

# Scientific and Natural Area (SNA) Strategic Land Protection Plan

*Minnesota Department of Natural Resources  
Division of Ecological and Water Resources  
Scientific and Natural Area Program*



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Note: The following parts of this Plan are not integrated into this document:

- Appendix A. Gap Analysis Results - Native Plant Communities
- Part 2 Conservation Opportunity Areas Descriptions

Also, this draft of the plan will be updated with newer versions of Figures 4, 6, and 10.

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## Executive Summary

The SNA Strategic Land Protection Plan (Plan) provides a multi-tiered approach for prioritizing lands to protect through designation as a state Scientific & Natural Area (SNA). A secondary purpose is to identify and prioritize areas for conserving biodiversity and rare natural resources.

The previous SNA Long Range Plan has not fundamentally changed since 1976. A new Strategic Land Protection Plan is needed and possible because of the following.

1. Impacts to native ecosystems from development, agricultural conversion, fragmentation, human disturbance, and invasive species
2. The need for more robust prioritization of candidates for acquisition
3. The need for identifying opportunities and priorities for the broader conservation community to conserve biodiversity and rare resources
4. Funding opportunities through the Environment and Natural Resources Trust Fund and the Outdoor Heritage Fund

The development of the plan was *facilitated* by a grant from the Environment and Natural Resources Fund as recommended by the Legislative-Citizens Commission on Minnesota Resources. A scientific means of prioritizing future conservation efforts is facilitated by decision-support systems and the expertise of scientists and professionals with local and statewide knowledge.

The Plan specifies two goals and six objectives towards conserving the state's natural heritage and achieving SNA system purposes. The primary goal: The state's natural heritage is not lost from any ecological region of Minnesota. The secondary goal: The state SNA system provides the people with opportunities for compatible nature-based recreation, education, and scientific opportunities. The objectives define the parameters to support the goals. This includes occurrences of existing native plant communities, plant and animal species, geological features, protection and conservation, conserving natural heritage, contributing ecological values in watershed, and sustainability.

SNAs protect areas of greatest biodiversity significance, native plant communities, habitat for rare species, and significant unique natural features such as geological formations. They are to be established through multiple approaches including designating SNAs on existing public lands, acquisition, and leasing.

At a statewide scale, a gap analysis evaluated which native plant communities in each ecological subsection are already protected within existing SNAs and the broader conservation network. Over 125 native plant community (NPC) types and subtypes have no representation within any SNAs across the state. Only 16% to 41% are protected by SNAs when considered by subsection. Marxan decision-support software prioritized the protection of areas that support the greatest range of biodiversity the most efficiently. The data produced a Conservation Prioritization Results map that identified high priority areas for biodiversity conservation.



If 10% of these high priority areas become SNAs, the state could protect approximately 300 SNAs by the end of the 21st century. This totals about 325,000 acres or 0.6 % of the state, and means designating 136,000 more acres of SNA over the next 85 years. In the next twenty years, SNA protection would be targeted as follows: 40% for the Prairie Parkland ecological province, 30% for the Laurentian Mixed Forest province, 20% for the Eastern Broadleaf Forest, and 10% for the Tall-grass Aspen Parkland. Aspen Parkland is the smallest province of the four, and its proportion is a function of its small size.

At a regional (multi-county) landscape scale, the Plan names and describes Conservation Opportunity Areas (also called Opportunity Areas) to focus the work of the SNA Program, partners, and others in protecting biodiversity and rare features. Each of the 84 Opportunity Areas to date are identified in a 4-page descriptions in Part 2 of the Plan. These Opportunity Areas range in size from approximately 1,200 acres to 410,000 acres.

At the smaller parcel level, the Plan provides a method to prioritize sites for potential SNA designation. The SNA Candidate Site Evaluation Guide was developed through this planning process to help rate each candidate site and to make informed decisions about whether to pursue potential acquisitions and designations. The Site Evaluation Guide has been tested and used on a number of sites. The Guide is a useful way of quantitatively sifting out sites that are not priorities as SNAs and to keep future additions in line with the goals and objectives of the program.

The methods used in this planning process require extensive ecological survey data. Therefore, landscape level priorities have been identified throughout the state in those subsections where the Minnesota Biological Survey work is complete. As data become available, subsequent versions of this Plan will contain additional prioritization results and opportunity area identification and descriptions.

The future of natural areas and rare natural features depends upon conservation across all ownerships. The SNA Program and the DNR look forward to building relationships with individuals and organizations across all ownerships to implement this Plan in conserving the state's natural areas and rare resources.



## Purpose and Scope of this Plan

The primary purpose of this Plan is to provide a multi-tiered approach for prioritizing lands to protect through designation as a state Scientific & Natural Area (SNA). A secondary purpose is to identify and prioritize areas for conserving biodiversity and rare natural resources.

At a larger statewide scale, this Plan prioritizes protection of geographic areas that contain the state's range of biodiversity. At an intermediate landscape scale, the Plan names and describes Conservation Opportunity Areas that focus the work of the SNA Program, partners, and local landowners/jurisdictions in protecting biodiversity and rare features. At the smaller parcel level, the Plan provides a method to prioritize candidate sites to become SNAs.

The SNA Strategic Land Protection Plan replaces all previous versions of the *SNA Long Range Plan* that has been substantially the same since it was initially prepared in 1979-80.

By intention, this Plan does not include other components of the SNA Program (namely Native Prairie Bank and Natural Area Registry) nor administration and operations of the SNA Program. The SNA Program administration is directed by Department of Natural Resources (DNR) Operational Order #29, which was updated and approved by the DNR Commissioner in 2012. The Operational Order authorizes creation and use of the *SNA Program Administrative Handbook* to contain a series of operational directives. The *SNA Program Administrative Handbook* (under development) will contain four sections (or chapters) as follows: (1) Land Protection and Acquisition; (2) Natural Resource Restoration and Management (3) Facility and Public Use Management; and (4) Administration and Coordination.

This 2014 document is an interim version of the SNA Strategic Land Protection Plan. The Conservation Prioritization Map and Conservation Opportunity Areas sections of this Plan are dependent on extensive baseline ecological survey data for each ecological subsection of the state. For this reason, these portions of the Plan have not been done for the following eight ecological subsections of the state: Agassiz Lowlands, Border Lakes, Chippewa Plains, Littlefork Vermillion Uplands, Nashwauk Uplands, Pine Moraines and Outwash Plains, St. Louis Moraines, and Tamarack Lowlands. In addition, a few areas of other subsections were based on preliminary data. As additional information becomes available, primarily through the Minnesota Biological Survey, the Plan will be updated with these new areas.

In addition, this Plan does not fully address some important natural features SNAs are authorized to protect. This is particularly true of geological features of statewide significance, including land formations and fossil evidence. The DNR will be considering how to identify and prioritize candidate geological features, the relationship between the State Wildlife Action Plan (currently under revision), and future versions of SNA plans.





## Scientific and Natural Area Basics

For the purposes of this plan, a “natural area” is any place composed of native plant communities and natural features that are generally unaffected by human impacts. This plan focuses on lands officially designated as Scientific and Natural Areas by the Minnesota Commissioner of Natural Resources. The plan also recognizes the critical importance of conservation of other natural areas by numerous organizations and individuals.

### Purpose of SNAs

Scientific and Natural Areas (SNAs) are established to protect and perpetuate natural features which possess exceptional scientific or educational value, in an undisturbed natural state. SNAs are primarily composed of native plant communities, populations of rare species, and geological features of statewide significance. By law, they may also be places that contain successional processes, relict flora or fauna, natural formations, fossil evidence, habitat for concentrations of animals, or vantage points for observing concentrated animal populations, such as migration routes. Often the places which contain these natural features are recognized as areas of biodiversity significance.

### Legislative Authority and State Law Regarding SNAs

Under the state Outdoor Recreation Act enacted by the Minnesota Legislature in 1975, SNAs became part of the State Outdoor Recreation System administered by the Department of Natural Resources.

The primary Minnesota Statutes (M.S.) governing the acquisition and use of lands as SNAs are as follows:

- **M.S. 84.033:** Authorizes the acquisition through gift, lease, conservation easement, exchange, or purchase, and the designation of SNAs; requires county board approval to acquire [purchase in fee] SNAs following the procedures under Section 97A.145, subd. 2.
- **M.S. 84.035-36 (Peatlands):** Establishes peatland SNAs on state-owned land within 18 specified peatland boundaries.
- **M.S. 84.944 (Critical Habitat):** Provides considerations for the acquisition of critical habitat and directs acquisition of lands follow the county board approval process as provided in 97A.145.
- **M.S. 86A.05, Subd. 5 (Outdoor Recreation System):** Establishes SNAs as part of the Outdoor Recreation System and defines their purpose, criteria, uses, and procedures for changes in use. This includes a provision that physical development in SNAs be limited to the facilities absolutely necessary for protection, research, and educational projects, and, where appropriate, for interpretive services.
- **M.S. 92.69 (Endowment Account for Lakeshore Lease Proceeds):** Directs the proceeds of the Laws of 1986, chapter 449, sections 1-3, to the land acquisition account (M.S. 94.165) to be spent only to acquire SNAs. *Note: the proceeds have been dropping annually and as of 2014 are under \$4000 per year.*
- **M.S. 97A.093:** Allows opening SNAs to hunting, fishing or trapping in through Commissioner’s Designation Order and provides for opening previously designated sites through a public hearing process.



- **M.S. 97A.145:** Directs land acquisition including county board notification and approval.

Several chapters of Minnesota Rules (M.R.) also provide protections for lands established as SNAs.

- M. R. 6136 sets forth the general provisions for use of SNAs; activities prohibited unless otherwise allowed by designation order or permit; criteria for allowing otherwise prohibited activities by permit or designation order and types of conditions that may be placed on these activities. This rule also specifies that it is unlawful for any person to destroy, injure, damage, molest, or remove any natural resources.
- M.R. 6130.1200 generally prohibits taconite mining within SNAs. M.R. 6132.200 regarding the siting of non-ferrous mining (such as copper and nickel) prohibits mining within state SNAs and with state peatland SNAs under some conditions and also prohibits surface disturbance from mining activities within ¼ mile of a state SNA.
- M.R. 4410.4300, Subpart 30 requires a mandatory Environmental Assessment Worksheet for any proposed permanent physical encroachment on an SNA that is inconsistent with state law or a management plan.

## Evolution of the SNA Program

In the mid-1960s, in association with a surge in federal environmental protection laws, people across the United States began talking about protecting natural areas and habitats for rare species. Concerned citizens urged Minnesota to be one of the first states to create state owned and managed natural areas. In 1965, the Commissioner’s Advisory Committee (CAC) – a 15-member panel of citizens with expertise or interest in biological and geological sciences – was formed to advise the DNR Commissioner on state natural areas and to encourage the legislature to establish a natural area program.

State-administered SNAs were initially authorized by the Minnesota Legislature in 1969 (M.S. 84.033). The first SNA unit was acquired in 1974 to preserve a heron rookery. And, as stated above, in 1975, SNAs became one of the unit types administered by the DNR under the state Outdoor Recreation System.

Administration of SNAs grew into the SNA Program with the addition of other tools aimed at protecting natural areas. In 1986, the Natural Area Registry moved from DNR’s Natural Heritage Program to the SNA Program. In 1987, the legislature gave new directions to the Department to conserve native prairie. Specifically, a Prairie Biologist position and authority to acquire and administer Native Prairie Bank conservation easements were added to the SNA Program (M.S. 84.96 and 84.961). This Plan focuses on SNAs explicitly. However, the Partners Section of this Plan, starting on page 54, describes the natural area protection roles of Native Prairie Bank easements and Natural Area Registry agreements within the SNA Program, as well as land ownerships and tools outside the SNA Program. In 1991 the state legislature identified 18 areas of high quality representative patterned peatland and designated lands in 16 of these areas as SNAs through the Wetland Conservation Act.

Over time, responsibility for SNAs shifted within the DNR, including being administered by State Parks and being within the Ecological Services Section of the Division of Fish and Wildlife. In 2000, Ecological Services became its own Division including the SNA Program.



In 2011, the home of the SNA Program became the Ecosystem Management and Protection Section of the DNR Division of Ecological and Water Resources (EWR). This Section of EWR also includes the Nongame Wildlife Program, Invasive Species Program, and responsibilities for protection of state listed species and the State Wildlife Action Plan. The SNA Program works closely with these programs and the Minnesota Biological Survey, which is in a different Section in the EWR Division.

Until about 2008, the SNA Program was largely operated out of the DNR Central Office in St. Paul, with a centralized field crew, a Prairie Biologist in western Minnesota, and an SNA forest specialist in northeastern Minnesota. As part of the larger decentralization process of the Division, the SNA Program now has offices and staff in each of the four DNR regions across the state. While staffing is largely dependent on project funding, the SNA Program now has about 15 full time staff in the regions and about 5-6 in Central Office.

## SNA Lands

The SNA Program now administers 159 SNAs totaling over 189,000 acres (Table 1). Almost 80% of the SNA acreage is the peatland SNAs which were state lands administered by DNR Forestry or DNR Wildlife and were designated as SNAs by statute. *(Note: In statute, the legislature identified 18 peatland SNA boundary areas, but also specified that only state lands within these boundaries are designated as SNA. Wawina and Nett Lake have no state lands; therefore they have zero acres of designated SNAs, yet are included in the total number of SNAs above.)*

SNAs may be designated on lands owned in fee or easement by the DNR and acquired through purchase or donation. SNAs may also be acquired through land exchange. SNAs include some received from other state agencies or other DNR Divisions. Not counting Native Prairie Bank easements, the SNA Program administers 18 conservation easements, on all or part of 10 SNAs.

In addition to acquiring lands directly, SNAs may be designated as secondary units on state lands whose primary administrator is another DNR Division. Currently, 7 SNAs have been designated on DNR Forestry-administered lands and 5 SNAs are within State Parks administered by the Division of Parks and Trails.

Law also allows SNAs to be designated on lands leased by the DNR. The only SNA leased lands are owned as preserves by The Nature Conservancy (TNC) who manages them cooperatively with DNR. No new leased SNAs have been established since the 1980s.

**Table 1. Ownership Status of SNAs**

	# of SNAs	Acres	% Area
SNAs acquired in fee (purchased or donated <i>all or in part</i> )	122	29,020	15%
Statutory Peatland SNAs (counting 2 statutory named peatlands with no state acreage)	18	148,750	79%
SNAs designated on DNR Forestry or Parks land (# of SNAs are those which are <i>all or in part</i> )	12	5,080	3%
SNAs held through DNR conservation easement (# of SNAs are those which are <i>all or in part</i> ; acres are only those in which a non-DNR entity owns the land in fee)	10	810	<1%



SNAs designated on leased lands ((# of SNAs are those which are <u>all or in part</u> leased)	14	5,410	3%
TOTAL	159	189,070	

Notes: Size is rounded to nearest 10 acres

Unit #s listed above do not add up to total since some units are a mix of ownership types.

SNAs are generally well distributed throughout each of Minnesota’s ecological provinces. However, currently three of the state’s 24 ecological subsections have no SNAs. The Laurentian Mixed Forest Province of northeastern Minnesota is both the largest province in the state and contains large peatland SNAs comprising 86% of the SNA acreage. That is, SNAs are already 0.7 % of the land area of this province. In contrast, SNAs have a lesser presence in the Prairie Parkland and Eastern Broadleaf Forest Provinces of the state, comprising 0.07% and 0.09% of these provinces respectively. The current average (mean) size of an SNA is 1,189 acres. If the peatland SNAs are not included, the average becomes 285 acres.

**Table 2. Numbers and Size of SNAs by Ecological Province**

Province	Province Area (acres)	% of State in Province	# of SNAs	Total SNA Area (acres)	% of province in SNAs	% of state's SNAs in province	Avg. Size SNAs (acres)	# of non-peatland SNAs	Total non-peatland SNA Area (acres)	Avg. Size of non-peatland SNAs (acres)
Tallgrass Aspen Parkland	2,906,100	5%	4	5,558	0.19%	3%	1,390	4	5,558	1,390
Prairie Parkland	16,094,400	30%	40	10,699	0.07%	6%	267	40	10,699	267
Laurentian Mixed Forest	23,166,100	43%	57	162,009	0.70%	86%	2,842	39	13,139	337
Eastern Broadleaf Forest	11,839,400	22%	58	10,801	0.09%	6%	186	58	10,801	186
TOTAL	54,006,000	100%	159	189,067	0.35%	100%	1,189	141	40,197	285

## Public Use of SNAs

The State Outdoor Recreation System states that SNAs are designated as Research Units, Educational Units, or Public Use Units. Nearly all SNAs are designated as Public Use Units. Nearly all the SNAs are open to everyone throughout the year for hiking, bird-watching, nature photography, snowshoeing and other activities that do not disturb natural conditions. Additional public recreational uses may be allowed on an SNA that are otherwise prohibited in law if so specified in the Commissioner’s Designation Order establishing a specific SNA.

