MASTER PLAN

GOVERNOR KNOWLES STATE FOREST

SEPTEMBER 2012

GOVERNOR KNOWLES STATE FOREST

MASTER PLAN • SEPTEMBER 2012

WISCONSIN
DEPT. OF NATURAL RESOURCES

ACKNOWLEDGEMENTS

This plan has been developed through a team effort by many individuals from the Department of Natural Resources. Through their hard work and expertise, these people have developed a plan that will guide the Governor Knowles State Forest into the future.

NATURAL RESOURCE BOARD

David Clausen, Chair
Preston D. Cole, Vice Chair
Christine L. Thomas, Secretary
William Bruins
Terry N. Hilgenberg
Gregory Kazmierski
Jane Wiley

WISCONSIN DEPARTMENT OF NATURAL RESOURCES

Cathy Stepp, Secretary
Paul DeLong, Chief State Forester

PLAN ACCEPTANCE TEAM

Erin Crain	Bureau of Endangered Resources
Paul Cunningham	Bureau of Fisheries
Tom Hauge	Bureau of Wildlife Management
Bob Mather	Bureau of Forest Management
Steve Miller	Bureau of Facilities and Lands
Dan Schuller	Bureau of Parks and Recreation

PLAN SPONSORS

Tom Duke, Kate Fitzgerald, and Jim Warren

PLAN PROCESS TEAM

Bob Dall, Kristin Lambert, Amy Mercer, Teague Prichard, Steve Runstrom, Dan Thill, and Mike Wallis

TECHNICAL TEAM

Bob Hanson, Todd Hintz, Rhonda Kenyon, Robin Maercklein, Ryan Magana, Colleen Matula, Tim Miller, and Jamison Wendel

CARTOGRAPHY

Andy Stoltman

OTHER CONTRIBUTORS

Ken Brokaw, Mark Dudzik, Bob Hartshorn, Angela Jacobs

PHOTO CREDITS

Department of Natural Resources Staff

The Wisconsin Department of Natural Resources provides equal opportunity in its employment, programs, services and functions under an Affirmative Action Plan. If you have any questions, please write to Equal Opportunity Office, Department of the Interior, Washington D.C. 20240, or Wisconsin's Office of Diversity – WDNR Office of Diversity, P.O. Box 7921, Madison, WI 53707. This publication is available in alternative format upon request. Contact the Division of Forestry at 608-267-7494.

Wisconsin Department of Natural Resources
Division of Forestry
101 South Webster Street PO Box 7921
Madison, Wisconsin 53707-7921

For your convenience this document is available on the internet at: dnr.wi.gov/master_planning/govknowles/

TABLE OF CONTENTS

CHAPTER 1: INTRODUCTION AND PLAN OVERVIEW 1

Introduction 1
Purpose of the Master Plan 1
Overview of the Planning Process 2
Organization and Content of This Document 2
Need To Revise the Governor Knowles State Forest Master Plan 2
Summary of the Master Plan 2
How the Statutory and Other Purposes and Benefits of the State Forest Will Be Realized Through the Plan 6

CHAPTER 2: MANAGEMENT AND DEVELOPMENT 9

Property Designation and Authority 9
Vision Statement 9
Property Goals 9
General Management Strategy of the State Forest 9
Land Management Areas 11
Forest Production Management Areas 14
- Bluff Lake 16
- Sand Plain 20

Native Community Management Areas 24
- St. Croix River Lowlands 26
- Brandt Pines and Foxes Landing 30
- Lagoo Creek Forest and Wetlands 34
- Sunrise Ferry Terrace 38
- Trade River Corridor and Wolf Creek Lowlands 42

Habitat Management Areas 46
- Kohler-Peet Barrens 48
- Sterling Barrens 52

Recreation Management Areas 56
- St. Croix Campground 58
- Trade River Equestrian Campground and Day Use 62

State Natural Area Designations 66
General Forest Management Prescriptions By Primary Forest Type 69
Wildlife Management Plan 73
Fisheries Management Plan 78

Recreation Management....80
Background....80
Designated Recreation Trails....80
Non-Motorized Trails....80
Motorized Trails....84
Camping....89
Day Use Areas....91
Nature Observation....92
Hunting and Trapping....93
Fishing....93
Water Recreation....93
Additional Recreational Activities and Trends....93
Education and Interpretation....94
Recreation Land Use Agreements....94
Parking Areas....98
Aesthetic Management On Lake and Stream Shorelines....98
Real Estate Management....103
Boundary Expansion Areas....103
Boundary Expansion Considerations....105
Real Estate Acquisition Policies....108
Aides in Lieu of Taxes....108
Easements, Access Permits, and Land Use Agreements....108
Future Boundary Adjustment Process....108
Road Management....109
Non-Metallic Mining Policy....111
Cultural Resources Management....112
General Land and Forest Management Policies and Provisions....113
General Administration Policies and Provisions....115
Public Communications Plan....117

CHAPTER 3: BACKGROUND AND AFFECTED ENVIRONMENT....119

Significance of the RPA in the Master Planning Process....119
Description of the Property and Region....119
Past Management and Use....119
Existing Assessment Reports....120
Regional Assessment....121
Property Assessment....135
Findings and Conclusions....167

APPENDICES **179**

A. Governor Knowles State Forest Master Plan Designation Process for State Natural Areas 179

B. Endangered Or Threatened Species and Species of Special Concern 182

C. Wildlife Species of Greatest Conservation Need 185

D. Natural Resources Used By Local Native American Tribes 190

E. Glossary of Terms 191

F. Group Camp Concept 193

G. References 194

H. Maps ..... Appendix

LIST OF FIGURES

Figure 2.1 Cover Types of the Governor Knowles State Forest....10
Figure 2.2 Bluff Lake Current Land Cover....18
Figure 2.3 Sand Plain Current Land Cover....22
Figure 2.4 St. Croix Current Land Cover....28
Figure 2.5 Brandt Pines and Foxes Landing Current Land Cover....32
Figure 2.6 Lagoo Creek Forest and Wetlands Current Land Cover....36
Figure 2.7 Sunrise Ferry Terrace Current Land Cover....40
Figure 2.8 Trade River and Wolf Creek Current Land Cover....44
Figure 2.9 Kohler-Peet Barrens Current Land Cover....50
Figure 2.10 Sterling Barrens Current Land Cover....54
Figure 2.11 St. Croix Campground Current Land Cover....60
Figure 2.12 Trade River Current Land Cover....64
Figure 3.1 Land Ownership in Barron, Burnett, Polk, St. Croix and Washburn Counties....122
Figure 3.2 Preferences in Camping by Type....128
Figure 3.3 Land Cover On the Governor Knowles State Forest....138
Figure 3.4 Acres Planted by Year on the GKSF....140
Figure 3.5 Primary Cover Types within the Forest Production Management Classification....146
Figure 3.6 Governor Knowles State Forest Red Pine Plantation Acreage by Year Established....158

LIST OF TABLES

Table 2.1 Land Management Areas 12
Table 2.2 Forest Production Areas 14
Table 2.3 Bluff Lake Current and Predicted Cover Types 18
Table 2.4 Sand Plain Current and Predicted Cover Types 22
Table 2.5 Native Community Management Areas 24
Table 2.6 St. Croix River Lowlands Current and Predicted Cover Types 28
Table 2.7 Brandt Pines and Foxes Landing Current and Predicted Cover Types 32
Table 2.8 Lagoo Creek Forest and Wetlands Current and Predicted Cover Types 36
Table 2.9 Sunrise Ferry Terrace Current and Predicted Cover Types 40
Table 2.10 Trade River and Wolf Creek Current and Predicted Cover Types 44
Table 2.11 Habitat Management Areas 46
Table 2.12 Kohler-Peet Barrens Current and Predicted Cover Types 50
Table 2.13 East Fork of the Black River Current and Predicted Land Cover 54
Table 2.14 Recreation Management Areas 56
Table 2.15 St. Croix Campground Current and Predicted Cover Types 60
Table 2.16 Trade River Current and Predicted Cover Types 64
Table 2.17 State Natural Areas 66
Table 2.18 Current and Planned Designated Trails 86
Table 2.19 Current and Planned Recreation Facilities 95
Table 2.20 Parking Areas on the GKSF 98
Table 2.21 Boundary Expansion Areas 103
Table 2.22 Total Acres Currently within GKSF and Boundary That Are Owned by Other Entities or within the Planned Project Boundary 106
Table 2.23 Land Cover within the Expanded Boundaries 106
Table 2.24 State Forest Road Classifications Open To Public Vehicles 109
Table 3.1 Seasonal Housing and Tourism 121
Table 3.2 Acres Harvested on County Forest and the GKSF 123
Table 3.3 Employment by industry in the GKSF Region 124
Table 3.4 Regional and State Recreational Preferences 125
Table 3.5 ATV Trail Miles by Season 127
Table 3.6 Snowmobile Trail Miles 128
Table 3.7 Public Camping Opportunities within Barron, Burnett, Polk and Washburn Counties 128
Table 3.8 Regional Recreation Shortages and Demand 130
Table 3.9 GKSF Acreage within the Northwest Sands and Northwest Lowlands Ecological Landscapes 131
Table 3.10 Trout Streams within the GKSF 137
Table 3.11 Acres of Cover Type on the GKSF 139

Table 3.12 Current Management Designations on the GKSF 141
Table 3.13 Natural Communities within the SNAs on the GKSF....142
Table 3.14 Community Types on the GKSF 146
Table 3.15 NHI Working List Plants Documented within the GKSF....147
Table 3.16 NHI Working List Animals Documented within the GKSF....149
Table 3.17 Species of Greatest Conservation Need Occurring in the Northwest Lowlands or the Northwest Sands Ecological Landscapes 151
Key For Tables 14, 15, 16 and 17 152
Table 3.18 Camping Opportunities on the GKSF 161
Table 3.19 Recreational Trails on the GKSF 163
Table 3.20 Parking Areas on the GKSF 166
Table B.1 Endangered, Threatened, or Special Concern Animals on the Governor Knowles State Forest....183
Table B.2 Endangered, Threatened, or Special Concern Plants on the Governor Knowles State Forest....184
Table C.1 Wildlife Species of Greatest Conservation Need within the Northwest Sands Ecological Landscape 185
Table C.2 Wildlife Species of Greatest Conservation Need within the Northwest Lowlands Ecological Landscape....188

LIST OF MAPS

Map 2.1 Land Cover ..... Appendix H
Map 2.2 Land Management Classifications ..... Appendix H
Map 2.3 Forest Production Management Areas 15
Map 2.4 Bluff Lake 17
Map 2.5 Sand Plain 21
Map 2.6 Native Community Management Areas 25
Map 2.7 St. Croix River Lowlands 27
Map 2.8 Brandt Pines and Foxes Landing 31
Map 2.9 Lagoo Creek Forest and Wetlands 35
Map 2.10 Sunrise Ferry Terrace 39
Map 2.11 Trade River Corridor and Wolf Creek Lowlands 43
Map 2.12 Habitat Management Areas 47
Map 2.13 Kohler-Peet Barrens 49
Map 2.14 Sterling Barrens 53
Map 2.15 Recreation Management Areas 57
Map 2.16 St. Croix Campground 59
Map 2.17 Trade River Equestrian Campground and Day Use 63
Map 2.18 State Natural Area Designations 67
Map 2.19 Current and Planned Recreation ..... Appendix H
Map 2.20A Recreation Infrastructure 99
Map 2.20B Recreation Infrastructure 100
Map 2.20C Recreation Infrastructure 101
Map 2.20D Recreation Infrastructure 102
Map 2.21 Boundary Expansion Areas ..... Appendix H

INTRODUCTION AND PLAN OVERVIEW

INTRODUCTION

The Governor Knowles State Forest (GKSF) is located in north western Wisconsin in Burnett and Polk Counties. It lies along the St. Croix National Scenic Riverway and encompasses approximately 34,000 acres, of which about 20,500 acres are state owned. The property's headquarters is located in the Village of Grantsburg.

The forest is perhaps most well known for its proximity to the St. Croix River. Most of the 55 mile length of the long and narrow property lies along the St. Croix which is designated a National Scenic Riverway. The National Park Service manages the majority of the recreational facilities directly along the river.

The area surrounding the GKSF is dominated by forests, agriculture, and some notably large wetlands to the east. Although it is one of the largest state owned properties in a region with an abundance of privately owned lands, the GKSF is a relatively small publicly owned property in comparison to other public ownerships in the area. More than 100,000 acres of Burnett and Polk County Forests and 52,000 acres of state wildlife areas, including Crex Meadows, Fish Lake, and Danbury State Wildlife Areas, border the forest. The location of the GKSF in such close proximity to county forests, state wildlife areas, and the National Scenic Riverway, creates a large block of publicly owned forest land.

The GKSF supports a diversity of cover and community types, including forested and non-forested upland and lowland assemblages. The property's ecological characteristics are largely defined by the two Ecological Landscapes which meet along the St. Croix River escarpment that runs the length of the property: the Northwest Sands and Northwest Lowlands. East of the escarpment, fire-adapted communities are present and consist of varied structural elements of the Pine Barrens community and extensive dry forests composed mostly of pines and oaks. West of the escarpment, there are clusters of seeps, forested wetlands, wet meadows and marshes, and numerous streams that feed into the St. Croix River. The habitat found within forests and water resources on the property support many rare species, including threatened, endangered, and special concern plant and animal species.

Over 17,000 acres of varied forest cover types provide a reliable source of sought after forest products ranging from pulpwood to softwood sawtimber, while also maintaining and enhancing the ecological integrity of the state forest. Land management on the forest utilizes a range of sustainable practices, from sustainable forest management to ecological restoration. Currently, the GKSF harvests approximately 383 acres annually, yielding an average of 10,000 cd. eq./year.

The forest's original designation and development was strongly oriented to serving recreational needs, due largely to a history of recreational activity in the area and on the St. Croix River. Today, opportunities exist for horseback riding, camping, hunting and trapping, wildlife viewing, hiking, skiing and snowmobiling. The primary draws to the property are the St. Croix River and the equestrian trails and campground. While the GKSF does not offer any recreational opportunities related to the St. Croix River itself, it does serve as a recreational backdrop to the St. Croix offering additional recreational opportunities and protecting the scenic qualities that make the St. Croix popular. The use of the equestrian trails and campground are extremely popular on the forest and a primary reason why people come to the GKSF. Traditional camping and other recreational trails are lightly used, with the exception of the snowmobile trail which is heavily used during good snow seasons and is part of a regional trail network.

The GKSF lies within the 1837-ceded territories of the Ojibwe Tribes and is located within proximity to tribes of the St. Croix Band of the Lake Superior Ojibwe as well as the Mille Lac Band of Ojibwe in Minnesota. Treaty rights affirmed under Lac Courte Oreilles Indians v. State of Wis., 775 F. Supp. 321, 323 (W.D. Wis. 1991) provide a permanent guarantee for the Ojibwe Tribes to engage in hunting, gathering, fishing, and trapping for subsistence, medicinal, cultural, religious and economic purposes on public lands within the ceded territories as they have for many generations.

PURPOSE OF THE MASTER PLAN

The Governor Knowles State Forest Master Plan outlines how the property will be managed, used and developed, and the benefits it will provide. It defines the forest management practices, recreational uses, other land management activities, and additional aspects of the property's future use and development. The revised plan reflects changing ecological, economic, and social conditions, and current management principles for resource and recreation management in the context of the

larger landscape in which the forest is located, as required by Wisconsin State Statute 28.04. The master plan will receive a formal review approximately every 15 years and will be updated by plan amendments and variances as necessary through a formal process that includes public involvement.

Benefits of the Governor Knowles State Forest Master Plan:

- Provides a vision and framework for the use, development, management and acquisition of the forest well into the future with an emphasis on the next 15 years.
- Identifies land management areas and plans for their future management.
- Describes general management objectives and specific management prescriptions for each management area.
- Makes recommendations for forest production, recreation, and habitat conservation to meet current and future needs.
- Provides for continuing public involvement during plan implementation.

OVERVIEW OF THE PLANNING PROCESS

There are several major phases in the master planning process as well as opportunity for public input and participation. These phases include completing the Regional and Property Analysis, establishing the property vision and goals, considering management alternatives, and finally creating a plan and an environmental analysis. The planning process is guided by State Statute 28.04 and Wisconsin Administrative Code NR 44.

The development of the Governor Knowles State Forest Master Plan has been guided by a commitment to sustainable forestry. While individual definitions may vary slightly, there is general agreement that sustainable forestry focuses on meeting the ecological, environmental, economic, recreational and social needs of current generations while protecting the forest's ability to fill the same role for future generations. Additionally, the previous property plan and extensive ecological, economic, and social assessments provided a data foundation for the development of this plan.

PUBLIC PARTICIPATION

Public involvement has been an integral part of the planning process, beginning with public open house meetings and surveys to identify important planning issues and views on the forest's future direction. To create a shared vision for the future of the Governor Knowles State Forest, the planning process relied on a solid foundation of public participation. In July of 2010, a Public Involvement Plan was adopted, outlining the process, procedures, and tools used throughout the planning process to encourage public awareness, interaction, and input. The Department of Natural Resources also worked actively with local towns, tribes, non-governmental organizations, citizens, and businesses to develop this master plan. A public meeting was held in December of 2010, and public comment forms seeking input on a range of resource and recreation management considerations were mailed and available online. Additional opportunities for public participation will be provided during the development of the master plan and plan implementation.

ORGANIZATION AND CONTENT OF THIS DOCUMENT

The master plan is presented in three chapters:

Chapter One	Overview of the forest, the purpose of the master plan, and a planning process overview.
Chapter Two	Use and development of the property.
Chapter Three	Background information on the region and the property.

NEED TO REVISE THE GOVERNOR KNOWLES STATE FOREST MASTER PLAN

The last master plan for the Governor Knowles State Forest was approved in 1988. The Department determined the need to revise the plan in light of changing ecological, economic, and social conditions, to incorporate new information learned since that time and to consider management in context of the larger landscape in which the forest is located as required by Wisconsin State Statute 28.04. This plan will receive a formal, rigorous review approximately every 15 years. When necessary, the plan may also be updated by plan amendments and variances through a formal process that includes public involvement.

SUMMARY OF THE MASTER PLAN

LAND MANAGEMENT

The state forest has been divided into 11 land management areas with forest production areas comprising approximately 69% of the forest. Native community management areas, which include the majority of the passively managed acres, equate to 23% of the forest. About 7% of the forest is classified as habitat management area. The remaining acreage, about 1% of the forest, is in recreation management areas. Of the 20,500 acres of state ownership, approximately 70% is upland and 30% is lowland.

Cover Type and Forest Production

Over 10,000-acres are managed for forest production, representing 51% of the current GKSF acreage. Approximately 5,000-acres (24% of the total property acres) are classified as scrub oak. Overall, there will be a 1,600 acre decrease in the scrub oak cover type over the next 50 years, from 24% to 16% of the total property acres, and an associated increase in the pine cover types and the shade tolerant types (NH, MR),

with the latter due primarily to areas of viewshed and passive management. The reduction of scrub oak will create a more balanced distribution of cover types across the forest. Even with this reduction, in many other forest types, scrub oak will remain as a secondary species. With that, the scrub oak and swamp hardwoods will still be the dominant cover types on GKSF.

The forest will continue to provide structural diversity with age variability, snags, den trees, coarse woody debris, and large-diameter canopy trees. Annual forest production levels will see a slight increase, due to the re-designation of the former wilderness area, with slight annual variations. Forest production management techniques include even-aged management (80%) and uneven-aged management (20%) (thinnings are part of even-aged management regime).

On the northern portion of the forest, efforts will be made to coordinate aspen management with the adjacent Danbury Wildlife Area, providing age diversity and excellent wildlife habitat on a larger scale. This planning will be done at the local level between forestry and wildlife staff.

The former 9,460 acre Wilderness Area has been re-designated in this plan. Approximately 1,325 acres of the former Wilderness Area was classified as State Natural Area (SNA). In this plan, approximately 4,450 additional acres of the former Wilderness Area have been classified as SNA bringing the total to 5,775 acres, most of which will be passively managed.

There will be an increase of forest management and gathering within the balance of the former Wilderness Area. However, measures have been prescribed in this plan to preserve the aesthetic qualities of the St. Croix River viewshed. With input from the National Park Service, it was determined that the viewshed will be preserved by tailoring management activities such that no management (harvesting) will be visible from the river during leaf on conditions.

Native Community Management

Nearly 8,000-acres (39%) will be in native community management. These areas include many wetlands and important community types on the forest. With approximately 6,500 acres under passive management, developing and retaining old growth forests and forests with old growth characteristics will be an integral part in some of these areas. Emphasis will primarily be on swamp hardwoods, scrub oak, and red and white pine. Of this, 14% will be actively managed and 86% will be passively managed.

State Natural Area Designations

The GKSF previously had six State Natural Area (SNA) designations, totaling 1,710 acres, including Sterling Barrens, St. Croix Ash Swamp, Brandt Brook Pines and Hardwood Forest, Ekdall Wetlands, Norway Point Bottomlands, and Kohler-Peet Barrens and Cedar Swamp. The current master plan designates one additional SNA (Trade River Forest and Wetlands), along with boundary modifications to the existing six SNAs for a total of 7,100 acres of SNAs.

Within the native community management areas, there are 4 existing and 1 new State Natural Areas (SNA) totaling 5,950 acres. Three of the four existing SNAs are being expanded in this plan and a small portion of an existing SNA will be absorbed into the new SNA. Sites were chosen that contribute to critical habitat for rare species, provide ecological reference areas, or which contain significant geological or archaeological features.

State Natural Areas are part of a statewide system of sites identified for the purposes of ecological research, education, and to assure the full range of ecological diversity for future generations. State Natural Areas are unique because they can serve as stand alone properties or they can be designated on other properties such as state forests.

Wildlife Habitat

Approximately 2,300 acres of habitat management are being proposed. This acreage is accounted for in the Kohler-Peet Barrens and Sterling Barrens management areas. Rare, Threatened, and Endangered Species will continue to be protected by improving and maintaining a variety of barrens, savanna, and

forest seral stages and associated habitat. Forest management practices will continue to be utilized in portions of these areas and considerations for threatened and endangered species will be incorporated. Large and small game populations will also be maintained through forest and habitat management, providing an array of forest types and age classes.

Within the wildlife habitat management areas, there are 2 existing SNAs, both of which are being expanded in this plan, totaling approximately 1,150 acres. Sites were chosen that contribute to critical habitat for rare species.

Wetlands and Aquatic Resources

Wetlands, forested and non-forested, account for approximately 31% of the forest, will continue to be protected. They provide habitat for a diverse range of plants and wildlife, and are known to harbor many rare species. Wetlands are also critical in maintaining water quality for lakes, rivers, and streams. The diverse array of aquatic resources on the forest includes segments of the Trade, Wood, and Clam Rivers, many streams, and numerous seeps, most within an extensive forest matrix. These important resources will be maintained and protected.

RECREATION

Non-Motorized Trail-Based Recreation

Nature based non-motorized trail activities are a popular and established recreation niche at Governor Knowles State Forest. Public opportunities will expand as the master plan prescribes increased miles for traditional trail uses such as hiking, horseback riding, and cross country skiing. Trails will be lengthened and diversified with additional trail loops, bridges or surface renovation. New trails will be designed for sustainability, and most will follow primitive to lightly developed routes. Development will strive to connect trails and trail systems and to create links for public access to other public lands, scenic resources and amenities.

Non-motorized recreation will be further diversified as trails are developed or designated to accommodate new activities — skate skiing, equestrian driving, off road bicycling, winter walking and snowshoeing. Added amenities such as trailhead parking, information facilities, and restrooms will further support trail based recreation. Some trails will be designated for multiple uses throughout the year or on a seasonal basis. In

some locations trails will be renovated to enhance barrier-free ADA accessibility.

Motorized Recreation
Forest staff will continue to work with partners, recreation clubs and other trail users to maintain the GKSF snowmobile trail through the forest. As part of a regional trail network, this 32 mile route will continue to connect the Polk County snowmobile trail at the southern end of the forest to the Burnett County snowmobile trail in the north. This trail accommodates ATV travel during winter months, as trail conditions allow, and other multiple uses throughout the year. A three mile trail reroute is planned along one portion of the snowmobile trail to improve safety and to adjust to a change in land ownership.

Two short, seasonal pass-through trails may be considered in the future if alternatives become necessary to maintain links between portions of the multi-use County Forest trail system. Any future management and development will follow principles of sustainable design to reduce environmental impact, to consider visitor safety, and to avoid user conflict.

Camping
The GKSF master plan expands camping opportunities throughout the forest. St. Croix Family Campground and the Trade River Equestrian Campground will both receive some modern upgrades including electric service at half of the campsites and a shower building. A portion of campsites will be added to the statewide camping reservation system. A rustic outdoor group camp will be developed near the Clam Flowage, and a second small-group outdoor group camp will be developed near the St. Croix Campground. An equestrian group camp is planned near the Trade River Equestrian Trails. For primitive campers, additional backpack campsites are planned within the GKSF hiking trail system, and equestrian trail campsites will be provided along the Trade River Horse Trail. An ADA accessible cabin will be constructed to provide camping opportunities for people with physical disabilities and their families.

Day Use Areas
Several rustic day use areas will be maintained and renovated. The Sioux Portage group camp will be converted to an equestrian day use area with amenities added to accommodate horses and riders. The Trade River day use area and the Highway 70 wayside will be upgraded with additional amenities including picnic shelters and improved ADA access.

Nature Observation
Future management will provide and enhance opportunities for birding and wildlife watching, scenic viewing, photography and nature study — all popular pastimes at GKSF. Management efforts will continue to protect and strive to connect wild lands, scenic resources, wildlife corridors and habitats. Scenic viewing areas, public parking and information facilities, and barrier-free ADA access will be developed at significant locations throughout the forest.

Hunting, Fishing, and Trapping
GKSF will continue to provide abundant opportunities for hunting, fishing, and trapping, and to maintain reasonable public access to forest and water resources. Forest staff will work in cooperation with wildlife and fisheries management to support sporting opportunities while protecting rare, threatened or endangered species and their habitats.

Water Recreation
The primary water based recreation in the area of GKSF is the St. Croix National Scenic Riverway. The National Park Service manages the scenic corridor of the river and provides remote river camping opportunities for the public. State Forest property runs adjacent to the NPS boundary for over 50 miles on the eastern side of the river, providing an added river protection zone. When complete, the GKSF hiking trail will extend the length of the forest with opportunity for hikers to access and enjoy the river.

Several rivers and trout streams pass through the GKSF including the Wood and Trade Rivers. In the counties surrounding the forest, hundreds of lakes, and miles of streams and shoreline provide public access. A canoe landing and fishing pier at the new outdoor group camp on the Clam Flowage will provide additional water-based recreation.

Education and Interpretation
A range of educational opportunities will enhance visitor experience and to alert them to the benefits and opportunities provided by Governor Knowles State Forest. Information facilities will be installed or improved at trail heads and parking areas. The Cedar, Brandt Pines, and Wood River interpretive trails will be renovated with new themes and interpretive signage. An equestrian interpretive trail is planned for the Trade River Horse Trails system. An auto tour route is planned to follow existing roads, with stops at information facilities to interpret forest resources and management. A forest-wide interpretive plan will be developed to coordinate education and enhance delivery of information to the public.

BOUNDARY EXPANSION AREAS
The current project boundary of the state forest is 38,000 acres, 20,500 of which are state owned. The boundary expansion areas include ten areas totaling 7,989 acres. These areas have been selected for their ability to protect and enhance important ecological, social, and economic values of the property and region. The boundary expansion areas can be viewed individually or any combination. Areas for consideration are identified based on a range of ecological, economic and social factors often times in vary degrees for each expansion area. A number of additional areas were evaluated for consideration but not selected for public review and consideration. If all lands were purchased within the expanded project boundary, the Governor Knowles State Forest would encompass approximately 46,000 acres and protect more than 58 linear miles of the St. Croix River.

THE ENVIRONMENTAL ANALYSIS
The Environmental Analysis (EA) analyzes the potential impacts of actions recommended in the master plan, ranging from land acquisition and facility development to forest management and operation. The EA for this plan concludes that the implementation of the master plan provides positive recreational, ecological, social, and economic benefits to the region with minimal adverse impacts.

HOW THE STATUTORY AND OTHER PURPOSES AND BENEFITS OF THE STATE FOREST WILL BE REALIZED THROUGH THE PLAN

PURPOSE OF THE STATE FOREST
State forests are managed in accordance with Wis. Stat. s. 28.04 to assure sustainably managed forests that provide ecological, social, and economic benefits for present and future generations. The purposes and benefits of state forests are outlined in the following language of Wis. Stat. s. 28.04 (2):

(a) The Department shall manage the state forests to benefit the present and future generations of residents of this state, recognizing that the state forests contribute to local and statewide economies and to a healthy natural environment. The Department shall assure the practice of sustainable forestry and use it to assure that state forests can provide a full range of benefits for present and future generations. The Department shall also assure that the management of state forests is consistent with the ecological capability of the state forest land and with the long-term maintenance of sustainable forest communities and ecosystems. These benefits include

This is your plan. The Governor Knowles State Forest Master Plan addresses the desires of Wisconsin's citizens who expect a full range of environmental, social, and ecological benefits today and in the future. This plan attempts to achieve that balance in a scientifically credible and sustainable way. It was developed with countless hours of public input and several rigorous scientific and technical reviews. Many hands were involved in shaping it.

This is a visionary plan. The Governor Knowles State Forest Master Plan captures an idealized view of the state forest's long-term future. This points general direction for short-term actions. The diversity of the forest structure is enhanced over time, providing for a broad range of social and ecological values important to Wisconsin citizens, including recreation. Diverse natural communities contribute to the range of wildlife habitats necessary for native species, and contribute to broad biodiversity.

This is a focused plan. The plan calls for active and passive management across the landscape and over time to achieve its goals and objectives. It relies on integrated and adaptive management of the forest resources and focuses on the compatibility of forest uses over time.

This is a flexible and adaptive plan. The plan calls for adaptive management and monitoring the response of the forest to strategies outlined in the plan. The responses are evaluated against the objectives. The plan calls for continuous monitoring and regular public reviews and a major review every 15 years.

This is a sustainable plan. A sustainable forest requires flexibility and adaptability. This plan will assure sustainable forest products, continued recreation opportunities as well as a sustainable ecosystem and healthy watersheds.

soil protection, public hunting, protection of water quality, production of recurring forest products, outdoor recreation, native biological diversity, aquatic and terrestrial wildlife, and aesthetics. The range of benefits provided by the Department in each state forest shall reflect its unique character and position in the regional landscape.

(b) In managing the state forests, the Department shall recognize that not all benefits under part (a) can or should be provided in every area of a state forest.

(c) In managing the state forests, the Department shall recognize that management may consist of both active and passive techniques.

LOCAL AND STATEWIDE ECONOMIES

Under the plan, the forest would increase its contribution to the state and local economies through forest products and tourism. The acreage available for harvest will increase which could lead to a slight increase in the long term annual harvest based on current inventory data. That slight increase may not be realized in the short term due to the impacts from the 2011 wind storm since roughly five years worth of annual harvest were established following the storm. Providing a wide range of diverse recreational opportunities and settings, maintaining scenic forest resources, and providing wildlife and fisheries habitat will ensure the forest's role as a destination in the region.

A HEALTHY NATURAL ENVIRONMENT AND THE LONG-TERM MAINTENANCE OF SUSTAINABLE FOREST COMMUNITIES AND ECOSYSTEMS

Due to the variety of resources located on the Governor Knowles State Forest, all of the prescribed benefits of a state forest may be realized on the property. By managing for these benefits, the goals of achieving a healthy natural environment and the long-term maintenance of sustainable forest communities and ecosystems will be realized.

FULL RANGE OF BENEFITS

Protection of Soil and Water Quality

Soil and water quality will continue to be protected by maintaining the majority of the forest in an undeveloped condition. Erosion control practices, such as Best Management Practices (BMPs) for water quality, will be followed when conducting forest and other management activities. Expansion of the forest boundary provides opportunities to expand protection to new areas.

Production of Recurring Forest Products

Under the plan, 68% of the potentially productive lands will be under active sustainable management producing forest products.

Outdoor Recreation

The Governor Knowles State Forest Master Plan will continue to provide the existing recreational opportunities, while providing many improvements and upgrades throughout the property.

Native Biological Diversity

Native biological diversity will be maintained through enhanced forest structure and species composition in some areas. Aquatic resources and other unique habitats will be protected. Endangered and threatened species will continue to be protected.

Wildlife

The forest and wildlife management prescriptions in this plan have been developed to ensure that habitat and ecosystems for a wide range of terrestrial and aquatic wildlife will be sustained and improved.

Aesthetics

Over time, forest health and scenic qualities will be enhanced as longer-lived conifers such as red and white pine become more common through forest management. Jack pine will also Increase over time adding to the diversity and scenic qualities. In certain situations, management activities may improve the scenic qualities of a particular setting by improving the scenic vista. The scenic quality of all shoreline, trails and forest roads will be evaluated prior to management.

MANAGEMENT AND DEVELOPMENT

MANAGEMENT AND DEVELOPMENT

PROPERTY DESIGNATION AND AUTHORITY

This master plan is for the development and management of the Governor Knowles State Forest. Governor Knowles is designated as a State Forest as defined in Wisconsin Statute 28.04.

VISION STATEMENT

The Governor Knowles State Forest is a healthy, dynamic forest that contributes to the diversity of plant and animal communities within the region, and is managed to provide a range of ecological, cultural, social and economic attributes to benefit present and future generations. Emphasis is placed on the St. Croix River by protecting and enhancing the forested landscape along the river while providing recreational opportunities consistent with its scenic beauty and natural setting. The forest is managed in consultation with federal, tribal, county, local, and other governments; and with the people who care about the forest, including those that live, work, and recreate around it.

PROPERTY GOALS

- Maintain and enhance the natural, undeveloped, scenic qualities of the state forest, especially those areas visible from the St. Croix River.
- Protect and enhance the aquatic resources of the forest, especially seeps and streams that lead to the St. Croix River.
- Manage the property within the ecological capability of the land using principles of ecosystem management and sustainable forestry to provide a variety of renewable forest products and to protect and enhance important natural communities, habitats and recreational values.
- Provide a diversity of natural communities and wildlife habitats consistent with the forest's capabilities and property goals, including diverse forest types and age classes, with an emphasis on communities that are unique to the Governor Knowles State Forest.
- Protect and enhance habitat for rare, threatened and endangered species.
- Protect biological diversity and areas of geological, archeological, or cultural significance.
- Maintain forest health and protect it from unacceptable levels of degradation from invasive plants, insects and diseases.
- Provide opportunities for hunting, fishing, trapping, and wildlife viewing.
- Provide opportunities for motorized and non-motorized outdoor recreational activities that are compatible and can be sustained without harm to the trail network or forest ecosystems.
- Provide an appropriate balance of ecological diversity, forest management, recreational use, and research considering the opportunities and goals for the property.
- In consultation with tribal governments, assure that off-reservation rights to hunt, fish, and gather are sustained into the future.
- Provide opportunities for greater landscape-scale management for the permanent protection of significant natural resources or features.
- Provide opportunities for additional recreational uses and land management opportunities through land acquisitions and easements.
- Contribute to local and regional economies through sustainable management of timber, wildlife, and recreational resources.

GENERAL MANAGEMENT STRATEGY OF THE STATE FOREST

The Governor Knowles State Forest is part of a complex ecosystem, with a mix of biotic communities that provide habitat for a diversity of plants and animals. Forests will be managed using sustainable forestry practices and a combination of both active and passive management to provide ecological, economic, and social benefits. The forest is mainly comprised of scrub oak, swamp hardwood, jack pine, aspen, red pine, northern hardwood, white pine, black spruce, lowland brush, and grassland (Figure 2.1).

Forest management activities on the GKSF have focused on maintaining age diversity and wildlife habitat while reducing fuel loads. Timber harvesting most commonly utilizes even-aged management, including regeneration harvests of oaks, pines, and aspen, which provides a range of qualities of softwood and hardwood timber to the local and regional economy. Some of the lowland forested acreage, especially the swamp hardwood cover type, has not been actively managed in the past due to its presence within the wilderness zone from the 1988 master plan which restricted timber harvesting.

MANAGEMENT AND DEVELOPMENT

Further, these areas exist below the escarpment and access for management purposes can be difficult. Several historical factors have influenced the current structure and composition of the GKSF and surrounding landscape, such as flooding, grazing, fire, as well as various management activities since European settlement. Changes in GKSF vegetation since European settlement follow trends similar to many other dry forested habitats in northern Wisconsin. Jack pine is less abundant, while aspen and red pine have both increased in relative abundance. Forests are mostly found in small blocks, largely as a result of the size and configuration of the property. Barrens/savanna communities are small and localized, having largely succeeded to forest following the lack of fire in these areas.

Figure 2.1 shows the general cover types on the Governor Knowles State Forest (Map 2.1, Appendix). For inventory purposes, forest stands are classified by their dominant cover type. This means that forest stands listed as aspen have 50% or more of their basal area in aspen trees. Most forest stands contain a mix of tree species. For example, an "aspen" area probably includes a mixture of scrub oak, red maple, and jack and white pine. Therefore, two forest stands with the same dominant cover type may not have the same overall forest composition.

Forest management on the property will maintain a diversity of forest cover types and age classes for forest health, aesthetic appeal, and wildlife habitat. This will be accomplished through different management opportunities. There will be a diversity of age classes through efforts to achieve forest regulation, which spreads the work load and income from harvests over time with the goal of providing a constant and predictable flow of products to the market. This applies particularly to the aspen, scrub oak, and jack pine cover types. Aspen will be maintained and increased in mixed stands. Jack pine will be maintained and increased. Red and white pine will be maintained through periodic thinning and planting when necessary. Understory white pine will be favored where it is present in mixed forests. In some areas, large red and white pine will be maintained to provide seed. These larger, older trees may also provide structural attributes consistent with older forests.

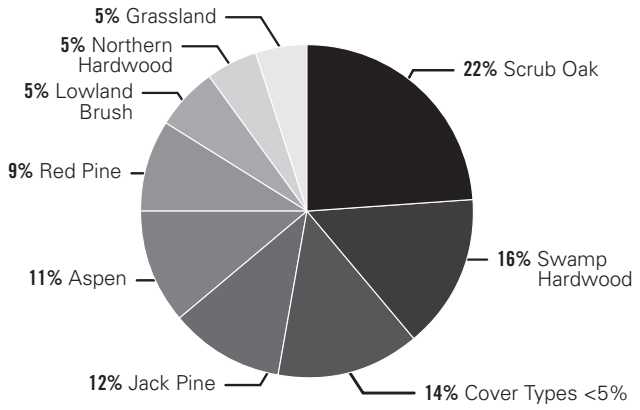
Recreation management is also an important component of the Governor Knowles State Forest and will be implemented in a way that provides safe and sustainable recreational access while protecting the ecology and unique features of the forest.

The wetlands, streams, seeps and flowages on the property will be managed to protect water quality and provide habitat for a variety of fish, birds, insects and plants, including many rare species.

Endangered and threatened species and their habitats will be protected through integrated and adaptive management techniques.

Aesthetics management is also an important objective of the plan. Aesthetics are considered near high use recreation areas including campgrounds, day use areas, and trails. Aesthetic management will be implemented in the viewshed of the St. Croix River by designing management activities so they are not visible from the river during leaf-on conditions.

FIGURE 2.1 COVER TYPES OF THE GOVERNOR KNOWLES STATE FOREST



LAND MANAGEMENT AREAS

The Governor Knowles State Forest has been divided into 11 land management areas: two Forest Production Management Areas, five Native Community Management Areas, two Habitat Management Areas, and two Recreation Management Areas (Map 2.2, Appendix). Each management area describes a future desired condition that considers soils, topography, community type, and other factors which shape the objectives and management actions for each area.

Each management area has specific short-and long-term objectives that articulate the future desired condition based on the ecological capabilities. Because forests and landscapes change slowly, actions taken, or not taken, over the next 15 years may require 50-100 years to affect the forest as a whole. The long- and short-term objectives, as written, reflect the intent and ability to meet those objectives under ideal conditions. Factors such as growth rates, insects and diseases, destructive wild fires, or major wind events may impact the ability to meet the stated objectives.

The General Forest Management Prescriptions provided later in this chapter outline the standard management practices to be used for each forest type (e.g. aspen, white/red pine, oak, etc.). However, as management objectives vary from area to area, individual area management prescriptions may be modified from the standard prescriptions.

Under the plan, there are approximately 12,160 acres available for active forest management. This equates to 68% of the property's forested acreage, or 59% of the entire property. 32% percent, or 6,656 acres, of the entire property is designated to be passively managed allowing natural processes to predominate. Some of the passively managed areas are forested, but many have not been actively managed in the past due to their former passive management designations, or their steep, wet, or otherwise inaccessible nature. The designation of some forested acres as passive management equates to approximately 32% of the forested acres on the property being removed from management. An additional 950 forested acres, or 5% of the property's forested acreage is designated to be actively managed, however they will be managed for non-forested habitats (barrens, savanna). Non-forested areas, such as open water and wetlands, account for the balance of acreage unavailable for forest management.

