Chapter 5

An Ecological Assessment of Species in Greatest Conservation Need in Minnesota

Chapter 5 is the heart of *Tomorrow's Habitat for the Wild and Rare: An Action Plan for Minnesota Wildlife* (referred to in this document as Minnesota's Comprehensive Wildlife Conservation Strategy or CWCS). It begins by presenting an overview of the ecology of Minnesota, then scales down to the state's four Ecological Classification System (ECS) provinces, and then down further to the 25 ECS subsections (see Figure 5.1). The statewide overview describes Minnesota's history and ecology. The province-level information provides a more detailed description and assessment of the species in greatest conservation need (SGCN), their key habitats, and the ecological patterns that arise at this level. The 25 subsection profiles, organized alphabetically within each of their respective provinces, provide similar but more detailed information about SGCN and key habitats as well as priority conservation actions.

The CWCS stakeholders—biologists, conservation planners, and other natural resource professionals—work at a variety of levels to sustain Minnesota's species in greatest conservation need. Given this fact, the information provided in this chapter is relevant to people working at multiple conservation scales and can be approached from a number of ways, ranging from interest in a particular SGCN or key habitat to information specific to a geographic location.
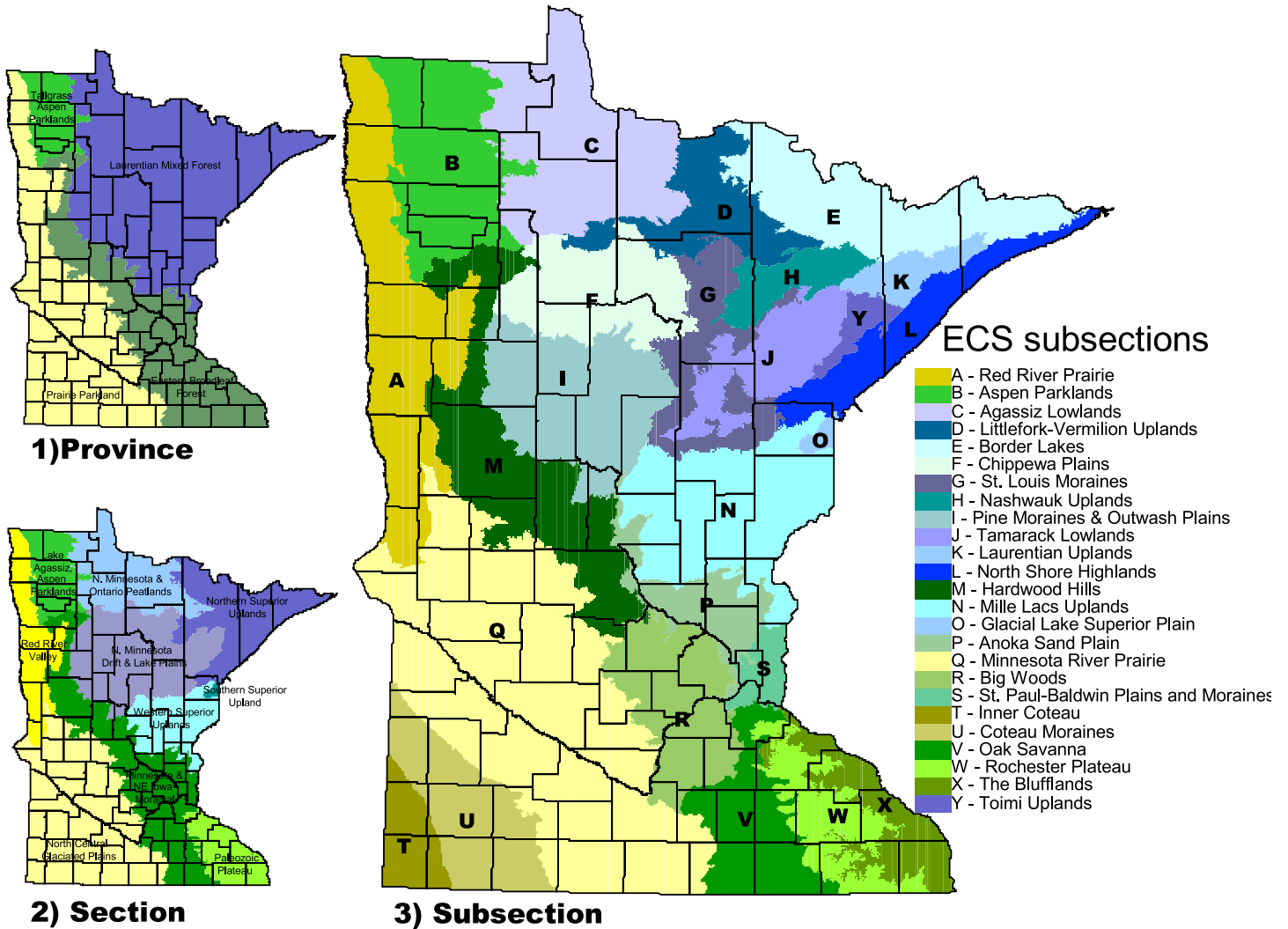
Minnesota's Ecological Classification System (ECS) was developed by the Minnesota Department of Natural Resources and the U.S. Forest Service for ecological mapping and landscape classification. This ecological land classification hierarchy is used to identify, describe and map progressively smaller areas of land with increasingly uniform ecological features. The system uses associations of biotic and environmental factors, including climate, geology, topography, soils, hydrology, and vegetation. There are eight levels of ECS units in the United States; the CWCS focuses on two, province and subsection. Provinces are units of land defined using major climate zones, native vegetation, and biomes such as prairies, deciduous forests, or boreal forests. There are four Provinces in Minnesota. Subsections are units within the provinces that are defined using glacial deposition processes, surface bedrock formations, local climate, topographic relief and the distribution of plants, especially trees. Minnesota has 25 subsections.