Many SNAs provide opportunities for hunting and fishing. About 88% of the acres designated as SNA are open to some form of public hunting. As of the 2013 hunting season: about 25 SNAs (79% of the SNA acreage including the peatland SNAs) are open to all public hunting and trapping; another 21 SNAs (3% of the SNA acreage) are open to all public hunting; and another 18 SNAs (5% of the SNA acreage) are



open to some forms of hunting (such as deer only or archery only or special hunts). Fishing is allowed at 28 SNAs. Dogs are allowed at about 25 SNAs (usually in association with hunting).

A few SNAs offer limited opportunities for trail uses, where trails existed prior to establishment as an SNA or where they are allowed through management with a partner entity. Three SNAs have authorized pedestrian trails, though field roads and other paths are known to remain on a number of other SNAs. One SNA is transected by a developed regional non-motorized bicycle trail; another bicycle trail is allowed in the designation order and its development is starting by the local government. Horses (and horse trails which existed prior to SNA designation) are only allowed at one SNA and are proposed for an SNA being acquired by a partner organization. The peatland SNAs and a few other SNAs have grandfathered grant-in-aid snowmobile trails.

Out of the 159 SNAs, only 9 SNAs have restrictions on public access. A few SNAs are not open to the public during some times or in some part of the SNA in order to protect vulnerable resources such as nesting birds or fragile slopes. Only one SNA does not allow any public access because of security concerns given its location at an airport.

## **SNA Program Funding**

The SNA Program is funded through appropriations made by the Minnesota legislature. The amount of general funding allocated to the SNA Program is usually less than \$500,000 annually and has not increased in at least the last 8 years despite increases in lands administered and program staff. The Program also receives modest Heritage Enhancement appropriations for prairie-related work and a very small amount of invasive species-related general fund. The Program's two largest sources of funding are received through annual competitive grant processes and subsequent legislative appropriations.

The Environment and Natural Resource Trust Fund (ENRTF) comes from state lottery proceeds. Those allocations are recommended by the Legislative-Citizens' Commission on Minnesota Resources following an open competitive process. For the last 3 decades, the ENRTF has been the SNA Program's largest source of funding. As authorized through an approved work plan, the ENRTF may be used broadly to support the SNA Program. Over the years, ENRTF has funded a substantial amount of the SNA acquisitions. Current ENRTF appropriations support SNA outreach and education (including electronic and social media and an expanded volunteer site steward network), SNA management plans and monitoring, as well as acquisition, restoration, enhancement, and site development. Preparation of this Plan was made possible by an ENRTF grant.

The Outdoor Heritage Fund (OHF) is supported by state sales tax as approved by the people of Minnesota in 2008 through the Legacy constitutional amendment. This funding is appropriated by the Legislature based on recommendations by the Lessard-Sams Outdoor Heritage Council through an open competitive grant process. The constitutional amendment only allows the OHF to be used on acquisition (fee or easement), restoration, and enhancement of prairie, forest, wetlands, and other wildlife habitat. All lands acquired in fee with OHF must be open to all taking of game (hunting and trapping) during the regular season unless otherwise provided in law.



In some biennia, the Program also receives sizable appropriations of state general obligation bonds. This bonding is only for acquisition, site development and some restoration/enhancement work of a capital nature. No new SNA bonding has been appropriated since 2008.

The State-authorized Reinvest in Minnesota (RIM) Critical Habitat account also provides funds primarily for acquisition, including SNAs. Its sources of funds are sales of Critical Habitat vehicle license plates, legislative appropriations, and donations. Through RIM Critical Habitat, the appraised value of lands donated to the DNR by private organizations or individuals generates a match of equal value, which goes towards additional land acquisitions.

A number of organizations and individuals donate to the SNA. Of these, the Nature Conservancy has donated the most land. Other land donating organizations include the Isaak Walton League, Minnesota Land Trust, and the Minnehaha Creek Watershed District. Sizable direct cash contributions have also been made by partners acquiring land for and with the SNA Program. This includes the Trust for Public Land, Dakota County, Friends of the Mississippi River, The Conservation Fund, etc. Donations for SNA operations are received from the Native Plant Society of Minnesota, individual artists in Project Art for Nature, and individual donors.

Occasionally, the SNA Program receives federal funding, such as through the State Wildlife Grant Program or the Lake Superior Coastal Zone Management Program.

From all sources, the level of funding to acquire lands as SNAs is typically about \$1 million to \$2 million a year. This may protect about 300-1000 acres per year. A *Long Range Budget Analysis of Land Management Needs* report prepared for the Legislature in 2010 projected a need of acquiring 1980 acres per year for SNAs at an estimated cost of about \$9.9 million. To meet guidelines for fully restoring and managing SNA lands, this report estimated that the Department could use about \$1.4 million more annually for existing SNAs and another \$220,000 annually for each additional 2000 acres acquired.



## Previous SNA Plans

### 1979-80 SNA Long Range Plan

The *SNA Long Range Plan* was developed in 1979 with a full version of it completed in July 1980. That plan focused on land protection (SNA identification, evaluation, and designation), but also had a paragraph on management and use of SNAs and a section on budgets.

The goal of the SNA system as set forth in the 1979-80 *SNA Long Range Plan* is:

*To preserve and perpetuate the ecological diversity of Minnesota's natural heritage, including landforms, fossil remains, plant and animal communities, rare and endangered species or other biotic features, and geological formations, for scientific study and public edification as components of a healthy environment.*

The 1979-80 plan established the following two Protection Objectives:

- 1. To protect through SNA designation up to three occurrences of each of the following Elements: plants, animals, geological features, or other special features within each landscape region where they occur. Other occurrences may be registered.*
- 2. To protect through SNA designation up to five occurrences of each plant community Element within each landscape region where they occur. Other occurrences may be registered.*

The second native plant community objective was considered a coarse filter capturing most species. The first objective was considered a fine filter to achieve protection of elements (species or natural features) not predictably associated with native plant community types. It stated that multiple occurrences are necessary to prevent loss from catastrophes (such as oil spills, storms, etc), for research and education purposes, and to protect variances in species (i.e., genetic diversity). The 1979-80 Plan anticipated that on order to reach the objectives, 0.1% of the state would need to be protected (one tenth of one percent, listed in the plan as 52,000 acres).

The 1979-80 plan also directed that the following criteria be used in ranking areas for possible SNA designation:

- 1. Rareness of Elements present in an area on a national or state scale.*
- 2. Excellence and completeness of Element occurrences found in an area.*
- 3. Degree to which an area or its Element are threatened with incompatible use.*
- 4. Degree of protection afforded similar Elements elsewhere in the landscape region.*
- 5. The adequacy of representation of Elements in terms of genetic diversity.*

### 1985-86 SNA Long Range Plan

The 1985-86 update of the SNA Long Range Plan projected that Minnesota would need to establish a system of 500 natural areas by 2085 in order to adequately protect all elements of biological diversity in



the state. Of these, 200 sites were projected to be in the prairie biome, 135 in the deciduous forest biome, and 165 in the northern coniferous biome.

## 2008 Update to SNA Long Range Plan

In 2008, the Commissioner's Advisory Committee approved the following revisions to the Protection Objectives:

1. *To protect through SNA designation a minimum of three occurrences of each of the following elements: plants, animals, geological features, or other special features within each landscape region where they occur. Other occurrences may be registered.*
2. *To protect through SNA designation a minimum of five occurrences of each plant community element within each landscape region where they occur. Other occurrences may be registered.*

## Long Range Budget Analysis

In 2010, in response to Legislative Direction, the Department prepared the *Long Range Budget Analysis of Land Management Need*. It called for land managing divisions in the DNR to project costs for managing current DNR lands, as well as for acquiring and managing lands over the next 10 years. The SNA projections in this report were based the two types of analysis listed in the excerpts below:

*The SNA program targets acquisition and designation of Minnesota County Biological Survey (MCBS) mapped sites of outstanding and high biodiversity significance. If the program were to target, in the next 10 years, acquisition and protection of one percent of the already mapped unprotected outstanding and high biodiversity significance acres in all ecological sections (excluding the section containing the large peatland SNAs), the resulting total would be a SNA acquisition target of approximately 19,800 in the next 10 years. This 10-year total would equal an average of 1,980 acres acquisition and designation per year which compares to the FY06-10 average of 500 acres acquired per year.*

*The SNA Long Range Plan identifies two types of SNA protection goals: number of sites to be protected as SNAs and number of occurrences of the state's natural features. To meet the long range plan goal of 500 SNAs by 2085, another 348 sites would need to be designated or about 5 sites per year. This report identifies a short-term target of acquiring 1% of the unprotected high and outstanding biodiversity significance acres or 1,980 acres/year over the next 10 years. Both the long range goal and short-term target are feasible, but dependent on availability of funding, staff and land acquisition opportunities, which are beyond the department's control.*





# Protecting Minnesota's Natural Heritage

## Biodiversity: Its Importance and Its Indicators

The Strategic Plan incorporates several concepts of biodiversity as a basis for conservation planning. This section addresses biodiversity, why it's important, and how it is used as a building block for this plan.

### Definition and Importance

Biological diversity, or biodiversity, has been defined as the “the variety of life and its processes.” A more detailed definition would further define it as “the variety of organisms, the genetic differences among them, the communities and ecosystems in which they occur, and the ecological and evolutionary processes that keep them functioning, yet ever changing and adapting,” (Noss and Cooperrider 1994).

Minnesota's biodiversity has evolved over millennia into complex ecosystems composed of thousands of plant, animal and microbial species. Within each ecosystem, interactions among species are complex, and in many situations, not fully mapped and understood. The presence of one species may affect the survival of another species. For example, monarch butterflies are dependent on summer habitats, their wintering areas, and possibly habitats on their migratory route. Loss of grasslands and marshes that provide habitat for milkweeds will reduce food sources for monarchs. In Minnesota, monarchs are dependent milkweeds in our prairies, savannas, and wetlands. Each time a species is lost, the dice are rolled to see if and how an ecosystem can adapt to the loss. Resilience declines and functions and values of an ecosystem may be permanently compromised. According to The Nature Conservancy, the United States has lost over 271 species since the beginning of European settlement (The Nature Conservancy, 1992). This does not count invertebrates or nonvascular plants. While species extinction is part of natural evolution, the rate at which species are lost has greatly increased with the expansion of human settlement. The rate of loss has been estimated to be 400 times higher than the rate prior to human impacts (Wilson, 1992).

Losing species from ecosystems may affect their ability to provide ecosystem services that benefit agricultural, economic, and environmental functions. Examples are crop pollination, groundwater infiltration, surface water filtration, carbon sequestration, nutrient capture and recycling, air pollution filtration, and ambient temperature reduction.

Not only is the loss of species a concern directly for the pure value of the loss, but the loss also creates a vacuum that opportunistic species may capitalize on and expand their presence. The concern is elevated if the opportunistic species is a non-native invasive. Ecosystems are under growing assault from invasive species. There are currently 4,300 invasive species in the United States (U.S. Fish and Wildlife Service), most of which are expanding their ranges into new habitats routinely. Maintaining healthy ecosystems and species composition reduces the chance for voids where invasive species may colonize, and the ecosystem maintains a higher degree of resilience.



Biodiversity decreases from habitat fragmentation or loss, conversion to agricultural and urban lands, degradation from invasive species, activities such as logging and grazing, and discharge of pollutants. As habitats become increasingly fragmented and smaller, the question arises regarding the minimum size that provides viability for plant communities. This Plan does not address the minimum size for each native plant community to be considered biologically viable. It does recognize that small patches of native plant communities may not function in the same capacity as larger ones, and simply capturing a small remnant may not fulfill the objective of protecting viable examples of native plant communities.

**Minnesota Biological Survey: Definition of Biodiversity Significance**

At the conclusion of work in a geographic region, Minnesota Biological Survey ecologists assign a biodiversity significance rank to each site they survey. These ranks are used to communicate the statewide native biological diversity significance of each site to natural resource professionals, state and local government officials, and the public. The biodiversity ranks help to guide conservation and management.

A site's biodiversity significance rank is based on the presence of rare species populations, the size and condition of native plant communities within the site, and the landscape context of the site (for example, whether the site is isolated in a landscape dominated by cropland or developed land, or whether it is connected or close to other areas with intact native plant communities).



As defined by the Biological Survey, there are four biodiversity significance ranks: outstanding, high, moderate, or below.

- **"Outstanding"** sites contain the best occurrences of the rarest species, the most outstanding examples of the rarest native plant communities, and/or the largest, and most ecologically intact or functional landscapes.

- **"High"** sites contain very good quality occurrences of the rarest species, high-quality examples of rare native plant communities, and/or important functional landscapes.
- **"Moderate"** sites contain occurrences of rare species, moderately disturbed native plant communities, and/or landscapes that have strong potential for recovery of native plant communities and characteristic ecological processes.
- **"Below"** sites lack occurrences of rare species and natural features or do not meet MBS standards for outstanding, high, or moderate rank. These sites may include areas of conservation value at the local level, such as habitat for native plants and animals, corridors for animal movement, buffers surrounding higher-quality natural areas, areas with high potential for restoration of native habitat, or open space.

Sites of biodiversity significance mapped by the Biological Survey may contain high-quality native plant communities, rare plants, rare animals, and/or animal aggregations. Initially, the boundaries of these sites are determined by review of aerial photography based on native vegetation. In subsequent field investigations, ecologists assess the ecological characteristics of the site and the presence of rare species. Following field investigations, site boundaries sometimes are revised, or sites added, to incorporate critical habitat for rare plants and rare animals. In these instances, the quality of native plant communities is not the primary criterion for ranking the site.

The data mapped by the Minnesota Biological Survey generally reflect the condition of sites at the time of fieldwork in a region and have not been systematically updated to account for changes to the vegetation or species populations. The oldest data is of the western prairie region of Minnesota, where surveys began in 1987, followed by southeastern Minnesota and then the eastern Twin Cities metropolitan counties. Surveys are still underway in the northern part of the state. Areas not mapped as sites of statewide biodiversity significance include: (1) lands where native plant communities have been altered or destroyed by human activities such as farming, overgrazing, non-sustainable timber harvest, draining, invasive species, and development; and (2) occurrences of native plant communities that are too small to meet minimum size standards for mapping.

### **Vegetation (Native Plant Communities) as a Surrogate for Biodiversity**

The Strategic Planning Team and its advisors have chosen to use inputs based on biodiversity indicators of existing native plant communities. While the presence of wildlife species and their habitat are also indicators of biodiversity, data for these factors are not consistently available. It is also relatively easy to describe, classify, and map. As such, it provides a useful, if simplistic, “surrogate” for habitats and the myriad of components of terrestrial biodiversity that are little known, poorly understood, or difficult to quantify.

This Plan uses native plant community data, biodiversity significance data, and state-ranked communities as a coarse filter to map broad areas of conservation importance. However, any depiction of vegetation is really only a temporal snapshot, and interpretations are limited by the quality of the data. Vegetation types and conditions may change as a community moves through natural succession toward climax conditions, or it may revert to a pioneering community due to natural disturbance such as fire or flooding, or from human activities.



## Native Plant Communities

A native plant community is a group of native plants that interact with each other and with their environment in ways not greatly altered by modern human activity or by introduced organisms. These groups of native plant species form recognizable units, such as oak savannas, pine forests, or marshes, that tend to repeat over space and time. Native plant communities are classified and described by considering vegetation, hydrology, landforms, soils, and natural disturbance regimes. Examples of natural disturbances include wildfires, droughts, and floods.

Native plant communities are named for the characteristic plant species within them or for characteristic environmental features. Examples of native plant communities in Minnesota include dry barrens oak savanna, red pine-white pine forest, and bulrush marsh.

Many kinds of vegetated areas are not native plant communities. These include places where native species have largely been replaced by exotic or invasive species such as smooth brome grass, buckthorn, and purple loosestrife; and planted areas such as orchards, pine plantations, golf courses, and lawns. Other areas not considered to be native plant communities include areas where modern human activities such as farming, logging, and development have destroyed or greatly altered the vegetation.

## Rare Species

When European explorers first visited Minnesota in the 17th and 18th centuries, they found a land rich in habitats, teeming with a diversity of plants and animals. Today some of the species seen by those early explorers no longer exist, or they survive only in small, fragmented populations. In an effort to prevent further losses, the state legislature passed Minnesota's Endangered and Threatened Species law in 1971.

The law directs the DNR to identify those species that are at greatest risk of disappearing from the state. By alerting resource managers and Minnesota's citizens to species in jeopardy, actions can be taken to help preserve the diversity of Minnesota's flora and fauna.

## Rare Native Plant Communities

Native plant communities are classified by community type and by their relative rarity on a state and a global level. The more the imperiled the community, the lower the rank at a state (S) and global (G) scale, i.e. S1 communities are more imperiled than S2 communities. The status each community has is for scientific purposes only, and has no legal status for protection.

- S1: Critically imperiled statewide
- S2: Imperiled statewide
- S3: Rare or common statewide
- S4: Widespread, abundant, and apparently secure, but with cause for long-term concern
- S5: Demonstrably widespread, abundant and secure



S-ranks are separated by a slash (e.g. S1/S2) if more than one possible native plant community subtype with a unique S-rank is possible. Those with an S-rank of S1S2 or S2S3 indicate a community which may yet be classified as either of the two types because of uncertainty.