Total Property Acres: 20,500
Forested Acres: 17,840
Forested Acres Available for Management: 12,160
Passive Management Acres*: 6,656

* Forested acres designated as passive management areas equate to 32% of the property's forested acres being removed from active forest management opportunities.

MANAGEMENT AND DEVELOPMENT

Short descriptions for the different types of management areas are below.

FOREST PRODUCTION MANAGEMENT

Management activities are focused primarily on the sustainable production of timber and other forest products; however in areas of high recreation use and where site conditions allow, management can promote the production of timber on extended rotations in a manner that promotes long-term visual appeal. In addition, while managing for timber products, management activities will also promote the development and maintenance of certain ecological attributes.

NATIVE COMMUNITY MANAGEMENT

Management activities are intended to represent, restore and perpetuate native plant and animal communities, whether upland, wetland, or aquatic, and other aspects of native biological diversity. Although the production of forest products is not the primary focus, harvesting of forest products will occur at some locations.

HABITAT MANAGEMENT

Management activities are designed to provide or enhance habitat, whether upland, wetland or aquatic, to support specific species of plants or animals. Although the production of forest products is not the primary focus, harvesting of forest products will occur at some locations.

RECREATION MANAGEMENT

Management activities are focused on providing and maintaining land and water areas and facilities for outdoor public recreation or education.

Each Land Management Area contains the following information:

- Overview and summary
- Description of the forest resource
- Current and projected land cover
- Land Type Associations, soils and habitat types
- Short- and long-term management objectives
- Management prescriptions

STATE NATURAL AREAS

Seven State Natural Areas (SNA) are designated on the GKSF totaling 3,099 acres. SNAs are considered overlays to the land management areas because they do not change the underlying management objectives or prescriptions for each land management area. Sites contribute to rare species habitat, provide ecological reference areas, or contain significant geological or archaeological features.

TABLE 2.1 LAND MANAGEMENT AREAS

Area #	Land Management Areas (% of forest)	Acres
	Forest Production Management Areas (69%)	**23,535**
1	Bluff Lake	4,635
2	Sand Plain	18,900
	Native Community Management Areas (23%)	**7,835**
3	St. Croix River Lowlands*	5,027
4	Brandt Pines and Foxes Landing*	614
5	Lagoo Creek Forest and Wetlands	530
6	Sunrise Ferry Terrace	558
7	Trade River Corridor and Wolf Creek Lowlands*	1,106
	Habitat Management Areas (7%)	**2,364**
8	Kohler-Peet Barrens*	2,040
9	Sterling Barrens*	324
	Recreation Management Areas (1%)	**372**
10	St. Croix Campground	341
11	Trade River Equestrian Campground and Day Use	31
	Total	**34,106**

** Includes a designated State Natural Area*

MANAGEMENT AND DEVELOPMENT

FOREST PRODUCTION MANAGEMENT AREAS

The general management objective of a forest production area is the sustainable production of forest products. Forest production areas also meet a wide range of ecological, aesthetic, wildlife, and recreation objectives. The specific objectives for any given management area may vary depending on site capability, forest types, and societal needs. Desired associated benefits, desired future conditions, adjacent land uses, and local economic conditions all influence the objectives as well.

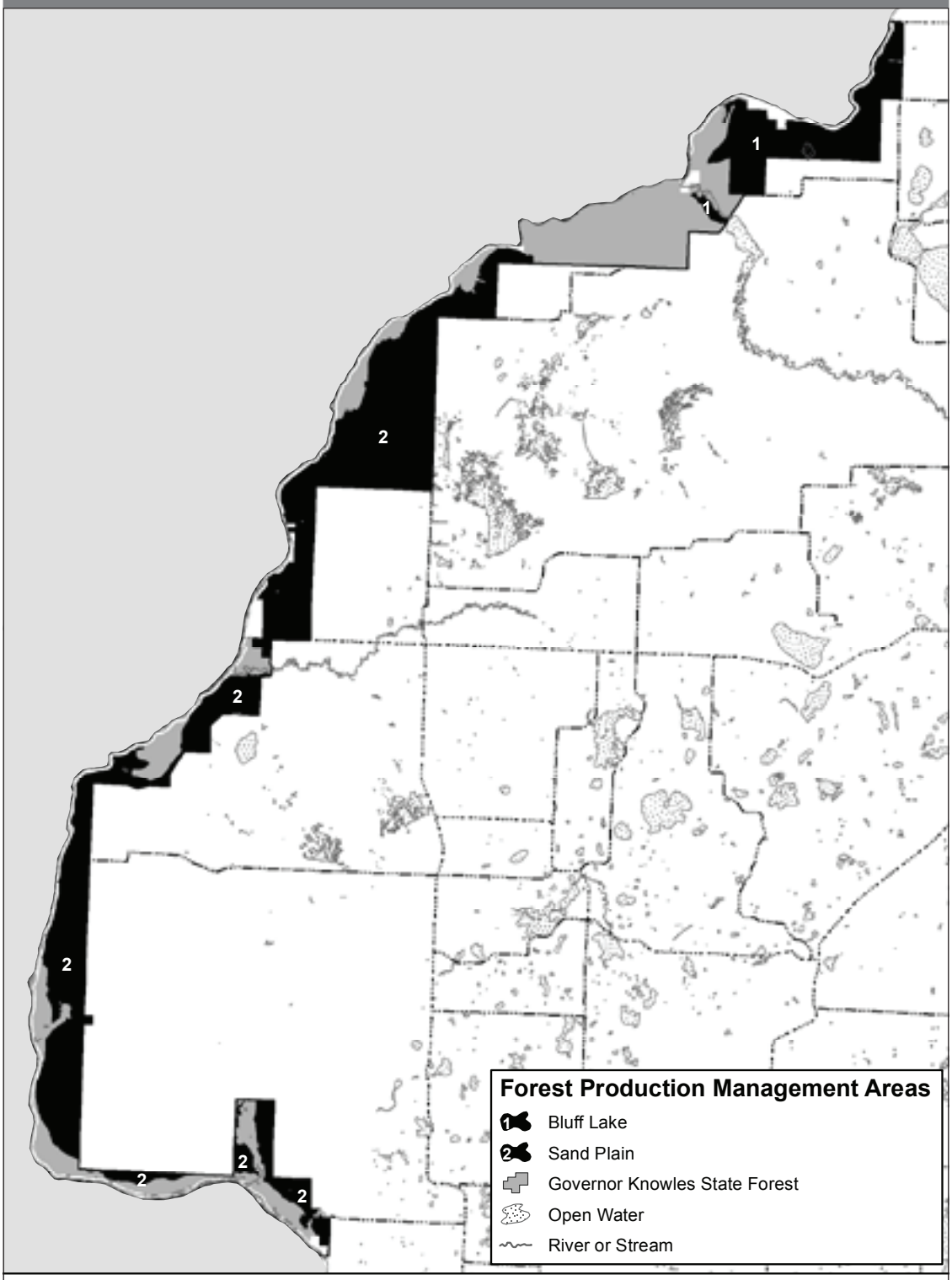
In areas of high recreation use or scenic value and where site conditions allow, management can promote the production of timber on extended rotations in a manner that promotes long-term visual appeal. Management activities will also promote the development and maintenance of certain ecological attributes to protect and enhance unique habitats and biological diversity.

TABLE 2.2 FOREST PRODUCTION MANAGEMENT AREAS

Area #	Forest Production Management Areas	Acres
1	Bluff Lake	4,635
2	Sand Plain	18,900
	Total	**23,535**

The General Forest Management Prescriptions by Primary Forest Type typically describe the management techniques to achieve the desired future conditions specified in each forest production management area. Given the large size of forest production areas, a number of special circumstances occur that require a modification to the General Forest Management Prescriptions in order to maintain and enhance those unique features. Examples of unique features commonly located in forest production management areas include small acreages of High Conservation Value Forests (HCVF) (e.g. swamp hardwood stands and wetland complexes), rustic campsites, and unique scenic geological and cultural features.

MAP 2.3 FOREST PRODUCTION MANAGEMENT AREAS



GKSF305P
February, 2012

Miles
0 1.5 3 6

Governor Knowles State Forest
Master Plan

The delineation of boundaries between all of the various land management classification is a general representation of those boundaries. More detailed delineation will be produced at the discretion of the department where authorized activities, management or improved on the ground information is available.

N

BLUFF LAKE

Overview and Summary

The Bluff Lake management area includes the land surrounding Bluff Lake from the south shore of the Clam Flowage to Highway 77 at the northern boundary of the forest. This management area is 4,635 acres of which 2,274 acres are in state ownership. Bluff Lake, a 60 acre state owned lake, with no public access, lies in the center of this management area. Burnett County Forest comprises 1,534 acres and 813 acres are private in-holdings with both permanent and seasonal residences. The National Park Service administers approximately 529 acres adjacent to this management area which generally includes a 412 feet wide strip of land adjacent to the St. Croix River as well as scattered blocks further inland. The management objectives and prescriptions described later in this section apply only to those lands in state ownership.

This management area is dominated by flat to gently rolling terrain with vegetation typical of Northern Dry Forests and Northern Dry-Mesic Forests. Examples of Mesic Forest and Hardwood Swamp are also present in this area below the St. Croix River escarpment and in low lying areas. The Sioux Portage Creek, an Exceptional Resource Water, originates on the state forest east of Bluff Lake and flows north through this management area and into the St. Croix River. Numerous recreational trails and roads provide access to the Sioux Portage Group Camp and the Clam River Flowage.

The Danbury Wildlife Area (DWA), part of the Glacial Lake Grantsburg Management Unit, is located adjacent to the northern portion of this management area. The DWA is managed similarly to the GKSF and is comprised of similar cover types. There is an opportunity to coordinate forest management between these two properties.

Description of the Forest Resource

This area is generally dominated by aspen and scrub oak (northern pin oak) with minor components of jack pine, red pine, white pine, red oak, red maple, northern hardwoods, and swamp hardwoods. The large acreage of aspen, combined with scrub oak, make this area highly susceptible to gypsy moth defoliation.

The soils and forest habitat types (described below) make this area highly suitable for red, jack and white pine. White pine is especially under-represented in all size classes in this area, even as a secondary timber type. When combined, the pine cover types make up 17% of the management area, compared to aspen which comprises 41% of the management area. Although conifers are poorly represented in this management area, the relatively large acreage of state owned aspen is a good compliment to the county forest acreage within this management area which is predominantly red pine.

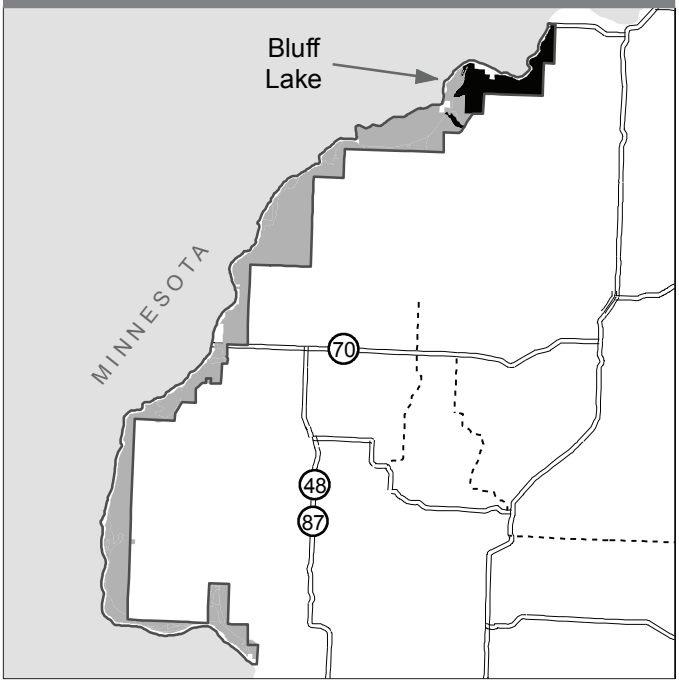
The scrub oak cover type is expected to decrease over the next 50 years due to the encouragement of aspen and the natural conversion of scrub oak to red maple and northern hardwoods which will occur due to inaccessibility or scenic considerations near the St. Croix River.

On July 1, 2011, severe winds impacted much of the mature timber in this management area causing significant, stand altering damage. A salvage harvest occurred shortly after the storm in October 2011, which removed much of the damaged oak, pine, and aspen. The salvage prescriptions were developed with consideration given to the objectives of this section.

AREA 1 SUMMARY

- 4,635 acres
- Aspen is the dominant forest type (44% of state-owned land)
- Greatly impacted by the 2011 wind storm
- Shares boundaries with county forest and a state wildlife area
- Rocky sandy soils
- Increase and maintain ruffed grouse habitat

AREA 1 LOCATOR MAP



MAP 2.4 BLUFF LAKE

GKSF314P
May, 2012

Miles
0 0.35 0.7 1.4

Governor Knowles State Forest
Master Plan

The delineation of boundaries between all of the various land management classifications is a general representation of those boundaries. More detailed delineation will be produced at the discretion of the department where authorized activities, management or improved on the ground information is available.

N

Land Type Associations

Four LTAs are found within this management area. Covering approximately half of the acreage, the St. Croix Plains (212Kb18) is characterized as undulating outwash plain and outwash-veneered moraine. A small fraction of the area is within the Webb Lake Collapsed Barrens (212Ka05) and can be characterized by rolling collapsed outwash plain with frequent lakes. The remainder of the area is divided between the Danbury-Trego Plains (212Ka16) and the Grantsburg Dunes (212Ka01) LTAs. The characteristic landform pattern of the Danbury-Trego Plains is undulating outwash plain with fans and frequent stream terraces. The characteristic landform pattern of the Grantsburg Dunes is undulating outwash plain with dunes, marshes, and frequent swamps.

Soils and Habitat Types

The soils are predominantly excessively drained sands (menahga, grayling, and meehan), loamy sands (grettum and wurtsmith), and poorly drained mineral or muck. Some of the area is covered with stony complexes making site preparation and tree planting a challenge.

The habitat types are closely tied to soil type and all are classified as dry in soil moisture and poor to medium in soil nutrients. The two common upland habitat types found in this management area are PQGCe (Pinus-Quercus/Gaultheria-Ceanothus) and PArVAm (Pinus-Acer rubrum/ Vaccimium-Amphicarpa). PQGCe is the most nutrient deficient and driest habitat type found on the GKSF. The dominant shrubs of this habitat type are blueberries, hazel, and juneberry. The dominant ground flora is bracken fern, sedges, wild lily-of-the-valley, and wintergreen. The climax tree species are white pine and oak species. PArVAm, very similar to PQGCe, is slightly higher in the nutrient regime. Other subtle differences include the presence of big leaf aster, wild sarsasparilla, false Solomon's seal, and northern bedstraw. Along with white pine and oak species, red maple is considered a climax species.

The AAtRp (Acer/Athyrium-Rubus) habitat type is found in the low lying areas and is less common. These sites have medium nutrient regimes and wet-mesic moisture regimes. These sites exhibit poor drainage with windthrow being the principal natural disturbance. Mixed hardwoods, such as red maple, black ash, aspen, birch, and basswood are typically found on this habitat type.

Long Term Management Objectives

The Bluff Lake Management Area will provide a continuous supply of forest products with consideration given to the aesthetic environment for recreation. Aspen will continue to be the dominant cover type. White pine and red oak will increase in some areas, especially within the river corridor, contributing

FIGURE 2.2 BLUFF LAKE CURRENT LAND COVER

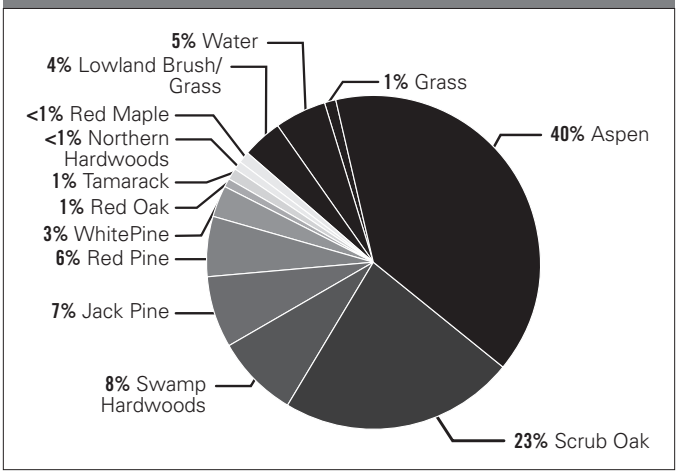


TABLE 2.3 BLUFF LAKE CURRENT AND PREDICTED COVER TYPES

Cover Type	CURRENT		PREDICTED 50 YEAR	
	Acres	% Total	Acres	% Total
Forested Types				
Aspen	903	40%	1,000	44%
Scrub Oak	520	23%	280	12%
Swamp Hardwoods	184	8%	184	8%
Jack Pine	170	7%	170	7%
Red Pine	133	6%	150	7%
White Pine	60	3%	80	4%
Red Oak	29	1%	40	2%
Tamarack	26	1%	26	1%
Northern Hardwoods	14	<1%	40	2%
Red Maple	6	<1%	75	3%
Non-forested Types				
Lowland Brush/Grass	94	4%	94	4%
Water	113	5%	113	5%
Grass	22	1%	22	1%
Total	**2,274**	**100%**	**2,274**	**100%**

to the aesthetic qualities of the area. Jack pine will increase and will be managed primarily for forest products.

The age structure of the early successional aspen/birch forest types will increase, in coordination with the Danbury Wildlife Area, providing habitat for species such as Ruffed Grouse, Woodcock, Golden-winged Warbler and other common wildlife and Species of Greatest Conservation Need (SGCN) that depend on this habitat.

Water quality and riparian habitat will be protected. Swamp hardwood stands will likely be impacted by Emerald Ash Borer (EAB).

Ample hunting and wildlife viewing opportunities will exist through a variety of habitats. Deer, bear, Ruffed Grouse and other wildlife will continue to flourish in this area.

Short Term Management Objectives

- Maintain the overall health and vigor of the forest, aesthetic appeal, and continue to provide wildlife habitat.
- Protect and enhance the water quality and riparian habitat of Bluff Lake, Clam Flowage, St. Croix River and its tributaries, as well as the wetlands in the area.
- Develop strategies to address future EAB impacts in swamp hardwood stands.
- Promote red oak development and regeneration where it occurs.
- Increase the presence of jack, red, and white pine on suitable sites across the area, especially in mixed hardwood stands nearer the St. Croix River where red pine and white pine are already present.
- Maintain the existing acreage of pure aspen stands. In mixed stands of aspen and oak, increase the acreage of aspen to provide habitat for species such as Ruffed Grouse, Woodcock and Golden-winged Warbler.
- Minimize the appearance of management activities that are visible from the river, lakes, flowages, and intensive recreational use areas.

Management Prescriptions

Please see the General Forest Management Prescriptions by Primary Type later in Chapter Two for specific management prescriptions for various cover types. The General Forest Management Prescriptions are authorized, except as noted below.

- This entire area is managed using active management techniques and will be implemented following all DNR handbooks and guidelines.
- When harvesting timber within view of the St. Croix River, design sales so that no management activity can be seen from the river during leaf on conditions. Use aesthetic management techniques for timber harvests that are visible from the rivers, lakes, flowages, and intensive recreational use areas such as reducing the size of cuts, establishing irregular harvest boundaries, conducting partial harvests, planting trees, favoring longer-lived species, and where necessary, harvesting during the winter.
- In mixed stands with scattered pine, retain some pine and oak legacy trees where possible and employ silvicultural techniques that favor pine regeneration and improve structural diversity.
- Efforts will be made to manage the aspen in this area and the Danbury Wildlife Area as one unit in terms of forest regulation. Aspen harvests within this area will be determined by analyzing the aspen recon data for this area in conjunction with the aspen recon data for the Danbury Wildlife Area.
- Plant open fields, acquired through land acquisition, with species suitable to the site.
- Use adaptive management in the swamp hardwoods areas by employing available EAB guidance. Inaccessible stands adjacent to National Park Service ownership will be passively managed.

SAND PLAIN

Overview and Summary

The Sand Plain management area is comprised of 18,900 acres with 53% of the land in public ownership (state, county, and township). Approximately 8,302 acres (44% of the management area) are in state ownership. Burnett County, Polk County, and Sterling Township own approximately 1,147 (6%), 466 (2%), and 120 (1%) acres, respectively, within this management area. Private in-holdings with both permanent and seasonal residences make up the remaining 8,785 acres. The National Park Service (NPS) administers approximately 1,210 acres adjacent to this management area which generally includes a 412 feet wide strip of land adjacent to the St. Croix River as well as scattered blocks further inland. The management objectives and prescriptions described later in this section apply only to those lands in state ownership.

This management area, in part, shares boundaries with the Crex Meadows and Fish Lake State Wildlife Areas, which are part of the Glacial Lake Grantsburg (GLG) Wildlife Management Complex.

This area includes seven individual sites from Norway Point Landing on the north end of the management area extending to the southern boundary of the forest near Wolf Creek. This area offers abundant river accesses and access to public roads, recreational trails, and GKSF and National Park Service campsites.

Description of the Forest Resource

This area is comprised largely of forested uplands with a few forested wetlands. Timber types are predominantly even-aged, shade-intolerant timber types such as scrub oak (northern pin, bur), jack pine, red pine, and aspen. While white pine is under-represented as a primary type, occupying only 6% of the area, it is well represented when looking at its presence as a primary, secondary, and understory species throughout this management area.

Over the next 50 years, scrub oak will decrease while aspen, jack pine, red pine and white pine will increase. Red maple will see a slight increase and red oak a slight decrease due to scenic management nearer the St. Croix Riverway. The upland brush and upland grass types will see a decrease due to encroachment from surrounding forested types.

Currently the population of gypsy moth on the state forest is insignificant; however, the large acreage of scrub oak combined with aspen make this area highly susceptible to gypsy moth defoliation in the future as the population increases. Oak wilt is common throughout this management area with a higher concentration present south of Highway 70.

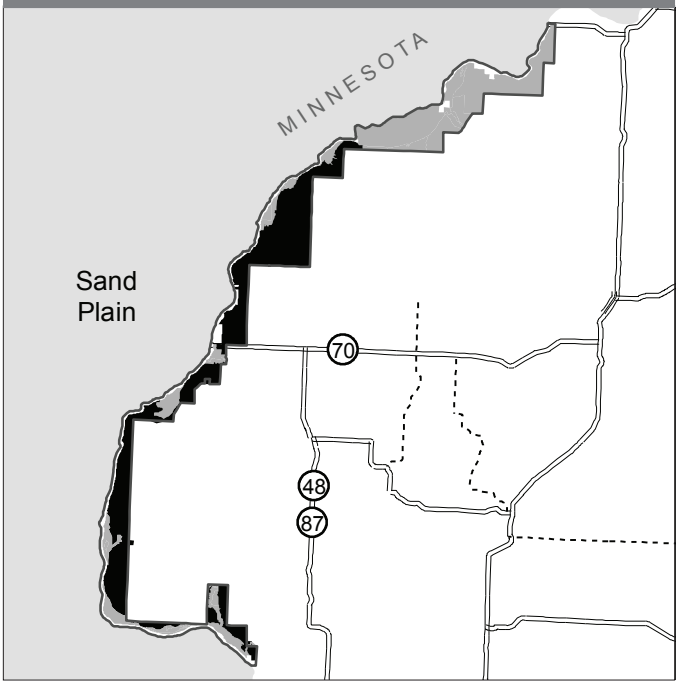
The swamp hardwoods type is generally dominated by ash species. The future health of this type is unknown due to the risk of Emerald Ash Borer (EAB).

Forest management on the other public forests within this area, in terms of management prescriptions, tools available to accomplish management objectives, and soil types is very similar to the GKSF. In addition, forest management is guided by the same processes and is conducted under the same management guidelines and silvicultural principles. Pine (jack

AREA 2 SUMMARY

- 18,900 acres – largest management area on the forest
- Adaptive management for insects and diseases such as gypsy moth, oak wilt, and emerald ash borer
- Impacts from the 2011 wind storm are evident throughout this area
- Shares boundaries with two county forests, two state wildlife areas, and township forest land
- Dry, sandy soils

AREA 2 LOCATOR MAP



MAP 2.5 SAND PLAIN

GKSF315P
February, 2012

Miles
0 1 2 4

Governor Knowles State Forest
Master Plan

The delineation of boundaries between all of the various land management classifications is a general representation of those boundaries. More detailed delineation will be produced at the discretion of the department where authorized activities, management or improved on the ground information is available.

N

and red primarily), aspen, and scrub oak are the dominant forest types on all three forests.

Land Type Associations

Two LTAs are found within this management area. Covering approximately ten percent of the acreage, the St. Croix Plains (212Kb18) is characterized as undulating outwash plain and outwash-veneered moraine. The remainder of the area is the Grantsburg Dunes (212Ka01) LTA. The characteristic landform pattern of the Grantsburg Dunes is undulating outwash plain with dunes, marshes, and frequent swamps.

Soils and Habitat Types

The soils in this area are primarily Omega fine sands and loamy sands on the uplands, and poorly drained mineral or muck in the lowlands.

The habitat types are closely tied to soil type and all are classified as dry in soil moisture and poor to medium in soil nutrients. The most common upland habitat type found in this area is PQGCe (Pinus-Quercus/Gaultheria-Ceanothus). PArVAm (Pinus-Acer rubrum/ Vaccimium-Amphicarpa) and QAp (Quercus albo-Quercus spp./Amorpha canescens) are also present. PQGCe is the most nutrient deficient and driest habitat type found in this management area. The dominant shrubs of this habitat type are blueberries, hazel, and juneberry. The dominant ground flora is bracken fern, sedges, wild lily-of-the-valley, and wintergreen. The climax tree species are white pine and oak species.

The PArVAm habitat type is very similar to PQGCe, but is slightly higher in the nutrient regime. Other subtle differences include the presence of big leaf aster, wild sarsasparilla, false Solomon's seal, and northern bedstraw. Along with white pine and oak species, red maple is considered a climax species. QAp sites are more dry-mesic, usually have a more developed shrub layer, and have a lesser developed herb layer than the PQGCe habitat type.

Long Term Management Objectives

The Sand Plain Forest Production Management Area will provide a continuous supply of forest products with consideration given to the aesthetic environment for recreation. Jack, red and white pine will increase and scrub oak dominated areas will be less abundant. Pine will especially be dominant in areas not already dominated by aspen.

Water quality and riparian habitat will be protected and maintained. Swamp hardwood stands will likely be impacted by Emerald Ash Borer.

FIGURE 2.3 SAND PLAIN CURRENT LAND COVER

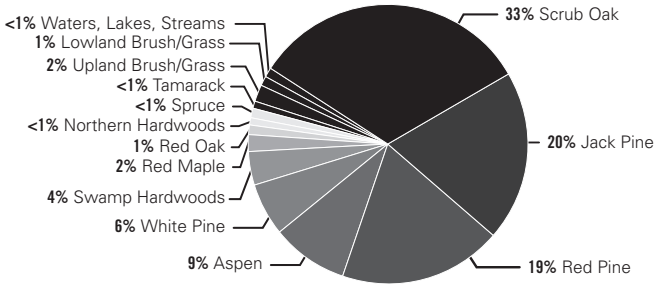


TABLE 2.4 SAND PLAIN CURRENT AND PREDICTED COVER TYPES

Cover Type	CURRENT		PREDICTED 50 YEAR	
	Acres	% Total	Acres	% Total
Forested Types				
Scrub Oak	2,751	33%	2,206	27%
Jake Pine	1,683	20%	1,954	24%
Red Pine	1,600	19%	1,690	20%
Aspen	737	9%	810	10%
White Pine	515	6%	750	9%
Swamp Hardwoods	339	4%	339	4%
Red Maple	126	2%	150	2%
Red Oak	106	1%	40	<1%
Northern Hardwoods	67	<1%	67	<1%
Spruce	52	<1%	52	<1%
Tamarack	2	<1%	2	<1%
Non-forested Types				
Upland Brush/Grass	168	2%	86	1%
Lowland Brush/Grass	123	1%	123	1%
Water, Lakes, Streams	33	<1%	33	<1%
Total	**8,302**	**100%**	**8,302**	**100%**

The Sand Plain Forest Production Management Area will continue to be an attractive setting for people to enjoy a variety of recreational opportunities, including hunting, hiking, equestrian uses, fishing, cross country skiing, snowshoeing, and wildlife viewing. Although managed primarily for the sustainable production of forest products, the aesthetically pleasing features of this area will be maintained or improved.

Short Term Management Objectives

- Maintain the overall health and vigor of the forest, aesthetic appeal, and continue to provide wildlife habitat.
- Protect water quality and riparian habitat of the St. Croix River, its tributaries, and the wetlands in the area.
- Minimize, to the extent possible, the spread of oak wilt and the future impacts of gypsy moth infestations so as to maintain an oak component within the area.
- Increase the presence of jack, red, and white pine on suitable sites across the area. Specifically, increase the acreage of stands that are dominated by jack pine, and increase natural pine regeneration in mixed stands where red pine and white pine are not the dominant species.
- Maintain a diversity of age classes across all timber types, thereby providing a continuum of wildlife habitats, including early seral stage.
- Increase natural tree regeneration and improve structural diversity on appropriate sites.
- Minimize the appearance of management activities that are visible from the rivers, flowages, and intensive recreational use areas.

Management Prescriptions

Please see the General Forest Management Prescriptions by Primary Type later in Chapter Two for specific management prescriptions for various cover types. The General Forest Management Prescriptions for each appropriate cover type apply to this management area, except as noted below.

- This entire area is managed using active management techniques and will be implemented following all DNR handbooks and guidelines.
- When harvesting timber within view of the St. Croix River, design sales so that no management activity can be seen from the river during leaf on conditions. Use aesthetic management techniques for timber harvests that are visible from the rivers, flowages, and intensive recreational use areas such as reducing the size of cuts, establishing irregular harvest boundaries, conducting partial harvests, planting trees, favoring longer-lived species, and where necessary, harvesting during the winter.
- Where feasible, use natural conversion to increase the presence of white pine where white pine is a secondary stand component. Efforts should focus on overstory removal and management prescriptions that promote natural white pine regeneration.
- In mixed stands with scattered pine, retain some large red and white pine legacy trees and employ silvicultural techniques that favor pine regeneration and improve structural diversity.
- Use prescribed fire where appropriate to increase plant and structural diversity, promote natural tree regeneration, or to prepare sites for artificial regeneration.
- Site preparation for regeneration will be tailored to meet the prescribed regeneration objectives. The forester will use the least intensive site preparation prescription that balances the intensity of the site preparation against the desired end stocking levels.
- Provide a shifting mosaic of early seral stage temporary barrens on appropriate sites. Larger harvests are more desirable from a wildlife habitat standpoint.
- Decrease the acreage of oak through natural conversion to other species or artificial regeneration techniques.
- Consider earlier rotations of oak stands not yet infected with oak wilt in order to mitigate susceptibility to wind damage.
- On oak wilt sites where oak maintenance is the objective, try a variety of techniques that favor seed source oak regeneration. Systems may include mechanical seed bed preparation through various types of scarification, prescribed fire, or any other techniques expected to promote seed origin oak.
- Use adaptive management in the swamp hardwood sites. Inaccessible stands will be passively managed. On accessible swamp hardwood sites, depending on EAB impacts, use silvicultural trials to better understand conversion opportunities so that aesthetic qualities and timber production are maintained.
- Plant open fields acquired through land acquisition with tree species suitable to the site.

NATIVE COMMUNITY MANAGEMENT AREAS

Native community management areas are managed with the primary objective of representing, restoring, and perpetuating native plant and animal communities, whether upland, wetland, or aquatic and other aspects of native biological diversity. Management activities are designed to achieve land management objectives through natural processes (passive management) or management techniques that mimic natural processes (active management) when possible. Areas that do not have the desired community conditions but have a reasonable potential to be restored to those conditions are included in the native community classification.

Native community management areas also provide low-impact public access for uses such as hunting, hiking, bird-watching, photography, and nature study. Opportunities are also available for research, ecological interpretation, and education.

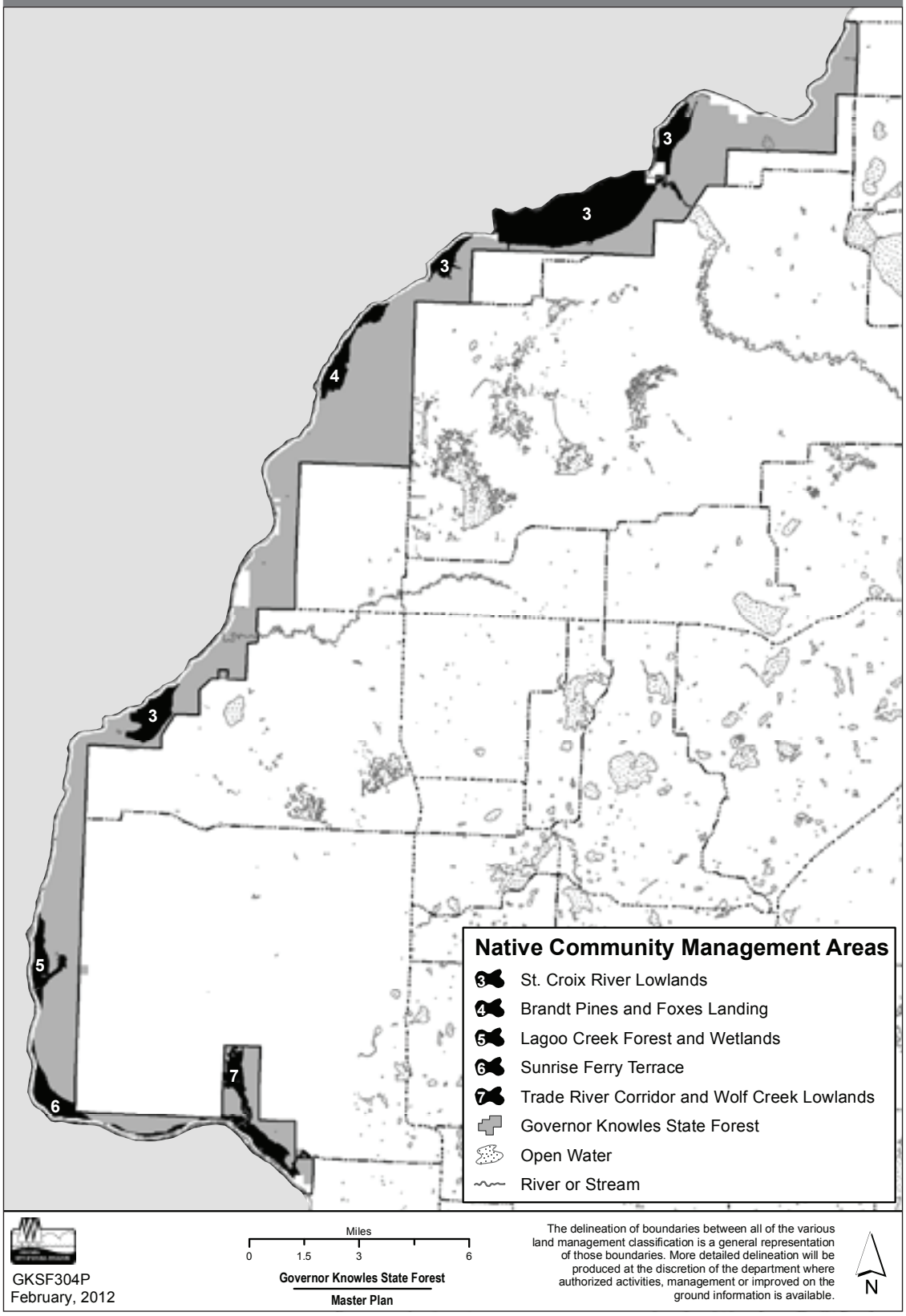
TABLE 2.5 NATIVE COMMUNITY MANAGEMENT AREAS

Area #	Native Community Management Areas	Acres
3	St. Croix River Lowlands*	5,027
4	Brandt Pines and Foxes Landing*	614
5	Lagoo Creek Forest and Wetlands	530
6	Sunrise Ferry Terrace	558
7	Trade River Corridor and Wolf Creek Lowlands*	1,106
	Total	**7,835**

The General Forest Management Prescriptions by Primary Forest Type describe the active management techniques to achieve some of the desired future conditions in native community management areas. In some cases, special circumstances occur that require a modification to the General Forest Management Prescriptions in order to maintain and enhance those unique features. Examples of unique features commonly located in native community management areas include small acreages of High Conservation Value Forests (HCVF) (e.g. swamp hardwood stands and wetland complexes), rustic campsites, and unique scenic geological and cultural features.

NATIVE COMMUNITY MANAGEMENT AREAS

MAP 2.6 NATIVE COMMUNITY MANAGEMENT AREAS



GKSF304P
February, 2012

ST. CROIX RIVER LOWLANDS

Overview and Summary

This management area is comprised of three separate sites totaling 5,027 acres, of which 4,881 acres are in state ownership. Private in-holdings make up the remaining 146 acres. The National Park Service (NPS) administers approximately 948 acres adjacent to parts of this management area which generally includes a 412 feet wide strip of land adjacent to the St. Croix River as well as scattered blocks further inland. The management objectives and prescriptions described later in this section apply only to those lands in state ownership.

This management area consists of relatively large blocks of wetland complexes near the St. Croix River that encompass a diverse mix of high quality wetland communities including hardwood swamp, alder thicket, shrub carr, black spruce swamp, tamarack swamp, and northern wet-mesic forest, as well as numerous forested seeps flowing from the escarpment forested in oak, northern hardwoods and pine.

The largest of the three sites, the 4,050 acre Kohler-Peet Site is the northern most site stretching from Norway Point Landing to the northeast approximately two miles north of, and including the Clam River Flowage. The majority of the Kohler-Peet Site extends all the way to the St. Croix River; however, the National Park Service administers 778 acres adjacent to part of the site boundaries (approximately two miles along the St. Croix River).

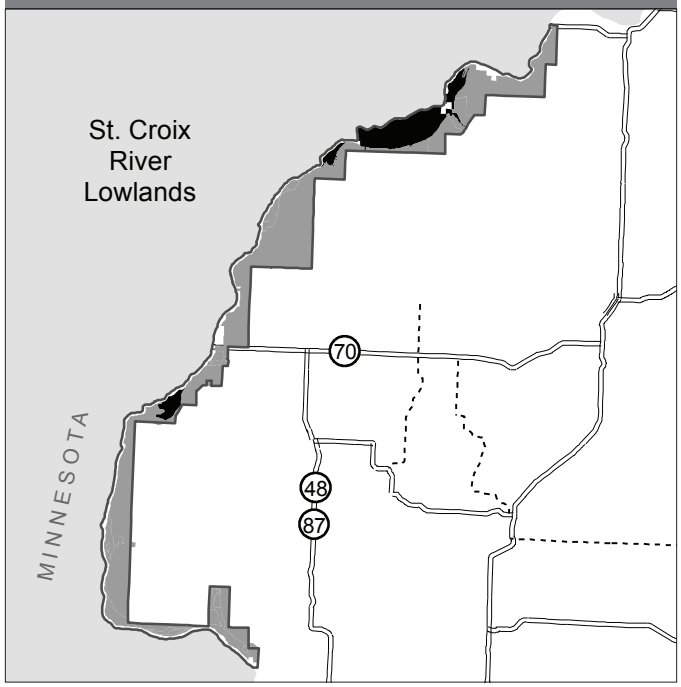
Just west of the Kohler-Peet Site is the 314 acre Ekdall Wetlands Site, which contains a mosaic of conifer swamp types (much of it tamarack-dominated, but some portions with black spruce or cedar), alder thicket, diverse black ash-dominated hardwood swamp, and open wetland grading into floodplain forest closer to the St. Croix River. This site is located north of County Road F between Nelson Landing Road and Nordstrom Lane. The main escarpment forms the eastern and southern boundaries of this site, with numerous seeps flowing into the wetland types below. The Ekdall Wetlands Site is separated from the St. Croix River by a 412 foot strip of land containing approximately 102 acres of National Park Service ownership.

Located approximately six miles southwest of Grantsburg is the 663 acre St. Croix Ash Swamp Site, which lies east of Pleasant Prairie Road and extends to the east. A majority of this site features mature hardwood swamp with high canopy cover, dominated by black ash with yellow birch, red maple, and scattered white pine. Other natural communities include tamarack swamp, alder thicket, northern sedge meadow, and a cedar-dominated northern wet-mesic forest. Benson Brook, along with its adjacent wetlands, is found along the south end of the site, much of it on private land. Similar to the Ekdall Wetlands Site, the St. Croix Ash Swamp Site is separated from the St. Croix River by 68 acres of National Park Service ownership.

