105NR033\ | <b>T105NR033W08</b> | 5098278.633 | 9037.639729 |
| 97 MN  | 5th Principal | † T108N | R034W | 14 | T108NR034\ | <b>T108NR034W14</b> | 5095121.574 | 9044.035849 |
| 98 MN  | 5th Principal | † T106N | R036W | 35 | T106NR036\ | <b>T106NR036W35</b> | 5079553.195 | 9018.152918 |
| 99 MN  | 5th Principal | † T105N | R034W | 35 | T105NR034\ | <b>T105NR034W35</b> | 4935085.711 | 8887.83353  |
| 100 MN | 5th Principal | † T107N | R034W | 18 | T107NR034\ | <b>T107NR034W18</b> | 5072923.027 | 9009.498266 |
| 101 MN | 5th Principal | † T106N | R034W | 22 | T106NR034\ | <b>T106NR034W22</b> | 5062192.906 | 8992.5732   |
| 102 MN | 5th Principal | † T106N | R034W | 2  | T106NR034\ | <b>T106NR034W02</b> | 4988493.355 | 8934.097476 |
| 103 MN | 5th Principal | † T106N | R036W | 27 | T106NR036\ | <b>T106NR036W27</b> | 4930313.465 | 8883.802641 |
| 104 MN | 5th Principal | † T107N | R036W | 13 | T107NR036\ | <b>T107NR036W13</b> | 5073405.316 | 9010.150244 |
| 105 MN | 5th Principal | † T106N | R035W | 30 | T106NR035\ | <b>T106NR035W30</b> | 4994923.762 | 8940.264469 |
| 106 MN | 5th Principal | † T105N | R034W | 6  | T105NR034\ | <b>T105NR034W06</b> | 4784535.289 | 8745.852647 |
| 107 MN | 5th Principal | † T107N | R036W | 1  | T107NR036\ | <b>T107NR036W01</b> | 5108744.871 | 9043.968686 |
| 108 MN | 5th Principal | † T108N | R036W | 27 | T108NR036\ | <b>T108NR036W27</b> | 5064530.738 | 9002.517464 |
| 109 MN | 5th Principal | † T108N | R033W | 29 | T108NR033\ | <b>T108NR033W29</b> | 5074126.289 | 9011.725339 |
| 110 MN | 5th Principal | † T107N | R035W | 13 | T107NR035\ | <b>T107NR035W13</b> | 4904277.234 | 8858.63582  |
| 111 MN | 5th Principal | † T106N | R034W | 34 | T106NR034\ | <b>T106NR034W34</b> | 5096205.898 | 9040.780419 |
| 112 MN | 5th Principal | † T106N | R035W | 31 | T106NR035\ | <b>T106NR035W31</b> | 5033438.594 | 8974.207663 |
| 113 MN | 5th Principal | † T106N | R036W | 14 | T106NR036\ | <b>T106NR036W14</b> | 4921295.93  | 8874.094052 |
| 114 MN | 5th Principal | † T105N | R034W | 2  | T105NR034\ | <b>T105NR034W02</b> | 4866152.328 | 8822.504059 |
| 115 MN | 5th Principal | † T106N | R035W | 24 | T106NR035\ | <b>T106NR035W24</b> | 4859576.047 | 8831.511606 |
| 116 MN | 5th Principal | † T105N | R034W | 15 | T105NR034\ | <b>T105NR034W15</b> | 5128907.578 | 9050.911205 |
| 117 MN | 5th Principal | † T107N | R035W | 2  | T107NR035\ | <b>T107NR035W02</b> | 4906613.375 | 8861.016903 |
| 118 MN | 5th Principal | † T107N | R034W | 21 | T107NR034\ | <b>T107NR034W21</b> | 5078504.98  | 9014.736046 |
| 119 MN | 5th Principal | † T106N | R033W | 29 | T106NR033\ | <b>T106NR033W29</b> | 5046757.98  | 8975.879503 |
| 120 MN | 5th Principal | † T106N | R034W | 7  | T106NR034\ | <b>T106NR034W07</b> | 5078743.5   | 9050.747577 |
| 121 MN | 5th Principal | † T106N | R036W | 26 | T106NR036\ | <b>T106NR036W26</b> | 4901647.344 | 8852.696752 |
| 122 MN | 5th Principal | † T105N | R033W | 6  | T105NR033\ | <b>T105NR033W06</b> | 4512972.348 | 8518.527258 |
| 123 MN | 5th Principal | † T107N | R036W | 17 | T107NR036\ | <b>T107NR036W17</b> | 5000701.188 | 8945.322473 |
| 124 MN | 5th Principal | † T107N | R034W | 34 | T107NR034\ | <b>T107NR034W34</b> | 5028017.426 | 8969.917254 |
| 125 MN | 5th Principal | † T104N | R033W | 19 | T104NR033\ | <b>T104NR033W19</b> | 4839412.285 | 8799.781421 |
| 126 MN | 5th Principal | † T105N | R033W | 26 | T105NR033\ | <b>T105NR033W26</b> | 5064860.945 | 8969.593971 |
| 127 MN | 5th Principal | † T107N | R035W | 15 | T107NR035\ | <b>T107NR035W15</b> | 4890146.16  | 8845.875713 |
| 128 MN | 5th Principal | † T107N | R035W | 20 | T107NR035\ | <b>T107NR035W20</b> | 5009510.844 | 8953.725854 |
| 129 MN | 5th Principal | † T105N | R033W | 11 | T105NR033\ | <b>T105NR033W11</b> | 5168292.215 | 9092.850702 |
| 130 MN | 5th Principal | † T106N | R034W | 3  | T106NR034\ | <b>T106NR034W03</b> | 4957833.691 | 8906.80543  |
| 131 MN | 5th Principal | † T105N | R033W | 33 | T105NR033\ | <b>T105NR033W33</b> | 4930515.699 | 8888.969469 |
| 132 MN | 5th Principal | † T106N | R034W | 4  | T106NR034\ | <b>T106NR034W04</b> | 4962838.422 | 8911.111261 |
| 133 MN | 5th Principal | † T107N | R033W | 16 | T107NR033\ | <b>T107NR033W16</b> | 5093511.383 | 9027.583291 |
| 134 MN | 5th Principal | † T105N | R034W | 20 | T105NR034\ | <b>T105NR034W20</b> | 5048886.367 | 8990.944355 |