## Ecological Evaluations

Ecological Evaluations are reports typically prepared by DNR ecologists. They highlight sites in Minnesota that contain rare natural features or that have outstanding examples of natural features that characterize a specific landscape or region of the state. Examples of these features range from large patterned peatland complexes, to native prairies, to places with populations of rare species (such as ram's-head lady's-slippers and red-shouldered hawks). These sites are sometimes large and intact enough that they continue to support important ecological processes such as regenerative wildfires, historic flooding regimes, and large-scale nutrient cycling and soil development. Other sites may be smaller, but possess exceptional examples of native plant communities or populations of rare plant or animal species. Their outstanding natural features make these sites the highest priority for conservation action, including ecologically based management planning, conservation easements, and recommendation as natural areas or parks. The Ecological Evaluations summarize the conservation actions most relevant for maintaining the important natural features of these sites.

## Aquatic Resources

Aquatic resources include lake, river, stream, and deep-water/seasonally inundated wetland habitats and the species that occupy them. Aquatic resources have not been specifically addressed within State statutes for protection by the SNAs, as protection has been terrestrially focused.

That is not to say that SNAs have avoided aquatic habitats. SNAs have been acquired for desirable shoreline plant communities, entire lakes that house rare aquatic species, and regionally-sized areas of patterned peatlands that are underlain by water track systems.

## Strategies for Protection of Biodiversity

Finding the resources to access, inventory, analyze, acquire and manage hundreds of plant community types and thousands of species will be daunting. Strategies developed in the last 20 years focus on using a “coarse filter” to capture the majority of conservation features that adequately conserve most native plant communities and 85–90 % of the species found in them. This approach has been used by conservation organizations such as The Nature Conservancy and state Natural Heritage Programs. A “fine filter” addresses those features that may be missed by a coarse filter. Typically these help develop policies or management actions on a species-specific level, and focus on species that are rare or threatened, endangered, or of special concern.

A coarse filter assessment is typically conducted for large regions using a gap analysis. The gap analysis is an inventory of how existing conservation lands and practices have captured and protected regional biodiversity. A gap analysis is usually done by overlaying conservation feature data (e.g. native plant community polygons) over existing conservation lands to see which features are protected on which lands. This process and its results for Minnesota native plant communities are discussed in the next section of this document.



At what scale does a missing species or native plant community become significant? A remnant stand of Big Woods may take on a greater significance at a local scale than when it is viewed regionally. However, that same stand of woods may take on a greater importance regionally when it is at the edge of its range of occurrence, or otherwise has the potential to include a genetic variation. However, if there are adequate occurrences of protection of this community variant within the region, then it may be less important.

Considerations in conservation planning typically go one of two directions: focusing on areas of high biodiversity, or focusing on habitats for rare or listed species. Interestingly enough, areas of high biodiversity are usually not a refuge for rare species. This is because rare species can frequently be specialists requiring very specific or unique habitats that are less well suited to housing a wide variety of species. Most conservation biologists favor maintaining representation of conservation features across their respective ranges, and by doing so, capturing a variety of genetic expression of those species.

### **Resilience as a Strategy**

Conservation should promote practices that enhance ecosystem resilience to changes from climate change and fragmentation. Resilience refers to the capacity of a natural system to cope with profound disturbance such as the introduction of new species, fire, mowing, grazing, logging, erosion, sedimentation or impacts from a warming climate, and its ability to maintain the essential structure and functions operating in much the same manner as prior to the disturbance (However, some systems are adapted to and even dependent on regular disturbance created by fire or floods.). Resilient ecosystems maintain their biodiversity, have a greater capacity to recover from disturbance, have linkages across different biological scales, and are adaptable. As climate change affects ecosystems, and population growth increases the amount of land that is urbanized and cultivated, native ecosystems will face increasing vulnerability to the following conditions.

- Warming temperatures and increased evapotranspiration
- Less groundwater
- Increased frequency of extremes—storms, droughts:
  - increased wind or snow/ice damage
  - higher rainfall rates and increased runoff or flooding
  - increased erosion and sedimentation
- More invasive species—some promoted by warmer temperatures
- Greater pressure to be converted to cultivated or developed lands
- Increased fragmentation

One effective strategy at mitigating the impacts of climate change is to build resilience into native communities. This can be done by creating large areas or corridors that function in two ways to promote resilience: (1) to provide large pathways for species to migrate to cooler or more suitable climates and habitats, typically northward or eastward, (2) and to capture a greater variety of existing habitats that provide favorable locations for desirable species. Large areas reduce the perimeter to core ratio. Fewer perimeters will reduce the exposure of natural areas of being invaded by exotic species, particularly those invasive species that like edge conditions. Common buckthorn is a good example of a



species that is more likely to be found along the perimeter of forests than in the depths of the interior. By having larger tracts of forest, a smaller percentage becomes edge.

### *Minnesota Climate Change Vulnerability Assessment*

The *Climate Change Vulnerability Assessment* completed in 2014 by the Minnesota DNR projects that Minnesota's climate will most likely change in the following ways.

- Warmer climate , particularly winter and nighttime temperatures. Warmer winter temperatures allow certain pathogenic species (pine bark beetles, emerald ash borer, Japanese beetle) to increase their presence which may increase mortality of native species.
- Climate translocations may shift north by 400 miles within 50 years, i.e. International Falls climate will be more like Albert Lea's, and Albert Lea's climate will be more like Kansas City's.
- Precipitation will increase across much of the state but will not keep up with net evapotranspiration increases. It will evaporate faster in a warmer climate, thereby reducing the affectivity.
- Precipitation will fall more erratically, with an increase in extreme rainfall events. More intense rainfalls are less likely to infiltrate to groundwater aquifers, will run off the landscape, and increasing flooding.

### *System Vulnerability*

The vulnerability of different biological systems was mapped by a team of experts as part of the vulnerability assessment. The following potential vulnerabilities were identified.

#### *Forest Systems*

- High vulnerability (high potential impact combined with relatively low adaptive capacity): acidic peatland, forested rich peatland, and wet forest
- Moderate vulnerability: fire-dependent forest and mesic hardwood forest
- Low-to-moderate vulnerability (relatively low potential impact combined with moderately high adaptive capacity): floodplain Forest

Of the dozens of adaptation strategies considered for forest systems, the Assessment concluded that minimizing fragmentation and increasing connectivity is the single best approach for increasing the resilience of the different forest systems in Minnesota.

#### *Aquatic Systems*

##### Rivers & Streams

- Most vulnerable to changes in discharge/hydrology (base/peak flows, dams), water quality (nutrients & sediments), and geomorphology.
- Northern forest waterways more vulnerable to temperature increases than prairie systems.
- Trout streams in southeastern Minnesota have increased vulnerabilities to changes in temperature and turbidity.



- Flood frequency and peak flows will have the greatest impact on streams.

#### Depressional Wetlands

- Most vulnerable to changes in hydrologic regime, wetland system diversity, & nutrient loading

#### Upland and Wet (Brush) Prairies and “Surrogate” Grasslands

- Most vulnerable to habitat connectivity, invasive species, soil moisture, & agricultural cultivation

#### Lakes

- Lake systems will be affected by increased water temperatures, increased evapotranspiration, and reduced ice cover. Some impacts may include increased fish kills, greater variability in water levels, reduced water levels, increased nutrient cycling, reduced water quality, and vulnerability to land use changes.

#### *General Impacts*

- Fundamental shifts in habitat/ community distributions
- Prairie-Forest border may shift 300 miles NE during next century
- Forests in northeastern Minnesota may be replaced by savanna, brushland, or grassland
- Invasive species become more dominant





# Goals, Objectives and Targets

## Goals

Primary Goal:

**The state's natural heritage is not lost from any ecological region of Minnesota.\***

The state's natural heritage consists of the following.

- Plant and animal communities
- Rare species (including those listed as endangered, threatened, and special concern as well as Species in Greatest Conservation Need) and habitat that supports rare species
- Places of biodiversity significance
- Geological features/formations (including those that significantly illustrate geological processes, are of statewide significance, and include significant fossil remains)
- Other natural features of state or regional significance (including those illustrating succession of plant communities, relict flora or fauna persisting from an earlier period, and seasonal havens for wildlife)

The ecological regions of Minnesota are the twenty-four ecological subsections mapped through the Ecological Classification System.

*\*This Plan recognizes that with climate change, the natural landscape will change. Some species are likely to be extirpated from some areas. High quality, functioning natural communities today are likely to be the most resilient in the future, providing the greatest potential to sustain the state's natural heritage. These resilient natural communities are and will continue to be diverse, though the species composition may change over time. Natural communities may best persist when embedded within larger, interconnected areas of native and restored habitat.*

Secondary Goal:

**The state SNA system provides the people with opportunities for scientific purposes and compatible nature-based recreation and education.**

This goal is important in addressing SNAs role as units in the State Outdoor Recreation System. Lands designated as an SNA need to have public access. This goal also relates to the statutory criteria for SNAs being established as vantage points for observing concentrated populations of wildlife. Other aspects of addressing this goal are generally outside the scope of this Plan.

## Objectives

1. Five occurrences of each existing native plant community are within designated SNAs within each ecological subsection.
2. Three occurrences of each existing species of plant and animal are within designated SNAs within each ecological subsection.
3. One of each type geological feature in the state is within a designated SNA.
4. Ten percent of the state's high priority conservation areas are protected through SNAs, (orange and red areas depicted on the Conservation Prioritization Results Map); other landowners and managers conserve the natural heritage within high priority conservation areas.
5. SNAs contribute ecological values in key watersheds.
6. The SNAs natural features and public benefit are sustained over time.

## Strategies

1. Target SNAs to protect: (1) areas of greatest biodiversity significance, (2) high-ranked, rare native plant communities; with emphasis on protecting communities considered endangered and threatened in the state(S1-S2), and (3) habitat containing populations of rare (listed) species.
2. Increase the connectivity and/or size of SNAs to enhance ongoing viability and resiliency. Prioritize SNAs within larger scale interconnected areas of conservation lands and/or with SNAs that are larger in size (e.g. on average 400 acres in size).
3. Use the full range of approaches to establishing SNAs: a) designate SNAs on existing public lands (as secondary units on state lands, through transfer, and buying out school trust status when in the interest of the trust), b) acquire fee interest or conservation easement via purchase and gift, and c) explore establishing more SNAs through DNR leases.
4. Establish and manage SNAs to provide public access for compatible nature-based recreation and education.
5. Strive for establishing SNAs with reasonable management needs and the resources necessary to sustain the site's natural features and public benefits.

## Priorities

Evaluate and prioritize candidate areas for SNA designation considering the following criteria from high to low priority.

- A. The first protection of this resource within any state lands on a statewide basis:
  1. a state-ranked endangered or threatened (S1- or S2-ranked) native plant community
  2. a federally threatened or endangered rare feature
  3. a state threatened or endangered rare feature
  4. any native plant community
  5. any rare feature
- B. The first protection of this resource within an SNA on a statewide basis:
  1. any native plant community
  2. any rare feature



- C. The first protection of this resource within any state lands on an ecological subsection basis:
  1. any native plant community
  2. any rare feature
- D. The second protection of resources listed under “A” within any state lands (or SNAs) on a statewide basis.
- E. The second protection of resources listed under “A” within any state lands (or SNAs) on an ecological subsection basis.
- F. Located within Highest Priority Conservation Areas.
- G. Located within High Priority Conservation Areas.
- H. Provide connectivity either between SNAs or between SNAs and other conservation areas.

*NOTE: Areas that fulfill multiple objectives listed above are the highest priority, relative to the position on the list that the multiple objectives occupy. Also, sites that rate highest may not necessarily be appropriate or available as an SNA.*

## Targets

By the end of the 21st century (2099), the state aims to protect, approximately 300 SNAs statewide comprising about 325,000 acres (about 0.6 % of the state). This means designating 136,000 more acres of SNA over the next 85 years, or an average (mean) of 1,600 additional acres of SNA per year. This is based on establishing SNAs on about 10% of the high priority conservation areas across the state. This also assumes that the additional SNAs include lands already in state ownership.

Over the next twenty years, the target is to designate approximately 32,000 additional acres of SNAs with the following estimate of distribution across ecological provinces.

**Table 3. SNA 20-Year Targets by Ecological Province**

Province	20-year SNA designation target (acres)	20-year SNA designation target (%)
Tallgrass Aspen Parkland*	3,200	10%
Prairie Parkland	12,800	40%
Laurentian Mixed Forest	9,600	30%
Eastern Broadleaf Forest	6,400	20%
<b>TOTAL</b>	<b>32,000</b>	<b>100%</b>



## Plan Approach

Minnesota is blessed with a great diversity of landscapes and habitats: from mixed-grass gravel prairies and saline wetlands in the southwest to the northern white cedar-yellow birch forests of the Arrowhead. As an example of the potential for changes in the ecological landscape, consider the rapid succession of plant communities from the Red River Valley due eastward to Lake Itasca. Prior to European settlement one started in the tall grass prairie, and within 30 miles traversed a landscape that progressed from grassland, to brush prairie to savanna, to dry oak forest, to mesic maple-basswood forest, to mixed conifer-hardwood forest, to finally a more boreal coniferous forest. The variation within this ecological continuum was facilitated by an elevation change of 700 feet, increased rainfall, and a change in soil type. It shows how rapidly very different plant communities can be closely juxtaposed. This may be a statement of the state's biodiversity, but it may also indicate how dynamic these systems are. Biomes can change quickly in short distances, and can be vulnerable to natural or human disturbance. Now these plant communities are much more fragmented due to farmland cultivation and urbanization. Pollen cores indicate that drier climatic periods have pushed the prairie and oak communities farther to the east in transitional areas like this.

Minnesota is also home to some varied geological landscapes. The state varies from being glaciated or untouched by glaciers, hilly to level, and from being underlain by sedimentary bedrock or metamorphic rock. Some of the oldest geological bedrock of the planet reaches the surface within the state.

The SNA Program must prioritize its efforts so that scarce funds are most efficiently utilized. It is important to develop a process that is based on science, is reproducible, and respected. In addition, the approach needs to employ a methodology that provides the most efficient solution for the Program to acquire the most important land for sustaining biodiversity with the least resources.

The SNA Program sought an approach embracing these characteristics in order to determine where SNAs are the most appropriate means of conservation. This approach is based on ecological resiliency explained starting on page 22.

## Scales of Conservation

### *Statewide*

The Plan's initial step is to identify statewide areas of prioritization that could efficiently preserve the state's range of biodiversity. These areas are of sizes of regional importance, but in rare instances may approach the size of a small county. The range of key landscape areas that will be captured, such as major river valleys or glacially-related landscapes, are best visualized when viewed at a statewide scale.

### *Regional*

The next step would identify regional Conservation Opportunity Areas as high priority areas to focus the work of the SNA Program, its conservation partners, and local landowners and jurisdictions. These areas are not meant to be completely acquired for conservation, but help focus where individual site



acquisitions may occur. Concentrating efforts on fixed areas will result in more efficient protection of the state's natural heritage.

### *Local*

Once individual sites have been identified, the Plan provides a method of evaluating candidate sites for their capacity to contribute to the entire conservation network and their appropriateness as an SNA. Sites are scored by the biodiversity, rare species, proximity to other conservation areas and priority areas, and other factors. The evaluation process provides a way to prioritize individual sites. Should sites score highly enough through the evaluation process, they can continue into the acquisition process, and be placed into a prioritization scheme with other qualifying candidate sites.



## Gap Analysis

One of the first steps in conducting the conservation reserve system planning process is to analyze what is already protected by the existing conservation network. The best data layer to use for a statewide assessment needs to be determined, then what conservation features are most deficient in the protected lands and within the entire system statewide.

The primary resource type used in this analysis was the Native Plant Community (NPC) Classification generated by the Minnesota Biological Survey (MBS). This was selected at the request of the Commissioner's Advisory Committee, since it had some of the most comprehensive data at the highest resolution across the state. While the NPC data is subject to access to land, data and aerial photo interpretation, and is a subjective assessment, this data set is the most detailed with the greatest coverage. It is understood that MBS may have missed critical areas or NPCs within survey areas and that eight subsections in northern Minnesota have not been completed or only have preliminary data at the time of preparing this document. Therefore, this and future versions of the Strategic Plan will be seen as a living document that will be updated as MBS data become available for new areas and data are updated for already-surveyed areas.

The NPC data was entered into an assessment called a Gap Analysis. This type of analysis was conducted on a geographic basis using the 24 ECS subsections. All mapped NPCs were grouped by subsection. NPCs occurring within SNAs were selected and compared to NPCs that occur throughout the subsection on lands of all other ownership types. The same was done for NPCs that occur on all State, Federal or conservancy lands. By creating a master list of all NPCs occurring within a subsection and seeing how many of those NPCs are missing from SNAs, gaps in representation are identified. Likewise, gaps were determined in NPC representation for all public and conservancy lands. The minimum NPC acreage to be considered for representation is 0.1 acre. This removes NPC polygons that may not actually exist and are only artefacts from mapping. The minimum size was selected for documentation purposes and not for considerations of viability.