AREA 3 SUMMARY

- 5,027 acres
- Dominated by swamp hardwoods and other lowland types (84% of the area)
- Passive management
- 3 designated SNAs featuring wetland communities

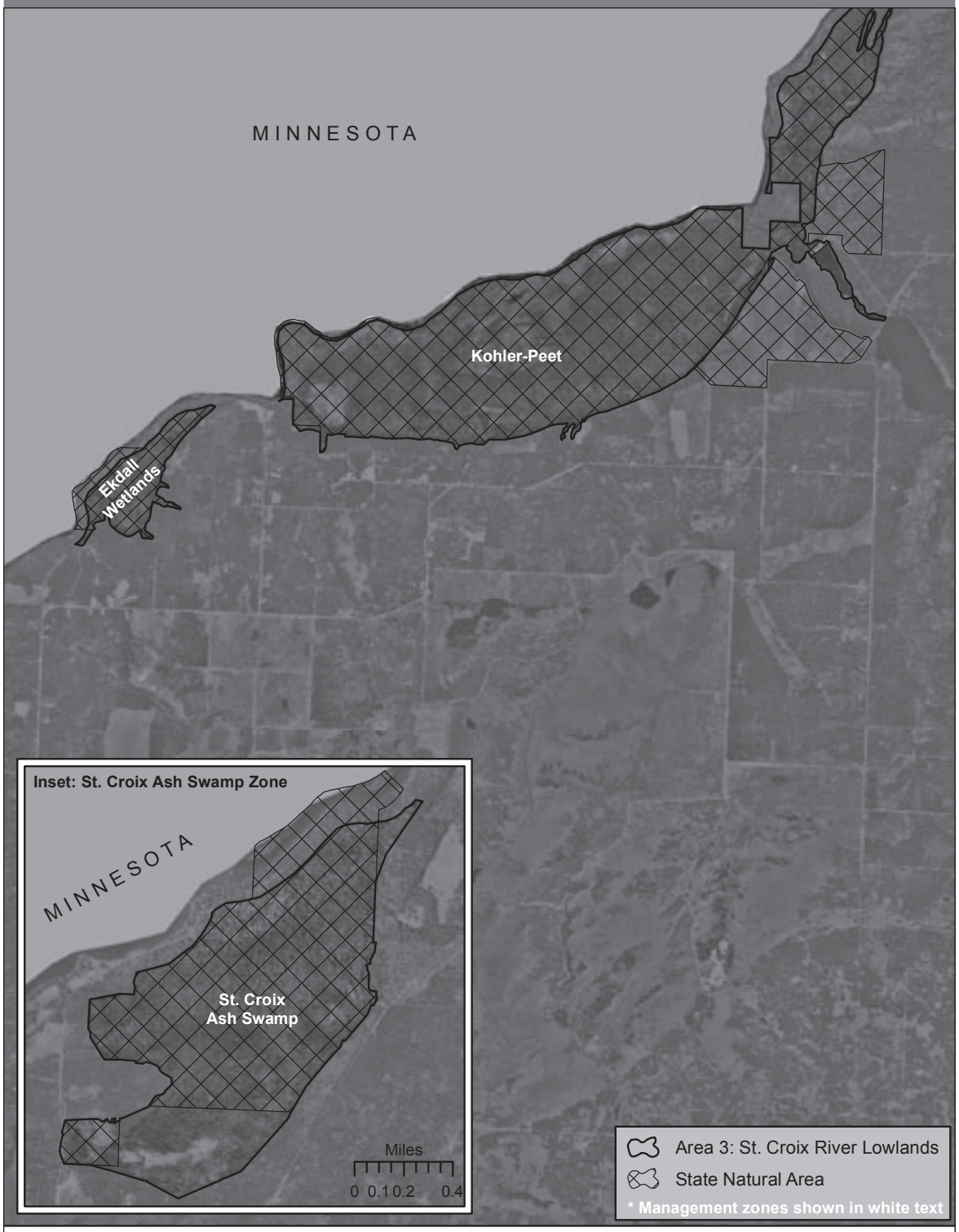
AREA 3 LOCATOR MAP



Description of the Forest Resource

Due to the abundance of moisture in this management area, the swamp hardwood type is well represented, occupying 46% of the acreage. The swamp hardwoods type is dominated by black ash. The future health of this type is unknown due to the risk of Emerald Ash Borer (EAB).

MAP 2.7 ST. CROIX RIVER LOWLANDS



GKSF309P
February, 2012

Miles
0 0.35 0.7 1.4

Governor Knowles State Forest
Master Plan

The delineation of boundaries between all of the various land management classifications is a general representation of those boundaries. More detailed delineation will be produced at the discretion of the department where authorized activities, management or improved on the ground information is available.

N

Non-forested lowlands and swamp conifer types consisting of black spruce, cedar, and tamarack are also well represented within this management area. A minor component of upland cover types of northern hardwood, aspen, oak (red and northern pin oak), and white pine can be found on a patchwork of dry, upland inclusions and on the slopes and terraces within the area.

The acreage of aspen and oak cover types will decrease over the next 50 years while the acreage of northern hardwoods and white pine is expected to increase through natural succession due to passive management of this area.

Land Type Association
The entire management area lies within the St. Croix Plains (212Kb18). The characteristic landform pattern of the St. Croix Plains is undulating outwash plain and outwash-veneered moraine.

Soils and Habitat Types
Soils are predominantly excessively drained sand over acid sandy loam till or outwash characteristic of floodplains. Typical soils include Bowstring Muck, Winterfied-Totogatic, and Rockmarsh-Clemens. The soil texture on these soils consists of muck and cobbly, mucky peat. Typical soils on the stream terraces and upland inclusions include the moderately well drained Dairyland-Emmert and Dairyland-Skog complexes. These soils are cobbly, sandy loams.

This management area exhibits qualities of hydric habitat types, which typically have medium to high nutrient regimes and wet-mesic moisture regimes. These sites exhibit poor drainage with windthrow being the principal natural disturbance. Habitat types for wetland soils have not been developed yet.

Long Term Management Objectives
A high quality complex of native wetland community types will be present. Aspen and oak will be less common as they succeed to the northern hardwood or naturally convert to white pine. Ecological values including water quality, hydrology, native flora, natural communities and rare species habitats will be protected. Ample opportunities for research, education, ecological interpretation and low-impact uses such as hunting, hiking, bird-watching, photography, and nature study will be available.

FIGURE 2.4 ST. CROIX CURRENT LAND COVER

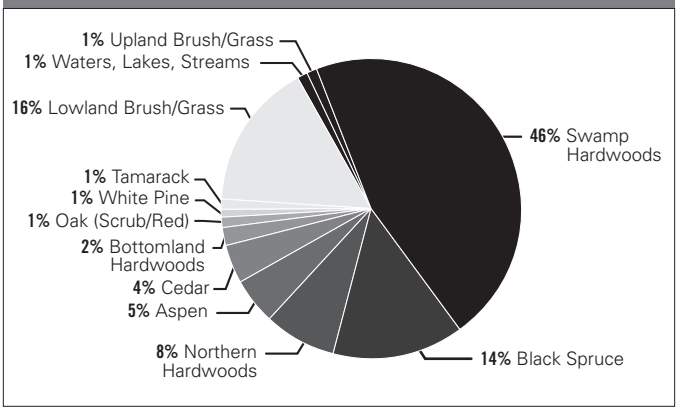


TABLE 2.6 ST. CROIX RIVER LOWLANDS CURRENT AND PREDICTED COVER TYPES

Cover Type	CURRENT		PREDICTED 50 YEAR	
	Acres	% Total	Acres	% Total
Forested Types				
Swamp Hardwoods	2,226	46%	2,226	46%
Black Spruce	707	14%	707	14%
Northern Hardwoods	385	8%	635	13%
Aspen	275	5%	25	1%
Cedar	214	4%	214	4%
Bottomland Hardwoods	97	2%	110	2%
Oak (Scrub/Red)	41	1%	20	<1%
White Pine	29	1%	45	1%
Tamarack	28	1%	28	1%
Non-forested Types				
Lowland Brush/Grass	778	16%	778	16%
Water, Lakes, Streams	73	1%	73	1%
Upland Brush/Grass	27	1%	20	<1%
Total	**4,881**	**100%**	**4,881**	**100%**

Short Term Management Objectives

- Across the entire management area, develop old-growth characteristics, including biologically mature trees, large diameter trees, structural diversity, standing dead snags, coarse woody debris, and an uneven canopy.
- Protect and enhance riparian habitat.
- Maintain a somewhat remote and undeveloped site along the St. Croix River.

Management Prescriptions

- Passively manage the entire area with the exception of clearing trails (material shall be left on site) to maintain low impact public access and invasive species control.
- Salvage operations due to catastrophic wind, ice, fire, disease or insects may take place. Prior to salvage an interdisciplinary team will be constructed to determine if salvage operations or additional management could be completed, considering the original objectives of the area.
- Periodically monitor the area for the presence of invasive species
- Control invasive species using appropriate techniques, including the use of pesticides.
- Monitor this area within the next ten years for the presence of additional rare, threatened or endangered species, as resources allow.

State Natural Area Designation

Three State Natural Areas, Norway Point Bottomlands, Ekdall Wetlands, and St. Croix Ash Swamp, will overlay this entire management area totaling 4,858 acres.

BRANDT PINES AND FOXES LANDING

Overview and Summary

The Brandt Pines and Foxes Landing Management Area is 614 acres in size and extends from just north of Foxes Landing Road south to the Brandt Pines Ski Trail parking lot. Of the 614 acres, 607 acres are in state ownership with the remainder in private in-holdings. The National Park Service (NPS) administers approximately 180 acres adjacent this management area which generally includes a 412 feet wide strip of land adjacent to the St. Croix River. The management objectives and prescriptions described later in this section apply only to those lands in state ownership.

This management area features the best examples of pine-dominated Northern Dry-Mesic Forest on the GKSF, growing in association with hardwood swamp. Typical dry-mesic herbs dominate the ground layer including bracken fern, low sweet blueberry, large-leaf aster, wintergreen, and starflower.

Numerous seeps run through the lower portions of the area, either flowing into several named streams or directly into the St. Croix River. Three small, cold water streams, Brandt Brook, Bear Brook and Kettle Brook, flow through the area into the St. Croix River. These brooks are steep gradient, sandy-bottomed coldwater streams deeply incised into the river terrace and support native brook trout.

This management area is split into three zones: the Foxes Landing Zone, the Brandt Oaks Zone, and the Brandt Pines Zone. Each zone has its own specific management prescriptions in addition to the prescriptions for the entire management area.

In addition to the natural features, this area also contains approximately four miles of the Brandt Pines cross country ski trail network and roughly two miles of hiking and interpretive trails.

Description of the Forest Resource

Nearly half of this area is scrub oak forest. These forests are dominated by northern pin and bur oak however, red and white oak are common associates in the northernmost extent of the management area. Other common associates include red maple, aspen, northern hardwoods, and jack pine. Without significant disturbance, scrub oak will decrease in the next 50 years. This predicted change will be a result of natural succession to shade-tolerant types, such as red maple, due to passive management, inaccessibility, extended rotation, and scenic harvest restrictions near the St. Croix River.

Occurring in scattered patches throughout the area are large diameter, natural-origin red pine forests, with white pine, jack pine, northern pin oak, large-toothed aspen and white birch as common associates. Historically a more common feature, mature, fire-origin red pine are now relatively rare in the southwest part of the Northwest Sands Ecological Landscape. This management area provides one of the best opportunities on the GKSF to promote older, natural origin pine, which is present here in higher amounts than elsewhere on the property.

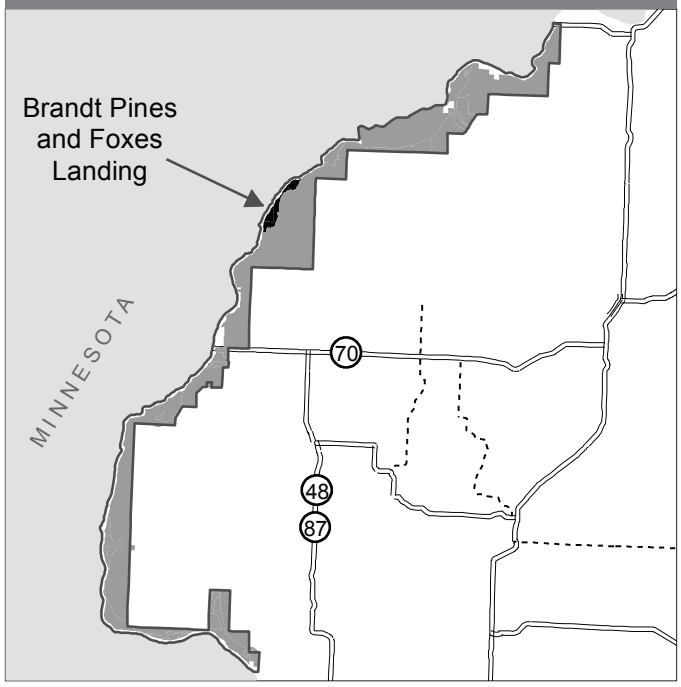
White pine forests are present on 11% of the area. White pine is also well represented as a secondary and understory species. The percentage of white pine forest in this area is expected to double in the next 50 years.

Swamp hardwood forests, dominated by mature black ash and yellow birch along with red maple and occasional white pine

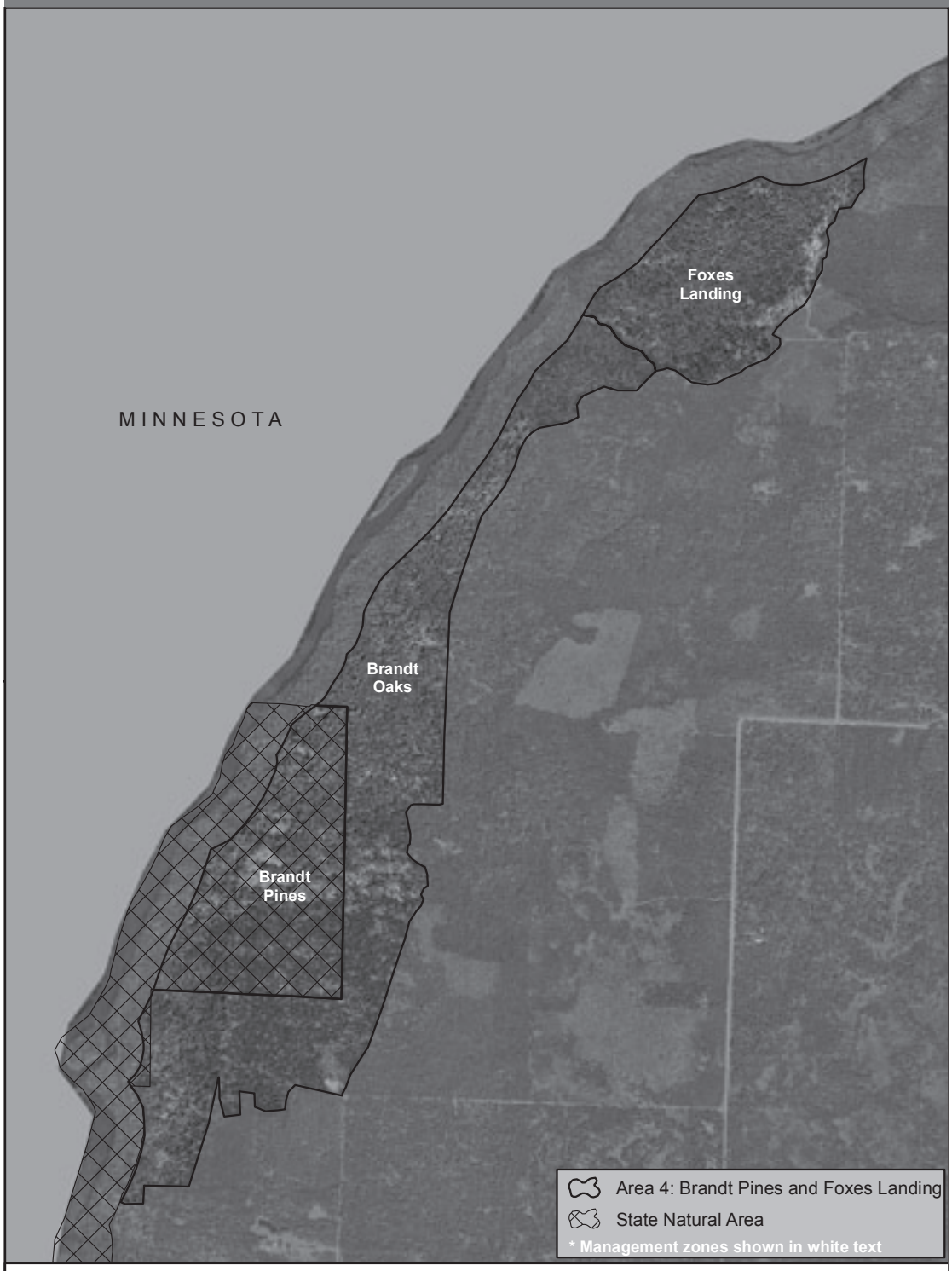
AREA 4 SUMMARY

- 614 acres
- Natural origin, large diameter pine present
- Natural white pine conversion
- 145 acre designated SNA
- Soils vary from sand to loamy sand

AREA 4 LOCATOR MAP



MAP 2.8 BRANDT PINES AND FOXES LANDING



GKSF308P
February, 2012

Miles
0 0.1 0.2 0.4

Governor Knowles State Forest
Master Plan

The delineation of boundaries between all of the various land management classifications is a general representation of those boundaries. More detailed delineation will be produced at the discretion of the department where authorized activities, management or improved on the ground information is available.

N

are found on 21% of this area in association with seeps, within the mid-level terrace portions of the area. The future health of this type is unknown due to the risk of Emerald Ash Borer (EAB).

On July 1, 2011, severe winds impacted the timber on roughly the southern half of this management area causing significant, stand altering damage to red pine and scrub oak.

Land Type Associations

The Grantsburg Dunes (212KA01) LTA makes up the eastern one third of this management area, and encompasses nearly the entire portion of the state forest that lies above the St. Croix River escarpment. The characteristic landform pattern of the Grantsburg Dunes is undulating outwash plain with dunes, marshes, and swamps common. Soils are predominantly excessively drained fine sand over outwash.

The western two thirds of this management area lies within the St. Croix Plains (212Kb18) LTA. The characteristic landform pattern of the St. Croix Plains is undulating outwash plain and outwash-veneered moraine. Soils are predominantly excessively drained sand over acid sandy loam till or outwash.

Soils and Habitat Types

Pomroy-Fremstadt-Fremstadt stony complex occurs on approximately 40% of the area. This complex is characterized as a moderately well to well drained, rocky, loamy sand. Grayling sand is also found on approximately 40% of the area. Grayling sand is a very deep, excessively drained sand common to outwash plains. The balance of the area consists of a variety of soils ranging from poorly drained muck to well drained loamy sands.

The habitat types are closely tied to soil types. The two common upland habitat types found in this area are PQGCe (Pinus-Quercus/Gaultheria-Ceanothus) and PArVAm (Pinus-Acer rubrum/ Vaccimium-Amphicarpa). PQGCe is the most nutrient deficient and driest habitat type found on the state forest. The dominant shrubs of this habitat type are blueberries, hazel, and juneberry. The dominant ground flora is bracken fern, sedges, wild lily-of-the-valley, and wintergreen. The climax tree species are white pine and oak. PArVAm, very similar to PQGCe, is slightly higher in nutrient regime. Other subtle differences include the presence of big leaf aster, wild sarsasparilla, false Solomon's seal, and northern bedstraw. Along with white pine and oak species, red maple is considered a climax species.

The AAtRp (Acer/Athyrium-Rubus) habitat type is found in the lowland areas but is less common. These sites have medium nutrient regimes and wet-mesic moisture regimes. These sites exhibit poor drainage with windthrow being the principal natural disturbance.

Hydric habitat types are also found in this area. They typically have medium to high nutrient regimes and wet-mesic moisture regimes. These habitat types exhibit poor drainage with windthrow being the principal natural disturbance. Habitat types for wetland soils have not been developed yet.

Long Term Management Objectives

The structural, compositional and functional characteristics associated with old growth and managed old growth forests will be present. Long-lived species such as white pine and bur oak will increase over time.

FIGURE 2.5 BRANDT PINES AND FOXES LANDING CURRENT LAND COVER

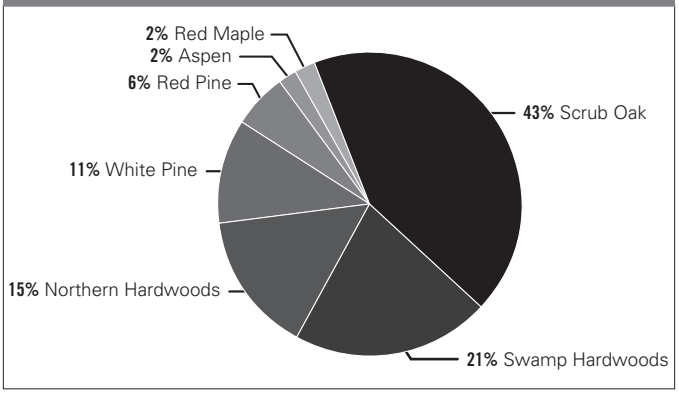


TABLE 2.7 BRANDT PINES AND FOXES LANDING CURRENT AND PREDICTED COVER TYPES

Cover Type	CURRENT		PREDICTED 50 YEAR	
	Acres	% Total	Acres	% Total
Forested Types				
Scrub Oak	263	43%	125	20%
Swamp Hardwoods	125	21%	125	21%
Northern Hardwood	93	15%	93	15%
White Pine	68	11%	131	22%
Red Pine	34	6%	34	6%
Aspen	14	2%	14	2%
Red Maple	10	2%	85	14%
Total	**607**	**100%**	**607**	**100%**

Water quality and riparian habitat will be protected. Swamp hardwood forests will likely be impacted by Emerald Ash Borer.

Short Term Management Objectives

- Allow old growth characteristics to develop naturally throughout parts of the area.
- Increase the abundance of red and white pine at the Foxes Landing Zone while promoting an older, mixed pine-oak forest community.
- Maintain and increase representation of mature bur oak on suitable sites.
- Allow swamp hardwood inclusions to continue developing older forest attributes.
- Promote research and demonstration projects that seek to balance the development of old forest characteristics with active forest management practices that maintain long-lived pine and oak species.

Management Prescriptions: Entire Management Area

- Use fire where possible to encourage pine and oak regeneration while reducing fire-intolerant species such as red maple and ironwood.
- Maintain and increase the representation of bur oak where possible. Allow bur oak to mature beyond economic rotation.
- Retain all snags and coarse woody debris to promote old growth characteristics when retention does not conflict with other forest management activities or present hazards.
- Do not harvest timber within swamps or wetlands within the area.
- Periodically monitor all areas within the site for the presence of invasive species.
- Control invasive species using appropriate techniques, including the use of pesticides.
- Manage the Brandt Pines Zone and portions of the Brandt Oaks and Foxes Landing Zones for biologically mature, large diameter trees, structural diversity, standing and downed coarse woody debris, and an uneven canopy.

Management Prescriptions: Foxes Landing Zone

- Promote red and white pine and red, white, and bur oak by reducing red maple, aspen, and northern pin oak through timber harvesting and periodic prescribed fire. Employ extended rotation forest management on pine types while selecting against northern pin oak, red maple and aspen.

Management Prescriptions: Brandt Oaks Zone

Please see the General Forest Management Prescriptions by Primary Type later in Chapter Two for specific management prescriptions for various cover types. The General Forest Management Prescriptions for each appropriate cover type apply to this zone, except as noted below.

- Use timber harvest and prescribed fire to promote bur oak, white pine and red pine where possible, while decreasing red maple and aspen.

Management Prescriptions: Brandt Pines Zone

- Passively manage the entire zone. Active management is limited to clearing trails, eliminating hazard trees, controlling invasive species, and the use of prescribed fire.
- Use prescribed fire at seven to ten year intervals to reduce shade tolerant forest types and stimulate native ground vegetation.
- Salvage operations following catastrophic wind, fire, disease or insect outbreaks may take place. However, prior to salvage, an interdisciplinary team will be consulted to determine whether salvage operations should proceed, as well as how they should be conducted.

State Natural Area Designation

The Brandt Pines and Hardwood Forest State Natural Area will overlay the Brandt Pines Zone of this management area, covering 145 acres. This SNA will also serve as an Ecological Reference Zone.

LAGOO CREEK FOREST AND WETLANDS

Overview and Summary

The Lagoo Creek Forest and Wetlands Native Community Management Area is 530 acres in size and located on the Polk/Burnett County line. 524 acres are in state ownership and 6 acres are in private in-holding within this management area. The National Park Service (NPS) administers approximately 138 acres adjacent this management area which generally includes a 412 feet wide strip of land adjacent to the St. Croix River. The management objectives and prescriptions described later in this section apply only to those lands in state ownership.

This management area contains several different plant communities within a former bend of the St. Croix River and has been divided into two management zones; the Ecological Reference Zone and the Blow Down Zone. Within the Ecological Reference Zone, and making up a sizeable portion of this management area, is a broad, forested river terrace. Some portions are dominated by a mix of bur oak, northern pin oak and red oak, with red maple, green ash, basswood and aspen as common associates.

Scattered throughout the Ecological Reference Zone are small wetland inclusions dominated by sedges and other herbaceous vegetation, some with a canopy cover of black ash. The main river escarpment forms the southeastern boundary, and below it are numerous Forested Seeps which flow through a red and white oak dominated forest. The ground layer there is a mix of wetland plants such as skunk cabbage growing adjacent to the seeps, along with rich forest herbs such as spring beauty, maidenhair fern and Virginia Waterleaf in the slightly drier areas. Many of these seeps feed into Lagoo Creek itself, which runs roughly parallel to the escarpment.

Along the upper portions of Lagoo Creek, several small ravines of maple and oak dominated mesic forest are interspersed with Forested Seeps along the steep northwest-facing bluff. Along the lower half of Lagoo Creek, several wetland types dominate, including Northern Sedge Meadow, shrub swamp and some limited areas of Tamarack Swamp.

The Blow Down Zone contains a mixture of oak and aspen, along with small areas dominated by fairly large (up to 24" diameter at breast height) white and red pine. On July 1, 2011, severe winds impacted a significant portion of this Zone causing stand altering damage.

Description of the Forest Resource

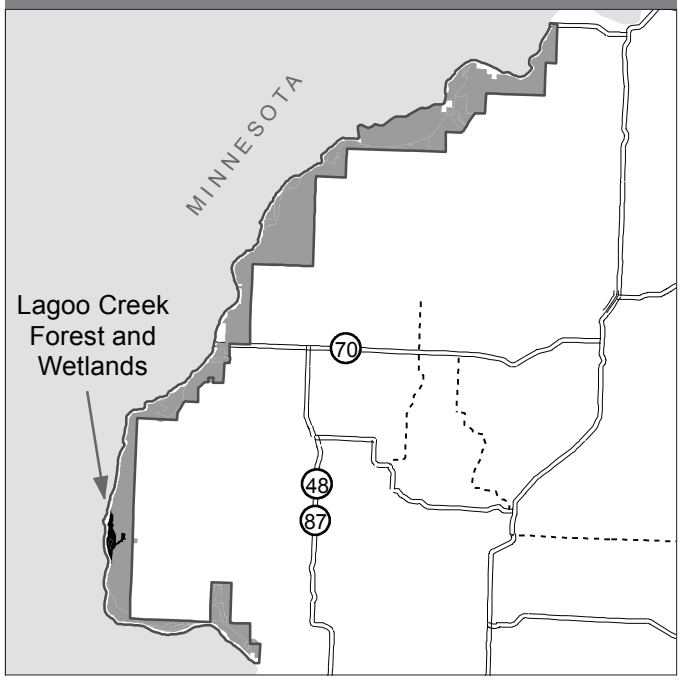
This management area is comprised largely of forested uplands with a few forested and un-forested wetlands. The tree species growing here include red, white, bur and northern pin oak, black ash, yellow birch, pines (red, white, and jack), black cherry, red maple, basswood, quaking and big tooth aspen, and paper birch. This management area exhibits a diverse mix of soil fertility and soil moisture, as indicated by the variety of tree species growing here, which have the potential to be fairly productive. The entire forest is classified as over-mature and, except for the red maple, all the types are older than 80 years of age. Scrub oak is the most common forest type in this management area covering more than one third of the area. A mix of hardwood types, tamarack, and non-forested types are well distributed across the remaining acreage.

The presence of oak makes this area susceptible to mortality caused by oak wilt and/or future gypsy moth defoliations. The swamp hardwood forests occupy 10% of the area and

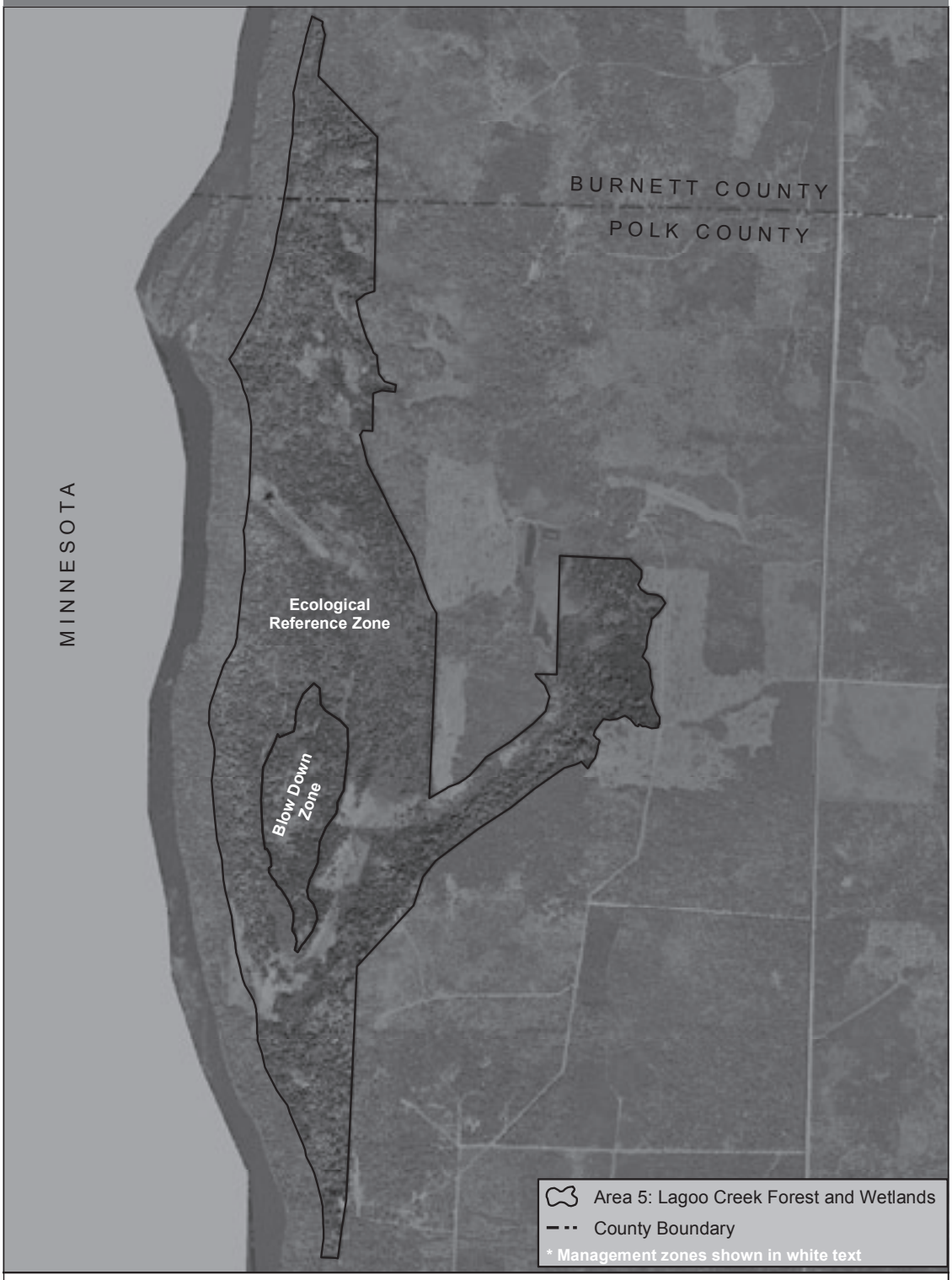
AREA 5 SUMMARY

- 530 acres
- Active management zone was impacted by the 2011 wind storm
- Numerous seeps
- Limited access due to topography and high water

AREA 5 LOCATOR MAP



MAP 2.9 LAGOO CREEK FOREST AND WETLANDS



GKSF310P
May, 2012

Miles
0 0.1 0.2 0.4

Governor Knowles State Forest
Master Plan

The delineation of boundaries between all of the various land management classifications is a general representation of those boundaries. More detailed delineation will be produced at the discretion of the department where authorized activities, management or improved on the ground information is available.

N

are dominated by black ash over 80 years of age. The swamp hardwood forests are susceptible to mortality caused by future Emerald Ash Borer (EAB) infestations.

Another issue facing this area is the high density of European buckthorn present in the understory of the scrub oak and aspen forests. Reducing the presence of buckthorn in these and surrounding forests will be critical to ensuring regeneration of the forests and restoration of native understory vegetation. In the absence of control measures, forest regeneration will be extremely difficult.

White pine is especially under-represented in all size classes in this area, even as a secondary timber type. Increasing white pine would improve wildlife habitat and aesthetics.

Land Type Association
This entire management area occurs within the St. Croix Plains (212Kb18) LTA. The characteristic landform pattern of the St. Croix Plains is undulating outwash plain and outwash-veneered moraine. Soils are predominantly excessively drained sand over acid sandy loam till or outwash.

Soils and Habitat Types
This management area is dominated by fluvaquent and Markey muck soils. These soils are typical of floodplains dissected by streams. They are somewhat to very poorly drained. Annual flooding can be expected during high water periods. Wooded swamps are common on these soils.

A small percentage of the area includes Omega fine sand and sandy udorthents. The Omega series consists of well-drained, deep, sandy soils commonly found on the terraces in the St. Croix River Valley. Typical trees species found on this soil are northern pin oak and jack pine. Udorthents occur along the eastern edge of this area. They consist of steep and very steep, somewhat excessively drained soils on steep escarpments adjacent to stream terraces with a high hazard of erosion.

The habitat types are closely tied to soil type. This management area is dominated by hydric habitat types, which typically have medium to high nutrient regimes and wet-mesic moisture regimes. These sites exhibit poor drainage with windthrow being the principal natural disturbance. A habitat type for lowlands has not been developed yet.

The PQGCe (Pinus-Quercus/Gaultheria-Ceanothus) habitat type, which is very dry and nutrient deficient, is also present in this area within the Blow Down Zone. The dominant shrubs of this habitat type are blueberries, hazel, and juneberry. The dominant ground flora is bracken fern, sedges, wild lily-of-the-valley, and wintergreen. The climax tree species are white pine and oak.

FIGURE 2.6 LAGOO CREEK FOREST AND WETLANDS CURRENT LAND COVER

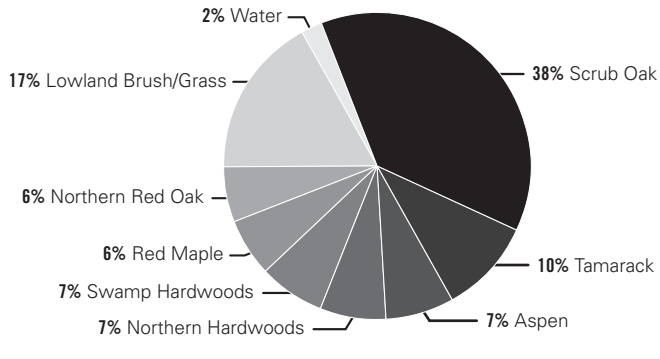


TABLE 2.8 LAGOO CREEK FOREST AND WETLANDS CURRENT AND PREDICTED COVER TYPES

Cover Type	CURRENT		PREDICTED 50 YEAR	
	Acres	% Total	Acres	% Total
Forested Types				
Scrub Oak	197	38%	65	12%
Tamarack	51	10%	51	10%
Aspen	38	7%	38	7%
Northern Hardwoods	37	7%	95	18%
Swamp Hardwoods	35	7%	35	7%
Red Maple	34	6%	94	18%
Northern Red Oak	31	6%	15	3%
White Pine	0	0%	30	6%
Non-forested Types				
Lowland Brush/Grass	92	17%	92	17%
Water	9	2%	9	2%
Total	**524**	**100%**	**524**	**100%**

Long Term Management Objectives
Portions of the management area will have developed the structural, compositional and functional characteristics associated with older forest. The Blow Down Zone will continue to

be dominated by early successional timber types with some white pine present.

Ample opportunities for research, education, ecological interpretation and low-impact uses such as hunting, hiking, bird-watching, photography, and nature study will be available.

Stands of Hardwood Swamp will continue to be present as inclusions within a broader forested setting.

Short Term Management Objectives

- Maintain the overall health and vigor of the forest, aesthetic appeal, and continue to provide habitat for migratory and forest interior birds, as well as other wildlife.
- Encourage and maintain longer-lived species, such as white pine, wherever feasible.
- Protect and enhance the water quality and riparian habitat of the St. Croix River, its tributaries, and wetlands in the area.
- Develop structural diversity and old growth characteristics such as large diameter trees, standing dead snags, and coarse woody debris.

Management Prescriptions: Entire Management Area

- Passively manage forested wetlands by allowing natural succession and natural disturbance to create structural diversity and old growth characteristics
- Retain snags and coarse woody debris in order to promote old growth characteristics when retention does not conflict with other forest management activities or present hazards.
- Harvest of fine woody material, as defined by the Department's Woody Biomass Harvesting Guidelines, will not occur in this management area.
- Salvage operations following catastrophic wind, fire, disease or insects may take place. However, prior to salvage, an interdisciplinary team will be consulted to determine whether salvage operations should proceed, as well as how they shall be conducted.
- Periodically monitor all areas within the site for the presence of invasive species.
- Control invasive species using appropriate techniques, including the use of pesticides.

Management Prescriptions: Ecological Reference Zone

- Passively manage the entire zone. Active management is limited to the clearing of trails when a safety hazard is present, and the control of invasive species.

Management Prescriptions: Blow Down Zone

- Utilize timber harvest to maintain the current forest types, with emphasis on promoting long-lived species such as white and red pine. Reduce shade-tolerant species such as red maple and ironwood.

SUNRISE FERRY TERRACE

Overview and Summary

This 558 acre management area is located between Evergreen Avenue and Sunrise Landing. The entire Management Area is under state ownership. The National Park Service administers approximately 175 acres adjacent to this management area which generally includes a 412 feet wide strip of land adjacent to the St. Croix River. The management objectives and prescriptions described later in this section apply only to those lands in state ownership.

This management area is comprised of mature forests along the terraces and in the fairly level "bottomlands" of the St. Croix River. The forests include various natural community types with a wide variety of tree species and wildlife habitat.

The northern portion of this area includes a long, narrow, mid-elevation terrace with mature mesic and dry-mesic forest. Here, the forest ranges from mature white pine dominated areas near the north end to drier northern pin oak dominated areas. Mature bur oak occurs sporadically and is co-dominant with ash and basswood in places. Some areas contain sugar maple and aspen in the overstory. The understory often contains typical dry-mesic herbs, although species associated with richer/moister habitats (e.g. maidenhair fern) are found in pockets. Numerous seeps and some slightly larger streams flow down slope toward the river, providing many important microsites and rare species habitats. Several bird Species of Greatest Conservation Need (SGCN) were documented here during the biotic inventory lending an opportunity to maintain and enhance this area for these species.

The southern portion, comprising the bulk of the area, contains an extensive mostly oak dominated forest on sandy loam soils derived from outwash. Interspersed in this area are numerous mucky wetland openings, and there are many small forested wetlands dotted throughout the area, including hardwood swamp.

Description of the Forest Resource

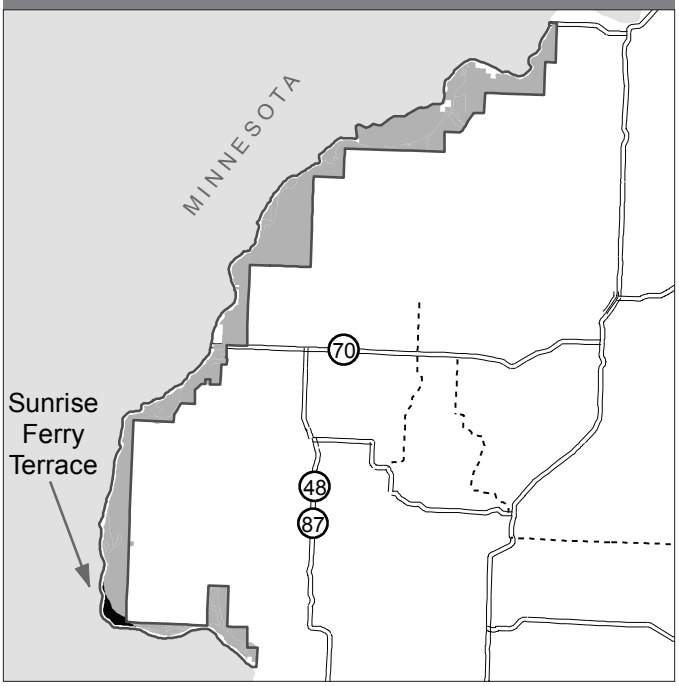
This management area is comprised largely of forested uplands with a few forested and un-forested wetlands. The tree species growing here include red, white, bur and northern pin oak, bitternut hickory, black ash, white pine, black cherry, hackberry, red maple, quaking and big tooth aspen, and paper birch. Compared to other areas on the state forest, this management area exhibits higher soil fertility, as indicated by the variety of tree species growing here, and the forests growing here have the potential to be fairly productive. There is a large acreage of mature to over-mature scrub oak and aspen. Approximately 54% of the forest is scrub oak older than 75 years of age and 10% of the forest is aspen older than 48 years of age. These large acreages of oak make this area susceptible to mortality initiated by oak wilt and future gypsy moth defoliations.