|        |               |        |       |    |            |                     |             |             |
|--------|---------------|--------|-------|----|------------|---------------------|-------------|-------------|
| 135 MN | 5th Principal | †T106N | R034W | 30 | T106NR034\ | <b>T106NR034W30</b> | 4862138.25  | 8799.479847 |
| 136 MN | 5th Principal | †T107N | R036W | 15 | T107NR036\ | <b>T107NR036W15</b> | 5044697.813 | 8984.424806 |
| 137 MN | 5th Principal | †T108N | R034W | 17 | T108NR034\ | <b>T108NR034W17</b> | 4880515.215 | 8854.439203 |
| 138 MN | 5th Principal | †T107N | R035W | 22 | T107NR035\ | <b>T107NR035W22</b> | 4946600.531 | 8897.250901 |
| 139 MN | 5th Principal | †T106N | R036W | 10 | T106NR036\ | <b>T106NR036W10</b> | 5079521.957 | 9066.130527 |
| 140 MN | 5th Principal | †T107N | R035W | 29 | T107NR035\ | <b>T107NR035W29</b> | 5046748.82  | 8986.332965 |
| 141 MN | 5th Principal | †T107N | R036W | 2  | T107NR036\ | <b>T107NR036W02</b> | 4901879.328 | 8856.601684 |
| 142 MN | 5th Principal | †T106N | R035W | 14 | T106NR035\ | <b>T106NR035W14</b> | 4791379.719 | 8833.598568 |
| 143 MN | 5th Principal | †T106N | R034W | 35 | T106NR034\ | <b>T106NR034W35</b> | 5025017.813 | 8960.361413 |
| 144 MN | 5th Principal | †T108N | R036W | 23 | T108NR036\ | <b>T108NR036W23</b> | 5035285.824 | 8976.683606 |
| 145 MN | 5th Principal | †T108N | R036W | 35 | T108NR036\ | <b>T108NR036W35</b> | 5026270.422 | 8969.01516  |
| 146 MN | 5th Principal | †T108N | R036W | 28 | T108NR036\ | <b>T108NR036W28</b> | 4970995.805 | 8918.17166  |
| 147 MN | 5th Principal | †T108N | R033W | 34 | T108NR033\ | <b>T108NR033W34</b> | 5171138.332 | 9094.899202 |
| 148 MN | 5th Principal | †T108N | R034W | 35 | T108NR034\ | <b>T108NR034W35</b> | 5088176     | 9024.587439 |
| 149 MN | 5th Principal | †T108N | R034W | 28 | T108NR034\ | <b>T108NR034W28</b> | 4979657.762 | 8926.44663  |
| 150 MN | 5th Principal | †T107N | R034W | 22 | T107NR034\ | <b>T107NR034W22</b> | 4969330.434 | 8916.943143 |
| 151 MN | 5th Principal | †T106N | R035W | 19 | T106NR035\ | <b>T106NR035W19</b> | 5140589.68  | 9066.102972 |
| 152 MN | 5th Principal | †T108N | R036W | 22 | T108NR036\ | <b>T108NR036W22</b> | 5119561.047 | 9051.116798 |
| 153 MN | 5th Principal | †T105N | R034W | 19 | T105NR034\ | <b>T105NR034W19</b> | 4906305.918 | 8873.100198 |
| 154 MN | 5th Principal | †T107N | R036W | 35 | T107NR036\ | <b>T107NR036W35</b> | 4824212.969 | 8786.300527 |
| 155 MN | 5th Principal | †T106N | R033W | 35 | T106NR033\ | <b>T106NR033W35</b> | 5076771.879 | 9011.810164 |
| 156 MN | 5th Principal | †T105N | R033W | 34 | T105NR033\ | <b>T105NR033W34</b> | 5081130.18  | 8999.165138 |
| 157 MN | 5th Principal | †T107N | R035W | 3  | T107NR035\ | <b>T107NR035W03</b> | 4969204.199 | 8917.656445 |
| 158 MN | 5th Principal | †T105N | R033W | 22 | T105NR033\ | <b>T105NR033W22</b> | 5083510.258 | 9011.075259 |
| 159 MN | 5th Principal | †T108N | R035W | 30 | T108NR035\ | <b>T108NR035W30</b> | 4958397.457 | 8907.158305 |
| 160 MN | 5th Principal | †T107N | R033W | 5  | T107NR033\ | <b>T107NR033W05</b> | 4821617.188 | 8798.79518  |
| 161 MN | 5th Principal | †T107N | R034W | 26 | T107NR034\ | <b>T107NR034W26</b> | 5175912.973 | 9100.642876 |
| 162 MN | 5th Principal | †T106N | R035W | 26 | T106NR035\ | <b>T106NR035W26</b> | 4864436.102 | 8867.250439 |
| 163 MN | 5th Principal | †T108N | R036W | 26 | T108NR036\ | <b>T108NR036W26</b> | 4969852.141 | 8918.300434 |
| 164 MN | 5th Principal | †T108N | R034W | 32 | T108NR034\ | <b>T108NR034W32</b> | 5054737.164 | 8987.665525 |
| 165 MN | 5th Principal | †T107N | R034W | 35 | T107NR034\ | <b>T107NR034W35</b> | 5063907.055 | 9001.87874  |
| 166 MN | 5th Principal | †T107N | R036W | 32 | T107NR036\ | <b>T107NR036W32</b> | 4988277.488 | 8934.06881  |
| 167 MN | 5th Principal | †T108N | R034W | 19 | T108NR034\ | <b>T108NR034W19</b> | 5029417.785 | 8968.138075 |
| 168 MN | 5th Principal | †T108N | R035W | 36 | T108NR035\ | <b>T108NR035W36</b> | 4947400.82  | 8899.043034 |
| 169 MN | 5th Principal | †T107N | R036W | 11 | T107NR036\ | <b>T107NR036W11</b> | 4951016.348 | 8900.589957 |
| 170 MN | 5th Principal | †T108N | R035W | 24 | T108NR035\ | <b>T108NR035W24</b> | 4881103.254 | 8837.369613 |
| 171 MN | 5th Principal | †T105N | R034W | 32 | T105NR034\ | <b>T105NR034W32</b> | 4975919.684 | 8905.144486 |
| 172 MN | 5th Principal | †T106N | R033W | 30 | T106NR033\ | <b>T106NR033W30</b> | 4919030.094 | 8871.486691 |
| 173 MN | 5th Principal | †T106N | R036W | 25 | T106NR036\ | <b>T106NR036W25</b> | 5002362.578 | 8948.174893 |
| 174 MN | 5th Principal | †T105N | R034W | 1  | T105NR034\ | <b>T105NR034W01</b> | 4914321.188 | 8866.065927 |
| 175 MN | 5th Principal | †T107N | R036W | 33 | T107NR036\ | <b>T107NR036W33</b> | 4917761.359 | 8870.480544 |
| 176 MN | 5th Principal | †T107N | R033W | 30 | T107NR033\ | <b>T107NR033W30</b> | 4969702.121 | 8919.932428 |
| 177 MN | 5th Principal | †T108N | R034W | 33 | T108NR034\ | <b>T108NR034W33</b> | 5104499.43  | 9037.513383 |
| 178 MN | 5th Principal | †T108N | R033W | 30 | T108NR033\ | <b>T108NR033W30</b> | 4999563.305 | 8945.130919 |
| 179 MN | 5th Principal | †T106N | R035W | 32 | T106NR035\ | <b>T106NR035W32</b> | 5147880.574 | 9075.818233 |
| 180 MN | 5th Principal | †T104N | R033W | 2  | T104NR033\ | <b>T104NR033W02</b> | 4912890.5   | 8857.653884 |
| 181 MN | 5th Principal | †T107N | R036W | 36 | T107NR036\ | <b>T107NR036W36</b> | 4935925.441 | 8888.046241 |
| 182 MN | 5th Principal | †T107N | R034W | 14 | T107NR034\ | <b>T107NR034W14</b> | 5008748.465 | 8953.097572 |
| 183 MN | 5th Principal | †T104N | R033W | 11 | T104NR033\ | <b>T104NR033W11</b> | 4809010.652 | 8759.552132 |
| 184 MN | 5th Principal | †T107N | R035W | 1  | T107NR035\ | <b>T107NR035W01</b> | 4860702.457 | 8819.554075 |
| 185 MN | 5th Principal | †T107N | R035W | 24 | T107NR035\ | <b>T107NR035W24</b> | 4906933.445 | 8861.083994 |
| 186 MN | 5th Principal | †T106N | R033W | 18 | T106NR033\ | <b>T106NR033W18</b> | 4875251.746 | 8835.234531 |
| 187 MN | 5th Principal | †T108N | R035W | 31 | T108NR035\ | <b>T108NR035W31</b> | 4893326.152 | 8851.882007 |
| 188 MN | 5th Principal | †T105N | R033W | 21 | T105NR033\ | <b>T105NR033W21</b> | 4993890.613 | 8939.619257 |
| 189 MN | 5th Principal | †T106N | R035W | 15 | T106NR035\ | <b>T106NR035W15</b> | 4987496.855 | 8935.644595 |
| 190 MN | 5th Principal | †T107N | R033W | 28 | T107NR033\ | <b>T107NR033W28</b> | 5075628.051 | 9012.554279 |
| 191 MN | 5th Principal | †T106N | R033W | 34 | T106NR033\ | <b>T106NR033W34</b> | 5060162.59  | 8985.063712 |
| 192 MN | 5th Principal | †T106N | R035W | 27 | T106NR035\ | <b>T106NR035W27</b> | 5062936.973 | 9000.55748  |
| 193 MN | 5th Principal | †T106N | R036W | 17 | T106NR036\ | <b>T106NR036W17</b> | 4890555.285 | 8846.033615 |
| 194 MN | 5th Principal | †T105N | R034W | 21 | T105NR034\ | <b>T105NR034W21</b> | 4986563.355 | 8927.839018 |
| 195 MN | 5th Principal | †T106N | R034W | 31 | T106NR034\ | <b>T106NR034W31</b> | 4979217.824 | 8926.088527 |
| 196 MN | 5th Principal | †T107N | R035W | 33 | T107NR035\ | <b>T107NR035W33</b> | 5016103.137 | 8959.605969 |
| 197 MN | 5th Principal | †T107N | R035W | 14 | T107NR035\ | <b>T107NR035W14</b> | 4928256.945 | 8880.628307 |
| 198 MN | 5th Principal | †T105N | R034W | 16 | T105NR034\ | <b>T105NR034W16</b> | 4890695.176 | 8846.536786 |
| 199 MN | 5th Principal | †T107N | R035W | 12 | T107NR035\ | <b>T107NR035W12</b> | 4944785.43  | 8896.067306 |
| 200 MN | 5th Principal | †T107N | R033W | 10 | T107NR033\ | <b>T107NR033W10</b> | 5094363.18  | 9027.918741 |
| 201 MN | 5th Principal | †T106N | R036W | 33 | T106NR036\ | <b>T106NR036W33</b> | 5079621.758 | 9015.574004 |
| 202 MN | 5th Principal | †T106N | R033W | 15 | T106NR033\ | <b>T106NR033W15</b> | 5103888.527 | 9035.46153  |