## Results

### Native Plant Communities Represented in SNAs

The first application of the results of the Gap Analysis was to assess the percentage of native plant community types captured by SNAs. For the subsections with mapped data, 16 to 41% of NPC types have are represented within SNAs, with a statewide ECS subsection average of approximately 28%.

The Ecological Classification System (ECS) subsections with the highest number of plant community types represented are the Red River Prairie and The Blufflands. This may be because the Red River Prairie has fewer types of NPCs within it, and therefore, it's easier to capture a broader representation of the subsection. Within The Blufflands, many areas are steeply rolling with abrupt changes in slope, orientation, and hydrology within any given parcel, particularly in valleys. The likelihood of a given parcel containing several types of NPCs is much higher due to the variations of the landscape. The

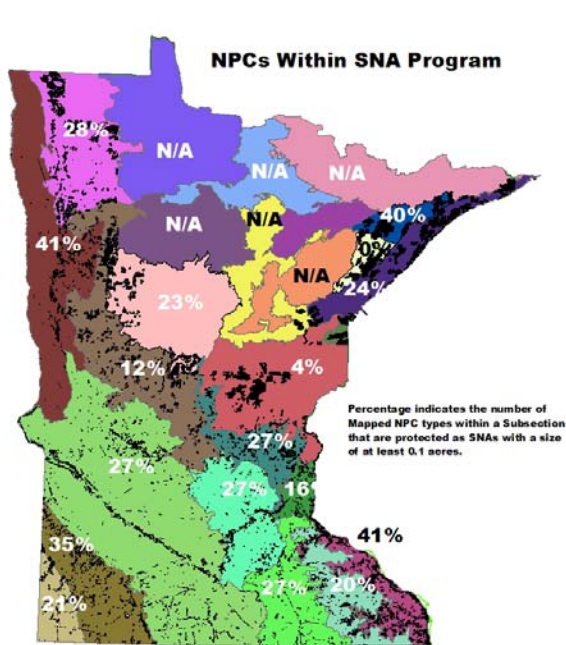


subsection with the lowest number of represented NPCs was the Mille Lacs Moraine; however this might be more of a reflection of missing data from Pine County. The next lowest was the Hardwood Hills subsection, which is a transitional area not only between prairie and forest, but also between northern and southern biomes. Therefore, the Hardwood Hills contains prairie, savanna, deciduous forest, coniferous forest, marsh, lakes, and woodland swamp/bog communities. The landscape has numerous hilly areas with many lakes and wetlands. However, quite a bit of the subsection is farmed, and a notable percentage is privately-held recreational land that may limit some of the public holdings in the subsection, particularly those adjacent to the many lakes in the area.

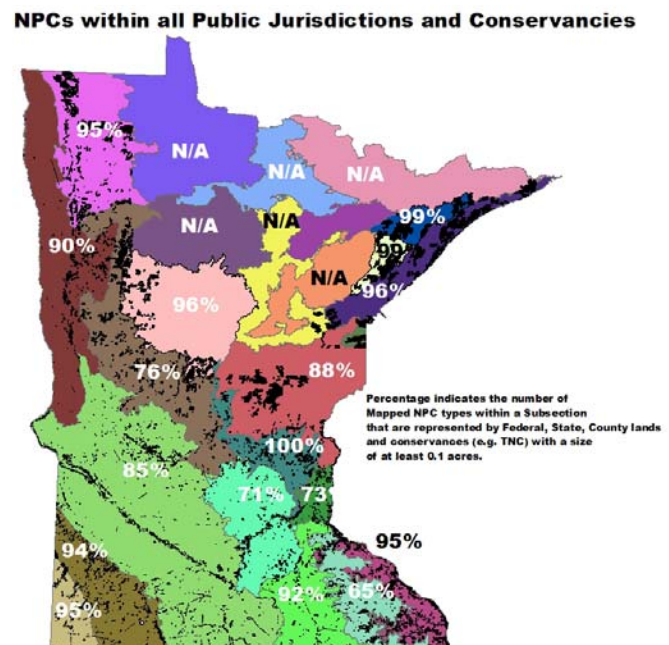
In addition, a list of NPCs not present within SNAs was created from the GAP Analysis. A separate list was created for NPCs without any representation within all DNR-administered lands (state parks, state forests and other forestry-administered lands, wildlife management areas, aquatic management areas, state recreation areas, SNAs), federal lands, and other conservancy ownerships such as the Nature Conservancy. Over 125 NPCs have no representation statewide within SNAs *within any subsection*. The spectrum of missing communities runs from wetlands and bogs to prairies, savannas, forests, and cliff plant communities. This list is provided within Appendix A.

**How the Results Will Be Used**

One of the important parts of completing the Gap Analysis was to provide a baseline of current NPC representation within SNAs. The baseline level of protection provided an input for use in the decision-support system the prioritization results, i.e. that the level of NPC representation in each ECS subsection is the basis for how much additional representation would be needed to achieve the conservation targets set forth.



**Figure 1. Native Plant Communities in SNAs**



**Figure 2. Native Plant Communities in State, Federal and Conservancy Lands**

### *Incorporation into a Decision Support System*

NPC averages for each ECS subsection were used as a baseline for determining additional protection necessary within each subsection. NPC types that are common and have a widespread presence within a subsection provide more options for selection than a NPC type that has very little presence anywhere within a subsection. With infrequent NPCs, the decision support system will have to select most if not all of the examples of a rare NPC type to meet the conservation targets. However, with a plentiful NPC type, the system can pick and choose which locations provide the most efficient solution with regard to the amount of land required, since it won't require all locations to meet its preservation target. Therefore, the Gap Analysis provides guidance about the selectivity requirements of how many sites are needed to meet conservation goals.

### *Incorporation into Candidate SNA Site Evaluation Guide*

The most direct application of the results of the Gap Analysis is incorporation into the SNA Candidate Site Evaluation Guide explained starting on page 39. Candidate sites are scored by characteristics such as the occurrence of rare species, rare NPC types, biodiversity, or proximity to other conservation hotspots. Candidate sites that protect an unrepresented NPC receive the higher score. Occurrence of a federally- or state-listed species in a site also receives the higher score. Sites that contribute an NPC type that has a limited ECS subsection presence, but has not met the objective of five examples of each NPC type receive a partial score. Appendix A provides a more detailed list of the occurrence of NPC types by subsections within SNAs, and within all state, federal and conservancy lands.



# Decision Support System

## Introduction

When planning a conservation network across a state as large as Minnesota, conservation actions must be prioritized. Otherwise the process could become overwhelmed by a sentiment of “where do I even start?” Prioritization may use ratings of ecological, economic, or geographic factors.

The data used needs to be comprehensive, reasonably current, relevant, and ranked to use as an input. A sound methodology also must provide reproducible results.

## Decision Support tools

A Decision Support System (DSS) or Tool (DST) is a computer-based information system that supports planning or organizational decisions. DSSs are set up to serve the management, operations, and planning levels of a program or organization and help to make decisions. These systems can be either fully computerized, human or a combination of both. Software tools are also developed to assist in the decision process for computationally intensive analysis. They are categorized as data-driven or model-driven. A DSS is defined by these characteristics:

1. Tends to be aimed at problems that are less structured and underspecified, that upper level managers typically face.
2. Specifically focuses on features which make them easy to use in an interactive mode.
3. Emphasizes flexibility and adaptability to accommodate changes in the environment and the decision making approach of the user.
4. Is explicitly designed to solve ill-structured problems.
5. Is easy-to-use and has a powerful user interface.
6. Combines analytical models with data.
7. Explores the solution space by building alternatives.
8. Is capable of supporting a variety of decision-making styles.
9. Allows interactive and recursive problem-solving.

DSSs include knowledge-based systems. A properly designed DSS is an interactive software-based system intended to help decision makers compile useful information from a combination of raw data, documents, and personal knowledge, or business models to identify and solve problems and make decisions.

DSTs differ from models in that a DST provides the information in terms of a decision variable, which may be a parameter in relative terms (e.g. determining the optimal conservation locations capturing as many habitats as economically possible). This is different from computer models that provide output in terms of a technical variable, which may be a parameter in absolute terms (e.g. modeling specific groundwater impacts to habitats). Technical variables can be incorporated into a DSS.



The DST software programs investigated for possible use in this planning process included Zonation, ConsNet, Zonae Cogito, Marxan, Marxan with Zones, and CLUZ. Several were dismissed due to software incompatibilities with operating systems and the current version of GIS in use by the DNR. Other programs were better suited to address multi-goal conservation scenarios than simply prioritizing lands for the SNAs. These other DSTs can address conservation scenarios with different internal goals by creating zones which are used to determine qualitatively-ranked conservation use areas, e.g. areas best for logging, selective logging, or solely for preservation (no logging). Once the goals of the SNA Plan were finalized and it was determined that zones were not needed, it was decided that Marxan would be the DST of choice. This was based on Marxan's ability to process large amounts of data, respond to the amount of connectivity desired and then map the most efficient solution, and finally to find the optimal solution set for the least amount of opportunity cost (financial, economic, or social).

## **The Selection of Marxan**

Marxan is the most widely-used decision support software for the design of conservation reserve systems in the world. Marxan has the ability to take primary input information such as the location of rare species, biodiversity areas, or mapped extent of different native plant communities and weigh against other types of information such as conservation constraints against the primary input. It then maps a result that provides the most efficient layout of a conservation system that addresses the primary conservation targets. Marxan has been used successfully in planning conservation reserves within entire countries, and regionally, such as in The Great Barrier Reef, Florida Keys, and the state of Florida. It was also used to prioritize actions within the Pennsylvania State Wildlife Action Plan (SWAP).

### **How Marxan Works**

Marxan operates by creating hypothetical mapping solutions to see how well the areas mapped in each solution provide the most efficient means of creating a conservation reserve system. As applied to this plan, the software creates 300 scenarios using 160-acre cells across each ECS subsection in the state. A cell size of 160 acres was selected since it provides a reasonable level of resolution for a state-level plan and stays within the capacity of the computers processing very large amounts of data. It conducts iterative sampling via 1,000,000 iterations per scenario to create the optimal grouping of cells that efficiently capture enough locations of conservation features to meet the target level of conservation for each designated type of feature within the study area.

A target was set for each NPC type occurring within each subsection. An example would be a target value of capturing 75% of all calcareous fens within an ECS subsection. If a solution set does not meet this goal, it can be penalized, and Marxan will go through the remainder of the 1,000,000 iterations for that scenario trying to create a better solution that captures 75% of calcareous fens. The solution seeks to meet the conservation target and minimize the amount of land required to meet all of the other conservation targets (for other NPC types) also.



Other factors are also entered such as the following:

- Determining whether certain cells should be locked in or out, i.e. sometimes certain cells would always be included or excluded
- Areas that have low availability such as Prime and Unique Farmland soils (likely to be already farmed or have a high likelihood of being converted to farmland), contaminated sites, or School Trust Fund lands due to their high opportunity costs
- The degree to which cells should be grouped together to create small, discrete sites versus landscape corridors

When costs or opportunity costs are mentioned here, these are not literal costs that the State may pay, or a direct monetary cost to an industry that may also be considering utilization of the same land. Direct monetary values were avoided (such as tax valuation) due to their ability to skew the results. Instead, in keeping with a directive of biologically based inputs, costs were based on non-economic inputs. For example, Prime and Unique Farmland Soils were used as a cost layer in heavily agricultural sections of the state instead of land values. Land value data is generally only available at a resolution of civil townships (36 square mile blocks or greater), while soils data are mapped at a very fine resolution of 100 feet. Yet, using soils data does provide some indications of the economic implications of protecting land. Prime and Unique Farmland Soils are considered the most productive within the state, and are most likely already under cultivation or likely to be converted to cultivation. Typically, these soils have a higher market value since they are so productive and generate more crop revenue. Other data layers that were used in other parts of the state were land cover within the greater Twin Cities metropolitan area, and School Trust Fund lands within northeastern Minnesota. Land cover data was sorted by the amount of impervious surface, with those land cover types exceeding 4% impervious considered to be indicative of urbanization and high acquisition costs. However, this approach still allowed for the selection of conservation sites within urbanized areas, but typically little buffer would be selected due to its higher cost if the adjacent areas were urbanized. Likewise, in northeastern Minnesota, School Trust Fund Lands are dedicated as income-generating lands for school districts and are generally not suitable for use as an SNA, which would restrict uses such as logging or mining.

The Commissioner's Advisory Committee assisted with target-setting and input determination. One of the metrics that it determined was to not lock in or lock out cells. Locking cells in would always include those cells even if there might be a more efficient result without them. An example of a cell to consider locking in would be existing SNAs, as they are already part of the network. Locking cells out would always exclude those cells. An example of cells to lock out would be highways or areas of urban development that provide virtually no potential for important native habitat. By not locking cells a strictly biologically-based result is generated. By locking cells, the software may go to great lengths to include or exclude those cells at the expense of including other biologically important sites. Future work may test an alternative to this approach to exclude all SNA and other state, federal, and conservancy land so that acquisition opportunities are further highlighted outside of existing public lands.

Marxan will try to avoid selecting cells that have high opportunity costs even if they contain rare conservation features, as this will drive up the total "cost" of the solution set. However, some conservation features are so rare that all locations must be selected regardless of cost. Either these features may be included at the expense of other less costly features, or their costs are so high that the

selection will be very specific, resulting in virtually no areas peripheral to the conservation feature being selected that could function in a buffering or connecting capacity.

One of the most useful functions of Marxan is its ability to sort through different layers of inputs and constraints to generate results at a desired level of aggregation. Marxan also has a “clumping factor” input that allows the project to generate results with highly segregated priority areas, or to find the optimal way to create landscape-level “clumps” of conservation areas. The latter approach was selected as an adaptation strategy set forth in climate change assessments. **This is explained starting on page 20.**

## Conservation Prioritization Results

The Marxan decision support system was used to create the Conservation Prioritization Results map (Figure 4) that rates the geographic areas that contain the state's range of biodiversity most efficiently. Please note that a very large portion of northern Minnesota has not been mapped yet. Minnesota Biological Survey is not complete in this region. Once entire subsections have been mapped, Marxan prioritization will be performed.

The mapped outputs from the Marxan areas of conservation priority are shown in Figure 4.

- dark green matrix = very low priority
- light green = low priority
- yellow = moderate priority
- orange = high priority
- red = highest priority
- white = MBS not complete; Marxan will be run when data are available.
- lavender = areas that have been surveyed and for which preliminary data will be forthcoming.

The high priority conservation areas (depicted in orange and red) were mapped in the following geographic areas:

- Glacial Agassiz Beach Ridges
- Agassiz Peatlands
- Minnesota River Valley
- Coteau des Prairie Escarpment
- Lower Mississippi River
- Lower Cannon Valley
- Whitewater Valley
- Upper Root River Valley
- Anoka Sand Plain
- Central sands and hills region
- Glacial Lakes of central Minnesota
- St. Croix River
- Nemadji Uplands
- North Shore of Lake Superior
- Arrowhead Highlands

The results have grouped together high priority areas for conservation at a landscape scale, giving a good indication of how corridors could be based on high priority core areas. These results correlate well with other plans and prioritization such as the Prairie Plan. The high priority cores give good guidance for considering sites that have conservation features warranting protection. It can later be determined whether any potential corridors or other conservation partners are within the scope of the SNA Program to procure.