Another issue facing this area is the high density of European buckthorn present in the understory of the scrub oak and aspen forests. Reducing the presence of buckthorn in these and surrounding forests will be critical to ensuring regeneration of the forests and restoration of native understory vegetation. In the absence of control measures, forest regeneration will be extremely difficult.

AREA 6 SUMMARY

- 558 acres
- Conduct management trials to control the high levels of European buckthorn that are present throughout the area
- Balanced management to maintain some old forest characteristics while encouraging regeneration of early successional types
- Sandy loam soils are common

AREA 6 LOCATOR MAP



MAP 2.10 SUNRISE FERRY TERRACE

GKSF311P
May, 2012

Miles
0 0.1 0.2 0.4

Governor Knowles State Forest
Master Plan

The delineation of boundaries between all of the various land management classifications is a general representation of those boundaries. More detailed delineation will be produced at the discretion of the department where authorized activities, management or improved on the ground information is available.

N

White pine is especially underrepresented in all size classes in this area, even as a secondary timber type. Only 1% of the area is white pine which is older than 110 years of age. Increasing white pine would increase forest productivity, wildlife habitat, and aesthetics.

The swamp hardwood forests occupy 10% of the area and are dominated by black ash over 85 years of age. The swamp hardwood forests are susceptible to mortality initiated by future Emerald Ash Borer (EAB) infestations.

Land Type Associations

The Sunrise Ferry Terrace Area is comprised of both the Grantsburg Dunes (212Ka01) and St. Croix Plains (212Kb18) Land Type Associations (LTAs). The Grantsburg Dunes LTA covers 16% of the management area along its east boundary. The characteristic landform pattern of the Grantsburg Dunes is undulating outwash plains with dunes, marshes, and swamps common.

The remaining 84% of the management area is in the St. Croix Plains LTA. The characteristic landform pattern of the St. Croix Plains LTA is undulating outwash plain and outwash-veneered moraine.

Soils and Habitat Types

The dominant soils in this area include Cromwell Sandy Loam in the upland terrace, and Markey and Seeleyville Muck in the lower elevations. The soils are defined as excessively drained and moderately well drained sandy soils with a sand or fine sand surface over non-calcareous sand or fine sand outwash, along with very poorly drained nonacid organic soils.

The dominant habitat type is AAt (Acer/Athyrium) with minor occurrences of PArVAm (Pinus-Acer rubrum/ Vaccimium-Amphicarpa) and QAp (Quercus Amorpha). The AAt type exhibits a medium to rich nutrient regime and a dry-mesic moisture regime. The dominant shrubs include maple-leaved viburnum, hazel, and dogwood. The typical ground flora includes large-leaved aster, ferns, sweet cicely, tick trefoil, and wild geranium. Historically there was sufficient windthrow and fire disturbance to maintain significant presence of white pine, oaks and other less shade tolerant species. In the absence of disturbance or management, tolerant hardwoods, such as, maple and basswood will increasingly dominate future forests.

The PArVAm type is a somewhat nutrient deficient and dry habitat type found on the state forest. Aspen, pines and oaks are the most common forest types found in this habitat type. Birch and red maple are also common associates. The dominant shrubs of this habitat type are blueberries, hazel, and juneberry. The dominant ground flora is large leaf aster, bracken fern, sedges, wild lily-of-the-valley, and wintergreen. White pine, oaks and red maple represent the climax species for this type in the absence of disturbance or management.

The QAp occurs on deep, excessively drained outwash sands with a dry moisture regime and poor to medium nutrient levels. Pin oak is a common tree species found with a shrub layer of wild rose, black cherry and leadplant. Oak is the climax species in this type along with white pine if a seed source is available.

In the wetlands there are hydric habitat types which are not classified yet.

FIGURE 2.7 SUNRISE FERRY TERRACE CURRENT LAND COVER

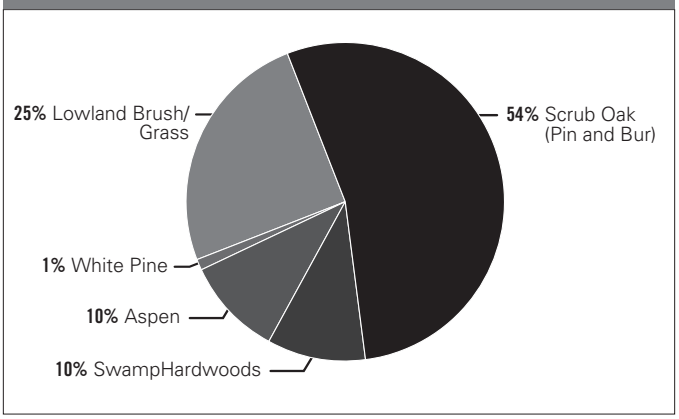


TABLE 2.9 SUNRISE FERRY TERRACE CURRENT AND PREDICTED COVER TYPES

Cover Type	CURRENT		PREDICTED 50 YEAR	
	Acres	% Total	Acres	% Total
Forested Types				
Scrub Oak (Pin and Bur)	301	54%	200	36%
Swamp Hardwoods	59	10%	59	10%
Aspen	54	10%	54	10%
White Pine	4	1%	105	19%
Non-forested Types				
Lowland Brush/Grass	140	25%	140	25%
Total	**558**	**100%**	**558**	**100%**

Long Term Management Objectives

The structural, compositional and functional characteristics associated with older forest such as coarse woody debris and standing dead snags will provide habitat and structural diversity along with smaller patches of young forest. Tree species composition will remain the same, with pine and oak as the dominants, along with small pockets of aspen. Swamp hardwood inclusions will continue to provide habitat for associated wildlife species.

Short Term Management Objectives

- Maintain the overall health and vigor of the forest, aesthetic appeal, and continue to provide habitat for migratory and forest interior birds, as well as other wildlife.
- Maintain and regenerate pockets of aspen.
- Increase the abundance of white pine and develop older pine and mixed pine-oak forest communities, where possible.
- Maintain and increase the abundance of bur and red oak, where possible.
- Maintain forest stands dominated by old trees, large amounts of coarse woody debris, numerous standing dead snags, and an age diversity of trees.
- Protect and maintain the swamp hardwoods that occur within the area.
- Protect and enhance the water quality and riparian habitat of the St. Croix River, its tributaries, and the wetlands in the area.
- Increase the presence of oak and pine regeneration by controlling and minimizing the spread of invasive species such as buckthorn, exotic honeysuckle and garlic mustard.
- Minimize the appearance of management activities that are visible from the rivers, flowages, and intensive recreational use areas.

Management Prescriptions

- Conduct control trials to evaluate appropriate methods for control and/or removal of invasive species, especially buckthorn. Trials may include mechanical and chemical treatments and prescribed burning. The effectiveness of the control trials should be evaluated, and if effective techniques have been identified, efforts should be made to control invasive species, especially buckthorn, in this area on a larger scale. Trials should also include evaluating methods for regenerating stands of long-lived forest types if/when control is achieved.
- Use a variety of harvest prescriptions, including thinnings, canopy gaps, patch clear cuts and shelterwood cuts to encourage regeneration while maintaining some old forest characteristics within pine and oak stands. Reduce shade-tolerant species such as red maple and ironwood.
- Conduct patch clearcuts where small aspen pockets exist.
- Passively manage swamp hardwood stands.
- When harvesting timber within view of the St. Croix River, design sales so that no management activity can be seen from the river during leaf on conditions. Use aesthetic management techniques for timber harvests that are visible from the rivers, flowages, and intensive recreational use areas such as reducing the size of cuts, establishing irregular harvest boundaries, conducting partial harvests, planting trees, favoring longer-lived species, and where necessary, harvesting during the winter.
- Employ extended rotation forest management on pine species to develop older forest stands with large diameter trees and structural diversity while selecting against northern pin oak, red maple and aspen.

TRADE RIVER CORRIDOR AND WOLF CREEK LOWLANDS

Overview and Summary

This 1,106 acre management area is located at the far southern terminus of the state forest and includes a variety of upland and lowland community types along the Trade River from Evergreen Avenue, extending south to Wolf Creek. The Trade River is the largest tributary of the St. Croix River within the Governor Knowles State Forest.

1,056 acres of this management area are in state ownership. An additional 8 acres are owned by Polk County. Private in-holdings with both permanent and seasonal residences make up 42 acres. The National Park Service administers approximately 380 acres adjacent to this management area which generally includes a 412 feet wide strip of land adjacent to the St. Croix River as well as scattered blocks further inland. The management objectives and prescriptions described later in this section apply only to those lands in state ownership.

This management area is divided into two management zones. The Floodplain Zone encompasses the part of the area lying below the Trade and Wolf Creek escarpments, as well as a stretch of wetlands between the Trade River confluence and the Wolf Creek confluence. The White Pine Zone includes a portion of the area east of the Trade River, beyond the escarpment.

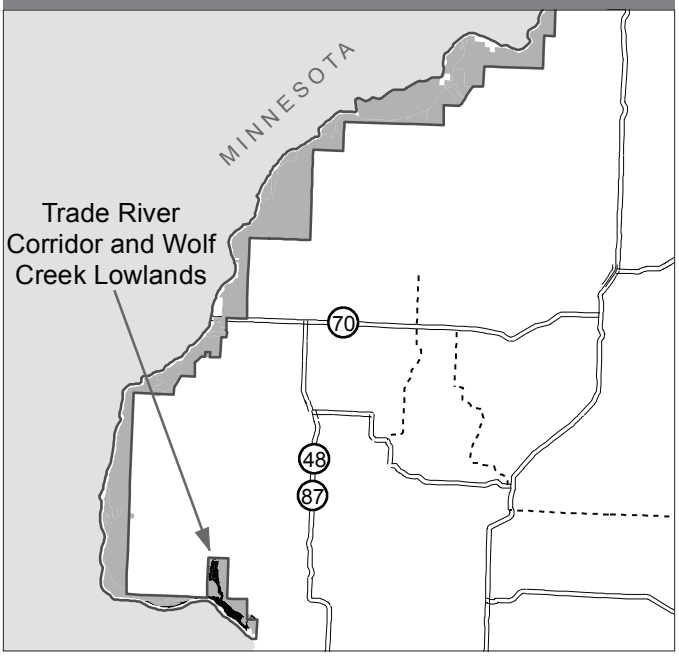
The Floodplain Zone contains a wide diversity of landforms associated with nutrient rich habitats including an unusual variant of Southern Mesic Forest, consisting of a mixture of bur oak, black ash, basswood and scattered patches of white pine. Typical mesic flora and herbs make up the ground layer, including Virginia Waterleaf, maidenhair fern, sensitive fern, bloodroot, wild leeks, and wild ginger. Numerous high-quality Forested Seeps are intermixed with Hardwood Swamp and mesic forest along some of the winding sections of the Trade River. Further downstream, Floodplain Forests with silver maple, American elm, box elder, basswood, bur oak, and green ash are common.

Near the confluence of the Trade River and St. Croix River is a large, riparian wetland complex that extends south to Wolf Creek, at the southern boundary of the state forest. Natural community types include a mature, closed-canopy Hardwood Swamp dominated by black ash, yellow birch and silver maple with a diverse ground layer of native sedges and herbs. Also well represented in this wetland complex are Alder Thickets and an extensive sedge-meadow/shrub swamp.

AREA 7 SUMMARY

- 1,106 acres
- Large riparian wetland complexes associated with the Trade River and Wolf Creek and numerous seeps provide opportunities to preserve these natural communities
- Variety of timber types associated with a range of soils from nutrient rich to dry sandy
- 920 acre designated SNA

AREA 7 LOCATOR MAP



The White Pine Zone consists of a mixed forest of white pine and bur oak, with inclusions of swamp hardwoods in some areas. This zone is situated between the wetter, nutrient rich soils of the Floodplain Site to the west and the droughty, nutrient poor soils to the east. Due to these transitional qualities, this zone has the potential to maintain and increase the presence of white pine and associated species.

Description of the Forest Resource

Northern hardwoods, swamp hardwoods, and lowland brush make up a majority of this management area. Most of this acreage is located in the Trade River and Wolf Creek floodplains and on the adjacent steep slopes. A patchwork of aspen, oak, and white pine can be found throughout the remainder of the management area.

TRADE RIVER CORRIDOR AND WOLF CREEK LOWLANDS

MAP 2.11 TRADE RIVER CORRIDOR AND WOLF CREEK LOWLANDS

GKSF312P
May, 2012

Miles
0 0.35 0.7 1.4

Governor Knowles State Forest
Master Plan

The delineation of boundaries between all of the various land management classifications is a general representation of those boundaries. More detailed delineation will be produced at the discretion of the department where authorized activities, management or improved on the ground information is available.

N

Currently, red maple is present as a secondary component in parts of this management area. Due to passive management and inaccessibility, this type will be present as a primary type in the next 50 years. In addition, the white pine acreage will increase over the next 50 years with a decrease in the aspen, northern hardwoods, oak, and upland grass types.

Land Type Associations

The characteristic landform pattern of the Grantsburg Dunes (212Ka01) is undulating outwash plain with dunes, marshes, and swamps common. Soils are predominantly excessively drained fine sand over outwash. This LTA covers approximately 35% of this management area, and encompasses nearly the entire portion of the state forest that lies above the St. Croix River escarpment.

The characteristic landform pattern of the St. Croix Plains (212Kb18) is undulating outwash plain and outwash-veneered moraine. Soils are predominantly excessively drained sand over acid sandy loam till or outwash. Approximately 65% of this management area lies within the St. Croix Plains LTA.

Soils and Habitat Types

Warman Variant sandy loam is the dominant soil type in the White Pine Zone. This poorly drained soil occurs on outwash plains and on low stream terraces making is subject to occasional flooding. Because of the high water table and flooding, there is a risk of windthrow. Other soils found in this zone include a variety of sandy loams and loam.

The Floodplain Zone is dominated by fluvaquent soils. These soils are typical of floodplains dissected by streams. They are somewhat to very poorly drained. Annual flooding can be expected during high water periods. Wooded swamps are common on these soils. A small percentage of the area includes Udorthents, and various loamy sands and loams. Udorthents occur along the banks of the Trade River and Wolf Creek. They consist of steep and very steep, somewhat excessively drained soils on steep escarpments adjacent to stream terraces with a high hazard of erosion.

Hydric habitat types are dominant in this management area and typically have medium to high nutrient regimes and wet-mesic moisture regimes. These sites exhibit poor drainage with windthrow being the principal natural disturbance. Habitat types for wetland soils have not been developed yet.

The upland habitat types found in this management area are PArVAm (Pinus-Acer rubrum/ Vaccimium-Amphicarpa) and QAp (Quercus Amorpha). The PArVAm type is a somewhat nutrient deficient and dry habitat type found on the state forest. The dominant shrubs of this habitat type are blueberries, hazel, and juneberry. The dominant ground flora is large leaf aster, bracken fern, sedges, wild lily-of-the-valley, and wintergreen. The QAp occurs on deep, excessively drained outwash sands with dry moisture regime and poor to medium nutrient. Jack pine and pin oak are common tree species found with a shrub layer composed of wild rose, black cherry and leadplant.

FIGURE 2.8 TRADE RIVER AND WOLF CREEK CURRENT LAND COVER

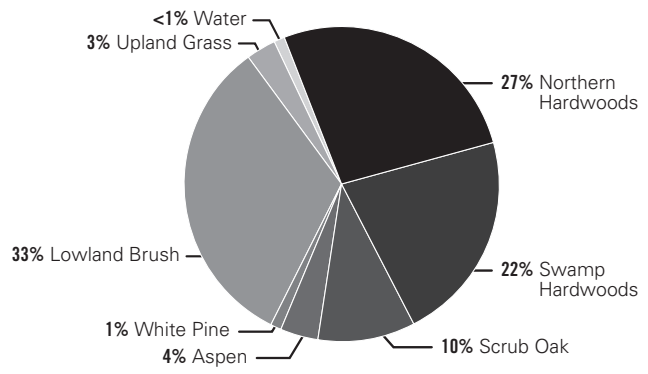


TABLE 2.10 TRADE RIVER AND WOLF CREEK CURRENT AND PREDICTED COVER TYPES

Cover Type	CURRENT		PREDICTED 50 YEAR	
	Acres	% Total	Acres	% Total
Forested Types				
Northern Hardwoods	281	27%	250	24%
Swamp Hardwoods	235	22%	235	22%
Scrub Oak	106	10%	55	5%
Aspen	39	4%	35	3%
White Pine	5	1%	46	4%
Red Maple	0	0%	50	5%
Non-forested Types				
Lowland Brush	353	33%	353	33%
Upland Grass	35	3%	30	3%
Water	2	<1%	2	<1%
Total	**1,056**	**100%**	**1,056**	**100%**

Long Term Management Objectives

Below the Trade River escarpment, the forest will have developed the structural, compositional and functional characteristics associated with old-growth forest.

Above the escarpment, the forest will have an increased component of long-lived tree species such as white pine and bur oak.

The high quality wetland community types throughout the area will be protected and maintained to provide ecological values including water quality, hydrologic processes, native flora, natural communities and rare species habitats.

Ample opportunities for education, ecological interpretation and low-impact uses such as hunting, hiking, bird-watching, photography, and nature study will be available.

Short Term Management Objectives

- Above the Trade River escarpment, develop older stands of longer-lived species such as white pine and bur oak where appropriate.
- Within the lowlands, allow natural succession and natural disturbance to gradually produce structural diversity and the development of old-growth characteristics such as large diameter trees, standing dead snags, and coarse woody debris.
- Protect water quality through protection of riparian habitat and forested seeps.
- Protect and maintain rare species habitats and high-quality natural communities.
- Promote research and demonstration that seek to balance the development of old forest characteristics with active forest management practices that maintain long-lived pine and oak species.

Management Prescriptions: Entire Management Area

- Perform no timber harvest within hardwood swamp inclusions or other wetlands in the area.
- Retain snags and coarse woody debris in order to promote old growth characteristics when retention does not conflict with other forest management activities or present hazards.
- Harvest of fine woody material, as defined by the Department's Woody Biomass Harvesting Guidelines, will not occur in this management area.
- Salvage operations following catastrophic wind, fire, disease or insects may take place. However, prior to salvage, an interdisciplinary team will be consulted to determine whether salvage operations should proceed, as well as how they shall be conducted.
- Periodically monitor all areas within the site for the presence of invasive species.
- Control invasive species using appropriate techniques, including the use of pesticides.
- Encourage and maintain longer-lived species, such as white pine, wherever feasible.

Management Prescriptions: White Pine Zone

- Employ extended rotation forest management on white pine to develop older forest stands with large diameter trees for seed production and structural diversity.
- Increase white pine by selecting against northern pin oak, red maple and aspen. Techniques will be tailored to meet on-the-ground needs and may include, but are not limited to, extended rotations, intermediate thinnings, canopy gaps, and patch clear cuts.
- Reforestation after timber harvests will be limited to natural regeneration.
- Plant acquired open fields to white pine.

Management Prescriptions: Floodplain Zone

- Passively manage the entire site. Active management is limited to the clearing of trails, eliminating safety hazards, and the control of invasive species using appropriate techniques, including the use of pesticides.
- Encourage opportunities for education and interpretations of these natural communities and habitats.

State Natural Area Designation

The Trade River Forest and Wetlands State Natural Area will overlay the Floodplain Zone of this management area, covering 920 acres. All trails have been excluded from the State Natural Area boundary, including a 50 foot buffer on both sides of the trail, where applicable. This SNA will also serve as an Ecological Reference Zone.

HABITAT MANAGEMENT AREAS

The management objective of habitat management areas is to provide or enhance habitat (upland, wetland, or aquatic) to support specific species of plants or animals. Habitats and communities with this designation are managed for a wide variety of purposes, including focused species production and protection.

Examples of activities within habitat management areas are dependent upon the habitat or species type included. Management could potentially include timber harvesting, herbicide application, mowing, burning, road construction, site preparation, planting, and/or erosion control.

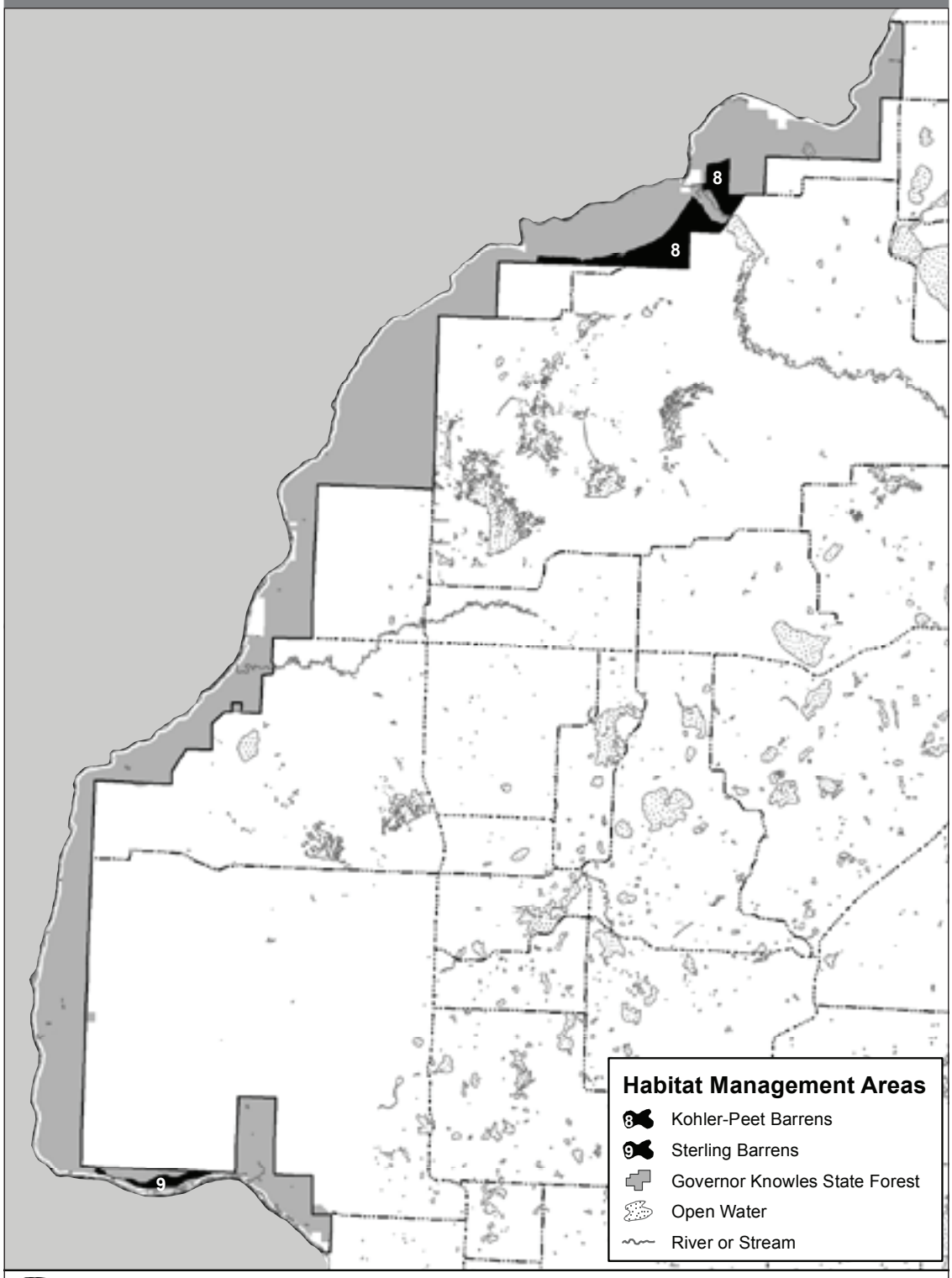
The General Forest Management Prescriptions by Primary Forest Type describe the active management techniques to achieve some of the desired future conditions in habitat management areas. In some cases, special circumstances occur that require a modification to the General Forest Management Prescriptions in order to maintain and enhance those unique features. Examples of unique features commonly located in habitat management areas include small acreages of High Conservation Value Forests (HCVF) (e.g swamp hardwood stands and wetland complexes), rustic campsites, and unique scenic geological and cultural features.

TABLE 2.11 HABITAT MANAGEMENT AREAS

Area #	Habitat Management Areas	Acres
8	Kohler-Peet Barrens*	2,040
9	Sterling Barrens*	324
	Total	**2,364**

** Includes a designated State Natural Area*

MAP 2.12 HABITAT MANAGEMENT AREAS



GKSF306P
February, 2012

Miles
0 1.5 3 6

Governor Knowles State Forest
Master Plan

The delineation of boundaries between all of the various land management classification is a general representation of those boundaries. More detailed delineation will be produced at the discretion of the department where authorized activities, management or improved on the ground information is available.

N

KOHLER-PEET BARRENS

Overview and Summary

The 2,040 acre Kohler-Peet Barrens Habitat Management Area is located on the dry sandy uplands above the escarpment of the St. Croix and Clam Rivers. This area is located in the northern part of the forest east of Iron Creek and extends north of the Clam River Flowage. It includes the uplands of the Old Kohler-Peet Wildlife Area, which became part of the GKSF in 1970. There are 1,742 acres of state ownership within this management area, as well as 240 acres of Burnett County ownership and 58 acres of private in-holdings. The management objectives and prescriptions described later in this section apply only to those lands in state ownership.

This management area has been divided into two management zones. The 945 acre Open Oak Barrens Zone was burned in a 1959 wildfire that grew to approximately 20,000 acres, and has since been managed for early successional open oak and pine barrens. The 1,095 acre Forested Jack Pine Barrens Zone consists of two separate blocks located on either side of the Open Oak Barrens Zone. Part of the eastern block of the Forested Jack Pine Barrens, north of the Clam River Flowage, was also burned in the 1959 wildfire. In addition, a small part of the western block of the Forested Jack Pine Barrens was within the Ekdall Church Fire that consumed nearly 5,000 acres in 1980. The entire Forested Jack Pine Barrens Zone is forested with quality examples of Northern Dry forest with jack pine, oak (northern pin and bur), and aspen as the dominant tree species.

The east half of this habitat management area has been identified as important for native barrens ground layer plants and prairie species diversity (WDNR 2010e). Barrens dependant wildlife including many special concern species and Species of Greatest Conservation Need (SGCN) have been documented here, such as Sharp-tailed Grouse, Upland Sandpiper, and Connecticut Warbler (see Appendices B and C).

Description of the Forest Resource

This area is approximately one-third open oak barrens with structure and composition that has been maintained through prescribed fire conducted by WDNR wildlife and forestry staff. Found in the Open Oak Barrens Zone, this structure is dominated by a mix of young (less than five years old) scrub oak (northern pin and bur), aspen, upland brush and prairie grasses. Pine cover types are present, but not common.

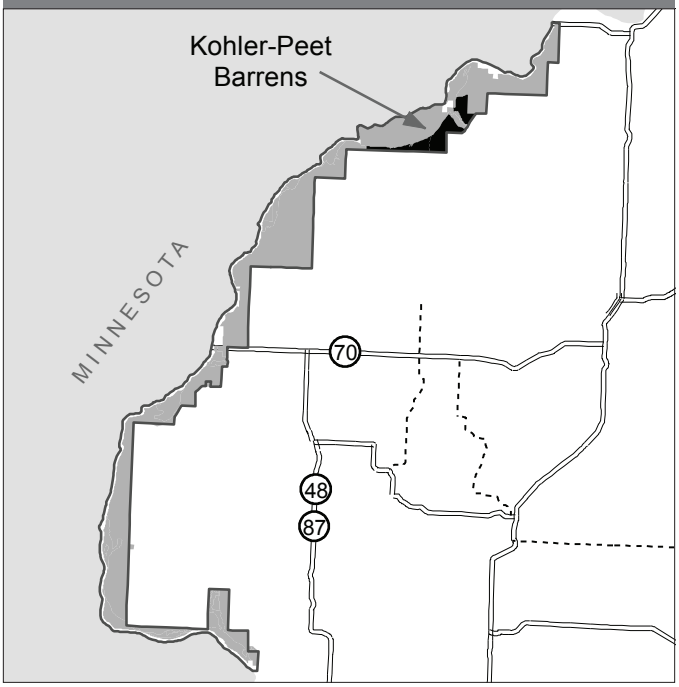
Nearly two-thirds of this area consists of variable aged aspen, scrub oak (northern pin and bur), and pine (jack, red, and white), which are found within both zones, a majority being in the Jack Pine Barrens Zone. The two blocks of forested jack pine barrens differ in terms of age class distribution. The eastern block was within a designated Wilderness Zone in the previous GKSF Master Plan and is forested with mature to over-mature scrub oak, jack pine, and aspen. These same cover types also dominate the western block; however, the age distribution is more diverse ranging from three to 100 years of age.

On July 1, 2011, severe winds impacted much of the timber throughout this management area causing significant, stand altering damage to the scrub oak, aspen, and jack pine forests. Salvage harvests occurred shortly after the storm in October 2011, which removed much of the damaged scrub oak, pine, and aspen. The salvage prescriptions were developed with consideration given to the objectives later in this section.

AREA 8 SUMMARY

- 2,040 Acres
- 1/3 open barrens management
- 835 acre actively managed Kohler-Peet Barrens SNA
- Opportunities to manage the forest to enhance and maintain barrens dependent species

AREA 8 LOCATOR MAP



MAP 2.13 KOHLER-PEET BARRENS

GKSF316P
May, 2012

Miles
0 0.3 0.6 1.2

Governor Knowles State Forest
Master Plan

The delineation of boundaries between all of the various land management classifications is a general representation of those boundaries. More detailed delineation will be produced at the discretion of the department where authorized activities, management or improved on the ground information is available.

N

KOHLER-PEET BARRENS

Land Type Association

The Grantsburg Dunes LTA (212Ka01) not only covers this entire management area, but it is also very common throughout the GKSF as it encompasses nearly the entire portion of the GKSF that lies above the St. Croix River escarpment. The characteristic landform pattern of this LTA is undulating outwash plain with dunes, marshes, and swamps.

Soils and Habitat Types

The two most common soil types of this area are Menahga and Grayling sands. Both are very deep, excessively drained sand. Much less common and occurring in isolated pockets are muck, loamy sands, and seeped complexes.

The habitat types are closely tied to soil types. The two common upland habitat types found in this area are PQGCe (Pinus-Quercus/Gaultheria-Ceanothus) and PArVAm (Pinus-Acer rubrum/ Vaccimium-Amphicarpa).

Occurring on approximately 95% of this area, the PQGCe type is the most nutrient deficient and driest habitat type found on the state forest. The dominant shrubs of this habitat type are blueberries, hazel, and juneberry. The dominant ground flora is bracken fern, sedges, wild lily-of-the-valley, and wintergreen. The climax tree species are white pine and oak species.

Associated with the loamy sands in this management area, the PArVAm type is very similar to the PQGCe type but is slightly higher in the nutrient regime. Other subtle differences include the presence of big leaf aster, wild sarsasparilla, false Solomon's seal, and northern bedstraw. Along with white pine and oak species, red maple is considered a climax species.

Hydric habitat types are present in this area but are rare. They typically have medium to high nutrient regimes and wet-mesic moisture regimes. These sites exhibit poor drainage with windthrow being the principal natural disturbance. Habitat types for wetland soils have not been developed yet.

Long Term Management Objectives

The large open oak barrens will persist, providing a high quality, ecologically functional prairie, shrub, oak, and pine barrens habitat for rare species dependent on this type.

The forested jack pine barrens will contain a range of age and size classes of jack pine stands, some that are nearly pure jack pine, and others that are jack pine mixed with red pine, scrub oak and aspen. A continuum of community types will be present, ranging from relatively open Pine Barrens to older stages of Northern Dry Forest. High quality barrens ground flora will be maintained during all management treatments.

FIGURE 2.9 KOHLER-PEET BARRENS CURRENT LAND COVER

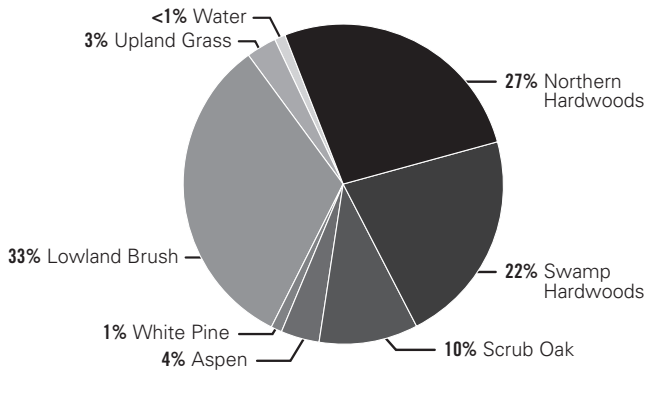


TABLE 2.12 KOHLER-PEET BARRENS CURRENT AND PREDICTED COVER TYPES

Cover Type	CURRENT		PREDICTED 50 YEAR	
	Acres	% Total	Acres	% Total
Forested Types				
Scrub Oak	575	33%	389	22%
Jack Pine	376	21%	526	30%
Aspen	124	7%	160	9%
Red Pine	35	2%	35	2%
White Pine	14	1%	14	1%
Non-forested Types				
Grass	605	35%	605	35%
Lowland Brush/Grass	13	1%	13	1%
Total	**1,742**	**100%**	**1,742**	**100%**

Opportunities for hunting, trapping, hiking, nature study, and bird watching will be available.

Short Term Management Objectives

- Maintain the open oak barrens and forested jack pine barrens communities to provide habitat for barrens associated animals, including rare birds, invertebrates, and reptiles.
- Increase the presence of jack pine within the forested jack pine barrens community.

- Provide habitat for late seral stage Northern Dry Forest wildlife species north of Clam Dam Road.
- Protect, maintain, and increase barrens ground layer vegetation with specific emphasis on rare plants.
- Increase connections between patches of barrens vegetation for habitat travel corridors.

Management Prescriptions: Open Oak Barrens Zone

- Actively manage the Open Oak Barrens Zone through prescribed burns, fire break construction, mowing, selective use of herbicides and planting of jack pine.
- Relocate existing fire breaks to match the natural boundaries of the Kohler-Peet Swamp.

Management Prescriptions: Forested Jack Pine Barrens Zone

Please see the General Forest Management Prescriptions by Primary Type later in Chapter Two for specific management prescriptions for various cover types. The General Forest Management Prescriptions for each appropriate cover type apply to this zone, except as noted below.

- The Forested Jack Pine Barrens Zone will be managed using active management techniques which will be implemented by following all DNR handbooks and guidelines.
- When harvesting timber, implement larger clearcuts where possible, to mimic natural disturbance patterns.
- Use artificial regeneration techniques to maintain stands of jack pine, except for trenching, blade scarification, scalping (bracke, Leno, etc.), or broadcast herbicide applications, which are not allowed.
- Use artificial regeneration techniques to increase jack pine in stands dominated by oak and/or aspen, except for trenching, blade scarification, or broadcast herbicide applications, which are not allowed.
- When planting, allow variable densities and techniques to create patchiness of variable sizes that will complement new and existing openings.
- Determine timing of harvests in all timber types by evaluating structural attributes and density of ground flora at rotation age. The jack pine stands north of Clam Dam Road should generally be given longer rotations in order to provide habitat for late-seral stage Northern Dry Forest wildlife species.
- Prescribed fire may be used.
- Control invasive species using appropriate techniques including the use of herbicide.

State Natural Area Designation

The Kohler-Peet Barrens State Natural Area will overlay the northernmost portions of this management area, covering 836 acres.

STERLING BARRENS

Overview and Summary

The 324 acre Sterling Barrens Habitat Management Area is located at the southern end of the forest along the east flowing stretch of the St. Croix River between the Trade River and Sunrise Ferry Trail. This area includes 308 acres of state owned land and 16 acres of Polk County land. The National Park Service administers approximately 135 acres adjacent to this management area which generally includes a 412 feet wide strip of land adjacent to the St. Croix River as well as scattered blocks further inland. The management objectives and prescriptions described later in this section apply only to those lands in state ownership.

This management area contains a mix of habitats ranging from open prairie and oak barrens, to savanna, to closed jack pine and oak forests. Past disturbances, such as grazing and fire, and the varying topography have contributed to the diversity found in this management area. Throughout the management area the ground vegetation consists of many barrens associated grasses and forb species such as silky prairie clover, wild lupine, and bluestem grasses. This ground vegetation is more diverse in areas where sufficient light reaches the forest floor. Many rare and common wildlife species are associated with this habitat including Wild Turkey and Whip-poor-will.

This area has been identified as a high priority for management of oak savanna and the globally imperiled Pine Barrens plant community (WDNR 2006d). The management area has been divided into two management zones: the 251 acre Oak Savanna Zone and the 73 acre Jack Pine Zone. Within the Oak Savanna Zone, 124 acres was designated as the Sterling Barrens State Natural Area in 1974 to protect and manage a matrix of dry forest and barrens, as well as numerous rare plants and animals. It has been actively managed through timber harvesting and prescribed burning, resulting in an open oak barrens with a 19 acre failed jack pine plantation. Each zone has its own objectives and management prescriptions in addition to the prescriptions for the entire management area.

Description of the Forest Resource

The dominant timber type in this management area is northern pin oak with a component of bur oak. Together these timber types make up the scrub oak cover type. Jack pine and aspen are also common throughout the management area. The forested types in this area are generally mature to over-mature. Grass cover types are also present on roughly one-third of the acreage in retired farm fields and managed prairie/barrens.

The age structure of the existing cover types is expected to change significantly over the next 50 years; however, the acreage of the existing cover types is expected to remain unchanged in the future.

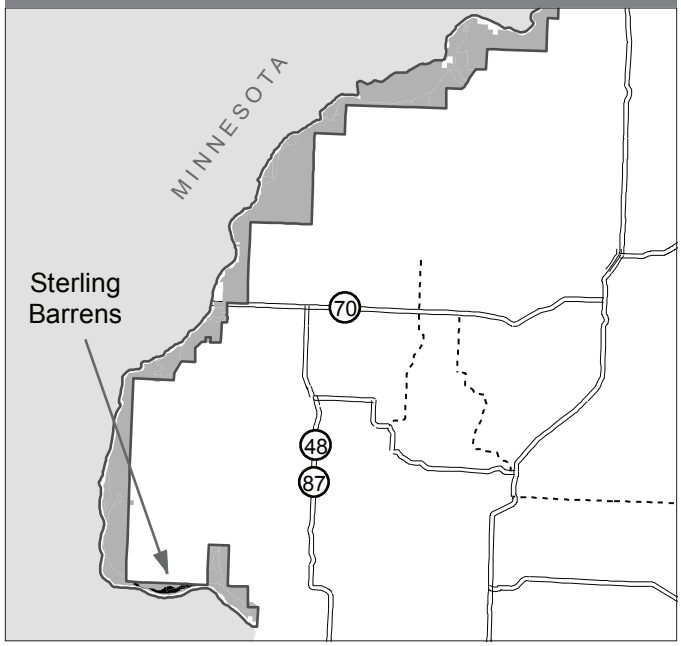
The Oak Savanna Zone is currently either oak (northern pin and bur), and aspen that originated less than ten years ago, or is mature to over-mature oak with jack pine and aspen components mixed in. Grass openings ranging in size from one acre to ten acres occur in this zone.

The Jack Pine Zone is dominated by over-mature jack pine with minor components of oak and aspen. Variable stocking rates and small (less than one acre) canopy gaps are common in parts of this zone.