|        |               |         |       |    |            |                     |             |             |
|--------|---------------|---------|-------|----|------------|---------------------|-------------|-------------|
| 203 MN | 5th Principal | † T106N | R035W | 35 | T106NR035\ | <b>T106NR035W35</b> | 4911466.992 | 8938.184227 |
| 204 MN | 5th Principal | † T108N | R033W | 26 | T108NR033\ | <b>T108NR033W26</b> | 4918537.586 | 8871.48699  |
| 205 MN | 5th Principal | † T108N | R034W | 13 | T108NR034\ | <b>T108NR034W13</b> | 5173341.539 | 9098.096193 |
| 206 MN | 5th Principal | † T104N | R033W | 17 | T104NR033\ | <b>T104NR033W17</b> | 5139509.012 | 9055.715938 |
| 207 MN | 5th Principal | † T107N | R033W | 29 | T107NR033\ | <b>T107NR033W29</b> | 5213697.066 | 9133.253131 |
| 208 MN | 5th Principal | † T105N | R034W | 10 | T105NR034\ | <b>T105NR034W10</b> | 5160293.008 | 9071.714777 |
| 209 MN | 5th Principal | † T106N | R036W | 21 | T106NR036\ | <b>T106NR036W21</b> | 5162630.273 | 9090.511487 |
| 210 MN | 5th Principal | † T106N | R033W | 27 | T106NR033\ | <b>T106NR033W27</b> | 4968633.863 | 8930.682289 |
| 211 MN | 5th Principal | † T106N | R033W | 16 | T106NR033\ | <b>T106NR033W16</b> | 4959095.461 | 8913.956053 |
| 212 MN | 5th Principal | † T107N | R035W | 19 | T107NR035\ | <b>T107NR035W19</b> | 4916414.207 | 8871.355893 |
| 213 MN | 5th Principal | † T108N | R036W | 32 | T108NR036\ | <b>T108NR036W32</b> | 5132449.344 | 9063.523217 |
| 214 MN | 5th Principal | † T107N | R036W | 10 | T107NR036\ | <b>T107NR036W10</b> | 5091757.652 | 9026.099582 |
| 215 MN | 5th Principal | † T107N | R033W | 7  | T107NR033\ | <b>T107NR033W07</b> | 4987129.449 | 8940.938155 |
| 216 MN | 5th Principal | † T108N | R034W | 31 | T108NR034\ | <b>T108NR034W31</b> | 5164644.105 | 9090.640809 |
| 217 MN | 5th Principal | † T107N | R036W | 23 | T107NR036\ | <b>T107NR036W23</b> | 5016503.234 | 8959.367376 |
| 218 MN | 5th Principal | † T107N | R034W | 7  | T107NR034\ | <b>T107NR034W07</b> | 5079241.633 | 9014.961305 |
| 219 MN | 5th Principal | † T106N | R033W | 14 | T106NR033\ | <b>T106NR033W14</b> | 4906028.82  | 8861.108597 |
| 220 MN | 5th Principal | † T107N | R034W | 29 | T107NR034\ | <b>T107NR034W29</b> | 4956737.414 | 8906.446345 |
| 221 MN | 5th Principal | † T106N | R033W | 28 | T106NR033\ | <b>T106NR033W28</b> | 4919230.32  | 8881.546513 |
| 222 MN | 5th Principal | † T107N | R036W | 34 | T107NR036\ | <b>T107NR036W34</b> | 5031042.949 | 8972.797526 |
| 223 MN | 5th Principal | † T107N | R036W | 24 | T107NR036\ | <b>T107NR036W24</b> | 5117815.402 | 9049.170484 |
| 224 MN | 5th Principal | † T108N | R034W | 30 | T108NR034\ | <b>T108NR034W30</b> | 5083155.637 | 9018.935211 |
| 225 MN | 5th Principal | † T108N | R036W | 24 | T108NR036\ | <b>T108NR036W24</b> | 5167251.559 | 9093.011212 |
| 226 MN | 5th Principal | † T106N | R035W | 11 | T106NR035\ | <b>T106NR035W11</b> | 4910377.59  | 8983.418916 |
| 227 MN | 5th Principal | † T106N | R034W | 17 | T106NR034\ | <b>T106NR034W17</b> | 4983639.367 | 8932.734817 |
| 228 MN | 5th Principal | † T106N | R036W | 12 | T106NR036\ | <b>T106NR036W12</b> | 5070889.168 | 9029.072086 |
| 229 MN | 5th Principal | † T104N | R033W | 18 | T104NR033\ | <b>T104NR033W18</b> | 5008314.535 | 8952.613026 |
| 230 MN | 5th Principal | † T108N | R036W | 20 | T108NR036\ | <b>T108NR036W20</b> | 5107664.063 | 9040.3949   |
| 231 MN | 5th Principal | † T106N | R033W | 32 | T106NR033\ | <b>T106NR033W32</b> | 5139900.285 | 9060.977953 |
| 232 MN | 5th Principal | † T107N | R035W | 27 | T107NR035\ | <b>T107NR035W27</b> | 5023376.297 | 8965.569416 |
| 233 MN | 5th Principal | † T108N | R035W | 28 | T108NR035\ | <b>T108NR035W28</b> | 5057408.246 | 8995.673633 |
| 234 MN | 5th Principal | † T106N | R034W | 32 | T106NR034\ | <b>T106NR034W32</b> | 5144989.137 | 9075.845827 |
| 235 MN | 5th Principal | † T104N | R033W | 23 | T104NR033\ | <b>T104NR033W23</b> | 4823015.598 | 8784.968403 |
| 236 MN | 5th Principal | † T105N | R033W | 29 | T105NR033\ | <b>T105NR033W29</b> | 5035068.352 | 8975.352754 |
| 237 MN | 5th Principal | † T107N | R033W | 33 | T107NR033\ | <b>T107NR033W33</b> | 4989747.254 | 8936.307134 |
| 238 MN | 5th Principal | † T108N | R033W | 20 | T108NR033\ | <b>T108NR033W20</b> | 5141887.793 | 9073.854688 |
| 239 MN | 5th Principal | † T108N | R035W | 20 | T108NR035\ | <b>T108NR035W20</b> | 5123856.543 | 9055.134129 |
| 240 MN | 5th Principal | † T108N | R035W | 34 | T108NR035\ | <b>T108NR035W34</b> | 5067133.273 | 9004.114836 |
| 241 MN | 5th Principal | † T107N | R033W | 15 | T107NR033\ | <b>T107NR033W15</b> | 5094204.887 | 9028.771341 |
| 242 MN | 5th Principal | † T106N | R033W | 2  | T106NR033\ | <b>T106NR033W02</b> | 4967134.375 | 8915.518398 |
| 243 MN | 5th Principal | † T107N | R034W | 6  | T107NR034\ | <b>T107NR034W06</b> | 5036718.008 | 8977.71372  |
| 244 MN | 5th Principal | † T106N | R035W | 28 | T106NR035\ | <b>T106NR035W28</b> | 4835109.77  | 8796.387289 |
| 245 MN | 5th Principal | † T106N | R034W | 26 | T106NR034\ | <b>T106NR034W26</b> | 4835931.945 | 8798.800613 |
| 246 MN | 5th Principal | † T105N | R034W | 17 | T105NR034\ | <b>T105NR034W17</b> | 4897617.324 | 8852.984146 |
| 247 MN | 5th Principal | † T107N | R036W | 4  | T107NR036\ | <b>T107NR036W04</b> | 4858492.328 | 8816.961816 |
| 248 MN | 5th Principal | † T104N | R033W | 9  | T104NR033\ | <b>T104NR033W09</b> | 4830348.004 | 8797.250176 |
| 249 MN | 5th Principal | † T106N | R036W | 2  | T106NR036\ | <b>T106NR036W02</b> | 4946735.484 | 8897.143779 |
| 250 MN | 5th Principal | † T106N | R036W | 8  | T106NR036\ | <b>T106NR036W08</b> | 5073840.414 | 9068.119835 |
| 251 MN | 5th Principal | † T106N | R034W | 16 | T106NR034\ | <b>T106NR034W16</b> | 4852360.574 | 8813.81077  |
| 252 MN | 5th Principal | † T108N | R034W | 24 | T108NR034\ | <b>T108NR034W24</b> | 5111618.023 | 9044.34615  |
| 253 MN | 5th Principal | † T106N | R034W | 28 | T106NR034\ | <b>T106NR034W28</b> | 4950235.074 | 8904.336103 |
| 254 MN | 5th Principal | † T107N | R036W | 14 | T107NR036\ | <b>T107NR036W14</b> | 4960585.125 | 8909.263917 |
| 255 MN | 5th Principal | † T105N | R033W | 28 | T105NR033\ | <b>T105NR033W28</b> | 4940598.051 | 8891.877477 |
| 256 MN | 5th Principal | † T105N | R034W | 7  | T105NR034\ | <b>T105NR034W07</b> | 4944748.754 | 8892.927514 |
| 257 MN | 5th Principal | † T107N | R035W | 21 | T107NR035\ | <b>T107NR035W21</b> | 4920789     | 8880.631778 |
| 258 MN | 5th Principal | † T105N | R033W | 10 | T105NR033\ | <b>T105NR033W10</b> | 5120692.223 | 9039.184689 |
| 259 MN | 5th Principal | † T107N | R034W | 30 | T107NR034\ | <b>T107NR034W30</b> | 5114989.922 | 9046.907332 |
| 260 MN | 5th Principal | † T106N | R035W | 33 | T106NR035\ | <b>T106NR035W33</b> | 4973118.926 | 8921.221601 |
| 261 MN | 5th Principal | † T106N | R033W | 11 | T106NR033\ | <b>T106NR033W11</b> | 4963790.953 | 8913.277465 |
| 262 MN | 5th Principal | † T106N | R035W | 18 | T106NR035\ | <b>T106NR035W18</b> | 4945112.332 | 8885.650902 |
| 263 MN | 5th Principal | † T106N | R033W | 23 | T106NR033\ | <b>T106NR033W23</b> | 5054110.203 | 8994.368648 |
| 264 MN | 5th Principal | † T106N | R033W | 22 | T106NR033\ | <b>T106NR033W22</b> | 5122976.621 | 9053.072747 |
| 265 MN | 5th Principal | † T108N | R035W | 23 | T108NR035\ | <b>T108NR035W23</b> | 5014303.191 | 8958.490662 |
| 266 MN | 5th Principal | † T107N | R034W | 5  | T107NR034\ | <b>T107NR034W05</b> | 4852877.293 | 8822.750287 |
| 267 MN | 5th Principal | † T107N | R035W | 36 | T107NR035\ | <b>T107NR035W36</b> | 4948558.656 | 8900.757711 |
| 268 MN | 5th Principal | † T106N | R034W | 11 | T106NR034\ | <b>T106NR034W11</b> | 4930070.441 | 8925.6792   |
| 269 MN | 5th Principal | † T104N | R033W | 16 | T104NR033\ | <b>T104NR033W16</b> | 4964943.078 | 8927.331234 |
| 270 MN | 5th Principal | † T107N | R035W | 5  | T107NR035\ | <b>T107NR035W05</b> | 4970769.977 | 8922.029116 |