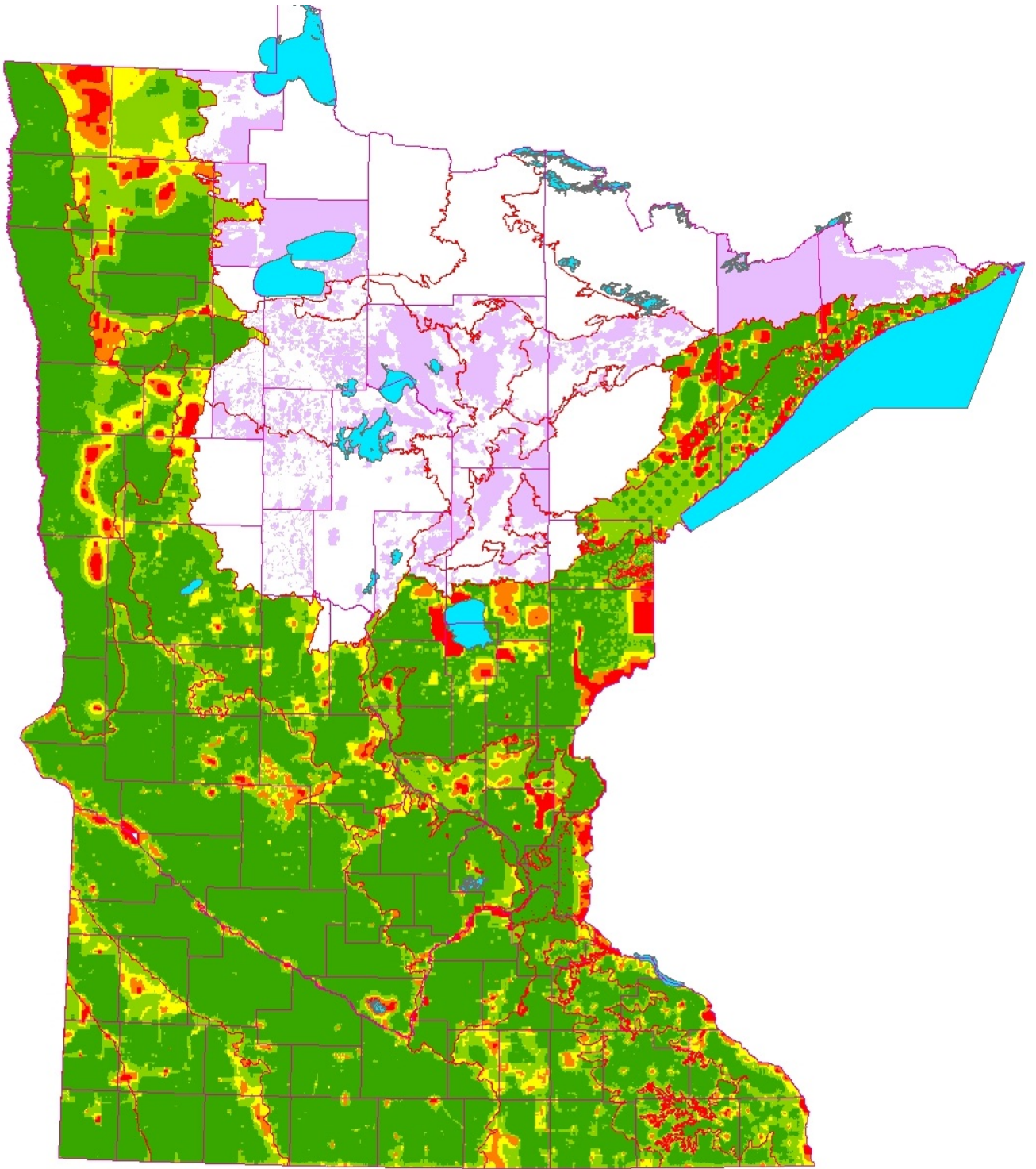


Figure 4. Conservation Prioritization Results

# Conservation Opportunity Areas

## Introduction

The Conservation Prioritization Map (Figure 4) is useful at a statewide scale for showing conservation needs across subsections, sections, and provinces. However, having a way to implement SNA conservation planning at a regional scale, and ultimately at a local level enables the on-the-ground implementation of the SNA Strategic Plan. This section will focus on the methodology chosen for regional implementation through Conservation Opportunity Areas (also referred to Opportunity Areas or Areas below).

Opportunity Areas are a way of further defining the Marxan high priority aggregations as discrete planning areas to focus for conservation efforts. These areas are selected for their capacity to provide the following:

- Significant rare resources, native communities, natural features, or biodiversity significance
- Partners that are willing to plan, implement, and evaluate conservation actions
- Conservation that is motivated by an agreed-upon conservation purpose and set of objectives
- Contributions to a conservation network that provides pathways for species mobility, which is particularly critical when addressing climate change concerns

Opportunity Areas were only developed for the ECS subsections that had complete MBS data coverage. These Opportunity Areas are detailed in Part 2 of the SNA Strategic Plan.

Sites possessing features worthy of SNA status would receive a higher level of consideration for acquisition if they are located within an Opportunity Area. Likewise, an Area can become a basis for seeking out and identifying opportunities that may exist so that a conservation network can be pursued instead of reactively purchased as land acquisition prospects arise.

It should be noted that while these Areas have special importance in conserving Minnesota's natural heritage, not all rare features or communities occur within this set of locations, and restricting conservation actions to these areas will not necessarily maintain viable populations of all species. *Nor is it the goal of the SNA Program to acquire all or even most of the territory circumscribed within each Area.* Opportunity Areas highlight where conservation actions should be focused.

During the review of the draft of this document, concerns were expressed about the intentions of the Opportunity Areas in that a greater amount of significance had been placed on their boundaries than was warranted. Since the objective is to capture significant conservation features that occur within the COAs, and not to acquire all land within COAs, the planning team initially believed that delineating COA boundaries was worthwhile. However, feedback from reviewers included concern that these boundaries implied acquisition areas in which all lands should be acquired for fee or easement. Therefore, the boundaries are muted.



## Process

Initially, the boundaries of Conservation Opportunity Areas were drawn to capture the high and highest-priority areas (orange and red zones) from the Marxan output, and in many cases the moderate priority areas (yellow zones). This provided a base area for each Opportunity Area. Additional information layers were added to see how well the Marxan outputs protected rare or diverse conservation features, such as the National Land Cover Data set, the Element Occurrences of Natural Heritage rare features, Ecological Evaluations, and areas of biodiversity significance. Land cover was used as a layer to look at connectivity within high priority areas. This was particularly helpful in areas such as southeastern Minnesota, where strong landform patterns created by ridges and valleys can be used to provide connectivity. Ridges and floodplains are frequently cultivated, but valley side slopes also form a network that provides native forest or goat prairies that provide better species connectivity than cropped lands. Mapping workshops were held with a variety of DNR staff to refine the Opportunity Areas. In most regions, some boundary adjustments were made to include conservation features. Infrequently, an entirely new area was added and a few areas were removed.

## Results

To date, 84 Conservation Opportunity Areas have been mapped within the 16 subsections where MBS data have been completed. Each of the 16 subsections has at least 3 Opportunity Areas. They range from 1,242 to 409,677 acres, with an average size of 85,655 acres or 133 square miles. Typically Opportunity Areas have a greater extent than the Marxan high priority areas, but it should be noted that the high priority areas were used to estimate future needs for the SNA Program.

Opportunity Areas were sometimes left deliberately unconnected to a neighboring Area if they had distinctly different geologies, landscapes, or major community types (e.g. peatland versus hardwood forest). Any particular Opportunity Area may contain diverse native plant communities. While these distinctions may be subtle in some cases, it allows for Opportunity Areas to be considered as a planning entity that addresses common concerns with regard to acquisition and management. Opportunity Areas were named using a dominant landscape feature. Naming them reinforces an identity that may be helpful in building community support and generating partnerships.

The Opportunity Areas closely approximate the High- and Highest Priority Areas [explained on page 34](#), and therefore align closely with core areas identified in planning efforts, such as the Minnesota Prairie Conservation Plan. They are clustered around critical Minnesota landscapes such as the Glacial Beach Ridges and the Minnesota River Valley. Figure 5 illustrates the location of the Conservation Opportunity Areas and their relationship to the Marxan high priority areas.

## Implementation

Each year, efforts will be initiated to identify and pursue important sites within a handful of the Conservation Opportunity Areas (COA). Using the COA descriptions in Part 2 of this Plan, SNA staff and partners will engage local governments and groups in targeted COAs to identify the best candidates as

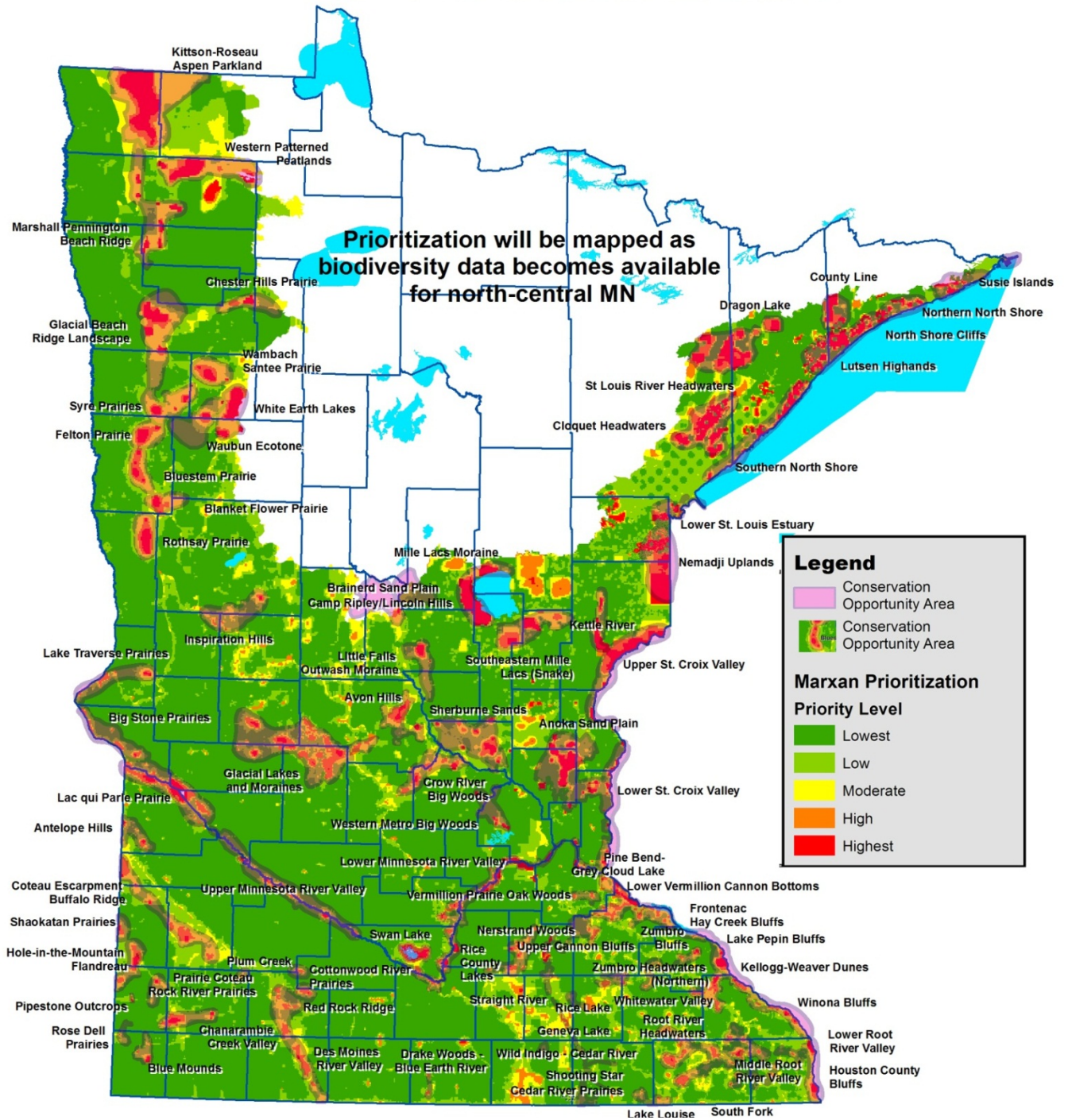




potential SNAs. Landowners and land administrators will be approached to ascertain their interest. In many COAs, this process of engagement and cultivating interested landowners/manager is something that is developed methodically and respectfully.



# SNA Land Acquisition Strategic Plan: Opportunity Areas and Conservation Prioritization Areas



**Figure 5. Opportunity Areas and Conservation Prioritization Results**



## SNA Candidate Site Evaluation Guide

Individual sites will be evaluated through a finer filter using the SNA Candidate Site Evaluation Guide, developed at part of this Plan. To make parcel decisions, a number of site-specific factors need to be reviewed, evaluated, and scored systematically. This could not be done at a landscape scale, though the landscape scale analysis and planning are incorporated into the evaluation of each candidate site. It is not within the scope of this document to evaluate individual candidate sites. The SNA Candidate Site Evaluation Guide (also called the Site Evaluation Guide) will provide a finer level of prioritization that may be particularly useful when determining how funds should be allocated.

To be considered, the site needs public access, a landowner willing to sell, and an Ecological Evaluation that recommends designating as an SNA. Once it has met these three initial criteria, additional factors are evaluated with the guide.

Each of six metrics (as described below) awards full or partial scores based on the site's characteristics and how well the site meets the requirements of that metric. Each metric may award a maximum of 15 or 20 points, with a minimum of 0 points. Six classification levels are provided to guide the reviewer in scoring of the site. The matrix was designed to have a maximum score of 100. The guide was "beta-tested" on a number of known sites by several evaluators. While some minor variations in total scores occurred, in general, site scores were consistent and results differentiated higher priority candidates. Very few sites scored higher than 80 points. This was still useful, so that only a very few sites of extreme biological and/or geological importance would stand out from other sites that are worthy of designation. Most sites achieved scores between 60 and 80 points that are under consideration for acquisition. Sites between 50 and 60 points are considered of marginal importance, and would need a compelling reason to continue consideration. Sites below 50 points are generally not pursued further. The lowest site score was 30 points.

A copy of the Site Evaluation Guide is included in Figure 6.

### ***Metric 1: Diversity and quality of native habitat***

Parcel score: up to 20 points. This metric evaluates a site's contribution to the Subsection's biodiversity. Sites receive a high score if they contain an area of Outstanding Biodiversity Significance, or the majority of the site has B-ranked or higher element occurrence ranking. Sites receive progressively lesser scores until a site only has D-ranked communities, or only has "below threshold" biodiversity significance. While this metric is focused exclusively on biodiversity, some concern may exist that biodiversity is already factored in as a primary input of Marxan. However, a number of other inputs are made into Marxan that generates a mapped output that incorporates aggregation factors and opportunity costs to find an optimal way to group conservation areas, which is different than solely using biodiversity data. Also, not only is biodiversity important at a landscape scale, it is a strong indicator of value at a parcel level.



## ***Metric 2: Habitat for rare species and under-protected plant communities***

Parcel score: up to 20 points. This metric Addresses species that are federally or state threatened or endangered. The documented presence of listed species at a candidate site qualifies for the highest scoring, as does the site with a native plant community that is missing from other SNA holdings within the Subsection. The next most important ranking would be for habitat for a federally-listed species, regardless of whether the species is present. Other factors that would provide this level or ranking would be sites with priority habitat or key habitat as identified by the State Wildlife Action Plan. Sites that provide an additional occurrence of a rare species or a native plant community (toward meeting the objectives of 3 occurrences of each species and five of each plant community per ECS subsection) also qualify for the second highest scoring category. Sites with species of Special Concern qualify for the third category. And finally, abutting properties with any listed species or five Species in Greatest Conservation Need qualify the candidate site for the category providing the lowest ratings.

## ***Metric 3: Size***

Parcel score: up to 15 points. This metric considers the size of the parcel and the sizes of the native plant communities occurring within it. If the parcel is large, or the plant community area is significant for that type of plant community, the site warrants a highly-ranked score. Moderately sized parcels or native plant communities receive a moderate score.

## ***Metric 4: Location and connectivity***

Parcel Score: up to 15 points. This metric considers proximity to other areas. Candidate sites are superimposed on the Conservation Prioritization Map and the core and corridor areas from the Minnesota Prairie Conservation Plan to assess their proximity to these conservation areas. If a site is located within a red or orange Marxan zone, or within a Core area of the Prairie Plan, it would receive the highest score. If a site abuts another conservancy land or is within a Prairie Plan corridor it would receive the next highest score, as it would provide connectivity to other conservation lands. Sites within a yellow prioritization Marxan area would receive a medium ranking, and as sites became more distant from Marxan or Prairie Plan priority areas they would receive diminishing points up to a distance of 10 miles, at which distance no points would be awarded.

## ***Metric 5: Management needs***

Parcel Score: up to 15 points. This metric addresses the extent to which the parcel helps the SNA Program in addressing habitat and property management. Sites that currently have no or minimal invasive species management needs would score the highest, as would sites that provide access and connectivity for management for existing conservation areas. Connectivity is important for management activities as it allows for a singular effort that covers a broader area. This is particularly helpful for conducting prairie burns, reducing exposure to invasive species from edge effect, and reducing potential impacts from management actions to off-site properties. As a parcel requires greater or long-term efforts to eradicate invasive species already present, remove buildings, wells, debris, or



other structures, or significant reconstruction of native plant communities, the scoring may be reduced to zero.

### ***Metric 6: Additional factors***

Parcel Score: up to 15 points. This metric addresses factors that warrant consideration that may not apply to every site, or are less easily grouped into a metric of its own. The first is whether the parcel is in jeopardy through acquisition by another party, or of development—particularly if it contains high ranking native plant communities. If the site is in a region experiencing the development of sand, gravel, or mineral mines, rapid urbanization, or conversion to cropland, the site may warrant awarding additional points to increase its score. In addition, a site may receive points for containing geological features of statewide significance, or has a landowner that is willing to donate a large portion of the site to the SNA Program.





## Related Planning Efforts

Conservation of Minnesota's natural areas and natural heritage are addressed in a number of other plans. This Plan has identified several efforts directly related to the SNA Strategic Land Protection Plan (SNA Strategic Plan). These plans reinforce each other and will help lead to cooperative conservation of natural areas. The Minnesota Climate Change Vulnerability Assessment is explained in starting [on page 21](#). The plans or planning initiatives discussed below are:

- Statewide Conservation and Preservation Plan
- Minnesota Prairie Conservation Plan
- Strategic Conservation Agenda
- Conservation that Works
- State Wildlife Action Plan
- Strategic Land Asset Management

### Statewide Conservation and Preservation Plan

The *Statewide Conservation and Preservation Plan (SCPP)* (2008) is an integrated inventory and assessment of Minnesota's environment and natural resources. It helps guide decision-makers on future short and long term planning, policy, and funding investment. The Legislative-Citizens Commission on Minnesota Resources (LCCMR) commissioned the University of Minnesota's Institute on the Environment to prepare the SCPP. The SCPP contains recommendations in four categories: habitat, land use, transportation, and energy. The Habitat section contains 13 recommendations. Of particular interest are Recommendation 1: *Protect priority land habitats*; and Recommendation 3: *Improve connectivity and access to outdoor recreation*.