Province Summaries and Assessments

Although the information used to develop conservation actions and priorities was generated at the subsection level, much of it can be scaled up to the province level to provide a different perspective. This overview of the four provinces provides summary information about SGCN by province, including the number and percentage of SGCN unique to each province and the number and percentage of SGCN using at least one key

habitat. In the CWCS, key habitats are defined as those habitats that are most important to Minnesota's SGCN. Specifically, they have been defined as those habitats (1) used by the greatest number of SGCN, (2) changed the most over the past 100 years, (3) having a high percentage of habitat specialist SGCN, or (4) having been identified as important stream segments by The Nature Conservancy.

Figure 5.1. Ecological Classification System for Minnesota – Three Levels

1) Province

2) Section

3) Subsection

ECS subsections

A - Red River Prairie
B - Aspen Parklands
C - Agassiz Lowlands
D - Littlefork-Vermilion Uplands
E - Border Lakes
F - Chippewa Plains
G - St. Louis Moraines
H - Nashwauk Uplands
I - Pine Moraines & Outwash Plains
J - Tamarack Lowlands
K - Laurentian Uplands
L - North Shore Highlands
M - Hardwood Hills
N - Mille Lacs Uplands
O - Glacial Lake Superior Plain
P - Anoka Sand Plain
Q - Minnesota River Prairie
R - Big Woods
S - St. Paul-Baldwin Plains and Moraines
T - Inner Coteau
U - Coteau Moraines
V - Oak Savanna
W - Rochester Plateau
X - The Blufflands
Y - Toimi Uplands

While the province summaries are not as detailed as the subsection profiles, they can help guide management decisions at this coarser scale. Province-level information on land use, ownership, human population, and SGCN identifies patterns unique to this scale and sets the context for the subsection information.

Province-Level Summaries of Species in Greatest Conservation Need

Information about the numbers of SGCN in each subsection and SGCN unique to the subsection are provided for each province. The subsections are ranked by number of SGCN from highest to lowest. This ranking may help conservation stakeholders prioritize work within a province. For example, the number of SGCN (128) found in the Mille Lacs Uplands Subsection is substantially higher than in the other subsections in the Laurentian Mixed Forest Province and is a large proportion of the total 171 SGCN that potentially occur in this province. Thus, conservation stakeholders may decide to focus more efforts on this important subsection.