|        |               |         |       |    |            |                     |             |             |
|--------|---------------|---------|-------|----|------------|---------------------|-------------|-------------|
| 271 MN | 5th Principal | † T107N | R034W | 11 | T107NR034\ | <b>T107NR034W11</b> | 5075284.539 | 9011.543363 |
| 272 MN | 5th Principal | † T105N | R033W | 15 | T105NR033\ | <b>T105NR033W15</b> | 4977180.391 | 8924.504264 |
| 273 MN | 5th Principal | † T107N | R036W | 21 | T107NR036\ | <b>T107NR036W21</b> | 4984821.852 | 8932.197122 |
| 274 MN | 5th Principal | † T107N | R033W | 32 | T107NR033\ | <b>T107NR033W32</b> | 5121574.887 | 9052.829025 |
| 275 MN | 5th Principal | † T107N | R034W | 33 | T107NR034\ | <b>T107NR034W33</b> | 5067112.863 | 9004.065947 |
| 276 MN | 5th Principal | † T107N | R034W | 36 | T107NR034\ | <b>T107NR034W36</b> | 5024901.133 | 8967.200938 |
| 277 MN | 5th Principal | † T104N | R033W | 8  | T104NR033\ | <b>T104NR033W08</b> | 4973819.281 | 8913.367763 |
| 278 MN | 5th Principal | † T105N | R033W | 23 | T105NR033\ | <b>T105NR033W23</b> | 5056800.414 | 9013.235643 |
| 279 MN | 5th Principal | † T108N | R034W | 25 | T108NR034\ | <b>T108NR034W25</b> | 4935839.559 | 8887.429513 |
| 280 MN | 5th Principal | † T107N | R034W | 19 | T107NR034\ | <b>T107NR034W19</b> | 5033795.844 | 8975.291376 |
| 281 MN | 5th Principal | † T107N | R036W | 5  | T107NR036\ | <b>T107NR036W05</b> | 4973110.609 | 8921.941183 |
| 282 MN | 5th Principal | † T108N | R034W | 16 | T108NR034\ | <b>T108NR034W16</b> | 5059845.824 | 8989.610491 |
| 283 MN | 5th Principal | † T108N | R035W | 33 | T108NR035\ | <b>T108NR035W33</b> | 5048954.914 | 8988.626299 |
| 284 MN | 5th Principal | † T105N | R034W | 13 | T105NR034\ | <b>T105NR034W13</b> | 5024246.559 | 8954.055756 |
| 285 MN | 5th Principal | † T108N | R033W | 33 | T108NR033\ | <b>T108NR033W33</b> | 5165161.691 | 9090.961478 |
| 286 MN | 5th Principal | † T106N | R036W | 34 | T106NR036\ | <b>T106NR036W34</b> | 4999072.414 | 8942.033738 |
| 287 MN | 5th Principal | † T107N | R034W | 15 | T107NR034\ | <b>T107NR034W15</b> | 4913207.668 | 8866.058354 |
| 288 MN | 5th Principal | † T107N | R034W | 3  | T107NR034\ | <b>T107NR034W03</b> | 4875977.746 | 8833.300594 |
| 289 MN | 5th Principal | † T104N | R033W | 14 | T104NR033\ | <b>T104NR033W14</b> | 4932475.91  | 8896.847101 |
| 290 MN | 5th Principal | † T108N | R035W | 26 | T108NR035\ | <b>T108NR035W26</b> | 4909344.641 | 8863.191916 |
| 291 MN | 5th Principal | † T108N | R035W | 25 | T108NR035\ | <b>T108NR035W25</b> | 4836634.035 | 8797.142729 |
| 292 MN | 5th Principal | † T105N | R033W | 16 | T105NR033\ | <b>T105NR033W16</b> | 4876383.34  | 8842.630969 |
| 293 MN | 5th Principal | † T107N | R036W | 25 | T107NR036\ | <b>T107NR036W25</b> | 5061117.703 | 8998.900511 |
| 294 MN | 5th Principal | † T106N | R033W | 31 | T106NR033\ | <b>T106NR033W31</b> | 5016507.066 | 8959.845521 |
| 295 MN | 5th Principal | † T107N | R035W | 6  | T107NR035\ | <b>T107NR035W06</b> | 4737178.426 | 8708.029033 |
| 296 MN | 5th Principal | † T106N | R033W | 9  | T106NR033\ | <b>T106NR033W09</b> | 4924688.387 | 8907.88808  |
| 297 MN | 5th Principal | † T106N | R035W | 2  | T106NR035\ | <b>T106NR035W02</b> | 4933256.668 | 8950.875544 |
| 298 MN | 5th Principal | † T106N | R035W | 13 | T106NR035\ | <b>T106NR035W13</b> | 4828316.949 | 8785.633312 |
| 299 MN | 5th Principal | † T105N | R033W | 31 | T105NR033\ | <b>T105NR033W31</b> | 4894899.969 | 8865.439221 |
| 300 MN | 5th Principal | † T108N | R034W | 22 | T108NR034\ | <b>T108NR034W22</b> | 5018329.793 | 8961.596105 |
| 301 MN | 5th Principal | † T106N | R035W | 1  | T106NR035\ | <b>T106NR035W01</b> | 4823846.234 | 8786.387927 |
| 302 MN | 5th Principal | † T105N | R033W | 19 | T105NR033\ | <b>T105NR033W19</b> | 4972432.996 | 8908.671899 |
| 303 MN | 5th Principal | † T108N | R034W | 29 | T108NR034\ | <b>T108NR034W29</b> | 4954214.352 | 8923.606745 |
| 304 MN | 5th Principal | † T105N | R033W | 9  | T105NR033\ | <b>T105NR033W09</b> | 4988449.063 | 8980.508994 |
| 305 MN | 5th Principal | † T105N | R034W | 27 | T105NR034\ | <b>T105NR034W27</b> | 5100029.461 | 9033.370524 |
| 306 MN | 5th Principal | † T106N | R036W | 4  | T106NR036\ | <b>T106NR036W04</b> | 4982056.477 | 8928.661288 |
| 307 MN | 5th Principal | † T107N | R034W | 31 | T107NR034\ | <b>T107NR034W31</b> | 5112132.309 | 9044.805476 |
| 308 MN | 5th Principal | † T107N | R034W | 13 | T107NR034\ | <b>T107NR034W13</b> | 5033420.242 | 8974.448631 |
| 309 MN | 5th Principal | † T107N | R036W | 28 | T107NR036\ | <b>T107NR036W28</b> | 4908157.598 | 8861.795819 |
| 310 MN | 5th Principal | † T106N | R034W | 21 | T106NR034\ | <b>T106NR034W21</b> | 4936223.02  | 8884.69773  |
| 311 MN | 5th Principal | † T108N | R036W | 25 | T108NR036\ | <b>T108NR036W25</b> | 5032966.867 | 8974.820835 |
| 312 MN | 5th Principal | † T104N | R033W | 4  | T104NR033\ | <b>T104NR033W04</b> | 4785839.164 | 8734.384802 |
| 313 MN | 5th Principal | † T108N | R035W | 32 | T108NR035\ | <b>T108NR035W32</b> | 5115485.609 | 9046.912788 |
| 314 MN | 5th Principal | † T106N | R035W | 16 | T106NR035\ | <b>T106NR035W16</b> | 4858978.039 | 8818.936666 |
| 315 MN | 5th Principal | † T107N | R034W | 20 | T107NR034\ | <b>T107NR034W20</b> | 4916777.949 | 8869.474751 |
| 316 MN | 5th Principal | † T107N | R033W | 4  | T107NR033\ | <b>T107NR033W04</b> | 4778327.176 | 8748.621791 |
| 317 MN | 5th Principal | † T108N | R033W | 15 | T108NR033\ | <b>T108NR033W15</b> | 5031174.215 | 8973.829981 |
| 318 MN | 5th Principal | † T107N | R036W | 8  | T107NR036\ | <b>T107NR036W08</b> | 5032742.27  | 8973.442355 |
| 319 MN | 5th Principal | † T106N | R036W | 36 | T106NR036\ | <b>T106NR036W36</b> | 5075285.531 | 9011.947953 |
| 320 MN | 5th Principal | † T105N | R034W | 11 | T105NR034\ | <b>T105NR034W11</b> | 4950728.57  | 8904.012265 |
| 321 MN | 5th Principal | † T106N | R034W | 19 | T106NR034\ | <b>T106NR034W19</b> | 5012296.809 | 8933.180278 |
| 322 MN | 5th Principal | † T106N | R035W | 7  | T106NR035\ | <b>T106NR035W07</b> | 5057285.539 | 9005.529326 |
| 323 MN | 5th Principal | † T104N | R033W | 20 | T104NR033\ | <b>T104NR033W20</b> | 4903971.23  | 8859.50467  |
| 324 MN | 5th Principal | † T107N | R033W | 6  | T107NR033\ | <b>T107NR033W06</b> | 4841064.563 | 8795.12172  |
| 325 MN | 5th Principal | † T106N | R034W | 8  | T106NR034\ | <b>T106NR034W08</b> | 4952798.492 | 8960.253845 |
| 326 MN | 5th Principal | † T106N | R036W | 11 | T106NR036\ | <b>T106NR036W11</b> | 5013661.289 | 8998.645388 |
| 327 MN | 5th Principal | † T106N | R036W | 3  | T106NR036\ | <b>T106NR036W03</b> | 5125025.59  | 9055.651377 |
| 328 MN | 5th Principal | † T106N | R033W | 10 | T106NR033\ | <b>T106NR033W10</b> | 5053349.398 | 9010.089128 |
| 329 MN | 5th Principal | † T106N | R033W | 8  | T106NR033\ | <b>T106NR033W08</b> | 5015889.133 | 9024.830694 |
| 330 MN | 5th Principal | † T106N | R035W | 17 | T106NR035\ | <b>T106NR035W17</b> | 5000335.922 | 8959.301352 |
| 331 MN | 5th Principal | † T105N | R034W | 34 | T105NR034\ | <b>T105NR034W34</b> | 4985289.066 | 8917.178659 |
| 332 MN | 5th Principal | † T108N | R036W | 29 | T108NR036\ | <b>T108NR036W29</b> | 5056220.934 | 8995.944151 |
| 333 MN | 5th Principal | † T108N | R034W | 20 | T108NR034\ | <b>T108NR034W20</b> | 4952322.523 | 8884.661708 |
| 334 MN | 5th Principal | † T108N | R036W | 36 | T108NR036\ | <b>T108NR036W36</b> | 5124544.289 | 9055.708998 |
| 335 MN | 5th Principal | † T106N | R036W | 13 | T106NR036\ | <b>T106NR036W13</b> | 4933687.023 | 8867.680316 |
| 336 MN | 5th Principal | † T107N | R035W | 30 | T107NR035\ | <b>T107NR035W30</b> | 4902205.621 | 8857.203843 |
| 337 MN | 5th Principal | † T105N | R034W | 29 | T105NR034\ | <b>T105NR034W29</b> | 5006302.109 | 8938.484141 |
| 338 MN | 5th Principal | † T108N | R033W | 31 | T108NR033\ | <b>T108NR033W31</b> | 5172663.441 | 9097.883304 |