The SCPP prioritizes geographic areas across the state for conservation and preservation. It states:

*Conservation and protection of these land areas will require multiple mechanisms and a coordinated effort among local, county, regional, state, and national public agencies; nonprofits; and private entities. Of particular importance are rare land features and areas such as native prairie and savanna ...*

*Focus protection on the critical lands the SCPP has identified by township (Figure H16). Within most highly ranked townships, use detailed analysis to identify specific land parcels for purchase, for development of permanent easements ... (probable range: <1% to 3% of additional Minnesota land). High-priority examples include native prairie, savanna, old-growth forest, and areas that add to or provide linkages between large, intact ecosystems.*

(pp. 63 & 66, *Statewide Conservation and Preservation Plan*, 2008).



The SCPP integrated 12 weighted sets of geographic data on land use and resources, including biodiversity significance, potential species richness, road and housing density, etc., to develop a statewide “Integrated Terrestrial Value Score” map rating each township in the state.

Under Recommendation 3: Improve connectivity and access to outdoor recreation, the SCPP states:

*Action should be taken to improve connectivity of and access to outdoor recreation areas (parks, natural areas, wildlife management areas, etc. ...*

*Prioritization for acquisition, protection, and restoration of the natural resource base that supports outdoor recreation should focus on large, contiguous land areas suitable for: natural resource-based outdoor recreation; shorelands; threatened habitat areas with opportunities to improve connectivity to underserved areas; ...*

*(pp. 74 & 76, Statewide Conservation and Preservation Plan, 2008).*

### Implications for the SNA Strategic Plan

These statements of emphasis within the Statewide Conservation and Preservation Plan are consistent with the approach advocated in the SNA Strategic Plan. Furthermore, the two maps (below) from the SCPP (which have reverse coloring from each other) warrant comparison. In particular, the resulting pattern of highly scored areas on the “Integrated Terrestrial Value Score” map on the left correlates with the Conservation Prioritization Map in the SNA Plan.

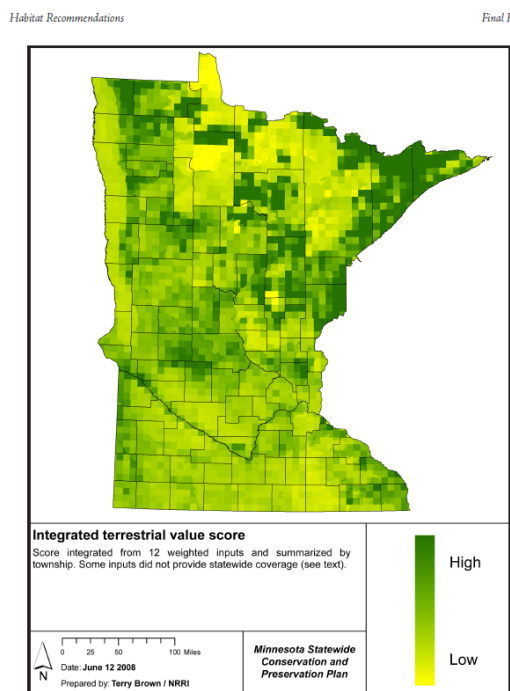


Figure H7. Integrated terrestrial value score. Credit: Terry Brown, NRRI.

**Figure 7. SCPP H7. Integrated Terrestrial Value Score**

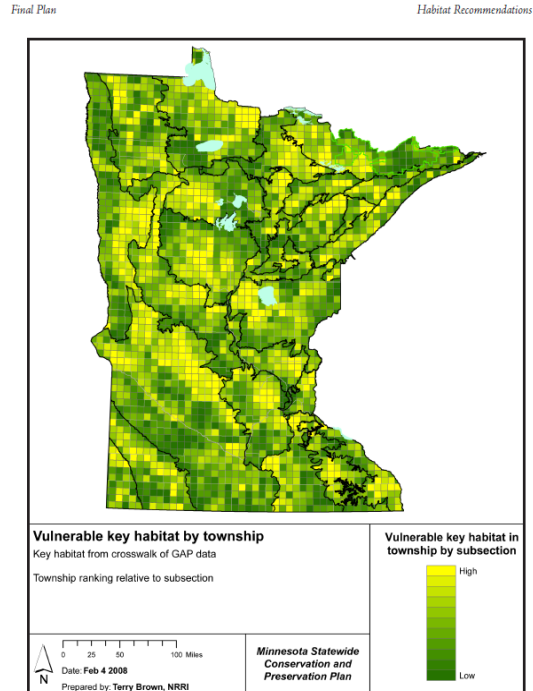


Figure H16. Vulnerable key habitat by township. Credit: Terry Brown, NRRI.

**Figure 8. SCPP H16. Vulnerable Key Habitat by Township**





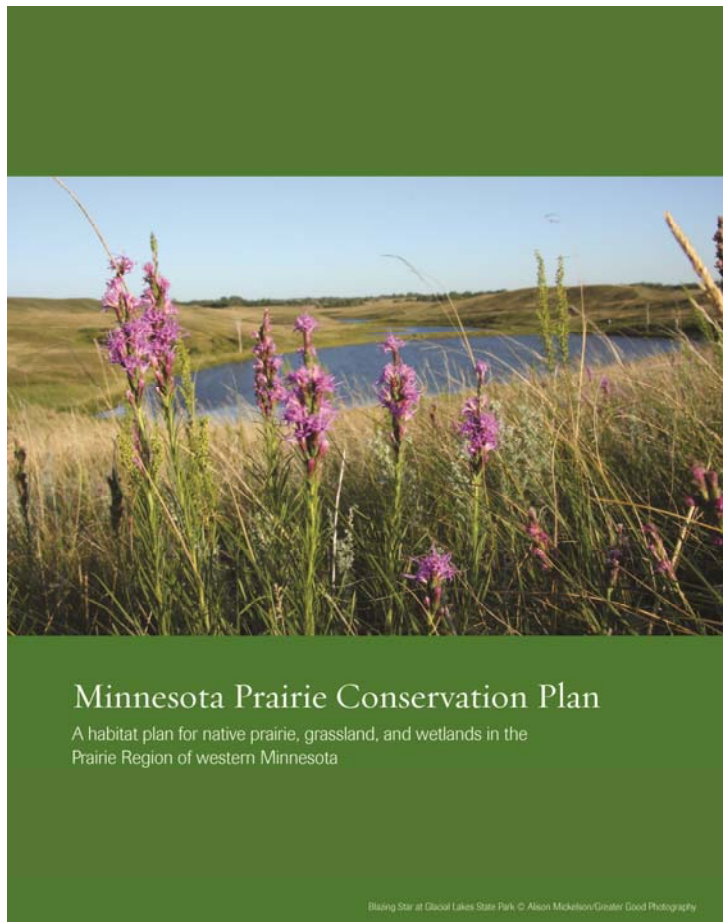
## Minnesota Prairie Conservation Plan

The *Minnesota Prairie Conservation Plan* (Prairie Plan) was a multiagency collaborative effort among the DNR, MN Board of Water and Soil Resources, The Nature Conservancy, U.S. Fish and Wildlife Service, MN Prairie Chicken Society, Pheasants Forever, and The Conservation Fund. These conservation partners in the Prairie Region of the state collaborated to develop a twenty-five year strategy for accelerating prairie, grassland and wetland conservation. This strategy was precipitated by several factors:

1. Continuing loss and degradation of prairies, grasslands, wetlands and associated habitats along with the fish and wildlife dependent upon them.
2. An acknowledged need to better coordinate between programs and organizations to maximize efficiency.
3. Tremendous opportunities provided by the passage of the Clean Water, Land and Legacy Amendment by voters in 2008 that will provide significant conservation funding through 2034.

The Prairie Plan calls for three approaches to conservation in the Prairie Region of the state. First, core areas with a high concentration of native prairie, other grasslands, wetlands, and shallow lakes were identified. Within these core areas, partners will work to ensure a minimum of 40% grassland and 20% wetland with the remainder in cropland or other uses. Second, habitat corridors connecting core areas were designed that include grassland/wetland complexes nine square miles in size at about six mile intervals along and within the corridors. Within the corridor complexes a goal of 40% grassland and 20% wetland was set. For the remainder of the corridors 10% of each legal land section is to be maintained in permanent perennial cover. Third, in the remainder of the Prairie Region a goal to maintain 10% of each Land Type Association in perennial native vegetation was established.

The existing wildlife management area plan, plans targeted at pheasant and ducks, and other resource plans provided guidance in setting goals for protection, restoration and enhancement in each conservation approach. The Prairie Plan is an umbrella plan that draws from these program and species plans, but does not replace them.



Based on this framework and background, the Prairie Plan proposed the following:

1. Permanent protection through the acquisition from willing sellers of fee title or easement of native prairies, wetlands and other habitats (including land to be restored): about 222,100 acres in core areas, 82,000 acres in corridors, and 547,300 acres elsewhere.
2. Restoration activities in grasslands, wetlands and other habitats: 180,900 acres in core areas, 84,100 acres in corridors, and 251,000 acres elsewhere.
3. Enhancement of prairies and grasslands via prescribed fire, conservation grazing, haying and invasive species control: 100,560 acres annually in core areas, 42,050 acres annually in corridors, and 334,397 acres elsewhere. Enhancement of 335,047 acres of existing wetlands and shallow lakes through control of invasive species and intensive water level management is also included.
4. Incorporation of conservation into “working lands” so that some conservation lands contribute directly to local economies via “grass-based” agriculture and agricultural lands in turn provide some natural resource benefits as a result of using the full range of conservation practices.

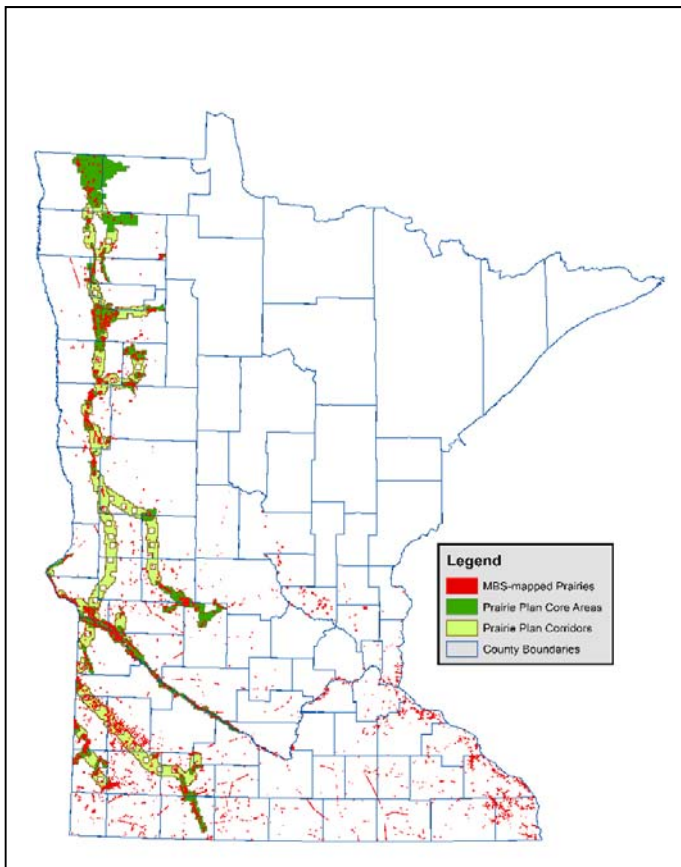


Figure 9. Prairie Plan Core Areas and Corridors

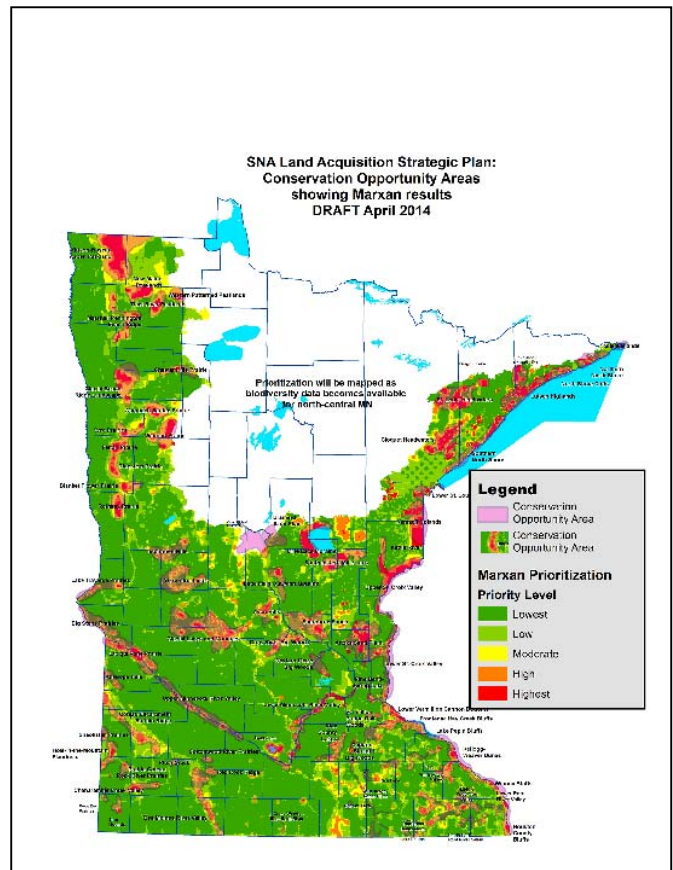


Figure 10. Conservation Opportunity Areas



### *Implications for the SNA Strategic Plan*

The Prairie Plan has set conservation targets for upland prairie, wet prairie, brush prairie, savanna, and wetlands. However, while it promotes the conservation of all native plant communities within the Prairie Province, it has not set specific conservation goals for other woodlands, forests, or wetlands, nor has it mapped prioritization areas for those landscapes. In comparison, the SNA Strategic Plan has prioritized areas based on their biodiversity significance regardless of whether they are prairie, forest, or wetland. Therefore the SNA Plan identified more areas than the Prairie Plan does.

However, even though the SNA Plan addresses non-grassland biomes, the priority areas identified in both plans are strongly correlated. The Prairie Plan established Core Areas and Corridors that prioritized the same geographic areas that the SNA Plan's Conservation Prioritization Map identified. Areas such as the Coteau Escarpment, Minnesota River Valley, Glacial Beach Ridges of the Red River Valley, and the Aspen Parklands of eastern Kittson County are present in both plans.

Since both plans have closely-aligned results and recommendations, partnering opportunities are greater for both efforts. The SNA Program is actively participating in implementing the Prairie Plan through its Local Technical Teams. Furthermore, the SNA Program already has a strong partnership with The Nature Conservancy (TNC), and many sites are protected through the combined efforts. In addition, TNC has utilized SNA's Conservation Prioritization Map (Marxan) and Conservation Opportunity Areas as part of its long-range planning.

## **DNR's Strategic Conservation Agenda and Conservation That Works**

The DNR *Strategic Conservation Agenda* provides a foundation for communicating three trends that shape DNR's mission and conservation strategies. It also described 83 performance indicators and conservation targets DNR uses to measure and communicate progress. Specifically, the number of sites protected in SNAs is one of its Natural Lands indicators.

*Conservation that Works* (CTW) is the DNR Senior Managers strategic priorities and goals that complements the *Strategic Conservation Agenda*. Version 2 of CTW describes the four goals and major strategies to be implemented between 2011 and 2014. The first two goals most directly support habitat conservation under the state Outdoor Recreation System.

*Goal 1. Minnesota's waters, natural lands, and diverse fish and wildlife habitats will be conserved and enhanced. Strategies include the following:*

- *accelerate and better target prairie landscape conservation*
- *strategically conserve forests and improve forest planning processes*
- *adapt programs to respond to changing climate ...*

*Goal 2. Minnesota's outdoor recreation opportunities meet the needs of new and existing participants so that all feel connected to nature.*



### *Implications for the SNA Strategic Plan*

Continuing SNAs as key indicator of conserving natural lands is in line with the SNA Plan. Consideration could be given to measuring acres rather than numbers of sites in SNA as a better indicator of progress. This is particularly true given more emphasis on fewer, larger SNAs.

CTW's Goal 1 clearly gives priority to protection of natural lands through SNAs and other Programs. While strategies refer to both prairie and forest, together with the Prairie Plan, near term emphasis for new land protection efforts is on the prairie. The SNA Plan's inclusion of climate change and resiliency meshes with the departmental strategy. Regarding CTW's Goal 2, as part of the Outdoor Recreation System, SNAs clearly strive to connect people to nature. While not within the scope of this Plan, specific strategies are engaging more people with SNAs.