Summaries of Key Habitats

For each province, two tables summarize the key habitats in the subsections found in that province. The first table ranks the habitats by the frequency with which they are identified in the subsections as key habitats. For example, in the Eastern Broadleaf Forest Province, three habitats are key habitats in all seven subsections found in the province: Shrub/woodland-upland, nonforested wetlands, and headwater to large rivers. The second table ranks the subsections by their number of key habitats. For example, in the Eastern Broadleaf Forest Province, the St. Paul-Baldwin Plains Subsection has 10 key habitats, the highest number in the province, while the Rochester Plateau has five, the lowest number. This information can be used to help identify priorities at the province level, such as which subsections may require more resources because they have more key habitats.

Assessment of Species in Greatest Conservation Need and Key Habitats

This assessment identifies the number of species that use at least one key habitat at the subsection, province, and statewide scales and thus the species that potentially benefit from the key habitats approach. Subsections are ranked within each province by the percentage of SGCN that use at least one key habitat in that subsection. Statewide, 92 percent of SGCN use at least one key habitat. The provinces range from 87 percent of SGCN that use at least one key habitat in Tallgrass Aspen Parklands to 96 percent in the Laurentian Mixed Forest.

Subsection Profiles Overview

There are 25 subsection profiles in the CWCS, one for each ECS subsection in the state. The CWCS Technical Team scaled the plan to this level because it believes information about the subsections is meaningful for making decisions about SGCN and their habitats. The purpose of each of the subsection profiles is to identify key habitats and conservation actions called for during the next 10 years. This part of the plan is intended to help focus and coordinate the attention of the CWCS partnership in new and innovative ways.

Many of the analyses used to produce the subsection profiles are described in greater detail in chapter 7, Methods and Analyses. Without this analytical context, the material in the subsection profiles may seem dense and challenging.

Each subsection profile is six pages long and contains four major parts:
- Subsection Overview
- Species in Greatest Conservation Need
- Key Habitats
- Ten-Year Goals, Management Challenges, Strategies, and Priority Conservation Actions

Subsection Overview and Quick Facts

The subsection overview provides a general description of the major characteristics of the subsection, as well as a brief review of the historical and existing dominant vegetation communities and current land uses in the subsection.

The quick facts and land use/land cover pie chart provide general information regarding current land ownership patterns and land uses in the subsection. The information is based on the 2000 U.S. Census data for population density, Minnesota GAP Analysis Project Stewardship data for land ownership, and GAP Land Cover data for the land use/land cover pie chart. (GAP is a nationwide project coordinated by the U.S. Geological Survey and is aimed at setting priorities for protection of critical wildlife habitat. GAP brings together three critical data elements: vegetation maps, land ownership maps, and ranges of wildlife species.)

Species in Greatest Conservation Need

SGCN by Taxonomic Group Table

This table presents the species in greatest conservation need for each subsection by taxonomic group. This information was derived using the methods developed by the Minnesota GAP project's predicted occurrence modeling for the terrestrial vertebrate species. For aquatic and invertebrate species, the information was derived by consulting with species experts (see chapter 3 for further SGCN information). This table also compares the number of SGCN by taxonomic group to the total number of SGCN in the set. For example, the 16 reptile SGCN known or predicted to occur in the Blufflands Subsection represent 95 percent of all the reptiles in the SGCN set statewide. This information helps conservation stakeholders identify whether a subsection is relatively important for certain taxa.

Subsection Highlights

This section provides summary-level interesting facts relevant to species management goals and objectives, such as wildlife viewing opportunities and unique assemblages of SGCN. By no means exhaustive, the highlights nonetheless provide the reader with an understanding of some characteristic features of the subsection.