|        |               |         |       |    |            |                     |             |             |
|--------|---------------|---------|-------|----|------------|---------------------|-------------|-------------|
| 339 MN | 5th Principal | † T107N | R036W | 12 | T107NR036\ | <b>T107NR036W12</b> | 5166969.23  | 9093.593724 |
| 340 MN | 5th Principal | † T107N | R035W | 18 | T107NR035\ | <b>T107NR035W18</b> | 4944645.121 | 8895.213911 |
| 341 MN | 5th Principal | † T105N | R034W | 9  | T105NR034\ | <b>T105NR034W09</b> | 4976163.617 | 8939.494461 |
| 342 MN | 5th Principal | † T105N | R034W | 36 | T105NR034\ | <b>T105NR034W36</b> | 5020660.363 | 8961.791118 |
| 343 MN | 5th Principal | † T106N | R035W | 22 | T106NR035\ | <b>T106NR035W22</b> | 5213258.074 | 9133.921611 |
| 344 MN | 5th Principal | † T106N | R034W | 24 | T106NR034\ | <b>T106NR034W24</b> | 5150097.504 | 9079.161383 |
| 345 MN | 5th Principal | † T105N | R034W | 14 | T105NR034\ | <b>T105NR034W14</b> | 4907170.18  | 8870.834078 |
| 346 MN | 5th Principal | † T107N | R034W | 32 | T107NR034\ | <b>T107NR034W32</b> | 4986771.668 | 8932.419984 |
| 347 MN | 5th Principal | † T107N | R034W | 28 | T107NR034\ | <b>T107NR034W28</b> | 5132050.711 | 9061.724397 |
| 348 MN | 5th Principal | † T108N | R035W | 19 | T108NR035\ | <b>T108NR035W19</b> | 5003207.656 | 8949.165009 |
| 349 MN | 5th Principal | † T107N | R034W | 17 | T107NR034\ | <b>T107NR034W17</b> | 4951136.016 | 8900.979581 |
| 350 MN | 5th Principal | † T107N | R033W | 22 | T107NR033\ | <b>T107NR033W22</b> | 4981627.434 | 8927.84689  |
| 351 MN | 5th Principal | † T108N | R033W | 14 | T108NR033\ | <b>T108NR033W14</b> | 4910993.543 | 8855.057905 |
| 352 MN | 5th Principal | † T106N | R035W | 6  | T106NR035\ | <b>T106NR035W06</b> | 5009449.777 | 8953.520955 |
| 353 MN | 5th Principal | † T107N | R035W | 25 | T107NR035\ | <b>T107NR035W25</b> | 4991906.535 | 8937.083621 |
| 354 MN | 5th Principal | † T107N | R035W | 10 | T107NR035\ | <b>T107NR035W10</b> | 4993714.801 | 8940.386455 |
| 355 MN | 5th Principal | † T106N | R036W | 24 | T106NR036\ | <b>T106NR036W24</b> | 5189006.977 | 9111.681555 |
| 356 MN | 5th Principal | † T106N | R033W | 26 | T106NR033\ | <b>T106NR033W26</b> | 4949835.426 | 8899.344985 |
| 357 MN | 5th Principal | † T107N | R033W | 26 | T107NR033\ | <b>T107NR033W26</b> | 5129113.57  | 9059.129828 |
| 358 MN | 5th Principal | † T106N | R034W | 14 | T106NR034\ | <b>T106NR034W14</b> | 4931224.676 | 8885.050487 |
| 359 MN | 5th Principal | † T107N | R033W | 2  | T107NR033\ | <b>T107NR033W02</b> | 4875597.609 | 8821.475722 |
| 360 MN | 5th Principal | † T106N | R034W | 13 | T106NR034\ | <b>T106NR034W13</b> | 5204458.848 | 9127.151431 |
| 361 MN | 5th Principal | † T105N | R034W | 18 | T105NR034\ | <b>T105NR034W18</b> | 4839940.383 | 8801.536517 |
| 362 MN | 5th Principal | † T107N | R035W | 8  | T107NR035\ | <b>T107NR035W08</b> | 5051372.289 | 8990.948691 |
| 363 MN | 5th Principal | † T107N | R036W | 29 | T107NR036\ | <b>T107NR036W29</b> | 5074869.938 | 9011.891457 |
| 364 MN | 5th Principal | † T106N | R035W | 10 | T106NR035\ | <b>T106NR035W10</b> | 5096320.047 | 9065.788976 |
| 365 MN | 5th Principal | † T105N | R034W | 24 | T105NR034\ | <b>T105NR034W24</b> | 5100313.266 | 9037.911865 |
| 366 MN | 5th Principal | † T105N | R033W | 2  | T105NR033\ | <b>T105NR033W02</b> | 4715229.227 | 8692.457188 |
| 367 MN | 5th Principal | † T105N | R033W | 32 | T105NR033\ | <b>T105NR033W32</b> | 5068756.191 | 8993.31987  |
| 368 MN | 5th Principal | † T107N | R034W | 1  | T107NR034\ | <b>T107NR034W01</b> | 4997460.902 | 8940.864126 |
| 369 MN | 5th Principal | † T106N | R034W | 1  | T106NR034\ | <b>T106NR034W01</b> | 5012321.305 | 8955.517399 |
| 370 MN | 5th Principal | † T105N | R034W | 31 | T105NR034\ | <b>T105NR034W31</b> | 4942075.02  | 8861.094    |
| 371 MN | 5th Principal | † T107N | R036W | 22 | T107NR036\ | <b>T107NR036W22</b> | 5055584.734 | 8993.940003 |
| 372 MN | 5th Principal | † T108N | R033W | 18 | T108NR033\ | <b>T108NR033W18</b> | 5065734.48  | 9008.065108 |
| 373 MN | 5th Principal | † T106N | R034W | 9  | T106NR034\ | <b>T106NR034W09</b> | 4853468.574 | 8905.196621 |
| 374 MN | 5th Principal | † T106N | R033W | 21 | T106NR033\ | <b>T106NR033W21</b> | 4975908.066 | 8923.435432 |
| 375 MN | 5th Principal | † T105N | R034W | 12 | T105NR034\ | <b>T105NR034W12</b> | 5067306.16  | 9006.331011 |
| 376 MN | 5th Principal | † T108N | R034W | 27 | T108NR034\ | <b>T108NR034W27</b> | 4904367.133 | 8858.700248 |
| 377 MN | 5th Principal | † T107N | R033W | 17 | T107NR033\ | <b>T107NR033W17</b> | 5106294.301 | 9060.839053 |
| 378 MN | 5th Principal | † T105N | R034W | 26 | T105NR034\ | <b>T105NR034W26</b> | 4988113.66  | 8934.763523 |
| 379 MN | 5th Principal | † T106N | R035W | 12 | T106NR035\ | <b>T106NR035W12</b> | 4878491.695 | 8881.774339 |
| 380 MN | 5th Principal | † T106N | R036W | 22 | T106NR036\ | <b>T106NR036W22</b> | 5092843.965 | 9027.476063 |
| 381 MN | 5th Principal | † T106N | R033W | 20 | T106NR033\ | <b>T106NR033W20</b> | 5084495.402 | 9019.563841 |
| 382 MN | 5th Principal | † T108N | R035W | 27 | T108NR035\ | <b>T108NR035W27</b> | 5045369.051 | 8985.466129 |
| 383 MN | 5th Principal | † T106N | R036W | 15 | T106NR036\ | <b>T106NR036W15</b> | 4955205.301 | 8898.551128 |
| 384 MN | 5th Principal | † T106N | R035W | 36 | T106NR035\ | <b>T106NR035W36</b> | 5015093.895 | 8956.183065 |
| 385 MN | 5th Principal | † T105N | R033W | 35 | T105NR033\ | <b>T105NR033W35</b> | 4999233.535 | 8943.877605 |
| 386 MN | 5th Principal | † T105N | R034W | 33 | T105NR034\ | <b>T105NR034W33</b> | 4920643.438 | 8863.873692 |
| 387 MN | 5th Principal | † T105N | R033W | 7  | T105NR033\ | <b>T105NR033W07</b> | 4931775.438 | 8892.151335 |
| 388 MN | 5th Principal | † T107N | R034W | 9  | T107NR034\ | <b>T107NR034W09</b> | 5187921.941 | 9110.692948 |
| 389 MN | 5th Principal | † T108N | R033W | 32 | T108NR033\ | <b>T108NR033W32</b> | 5212807.656 | 9133.091681 |
| 390 MN | 5th Principal | † T108N | R033W | 17 | T108NR033\ | <b>T108NR033W17</b> | 5251635.785 | 9163.651785 |
| 391 MN | 5th Principal | † T108N | R034W | 36 | T108NR034\ | <b>T108NR034W36</b> | 5128916.039 | 9059.608197 |
| 392 MN | 5th Principal | † T108N | R034W | 18 | T108NR034\ | <b>T108NR034W18</b> | 4938538.645 | 8894.543382 |
| 393 MN | 5th Principal | † T105N | R034W | 25 | T105NR034\ | <b>T105NR034W25</b> | 5072790.73  | 9008.556659 |
| 394 MN | 5th Principal | † T106N | R033W | 17 | T106NR033\ | <b>T106NR033W17</b> | 5055482.648 | 8989.798062 |
| 395 MN | 5th Principal | † T106N | R033W | 6  | T106NR033\ | <b>T106NR033W06</b> | 4862203.766 | 8828.550189 |
| 396 MN | 5th Principal | † T107N | R036W | 9  | T107NR036\ | <b>T107NR036W09</b> | 4967017.402 | 8915.340246 |
| 397 MN | 5th Principal | † T108N | R035W | 21 | T108NR035\ | <b>T108NR035W21</b> | 5056052.699 | 8994.589025 |
| 398 MN | 5th Principal | † T106N | R035W | 25 | T106NR035\ | <b>T106NR035W25</b> | 4846248.59  | 8804.918376 |
| 399 MN | 5th Principal | † T107N | R036W | 16 | T107NR036\ | <b>T107NR036W16</b> | 4991569.926 | 8936.724927 |
| 400 MN | 5th Principal | † T108N | R034W | 34 | T108NR034\ | <b>T108NR034W34</b> | 5087930.344 | 9023.006574 |
| 401 MN | 5th Principal | † T106N | R034W | 12 | T106NR034\ | <b>T106NR034W12</b> | 5045073.551 | 9039.464194 |
| 402 MN | 5th Principal | † T106N | R033W | 3  | T106NR033\ | <b>T106NR033W03</b> | 5025019.492 | 8968.364143 |
| 403 MN | 5th Principal | † T107N | R033W | 34 | T107NR033\ | <b>T107NR033W34</b> | 4990091.797 | 8935.389837 |
| 404 MN | 5th Principal | † T107N | R033W | 8  | T107NR033\ | <b>T107NR033W08</b> | 5224816.414 | 9121.981719 |
| 405 MN | 5th Principal | † T108N | R034W | 23 | T108NR034\ | <b>T108NR034W23</b> | 4989192.914 | 8922.829276 |
| 406 MN | 5th Principal | † T107N | R034W | 24 | T107NR034\ | <b>T107NR034W24</b> | 4999597.406 | 8944.411869 |

|        |                       |       |               |                     |             |             |
|--------|-----------------------|-------|---------------|---------------------|-------------|-------------|
| 407 MN | 5th Principal † T104N | R033W | 10 T104NR033\ | <b>T104NR033W10</b> | 4985098.059 | 8932.576245 |
| 408 MN | 5th Principal † T105N | R033W | 5 T105NR033\  | <b>T105NR033W05</b> | 4615350.391 | 8590.952616 |
| 409 MN | 5th Principal † T106N | R035W | 20 T106NR035\ | <b>T106NR035W20</b> | 5148354.473 | 9076.743442 |
| 410 MN | 5th Principal † T107N | R033W | 14 T107NR033\ | <b>T107NR033W14</b> | 5122088.777 | 9053.163125 |
| 411 MN | 5th Principal † T108N | R034W | 26 T108NR034\ | <b>T108NR034W26</b> | 4862000.172 | 8820.111212 |
| 412 MN | 5th Principal † T106N | R033W | 19 T106NR033\ | <b>T106NR033W19</b> | 4862493.781 | 8823.210639 |
| 413 MN | 5th Principal † T105N | R034W | 23 T105NR034\ | <b>T105NR034W23</b> | 4975066.445 | 8922.608143 |
| 414 MN | 5th Principal † T106N | R036W | 29 T106NR036\ | <b>T106NR036W29</b> | 4922071.953 | 8873.607019 |
| 415 MN | 5th Principal † T106N | R036W | 5 T106NR036\  | <b>T106NR036W05</b> | 5077030.48  | 9013.260952 |
| 416 MN | 5th Principal † T108N | R033W | 35 T108NR033\ | <b>T108NR033W35</b> | 5071565.934 | 9018.551318 |
| 417 MN | 5th Principal † T107N | R034W | 16 T107NR034\ | <b>T107NR034W16</b> | 5046177.117 | 8986.099862 |
| 418 MN | 5th Principal † T107N | R035W | 4 T107NR035\  | <b>T107NR035W04</b> | 4904129.34  | 8858.691102 |
| 419 MN | 5th Principal † T106N | R034W | 20 T106NR034\ | <b>T106NR034W20</b> | 5031486.66  | 8998.351817 |
| 420 MN | 5th Principal † T104N | R033W | 6 T104NR033\  | <b>T104NR033W06</b> | 4878147.891 | 8820.650862 |
| 421 MN | 5th Principal † T108N | R035W | 22 T108NR035\ | <b>T108NR035W22</b> | 5076025.043 | 9012.944251 |
| 422 MN | 5th Principal † T107N | R036W | 27 T107NR036\ | <b>T107NR036W27</b> | 5060125.098 | 8998.454976 |
| 423 MN | 5th Principal † T105N | R033W | 30 T105NR033\ | <b>T105NR033W30</b> | 4964567.207 | 8915.587684 |
| 424 MN | 5th Principal † T105N | R033W | 3 T105NR033\  | <b>T105NR033W03</b> | 4613745.473 | 8592.643261 |
| 425 MN | 5th Principal † T108N | R035W | 35 T108NR035\ | <b>T108NR035W35</b> | 4979835.543 | 8926.458149 |
| 426 MN | 5th Principal † T106N | R035W | 4 T106NR035\  | <b>T106NR035W04</b> | 5017804.613 | 8960.49702  |
| 427 MN | 5th Principal † T108N | R033W | 21 T108NR033\ | <b>T108NR033W21</b> | 5084276.234 | 9019.855017 |

## Jennie Geiger

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**From:** Warzecha, Cynthia (DNR) <cynthia.warzecha@state.mn.us>  
**Sent:** Tuesday, April 23, 2019 8:54 AM  
**To:** Jennie Geiger  
**Cc:** Joyal, Lisa (DNR); Horton, Becky (DNR)  
**Subject:** Big Bend Wind - Native Prairie and Calcareous Fens  
**Attachments:** 2016-TechCriteria-CalcareousFens.pdf

Hi Jennie,

At our meeting last Friday, you asked about setbacks to native prairie to allow for management activities such as prescribed burns. Although the DNR recommends that turbines and other infrastructure are far enough from native prairies to allow for prairie management, we currently do not have a set distance. Our agency provides this recommendation so the developer can assess their comfort level with the distance of infrastructure to a potential prescribed burn. Prevailing wind direction, season, and available fuel are some of the variables affecting prescribed burns. We can have a more informed discussion after shape files of the proposed project layout are available.