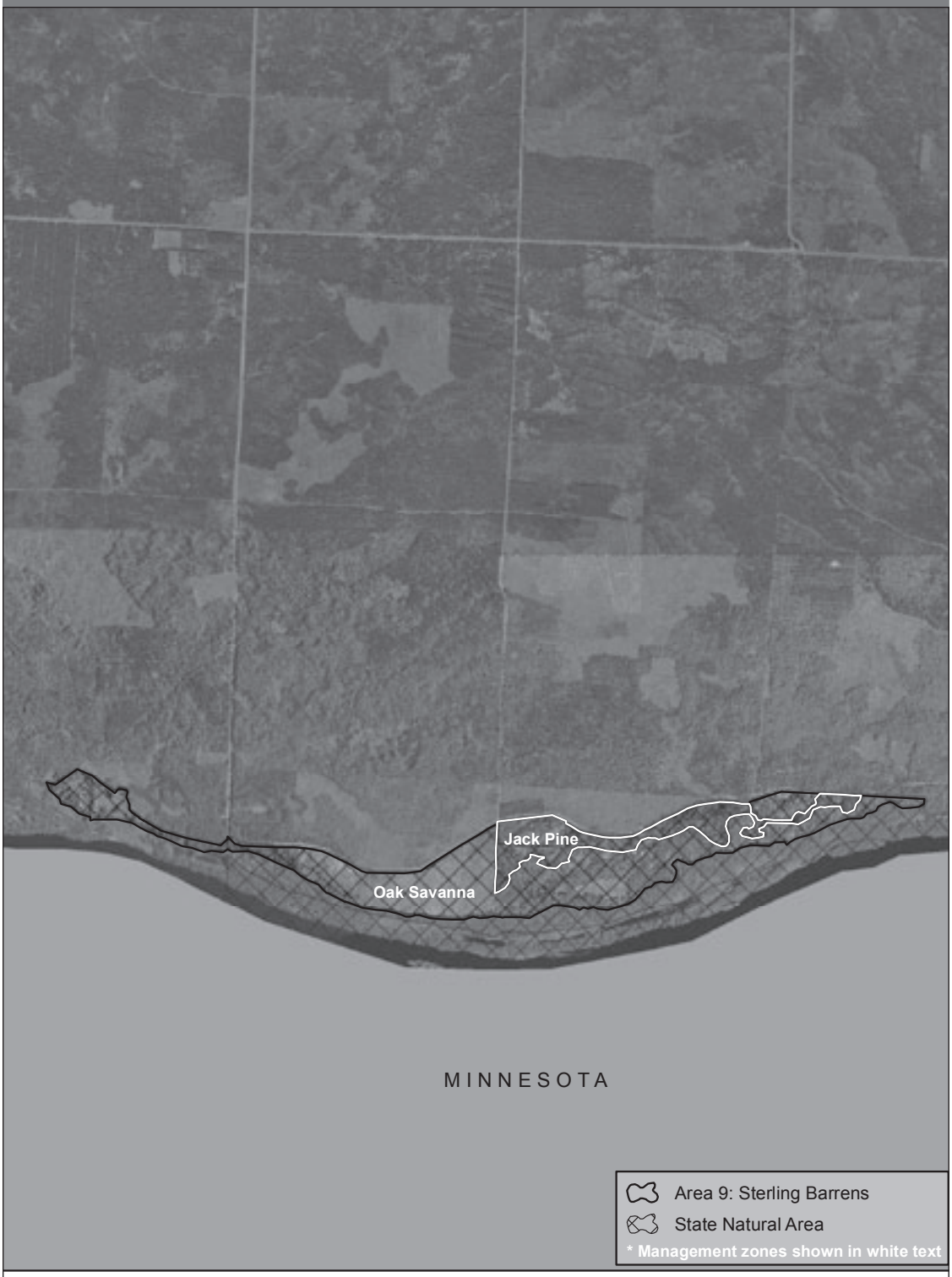
AREA 9 SUMMARY

- 324 Acres
- Prescribed fire is a critical tool for maintenance
- Opportunity to provide habitat for barrens dependent species
- Savanna management allowing succession from savanna to a partial open canopy
- Timber harvesting and fire will be used to maintain habitat and canopy density
- Jack pine management with harvesting and prescribed fire to promote jack pine regeneration and to create temporary barrens
- 308 acres designated as the Sterling Barrens SNA

AREA 9 LOCATOR MAP



MAP 2.14 STERLING BARRENS



GKSF317P
May, 2012

Miles
0 0.2 0.4 0.8

Governor Knowles State Forest
Master Plan

The delineation of boundaries between all of the various land management classifications is a general representation of those boundaries. More detailed delineation will be produced at the discretion of the department where authorized activities, management or improved on the ground information is available.

N

Land Type Associations
Two LTAs occur within this management area. The Jack Pine Zone is within the Grantsburg Dunes (212Ka01) LTA and the Oak Savanna Zone is within the St. Croix Plains (212Kb18) LTA.

The characteristic landform pattern of the Grantsburg Dunes is undulating outwash plain with dunes, marshes, and swamps common. Soils are predominantly excessively drained fine sand over outwash.

The characteristic landform pattern of the St. Croix Plains is undulating outwash plain and outwash-veneered moraine. Soils are predominantly excessively drained sand over acid sandy loam till or outwash.

Soils and Habitat Types
Omega fine sand is the dominant soil type covering approximately 75% of the management area. Menahga loamy sand and Cromwell sandy loam are present on the remainder of the management area primarily on the southern and western extremes. All soils found here are well to excessively drained.

The dominant habitat type found in this management area is PQGCe (Pinus-Quercus/Gaultheria-Ceanothus) which is associated with the Omega soil type. The PArVAm (Pinus-Acer rubrum/ Vaccimium-Amphicarpa) and QAp (Quercus Amorpha) habitat types are present to a much less degree in this management area and are associated with the Menahga and Cromwell soil types.

PQGCe is the most nutrient deficient and driest habitat type found on the GKSF. The dominant shrubs of this habitat type are blueberries, hazel, and juneberry. The dominant ground flora is bracken fern, sedges, wild lily-of-the-valley, and wintergreen. The climax tree species are white pine and oak species.

The PArVAm type is a somewhat nutrient deficient and dry habitat type found on the GKSF. The dominant shrubs of this habitat type are blueberries, hazel, and juneberry. The dominant ground flora is large leaf aster, bracken fern, sedges, wild lily-of-the-valley, and wintergreen. The QAp occurs on deep, excessively drained outwash sands with dry moisture regime and poor to medium nutrient regime. Jack pine and pin oak are common tree species found with a shrub layer composed of wild rose, black cherry and leadplant.

Long Term Management Objectives
Oak savanna and jack pine barrens will continue to dominate this area, with barrens associated herbaceous ground flora well represented.

FIGURE 2.10 STERLING BARRENS CURRENT LAND COVER

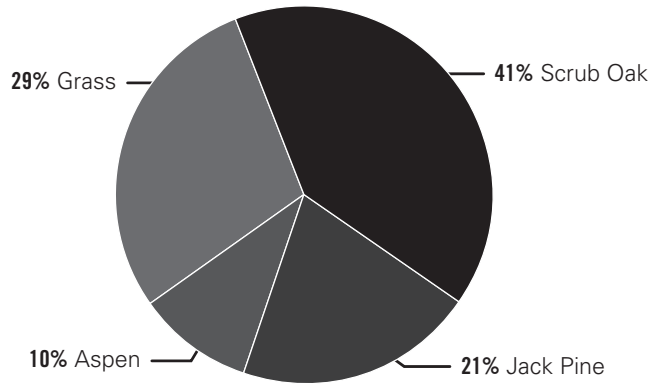


TABLE 2.13 EAST FORK OF THE BLACK RIVER CURRENT AND PREDICTED LAND COVER

Cover Type	CURRENT		PREDICTED 50 YEAR	
	Acres	% Total	Acres	% Total
Forested Types				
Scrub Oak	125	41%	125	41%
Jack Pine	64	21%	64	21%
Aspen	30	10%	30	10%
Non-forested Types				
Grass	89	29%	89	29%
Total	**308**	**100%**	**308**	**100%**

The oak savanna will rotate between savanna and partial open canopy forest. A partial open canopy will provide rare species habitats and high quality natural community remnants. Diversity in tree density will provide forest products and critical habitat for savanna dependant wildlife, such as Wild Turkey and Red-headed Woodpecker.

The jack pine barrens will rotate between open jack pine barrens and jack pine forest. A partial open canopy will provide rare species habitats and high quality natural community remnants. The jack pine forest will provide forest products and critical habitat for barrens dependant wildlife, such as Connecticut Warbler and Whip-poor-will.

Opportunities for hunting, trapping, hiking, wildlife viewing and nature study will be available.

Short Term Management Objectives

- Maintain the oak savanna and jack pine barrens to provide wildlife habitat with a specific emphasis on rare birds, invertebrates, and reptiles.
- Develop a partial open canopy in the oak savanna and Jack Pine Barrens.
- Maintain the existence of barrens associated grass and forb species.
- Promote variable stocking rates.
- Promote large savanna legacy trees, focusing on bur oak and jack pine, to provide savanna structure, mast crops and seed trees.
- Reduce the presence of prickly ash.
- Increase the connection between patches of barrens vegetation for habitat travel corridors.

Management Prescriptions: Entire Management Area

- Coordinate barrens management with Polk County Forestry and the National Park Service.
- Control invasive species across the habitat area through mowing, and hand spot treatments (mechanical or herbicide).

Management Prescriptions: Oak Savanna Zone

- Actively manage the oak savanna zone through timber harvesting and prescribed burning.
- Retain large oaks and pines to serve as savanna legacy trees.
- Use prescribed burns and hand treatments to reduce prickly ash which will allow native savanna species to increase.
- Allow the savanna to succeed to a partial open canopy forest before the next timber harvest and prescribed burn.

Management Prescriptions: Jack Pine Zone

- Actively manage the jack pine zone through timber harvesting.
- Use only prescribed burning for site preparation in jack pine stands to encourage natural regeneration. If natural regeneration in jack pine stands is unsuccessful, hand plant or seed in jack pine.
- Once regeneration goals are achieved, do not utilize prescribed burning until stand rotation.

State Natural Area Designation

The Sterling Barrens State Natural Area (308 acres) will overlay the entire management area.

RECREATION MANAGEMENT AREAS

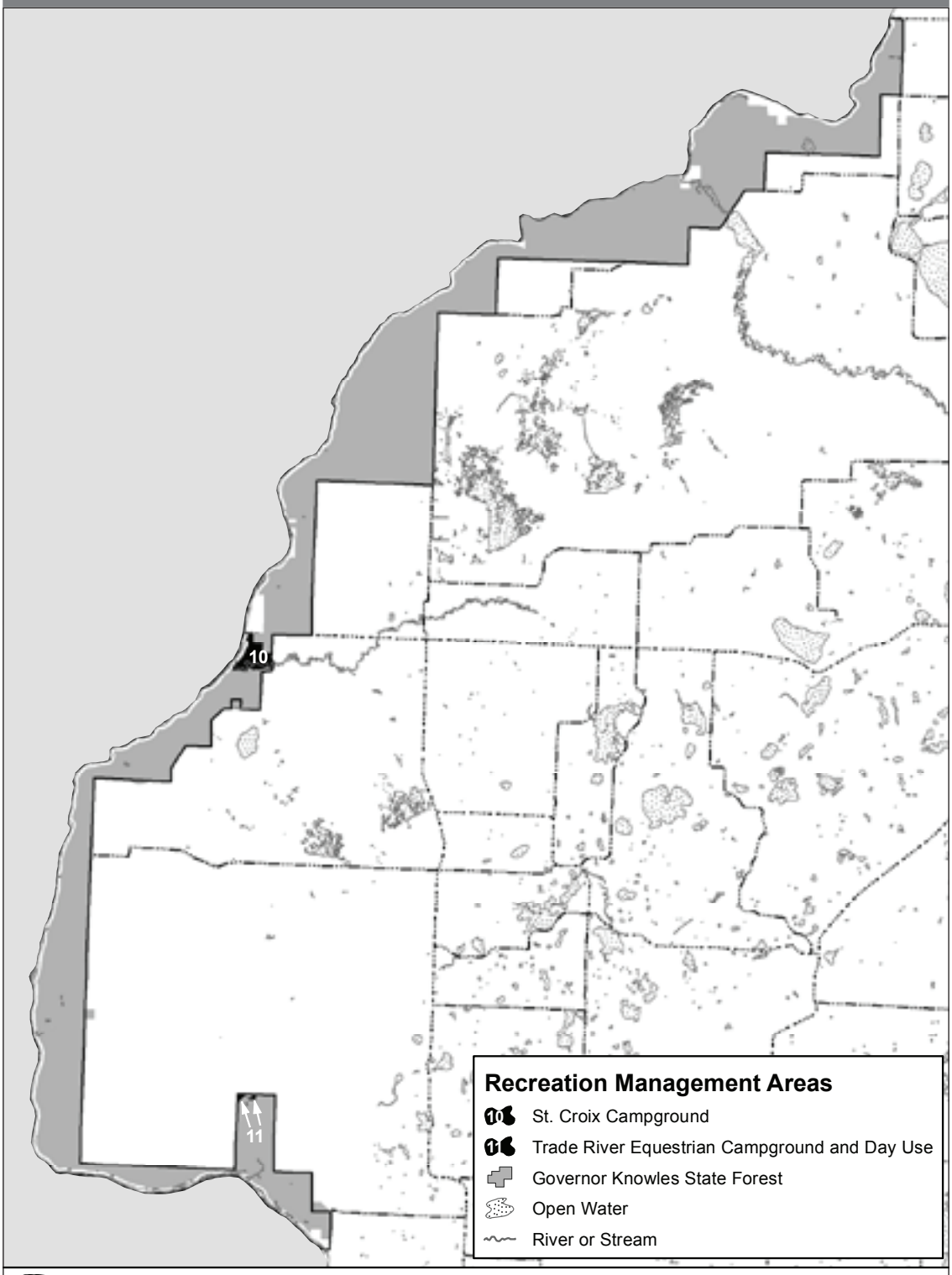
The purpose of a recreation management area is to provide and maintain land and water areas and facilities for outdoor public recreation or education. Objectives and prescriptions incorporate future desired landscape conditions, management activities, and policies for the protection, maintenance, enhancement, or restoration of the visual characteristics important to the recreational use of the area.

TABLE 2.14 RECREATION MANAGEMENT AREAS

Area #	Recreation Management Areas	Acres
10	St. Croix Campground	341
11	Trade River Equestrian Campground and Day Use	31
Total		**372**

The General Forest Management Prescriptions by Primary Forest Type are authorized unless restricted by a prescription within the management area itself.

MAP 2.15 RECREATION MANAGEMENT AREAS



GKSF307P
February, 2012

Miles
0 1.5 3 6

Governor Knowles State Forest
Master Plan

The delineation of boundaries between all of the various land management classification is a general representation of those boundaries. More detailed delineation will be produced at the discretion of the department where authorized activities, management or improved on the ground information is available.

N

ST. CROIX CAMPGROUND

Overview and Summary
The St. Croix Campground Recreation Management Area is located south of State Highway 70 and is 341 acres in size, all of which is in state ownership. This area includes land located on both the north and south sides of the Wood River, which flows west into the St. Croix River. This area is easily accessed from the state highway on the north via an asphalt road that services the campsites.

This management area includes the St. Croix Campground and surrounding trail network as well as land along the Wood River. The campground offers 30 sites for rustic camping approximately 500 feet from the St. Croix River. This management area is classified as a Type 4 Recreational Use Setting (NR 44.07).

The land along the Wood River is comprised of steep embankments and river terraces, with a variety of community types present. Forested Seeps flow down the slopes in some areas and lead to Hardwood Swamps which contain a good diversity of native ground layer vegetation. Mature pine forest occurs on several of the dry terraces along the banks of the Wood River, providing habitat for forest-interior birds. The Hooded Warbler, a State-Threatened bird species is found here, at the northernmost edge of its range.

Description of the Forest Resource
This area contains good representations of most, if not all, of the forest types typical to this state forest. Scrub oak (northern pin and bur) is the most prevalent cover type. White pine and aspen are also abundant. Northern, bottomland, and swamp hardwoods, and jack and red pine also occur in this area but to a lesser degree.

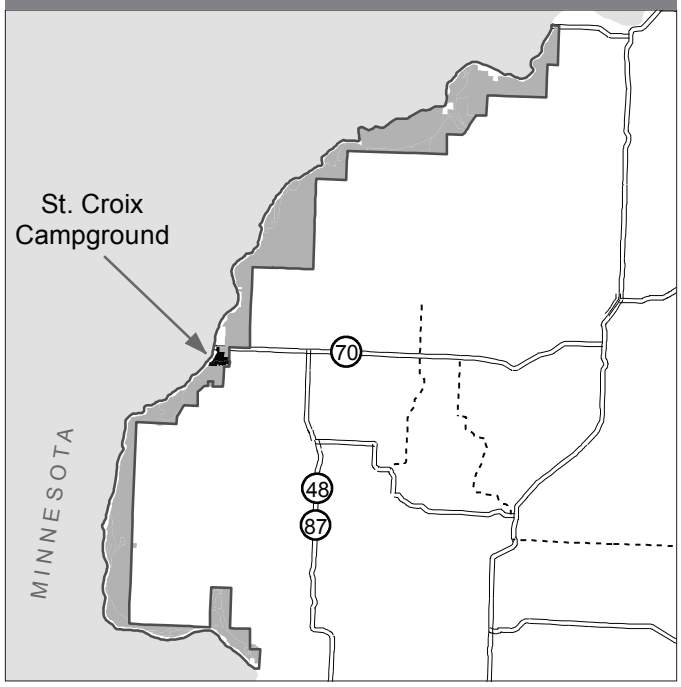
On July 1, 2011, severe winds impacted much of the mature timber in the campground causing significant, stand altering damage. A salvage harvest occurred shortly after the storm, which removed much of the damaged oak, pine, and aspen. The salvage prescriptions were developed with consideration given to the objectives of this management area.

Land Type Associations
Two LTAs are found within this management area. Covering approximately ten percent of the acreage, the St. Croix Plains (212Kb18) is characterized as undulating outwash plain and outwash-veneered moraine. The remainder of the area is the Grantsburg Dunes (212Ka01) LTA. The characteristic landform pattern of the Grantsburg Dunes is undulating outwash plain with dunes, marshes, and frequent swamps.

AREA 10 SUMMARY

- 341 acres
- Type 4 Recreational Use Setting providing 30 campsites with reservations, showers, electric hook-ups, and a group campsite to be added
- Promote long-lived naturally occurring pine species in the wake of the 2011 wind storm which greatly impacted this area.
- Passively manage the Wood River Corridor
- Includes the Highway 70 wayside and day use area

AREA 10 LOCATOR MAP



Soils and Habitat Types
The soils in this area are primarily Grayling sand and various loamy sands on the uplands, and poorly drained mineral or muck in the lowlands.

The habitat types are closely tied to soil type and all are classified as dry in soil moisture and poor to medium in soil nutrients. The most common upland habitat types found in this area are PQGCe *(Pinus-Quercus/Gaultheria-Ceanothus)* and PArVAm *(Pinus-Acer rubrum/ Vaccimium-Amphicarpa).*

PQGCe is the most nutrient deficient and driest habitat type found in this management area and occurs in the campground. The dominant shrubs of this habitat type are blueberries, hazel,

MAP 2.16 ST. CROIX CAMPGROUND

GKSF318P
May, 2012

Miles
0 0.05 0.1 0.2

Governor Knowles State Forest
Master Plan

The delineation of boundaries between all of the various land management classifications is a general representation of those boundaries. More detailed delineation will be produced at the discretion of the department where authorized activities, management or improved on the ground information is available.

N

and juneberry. The dominant ground flora is bracken fern, sedges, wild lily-of-the-valley, and wintergreen. The climax tree species are white pine and oak species.

The PArVAm habitat type occurs along the Wood River and is very similar to PQGCe, but is slightly higher in the nutrient regime. Other subtle differences include the presence of big leaf aster, wild sarsasparilla, false Solomon's seal, and northern bedstraw. Along with white pine and oak species, red maple is considered a climax species.

Long Term Management Objectives

The St. Croix Campground Recreation Management Area will continue to be an attractive setting for people to enjoy a variety of recreational opportunities, including camping, hunting, hiking, fishing, cross country skiing, snowshoeing, and wildlife viewing. Although managed for recreation, this area will occasionally produce forest products.

The overall health and vigor of the forest and aesthetic appeal will be maintained and long-lived tree species will dominate. The future of oak and ash (swamp hardwood stands) in this area is uncertain due to the presence of oak wilt and the potential for Emerald Ash Borer and Gypsy Moth infestations. White pine will be the primary forest type on nearly half the acres in this area.

The water quality and riparian habitat of the Wood River will be protected and maintained.

Short Term Management Objectives

- Increase the age and presence of larger, longer-lived species such as white pine
- Maintain the aesthetic appeal and high water quality in the Wood River Corridor and other wetlands in the area
- Promote timber types, such as red and white pine, that are managed through thinning rather than regeneration harvests where possible.

Resource Management Prescriptions

Please see the General Forest Management Prescriptions by Primary Type later in Chapter Two for specific management prescriptions for various cover types. The General Forest Management Prescriptions for each appropriate cover type apply to this management area, except as noted below.

- Passively manage the part of the area that lies south of the north bank escarpment of the Wood River.
- Promote white pine and red pine where appropriate. Where feasible, use natural conversion to increase the presence of white pine where white pine is a secondary stand component. Efforts should focus on selective thinning.

FIGURE 2.11 ST. CROIX CAMPGROUND CURRENT LAND COVER

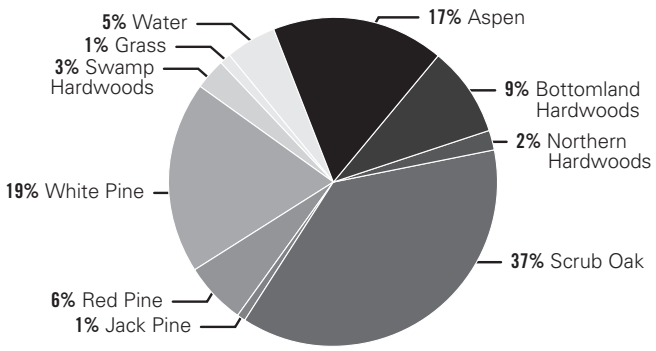


TABLE 2.15 ST. CROIX CAMPGROUND CURRENT AND PREDICTED COVER TYPES

Cover Type	CURRENT		PREDICTED 50 YEAR	
	Acres	% Total	Acres	% Total
Forested Types				
Aspen	59	17%	7	2%
Bottomland Hardwoods	30	9%	30	9%
Northern Hardwoods	9	2%	59	17%
Scrub Oak	127	37%	39	11%
Jack Pine	2	1%	2	1%
Red Pine	19	6%	19	6%
White Pine	65	19%	155	45%
Swamp Hardwoods	11	3%	11	3%
Non-forested Types				
Grass	3	1%	3	1%
Water	16	5%	16	5%
Total	**341**	**100%**	**341**	**100%**

- In mixed stands with scattered pine, retain some large red and white pine legacy trees and employ sivicultural techniques that favor pine regeneration and improve structural diversity.
- Modify timber sales to give special consideration to aesthetics, including irregular harvest areas, more restrictive slash requirements, and increased retention .

- Conduct forest management activities in ways that minimize visual, noise, and access impacts to recreational users, such as conducting timber management during times of lowest visitor use.
- Implement aesthetic management prescriptions consistent with the DNR Silviculture and Forest Aesthetics Handbook guidelines for a Class A Aesthetic Management Zone.
- Conduct additional management activities as needed to support the use and purpose of the area, such as mowing, brushing and cutting.
- When harvesting timber within view of the St. Croix River, design sales so that no management activity can be seen from the river during leaf on conditions. Use aesthetic management techniques for timber harvests that are visible from the rivers, flowages, and intensive recreational use areas such as reducing the size of cuts, establishing irregular harvest boundaries, conducting partial harvests, planting trees, favoring longer-lived species, and where necessary, harvesting during the winter.
- Decrease the acreage of oak through natural or artificial regeneration techniques.

Recreation Management

The master plan prescribes future developments for recreational facilities located within Management Area 10. For complete details see the Recreation Management section.

- At St. Croix Campground half of the rustic campsites will be placed on the statewide campsite reservation system, and modern amenities will be added including a shower building and some electric sites.
- The Highway 70 Wayside and Day Use Area will be renovated with facility upgrades and improved ADA accessibility.
- Interpretive signs will be renovated to enhance visitor education along the Wood River Interpretive Trail.
- A new, rustic outdoor group camp will be constructed near the St. Croix Campground to accommodate small groups, youth and family gatherings.

TRADE RIVER EQUESTRIAN CAMPGROUND AND DAY USE

Overview and Summary

The 31 acre Trade River Recreation Management Area is the most popular area of the Governor Knowles State Forest and is located near the southern most portion of the GKSF where the Trade River flows into the property. This management area can be accessed from off of State Highway 87. The entire area is in state ownership.

This management area includes an equestrian day use area, a 40 site equestrian campground, and the starting point for the Trade River Equestrian Trail system. This management area is classified as a Type 4 Recreational Use Setting (NR 44.07).

This area is ecologically significant and diverse in topography, soils, and animal habitat. A typical mix of dry-forest tree species occur on the level outwash sands that are present at the equestrian campground. The day use area is found along the eastern bank of the Trade River, where ecological conditions are much different. Below the escarpment of the Trade River is a wide diversity of landforms and habitats, including an unusual variant of Southern Mesic Forest, consisting of a mixture of bur oak, black ash, basswood and scattered patches of white pine. Typical mesic herbs make up the ground layer, including Virginia Waterleaf, maidenhair fern and sensitive fern. Numerous high-quality Forested Seeps are intermixed with Hardwood Swamp and mesic forest along some of the winding sections of the Trade River. The forested attributes present within this management area add to the value of the adjacent Trade River and Wolf Creek Native Community Management Area.

Description of the Forest Resource

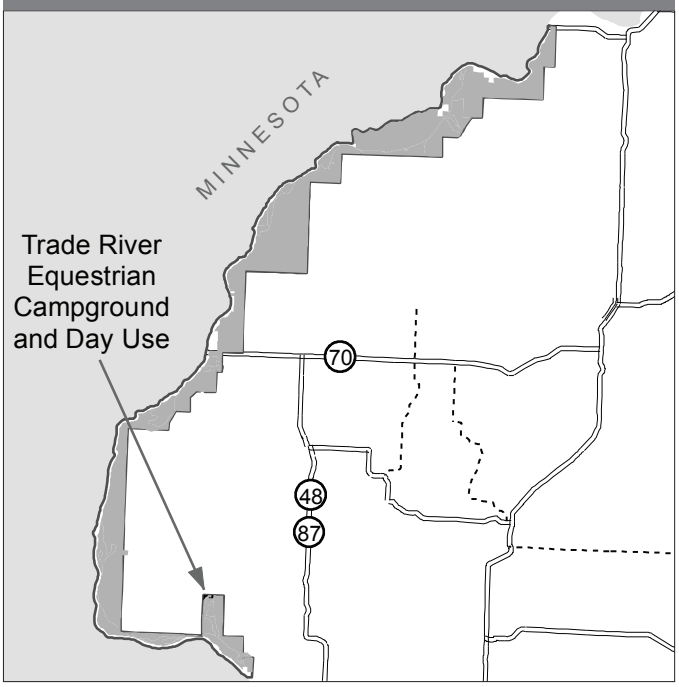
The Trade River Recreation Management Area contains a mix of upland cover types. Scrub oak, Aspen, jack and white pine, and northern hardwood types are present. The swamp hardwoods type also occurs in this area. Scrub oak (northern pin and bur) is the most common cover type covering nearly half of the area, most of which is found in and around the Trade River Equestrian Campground. A timber sale occurred in this campground prior to its construction so much of the scrub oak forest is young in age. The aspen in this area is either young or over mature. The remaining forest types tend to be mature to over mature due to inaccessibility or lack of active management near recreational developments.

Over the next 50 years the jack pine forest is expected to decrease slightly while white pine is expected to increase. The swamp hardwood forests are susceptible to mortality initiated by future Emerald Ash Borer (EAB) infestations.

AREA 10 SUMMARY

- 31 acres
- Type 4 Recreational Use Setting providing 40 campsites with some reservation sites, showers, electric hook-ups, and a group campsite accommodating 30 camper units to be added
- Access to extensive equestrian trail network
- Equestrian trail rides and trout fishing on the Trade River are the two main recreational uses of the day-use area

AREA 10 LOCATOR MAP



Land Type Associations

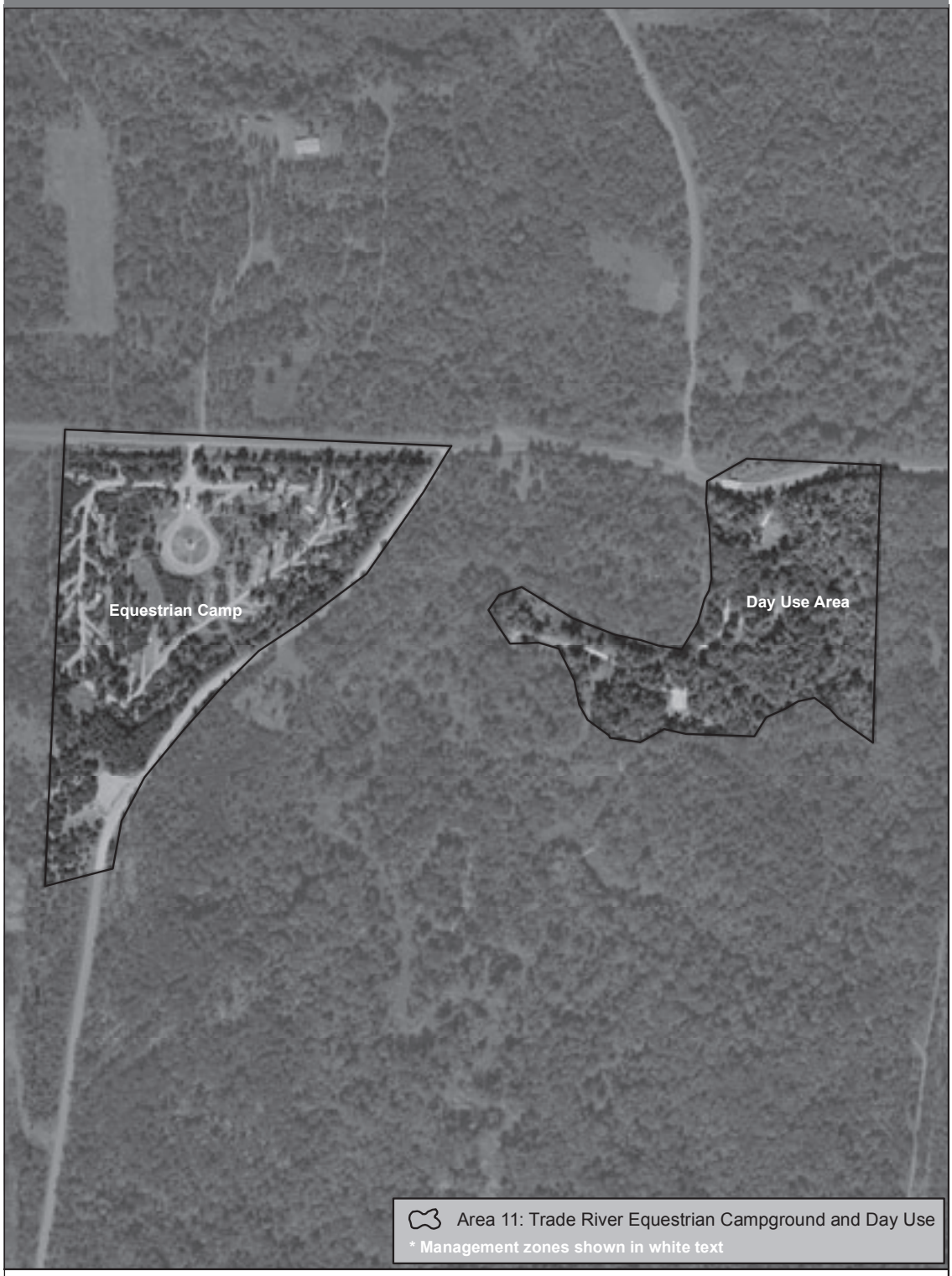
This entire management area is in the Grantsburg Dunes (212Ka01) LTA. The characteristic landform pattern of the Grantsburg Dunes LTA is undulating outwash plain with dunes, marshes, and swamps common. Soils are predominantly excessively drained fine sand over outwash.

Soils and Habitat Types

The soils range from very dry sand to loamy sand in the Trade River Equestrian Campground. The day use area is situated

TRADE RIVER EQUESTRIAN CAMPGROUND AND DAY USE

MAP 2.17 TRADE RIVER EQUESTRIAN CAMPGROUND AND DAY USE



GKSF319P
May, 2012

Miles
0 0.03 0.06 0.12

Governor Knowles State Forest
Master Plan

The delineation of boundaries between all of the various land management classifications is a general representation of those boundaries. More detailed delineation will be produced at the discretion of the department where authorized activities, management or improved on the ground information is available.

N

adjacent to the Trade River and is comprised of richer, moister loams and sandy loams.

The habitat types are closely tied to soil types. The most common upland habitat type found in this area is QAp (Quercus albo-Quercus spp./Amorpha canescens). PArVAm *(Pinus-Acer rubrum/ Vaccimium-Amphicarpa)* and hydric habitat types are also present.

QAp sites are dry with a poor to medium nutrient regime. These habitat types usually have a developed shrub layer with hazel, chokecherry and juneberry common. Poison ivy is often abundant. QAp sites typically exhibit a poorly developed herb layer with grasses and sedges being the most common. Oaks (white, bur, northern pin, and red) are considered climax species in this habitat type. However, with a seed source present, white pine is also a climax component.

The PArVAm habitat type is dry to dry-mesic with a poor to medium nutrient regime. A well developed shrub layer of hazel is common. Bracken fern and big leaf aster typically dominate the ground layer. Along with white pine and oak species, red maple is considered a climax species.

The hydric habitat types typically have medium to high nutrient regimes and wet-mesic moisture regimes. These sites exhibit poor drainage with windthrow being the principal natural disturbance. A habitat type for lowlands has not been developed yet.

LONG AND SHORT TERM MANAGEMENT OBJECTIVES

- Maintain and enhance equestrian camping and day use opportunities.
- Provide access to the Trade River Equestrian Trails.
- Promote a naturally appearing, older forest that provides aesthetic appeal.
- Protect, manage, and enhance the natural communities for ecological values and rare species habitat needs.

FIGURE 2.12 TRADE RIVER CURRENT LAND COVER

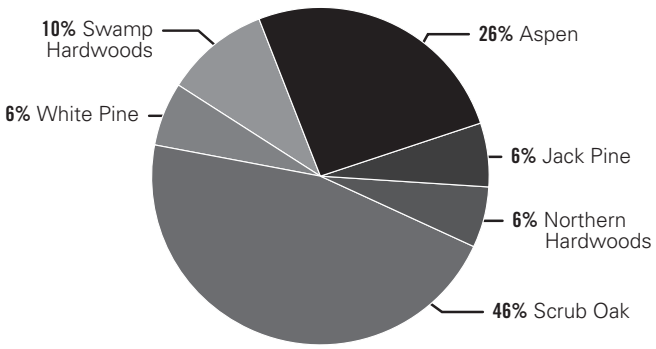


TABLE 2.16 TRADE RIVER CURRENT AND PREDICTED COVER TYPES

Cover Type	CURRENT		PREDICTED 50 YEAR	
	Acres	% Total	Acres	% Total
Forested Types				
Aspen	8	26%	8	26%
Jack Pine	2	6%	1	3%
Northern Hardwoods	2	6%	2	6%
Scrub Oak	14	46%	14	46%
White Pine	2	6%	3	10%
Swamp Hardwoods	3	10%	3	10%
Total	**31**	**100%**	**31**	**100%**

MANAGEMENT PRESCRIPTIONS

Please see the General Forest Management Prescriptions by Primary Type later in Chapter Two for specific management prescriptions for various cover types. The General Forest Management Prescriptions for each appropriate cover type apply to this management area, except as noted below.

- Promote the growth and retention of large oak and pines.
- Remove diseased and defective trees that are hazardous to staff or the public.
- Conduct forest management activities in ways that minimize visual, noise, and access impacts to recreational users, such as conducting timber management during times of lowest visitor use.
- Implement aesthetic management prescriptions consistent with the DNR Silviculture and Forest Aesthetics Handbook guidelines for a Class A Aesthetic Management Zone.
- Control invasive species using appropriate techniques.
- Conduct additional management activities as needed to support the use and purpose of the area, such as mowing, brushing and cutting.

Recreation Management

The master plan prescribes future developments for recreational facilities located within Management Area 11. For complete details see the Recreation Management section.

- The Trade River Equestrian Campground will receive some modern upgrades including a shower building, electric service to some campsites, and some reservable sites.
- The Trade River Day Use Area will be maintained with parking and facilities to accommodate horse riders and trout fishing enthusiasts.

STATE NATURAL AREA DESIGNATIONS

State Natural Areas (SNAs) are part of a statewide system of sites identified for the purposes of ecological research, education, and to assure the full range of ecological diversity for future generations. After the designation of land management areas, and identifying their specific resource management objectives and prescriptions, the master planning team examined opportunities to further protect areas with exceptional natural features. Bureau of Endangered Resources staff evaluated sites that could contribute to critical habitat for rare species, provide ecological reference areas, or which contain significant geological or archaeological features.

STATE NATURAL AREA PROGRAM OBJECTIVE

Locate, establish, and preserve a system of SNAs that as nearly as possible represents the wealth and variety of Wisconsin's native landscape for education, research, and long-term protection of Wisconsin's biological diversity for future generations.

DESIGNATION PROCESS AND AUTHORITY

The process for selecting and designating SNAs is determined by cooperative efforts between the Division of Forestry and the Bureau of Endangered Resources. The master planning process for State Forests requires that the goals set by the Division of Forestry be considered before the Bureau of Endangered Resources submits candidate sites for SNA designation. As a result, SNAs are considered overlays to Land Management Areas. In this way, the same piece of land can achieve the goals of two different Department programs. Activities for each SNA are the same as the land management objectives and prescriptions as well as the recreation uses designated to meet forestry goals. For example, a SNA located within an area managed for white pine will follow the objectives for that land management area, rather than a separate SNA management plan. The forest management and recreation uses that were determined by the master planning team (Forestry, Wildlife, Endangered Resources, Fisheries) and in consultation with the public, would occur with or without SNA designation. See Appendix A for details on the designation process for State Natural Areas.

The Wisconsin State Natural Areas Program oversees the establishment of SNAs and is advised by the Natural Areas Preservation Council.

STATE NATURAL AREA MANAGEMENT AND RECREATIONAL ACTIVITIES

The State Natural Area designation does not change the underlying recreation management activities outlined in this master plan for each land management area. There are no additional management prescriptions associated with these State Natural Areas. See the specific management areas for detailed maps showing the location of SNA overlay zones.

GOVERNOR KNOWLES STATE FOREST STATE NATURAL AREAS

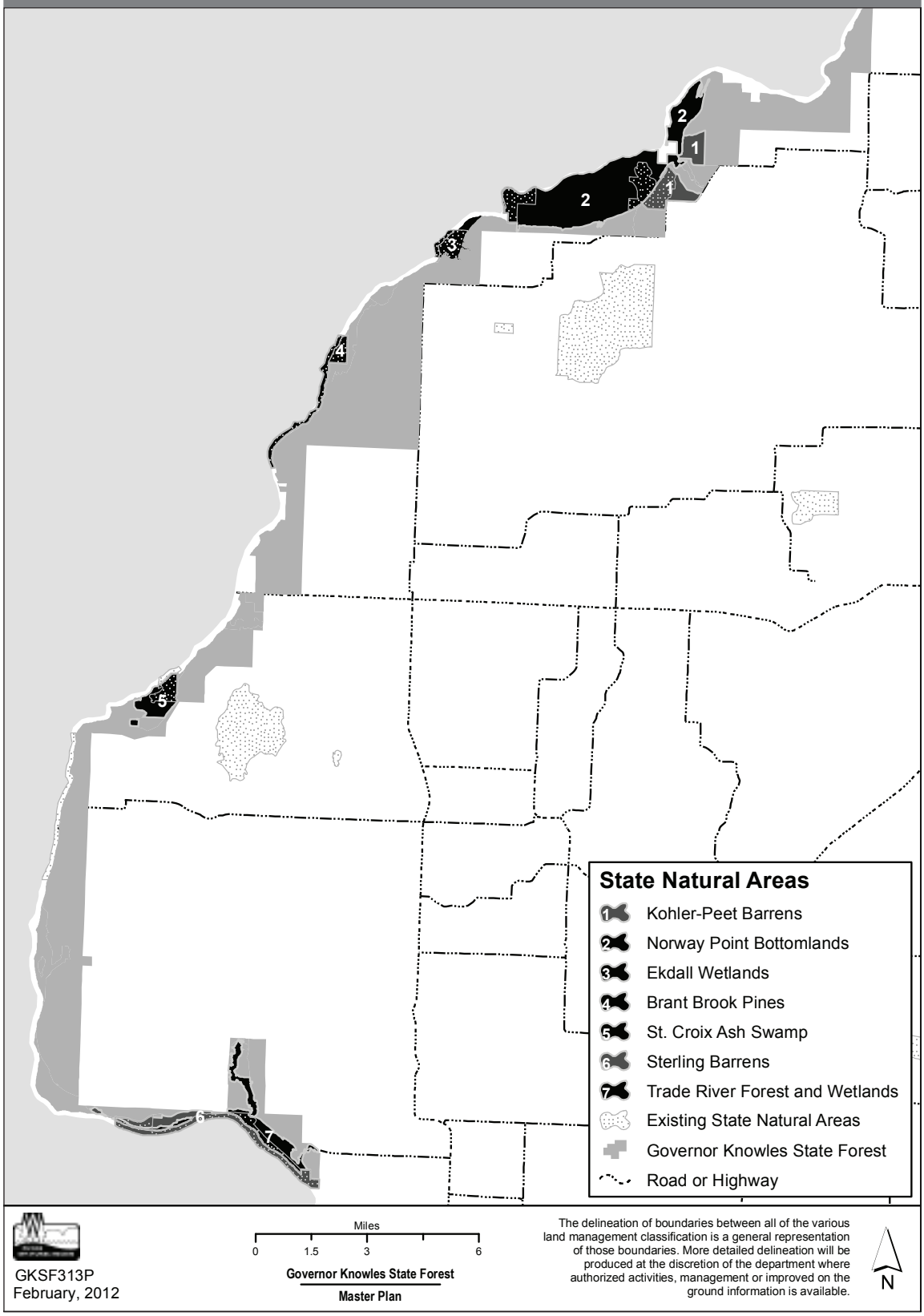
The GKSF previously had six SNA designations, totaling 1,710 acres, including Sterling Barrens, St. Croix Ash Swamp, Brandt Brook Pines and Hardwood Forest, Ekdall Wetlands, Norway Point Bottomlands, and Kohler Peet Barrens and Cedar Swamp. The current master plan designates one additional SNA (Trade River Forest and Wetlands), along with boundary modifications to the existing six SNAs for a total of 7,026 acres of SNAs (Table 2.17).