<u>Species Spotlight</u>

The species spotlight provides an in-depth view of one SGCN known to occur in the subsection. The species selected are often unique representatives of the subsection, whether they are endemic to that particular subsection, facing serious population declines, or serve as a flagship for other important SGCN in the subsection. Species chosen for the spotlights are not meant to represent all SGCN occurring in the subsection but are simply used to illustrate the variety of SGCN identified in the CWCS.

<u>SGCN Element Occurrences by Township Map</u>

This map, on the second page of each subsection profile, depicts by township the number of validated records of species in greatest conservation need since 1990. Records are based on data from the Minnesota County Biological Survey of animal species, the DNR fish survey database, the statewide mussel survey, and other validated records in the Rare Features Database of the Natural Heritage Information System. Some caution must be used in interpreting this map because the quality of information varies by location. Most important, the County Biological Survey has not yet surveyed some areas of the state. These areas should be cautiously and carefully compared to the ones that have been surveyed because a low number of occurrences may simply be an indication that no one has looked for the species, not that the area supports fewer SGCN. The intent of these maps is to prompt discussion among conservation stakeholders about the reasons for differences in SGCN abundance between townships. Possible topics for discussion would include:
1. The amount of available habitat
2. The quality of available habitat
3. The status of biological inventories
4. The inherent biological diversity of an area

Definitive answers to detailed questions that arise in the minds of conservation stakeholders about the information presented on these maps will require more in-depth field-based examinations.

Overlaid on top of the township maps are lands owned by public agencies and conservation-based organizations (primarily, but not exclusively, The Nature Conservancy). These data are from the Minnesota GAP stewardship layer.

<u>Species Problem Analysis</u>

The species problem analysis provides information on the types of problems SGCN face in the subsection (see chapter 7 for more detailed discussion.) This analysis shows that the overwhelming influence on species vulnerability and decline in every subsection is the loss or degradation of habitat.

Key Habitats—For Species in Greatest Conservation Need

Key habitats are defined as those habitats most important to the greatest number of SGCN in a subsection. Considered the heart of the subsection profiles, this section provides the rationale for why and how key habitats were selected by subsection. Five individual analyses were done to arrive at the key habitats to be targeted for conservation actions over the next 10 years. These analyses are described briefly on the third page of each profile and in greater detail in chapter 7. They are:
A: Terrestrial habitat use analysis
B: Specialist terrestrial habitat use analysis
C: Terrestrial habitat change analysis
D: Aquatic habitat use analysis
E: The Nature Conservancy/SGCN occurrence analysis

<u>Distribution of Key Habitats and Species Richness by Township Map</u>

This map, located on the fourth page of each subsection profile, shows how the key habitats array across the subsection. The source of this information varies by subsection. Native plant community maps created by the Minnesota County Biological Survey are used where available; otherwise, key habitats are identified from the Minnesota GAP Landcover. Native plant community maps provide an indication of high-quality habitat, whereas the GAP land cover habitat information gives no indication of quality. Key habitats identified from the GAP Land Cover overrepresent the habitat that is suitable for SGCN, so caution is recommended when interpreting this information. Information other than GAP land cover was available to assess the quality of grassland habitat for some of the subsections. These included two data sources developed by the U.S. Fish and Wildlife Service Habitat and Population Evaluation Team (HAPET): Grassland Bird Conservation Areas (GBCA) and grassland in their satellite derived landuse/landcover map. Grassland identified by the Twin Cities Metro Regionally Significant Ecological Areas (RSEA) was used for the St. Paul Baldwin Plains and Moraines subsection. Information on deep lakes is from the MN DNR 24k Lakes database, and for shallow lakes it is from the MN DNR shallow lakes program. Data used for rivers and streams are from several sources, which are identified in the individual subsection profiles.

The sources of data for the maps in the subsection profiles are identified in each individual profile. Detailed map references are located in Appendix K.

Key habitats are overlaid on a map showing the number of SGCN species (species richness) by township, based on occurrence information presented in the previous map, SGCN Element Occurrences by Township. Note that this map sums the number of different species by township, whereas the previous map presents the number of documented species records by township.