I also wanted to expand on the discussion about wetland delineations and the identification of potential fens. Our agency requests Apex Energy to determine if any calcareous fens are located within 500 feet in either direction from the construction corridor (includes crane paths, laydown areas, etc.). The investigation can use data collected during wetland delineations to determine presence/absence. Coordination with the DNR is expected if a potential calcareous fen is identified within 500 feet of proposed construction activities. To aid your investigation, I have attached the DNR's *Technical Criteria for Identifying Calcareous Fens in Minnesota*.

Our agency looks forward to continued coordination as the Big Bend Wind project moves forward.

Best regards,

Cynthia

**Cynthia Warzecha**  
Energy Projects Planner

**Minnesota Department of Natural Resources**  
500 Lafayette Road  
St. Paul, MN 55155  
Phone: 651-259-5078  
Email: [cynthia.warzecha@state.mn.us](mailto:cynthia.warzecha@state.mn.us)



# Technical Criteria For Identifying Calcareous Fens in Minnesota

June 2016

## INTRODUCTION

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This document describes the technical criteria currently used by the Minnesota Department of Natural Resources (DNR) for identifying calcareous fens under Minnesota Statutes 103G.223 and associated Minnesota Rules Chapter 8420.0935 (Appendix A). These criteria have been used by the DNR since 2005, when they were published in the following report:

Final Report to the U.S. EPA: Test of the Technical Criteria for Identifying and Delineating Calcareous Fens in Minnesota and Draft Revised Technical Criteria for Identifying Calcareous Fens in Minnesota by Jeanette H. Leete, MN DNR with Welby R. Smith, MN DNR; Joannes A. Janssens, Lambda Max; Norm Aaseng, MN DNR, April 13, 2005.

The technical criteria in this document are excerpted directly from that document for ease of reference and to denote that with ten years of experience with application, the DNR no longer considers them to be “draft.” This document also provides details on data collection methods and analysis/reporting standards. For additional background on calcareous fens and the development of these technical criteria, refer to the aforementioned report, which is available at: [MNDNR Files webpage](#). It should be noted that the DNR continues to collect and analyze data on calcareous fens and similar communities, which may lead to future revisions of the technical criteria.

A list of calcareous fens identified by the DNR is available at: [MNDNR Files webpage](#)

## TECHNICAL CRITERIA (DEFINITION)

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Calcareous fens possess four specific characteristics: 1) calciphytic vegetation, 2) histosols or histic epipedons, 3) hydrology, and 4) water chemistry. These characteristics and their technical criteria are essential for identification and delineation purposes. The four technical criteria specified must all be met for an area to be identified as a calcareous fen.

### HYDROLOGY TECHNICAL CRITERION

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An area meets the hydrology technical criterion when the hydrology is characterized by having stable, typically upwelling groundwater inflows sufficient to maintain saturation for the development of a histosol or a histic epipedon soil.

### SOILS TECHNICAL CRITERION

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An area meets the soils technical criteria when the soils are characterized by the presence of either a histosol or a histic epipedon. Calcium carbonate precipitates, such as tufa deposits, may frequently be associated with calcareous fens and high carbonate content in this case is not indicative of a mineral soil.

## WATER CHEMISTRY TECHNICAL CRITERION

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Water chemistry of calcareous fens should be characterized by measurement of the following parameters: specific conductance ( $\mu\text{S}/\text{cm}$ ), pH, alkalinity ( $\text{mg}/\text{l CaCO}_3$ ), ratio of the concentration of calcium plus magnesium ions ( $[\text{Ca}+\text{Mg}]$ ) to total cations ( $\% \text{ meq}/\text{l}$ ), and alkalinity/total anions ( $\% \text{ meq}/\text{l}$ ). Of these parameters, it is imperative that specific conductance, pH, and alkalinity be measured in the field (in situ). Samples could be collected for laboratory determination of the other parameters. Standard methods (APHA, most recent edition) should be used for sample collection techniques and sample preparation and handling.

An area meets the water chemistry technical criterion when the following conditions are met: pH of 6.7 or more; calcium of 30  $\text{mg}/\text{l}$  or more; alkalinity of 1.65  $\text{meq}/\text{l}$  or more; and, specific conductance of 500  $\mu\text{S}/\text{cm}$  or more. [Data for other parameters must be collected to provide further water chemistry definition of calcareous fens.]

## VEGETATION TECHNICAL CRITERION

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The Minnesota DNR has developed a regionalized list of vascular plant calciphiles (Table 1) and a statewide list of bryophyte calciphiles (Table 2) indicative of calcareous fens of the State.

An area meets the calcareous fen vegetation technical criterion when, under normal circumstances, the area has a natural community index value of 50 or more by summing the appropriate regional index values of the vascular plant plus the bryophyte calcareous fen indicator species. Where both bryophyte and vascular plant data are available and the site's latitude is greater than 47 degrees, the natural community index value must exceed 80. Plot size and shape are dependent upon the professional judgment of field personnel.

**NOTE:** *If a disturbed site has calcareous fen soil, hydrology, and water chemistry but the calciphile point total ranges from 30 to 50, the area will be considered to meet calcareous fen criteria. If a disturbed site has calcareous fen soil, hydrology, and water chemistry but a calciphile point total of less than 30, the disturbed area may have the potential to support a calcareous fen plant community*

**Table 1: Regionalized List of 29 Vascular Plant Indicators to Identify Calcareous Fens in Minnesota**

| Species                  | NW | MN valley | SE | SW |
|--------------------------|----|-----------|----|----|
| Aster borealis           | 1  | 5         | 5  | 5  |
| Berula pusila            | -  | 5         | 5  | -  |
| Betula pumila            | 1  | 5         | 5  | -  |
| Bidens coronata          | -  | 5         | 5  | -  |
| Bromus ciliatus          | 1  | 5         | 5  | -  |
| Cardamine bulbosa        | 5  | 5         | 5  | 5  |
| Carex aquatilis          | 1  | 5         | 25 | 25 |
| Carex hystericina        | 1  | 5         | 5  | 25 |
| Carex interior           | 1  | 5         | 5  | 5  |
| Carex prairea            | 25 | 25        | 25 | 25 |
| Carex sterilis           | 25 | 25        | 25 | 25 |
| Cladium mariscoides      | 5  | 25        | -  | -  |
| Eleocharis rostellata    | 25 | 25        | -  | -  |
| Eriophorum angustifolium | 1  | 1         | 5  | 5  |
| Gentianopsis procera     | 1  | 5         | 25 | 25 |
| Liparis loeselii         | 1  | 5         | 5  | 5  |

|                         |    |    |    |    |
|-------------------------|----|----|----|----|
| Lobelia kalmii          | 1  | 25 | 25 | 25 |
| Oxypolis rigidior       | -  | 5  | 5  | -  |
| Parnassia glauca        | 5  | 25 | 25 | 25 |
| Potentilla fruticosa    | 1  | 25 | 25 | -  |
| Primula mistassinica    | 25 | -  | -  | -  |
| Rhynchospora capillacea | 25 | 25 | 25 | 25 |
| Salix candida           | 5  | 5  | 5  | -  |
| Scirpus cespitosus      | 5  | 25 | 25 | -  |
| Scleria verticillata    | 25 | 25 | 25 | 25 |
| Tofieldia glutinosa     | 5  | 25 | -  | -  |
| Triglochin maritima     | 1  | 25 | 25 | 25 |
| Triglochin palustris    | 25 | 25 | 25 | 25 |
| Valeriana edulus        | -  | 5  | 5  | -  |

Note: Where the table does not contain a value in a regional column, that plant is not expected to occur in that region. In the unlikely case that it should occur, it will receive the maximum score for that plant.

**Table 2. Bryophyte species occurring in Minnesota’s calcareous fens in order of descending IPV\*.**

(IPV = frequency of occurrence in CF times the quotient of the frequency in CF with the frequency in non-CF ecotopes). The species with an IPV >1.000 are obligate and near-obligate (25 point) indicators, with and IPV >0.100 and <1.000 are facultative (5 point) indicators, and those with an IPV <0.100 are occasional (1 point) species. The column labeled ‘n CF’ lists the number of calcareous -fen ecotopes in which the species occurs (out of a total of 128), ‘n tot’ the total number of ecotopes in Minnesota where the species has been found (out of a total of 1128). The values in the columns labeled ‘CFB’, ‘CFPnw’, ‘CFPsw’, and ‘CFPse’ are the relative abundance of the species in the extreme rich fens of boreal forested region, and the calcareous fens of the NW, SW, and SE prairie sub-regions. The relative abundance is calculated as the 100 times quotient of the number of vouchers collected for the species over the total number of vouchers within the regions or sub-region (total number of vouchers for CFB = 928, CFPnw = 1806, CFPse = 1332, and CFPsw = 2339).