TABLE 2.17 STATE NATURAL AREAS

SNA Name	Management Area		Acreage
Brandt Brook Pines and Hardwood Forest	4	Brandt Pines and Foxes Landing Native Community Management Area	150
Ekdall Wetlands	3	St. Croix River Lowlands Native Community Management Area	308
Norway Point Bottomlands	3	St. Croix River Lowlands Native Community Management Area	4,014
St. Croix Ash Swamp	3	St. Croix River Lowlands Native Community Management Area	536
Trade River Forest and Wetlands	7	Trade River Corridor and Wolf Creek Lowlands Native Community Management Area	920
Kohler-Peet Barrens	8	Kohler-Peet Barrens Habitat Management Area	836
Sterling Barrens	9	Sterling Barrens Habitat Management Area	308
Total			**7,026**

STATE NATURAL AREA DESIGNATIONS

MAP 2.18 STATE NATURAL AREA DESIGNATIONS



STATE NATURAL AREA DESIGNATIONS

Kohler-Peet Barrens (836 acres)
Examples of open pine/oak barrens and jack pine dominated Northern Dry Forest are both represented within this SNA, which is made up of two geographically separated sites. The northern site features a jack pine stand of fire origin, with excellent quality native barrens ground flora present within the canopy gaps and open areas. Portions of the Jack Pine area were blown down during the July 1, 2011 wind storm. The southern site has been maintained as an open pine/oak barrens for many years, and provides habitat for uncommon wildlife species such as Sharp-tailed Grouse and Upland Sandpipers. Timber harvest, prescribed fire and mechanical brush control will all be used to maintain these community types. The SNA will comprise portions of the Kohler-Peet Barrens Habitat Management Area.

Norway Point Bottomlands (4,014 acres)
This extensive wetland complex features good quality examples of several community types, including Hardwood Swamp, Black Spruce Swamp, Alder Thicket, Northern Wet-Mesic Forest, in addition to numerous Forested Seeps. Its sheer size and diversity of community types provide habitat for several rare species of plants and animals. The SNA will make up the majority of the acreage within the St. Croix River Lowlands Native Community Management Area. The entire site will be passively managed in order to allow old forest attributes to continue developing.

Ekdall Wetlands (308 acres)
Located less than a mile from the Norway Point Bottomlands SNA, this site also features examples of several wetland community types, with tamarack dominated conifer swamp, Alder Thicket and Hardwood Swamp among those present. Forested Seeps are found along the steep banks of the escarpment, which forms the Southern and Eastern boundaries of the site. The SNA comprises a portion of the St. Croix River Lowlands Native Community Management Area and will be passively managed.

Brandt Pines and Hardwood Forest (150 acres)
Brandt Pines features an old growth stand of natural origin red pine, growing along the banks of Brandt Brook. Once common in the Northwest Sands Ecological Landscape, natural red pine stands are now relatively rare, and this site provides the largest stand of this type on the state forest. Portions of the red pine were blown down during a windstorm on July 1, 2011. The SNA boundary follows the same boundary that was established when the site was designated as an SNA, in 1979. The SNA makes up a portion of the Brandt Pines and Foxes Landing Native Community Management Area, and will continue to be passively managed.

St. Croix Ash Swamp (536 acres)
This site is made up of a fairly large and good quality wetland complex, including both forested and unforested types. Communities represented at this site include Hardwood Swamp, Tamarack Swamp, Alder Thicket and Northern Sedge Meadow. All of these are in good condition and provide habitat for several uncommon species of both plants and animals. This SNA is within the St. Croix River Lowlands Native Community Management Area and will be passively managed.

Sterling Barrens (308 acres)
Located on the dry, sandy uplands above the main escarpment, this site features several examples of plant communities that were once common within the Northwest Sands Ecological Landscape. High quality oak and pine barrens remnants are found throughout the site, many of which contain an excellent diversity of native barrens ground flora. Timber harvest and prescribed fire will be used to reduce woody vegetation in some areas, improve the structure of the site, and provide habitat for uncommon species of plants and animals. This SNA occurs within the Sterling Barrens Habitat Management Area.

Trade River Forest and Wetlands (920 acres)
Featuring an unusual combination of tree species and a wide diversity of community types, this site is the only newly designated SNA at Governor Knowles State Forest. Below the Trade River escarpment is a diverse mix of community types, including Southern Mesic Forest, but with an unusual combination of tree species, including bur oak, basswood, white pine and black ash. An extensive wetland complex along the St. Croix River makes up the remainder of the site, including Northern Sedge Meadow, Floodplain Forest, Hardwood Swamp, Alder Thicket and Northern Sedge Meadow. This SNA will comprise a large portion of the Trade River Corridor and Wolf Creek Lowlands Native Community Management Area and will be passively managed.

GENERAL FOREST MANAGEMENT PRESCRIPTIONS BY PRIMARY FOREST TYPE

For each forest type there is a specific set of management techniques which favor the maintenance and regeneration of a given type. The following describes the general management prescriptions to be used for each primary forest type on the Governor Knowles State Forest. Each prescription will be applied wherever management for that specific forest type is an objective, as stated in the individual management areas later in this chapter. The prescription may also include site preparation techniques suggested to optimize success in regenerating that species. In application, foresters will need to regularly review stands in the field and exercise professional judgment concerning growth and mortality. The individual area management plans may modify or limit these general prescriptions to fit the area.

ASPEN DOMINATED MIXED FOREST

This is an early successional forest type that requires disturbance and abundant sunlight to regenerate. It is typically managed with clearcuts (coppice) and modified clearcut harvests of various shapes and sizes. Recommended harvests should occur at intervals of 45-55 years to maintain this forest type. For extended rotation forestry, stands should be harvested at 55-70 years of age.

General Management Prescriptions

- Different management activities will be used to move the forest toward the desired condition depending on whether or not the stand is pure aspen or a mixed aspen community.
- Consider the ecological value of aspen and surrounding landscape on the Governor Knowles State Forest. A variety of age classes and stand sizes across the landscape provide wildlife and aesthetic value. Some considerations in landscape planning include age classes and patch sizes across the landscape, the natural disturbance regime in the area, and surrounding cover types and management.
- Harvest and regenerate aspen naturally, primarily through clearcutting (coppice). Coppice harvest is a method that encourages the species to naturally regenerate through vegetative reproduction (stump or root sprouts). In stands where the objective is to develop or maintain mixed species, the preferred management strategy is "coppice with standards", which means to harvest aspen trees but retain individual oak, red pine, and white pine trees as the standards within a stand. This technique allows the remaining oak and pine trees to provide seed to the area and increases the diversity of the stand.
- Adhere to the green tree retention guidelines by leaving individual or patches of trees of high value for wildlife, forest diversity, and aesthetics.
- In aspen stands along flowages, stream borders, and aesthetic strips, or as islands in wetlands, modify the standard management practices or apply no management to meet the management objectives for these areas.

NORTHERN PIN OAK (SCRUB OAK) DOMINATED MIXED FOREST

This is an early successional forest type that requires disturbance and abundant sunlight for regeneration. Management will typically include even-aged harvest practices of various shapes and sizes occurring at intervals of 70-90 years. Stands managed for extended rotation forestry should be harvest at 90-110 years of age.

General Management Prescriptions

- When planning individual management actions, consider the ecological values and surrounding landscape of scrub oak's role on the Governor Knowles State Forest. A variety of age classes and stand sizes across the landscape provide wildlife and aesthetic value. Some considerations in landscape planning include age classes and patch sizes across the landscape and the natural disturbance regime in the area.
- Harvest and regenerate scrub oak naturally, primarily through clear cutting (coppice), overstory removal when advanced regeneration is present, or shelterwood harvests on better quality sites or critical sites in aesthetic areas. Reserve trees may be left as individuals or in groups and can be any species. In this region, reserve trees are typically red pine, white pine, birch, red maple and oak species that provide timber, aesthetics and wildlife value. Harvest area shape and size may vary with feathered edges or rough, irregular edges.
- Conversion to pine species, aspen or red maple will be determined on suitable sites if the opportunity allows due to desirable advanced regeneration, decreased sprouting capabilities, susceptibility of mortality due to insects or diseases, or the presence of suitable seed sources for other desirable species. Tree planting may occur to promote pine species. Conversion to white pine will facilitate succession while conversion to Jack pine will reinitiate succession.
- In scrub oak stands along flowages, stream borders, and road aesthetic strips, modify the standard management practices or apply no management to meet the management objectives for these areas.

GENERAL FOREST MANAGEMENT PRESCRIPTIONS BY PRIMARY FOREST TYPE

RED PINE DOMINATED FOREST PLANTATIONS

This forest type occurs throughout the forest in numerous plantation stands established over the last 65 years. Most of these stands were established within the last 30 years. Some of the older plantations have been thinned as many as three times to improve health and growth.

General Management Prescriptions

- Several management activities will be used to manage red pine stands toward the future desired condition of larger and older trees with a diverse understory.
- Thin pine plantations on a recurring basis (8-20 year intervals), according to prescriptions outlined in the DNR Silviculture and Forest Aesthetics Handbook, to gradually create a structure similar to that of a naturally occurring pine stand. At rotation age harvest red pine and replant or naturally regenerate. If natural regeneration is desired, stands may need to be rotated around 60-80 years in order to take advantage of advanced regeneration. Stands managed for extended rotation forestry should be harvest at 120-200 years of age.
- Plant red pine plantations as needed to maintain this species on the Forest. Decisions on site preparation methods are considered on a site by site basis, however, the least invasive method will be considered initially. Hand or machine plant seedlings following any necessary site preparation. Site preparation may include mechanical and/or chemical techniques. Use hand or herbicide release as needed following planting to maintain growth, vigor, and survival.
- Ground disturbance or prescribed fire may be used to promote natural regeneration of red pine where feasible, safe, and effective.

RED OAK DOMINATED MIXED FOREST

Oak forests historically developed or regenerated following a significant disturbance such as a fire or blow down event. Much of the current red oak developed following the large scale cutover and wildfires in the late 1800's to early 1900's. Red oak may be encouraged on sites that have good growing conditions. This forest type has value to a wide number of game and non-game wildlife species. Disturbance is required to regenerate existing stands and to maintain an oak component in mixed stands.

General Management Prescriptions

- Use intermediate thinning practices to develop oak stands as they near rotation age, and use shelterwood cuts to regenerate this species. Regenerate red oak at 80-120 years of age, depending on site characteristics. Other management techniques that may be applied to red oak stands include clear-cuts with reserves, scarification, hand release, herbicide treatments, and prescribed fire to promote regeneration. Stands managed for extended rotation forestry should be harvest at 120-150 years of age.
- Red oak is typically regenerated through the shelterwood method. In a shelterwood harvest, about 30-40% of the mature trees are harvested, depending on site characteristics, to allow for sunlight and the regeneration of young oak trees. Ten to 15 years after the young oak trees have regenerated, the majority of the mature trees are harvested, while maintaining 5 to 10 mature trees per acre for age and structural diversity and wildlife.
- A diverse stand is an important objective of regeneration. On mixed stands of red oak with white pine, red maple or other species, promote a diverse mix of tree species where possible.

WHITE PINE DOMINATED MIXED FOREST

White pine as a cover type currently makes up a very small percentage of the forest. However, short and long-term objectives in all land management areas include converting some current cover types to white pine, increasing the white pine component of mixed stands, or creating conditions that promote the establishment of natural white pine regeneration in a stand. Even-aged management practices will be used. To optimize vigor, white pine should be grown in full sunlight in a fully stocked condition. Pruning is essential for quality saw timber products as white pine does not self prune well.

General Management Prescriptions

- Several management techniques will be used to manage white pine stands toward the future desired condition, increased white pine composition, and an older forest with longer lived pine species. Where white pine is the primary cover type, use selective thinning to maintain the health, vigor and growth of the stand.
- Clear cutting, seed tree harvest and overstory release may be used depending on site conditions. Stand considerations, seed sources, and site prep needs will determine the appropriate management action to use. Regenerate white pine at 80-160 years of age. Stands managed for extended rotation forestry should be harvest at 160-200 years of age.
- Where white pine is a viable understory component in mixed stands, use natural regeneration techniques such as seed tree and/or shelterwood regeneration methods. To promote advanced regeneration, give established seedlings adequate light for optimal growth. Reduce the overstory to no greater than twenty percent crown closure.
- Where a seed source exists and advance regeneration is inadequate or absent, patch clearcutting near the seed source can be done to establish a greater white pine component.

- Plant white pine plantations as needed to maintain pine on sites or to convert other forest types to pine. Hand or machine plant seedlings following any necessary site preparation. Site preparation may include mechanical and/or chemical techniques. Use hand or herbicide release following planting to maintain growth, vigor and survival. Ground disturbance or prescribed fire may be used to promote regeneration of white pine where feasible, safe, and effective.
- Thin pine plantations on a recurring basis (8-10 year intervals), according to prescriptions outlined in the DNR Silviculture and Forest Aesthetics Handbook, to gradually create a structure similar to that of a naturally appearing pine stand. Leave scattered large white pine in harvest areas if they are healthy and do not pose a risk to humans or forest health.

JACK PINE DOMINATED FOREST

This is an early successional forest type that requires disturbance and full sunlight for regeneration. Historically, jack pine stands regenerated following fire and/or insect infestation events. Harvest and ground disturbance not only provide for good regeneration of jack pine but also support the development of a diverse mix of grasses, forbs and shrubs, which are important during successional stages of this forest community.

General Management Prescriptions

- On dry sites, clear-cut jack pine at 40-60 years and use appropriate means to regenerate the stand.
- Regenerate jack pine through natural and artificial regeneration as necessary to maintain or increase pine or to convert other forest types to jack pine. Clearcutting and planting, mechanical scarification or fire may be used. Mechanical scarification with natural seeding is the approach used most often and has proved to be an economical and effective regeneration method. Seeding and/or hand planting nursery stock, combined with a variety of site preparation techniques, are viable options for successful jack pine regeneration on some sites.
- The exact regeneration plan should be tailored for each stand at the forester's discretion after consideration of a number of factors including, stand size, ground cover, pre-harvest tree composition and the science available at the time.
- Decisions on site preparation methods are considered on a site by site basis, however, the least invasive method will be considered initially. Use any combination of mechanical, chemical, and/or prescribed burn treatments combined with natural or artificial seeding or seedling planting. Use hand or herbicide release, if needed, following planting to maintain seedling growth, vigor, and survival rate.

GENERAL FOREST MANAGEMENT PRESCRIPTIONS BY PRIMARY FOREST TYPE

RED MAPLE DOMINATED MIXED FOREST

Red maple is found on the forest on both dry and wet sites. For the most part, red maple is a secondary species in most stands on the Governor Knowles State Forest. It tends to occur at varying degrees in the understory of stands and tends to increase following thinning or other moderate disturbances. Because of its shade tolerance, it may be found as a second canopy layer in mature white pine stands.

General Management Prescriptions

- Even-aged management is the preferred silvicultural method to maintain red maple. Lower quality sites may be converted to early successional tree species. Higher quality sites with saw-log potential will be managed with either shelterwood or group selection regeneration techniques.
- Red maple saplings in stands with saw-log potential will be released to encourage accelerated diameter growth. Pole size stands will be commercially thinned. Poles and saplings on less rich sites do not warrant thinning or release.
- In mixed stands red maple maintenance will be considered on a stand-by-stand basis for forest diversity and aesthetics.
- Where red maple is an associate in aspen stands, harvest the red maple along with aspen. Red maple can stump sprout from healthy cut trees and can seed in along with the aspen regeneration.

FORESTED AND UNFORESTED WETLANDS

The forested wetland areas typically contain stands of swamp hardwoods (black ash and red maple) and swamp conifer (black spruce, tamarack, and white cedar). They can be pure stands of individual species or combinations of two or more tree species. The unforested wetlands are represented by large areas of sphagnum muskeg and open bogs, as well as alder thickets and marshes.

General Management Prescriptions

- No management activities will be conducted within wetlands with small sized slow growing trees, lowland brush, or areas of open bog and marsh. However, access across these stands on frozen ground for temporary roads may be required.
- Productive stands of swamp hardwood, primarily black ash, may be regenerated by following the guidelines in the *DNR Silviculture and Forest Aesthetics Handbook* depending on the site and stand conditions.
- Due to Emerald Ash Borer (EAB) concerns, alternative management strategies will be considered in some swamp hardwood stands to encourage diversity through conversion techniques and to ensure aesthetic and water quality in these wetlands.
- Productive stands of tamarack and black spruce may be regenerated by limited harvesting of stands (clearcut) following the guidelines in the *DNR Silviculture and Forest Aesthetics Handbook*.
- Conduct timber harvests on forested wetlands only under frozen ground conditions to prevent rutting and potential damage to organic soils.

FORESTED SEEPS

Forested seeps are one of the characteristic natural features on the GKSF, with higher concentrations of them occurring at this property than any other known state-managed land in Wisconsin. Seeps can flow year-round and they make significant contributions to the water quality of numerous small streams, as well as the St. Croix River itself. They also support high plant diversity as well as habitat for amphibian species and numerous invertebrates.

Forested seeps at GKSF are often found flowing down and/or at the base of, the steep slopes of the St. Croix River escarpment. As such, they are extremely susceptible to negative water quality impacts due to erosion.

Many seeps and their associated habitats will continue to be protected by adhering to the Riparian Management Zone (RMZ) harvest restrictions within the BMP's for Water Quality (WI DNR, 2011) and by the restrictions on harvest within the viewshed of the St. Croix River.

However, neither of these was designed specifically with seep habitats in mind. As a result, there is a need for additional restrictions on management activities near forested seeps.

General Management Prescriptions

- Adequate buffer zones should be left unharvested on the top of the St. Croix River escarpment whenever forested seeps are known to occur on or at the base of the escarpment slope.
- When harvesting on top of the escarpment, haul roads and skid trails should be routed at a distance sufficient to avoid disturbing the flow or introducing any fine sediments to the seep.
- When harvesting below the escarpment, the RMZ distances outlined within the WQ BMP's should always be exceeded for areas adjacent to Forested Seeps.
- As forested seeps and adjacent areas often do not freeze solid, harvesting equipment is never permitted to travel across a forested seep or at a distance that would negatively impact the water quality of the seep.
- Operating distances when in the vicinity of a forested seep should be determined by the property Forester, following a site visit, and in consultation with the Endangered Resources District Ecologist.

WILDLIFE MANAGEMENT PLAN

The Governor Knowles State Forest supports a great diversity of wildlife, including many common and rare species associated with the Northwest Sands and the Northwest Lowlands Ecological Landscapes. Resident wildlife species complete life cycles either using the forest exclusively or in combination with adjacent wildlands, including those in Minnesota. Wildlife requiring early successional habitat types will use the GKSF opportunistically, utilizing recently disturbed areas of regenerating forest. A great variety of birds utilize the state forest's habitats. Some bird species are true residents while others are seasonally present only during the nesting season or as winter migrants. Still other birds will use the GKSF by following seasonal migration routes along the river or the wildlands of the river valley. Some of the common wildlife species inhabiting the state forest include white-tailed deer, black bear, coyote, squirrels, Wild Turkeys, Ruffed Grouse, Wood Ducks, and Bald Eagles.

WILDLIFE HABITAT MANAGEMENT

The wildlife management program on the Governor Knowles State Forest focuses on maintaining and enhancing habitat and assessing the population status of important common, keystone, threatened, endangered, special concern, and Species of Greatest Conservation Need (SGCN). The abundant wildlife on the Governor Knowles State Forest requires diverse habitats in all successional stages from open barrens to old growth forests. Special opportunities exist to manage for large blocks of habitat required by certain wildlife. Diverse and healthy wildlife populations will be maintained by managing the composition and structure of habitats integrated with the management objectives and activities outlined for each land management area in the Land Management Section of this plan. Wildlife habitat values are further assured by wildlife staff working with foresters on timber sales in order to maximize species diversity and improve vegetative structure consistent with the management objectives for the area.

This wildlife management plan has been integrated into the management prescriptions for the individual management areas.

Habitats of the Northwest Sands Ecological Landscape

Most of the managed forest is located within the Northwest Sands Ecological Landscape which is a disturbance dependant system that provides barrens type habitats in various stages of succession. Today, timber harvesting mimics fire and other natural disturbances by providing a temporary open barrens habitat. Harvesting and regenerating the forest also maintains the barrens wildlife that this dynamic system supports throughout the various forest seral stages ranging from vast openness to closed canopy forest. Large scale timber harvests provide rare and critical habitat for area-sensitive wildlife.

11% of the Governor Knowles State Forest will be managed for aspen dominated mixed forest through coppice harvests. There will be a diversity of age classes through forest regulation, which spreads the work load and income from harvests over time. By harvesting some aspen stands before economic rotation and some aspen stands beyond economic rotation, an increased age structure is achieved maintaining the early forest. By rotating the blocks of habitat, a consistent supply of early, mid and late successional habitat is provided. While aspen-birch forests are dominated by aspen, they also contain a mixture of various pines, oaks, maples, and white birch. In the Bluff Lake Forest Production Management Area, where a high percentage of the aspen found in the state forest is concentrated, the landscape scale management effort will benefit early forest wildlife species, such as Ruffed Grouse. Species of Greatest Conservation Need associated with this structural/serial stage include the Golden-winged Warbler, Veery and Woodcock.

16% of the GKSF will be managed for northern pin oak dominated mixed forest. This is an early successional forest type that requires disturbance and abundant sunlight for regeneration. Even-aged management will not only regenerate this forest type, but will also stimulate ground layer herbaceous plants to flourish while the stand grows. As a stand grows, wildlife such as Brown Thrasher and Eastern Towhee will utilize the temporary open barrens and abundant ground layer plants. As the stand reaches canopy closure, woodland species of wildlife will benefit including Ovenbird, Scarlet Tanager and Least Flycatcher. Oaks of all types are the preferred tree for long-distance migrants as they rest and re-fuel.

2% of the GKSF will be managed for red oak dominated mixed forest. Red oak occurs on sites with good growing conditions where some level of disturbance was present historically. Most of the red oak that currently exists on the state forest developed following the large scale cutover and wildfires of the late 1800s and early 1900s. The resulting forest is now older and contributes structural attributes important to forest wildlife. Many of the red oak dominated sites are close to, or on the escarpment and contribute to the large blocks of old forest below the escarpment. Also associated with red oak stands are small streams grading down the terrace providing

the unique habitat utilized by the Louisiana Water Thrush (special concern). Red Oak is also very important for migrating warblers as they flower in May when warblers are moving through. In most cases, extended rotation forestry will benefit the maximum number of forest wildlife species, while stand regeneration will also be critical.

9% of the GKSF will be managed for red pine dominated forest plantations. Natural red pine is a valuable cover type within the GKSF and natural regeneration is preferred for wildlife. Where red pine plantations exist, steps to manage them to a more natural condition, such as installing gaps, will improve ecological simplification with diversity in pockets. Forest management objectives include thinning plantations on an 8-20 year interval to gradually create a structure similar to that of a naturally occurring pine stand. The future desired condition will be larger and older trees with a diverse understory.

7% of the GKSF will be managed for white pine dominated mixed forest. Before the large scale cutover, the pinery was an important feature of the river valley and adjacent uplands. Through management and succession, this cover type is increasing and will be important as thermal cover and a preferred habitat by mammals such as fisher. Super canopy white pines should be retained where possible along the escarpment as they provide important habitat for Blackburnian, Pine and Black-throated Green Warblers.

13% of the GKSF will be managed for jack pine dominated forest which will also increase across the property. Jack pine barrens have been identified in the Wisconsin Wildlife Action Plan (WDNR 2006d) as Globally Important and a major conservation priority. Timber harvests and less intense regeneration techniques will contribute to this priority by promoting this important forest type as well as the native ground layer species associated with it. Barrens wildlife will benefit across the continuum of age classes from the open barrens to northern dry forest. After a stand is harvested it will become temporary open barrens and will be important for early successional wildlife species. On larger sites, this new habitat will be critical for species such as Sharp-tailed Grouse and Upland Sandpiper. As a young forest, the jack pine will benefit other wildlife, especially in variable density stands, such as with Connecticut Warbler. Finally, as the jack pine stand reaches maturity, wildlife species such as Whip-poor-wills will utilize the forest gaps and its edges.

Habitats of the Northwest Lowlands Ecological Landscape
Much of the passively managed forest is below the escarpment and part of the Northwest Lowlands Ecological Landscape. This area is moist with many wetlands and fire was historically rare. Natural disturbance in this system is limited to blow downs, water level fluctuations and disease outbreaks. With less natural disturbance, the lowlands are more wooded with closed canopy forests common. The closed canopy areas that have open flight paths to wetland areas provide a unique habitat for Red Shouldered Hawks, and these areas will be protected. In general, the lowlands are large in size and provide critical habitat for many forest interior and large ranging species, including the timber wolf. The St. Croix Lowlands Native Community Management Area comprises much of these lowland areas. Most of this ecosystem will be passively managed, thereby allowing natural disturbance patterns to shape the landscape.

Also included in this lowland area is an extraordinary concentration of seeps and small streams which are critical to amphibians year round. Other wildlife species, such as wintering Turkeys and mink, use these seeps and streams seasonally. Seeps and small streams will be protected through the land management objectives and prescriptions within the master plan.

2% of the forest will be managed for red maple dominated mixed forest which is found on both upland and lowland sites, although it is best represented on the wet lowland sites. On dry sites, red maple is encroaching on native habitat types and without disturbance will negatively affect them. On wet sites, red maple is a native type and because of its shade tolerance, it may be found as a second canopy layer. Future management will move these stands towards other forest types, increasing the diversity of the stand and the wildlife utilizing it.

Forested and un-forested wetlands of the GKSF will primarily be passively managed. The forested wetland areas typically contain stands of swamp hardwoods and swamp conifers. The black spruce, tamarack, and white cedar swamp conifers are especially important for keystone species such as bobcat. Special concern wildlife that use forested wetlands include Canada Warbler, Veery and Black-backed Woodpeckers.

Un-forested wetlands contain large areas of Northern Sedge Meadow, shrub-carr, as well as alder thickets and marshes. These unique habitats are critical for special concern species including Woodcock, Black-billed Cuckoo and Golden-winged Warbler. Management activities in these wetland areas will be very limited and occur only during frozen ground conditions.

Barrens Wildlife Habitat Management Areas
Barrens habitat will be provided throughout the forest through standard forest management practices and within two barrens habitat management areas. Standard forest management practices will provide habitat as scattered timber harvests create a shifting mosaic of barrens in a diversity of age classes and

types. The largest timber harvests will be important for area sensitive wildlife that require large tracts of barrens, and will create temporary habitat and corridors for species such as Upland Sandpiper and Sharp-tailed Grouse. Using regeneration practices that support the development of a diverse mix of grasses, forbs and shrubs will be important for both common and rare wildlife species such as white-tailed deer and prairie skink. In places away from the escarpment, white pine and red maple are moving into barrens areas because of lack of fire and prolonged canopy cover which changes moisture regimes. Without disturbance this encroachment will negatively affect barrens wildlife populations. The two barrens habitat management areas will serve as places to focus management on barrens dependant wildlife species.

The Kohler-Peet Barrens Habitat Management Area will have an open barrens core consisting of a native barrens ground layer with high prairie species diversity, important for invertebrates and grassland birds. The forested jack pine barrens in this area will provide a continuum of community types including Northern Dry Forest. The partial shade of the dry forest will accommodate rare barrens species that will differ from those found in the more open barrens. Wildlife utilizing the Kohler-Peet barrens habitat include but are not limited to Sharp-tailed Grouse, Upland Sandpiper, Night Hawk, Vesper Sparrow, Connecticut Warbler, Brown Thrasher, bullsnake, northern prairie skink, and several species of rare invertebrates.

The Sterling Barrens Habitat Management Area will have an oak savanna and jack pine barrens with a highly diverse native ground layer. The savanna oaks will be maintained as will the jack pine component supplying a structure ranging from open canopy to partial open canopy over time. Rare ground layer plants such as dwarf milkweed, silky prairie-clover, dotted blazing star, and prairie fame-flower along with other barrens species will provide important wildlife habitat. Wildlife species utilizing this type of barrens include but are not limited to Wild Turkey, Savanna Sparrow, bullsnake, Connecticut Warbler, Whip-poor-will, and Red-headed Woodpecker.

AQUATIC HABITATS

All streams will be managed to protect water quality, maintain wildlife and fisheries habitat, and enhance aesthetics. Riparian shoreline and stream bank activities have a tremendous effect on the health of all fisheries. Buffer strips and shoreline restoration will be promoted on all waters in the forest. Aquatic habitats will be maintained by following Best Management Practices for Water Quality when performing all forest management activities.

The lowland areas below the escarpment contain an extraordinary concentration of seeps and small streams which are critical to amphibians year round. Other wildlife species, such as wintering Turkeys and mink, use these seeps and streams seasonally. The seeps also support unique plant diversity and contribute to the high water quality of the steams to which they feed, including the St. Croix River. Seeps and small streams will be protected through the land management objectives and prescriptions within the master plan.

ENDANGERED, THREATENED, AND SPECIES OF SPECIAL CONCERN

Wisconsin's Natural Heritage Inventory (NHI) Working List includes those species that are listed either at the federal or state level. As of September 2007 (WDNR 2007), NHI documented 49 rare fauna within the Northwest Lowlands Ecological Landscape including one mammal, six birds, three herptiles, seven fishes, and 32 invertebrates. These include one federally endangered species, one candidate for future listing, five Wisconsin Endangered species, 10 Wisconsin Threatened species, and 34 Wisconsin Special Concern species. NHI documented 100 rare fauna within the Northwest Sands Ecological Landscape including three mammals, 28 birds, four herptiles, seven fishes, and 58 invertebrates. These include one federally endangered species, one candidate for future listing, five Wisconsin Endangered species, 11 Wisconsin Threatened species, and 79 Wisconsin Special Concern species. See Appendix B for a list of species per taxa with special designations documented within both Ecological Landscapes.

Individuals of all endangered, threatened, and special concern wildlife species will be protected. All known critical habitat for these species will be protected or maintained through management which incorporates guidance from staff specialists, research and current literature. Examples of critical habitat includes sites used for breeding and foraging such as Bald Eagle and Osprey nest sites; wolf den and rendezvous sites; and Red-shouldered Hawk nest territories. The Natural Heritage Inventory database (NHI) will be searched prior to all timber sales, ground-breaking projects, and recreational and trail development.

Karner Blue Butterfly

The Karner blue butterfly (Lycaeides melissa samuelis) (Kbb) was listed as a federally endangered species in December of 1992. The Kbb inhabits oak/pine barrens, a globally rare vegetative community that exists on the GKSF. The Kbb Habitat Conversation Plan (HCP) identifies two distinct conservation strategies that will benefit Kbb: management with consideration for Kbb and habitat, and management to feature, protect or enhance Kbb and habitat. Both strategies are defined in detail in the HCP and are summarized below. Additional details on Kbb management within the GKSF can be found in the Implementing Agreement made between the U.S. Fish and Wildlife Service and the Wisconsin Department of Natural Resource.

Management with Consideration: Considerations will be incorporated into routine land management activities through the conducting of presence/absence surveys and incorporating considerations to allow for or encourage habitat viability. The goal and expectation is that habitat gains will equal or exceed losses.

Management to Enhance: One of the goals is to feature Kbb habitat or the broader barrens community that includes it through habitat management, enhancement, or restoration activities that promote wild blue lupine, nectaring plants, microhabitat, or habitat heterogeneity for the Kbb. The goal and expectation is that habitat gains will equal or exceed losses. In addition, measures are taken to promote viable Kbb populations despite potential economic costs.

The Governor Knowles State Forest falls under the first strategy of management with consideration for Kbb and habitat. Conservation protocols and guidelines for forest management, wildlife management, right-of-way (ROW) management, pesticide use, and invasive/exotic species control can be found in the HCP.

INTEGRATED MANAGEMENT

Most of the forest habitat work on the Governor Knowles State Forest occurs through timber harvesting. Activities associated with timber harvesting directly impact wildlife habitat. Wildlife biologists and regional ecologists review all timber harvests and provide recommendations to maintain and improve wildlife habitat. In habitat management and native community management areas foresters, wildlife biologists, and regional ecologists will work together to optimize habitat conditions.

WILDLIFE POPULATION MONITORING

Populations of important game species will be monitored through annual surveys at the local or regional level. Species surveyed include white-tailed deer, black bear, furbearers, waterfowl, Ruffed Grouse, Wild Turkey and Woodcock. Annual surveys provide valid population information for management of species on a unit, zone or statewide basis.

Surveys are conducted annually for certain rare animal species, using established protocols and survey routes. Species surveyed include Karner blue butterfly, Bald Eagle, Osprey, and gray (timber) wolf. Rare and uncommon wildlife such as Blanding's turtles, bull frogs, marsh birds, breeding birds, Red-shouldered Hawks, Whip-poor-wills and Night Hawks, are monitored through reports from staff and citizens. The reports are organized in the Bureau of Endangered Resources' NHI database.

WILDLIFE POPULATION MANAGEMENT

Game species are managed through hunting and trapping seasons. Each game species has a population goal set for a certain local or regional area. Hunting and trapping regulations and population goals are not set through the master planning process. Game populations are managed through regulations and goals set by the Natural Resources Board and the Voigt Intertribal Task Force. The public is involved in all stages of this review and implementation process.

WILDLIFE RESEARCH

DNR and university sponsored wildlife research may occur on the Governor Knowles State Forest. New research projects may be undertaken if they do not conflict with this master plan.

FISHERIES MANAGEMENT PLAN

Water resources within the Governor Knowles State Forest provide habitat for a range of fish communities. Management goals and activities for these waters vary by type of water and angling potential. The main water resources within the forest are warm water and cold water streams. Management for each type of resource is described below.

WARM WATER STREAMS

Four warm water streams cross the GKSF and empty into the St. Croix River: Trade River, Clam River, Wood River, and Iron Creek. Due to a lack of groundwater input these waters have summer water temperatures that regularly exceed 70 degrees. Smallmouth bass, northern pike, walleye, and channel catfish are the primary game fish found in these waters. Lake sturgeon have been observed in the Clam River, up to the Clam River Flowage dam. Trade River and Clam River also support seasonal trout fisheries, typically in the spring only. For the most part, these streams have adequate in-stream reproduction or are stocked by fish from the St. Croix River.

Management Objectives

- Maintain the health of waters on the Governor Knowles State Forest and their fishery potential.
- Provide quality harvest as well as trophy opportunities (where applicable).
- Allow adequate aquatic organism passage at trail and road crossings.

Management Prescriptions

- Continue to conduct electrofishing and netting surveys according to statewide monitoring protocols and provide results to public.
- Conduct beaver control as necessary by limiting dams that slow water flow, impede fish migration, and increase water temperatures and sedimentation.

COLD WATER STREAMS

Numerous cold water streams flow through the GKSF. These streams have summer water temperatures that rarely exceed 70 degrees and have moderate to low flows. The fisheries present in most of these waters consist of brook and/or brown trout. The Wolf Creek is the primary cold water stream of interest for trout anglers in the GKSF. Feral brown trout are stocked annually into the Wolf Creek. Many of the other cold water streams are very small. While many are self sustaining, they tend to be too small to provide the necessary habitat to grow trout to a size desirable for sport anglers. Although not of interest to anglers, fish populations within these small streams are unique in that they have sustained themselves naturally for many years with little human impact either through stocking or habitat alteration.

Management Objectives

- Maintain and enhance self-sustaining trout fisheries. Improve the food supply, provide cover, and improve spawning substrates.
- Provide quality harvest opportunities.
- Allow adequate aquatic organism passage at trail and road crossings.

Management Prescriptions

- Continue to conduct electrofishing and netting surveys according to statewide monitoring protocols and provide results to public.
- Conduct beaver control as necessary by limiting dams that slow water flow, impede fish migration, and increase water temperatures and sedimentation.
- Continue stocking the Wolf Creek with feral brown trout.

GENERAL HABITAT MAINTENANCE AND IMPROVEMENT

Habitat loss and shoreline/bank development are common issues on all waters within the state forest. Management activities that enhance habitat (such as tree drops, half logs, and bank structures) may be applied on waters, consistent with the site's land use classification. Riparian shoreline and stream bank activities have a tremendous effect on the health of all fisheries. Buffer strips and shoreline restoration will be promoted on all waters in the forest.

MANAGEMENT PRIORITIES

Fishery management activities are ultimately based on financial availability and workforce constraints. Attempts will be made to maximize efforts to manage these fisheries for the health of the resource first and secondly for public opportunity.

FISHING REGULATIONS

Control of fish harvests through lake and stream specific fishing regulations is the most effective tool in managing fisheries on state forest waters. A variety of fishing regulations are in effect on the state forest, including closed seasons, bag limits, and length restrictions. These regulations are not set through the master planning process, but through an annual rule making process involving local fisheries staff and warden, conservation congress, DNR Secretary, Natural Resources Board, legislature, and the Governor. The public is involved at all the stages in this process.

AQUATIC INVASIVE SPECIES

Currently, aquatic invasive species of concern for waters of the GKSF include Eurasian watermilfoil, purple loosestrife, and zebra mussel. Management of invasive species in the waters of the forest will follow Wisconsin's Comprehensive Management Plan to prevent further introductions and control existing populations of aquatic invasive species.

AQUATIC ORGANISM PASSAGE

Allowing barrier free movement for aquatic organisms is a major objective for all waters within the forest. Stream obstructions can prevent fish and other organisms from moving throughout a river system, effectively fragmenting populations. Attempts will be made to allow aquatic organism passage at trail and road crossings, and beaver dams.

RECREATION MANAGEMENT

BACKGROUND

The Governor Knowles State Forest Master Plan offers a variety of outdoor recreation opportunities for the public. Nature based recreation, the forest's niche, draws visitors and local residents alike. GKSF boundaries connect to several state wildlife areas, National Park, county forests, and township lands adding diversity to the outdoor experiences available. Forestry and recreation contributes to the local and regional tourism economy, and many visitors make the forest their travel destination.

The focus of recreation management at GKSF is to provide experiences that maintain the quiet and rustic character of the state forest, a fragile and favored feature of the property. The narrow, linear forest land was acquired to help protect the watershed and scenic corridor of the St. Croix River. Wetland seeps, erodible escarpments, and adjacent natural communities and wildlife areas limit some forms of recreational development or their intensity. During summer months there is an increased population of visitors and summer residents. The GKSF Master Plan strives to balance uses of the forest to provide sustainable management of forest resources and recreational experiences for the public.

Demand for new and expanded recreational trails, and up-grades to camping amenities, is increasing. The Governor Knowles State Forest Master Plan maintains existing recreational activities and amenities on the forest while expanding or upgrading some facilities to provide additional capacity and higher quality recreational opportunities.

As the new master plan is implemented in the coming years, an additional focus will be to modify or restore trails and recreational facilities as the forest recovers from severe storm impacts that occurred in July and August of 2011.

DESIGNATED RECREATION TRAILS

The phrase "designated trails" refers to trails that are designed, maintained, and limited to specific uses and are shown on the official map of the forest. On the GKSF, trail based activities such as hiking, backpacking, horseback riding, cross-country skiing, snowshoeing, and snowmobiling are a popular and natural fit with the linear layout of the forest. GKSF trails also provide public access for backcountry camping, hunting and fishing, birding and wildlife watching, nature study and interpretation, and scenic viewing. Equestrian trails are extremely popular and the Forest is exceptionally suited to accommodate this use. Some trails double for winter use by snowmobile and ATV enthusiasts.