Especially in areas where native plant community data are not available, these species richness maps can help to locate areas that need further investigation of possible quality key habitats identified through the GAP land cover. Like the species occurrence map,

these maps are not intended to be definitive but rather are intended to inspire further exploration.
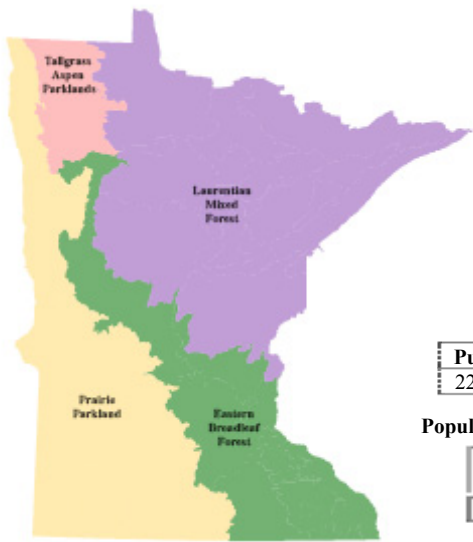
Subsection Habitat Percentages and Habitat Use by SGCN Taxa

This table describes all habitats present in the subsection, in descending order of percentage cover based on the 1990s land cover information. The habitats in boldface are the key habitats as identified by the key habitat analysis described above. The nonboldface habitats are not key habitats but are present in some amount in the subsection. In addition, SGCN use of all the habitats is described by taxonomic group, with the total of all SGCN by habitat listed in the last column.

Ten-Year Goals, Management Challenges, Strategies, and Priority Conservation Actions

Many of the priority conservation actions identified in this section are tailored to each subsection profile but are nevertheless quite broad in scope. These conservation actions describe the menu of possible actions for SGCN-related work. During implementation, these actions will be more clearly delineated through collaborative discussions among local managers in the CWCS partnership.
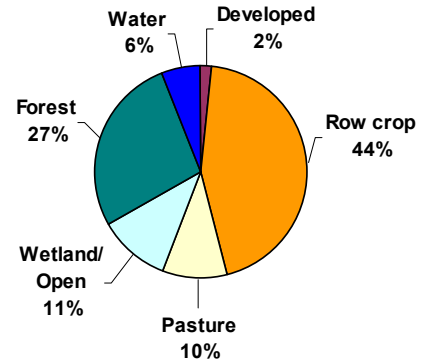
Minnesota

Current Land Use/Land Cover

- Water 6%
- Developed 2%
- Forest 27%
- Row crop 44%
- Wetland/Open 11%
- Pasture 10%

Quick facts

Acres: 54,006,738

Ownership

Public	Private	Tribal
22.8%	75.7%	1.5%

Population density (people/sq. mi.)

Current	Change (2000-2010)
75.0	+9.6

State Overview

Minnesota lies at the center of North America where three major biomes meet, the prairie, boreal forest and eastern deciduous forest. This unique location on the continent created a natural heritage rich in wildlife resources. From timber wolves in the north to timber rattlesnakes in the south, Minnesota's wildlife diversity is renowned. Minnesota's conservation community has been working to maintain and enhance this rich wildlife heritage that provides so many benefits to our economy, ecology, and society.

The Geology of Minnesota

Considered in geologic time, Minnesota's landscapes are dynamic and constantly changing. Long before historic human occupation, drastic changes occurred when massive sheets of ice pushed across the state. As these sheets of ice inched southward, growing as snow accumulated, they shaped Minnesota's four provinces.

When the glacial lobes began their retreat around 14,000 years ago, the resulting meltwater formed enormous rivers and lakes. The largest of these, Glacial Lake Agassiz, with a basin of almost 600,000 square miles, covered all of northwestern Minnesota at one time and was the largest glacial lake in North America. This lake began forming in the southern Red River valley 11,700 years ago and finally disappeared from the state around 9,000 years ago. During much of this period, the lake's northern outlets were barricaded by ice. Thus, its only outlet was the Glacial River Warren, which drained to the south and whose river corridor is visible today as the broad Minnesota River valley. As the ice continued to retreat, previously blocked northern drainage outlets gradually opened, and Lake Agassiz began to drain northward, as the Red River does today.