**obligate and near-obligate species (OB)**

| Acronym      | Species name             | IPV    | n  |     | boreal | prairie |       |       |
|--------------|--------------------------|--------|----|-----|--------|---------|-------|-------|
|              |                          |        | CF | tot | CFB    | CFPnw   | CFPse | CFPsw |
| BRYUULIG     | Bryum uliginosum         | inf.   | 1  | 1   |        | 0.06    |       |       |
| CATONIG<br>R | Catoscopium nigratum     | inf.   | 5  | 5   | 0.86   | 0.06    |       |       |
| PALUSQU<br>A | Paludella squarrosa      | inf.   | 3  | 3   | 1.29   |         |       |       |
| ANEUPIN<br>G | Aneura pinguis           | 7.6766 | 52 | 75  | 1.62   | 4.26    | 3.53  | 7.52  |
| LIMPCOSS     | Limprichtia cossonii     | 6.0073 | 46 | 69  | 11.96  | 13.95   | 0.23  | 11.59 |
| CAMPSTE<br>L | Campylium stellatum      | 4.1284 | 67 | 138 | 15.52  | 39.76   | 9.53  | 15.82 |
| DREPADU<br>N | Drepanocladus aduncus    | 3.4381 | 74 | 178 | 4.09   | 2.60    | 14.04 | 16.84 |
| BRYUPSE<br>U | Bryum pseudotriquetrum   | 3.3978 | 76 | 187 | 6.68   | 18.22   | 3.60  | 10.94 |
| BRACRIVU     | Brachythecium rivulare   | 3.2648 | 50 | 100 | 2.48   | 1.94    | 15.24 | 3.72  |
| CALRCUSP     | Calliergonella cuspidata | 2.7283 | 31 | 54  | 2.05   | 0.61    | 2.33  | 5.69  |

| Acronym      | Species name           | IPV    | n  | n   | boreal | prairie |       |      |
|--------------|------------------------|--------|----|-----|--------|---------|-------|------|
|              |                        |        |    |     | CFB    | CFP     | CFP   | CFP  |
| SCORSCO<br>R | Scorpidium scorpioides | 1.8590 | 22 | 39  | 4.74   | 5.09    |       |      |
| CINCSTYG     | Cinclidium stygium     | 1.8283 | 14 | 21  | 3.13   |         |       |      |
| MOERHIB<br>E | Moerckia hibernica     | 1.6324 | 15 | 24  | 2.59   | 0.55    |       |      |
| CALLTRIF     | Calliergon trifarium   | 1.5196 | 16 | 27  | 3.34   | 1.33    |       |      |
| PLAGELLI     | Plagiomnium ellipticum | 1.4570 | 59 | 215 | 2.91   | 1.38    | 14.19 | 7.48 |
| CAMPPOL<br>Y | Campylium polygamum    | 1.2612 | 26 | 61  | 4.09   | 1.05    | 1.88  | 3.33 |
| FISSADIA     | Fissidens adianthoides | 1.0535 | 22 | 52  | 4.85   | 0.50    | 1.13  |      |

### facultative species (FA)

| Acronym      | Species name                             | IPV    | n  | n   | boreal<br>CFB | prairie |      |      |     |     |
|--------------|------------------------------------------|--------|----|-----|---------------|---------|------|------|-----|-----|
|              |                                          |        |    |     |               | CF      | tot  | CFP  | CFP | CFP |
|              |                                          |        |    |     |               |         |      | nw   | se  | sw  |
| AMBLVARI     | Amblystegium varium                      | 0.8392 | 28 | 89  | 0.54          | 0.28    | 3.90 | 1.07 |     |     |
| TOMENITE     | Tomenthypnum nitens                      | 0.7384 | 21 | 60  | 2.37          | 0.72    | 0.15 |      |     |     |
| EURHHIAN     | Eurhynchium hians                        | 0.5224 | 12 | 30  | 0.43          |         | 1.50 |      |     |     |
| AMBLSEJU     | Amblystegium serpens var.<br>juratzkanum | 0.5119 | 14 | 39  | 0.86          | 1.72    | 0.53 | 3.51 |     |     |
| BRACSALE     | Brachythecium salebrosum                 | 0.3318 | 25 | 148 | 0.32          | 0.11    | 4.65 | 8.85 |     |     |
| HAMALAPP     | Hamatocaulis lapponicus                  | 0.2612 | 2  | 3   | 0.32          |         |      |      |     |     |
| MEESTRIQ     | Meesia triquetra                         | 0.2612 | 4  | 8   | 0.65          |         |      |      |     |     |
| HELOBLAN     | Helodium blandowii                       | 0.2137 | 12 | 56  | 0.22          | 0.39    | 0.53 | 0.21 |     |     |
| PSEATURG     | Pseudo-calliergon<br>turgescens          | 0.1959 | 3  | 6   | 0.11          | 0.89    |      |      |     |     |
| CRATFILI     | Cratoneuron filicinum                    | 0.1889 | 9  | 37  | 0.86          | 0.89    | 2.10 |      |     |     |
| CONACOM<br>P | Conardia compacta                        | 0.1632 | 5  | 15  |               | 0.06    |      | 0.43 |     |     |
| HYPNLIND     | Hypnum lindbergii                        | 0.1582 | 19 | 168 | 0.86          | 0.72    | 2.85 | 0.09 |     |     |
| CAMPSTPR     | Campylium stellatum var.<br>protensum    | 0.1469 | 3  | 7   |               | 0.83    |      | 1.71 |     |     |
| DREPADPO     | Drepanocladus aduncus<br>var. polycarpus | 0.1419 | 10 | 56  | 0.22          | 0.06    | 1.35 | 0.13 |     |     |
| RICDLATI     | Riccardia latifrons                      | 0.1175 | 6  | 26  | 0.97          |         |      |      |     |     |

### Occasional species (OC)

| acronym  | species name            | IPV    | n  | n   | boreal<br>CFB | prairie |      |      |     |     |
|----------|-------------------------|--------|----|-----|---------------|---------|------|------|-----|-----|
|          |                         |        |    |     |               | CF      | tot  | CFP  | CFP | CFP |
|          |                         |        |    |     |               |         |      | nw   | se  | w   |
| PLAGCUSP | Plagiomnium cuspidatum  | 0.0882 | 17 | 231 | 0.54          | 0.22    | 1.73 | 0.09 |     |     |
| DRESEND  | Drepanocladus sendtneri | 0.0871 | 2  | 5   | 0.11          | 0.22    |      |      |     |     |

| acronym  | species name                            | IPV    | n  |         | boreal |      | prairie |      |
|----------|-----------------------------------------|--------|----|---------|--------|------|---------|------|
|          |                                         |        | CF | tot     | CFB    | CFP  | CFP     | CFP  |
| RICDPALM | Riccardia palmata                       | 0.0840 | 3  | 10      | 0.43   |      |         |      |
| HYPNPRAT | Hypnum pratense                         | 0.0837 | 10 | 88      | 0.22   |      | 2.18    | 0.09 |
| LEPDHUMI | Leptodictyum humile                     | 0.0804 | 4  | 17      |        |      | 0.45    | 0.13 |
| ATRIUNDU | Atrichum undulatum                      | 0.0653 | 1  | 2       |        |      | 0.08    |      |
| DREPSORD | Drepanocladus sordidus                  | 0.0653 | 1  | 2       | 0.11   |      |         |      |
| ORTHPUMI | Orthotrichum pumilum                    | 0.0653 | 2  | 6       | 0.11   | 0.06 |         |      |
| PHILCAPI | Philonotis capillaris                   | 0.0653 | 1  | 2       |        |      | 0.08    |      |
| PHILMARC | Philonotis marchica                     | 0.0653 | 1  | 2       |        |      | 0.08    |      |
| LESKPOLY | Leskea polycarpa                        | 0.0615 | 4  | 21      | 0.22   | 0.17 | 0.08    | 0.17 |
| AULAPALU | Aulacomnium palustre                    | 0.0531 | 14 | 25<br>5 | 1.08   | 0.28 | 0.83    |      |
| BRYULICU | Bryum lisae var.<br>cuspidatum          | 0.0522 | 2  | 7       |        |      | 0.15    |      |
| HYGATENA | Hygroamblystegium tenax                 | 0.0495 | 5  | 38      | 0.11   |      | 0.45    |      |
| CAMPRADI | Campylium radicale                      | 0.0454 | 4  | 27      | 2.05   | 0.06 | 0.08    |      |
| CALLGIGA | Calliergon giganteum                    | 0.0452 | 6  | 58      | 0.97   | 0.17 |         |      |
| PLAHRIPA | Platyhypnidium riparioides              | 0.0373 | 2  | 9       |        |      | 0.23    |      |
| MYULJULA | Myurella julacea                        | 0.0367 | 3  | 19      | 0.32   |      |         |      |
| HAMAVERN | Hamatocaulis vernicosus                 | 0.0348 | 4  | 34      | 0.75   |      |         |      |
| BRACDIGA | Brachythecium digastrum                 | 0.0326 | 1  | 3       |        |      | 0.08    |      |
| DICEVARI | Dicranella varia                        | 0.0326 | 1  | 3       |        |      |         | 0.04 |
| PTEGFILI | Pterigynandrum filiforme                | 0.0326 | 2  | 10      | 0.11   |      | 0.08    |      |
| AMBLSERP | Amblystegium serpens                    | 0.0320 | 5  | 56      |        | 0.06 | 0.53    | 0.04 |
| HELOPALU | Helodium paludosum                      | 0.0237 | 2  | 13      |        |      | 1.65    |      |
| BRACOEDI | Brachythecium oedipodium                | 0.0228 | 6  | 10<br>9 | 2.16   |      | 0.60    |      |
| CAMPCHRY | Campylium chrysophyllum                 | 0.0227 | 4  | 50      | 0.22   | 0.17 | 0.23    |      |
| HELOBLHE | Helodium blandowii var.<br>helodioides  | 0.0218 | 1  | 4       |        |      | 0.15    |      |
| RICRNATA | Ricciocarpos natans                     | 0.0218 | 1  | 4       |        | 0.06 |         |      |
| CLIMAMER | Climacium americanum                    | 0.0201 | 2  | 15      |        |      | 0.23    |      |
| LESKGRAC | Leskea gracilescens                     | 0.0163 | 3  | 39      | 0.43   |      | 0.15    |      |
| ATRIALTE | Atrichum altocristatum                  | 0.0154 | 2  | 19      |        |      | 0.15    |      |
| BRACPLUM | Brachythecium plumosum                  | 0.0154 | 2  | 19      |        |      | 0.15    |      |
| SPHAWARN | Sphagnum warnstorffii                   | 0.0146 | 5  | 11<br>7 | 2.26   |      |         |      |
| BRACACUM | Brachythecium<br>acuminatum             | 0.0143 | 4  | 77      |        |      | 0.23    | 0.13 |
| ENTOSEDU | Entodon seductrix                       | 0.0137 | 2  | 21      |        |      | 0.08    | 0.04 |
| THUIRECO | Thuidium recognitum                     | 0.0137 | 5  | 12<br>4 | 0.97   |      | 0.08    |      |
| PLATDENT | Plagiothecium<br>denticulatum           | 0.0134 | 4  | 82      | 0.11   | 0.06 | 0.45    |      |
| CEPHPLSP | Cephalozia pleniceps ssp.<br>sphagnorum | 0.0131 | 1  | 6       | 0.11   |      |         |      |
| FISSDUBI | Fissidens dubius                        | 0.0131 | 2  | 22      |        |      | 0.30    |      |