Nearly all types of trail recreation will be enhanced over the course of the 15-year master plan. Trails for hiking and horseback riding will be lengthened to increase user opportunities. Where feasible, trails will be connected to expand trail systems and link destinations and amenities. Some new trails are proposed for cross-country skiing, snowshoeing, mountain biking, and winter walking. The Forest will continue to support the established snowmobile and winter-use ATV trail system. Expanded camping opportunities will accommodate a broader range of camping styles and interests. At some locations, additional amenities will be added to enhance user experience and improve access.

NON-MOTORIZED TRAILS

Non-motorized trails at GKSF will continue to accommodate a range of travel including hiking /walking, hunting, cross-country skiing, snowshoeing and horseback riding. Some trails are designated for multiple uses.

- Sustainably accommodate diverse opportunities for non-motorized trail recreation and public access to scenic resources and outdoor experiences while protecting natural resource quality.
- Develop additional sustainable trails and amenities to accommodate need and to connect trails, facilities, and other public properties or destinations.
- Provide barrier free ADA accessible trail opportunities where feasible and practicable.
- Provide long-distance hiking opportunities via a trail links running the length of the GKSF.
- Provide opportunities for bicycling based on demand and availability of sustainable routes.
- Expand recreational opportunities by working with the National Park Service and other partners to establish trail connections to other trails and amenities or destinations off the GKSF.
- Provide equestrian trails of diverse lengths, terrains and forest types that serve different rider's interests and abilities aligned with demand.
- Avoid or minimize conflicts between equestrians, bikers, hikers, or other non-motorized and motorized users.

EQUESTRIAN TRAILS

Horseback riding is an established and growing recreation niche at GKSF. For some enthusiasts, the forest is a travel destination where they come some distance to camp and ride. Camping is available at the Trade River Equestrian Campground and the Trade River Trail system offers miles of riding

opportunities and options. A Wisconsin State Trail Pass is required. A day-use area is available with amenities designed for equestrian use. An equestrian friends group lends support to maintenance and development. Equestrian riding opportunities at GKSF will be expanded and diversified into the future.

Trade River Horse Trails System

The Trade River Horse Trail system offers more than 40 miles of trail dedicated primarily to horseback riding and hiking. Five trail segments range in length from 2 to 20 miles. During winter months some trail segments are used for snowmobiling and ATV riding.

Management Prescriptions

- Maintain 40 miles of existing primitive to lightly developed trails for equestrian travel.
- Evaluate the condition of existing equestrian trails and, as necessary; enhance or improve trail design, surface and maintenance to ensure sustainability, and ability to withstand heavy use.
- Construct 2-4 day use/trail head parking areas within the Trade River Horse Trails system to improve public access and accommodate larger trucks and trailers. Install amenities – drinking water and single-unit, unisex vault toilet at 2 locations.
- Maintain bridges at Wolf Creek and Trade River to facilitate trail connections for equestrian and snowmobile travel
- Install a water supply for horses and riders at several key locations within the horse trail system.
- Install informational/interpretive signage along existing equestrian trails with support from partners.
- Work in cooperation with partners to support and maintain equestrian trails and amenities.
- Establish a connecting trail system (to Sioux Portage Day Use / Equestrian Group Camp) in cooperation with Burnett County Forest

Loop Horse Trails

Loop trails are popular with riders, especially if loops of different distances are available. Riders, and horses, prefer traveling in one direction, experiencing new scenery and terrain without having to double back on an already familiar trail.

Management Prescriptions

- Work in cooperation with the county at Pease Hill, Oak Ridge, and Sioux Portage Group camp locations to develop up to 18 additional miles of primitive to lightly developed loop trails on the north end of GKSF property.
- Construct two 3-5 mile, primitive to lightly developed, loop trails in the Trade River Horse Trails system at Harris and Sterling / 320th Ave. locations.
- Work in cooperation with the National Park Service at Sand Rock Cliffs to develop a 3-5 mile loop trail.
- Construct one 3-5 mile, primitive to lightly developed, loop trail near the Trade River Group Equestrian Camp.

Equestrian Wagon Trails
Equestrian driving by buggy, cart, and wagon is becoming a popular activity at GKSF, adding to the equestrian recreational niche. Expanding opportunities for this activity will establish the user base and further accommodate this alternative form of equestrian riding.

Management Prescriptions
- Designate and maintain up to 16 miles of equestrian trails as driving trails for horse-drawn buggies, carts and wagons as demand for this use continues. Trails will be designated or developed along new and existing corridors as part of the existing horse trail system. These trails will be developed and maintained as lightly developed trails.

HIKING TRAILS
The expanse of the GKSF is ideal for hiking, with miles of developed and designated trails on the state forest. Developed linear trails are split into six segments, all of which generally follow bluffs and scenic areas of the St. Croix River, and vary in difficulty. Amenities found at the trailhead parking areas may include maps and information, restrooms, or access to boat and canoe landings. Primitive camping is available by permit at designated sites along the trail system. The Raspberry Landing Route connects to the Wood River Interpretive Trail which leads to St. Croix Campground.

GKSF Linear Hiking Trail
The GKSF North Hiking Trail is about 22 miles in length and includes three trail segments – Sioux Portage, Kohler Peet, and Foxes Landing trails. The South Hiking Trail covers 18 miles divided into three segments – Raspberry, Benson Brook and Lagoo Creek trails.

Management Prescriptions
- Connect existing segments of hiking trail by constructing up to 18 miles of minimally developed primitive trail at key locations within the north and south trails system to complete the GKSF hiking trail the length of the forest, utilizing existing corridors where possible.
- Construct /install a bridge at Benson Brook to facilitate trail connections
- Work with the National Park Service and other agencies or partners over time to connect GKSF hiking trails with the North Country Trail and Ice Age Trail.

Loop Hiking Trails
Loop hiking trails are available at Brandt Pines Ski and Interpretive Trail, and the St. Croix Family Campground. Additional loop trails will be developed at GKSF.

Management Prescriptions
- Renovate 5-10 miles of existing primitive to lightly developed loop trails.
- Create up to 10 miles of additional primitive to lightly developed loop trails by connecting with existing trails where practical, to expand hiking opportunities.

INTERPRETIVE (NATURE) TRAILS
Five miles of self-guided interpretive trails pass through scenic areas and highlight the diverse nature of the forest. These include the Cedar, Wood River, and Brandt Brook Pines Interpretive trails. Interpretive trails are a popular destination for GKSF visitors.

Other locations will be considered for development of up to six miles of additional interpretive trails similar to the Brandt Brook Pines or Cedar interpretive trails. One location to be considered, Sterling Barrens, has multiple areas with existing trails that would lend itself to State Natural Area enthusiasts for viewing and visiting. The purpose of these trails would be to showcase and demonstrate the importance of the SNA's.

Management Prescriptions
- Maintain the existing 3 1/2 miles of primitive to lightly developed, interpretive trails and infrastructure.
- Upgrade trails to enhance the interpretive hiking experience, including trail signage, informational kiosks and brochures and related amenities.
- Develop up to 6 miles of additional primitive to lightly developed self-guided interpretive trails in conjunction with the State Natural Area program.
- Develop a 1-3 mile primitive to lightly developed interpretive trail with a "sustainable forestry" theme in association with Brandt Brook Pines interpretive trail, or in another suitable location, to demonstrate forest management practices. Install trail head information facilities and interpretive trail signage.

CROSS-COUNTRY SKIING
The Brandt Pines Ski Trail is a fee-based cross-country ski trail with eight miles of looped trail. The trail is groomed for a range of skill levels. A trail shelter is centrally located at a multiple trail junction in the trail system. Part of this trail doubles as an interpretive hiking trail in the non-snow seasons. A Wisconsin State Trail Pass is required. Hiking trails and forest access roads may also be used for skiing, but are not groomed, and are utilized throughout the year for forest and recreation management activities.

Management Prescriptions

- Maintain 8 miles of existing lightly developed trail loops.
- Develop an additional 6 to 8 miles of lightly developed trail to be groomed for skate skiing north of the trail shelter beyond Foxes Landing. Designate appropriate alternate warm season trail uses such as hiking or biking. Install parking and a single-unit, unisex vault toilet at the main ski trail head.
- Renovate the existing parking facility along Foxes Landing Road with information facilities and parking for up to 20 vehicles to accommodate skiers and other trail users throughout the year. Install amenities including information facilities and a toilet at Foxes Landing Road parking. Provide a drinking water source for warm season use.

SNOWSHOEING

Snowshoeing has become a popular sport in recent years throughout Wisconsin, including GKSF. While many forest roads and trails are open for snowshoeing, demand is increasing for trails that are specifically marked and designated for this use.

Management Prescriptions

- Designate up to 10 miles of primitive to lightly developed snowshoeing trails at several locations, to be determined, in the forest utilizing existing forest trails.
- Maintain winter use parking, and install trail confidence markers, maps, and trail head information facilities.

WINTER WALKING TRAILS

People are seeking trails to experience winter while walking. Trails that are well marked and able to accommodate people on foot, or people walking with leashed pets, are often popular. These trails offer an alternative location where people can stroll without disturbing groomed snow trails, without use of skis or snowshoes, and without conflict with faster moving skiers or snowmobiles.

Management Prescriptions

- Designate and maintain 4-6 miles of existing primitive to lightly developed trails for winter foot travel and pet-friendly use that is separate from other winter recreational uses.
- Provide winter access /parking
- Install informational signage and amenities as needed.

BICYCLING

Bicycling at GKSF is limited to local town roads for road bikes, and occasional multiple use of some existing forest trails for off-road / mountain biking. Soil types and steep escarpments at GKSF are somewhat limiting to mountain bike trail development. Any future development will consider topography, location, seasonality and compatibility with other uses to determine feasibility.

An area north of Foxe's Landing Road, in conjunction with other areas, will be considered for off-road bicycle trail development. The trail location will be chosen to provide appropriate terrain for trail construction while avoiding seepages. Trail development will use sustainable trail techniques to limit impacts and to provide for year around recreation.

Management Prescriptions

- Identify, designate and construct 4 to 8 miles of primitive to lightly developed, one-way, single-track, off-road bicycle trails, separate from equestrian uses.
- Construct a trail head /parking area to accommodate up to 10 vehicles and install information facilities, and a single-unit, unisex vault toilet.
- Design any future trails to accommodate a range of skill levels while adapting to topography to maximize safety and limit soil impacts.
- Work with local partners and consider International Mountain Bike Association techniques and assistance to plan trail development.
- Identify trails or road routes suitable for road bicycles and, as appropriate, designate those routes.

ADA ACCESSIBLE – BARRIER-FREE TRAILS

Management Prescriptions

- Develop up to 3 miles of barrier free, moderately developed, ADA Accessible trail surfaced to accommodate wheel chairs and walkers in a location to be determined, to provide access to scenic view-sheds. The trail may be a portion or portions of established recreation trails.
- Work with NPS to develop accessible paths to the Highway 70 wayside at the St. Croix River.

MOTORIZED TRAILS

Motorized recreation at GKSF is provided for snowmobile and winter ATV riding from December to March. A 32 mile trail accommodates this shared use as weather and trail conditions allow. The focus of the GKSF motorized trail system is to provide a connection to local and regional trail systems. The trail connects to regional snowmobile trails and is part of the statewide snowmobile trail system. Winter ATV riding is also available on more than 50 miles of trails in surrounding Burnett and Polk counties. Spring, summer and fall ATV riding is available throughout Burnett and Polk counties on 85 miles of developed trails. During the fall some adjacent town roads are open as ATV routes enabling riders to travel through GKSF. Nearby state trails, such as the Gandy Dancer and Cattail State Trails, offer additional riding opportunities.

Motorized trails on state forest lands are maintained with a range of development from lightly to fully developed trail as appropriate for designated use and site conditions. Some lightly developed trails may have sections with a higher level of development to protect environmental resources.

Management Objectives

- Meet Department trail standards to provide a safe and sustainable trail system for snowmobile and winter ATV use.
- Maintain connectivity between local and regional trail networks.

SNOWMOBILES

The Governor Knowles State Forest Snowmobile Trail provides scenic riding opportunities through the forest. More than 32 miles of snowmobile trail extend from the village of Grantsburg, Wisconsin to Wolf Creek. This trail is a primary corridor of the statewide snowmobile trail system. More than a third of the route travels through GKSF. Other state properties and county forest land provide additional mileage, and a number of private lands contribute by way of land use agreements. Parking and access is provided at points along the trail. Snowmobiling is a popular winter activity, and the trail serves as the westernmost connection between Burnett and Polk county trail systems.

Management Prescriptions

- Maintain up to 32 miles of lightly developed, sustainable, multi-use, winter Snowmobile /ATV travel routes on designated forest trails.
- Construct up to 3 miles of lightly developed trail to reroute a portion of snowmobile/equestrian/hike trail for safety, and due to land ownership changes.
- Work in partnership with landowners and snowmobile clubs to support land use agreements to maintain the snowmobile trail corridor, connections and crossings.

ALL-TERRAIN VEHICLES (ATVS)

GKSF provides seasonal riding opportunities for travel on signed ATV designated trails.

Management Prescriptions

- Maintain 32 miles of lightly developed, sustainable, multi-use, winter ATV travel routes on designated forest trails. These designated trails will be signed, indicating whether they are open of closed.
- Base timing of trail open or closed use on seasonal trail conditions.
- GKSF will Consider future establishment of a 1-mile, sustainable ATV trail connection through a portion of state forest, near the Clam Flowage, if the connection becomes critical to public safety, or to the ecological, social and economic sustainability of the regional ATV trail network.
    - *The purpose of the trail would be to provide "pass through trail use" to link two extensive segments of the Burnett County Forest lands currently open for seasonal use (mid-September through mid-November).*
- If the North River Road ATV route should be closed in the future and the connection becomes critical to public safety, or to the ecological, social and economic sustainability of the regional ATV trail network, GKSF will consider establishing a ½ mile, sustainable ATV trail connection through a portion of state forest, east of the group camp as an alternative route.
    - *Presently, a ½ mile segment of North River Road has been designated as an ATV route to link two extensive segments of the Burnett County Forest lands. If North River Road use were to be closed to ATV's in the future, the State Forest link could become essential to link two segments of the Burnett County Forest lands currently open for seasonal use (mid-September through mid-November), similar to the Clam Flowage link.*
    - *The two links listed above are existing Burnett County Snowmobile trail through a Trail Use Agreement with the GKSF. Upgrading of the links to make them ATV sustainable may be needed. Any future development would be in cooperation with Burnett County, and as a last resort alternative. If sustainable trail specifications can be met, routes would follow existing Snowmobile/winter ATV trail wherever possible, and conform to specifications regarding trail opening and closing dates in conjunction with the County.*
- Follow the Wisconsin Department of Natural Resources Guidance for All-Terrain Vehicle Use on Department Lands (WDNR 2005).

UNDESIGNATED ROADS AND TRAILS

There are approximately 62 miles of undesignated primitive woods roads and eight miles undesignated primitive trails on the property used for forest management activities and are not maintained for public use. Historically these have been used informally for access for hunting, hiking and sight-seeing, berry-picking, access to water resources, and tribal gathering. Portions of some trails may be gated, bermed or signed to restrict use in sensitive forest management areas.

Management Prescriptions

- Continue to maintain primitive roads and access trails for forest management, and allow public access according to management policies as appropriate to the objectives of the underlying management area.

TABLE 2.18 CURRENT AND PLANNED DESIGNATED TRAILS

Trail Name / Location	Trail Type	Current Miles	Additional Planned Miles	Net Miles Change**	Fees	Designation*	NR Standard	Max. Total Miles
Trade River Horse Trails								
Barrens Loop	Equestrian, Hiking	20	18	18	Trail pass	Non-motorized	Primitive to lightly developed	69
Sunrise Shortcut	Equestrian, Hiking	12			Trail pass	Non-motorized	Primitive to lightly developed	
Wolf Creek Trail	Equestrian, Hiking	5			Trail pass	Non-motorized	Primitive to lightly developed	
River Trail	Equestrian, Hiking	2			Trail pass	Non-motorized	Primitive to lightly developed	
Harris Trail	Equestrian, Hiking	2	3-5	3-5	Trail pass	Non-motorized	Primitive to lightly developed	
Sterling/320th St.	Equestrian, Hiking	2	3-5	3-5	Trail pass	Non-motorized	Primitive to lightly developed	
Wagon Trail an additional use of existing horse trail	Horse Cart, Buggy, or Wagon riding	0	16	0	Trail pass	Non-motorized	Lightly developed	16
Interpretive Equestrian an additional use of existing horse trail	Equestrian, Hiking, Nature study	0	6	0	Trail pass	Non-motorized	Primitive to lightly developed	6
Trade River Camp Loop Trail	Equestrian, Hiking	0	3-5	0	Trail pass	Non-motorized	Primitive to lightly developed	5
GKSF Linear Hiking – North Trail								
Sioux Portage Route	Hiking, Backpack camping	7.5	9	9	No fee, Camping permit	Non-motorized	Primitive trail	9
Kohler Peet Route	Hiking, Backpack camping	6.0			No fee, Camping permit	Non-motorized	Primitive trail	
Foxes Landing Route	Hiking, Backpack camping	9.0			No fee, Camping permit	Non-motorized	Primitive trail	
GKSF Linear Hiking – South Trail								
Raspberry Landing Route	Hiking, Backpack camping	1.5	9	9	No fee, Camping permit	Non-motorized	Primitive trail	9
Benson Brook Route	Hiking, Backpack camping	9.0			No fee, Camping permit	Non-motorized	Primitive trail	
Lagoo Creek Route	Hiking, Backpack camping	7.0			No fee, Camping permit	Non-motorized	Primitive trail	
Loop Hiking Trails								
Location to be determined	Loop hiking trails	0	10	10	No fee	Non-motorized	Primitive trail	10

TABLE 2.18 CURRENT AND PLANNED DESIGNATED TRAILS CONTINUED...

Trail Name / Location	Trail Type	Current Miles	Additional Planned Miles	Net Miles Change**	Fees	Designation*	NR Standard	Max. Total Miles
Interpretive (Nature) Trails								
Cedar Interpretive Trail	Hiking, Nature study	0.5	0	0	No fee	Non-motorized	Primitive to lightly developed	9.75
Wood River Interp. Trail	Hiking, Nature study	0.75	0	0	No fee	Non-motorized	Primitive to lightly developed	
Forestry Theme Interpretive trail at Brandt Brook Pines or on another existing trail	Skiing, Hiking, Nature study	0	2.5	0	No fee	Non-motorized	Primitive to lightly developed	
Natural areas interpretive trails existing corridor or primitive trails	Hiking, Nature study	0	6	6	No fee	Non-motorized	Existing / Primitive	
Cross Country Skiing – Brandt Pines Ski and Interpretive Trails								
Ravine Trail	Classic skiing, Hiking	1.5	0	0	Trail pass	Non-motorized	Primitive to lightly developed	8.5
Oak Hills Trail	Classic skiing, Hiking	3.5	0	0	Trail pass	Non-motorized	Primitive to lightly developed	
Ridge Line Trail	Classic skiing, Hiking	1.5	0	0	Trail pass	Non-motorized	Primitive to lightly developed	
River View Trail	Classic skiing, Hiking	2.0	0	0	Trail pass	Non-motorized	Primitive to lightly developed	
North of ski trail shelter beyond Foxes Landing	Skate skiing	0	6-8	6-8	Trail pass	Non-motorized	Lightly developed	8
Snowshoeing								
On existing trail corridors	Snowshoeing	0	10	0	No fee	Non-motorized	Signage only	10
Winter Walking								
On existing trail corridors	Winter walking, pet friendly	0	3	0	No fee	Non-motorized	Signage only	3
Bicycling								
To be determined	Off-road bicycle / mountain bike	0	4-8	4-8	No fee	Non-motorized	Primitive to lightly developed, one-way, single-track	8
To be determined	Forest road route for road bicycle travel	0	–	–	No fee	Non-motorized	Existing forest roads	–

TABLE 2.18 CURRENT AND PLANNED DESIGNATED TRAILS CONTINUED...

Trail Name / Location	Trail Type	Current Miles	Additional Planned Miles	Net Miles Change**	Fees	Designation*	NR Standard	Max. Total Miles
Accessible Barrier-free (ADA) Trail								
To be determined along renovated existing corridor(s)	Wheel chair accessible	0	3	0	No fee	Non-motorized	Moderate to fully developed	3
Snowmobiling								
GKSF Snowmobile Trail – re-route	Snowmobile, Hiking, Equestrian, Winter ATV	32	3	0	Trail pass or vehicle registration	Motorized use, multiple use	Lightly developed	32
All Terrain Vehicles								
Winter travel on existing GKSF Snowmobile Trail	ATV / Snowmobile, Licensed vehicle, Hike, Equestrian	Seasonal use of existing snow-mobile trail corridor	0	0	Trail pass or vehicle registration	Seasonal multiple use, motorized use	Lightly developed	(32)
Winter use pass-through trail link through state forest between Burnett Co. Forest lands near Clam Flowage	Winter ATV / snowmobile, multi-use	Possible future connec-tion	0	(1)	Trail pass or vehicle registration	Seasonal multiple use, motorized use	Lightly developed	(1)
Winter use pass-through trail link through state forest between Burnett Co. Forest lands near North River Road	Winter ATV / snowmobile, multi-use	Possible future connec-tion	0	(0.5)	Trail pass or vehicle registration	Seasonal multiple use, motorized use	Lightly developed	(0.5)
Self-guided Auto Tour								
Established on existing public use forest roads	Self-guided educational tour, approx. a dozen stops	Up to 50 miles depen-dent on points of interest	0	15-50	No fee	Motorized vehicles	Designated forest roads.	–
Undesignated Roads and Trails								
Undesignated. Unimproved woods roads and trails	Public access, hiking, hunter walking	62	0	0	No fee	Undesignated	Primitive roads or trails	62

* Some segments of "non-motorized" trails are open to licensed vehicles or winter travel by snowmobile or ATV.
** Some "planned miles" are simply a new use of existing trails, so no mileage increase occurs.

CAMPING

GKSF maintains facilities to offer a variety of camping experiences for families and groups, backpack campers, and equestrian enthusiasts.

Management Objectives

- Provide diverse opportunities for high quality camping experiences in attractive, natural settings.
- Maintain and support opportunities for: equestrian camping, family camping, outdoor group camping, primitive backpack camping, remote permit camping.
- Develop, enhance or upgrade camping facilities to accommodate use and demand as appropriate to land management classifications, recreation settings and forest policies.
- Provide barrier-free opportunities for disabled persons to enjoy the forest.
- Work in partnership with equestrian friends groups and other interested volunteer partners to enhance future state forest facilities.

EQUESTRIAN CAMPING

Trade River Equestrian Campground - Modern

The 20-acre Trade River Equestrian campground offers 40 sites, including 1 site for a camp host. Current Camping amenities include parking and tent pads, drinking water, fire rings, picnic tables, two accessible sites, vault toilets, a dump station, manure pits, and overhead tie lines for horses. This plan proposes to upgrade this campground with electric sites and other modern amenities. Each campsite is designed for a family or a group of up to 6 persons or less. The campground operates on a first-come, first-served basis with self-registration.

Management Prescriptions

- As resources are available install electric service at up to 26 of the existing campsites.
- Designate up to 35% of the campsites as reservable and place on the statewide campsite reservation system.
- If demand continues to increase after development of an Equestrian Group Camp, develop up to 20 additional non-electric equestrian campsites near the present campground to accommodate overflow camping at peak times.
- Install additional parking and amenities to include tables, fire rings, toilets, manure bunkers and tie systems, information facilities, pressurized water supply, and a shower building.

Trade River Equestrian Group Camp – Modern

Management Prescriptions

- Construct a modern group horse camp at a location close to the Trade River Equestrian Trails to accommodate up to 30 camping units, to be occupied on a reservation / fee basis. Amenities would include parking for up to 30 vehicles, tables and shelter, 2 accessible sites, group fire ring and benches, vault toilets, picnic shelter, manure bunkers and tie lines, information facilities, a pressurized water supply system, and a shower building.

Sioux Portage Equestrian Day Use Area – Possible future conversion to a modern equestrian group camp

Management Prescriptions

The Sioux Portage Equestrian Day Use Area will be converted to a modern equestrian group camp at a later date if demand and trail use on adjacent county forest land develops. If a future group horse camp develops, day use facilities for equestrians will remain, and amenities would be added or renovated to serve up to 20 equestrian camping units for overnight, reservable equestrian camping.

If converted to an equestrian group camp, Install additional parking and amenities to include tables and picnic shelter, fire rings, toilets, 2 accessible campsites, manure bunkers and tie systems, information facilities, pressurized water supply, and a shower building.

Equestrian "Trail Campsites" - Primitive

Management Prescriptions

Designate and develop opportunities for 3-5 ride-in, reservable, dispersed, primitive trail campsites along existing horse trails. Each site will accommodate up to 6 horses and campers. Minimal amenities will include a box latrine, table, fire ring, manure composter and tie line.

FAMILY CAMPING

St. Croix Family Campground - Modern

The St. Croix Family Campground provides family camping opportunities at 31 campsites. Current amenities include a self-registration and information station, fire rings, picnic tables, turf-covered tent pads, vault toilets, drinking water, a dump station for trailers and RVs, 2 accessible campsites, and a small amphitheater. This plan proposes to adding electricity to 50% of the sites and making them reservable. Campsite occupancy is designed for a family or small group of up to 6 persons. There is direct access to the Wood River Interpretive Trail as well as hiking trails that lead to the St. Croix River and Highway 70 wayside.

Management Prescriptions

- As resources are available install electric service at up to 12 of the campsites.
- Designate up to 50% of the campsites as reservable on the statewide campsite reservation system.
- Construct a small, approx. 3,000-6,000 sq. ft., open "free play area" (green space) near the campground for child and family recreation.
- Construct 2-6 walk-in campsites, each to include parking, walk-in access trail, tent pad, fire ring and table to accommodate a family, or a group of up to 6 people.
- Install a pressurized water supply, and a shower facility.

OUTDOOR GROUP CAMPING (NON-EQUESTRIAN)

Group campsites are designed for groups too large to meet the definition of a camping party in an individual campsite or family campground. The purpose of a group camp is to provide a high quality, rustic outdoor camping experience for organized groups in a secluded, semi-remote setting without conflict or disturbance of other campers or recreational activities, See Appendix F.

St. Croix Outdoor Small-Group Camp - Rustic

This facility will be designed to accommodate small groups such as youth, scouts, and family gatherings. Its location near the St. Croix Campground will enable efficient administration, as well as dual use of trails and some amenities.

Management Prescriptions

- Add a small, reservable group campsite near the St. Croix Campground to accommodate up to 30 campers. Amenities will include drinking water, 2 accessible campsites, toilets, a central gathering area with a group fire ring and benches, tables, a picnic shelter, and parking for up to 8 vehicles. Allow restricted vehicular access to the camp.

Clam Flowage Outdoor Group Camp - Rustic

This location will provide opportunities for water recreation such as fishing, canoeing, swimming, and sight-seeing that don't currently exist at the present group camp location. The site also has access to the existing hiking trail system.

Management Prescriptions

- Construct a new reservable, rustic, outdoor group camp on the banks of the Clam Flowage, with access to the flowage, to accommodate up to 60 campers, to be occupied on a reservable, fee basis. Amenities will include drinking water, vault toilets, two accessible sites, a central gathering area with group fire ring, tables, a picnic shelter, and parking for up to 15 vehicles. Allow restricted vehicular access to the camp.
- Develop water access, a canoe launch and fishing pier at the Clam Flowage.

Sioux Portage Outdoor Group Camp – Conversion to a Rustic Equestrian Day Use Area

The Sioux Portage Outdoor Group Camp, originally developed in the 1980's, covers about 5 acres and provides rustic amenities. Historically, the location has been underutilized due to its location, which is a considerable distance from a recreational water source. Demand for equestrian facilities has grown to become a popular activity at GKSF and the location is suitable for equestrian day use (See Day Use Areas).

Management Prescriptions

- Convert the existing Sioux Portage Outdoor Group Camp to an Equestrian Day Use Area (See Day Use Areas).
- A new Outdoor Group Camp (non-equestrian) is planned at the Clam Flowage (See Clam Flowage Outdoor Group Camp).

BACKPACK CAMPING - PRIMITIVE

Backpack camping is available at four designated sites, each located along the following trail routes: Benson Brook, Foxes Landing, Lagoo Creek, and Sioux Portage. A special permit is required and all campsites are primitive, with minimal development or amenities. Campsite occupancy is designed for a family or small group of up to 6 persons or less, each designated for a one-night stay. Similar campsites are available along the St. Croix River within the St. Croix National Scenic Riverway (operated by the National Park Service); they require no permit, are available on a first come-first-served basis, and use is shared by backpack campers.

Management Prescriptions

- Continue to provide minimally developed single-unit campsites that are primitive, remote and widely separated, minimally cleared, and with a native or primitive soil surface per NR44 standards.
- Designate and develop 4-6 additional dispersed, single-unit, primitive backpack campsites to accommodate hikers as trail segments are connected to complete the GKSF linear hiking trail. Camper capacity at each site will be one family or a group of up to 6 people. Amenities may include a box latrine, picnic table and fire ring at each location.
- Move or locate some campsites to provide trail access to water resources.
- Install information facilities at trail head parking areas. Install signage and confidence markers as the trail system develops and connects.
- Continue to work in partnership with the National Park Service to provide opportunity for backpackers to access the river, scenic locations and other camping options.

GENERAL PERMIT "REMOTE" - DISPERSED CAMPING

Remote camping is available by special permit from the forest superintendent at undeveloped, non-designated locations in the forest for hunting, fishing, dispersed backpacking or winter camping. Camp locations are approved by property staff. No developed facilities or amenities are provided, and campers are required to observe a "leave-no-trace" etiquette.

Management Prescriptions

- Continue to accommodate camping at remote locations in the forest by special permit as appropriate to land management classifications and forest policies, at dispersed, undeveloped, non-designated sites.

ADA ACCESSIBLE – BARRIER-FREE CAMPING CABIN

An accessible cabin will be developed for use exclusively by people (and their family or attendants) whose physical disability makes use of traditional camping facilities very difficult or impossible. Development will follow Department cabin design and construction standards which meet Americans with Disabilities Act (ADA) requirements.

Management Prescriptions

- Construct an accessible, barrier-free camping cabin near the St. Croix Campground or another location as feasible, for campers with special needs and their family or group of up to 6 persons. Amenities will include all utilities, accessible furnishings and appliances, and full wheel chair accessibility.

DAY USE AREAS

Day use areas at GKSF forest are generally rustic in nature and are usually located at recreational trail heads and parking access points. The sites are popular locations for birding and wildlife viewing, berry picking and hunter/walking access. Amenities are minimally developed with a map board kiosk, informational brochures and user sign-in log. The National Park Service maintains day use areas at Sand Rock Cliffs, Norway Point Landing, Raspberry Landing, and Highway 70 Wayside. Locations are on or adjacent to GKSF trails and facilities, and are often shared by both state forest and National Park Service visitors. Some day-use areas are more fully developed to accommodate specific use such as picnic or equestrian groups.

Upgrading amenities at popular locations would meet several needs. Additional signage and information facilities would strengthen a sense of place, and reinforce GKSF identity where property ownership is disrupted by other in-holdings. Providing additional amenities at popular access points and day-use areas would enhance user experience for a key recreation niche – nature observation, scenic and wildlife viewing.

The popularity of a particular day use location, or access to unique scenic or recreational values, will determine the level of development. Improvements will be designed to provide appropriate public access and necessary amenities, such as parking, restrooms or interpretive information.

Management Objectives

- Provide recreational day-use areas where visitors can rest or pursue outdoor interests in an attractive outdoor setting at various locations throughout the forest.
- Develop additional day-use areas at key locations as new trails or access points are developed.
- Maintain or upgrade existing day-use areas to a level of development appropriate to management classifications and recreational use settings designated by the master plan and associated NR 44 standards.

Trade River Day Use Area - Rustic

The Trade River Day Use area, formerly the Trade River Campground, primarily serves equestrian users and trout fishing enthusiasts. This location offers drinking water, sanitary facilities, tie lines for horses, and a trail self-registration station.

Management Prescriptions

- Install picnic shelter, manure bunkers, additional mounting blocks and ADA compliant mounting ramps, and information facilities.

Highway 70 Wayside - Rustic
Highway 70 Wayside is located on the south side of the highway near the St. Croix River. Facilities include parking, vault toilets, running water, a canoe landing, and picnic area maintained by the state forest. The NPS administers nearby canoe campsites, and a picnic area on the bank of the St. Croix River.

Management Prescriptions
- Pave the south lot and approaches to the toilet buildings.
- Install a picnic shelter.
- Work with NPS to construct accessible paths from the parking area to the St. Croix River.

Sioux Portage Equestrian Day Use Area - Rustic
Management Prescriptions
- Convert the existing Sioux Portage Outdoor Group Camp to an equestrian day-use area. Existing amenities, parking, hand pump water supply, and trails will be maintained to provide welcome accommodations for equestrian riders. (A new Outdoor Group Camp (non-equestrian) is planned at the Clam Flowage (See Clam Flowage Outdoor Group Camp).
- Install information facilities, tie lines, picnic shelter, and renovated parking for up to 20 vehicles, tie lines, mounting blocks and ADA compliant mounting ramps.
- Replace the existing toilet.
- Re-designate up 3 miles of hiking trail for equestrian/hiking trail use.
- Establish a connection to additional trails on adjacent property for equestrian /hiking use in cooperation with Burnett County Forest.
- Maintain the existing Sioux Portage Equestrian Day Use Area. If increased demand and trail use on adjacent county forest land develops in the future, convert the existing Sioux Portage Equestrian Day Use Area to a rustic equestrian group camp. If a future group horse camp is developed it would accommodate up to 20 camp units, with amenities renovated to accommodate overnight, reservable equestrian camping (See Equestrian Camping).

NATURE OBSERVATION

People have long been attracted to the sights and sounds of GKSF. Situated within the migratory flyway of the Mississippi River, and bordering some 55 miles of the St. Croix National Scenic Riverway, the forest is a natural setting for birding, wildlife watching and scenic viewing. The master plan maintains and enhances opportunities for the public to study and observe natural communities, scenery, plants and wildlife throughout the forest. The GKSF property borders hundreds of acres of county forest and three state wildlife areas: Fish Lake, Crex Meadows, and Danbury State Wildlife Areas which also provide recreational and viewing opportunities. GKSF is listed as Stop #20 on the Great Wisconsin Birding and Nature Trail.

A number of natural openings scattered throughout the Forest will be enhanced for wildlife viewing. Some possibilities include old fields south of the Wood River near St. Croix Campground, and areas off Pleasant Prairie Road and the Benson Brook Hiking Trail.

Management Objectives
- Provide opportunities for birding and wildlife watching, scenic viewing, photography and nature study.

Scenic Viewing
Management Prescriptions
- Designate or develop several wildlife viewing locations or observation areas as opportunity and resources allow. Include parking for 3-5 vehicles, and/or information facilities at each location.
- Identify and designate vistas or scenic overlooks as observation sites along roads or trails if suitable locations can be found.
- Develop some locations to accommodate ADA barrier-free access for scenic viewing or wildlife observation as feasible.
- Provide interpretive handouts and educational brochures, including wildflower and wildlife species lists, and maps.

HUNTING AND TRAPPING

Hunting and trapping are major recreational pursuits at the GKSF. Diversity of wildlife habitat and abundant populations of game animals are available. Popular game species for hunters include deer, bear, Wild Turkey, upland birds and waterfowl. Hunting is allowed along all trails and forest roads except in designated campgrounds.

Hunters desire wildlife habitat capable of producing good populations of wildlife, while staying free from excessive human disturbance. It is important to provide multiple opportunities and to disperse hunters as much as possible for safety, to enhance users' experience and to avoid user conflicts. The GKSF will continue to accommodate hunting throughout all of the open hunting seasons. Regulations governing hunting and trapping are outside the scope of the master plan.

Opportunities exist for hunters to camp in remote areas of the forest. This dispersed camping experience is offered during the gun-deer season by permit only. The remote locations do not include any amenities such as water or toilets.

Management Objectives

- Continue to offer abundant opportunities for big and small game hunting and trapping.

Management Prescriptions

- Continue to maintain public access for hunting.
- Provide opportunities for non-motorized hunter access, and remote hunting experiences.
- Provide information about hunting rules and opportunities at information facilities, in publications or online, taking care not to over-promote specific locations.
- Work in cooperation with staff from the Bureau of Wildlife Management to support and maintain diverse habitat for wildlife, and to protect rare, endangered and threatened species as described in the Resource Management Section of this plan.

FISHING

Fishing enthusiasts pursue warm and cold water species at Governor Knowles State Forest. Developed and undeveloped landings provide access to water resources throughout the forest. GKSF will continue to provide opportunities for fishing enthusiasts. Fishing regulations are outside the scope of the master plan.

Management Objectives

- Continue to support and provide public opportunities for fishing.
- Maintain public access to water resources throughout the forest for fishing.

Management Prescriptions

- Maintain or develop reasonable access to water resources and traditional fishing areas.
- Provide information about fishing rules and opportunities at information facilities, in publications or online, taking care not to over-promote specific locations.
- Work in cooperation with the Bureau of Fisheries Management on fish habitat management at GKSF.
- Acquire property or establish land use agreements to enable recreational access to lakes or other water resources within the GKSF as resources and opportunity allows.

WATER RECREATION

The Clam Flowage is a primary opportunity for water recreation at the GKSF. A walk-in public access with parking is provided within the GKSF off County Highway F for hiking, fishing, boating, canoeing, kayaking, waterfowl hunting, and wild rice harvesting. Additionally, a public boat landing is located within the Burnett County Forest off South River Road.

Management Objectives

- Support opportunities for sustainable water recreation at Governor Knowles State Forest.

ADDITIONAL RECREATIONAL ACTIVITIES AND TRENDS

New forms of outdoor recreation are emerging, and there is growing interest in reviving some traditional outdoor activities. As sports develop there is often need for trails to accommodate new and specific uses such as ski joring or dog sledding. Recent interests are as diverse as geocaching, orienteering, off-trail hiking, electric-powered recreational vehicles, and remote hunting.

Management Objectives

- Provide opportunities to accommodate new, varied forms of outdoor recreation if feasible and compatible with natural resource needs and existing recreational pursuits as determined by demand and available resources, and if suitable and sustainable facilities can be provided.

Management Prescriptions

- Evaluate the suitability and capability of providing for new forms of outdoor recreation when demand requires.
- Implement through plan amendments or plan variances if required.

EDUCATION AND INTERPRETATION

A small amphitheater in the St. Croix Campground serves as a location for interpretive programs, most of which are presented by NPS staff and guest presenters. Three self-guided interpretive nature trails are maintained – Cedar Interpretive Trail at Norway Point Landing, Brandt Brook Pines Interpretive and Ski Trail, and Wood River Interpretive Trail at St. Croix Campground (See Interpretive Nature Trails section).

Additional educational opportunities are available outside the GKSF at the Crex Meadows Visitor Center, at Interstate State Park, and at the NPS Marshland Visitor Center located approximately one mile from the St. Croix Family Campground.

Management Objectives

- Provide a range of educational opportunities to enhance visitors' experience and appreciation for the forest and the environment, while alerting them to benefits and opportunities that the forest provides.
- Utilize educational presentations, exhibits and messages to enhance and protect forest resources.

Management Prescriptions

- Develop a comprehensive interpretive program plan to coordinate and deliver education and public communications on the forest. Feature GKSF resources, forest management and public stewardship themes as part of the forest's interpretive program.
- Install information facilities and amenities at trail heads to provide maps and information about recreational opportunities, forest policies, and alerts about issues such as wildfire or weather safety, or invasive species.
- Develop an equestrian interpretive trail within the Trade River Horse Trail system, up to 6 miles long with up to a dozen stops, interpretive brochure, signage and entry kiosk, location to be determined, working with equestrian trail partners to develop an appropriate theme.
- Establish an auto tour route through the forest with up to a dozen roadside markers, interpretive signage, and a related map/interpretive brochure.
- Restore and redevelop Brandt Pines Trail to an appropriate interpretive theme in the aftermath of July 1, 2011 storm damage.
- Expand GKSF educational opportunities as demand and resources allow.
- Continue to work in partnership with local agencies and groups to offer educational opportunities for forest visitors.

RECREATION LAND USE AGREEMENTS

Governor Knowles State Forest maintains land use agreements with other agencies, National Park Service, local counties, townships and private land owners. The forest works in partnership with land owners to provide a variety of recreational opportunities such as trails and day uses (Map 2.19, Appendix).