Water Resources

Minnesota is a water-rich area, where lakes, rivers, and wetlands abound. It is home to three major river basins: the Great Lakes–St. Lawrence River Drainage, the Hudson Bay Drainage, and the Gulf of Mexico Drainage. Within these three major drainage areas are 10 large watersheds. The Red River and Rainy River flow north to Hudson Bay. The Lake Superior Watershed flows east through the St. Lawrence River and then to the Atlantic Ocean. The remaining seven watersheds—the Minnesota River, Missouri River, Des Moines River, Upper and Lower Mississippi River, the St. Croix River, and the Cedar River—flow south by way of the Mississippi River to the Gulf of Mexico. Very little water enters Minnesota from streams originating in other states or Canada.

Minnesota's More Recent Past

The Native Americans encountered in the middle of the 17th century by Minnesota's first European explorers were heirs to varied cultural traditions that can be traced back at least 12,000 years. The first human inhabitants of Minnesota were most likely Paleo-Indians. These pioneers entered the state in small numbers as the lobes of the last major glacier, the Wisconsin, receded. In some areas, they seem to have been highly mobile gatherers and hunters who pursued big game such as bison, woodland caribou, mastodons, and mammoths. In more recent periods, native peoples probably relied more on farming, hunting, and harvesting wild plants.

In the past 200 years, Euro-American settlers arrived and spread throughout Minnesota, substantially changing the landscape. Increased agricultural activity in the 1800s meant the loss of vast tracts of native prairie, hardwood forests, and wetlands. On the heels of farmers came loggers, who harvested much of the northern forestland in the state by the early 1900s. Rivers and streams were dammed and channelized, altering the structure of their corridors, preventing the passage of some aquatic animals, and changing the natural rhythm of water levels. During this period, there was rapid population growth and major shifts in the settlement pattern from rural locations to urban centers.

T. Whitfield MN DNR

Dry prairie (foreground) and Minnesota's agricultural landscape (background) – Hardwood Hills Subsection

Today, Minnesota's landscape continues to change. Agriculture and forestry remain significant and important parts of the economy. Minnesota's urban centers are vibrant, and many continue to expand. The state's bountiful rivers, lakes, and wetlands continue to be pressured by development and population growth. In 2000, Minnesota's population was just under 5 million people and is projected to approach 6.3 million by 2030, a gain of 27 percent.

Amid the changes that continue across all of Minnesota's diverse landscapes are tremendous opportunities to improve the quality and diversity of habitats on both public and private lands for the benefit of people and wildlife. Working in broad partnership with residents and the conservation community, the CWCS is designed to conserve key habitats that will benefit the greatest possible number of species in greatest conservation need. With efforts like these in place, Minnesota's wildlife will continue to inhabit Minnesota's landscapes and enrich the lives of the people who live here.

Minnesota's Species in Greatest Conservation Need and the SGCN Problem Assessment

Out of almost 1,200 documented species of wildlife in Minnesota, there are 292 SGCN. Each of these 292 SGCN was evaluated to determine the factors influencing their rarity, vulnerability, or decline. Table 5.1 lists the nine problems, or factors, used in the analysis, and the percentage of SGCN for which each factor influences species vulnerability or decline. The results of the species problem analysis indicate that habitat loss and degradation are the most significant challenges facing SGCN populations. An assessment of the SGCN that potentially benefit from the key habitats approach shows that a substantial number of SGCN use at least one key habitat at the subsection, province, and statewide scales. Statewide, 92 percent of SGCN use at least one key habitat, and in the provinces the range is from 87 percent in the Tallgrass Aspen Parklands Province to 96 percent in the Laurentian Mixed Forest Province. The range in the subsections is from 51 percent to 98 percent (Table 5.2). All of these results suggest that the coarse filter approach for managing key habitats is likely to benefit a great number of the 292 SGCN in Minnesota.