| acronym  | species name                          | IPV    | n  |         | boreal |      | prairie |      |
|----------|---------------------------------------|--------|----|---------|--------|------|---------|------|
|          |                                       |        | CF | tot     | CFB    | CFP  | CFP     | CFP  |
| FRULINFL | Frullania inflata                     | 0.0131 | 1  | 6       | 0.11   |      |         |      |
| PYLLSELW | Pylaisiella selwynii                  | 0.0122 | 3  | 51      | 0.32   |      | 0.08    |      |
| LOPCHETE | Lophocolea heterophylla               | 0.0118 | 5  | 14<br>3 | 0.11   | 0.11 | 0.30    | 0.04 |
| MARCPOLY | Marchantia polymorpha                 | 0.0104 | 2  | 27      |        | 0.06 | 0.15    |      |
| WARNEXAN | Warnstorfia exannulata                | 0.0104 | 2  | 27      |        | 0.06 | 0.08    |      |
| CAMPHISP | Campylium hispidulum                  | 0.0095 | 3  | 65      | 0.54   |      | 0.08    |      |
| BRACOXYC | Brachythecium oxycladon               | 0.0093 | 2  | 30      |        |      | 0.15    |      |
| PHYTPYRI | Physcomitrium pyriforme               | 0.0093 | 1  | 8       |        |      | 0.08    |      |
| SPHAFUSC | Sphagnum fuscum                       | 0.0084 | 4  | 12<br>9 | 0.65   |      |         |      |
| CEPHCOCO | Cephalozia connivens var.<br>compacta | 0.0082 | 1  | 9       | 0.32   |      |         |      |
| PHILFONT | Philonotis fontana                    | 0.0082 | 1  | 9       |        |      | 0.53    |      |
| PLADJUNG | Platydictya<br>jungermannioides       | 0.0082 | 1  | 9       |        |      |         | 0.09 |
| RHIZGRAC | Rhizomnium gracile                    | 0.0082 | 1  | 9       | 0.11   |      |         |      |
| FISSOSMU | Fissidens osmundioides                | 0.0077 | 2  | 36      | 0.43   |      |         |      |
| LEPDRIPA | Leptodictyum riparium                 | 0.0077 | 2  | 36      |        |      | 0.08    | 0.04 |
| SPHAFIMB | Sphagnum fimbriatum                   | 0.0069 | 2  | 40      |        |      | 0.75    |      |
| FRULOAKE | Frullania oakesiana                   | 0.0065 | 1  | 11      | 0.11   |      |         |      |
| CONCCONI | Conocephalum conicum                  | 0.0061 | 2  | 45      | 0.11   |      | 0.08    |      |
| THUIDELI | Thuidium delicatulum                  | 0.0060 | 3  | 10<br>1 |        |      | 0.38    |      |
| PLACASPL | Plagiochila asplenoides               | 0.0053 | 2  | 51      | 0.22   |      |         |      |
| BRACPOPU | Brachythecium populeum                | 0.0038 | 1  | 18      |        |      | 0.23    |      |
| MYLIANOM | Mylia anomala                         | 0.0036 | 1  | 19      | 0.11   |      |         |      |
| TORLFRAG | Tortella fragilis                     | 0.0036 | 1  | 19      | 0.22   |      |         |      |
| CHILPALL | Chiloscyphus pallescens               | 0.0034 | 1  | 20      |        |      | 0.08    |      |
| POLYSTRI | Polytrichum strictum                  | 0.0032 | 3  | 18<br>7 | 0.43   |      |         |      |
| ATRIOERS | Atrichum oerstedianum                 | 0.0028 | 1  | 24      |        |      | 0.08    |      |
| DISTCAPI | Distichium capillaceum                | 0.0028 | 1  | 24      | 0.11   |      |         |      |
| LEPTPYRI | Leptobryum pyriforme                  | 0.0028 | 1  | 24      | 0.11   |      |         |      |
| TAXIDEPL | Taxiphyllum deplanatum                | 0.0027 | 1  | 25      |        |      | 0.08    |      |
| SPHAANGU | Sphagnum angustifolium                | 0.0026 | 3  | 22<br>7 | 0.22   |      | 0.08    |      |
| BRACERYT | Brachythecium<br>erythrorrhizon       | 0.0026 | 2  | 10<br>4 | 0.11   | 0.06 |         |      |
| BRYERECU | Bryoerythrophyllum<br>recurvirostre   | 0.0023 | 1  | 30      |        | 0.06 |         |      |
| SPHACAPI | Sphagnum capillifolium                | 0.0018 | 2  | 14<br>6 | 0.11   |      | 0.15    |      |
| STEESEER | Stereocleus serrulatus                | 0.0017 | 1  | 39      |        |      | 0.08    |      |
| CLIMDEND | Climacium dendroides                  | 0.0015 | 2  | 17<br>5 |        |      | 0.75    |      |

| acronym  | species name                 | IPV    | n  |         | boreal | prairie |      |      |
|----------|------------------------------|--------|----|---------|--------|---------|------|------|
|          |                              |        | CF | tot     | CFB    | CFP     | CFP  | CFP  |
| ORTHOBTU | Orthotrichum obtusifolium    | 0.0015 | 1  | 45      | 0.11   |         |      |      |
| PLAGCILI | Plagiomnium ciliare          | 0.0014 | 1  | 47      |        |         |      | 0.17 |
| SPHASUSS | Sphagnum subsecundum<br>s.s. | 0.0013 | 1  | 50      |        |         | 0.08 |      |
| SPHASQUA | Sphagnum squarrosum          | 0.0013 | 1  | 51      |        |         | 0.08 |      |
| CEPHCONN | Cephalozia connivens         | 0.0012 | 1  | 56      | 0.11   |         |      |      |
| ORTHELEG | Orthotrichum elegans         | 0.0011 | 1  | 61      | 0.11   |         |      |      |
| POLYCOMM | Polytrichum commune          | 0.0011 | 1  | 63      |        |         | 0.08 |      |
| BRACREFL | Brachythecium reflexum       | 0.0010 | 1  | 64      |        |         | 0.08 |      |
| ENTOCLAD | Entodon cladorrhizans        | 0.0010 | 1  | 66      |        |         | 0.08 |      |
| PLEUSCHR | Pleurozium schreberi         | 0.0009 | 2  | 29<br>7 | 0.22   |         |      |      |
| PYLLPOLY | Pylaisiella polyantha        | 0.0009 | 1  | 76      |        | 0.17    |      |      |
| DICRUNDU | Dicranum undulatum           | 0.0008 | 1  | 79      | 0.11   |         |      |      |
| CERAPURP | Ceratodon purpureus          | 0.0008 | 1  | 83      |        |         | 0.08 |      |
| EURHPULC | Eurhynchium pulchellum       | 0.0008 | 1  | 84      |        |         | 0.30 |      |
| SPHACENT | Sphagnum centrale            | 0.0008 | 1  | 87      |        |         | 0.15 |      |
| ANOMMINO | Anomodon minor               | 0.0007 | 1  | 95      | 0.11   |         |      |      |
| HYLOSPLE | Hylocomium splendens         | 0.0007 | 1  | 96      | 0.11   |         |      |      |
| CALLCORD | Calliergon cordifolium       | 0.0007 | 1  | 10<br>1 |        |         | 0.15 |      |
| PLAYREPE | Platygyrium repens           | 0.0004 | 1  | 16<br>2 | 0.11   |         |      |      |
| PTIDPULC | Ptilidium pulcherrimum       | 0.0004 | 1  | 16<br>8 | 0.11   |         |      |      |
| DICRPOLY | Dicranum polysetum           | 0.0004 | 1  | 17<br>6 | 0.11   |         |      |      |
| SPHAMAGE | Sphagnum magellanicum        | 0.0003 | 1  | 24<br>1 | 0.11   |         |      |      |

## Appendix A Minnesota Regulations

The following are current references to Minnesota Statutes and Rules. For any possible updates, the Minnesota Revisor of Statutes maintains currently accurate listings at The Office of the Revisor of Statutes.

### **103G.223 CALCAREOUS FENS.**

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Calcareous fens, as identified by the commissioner by written order published in the State Register, may not be filled, drained, or otherwise degraded, wholly or partially, by any activity, unless the commissioner, under an approved management plan, decides some alteration is necessary. Identifications made by the commissioner are not subject to the rulemaking provisions of chapter 14 and section 14.386 does not apply.

History: 1991 c 354 art 6 s 9; 2004 c 221 s 43

### **8420.0935 STANDARDS AND CRITERIA FOR IDENTIFICATION, PROTECTION, AND MANAGEMENT OF CALCAREOUS FENS.**

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#### **Subpart 1. Purpose.**

The purpose of this part is to provide minimum standards and criteria for identifying, protecting, and managing calcareous fens as authorized by Minnesota Statutes, section 103G.223. Calcareous fens, as identified by the commissioner, must not be impacted or otherwise altered or degraded, wholly or partially, by any action, unless the commissioner, under an approved management plan, decides some alteration is necessary. The exemptions under part 8420.0420 and the sequencing provisions under part 8420.0520 do not apply to calcareous fens.

#### **SUBP. 2. IDENTIFYING CALCAREOUS FENS.**

A calcareous fen is a peat-accumulating wetland dominated by distinct groundwater inflows having specific chemical characteristics. The water is characterized as circumneutral to alkaline, with high concentrations of calcium and low dissolved oxygen content. The chemistry provides an environment for specific and often rare hydrophytic plants.

#### **SUBP. 3. PROCEDURES TO LIST CALCAREOUS FENS.**

- A. The commissioner must investigate wetlands to determine if the wetland is properly identified as a calcareous fen.
- B. The commissioner must, by written order published in the State Register, maintain a current list of known calcareous fens in the state and their location.
- C. The commissioner must provide an updated list of calcareous fens to the board for further distribution.

#### **SUBP. 4. MANAGEMENT PLANS.**

Calcareous fens must not be impacted or otherwise altered or degraded except as provided for in a management plan approved by the commissioner. The commissioner must provide technical assistance to landowners or project sponsors in the development of management plans.

## **SUBP. 5. RESTORATION.**

The commissioner may approve management plans to restore or upgrade a previously damaged calcareous fen.

## **SUBP. 6. APPEALS.**

- A. A landowner or project proposer may challenge the commissioner's determination that a wetland is a calcareous fen or the commissioner's calcareous fen management plan by requesting a hearing. The hearing shall be conducted in the same manner as water permit hearings under Minnesota Statutes, chapter 103G.
- B. The determination that a wetland is a calcareous fen may be appealed at any time by requesting a hearing. For a decision under a management plan, the hearing must be requested within 30 days after the notice of the commissioner's decision was mailed to the project proposer; otherwise the decision becomes final and may not be challenged by the project proposer.
- C. Appeal of the commissioner's decision after the hearing must be done in the manner provided for appeals from contested case decisions under Minnesota Statutes, chapter 14.

## **SUBP. 7. ENFORCEMENT PROCEDURES.**

ENFORCEMENT PROCEDURES FOR CALCAREOUS FENS MUST BE CONDUCTED CONSISTENT WITH MINNESOTA STATUTES, SECTIONS 103G.141 AND 103G.2372, EXCEPT THAT NECESSARY RESTORATION OR REPLACEMENT ACTIVITIES, IF REQUIRED, MUST BE DETERMINED BY THE COMMISSIONER, IN CONSULTATION WITH THE LOCAL SOIL AND WATER CONSERVATION DISTRICT.

STATUTORY AUTHORITY: MS S 103G.2242

HISTORY: 34 SR 145