## **Strategic Land Asset Management**

The DNR has initiated Strategic Land Asset Management (SLAM) with representation from all land-managing parts of the DNR, including the SNA Program. SLAM has three desired outcomes:

- *Optimizing the value of DNR's land asset portfolio. Conserving the right lands in the right places.*
- *Improving working relationships with local governments, the legislature, and partner organizations.*
- *Increasing efficiencies in managing DNR lands.*

Department leadership has adopted the following six state level goals for SLAM:

- *Protection of significant natural resources (such as rare resources, groundwater resources, habitats)*
- *Targeted conservation of MN's prairie-grasslands*
- *Consolidation of land ownership, creating larger, more contiguous blocks of DNR lands*
- *Improved access to existing land holdings*
- *More close-to-home outdoor recreational opportunities*
- *Meeting our fiduciary responsibilities on Trust Fund lands*

In 2013, the SLAM Integration Team developed the "Department Decision-making Framework for Prioritizing Lands to Acquire, Sell, or Exchange" with three primary purposes:

- *to help move the department toward more strategic acquisitions that complement our existing public lands and help us achieve our mission,*
- *to assure that the department continues to regularly assess our portfolio of lands in the future and make any necessary improvements, and*
- *to ensure effective, efficient and timely interdisciplinary participation in land asset decisions.*



In 2014, the Department is refining procedures to prioritize land transactions and to measure progress towards meeting SLAM goals. SLAM is also investigating using GIS-based decision support software to identify lands on a state scale that contribute towards each of the SLAM goals.

### *Implications for the SNA Strategic Plan*

The SNA Strategic Plan is very much in line with SLAM – from SNA’s state level prioritization to use of a parcel evaluation system and form. Through SLAM each DNR land-managing program is being encouraged to develop spatially defined priorities, the SNA Conservation Prioritization Map (Marxan) is being held up as a model of this. While SLAM is exploring using the Zonation decision support software rather than Marxan, how the results compare to those in the SNA Strategic Plan will benefit both efforts. Improvements to SNA’s process for identifying and prioritizing specific lands for acquisition also contribute to both the SLAM and SNAs. As part of future SLAM work, the SNA Program will also be developing a process and criteria for assessing possible disposition (sales or exchange) of its lowest priority lands.

## **State Wildlife Action Plan**

A State Wildlife Action Plan (SWAP) or State Comprehensive Wildlife Conservation Plan/Strategy is required for any state to qualify for monies from the federally-funded State Wildlife Grants program. The State Wildlife Grants Program provides federal grant funds for developing and implementing programs that benefit wildlife and their habitats, including species not hunted or fished. Priority is placed on projects that benefit Species in Greatest Conservation Need (SGCN). These species are defined as animals whose populations are rare, declining, or vulnerable to decline and are below levels desirable to ensure their long-term health and stability. Grant funds must be used to address conservation needs such as research, surveys, species and habitat management, and monitoring, identified within a SWAP.

An approach that different states have used in the development of their SWAPs is the development of Conservation Opportunity Areas as the module of planning. Opportunity Areas provide landscape scale levels of conservancy. Sometimes Opportunity Areas can encompass much larger areas of over 100 miles. SWAPs in other states, such as in Nebraska, sometimes encompass conservation areas (called Biologically Unique Landscapes by Nebraska) that encompass thousands of square miles by establishing priority landscapes that could conserve the majority of the state’s biological diversity.

The DNR Division of Ecological and Water Resources is responsible for Minnesota’s State Wildlife Action Plan (SWAP). The first Minnesota SWAP (completed in 2006) is a strategic plan focused on managing populations of SGCN. Minnesota is updating its SWAP with the revision due in September 2015 as part of the 10-year federally-required revision process.

### *Implications for the SNA Strategic Plan*

In the SNA Strategic Plan, Conservation Opportunity Areas were developed to be smaller and more local in scale than those developed through other states’ SWAPs. Some of this is a function of how

Opportunity Areas are used within SWAPs and how they are used within the SNA Plan. Within SWAPs, the focus is on enhancing biodiversity by managing Species in Greatest Conservation Need. For example, some of these species may have suitable habitat that follows Appalachian ridges for over 100 miles. In Minnesota, land fragmentation, abrupt changes in surface geology, water bodies, and climatic zones tend to reduce the viability of large conservation zones. Marxan has been used by some states to map the core areas of Opportunity Areas within their SWAPs.

While the use of Marxan and Opportunity Areas provides a parallel process for plan development in SWAPs and the SNA Strategic Plan, these planning efforts are not duplicative. In the SNA Plan, biodiversity significance is a primary input into the “coarse filter.” Marxan then provides results that delineate high priority areas. However, these areas are not intended to capture every biodiversity site of significance. Smaller sites that may merit protection are too small to warrant their own COA. Within SWAP, the strategy is to map priority habitats of Species in Greatest Conservation Need (SGCN), overlay the results for multiple SGCN within a taxon (e.g. birds, mussels), and then use Marxan to derive a connectivity analysis to determine the best solution. The focus in SWAP is to create a taxon-specific priority habitat prioritization, versus looking at the general biodiversity significance.

The Minnesota 2014-15 SWAP update, while still focusing on particular taxa, is utilizing Marxan in its analysis. The results may inform future iterations of the SNA Plan.

## Implementation

The primary purpose of the SNA Strategic Plan is direct to the protection of natural areas through designation of Scientific and Natural Areas. This Plan has identified goals, objectives and targets calling for additional lands to be designated as SNAs.

This section of the Plan lays out the strategies and processes by which designation of SNAs will work towards implementing this Plan. The section starting on page 58 addresses the necessary role partners, landowners, and managers that also play a role in conserving natural areas, biodiversity, and rare natural resources. These partners not only are vital as owners and managers of their own natural areas, but they often provide great assistance to SNA implementation.

### Overview of Purpose and Establishment of SNAs

As part of the state Outdoor Recreation Act, Scientific and Natural Areas are explicitly intended to protect and perpetuate in an undisturbed natural state those natural features which possess exceptional scientific or educational value (MS 86A.05, Subd. 5). SNAs are established by DNR Commissioner's Designation Order. Each designation order identifies the lands designated, the natural resource values the SNA is designated to protect, and allowed public uses. By statute (MS 84.033), SNAs can be designated on lands acquired through purchase or gift by the DNR, in fee title or conservation easement, and on lands leased by the DNR. An SNA can also be established as a secondary unit on other DNR-administered lands in the State Outdoor Recreation System. Finally, the peatland SNAs were designated by the Minnesota Legislature through statute (MS 84.036). State law and policies provide a very high level of protection of SNAs. The priority in state management and use is to perpetuate the SNAs' ecological values with particular emphasis on sustaining native plant communities and rare features.

### Targeting Lands for SNAs

This Plan provides the tools to be used by the SNA Program in identifying and targeting lands as potential SNAs. Each year, efforts will be initiated for a handful of the Conservation Opportunity Areas. Using the Opportunity Area descriptions in Part 2 of this Plan, the SNA staff and partners will engage local governments and groups in targeted Opportunity Areas to identify the best candidates as potential SNAs. Landowners and land administrators will be approached to ascertain their interest. In many Opportunity Areas, this process of engagement and cultivating interested landowners/managers will take years.

Prospective parcels will be assessed using the SNA Candidate Site Evaluation Guide. Parcels will be further pursued that meet SNA requirements, have a willing landowner, rate well using the SNA Candidate Site Evaluation Guide, are recommended as an SNA in an existing or planned Ecological Evaluation report, and will be able to provide public access.



## Acquisition

New SNAs and additions to existing SNAs will primarily be achieved through acquisition of land. Most new SNAs are expected to be fee title acquisition rather than conservation easement or lease. Landowners of qualifying sites are contacted by the SNA Program to determine their interest in selling or donating their land. Acquisition may only be from willing landowners and is highly dependent on funding appropriated by the Legislature. When landowners donate land, not only can that land become an SNA, but the donation generates an equal amount of Reinvest in Minnesota funds to be used to acquire SNAs.

A few DNR-administered School Trust Fund lands contain unique natural area features. If it is in the interest of the Trust, the SNA Program will seek to pay for the value of selected Trust lands, remove the Trust status and transfer administration to SNA. This is done through the DNR acquisition process, including an appraisal of the value of land that must be paid to the Trust.

Acquisition of SNAs (whether by purchase or donation) will follow the DNR's official acquisition process. Prior to moving forward, an acquisition that meets SNA requirements (above) must have its funding identified and departmental approvals made. Each acquisition is dependent upon securing funding for landowner payments, transaction costs, and SNA Program direct costs (staff time and expenses necessary to complete the acquisition as well as costs for developing and publishing designation orders). Before moving forward, an acquisition must also have regional and divisional approvals as per the Strategic Land Asset Management procedures.

Approved and funded proposed acquisitions will be pursued following procedures outlined in DNR Operational Order #6 "Land Acquisition Procedures" and SNA Program Operational Directive #101 "SNA Acquisition and Designation." This may take a year or more. Once the acquisition is complete the property is designated as SNA through a Commissioner's Order published in the State Register.

## Designation of SNAs on Lands Owned or Administered by Others

Some lands targeted as priorities for protection of natural areas are likely to be already in public ownership or owned by organizations dedicated to conservation. The SNA Program is very interested in exploring land protection options with the administrators of these lands. In particular, the Program is interested in opportunities to designate SNAs on these lands where mutually beneficial.

Lands already owned or administered by the DNR (other than school trust fund lands) may become an SNA as a secondary unit in the State Outdoor Recreation System or their administration may be transferred to the SNA Program through a Transfer of Administrative Control (TAC). Responsibility for lands now owned or administered by another state agency may be transferred to the DNR and become an SNA through a Transfer of Custodial Control (TCC). By law, SNAs may be designated on lands where the DNR's ownership interest is a conservation easement or lease, with the fee ownership being





retained by another public or private owner. Typically, SNA designation is considered a higher level of protection than other forms of ownership in the state.

When such projects are of potential mutual interest, they will be pursued following procedures outlined in SNA Program Operational Directive #102 “SNA Designation of Lands Owned or Administered by Others.” After a TAC, TCC, conservation easement or lease is executed, the property is designated as SNA through a Commissioner’s Order published in the State Register. The specific responsibilities and procedures involved with these approaches to designation are outside the scope of this Plan.

## Management and Use of SNAs

Protection of an SNA’s natural features is just beginning with the action of designation as an SNA. Natural features need ongoing monitoring and management to protect them from damage by invasive species, trespass, or inappropriate uses. This may include using management practices such as prescribed burning to simulate natural disturbances necessary to sustain some ecosystems and posting of boundary signs. Public use of SNAs is aided by modest parking areas, interpretive signs, and public outreach and education.

Once sites are designated as SNAs, responsibility for their administration and management belongs to the SNA Program. Funding and staff resources are necessary to meet standards for SNA restoration, enhancement, and development. The SNA Program greatly relies on partner organizations and a network of volunteer site stewards to help care for SNAs.

The SNA Program administration is directed by DNR Operational Order #29. The Operational Order authorizes creation and use of the *SNA Program Administrative Handbook* to contain a series of operational directives. The *SNA Program Administrative Handbook* (under development) will contain four sections (or chapters) as follows: (1) Land Protection and Acquisition (including directives on naming conventions, land divestiture, etc.); (2) Natural Resource Restoration and Management (including directives on seed collection and use, control of invasive species, prescribed burning, etc.); (3) Facility and Public Use Management (including directives on signs, parking facilities, site clean-up, etc.); and 4) Administration and Coordination (including directives on management plans, conservation easement stewardship, site stewards and volunteers, etc.).

## De-Designation of SNAs

In a vast majority of situations, the protection of resources through SNA designation is expected to be in perpetuity (i.e., as long as the State of Minnesota owns and manages land). Inevitably, infrequent situations will arise in which the natural resources no longer exist that the SNA was designated to protect. This may occur due to natural or ownership issues. For example, a lease allowing SNA designation may be terminated. Climate change and uncontrollable invasive species may so substantially alter and degrade a site’s habitat that it no longer qualifies as an SNA.

In such cases, the SNA Program needs to have a process for removing SNA designation from a property (i.e., de-designation). This requires a public hearing and Commissioner’s Order de-designating all or a portion of an SNA. An SNA Program Operational Directive on “Changes in SNA Designation and Divestitures” is proposed. When this happens, the DNR will strive to find a more appropriate public land managing entity or a conservation buyer.

## Partners in Conserving Natural Areas

The conservation of natural areas depends on their ownership and management. These special places may be protected by virtue of their ownership when laws or policies are in place specifically protecting the natural area values. This protection can occur through acquiring the land in fee (full land ownership) or by acquiring a conservation easement putting conditions on the land to protect its natural area values. Typically, the owner of a “protected” natural area is a unit of government or a conservation organization. How well the natural area values are sustained will depend on the purposes for that ownership as well as the management practices for that type of land. In addition, state and federal law limit the destruction of the listed endangered and threatened species.

The future of natural areas and rare natural features depends upon conservation across all ownerships. Individuals and organizations across all ownerships are strongly encouraged to use this Plan to do their part in conserving the state’s natural areas and rare resources.

This section of the Plan discusses how land protection and other conservation tools implemented by a range of landowners and managers can work towards sustaining natural areas. How these programs or partners compare with SNA designation is indicated. This discussion is not all-inclusive.

## Other DNR Natural Area Conservation Tools and Lands

### Native Prairie Bank

The SNA Program is responsible for Native Prairie Bank conservation easements. Through Native Prairie Bank, the DNR acquires a partial ownership interest from the landowner who retains the underlying fee title ownership. By statute (MS 84.96), to qualify to be a Native Prairie Bank easement, the land must be native prairie that has never been plowed and has no more than 10% tree cover. The landowner agrees to manage the land under an easement in ways that protect the native prairie in exchange for an upfront, one-time payment.

To date, all Native Prairie Bank easements are permanent. Each easement is tailored to the unique character of the land and desires of the landowner, with common protection features, such as no plowing or building on the native prairie. The easement leaves fee ownership in the hands of the property owners who may continue to enjoy it, manage it as part of their working farm, sell it, or pass it down to heirs. However, the easement remains in place between the State and all present and future



landowners. The SNA Program takes an active role in managing these easements' native prairie, including prescribed burning and removal of trees and brush encroaching on the prairie. About 107 Native Prairie Bank easements protect about 8600 acres.

#### *Comparison to SNA*

NPB cannot be used on all habitat sites, even including places such as savannas with native prairie grass understory and over 10% tree cover. The level of protection and ownership status is similar between NPB and SNAs in which DNR's ownership is limited to a conservation easement. However, NPBs are not part of the Outdoor Recreation System providing public access. State law also provides SNAs with some higher level of scrutiny in environmental review due to proposals such as transmission line crossings.

### **Natural Area Registry**

The SNA Program maintains the Natural Area Registry (NAR) of registered public sites that are managed to protect rare features and related natural resource values. The Division of Ecological and Water Resources (EWR) enters into a Natural Area Registry agreement with another division of the DNR or another state, federal, or local unit of government for sites to be managed to protect native plant communities and rare features. The NAR agreement identifies the site, explains its significance, describes a proposed management direction, and states that before any management contrary to that direction may occur, the parties who signed the agreement will discuss that proposed management activity.

The intention of a NAR agreement is to protect the site's native plant communities, populations or concentrations of rare species, or critical animal habitat, and to guide land management towards protection of those resources. In conjunction with forest certification on DNR lands, department policy calls for NARs to be developed for each identified Representative Sample Area in order to protect targeted native plant communities. About 42 NAR agreements guide conservation of native plant communities and rare resources on about 7770 acres.

#### *Comparison to SNA*

NARs are considered a non-binding voluntary agreement rather than a permanent level of protection. NARs are not explicitly authorized in statute and thus are vulnerable to changing administrations and reductions in funding to administer them.

### **Parks and Trails**

The DNR Division of Parks and Trails (PAT) is responsible for development, administration, and management of the following state lands within the state Outdoor Recreation System. Of these, state parks and state recreation areas (totaling about 230,000 acres) provide the primary opportunity for conserving natural areas.



- 24 multi-use state trails
- 76 state parks and recreation areas, 8 waysides, and 56 state forest campgrounds and day use areas
- Over 1,550 public water access sites
- 360 fishing piers and shore fishing sites
- 33 water trails with over 4,400 miles of paddling opportunities

PAT has a Natural Communities Restoration and Management Program whose purpose is to improve the quality of natural plant communities, wildlife habitat, and regional landscape integrity, enhancing the recreation experience and raising awareness of the state’s natural heritage. Program responsibilities include the following:

- Identify, preserve and manage natural plant communities.
- Minimize construction damage and vegetate disturbed areas with native plants that are ecologically appropriate for the area.
- Interpret natural plant communities and management practices to the recreating public.

#### *Comparison to SNA*

State Parks have higher levels of recreational use and greater expectation and authorization for developed recreational facilities. State Recreation Areas are typically intended for more intense recreational use (and facilities). State Parks and State Recreation Areas are constrained in protecting dispersed natural resources since they may only acquire land within their statutory boundary.

#### **State Forests**

Minnesota's 58 state forests (comprising about 3.1 million acres) are units under the state Outdoor Recreation System established to produce timber and other forest crops, provide outdoor recreation, protect watersheds, and perpetuate rare and distinctive species of native flora and fauna. The DNR applies multiple-use management including timber harvesting, reforestation, wildlife habitat improvement, and recreational development. Wildlife management includes creating permanent openings in the forest to produce forage for white-tailed deer and planting shrubs to produce seeds and berries to benefit birds. The DNR also protects the forest and surrounding areas from wildfires. Within state forests, old growth forest designation and forest certification are leading to more explicit conservation of natural areas on targeted stands of native plant communities (see below).