Table 5.1. SGCN Problem Assessment for Minnesota

Problem	Percentage of SGCN for which this is a problem
Habitat Loss in MN	76
Habitat Degradation in MN	83
Habitat Loss/Degradation Outside of MN	24
Invasive Species and Competition	24
Pollution	32
Social Tolerance/Persecution/Exploitation	21
Disease	3
Food Source Limitations	3
Other	18

NOTE: The inverse of the percentages for each problem does not necessarily represent the percentage of SGCN for which the factor is not a problem, but instead may indicate that there is not sufficient information available to determine the level of influence the factor has on SGCN in the subsection.

Table 5.2. Statewide Summary by Subsection of Species That Use Key Habitats

Province	Subsection	Percent of SGCN using at least 1 key habitat	Total number of SGCN	Number of SGCN using at least 1 key habitat
Eastern Broadleaf Forest	Anoka Sand Plain	85.6	97	83
	Oak Savanna	87.1	93	81
	Rochester Plateau	88.3	94	83
	The Blufflands	89.1	156	139
	Hardwood Hills	92.9	85	79
	Big Woods	95.9	121	116
	St. Paul Baldwin Plains	98.0	149	146
Laurentian Mixed Forest	St. Louis Moraines	51.4	74	38
	Glacial Lake Superior Plain	56.4	55	31
	Littlefork Vermilion Uplands	68.7	67	46
	Agassiz Lowlands	76.1	88	67
	Nashwauk Uplands	80.0	60	48
	Border Lakes	81.2	69	56
	North Shore Highlands	82.1	84	69
	Toimi Uplands	84.6	52	44
	Tamarack Lowlands	85.5	69	59
	Pine Moraines & Outwash Plains	86.5	89	77
	Laurentian Uplands	87.9	58	51
	Chippewa Plains	89.2	83	74
	Mille Lacs Uplands	97.7	128	125
Prairie Parkland	Minnesota River Prairie	87.9	116	102
	Coteau Moraines	92.3	78	72
	Inner Coteau	93.6	78	73
	Red River Prairie	94.0	83	78
Tallgrass Aspen Parklands	Aspen Parklands	87.1	85	74

Minnesota's Four Provinces and 25 Subsection Profiles

Overview

There are four major ecological provinces in Minnesota: the Eastern Broadleaf Forest, the Laurentian Mixed Forest, the Prairie Parkland, and the Tallgrass Aspen Parklands. All four are parts of much larger systems that cover major areas of central North America. The Eastern Broadleaf Forest Province, primarily made up of deciduous forest, extends eastward from Minnesota all the way to the Atlantic Ocean. The Laurentian Mixed Forest Province, largely consisting of coniferous forest, extends northward into Canada. The Prairie Parkland Province extends westward into the Dakotas and across the Central Plains of the United States. The Tallgrass Aspen Parklands Province represents the southern tip of a large province that extends north and west into the Canadian Prairie Provinces.

Tables 5.3 and 5.4 provide summary information about SGCN by province.

Table 5.3. Number of SGCN in Provinces and Number and Percentage of SGCN Unique to Provinces

Province	Number of SGCN	Number SGCN Unique to Province	Percentage of SGCN Unique to Province
Eastern Broadleaf Forest	205	51	25
Laurentian Mixed Forest	171	47	27
Prairie Parkland*	139	13	9.3
Tallgrass Aspen Parklands*	85	2	2.3
*Prairie Parkland and Tallgrass Aspen Parklands combined	147	20	14

Table 5.4. Number and Percentage of SGCN That Use Key Habitats

Province	Total number of SGCN	Number of SGCN Using At Least 1 Key Habitat	Percentage of SGCN Using At Least 1 Key Habitat
Tallgrass Aspen Parklands	85	74	87.1
Prairie Parkland	139	127	91.4
Eastern Broadleaf Forest	205	192	93.7
Laurentian Mixed Forest	171	164	95.9
State total	292	269	92.1