#### *Comparison to SNA*

State Forests are actively managed for multiple purposes with focus on producing commercial forest products. A greater array of recreational uses is allowed on state forests including trails for motorized use in some areas of the state.



## **Other Forestry Administered Lands**

The DNR Division of Forestry also administers about 700,000 acres other state lands owned in fee that are outside of State Forests. A majority of this land (and some within State Forests and Wildlife Management Areas) is administered by the Department for the School Trust Fund. The state's obligation in managing School Trust Lands is to maximize the long term financial benefit of these lands to school districts of the State.

In addition, the Division of Forestry administers 38 permanent conservation easements on 351,000 acres through the Forest Legacy and Forests for the Future Programs. The purpose of these easements is to protect environmentally important private forests threatened by conversion to non-forest uses. The landowner retains fee ownership and can continue activities such as timber management, recreation, hunting, and hiking as long as they do not conflict with the terms of the easement. The easements range from smaller remnants of native Big Woods Forest in southeastern Minnesota to large tracts of industrial forest land managed for timber production in northern Minnesota.

### *Comparison to SNA*

School Trust Fund Lands must be managed for long term income generation; all other values of these lands are secondary to financial obligations to the trust. Forestry conservation easements generally allow active forest management and may or may not allow public access and motorized use as dictated in the particular easement terms.

## **Wildlife Management Areas**

Wildlife management areas (WMAs) are part of state Outdoor Recreation System established to protect those lands and waters that have a high potential for wildlife production, public hunting, trapping, fishing, and other compatible recreational uses. A total of about 1,440 WMAs encompassing 1.29 million acres are administered by the Section of Wildlife within the Division of Fish and Wildlife. WMAs contain over 65,000 acres of native prairie – an estimated 28% of all remaining native prairie in Minnesota and over half the acres of native prairie in public ownership.

WMAs are the backbone of DNR's wildlife management efforts in Minnesota. Much of the wildlife managers' work is directed toward protecting and enhancing wildlife habitat on WMA lands. For instance, grasslands are planted to provide prime nesting cover critical to waterfowl and pheasant production. Wetlands are restored and enhanced to benefit waterfowl and other wetland wildlife species. Prescribed burning is done to maintain grasslands, prairies, and brush lands is important to sharp-tailed grouse and prairie chickens. Forest openings and regeneration projects benefit ruffed grouse, wild turkeys, deer, and moose. Wildlife food plots are managed to feed both resident and migratory wildlife. Woody shelter belts are planted to provide winter cover and nesting sites for upland birds and a variety of nongame species as well.



### *Comparison to SNA*

Wildlife Manager Areas may be actively managed for wildlife food and cover and using water control structures and other management practices to favor game species. State law also provides SNAs with some higher level of scrutiny in environmental review due to proposals such as transmission line crossings.

### **Aquatic Management Areas and Trout Streams Easements**

The Fisheries Section of the Division of Fish and Wildlife administers two types of land which protect some riparian and aquatic natural areas. First, Aquatic Management Areas (AMAs) are part of the state Outdoor Recreation System established to protect and manage shoreland habitat, lakes, rivers, streams, and adjoining wetlands that are critical for fish, other aquatic life, water quality, fishing, and non-motorized public uses. Currently, 915 AMAs protect over 42,760 acres and 980 miles of shoreline.

Second, the DNR has established over 545 miles of public fishing conservation easements along Minnesota's trout streams. Generally, easement corridors encompass 66 feet of land and water on either side of the centerline of the stream. Easements permit angler access, provide corridor protection, and allow the DNR to conduct habitat improvement activities if needed. Landowners retain ownership of the land and all rights not restricted by the easement.

### *Comparison to SNA*

AMAs and Trout Stream Easement are not explicitly intended to protect terrestrial natural areas, but rather are predominantly to provide or support fish populations and fishing activities. Most often they are limited to riparian corridors. The Fisheries Section also does not typically have the staff resources or expertise oriented to conserving terrestrial native habitats (e.g. prescribed burning, buckthorn control, etc.).

### **High Conservation Value Forests**

Forest lands in State Forests and WMAs are the focus of DNR's efforts to provide certified forest products through dual certification from the Forest Stewardship Council and the Sustainable Forestry Initiative. In particular, forest certification requires the DNR to identify high conservation value forests (HCVFs) as "*areas of outstanding biological or cultural significance*" to be managed for rare species, communities, and features. The Department's interim HCVF approach is to (1) manage all Minnesota Biological Survey (MBS) Outstanding Sites as interim HCVFs, (2) manage all MBS High Sites as interim HCVFs until a subset of high sites are identified, and (3) conduct an analysis to identify which high sites will be managed as HCVFs in the long-term.



### *Comparison to SNA*

HCVF is a management status reinforced forest certification rather than a form of permanent protection of natural areas. It is based on DNR policy rather than legislative direction and thus is vulnerable to changing administrations, priorities, and funding.

### **Old Growth Forest**

The DNR has designated “Old Growth Forest” status on about 44,000 acres of DNR administered lands. Old-growth forests are natural forests that have developed over a long period of time, generally at least 120 years, without experiencing a severe, stand-replacing disturbance: a fire, windstorm, or logging. Designated old-growth forest is protected as long as they maintain their old-growth characteristics. In order to sustain these forests’ rare habitat for plant and animal species and to protect their structural complexity and unique natural characteristics, old-growth forests are managed within the context of the larger forest landscape. Management of old-growth forests and adjacent lands may involve prescribed burning for forest types that require natural disturbance processes for tree regeneration, control and removal of exotic species, monitoring damage due to blowdowns, designing special harvest plans for lands around and between old-growth forests, conducting research in old-growth and old forests, and monitoring changes in old-growth forests compared with harvested forests.

### *Comparison to SNA*

Old growth is a management status reinforced forest certification rather than a form of permanent protection of natural areas. It is based on DNR policy rather than legislative direction and thus is vulnerable to changing administrations, priorities, and funding.

### **Other Units of Government and Tribal Lands**

Lands owned and managed by other units of government and tribal entities contain a high percentage of the state’s natural areas and habitat for rare species. For example, nearly all of the Nett Lake Peatland are lands managed by the Bois Forte Band of Chippewa.

Local units of governments (county, township, and city) play a key role in conserving and managing natural resources. Of particular note are those park and open space systems which explicitly protect natural areas managed for the native habitat values. Examples of these are the City of Duluth Natural Area system, the park reserves of several metropolitan counties (such as Three Rivers Park District), and county natural area protection programs (such as in Dakota and Washington Counties). Extensive areas in some northern counties are managed by their land commissioners primarily for timber production and revenue, but also with natural resource conservation such as when these county lands have forest certification.



Reinvest in Minnesota conservation easements held by the state Board of Water and Soil Resources are largely agricultural lands without native plant communities. Nonetheless, statewide, their easements protect over 1,700 of native prairie.

### *Comparison to SNA*

The authority of other governmental units to permanently protect natural areas is highly variable. In some cases, their status is based on policy rather than state law or local ordinance and thus is vulnerable to changing administrations, priorities, and funding. Lands protected through permanent conservation easements may be similar to SNAs in which DNR's ownership is limited to a conservation easement, but ONLY if the easement's conservation values and easement terms (restrictions) are the same as SNAs. This is usually not the case. Also, most easements do not provide for public access.

### **Federal Lands and Easements**

Several federal agencies are key players in conserving natural areas in Minnesota, including the following.

The U.S. Department of Agriculture (USDA) contains the Forest Service which manages two national forests. The Forest Service establishes Research Natural Areas (RNAs) within national forests to help protect biological diversity at the genetic, species, ecosystem, and landscape scales. The Superior National Forest, comprising 3 million acres, includes four established RNAs protecting 2100 acres, and the Boundary Waters Canoe Area Wilderness containing over 1 million acres which is largely undisturbed natural habitat. The Chippewa National Forest is over 660,600 acres and contains 4 RNAs protecting 1900 acres. Several dozen proposed or candidate RNAs have also been identified in Minnesota. Also, within the USDA is the Natural Resource Conservation Service holds perpetual Wetland Reserve Program (WRP) easements intended to protect, restore, and enhance wetlands. Nonetheless, WRP easements in Minnesota protect over 3,300 acres of native prairie.

Federal ownerships administered by the U.S. Department of Interior's National Park Service contain significant natural areas and habitat for rare species, including the 218,000 acre Voyageurs National Park and the St Croix Wild National Scenic Riverway. This protects over 255 miles of river shore in Minnesota and Wisconsin (including federal land ownership plus many federally-held conservation easements).

The U.S. Fish and Wildlife Service (USFWS) administers 13 federally-owned National Wildlife Refuges in Minnesota totaling more than 216,000 acres. These are managed to provide habitat for populations of fish and wildlife, including game and rare species. The USFWS also manages more than 273,000 acres of Waterfowl Production Areas and wildlife habitat conservation easements. WPAs conserve habitat for waterfowl, shorebirds, grassland birds, plants, insects and wildlife. Federally owned WPAs also provide public access for wildlife-dependent recreation such as hunting, wildlife watching and photography.



### *Comparison to SNA*

U.S. Forest Service RNAs have similar purposes as SNAs, but are based upon policy and may not be as permanent as SNA designation. Thus they may be vulnerable to changing administrations, priorities, and funding. The BWCA is also somewhat similar to SNAs in purpose, but with less resource management needs and issues. Some uses differ, e.g., in the allowance of camping, campfires, etc. within the BWCA. The Voyageurs National Park has some traits of State Parks (see above) and some of SNAs. Lands protected through permanent conservation easements by federal programs are typically not oriented towards protection of native plant communities and rare features. They are not likely managed for those purposes and have little or no staff resources or expertise oriented to conserving native habitats (e.g. prescribed burning, buckthorn control, etc.). Lands administered by the USFWS are more similar to WMAs with Areas may be actively managed for wildlife food and cover and using water control structures and other management practices to favor game species.

## **Private Conservation Organizations**

Private, non-profit organizations with a natural resource conservation mission are key in protecting native habitat by being landowners, conservation easement holders, or in helping public agencies acquire conservation lands.

Private, non-profit organizations have gifted or assisted in the acquisition of many SNA sites. The Nature Conservancy (TNC) has donated many sites that are SNAs. TNC also owns all the land leased by the DNR and designated as 14 SNAs, comprising about 5400 acres. Other non-profit donors of SNAs include the Izaak Walton League and The Trust for Public Land (who also helps acquire many SNAs). Other non-profits also lead the restoration and enhancement of plant communities at many SNAs, including Friends of the Mississippi River and Great River Greening.

The Nature Conservancy also owns and manages 57 preserves in Minnesota comprising over 70,000 acres which are managed comparably to DNR SNAs. The Minnesota Land Trust is the largest non-profit holder of conservation easements in Minnesota – the purpose of many of those easements is to protect the property’s natural habitat values. However, sustaining the habitat depends on the landowners commitment and resources to undertake management such as invasive species control.

Many other non-profits also own and manage nature centers, wildlife habitat, campground/retreat centers, etc. which may contain native plant communities and rare resources.

### *Comparison to SNA*

The authority and level of commitment of private conservation organizations to permanently protect natural areas is highly variable. In some cases, their status is based on policy rather than legal constraints and thus is vulnerable to changing administrations, priorities, and funding. Lands protected through permanent conservation easements may be similar to SNAs in which DNR’s ownership is limited



to a conservation easement, but ONLY if the easement's conservation values and easement terms (restrictions) are the same as SNAs. This is usually not the case. Also, most easements do not provide for public access. Functionally, TNC Preserves are very similar to SNAs, but without the same legal standing and level of protection.

## **Conservation By Private Individuals/Landowners**

Many of the state's most outstanding natural areas and unique natural features are owned by private individuals and families. These include people who are very dedicated conservationists who intend to continue to own and manage their land indefinitely. Their work is very important and is highly commended. This Plan is intended to help inform and inspire private landowners to conserve their native plant communities and rare features on their lands. Some forms of landowner assistance are available through the DNR and volunteers such as Master Naturalists. Landowners interested in protecting their lands natural resources in perpetuity can contact The Minnesota Land Trust about a conservation easement or any number of conservation organizations about other land protection options.

### *Comparison to SNA*

Conservation by individuals is generally voluntary rather than a permanent level of protection. Individuals and families may have a very high level of commitment. But that may change when the land changes hands through sale or inheritance or if the owner's financial or health situation changes. Lands protected through permanent conservation easements may be similar to SNAs in which DNR's ownership is limited to a conservation easement, but ONLY if the easement's conservation values and easement terms (restrictions) are the same as SNAs. This is usually not the case. Also, most easements do not provide for public access.



## Conclusions and Future Work

This interim version of the SNA Strategic Land Protection Plan provides the state and its partners with specific tools to use in protecting natural areas and places with rare resources. A science-based methodology prioritizes areas of biodiversity significance at a state scale. Conservation opportunity areas focus the work of the SNA Program and partners on the highest priority landscapes rich in natural areas and rare species. A site specific evaluation tool scores the suitability and priority of candidate parcels for SNA designation.

The methodologies used require reasonably complete ecological survey data to be most effectively applied. Therefore, landscape level priorities have been identified throughout the state in those subsections where the Minnesota Biological Survey has completed their survey, plant community mapping, and biodiversity area delineation work.

### Future Work

As Minnesota Biological Survey work is completed, the SNA Plan will be updated, including the eight ecological subsections in north central Minnesota not completed in this interim plan. Marxan analysis will identify the priority areas which would most efficiently protect the biodiversity and native communities. Then Conservation Opportunity Areas will be defined in these subsections. As additional ecological survey work is done in other parts of the state, results may be refined for those areas as well.

### Additional Input Layers

Marxan can use a variety of data as inputs. Polygons, or data mapped in a continuous surface, are most commonly used. However, point data can also be used. Therefore, data, such as rare species and element occurrences (contained in Biotics and the Natural Heritage Database) could also be considered as primary inputs along with biodiversity significance and S1-S2 ranked plant communities. However, caution is needed. Using data types that are too closely related may cause a result that is *auto correlated*, i.e. the data inputs take on greater importance than they should since they have been essentially duplicated in the input process. As an example, Species in Greatest Conservation Need contain endangered, threatened, and special concern species. To use both layers could introduce repetitive importance to these data.

### Additional Revisions to the Marxan Approach

Marxan was used to develop a biologically-based priority of conservation areas. Primary conservation inputs were biodiversity significance and state-ranked plant communities. Threat inputs were minimized, and only one primary opportunity cost type was used for each subsection. However, as discussion evolved through the planning process, a number of stakeholders expressed the interest in seeing how the prioritization would respond to removing lands already protected.



The current approach did not deduct a parcel's value if it were already within State or conservancy ownership. This was done for several reasons: (1) to achieve a purely biologically-based result, where each parcel is prioritized by how it contributes to an optimal solution set of conservation features, regardless of ownership; (2) to compare the results to other planning efforts by other entities; (3) to consider how further conservation actions on existing public lands or other ownership types; and (4) to aid Strategic Land Asset Management which is addressing sales and exchanges of DNR lands as well as acquisitions.

A future optional approach would be to either "lock out" existing state, federal or conservancy lands from the solution set or setting their opportunity costs at a high level. Then Marxan will look elsewhere to find parcels that more satisfactorily or efficiently solve the solution set. This method would prioritize sites outside of state, federal, or conservancy ownership, and would identify new opportunities. However, this may also steer solutions toward sites that are more isolated, and a more broken-up solution set is created instead of one that creates massed prioritization areas at a landscape scale. A massed solution may provide better utility for species migration, reduced edge effect, and may provide more partnering opportunities when multiple partners have a common interest in the same opportunity area.

On the other hand, using a locking out approach may redirect attention to new focal areas that have been overlooked by previous planning efforts. This is one of the intentions of Marxan, to see how responses to inputs create new relationships and linkages. The value of Marxan's ability to illustrate how systems can be developed is not to be underestimated. Adapting this tool to different prioritization scenarios is a highly appropriate way to utilize it.

## **Extending the Reach of this Plan**

This Plan is a tremendous resource for anyone interested in conserving natural areas, places of biodiversity, and rare resources. Other organizations and individuals are urged to apply the results of the Plan in their own work. The Conservation Opportunity Areas are intended to be foci of collaborative efforts and multiple approaches to land protection.

Within the DNR, the Plan will feed into interdisciplinary Strategic Land Asset Management and will lead to conversations about providing higher levels of protection to rare resources within state ownership. Its implementation will be coordinated with the State Wildlife Action Plan. The Plan and its methodologies are intended to be shared.

## References

Department of Natural Resources, State of Minnesota, 2013. Climate Change Vulnerability Assessment, Draft Version.

Nature Conservancy, The, 1992. Extinct Vertebrate Species in North America. Unpublished Draft List, Alexandria, Virginia.

Wilson, E.O., 1992, The Diversity of Life. Belknap Press, Harvard University Press, Cambridge, Massachusetts.