TABLE 2.19 CURRENT AND PLANNED RECREATION FACILITIES

Facility	Existing	Planned	Total
Camping			
Campgrounds			
Non-electric campsites (maintain 10 existing)	40	0	10
Electric campsites (upgrade 26 to electric)	4	26	30
Trade River Equestrian Campground Total Campsites >	40	0	40
Trade River Equestrian Campground – self-registration station	1	0	1
Non-electric campsites (maintain 16 existing)	31	0	16
Electric campsites (upgrade 12)	3	12	15
Walk-in campsites (St. Croix Family Campground)	0	6	6
St. Croix Family Campground Total Campsites >	31	6	37
Green space, free-play open recreation area (up to 10,000 - sq. ft.)	0	1	1
St. Croix Family Campground – self-registration station	1	0	1
Outdoor Group Camps			
St. Croix Outdoor Small-group Camp Camper Capacity >	0	30	30
Clam Flowage Outdoor Group Camp Camper Capacity >	0	60	60
Clam Flowage Water Access (canoe launch & fishing pier)	0	1	1
Sioux Portage Outdoor Group Camp (convert to equestrian day use, add group camping in future) Camper Capacity >	60	0	0
St. Croix Outdoor Small-group Camp – 24′ x 36′ picnic shelter	0	1	1
Clam Flowage Outdoor Group Camp – 24′ x 36′ picnic shelter	0	1	1
Equestrian Group Camps			
Trade River Equestrian Group Camp Camping Unit Capacity >	0	30	30
Sioux Portage Equestrian Group Camp Camping Unit Capacity > (keep day use, add camping in future)	0	20	20
Trade River Equestrian Group Camp – 24′ x 36′ picnic shelter	0	1	1
Primitive Trail Campsites			
Equestrian Trail Primitive Sites (Trade River Trails)	0	5	5
Backpack Primitive (GKSF Linear Hiking Trail)	4	6	10
Barrier-free Accessible (ADA) Campsites			
St. Croix Family Campground	2	0	2
Trade River Equestrian Campground	3	0	3
Barrier-free Accessible Cabin (Location to be determined)			
Fully furnished & accessible cabin (~ 1,000 sq. ft.)	0	1	1

TABLE 2.19 CURRENT AND PLANNED RECREATION FACILITIES CONTINUED...

Facility	Existing	Planned	Total
Day Use Areas			
Trade River Equestrian Day Use	1	0	1
Highway 70 Wayside	1	0	1
Sioux Portage Equestrian Day Use (convert from former group camp)	0	1	1
Trade River Day Use Area – 24′ x 36′ picnic shelter	0	1	1
Highway 70 Wayside Day Use – 24′ x 36′ picnic shelter	0	1	1
Sioux Portage Equestrian Day Use – 24′ x 36′ picnic shelter	0	1	1
Vault Toilets			
Single-unit, Unisex, Pre-constructed			
Brandt Pines Ski trail (at main trail head & Foxes Landing)	0	2	2
GKSF Off-road Bicycle Trail (at trail head parking)	0	1	1
Trade River Horse Trails (at trail head parking areas)	0	1	1
Two-unit Facility, Pre-constructed			
St. Croix Family Campground	2	0	2
Trade River Equestrian Campground	2	0	2
St. Croix Outdoor Small-group Camp	0	1	1
Trade River Day Use	1	0	1
Sioux Portage Equestrian Day Use (replace existing toilet, add another)	1	1	1
Highway 70 Wayside	1	0	1
Trade River Equestrian Group Campground	0	1	1
Clam Flowage Outdoor Group Camp	0	1	1
Shower Facilities			
St. Croix Family Campground (pre-constructed shower building)	0	1	1
Trade River Equestrian Campground (pre-constructed shower building)	0	1	1
Trade River Equestrian Group Camp (pre-constructed shower building)	0	1	1
Sioux Portage Equestrian Group Camp (pre-constructed shower bldg.)	0	1	1
Bridges			
Wood River (hiking trail)	1	0	1
Benson Brook (hiking trail)	0	1	1
Wolf Creek (snowmobile / equestrian)	1	0	1
Trade River (snowmobile / equestrian)	1	0	1
St. Croix Campground (entrance road vehicle bridge)	1	0	1

TABLE 2.19 CURRENT AND PLANNED RECREATION FACILITIES CONTINUED...

Facility	Existing	Planned	Total
Education and Interpretive Facilities			
Amphitheater	1	0	1
Trail and property signage (renovate & update throughout forest)	--	--	--
Nature Observation			
Wildlife observation areas (Develop up to 6 wildlife viewing or observation areas with ADA access at some locations)	0	6	6
Vistas, scenic viewing, locations to be determined (Designate several unique and scenic locations, add interpretive signage)	0	3	3
Parking Areas			
Parking Lot - gravel re-surface	--	6	6
Parking Lots (new construction)	22	2	24
Highway 70 Wayside (pave south parking and paths to toilets)	0	1	1
Parking /trail head information stations updates & new sites	--	10	10
Other Buildings / Structures			
Headquarters / Administration Buildings	0	0	0
Equipment and Supply Storage Facility /Space (unheated)	0	2	2
Rest & Observation Deck (accessible)	1	0	1
Brandt Pines Ski Trails (Trail Shelter)	1	0	1
Trail renovation and upgrades			
Water Wells (horse watering stations along trails)	0	3	3
All Trails – renovate tread surface where needed (4" aggregate, 5' W)	--	--	--
Trail and property signage (renovate & update throughout forest)	--	--	--

**Current electric sites at the Trade River Campground include the host site and three sites reserved for campers with a need for electricity due to medical reasons. If there is not a host, that site is available for public use, without the utilities.*
***Current electric sites at the St. Croix Campground include the host site and two sites which are handicap accessible and have electricity for those campers with a necessity for electricity due to medical reasons. If there is not a host, that site is available for public use, without the utilities.*

PARKING AREAS

There are 22 parking areas throughout the forest (over 570 stalls) to facilitate access for hiking, hunting and fishing, and recreational facilities (Table 2.20). Some locations serve multiple uses as trail heads, vistas, scenic overlooks, or places for berry picking, star gazing, or wildlife viewing. Some function as, or in association with, more developed day-use areas (See Day Use Areas).

Management Objectives

- Maintain parking facilities throughout the forest to provide public access.

Management Prescriptions

- Maintain existing parking areas at key locations to provide access to forest and water resources.
- Maintain parking areas to a level of development appropriate to land management classifications and recreational use setting according to NR44 standards.
- Enhance or renovate trail head/gravel surfaced parking access points and provide amenities as appropriate to use and demand.
- Install information facilities and signage at up to ten public access points throughout the forest to enhance visitor experience and to reinforce GKSF identity.
- Construct up to three new parking areas in conjunction with new group camps or trail renovations.

AESTHETIC MANAGEMENT ON LAKE AND STREAM SHORELINES

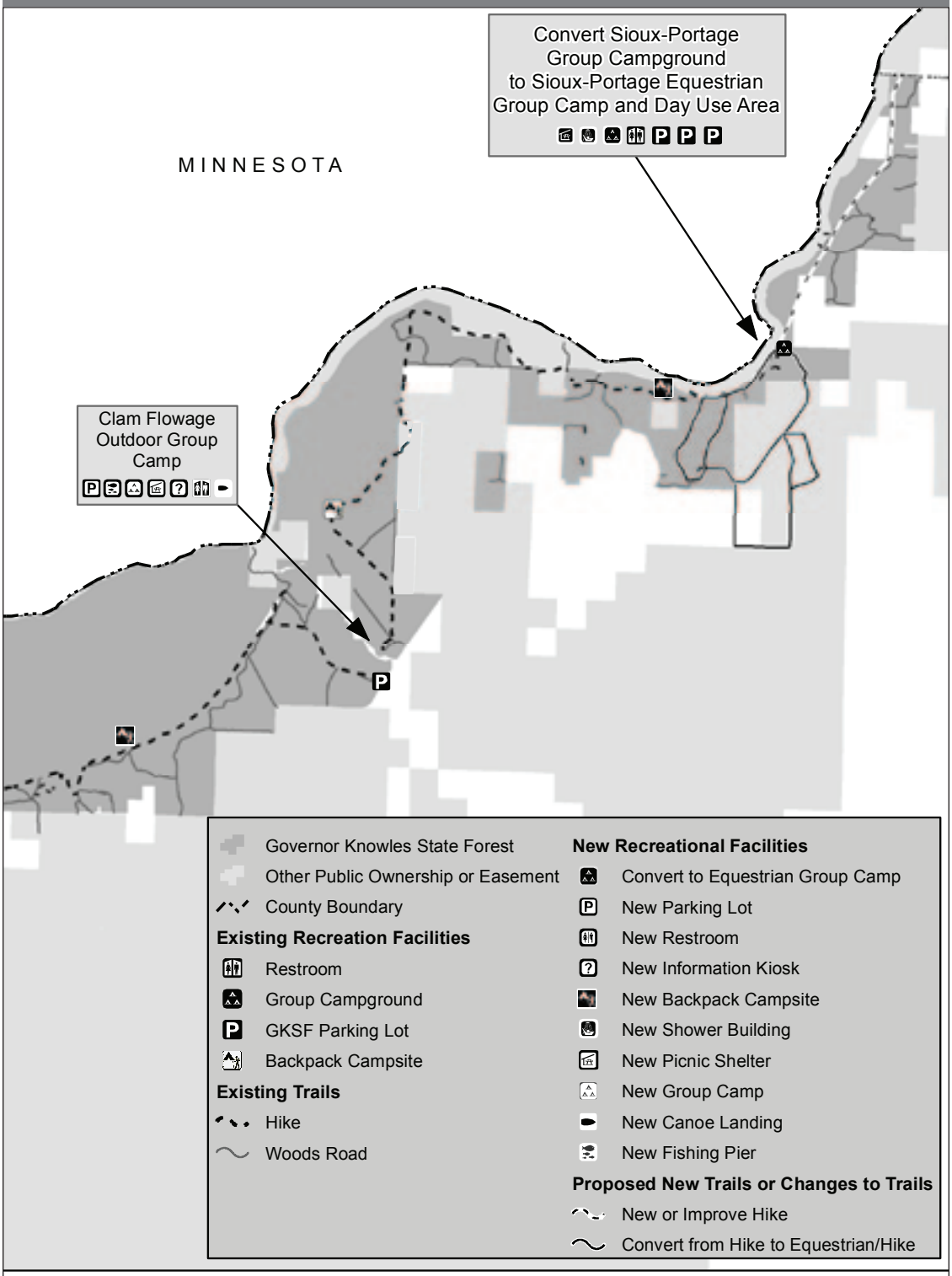
The state-owned shorelines on lakes, flowages, and streams within the Governor Knowles State Forest are designated a Class A Scenic Management Zone. All management activities along state owned lake and stream shorelines will follow guidelines of the *DNR Silviculture and Forest Aesthetics Handbook* and Best Management Practices for water quality.

Management activities that may be done when needed include: the development and maintenance of authorized facilities, herbicide application, prescribed burning, installation of fish habitat improvement devices including tree drops along the shoreline, trail and road construction, erosion control, hazard tree removal in public use areas, the removal of trees to maintain or create scenic vistas and invasive species control.

TABLE 2.20 PARKING AREAS ON THE GKSF

Parking Lot Name/Location	Number of Stalls	Surface
Brandt Brook Pines Main	23	Gravel
Brandt Brook Pines North	20	Sand
Nelson Landing	45	Gravel
Clam Flowage	22	Gravel
Sioux Portage Hiking	13	Gravel
Sioux Portage Outer	18	Gravel
Sioux Portage Inner	14	Gravel
Highway 70 Wayside North	60	Paved
Highway 70 Wayside South	51	Gravel
St. Croix Campground	18	Paved
Wood River Interpretive	5	Gravel
Robards Lot	30	Sand
North Benson	16	Gravel
County O	15	Gravel
North Horse Trail	73	Gravel
Evergreen	4	Gravel
Trade River Campground	6	Limestone
Trade River Day Use	28	Sand
Trade River West	12	Sand
Meyers	30	Sand
West River Road	67	Sand
Paint Mine	4	Gravel

MAP 2.20A RECREATION INFRASTRUCTURE



GKSF324P
April, 2012

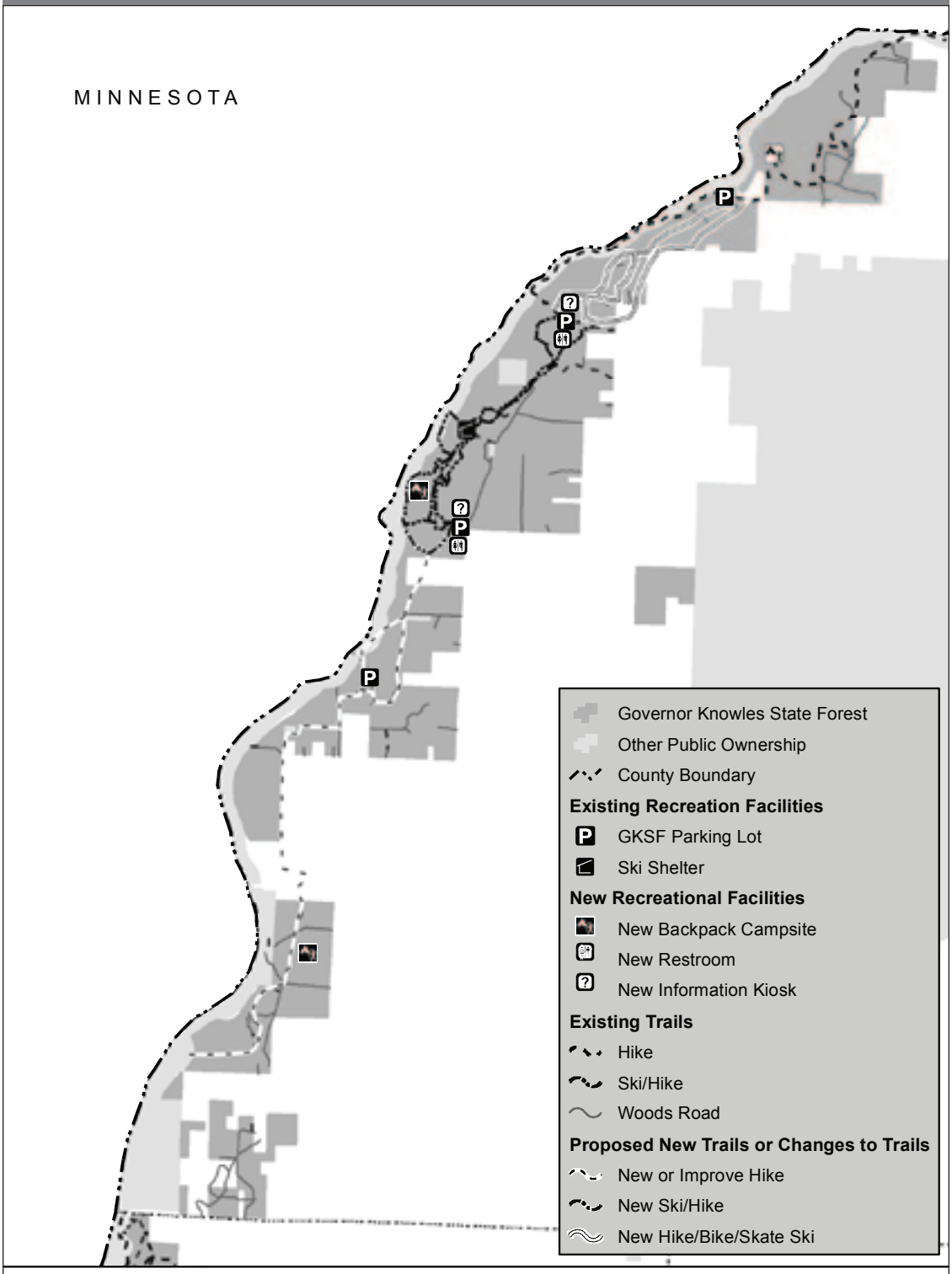
Miles
0 0.5 1 2

Governor Knowles State Forest
Master Plan

The delineations of proposed new recreation infrastructure are a general representation for the purposes of illustration and planning and do not reflect the exact final locations. More detailed locations will be produced at the Department's discretion as improved, on-the-ground, environmental information becomes available, including topography and other site features.

N

MAP 2.20B RECREATION INFRASTRUCTURE



GKSF323P
April, 2012

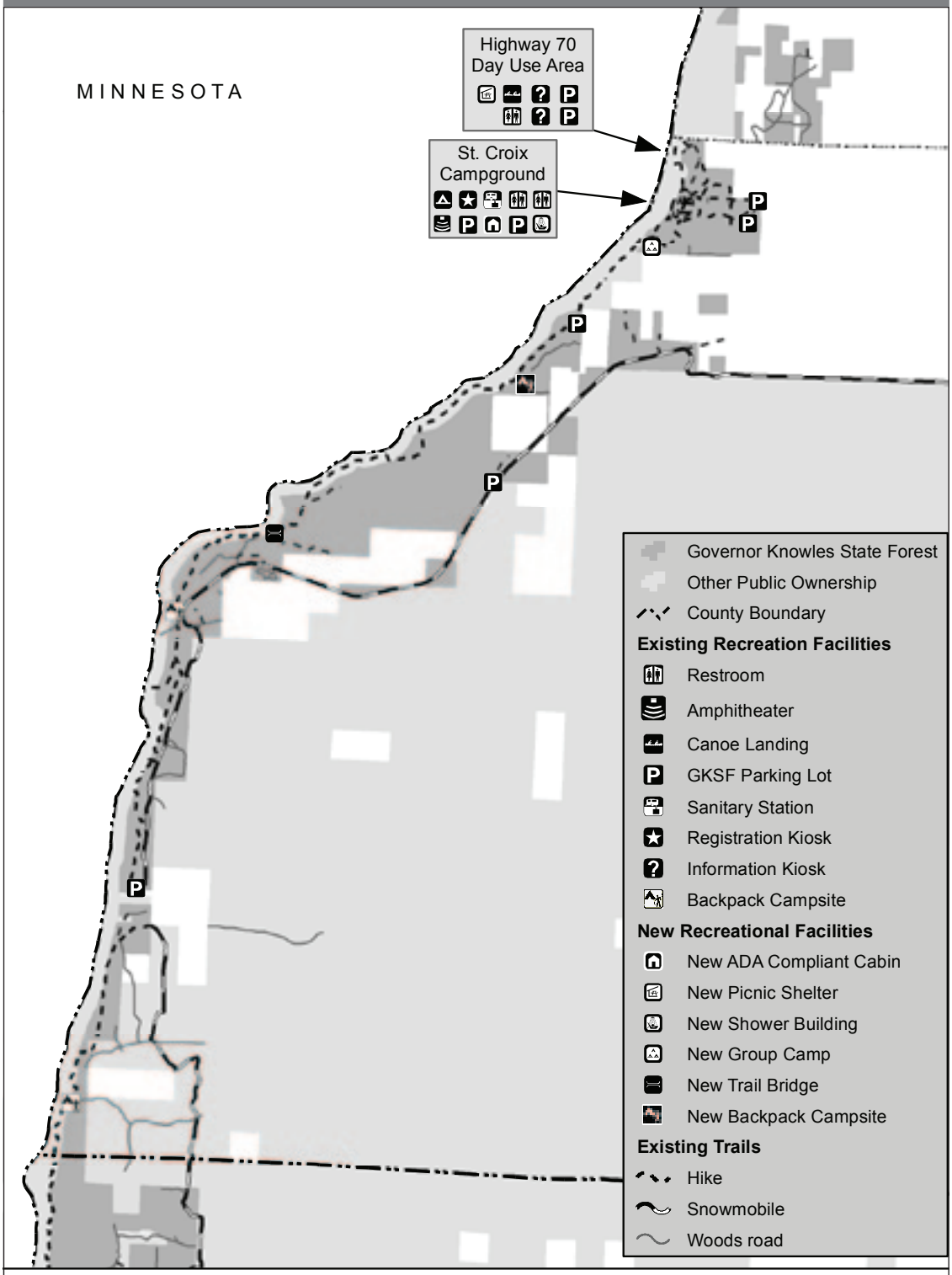
Miles
0 0.5 1 2

Governor Knowles State Forest
Master Plan

The delineations of proposed new recreation infrastructure are a general representation for the purposes of illustration and planning and do not reflect the exact final locations. More detailed locations will be produced at the Department's discretion as improved, on-the-ground, environmental information becomes available, including topography and other site features.

N

MAP 2.20C RECREATION INFRASTRUCTURE



GKSF322P
April, 2012

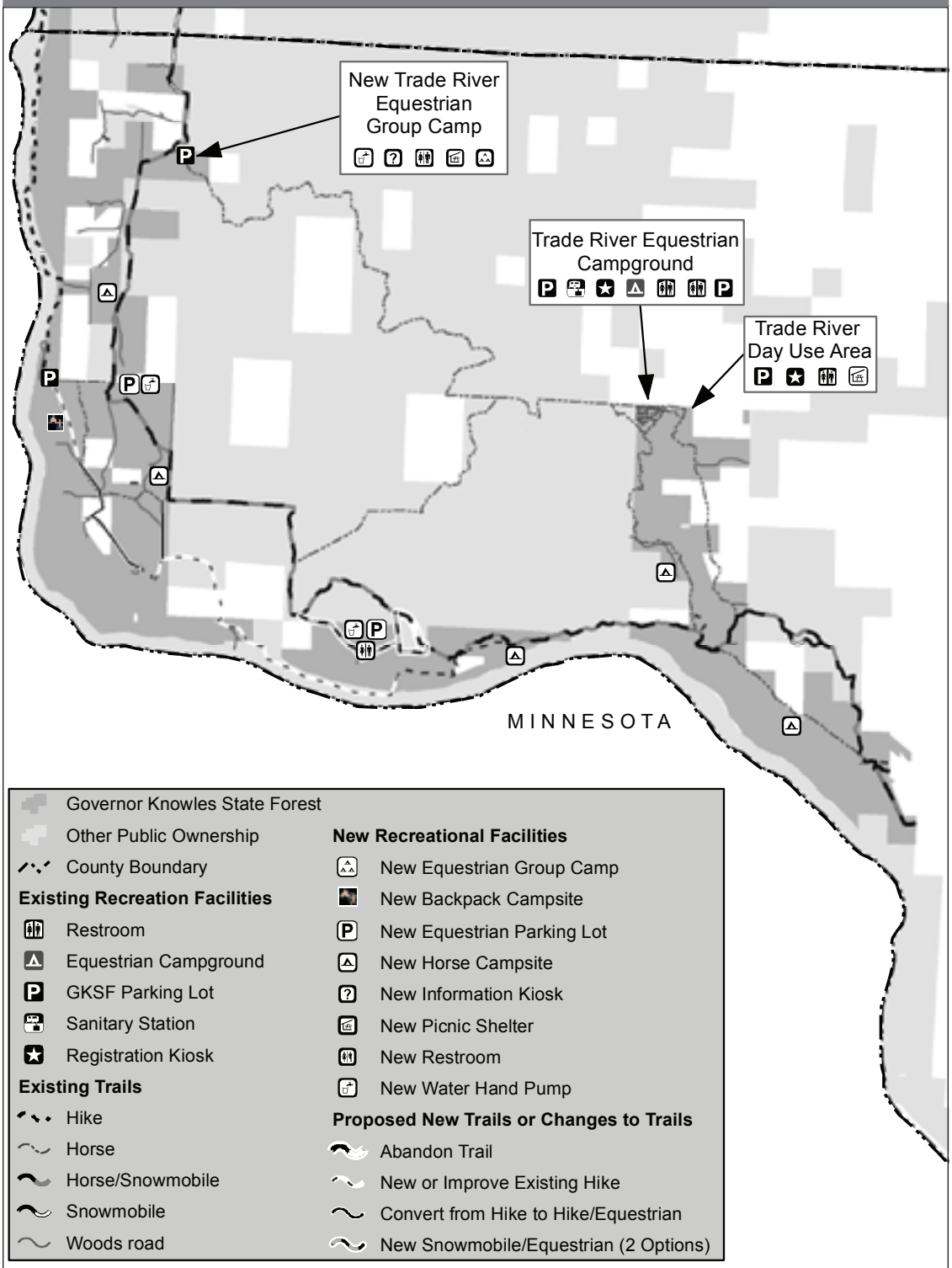
Miles
0 0.5 1 2

Governor Knowles State Forest
Master Plan

The delineations of proposed new recreation infrastructure are a general representation for the purposes of illustration and planning and do not reflect the exact final locations. More detailed locations will be produced at the Department's discretion as improved, on-the-ground, environmental information becomes available, including topography and other site features.

N

MAP 2.20D RECREATION INFRASTRUCTURE



GKSF321P
August, 2012

Miles
0 0.475 0.95 1.9

Governor Knowles State Forest
Master Plan

The delineations of proposed new recreation infrastructure are a general representation for the purposes of illustration and planning and do not reflect the exact final locations. More detailed locations will be produced at the Department's discretion as improved, on-the-ground, environmental information becomes available, including topography and other site features.

N

REAL ESTATE MANAGEMENT

BOUNDARY EXPANSION AREAS

The Governor Knowles State Forest was established in 1970 with a focus of protecting land along the St. Croix River. Today, the Governor Knowles State Forest protects approximately 55 linear miles of the St. Croix River and encompasses 38,000 acres, 20,500 of which are state owned. The corridor of the St. Croix National Scenic Riverway is within the state forest boundary, but is managed by the National Park Service (NPS). In addition to the federally owned corridor, more than 100,000 acres of county forest land and 47,000 acres of state wildlife land, including Fish Lake, Crex Meadows and Danbury State Wildlife Areas, share a boundary with portions of the Governor Knowles State Forest. This large quantity of diverse public ownership attracts tourism and recreational interests to the area. The state forest's proximity to other types of public land, imparts a unique expansion opportunity to improve connectivity of these recreational tracts and to better preserve and protect the St. Croix River and its valley.

There are ten boundary expansion areas totaling 7,989 acres for the Governor Knowles State Forest (Map 2.21, Appendix). Areas for consideration are identified based on a range of ecological, economic and social factors often times in vary degrees for each expansion area (Table 2.21). A number of additional areas were evaluated for consideration but not selected for public review and consideration.

The boundary expansion areas would:

- Protect lightly developed sections of the St. Croix National Scenic Riverway and its tributaries, safeguarding ecologically important habitat, water quality and scenic values of the St. Croix River watershed
- Create larger, better connected blocks of public lands thereby providing opportunities to improve and diversify recreational use and access, including connecting and lengthening recreational trails protect important natural communities, improve transitional habitats and migration corridors, and expand habitats for rare, threatened and endangered species
- Minimize development and fragmentation and preserve blocks of publicly owned land, and
- Improve management efficiencies by adjoining lands that are similarly managed both in terms of land management and recreation.

AREA 1: NORTH BOUNDARY EXPANSION (1,488 ACRES)

The North Boundary Expansion would extend the state forest boundary northeasterly to better protect approximately 4.5 linear miles of the corridor along the St. Croix National Scenic Riverway. This expansion area would connect the NPS corridor with the state forest and the Danbury Wildlife Area (2,900 acres). The majority of land in the North Boundary Expansion exists as fairly large, undeveloped to lightly developed tracts.

The DNR presently owns a 16 acre parcel located on the west boundary of this expansion area. That property was purchased for public access to the river in 1963 and extends to the south bank of the St. Croix River.

Expansion Area Opportunities

- Maintain and enhance the natural, undeveloped, scenic qualities of the St. Croix River corridor and the state forest as visible from the river
- Provide management and recreational access off of Highway 77
- Provide improved public access and recreational land use opportunities for both land and water-based activities, including the potential for a river hiking trail
- Protect an additional 3.5 linear miles of the St. Croix River

TABLE 2.21 BOUNDARY EXPANSION AREAS

Expansion Area Number	Expansion Area Name	Acres
Area 1	North Boundary Expansion	1,488
Area 2	Burnett County Forest Link	943
Area 3	Crex Meadows Link	2,484
Area 4	Wood River Expansion	637
Area 5	Fish Lake Connection	552
Area 6	Fish Lake Connection	321
Area 7	North Equestrian Trail Expansion	83
Area 8	Trail Restoration Block	313
Area 9	Trade River and Cowan Creek Confluence	930
Area 10	South Boundary Expansion	238
	Total	**7,989**

AREA 2: BURNETT COUNTY FOREST LINK (943 ACRES)
This expansion area includes the south tip of Bluff Lake and is surrounded by Burnett County Forest land. Currently there is no available public access to this lake. Expanding the state forest to include this tract will improve connectivity between the two forests. In addition, the connection of public lands will significantly simplify land management, encroachments, and trespass related issues for both the county and the state.

Expansion Area Opportunities
- Create a large block of continuous forest land to maintain and enhance existing public recreational uses
- Simplify borders and provide more easily recognized public land boundaries for recreational users
- Establish public access to Bluff Lake which is currently surrounded by private lands

AREA 3: CREX MEADOWS LINK (2,484 ACRES)
This expansion area lies along the southwestern edge of the Crex Meadows Wildlife Area and includes a one quarter mile thread of Hay Creek. It includes 320 acres of private industrial forest land. Acquisition of this area would create a common boundary between the state forest and Crex Meadows Wildlife Area, offering many advantages for management and public use of the two properties. The expansion area further extends the shared property line that was created and approved in a boundary expansion project authorized in October 2005.

Expansion Area Opportunities
- Create a large, contiguous block of public land for recreation, resulting in more efficient management and fewer conflicts among recreational users
- Improve wildlife habitat (forest and barrens habitats) and provide important habitat connectivity with Crex Meadows State Wildlife Area
- Provide additional opportunities for sustainable forest management
- Protect a portion of Hay Creek and its associated watershed
- Provide opportunities for co-management of the properties by state forest and wildlife staff for improved efficiency and cost savings.

AREA 4: WOOD RIVER EXPANSION (637 ACRES)
This block of expansion is south of Highway 70 and would extend the project boundary of GKSF one square mile to the east. This adjustment would provide additional protection to a highly meandering segment of the Wood River, a warm water tributary to the St. Croix River.

Expansion Area Opportunities
- Buffer and protect a portion of the Wood River corridor to protect its scenic attributes and to ensure its water quality, and the water quality of the larger watershed

AREAS 5 & 6: FISH LAKE CONNECTION (873 ACRES)
These areas would connect the St. Croix National Scenic Riverway, Governor Knowles State Forest, Burnett County Forest and the Fish Lake Wildlife Area to form a large, contiguous block of public land. These two expansion areas are also part of the current Burnett County Forest boundary expansion area, but are included in the GKSF boundary expansion to ensure the Department could acquire the land if the county was unable to, with the ultimate goal of public ownership.

Expansion Area Opportunities
- Provide important linkages between large tracts of state, federal and county owned lands
- Provide opportunities for co-management of the properties for improved efficiency and cost savings

AREA 7: NORTH EQUESTRIAN TRAIL EXPANSION (83 ACRES)
This area is located east of the Governor Knowles State Forest boundary and connects with Sterling Township land. The west 40 acres of the block is already owned by the DNR. There is a parking lot on this tract and the north equestrian trail traverses the parcel. Expanding the boundary 83 acres to the east will provide a contiguous block of public land available for recreational use. The expansion area is within the Polk County Forest boundary expansion area, but is included in the GKSF boundary expansion to ensure the Department could acquire the land if Polk County or Sterling Township were unable to, with the ultimate goal of public ownership.

Expansion Area Opportunities
- Establish new and/or enhance existing recreational uses through the construction of a camping overflow area and/or extension of the equestrian trail
- Provide important linkages with county forest and township owned public land
- Provide opportunities for co-management of the properties for improved efficiency and cost savings

AREA 8: TRAIL RESTORATION BLOCK (313 ACRES)
This expansion area extends the east boundary of the Governor Knowles State Forest and allows for the re-establishment and expansion of a public hiking trail that previously existed when Northern State Power Company owned the property. The trail was closed more than 15 years ago when the land was sold to a private party. Alternative recreational trail development was evaluated south of the expansion area

within the existing state forest boundary, but determined infeasible due to the presence of wetlands. This expansion area provides a viable option for re-establishing the hiking trail.

Expansion Area Opportunities

- Re-establish the recreational hiking trail that previously existed on this property
- Connect the GKSF and Polk County forest to create a large, contiguous block of public land with increased recreational use and access opportunities

AREA 9: TRADE RIVER AND COWAN CREEK CONFLUENCE (930 ACRES)

This area lies north of the GKSF Trade River Equestrian Campground. Cowan Creek and the Trade River, both Class II trout streams, meet within this area. Only light development has occurred to date, thereby making this a prime area to add to the state forest boundary. Blocks of county forest land are adjacent to this expansion area.

Expansion Area Opportunities

- Buffer and protect nearly two miles of undeveloped shoreline along the Trade River and Cowan Creek to preserve scenic qualities and protect water quality of the larger watershed
- Establish new accesses to the river to promote public access and recreational uses
- Connect the GKSF and Polk County Forest to create a large, contiguous block of public ownership with increased recreational use and access opportunities

AREA 10: SOUTH BOUNDARY EXPANSION (238 ACRES)

This area is northeast of the southern tip of the Governor Knowles State Forest and includes a 54 acre parcel the DNR previously acquired. A segment of Wolf Creek, a designated Exceptional Resource Water, traverses the area and empties into the St. Croix River just south of the expansion area.

The area is becoming increasingly more fragmented as properties are subdivided and sold. Given the proximity of this area to the St. Croix River and the importance of the Wolf Creek watershed, much resource value can be obtained from acquiring this small expansion area.

Expansion Area Opportunities

- Protect the habitat, water quality, and scenic values along a portion of Wolf Creek, an Exceptional Resource Water
- Protect and enhances aquatic resources that lead to the St. Croix River

BOUNDARY EXPANSION CONSIDERATIONS

Overlap with Other Publicly Owned Lands

The expansion areas were identified using a strategy of enlarging boundaries to minimize existing management issues and incorporating critical areas into the Governor Knowles State Forest Boundary, even in cases of overlap with other publicly owned lands. The expansion areas do overlap both with land currently owned by Polk or Burnett County Forest and with land currently within County Forest project boundaries (i.e. available for acquisition by the County Forest). County ownership within the GKSF boundary is not problematic; in fact currently there are 3,451 acres of County Forest, 3,000 acres of National Park Service (NPS), and 322 acres of Town owned lands within the GKSF boundary. The presence of these other ownerships as in holdings within the GKSF has presented opportunities for partnership and cooperative land management.

The inclusion of other publicly owned land within the expansion areas presents an opportunity for a land trade if desired in the future. The inclusion of lands currently within County Forest project boundaries in the GKSF expansion area ensures the Department could acquire the land if the County Forest, Township, or NPS were unable to, with the ultimate goal of public ownership. In these cases, the County Forest would have priority to purchase if and when overlapping parcels became available. It would not be a competitive process between the state and county, but a way to ensure public ownership for key parcels. Further, the acquisition goal is not set with the intention of acquiring 100% of the lands established within the boundary, but rather to provide a basis to pursue a given opportunity if circumstances justify it.

Developed Land and Development Pressures

The boundary expansion process is particularly challenging in areas within the state forest where subdivision and development have occurred. One of the major challenges facing property managers statewide is the encroachment of developments within and adjacent to state owned lands, which affects the character of the property. With the urban centers of Minneapolis-St. Paul and Duluth-Superior only an hour and a half drive away, the potential for development pressures exists. That being said, the DNR generally does not pursue acquisition of improved properties if the home and accessory buildings have value exceeding 33% of the total real estate value. It is difficult to speculate on the future real estate value of improved properties as upkeep, natural disasters, time, and various other factors can significantly impact improvement value. Several improved parcels are included within the boundary expansion. The Department understands that many of these properties may not be feasible to acquire, but have included these tracts to simplify boundary delineations and to

TABLE 2.22 TOTAL ACRES CURRENTLY WITHIN GKSF AND BOUNDARY THAT ARE OWNED BY OTHER ENTITIES OR WITHIN THE PLANNED PROJECT BOUNDARY

Ownership/Planned Project Boundary	Acres within Planned Project Boundary
Polk County Forest Ownership	672
Burnett County Forest Ownership	3,421
Town of Sterling Lands	436
Polk County Forest Project Boundary	2,604
Burnett County Forest Project Boundary	4,955
Total	**12,088**

Current: Land owned by another entity that is within the current GKSF boundary.
Planned: Land owned by another entity that is within one of the GKSF expansion areas.

TABLE 2.23 LAND COVER WITHIN THE EXPANDED BOUNDARIES

Land Cover Class	Current	Planned
Forest	5,500	69%
Wetland	901	11%
Shrub, Grassland	770	10%
Developed - Open Space	259	3%
Agriculture - Pasture/Hay	198	2%
Open Water	166	2%
Agriculture - Cultivated Crops	164	2%
Developed - Low Intensity	17	0%
Developed - Medium Intensity	13	0%
Total	**7,989**	**100%**

define interest in these lands should circumstances allow the DNR to pursue purchase. Past project boundary determinations have resulted in the loss of some key land acquisitions simply because the property was not located within the project boundary of the state forest.

Land Cover within the Expanded Boundary

Within the expansion area, the majority of the land cover (69%) is forest. Wetland and grassland account for the next two most common land cover classes (11% and 10% respectively). Agricultural lands make up approximately four percent of the land cover within the expanded boundary. This includes pasture/hay production (2%) for livestock and cultivated crops (2%) such as corn and soybeans. Developed areas make up only three percent of the land cover within the expanded boundary. This includes mostly "open space" development such as lawn grasses, but also includes minor amounts of single-family housing units.

As described in the previous section, the DNR generally does not pursue acquisition of improved properties (i.e. developed or agricultural). While the expansion area does include some agricultural and developed lands, the Department understands that many of these properties may not only be not feasible to acquire, but also not of interest to acquire for state ownership. The Department would not have a goal to acquire 100% of the lands within the expanded boundary, and therefore would not necessarily acquire a parcel just because it is within the expanded boundary. The purposes for including the developed and agricultural lands within the expanded boundary are to simplify boundary delineations, and to define interest in these lands should circumstances arise that make purchase of those lands appropriate.

Developed Open Space

Areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20% of total cover. These areas most commonly include large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.

Developed Low Intensity

Areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20% to 49% percent of total cover. These areas most commonly include single-family housing units.

Developed Medium Intensity

Areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50% to 79% of the

total cover. These areas most commonly include single-family housing units.

Agriculture – Pasture/Hay
Areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20% of total vegetation.

Agriculture – Cultivated Crops
Areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and also perennial woody crops such as orchards and vineyards. Crop vegetation accounts for greater than 20% of total vegetation. This class also includes all land being actively tilled.

Boundary Contractions
A standard step in the boundary analysis process for a master plan also includes reviewing parcels that could potentially be removed from state ownership. This might include developed parcels or scattered parcels that cannot be managed efficiently. The master planning team reviewed parcels for contraction and ultimately decided that the removal of such parcels would make boundaries more confusing, both for internal management purposes and for the recreating public.

REAL ESTATE MANAGEMENT

REAL ESTATE ACQUISITION POLICIES

All property purchases are on a willing seller basis. As required by state and federal laws, the Department pays just compensation for property, which is the estimated market value based on an appraisal. At times, it is in the interest of the Department and the landowner for the Department to acquire only part of the rights to a property, or an easement. The Department has a number of easement options available to address these situations.

Landowners within the state forest boundary will be contacted periodically by Department staff to explain the Department's land acquisition program and to see if they have an interest in selling their property. Acquisition priorities within the state forest vary from year to year and are based on a variety of factors, such as resource management or recreation needs and available funding.

Master plan amendments will be done when and as required by Wisconsin Administrative Code NR 44.04 when adding newly acquired lands to the forest.

AIDES IN LIEU OF TAXES

Local governments and communities are often concerned about the perceived reduction of the tax base when private lands come under public ownership. Under current law (Wis. Stats. 70), land acquired by the DNR is not subject to property taxes. Instead, DNR makes annual payments in lieu of taxes (PILT) to municipalities for the parcels that the DNR owns within those municipalities. More detailed information on how the Department pays property taxes may be found by visiting dnr.wi.gov and searching "PILT".

EASEMENTS, ACCESS PERMITS, AND LAND USE AGREEMENTS

Easements provide access across state property for utilities, town roads, or county highways. Easements are permanent and would continue to be upheld under the master plan. Access permits provide access across state property to private ownership within the forest boundary. Land use agreements provide for a variety of uses on state forest property, such as snowmobile trails and other recreational facilities open to the public. The Wisconsin Department of Natural Resources has a long history of cooperation in managing and maintaining public recreational and community facilities and access.

The Governor Knowles State Forest supports land use agreements with public and private partners that provide public benefits. Land use agreements can be used to facilitate agreements with partners to provide services that meet the goals and objectives of the master plan. Existing easements, land use and access permits will be reviewed periodically for compliance. The Department may grant new agreements, permits or easements where they do not conflict with the master plan's goals and objectives. All such requests will be evaluated on an individual basis, and follow Department standards for review approval.

FUTURE BOUNDARY ADJUSTMENT PROCESS

From time to time adjustments to the forest boundary are needed. In some cases parcels of land are removed from the boundary to allow alternative, necessary public uses by local governments. In other cases it may be desirable to add small parcels adjacent to the forest so they can be purchased for resource protection or to meet expanding recreational needs. Property boundary changes of 40 acres or more require approval by the Natural Resources Board. Wisconsin Administrative Code Ch. NR 44 provides a plan amendment process that may be used to make adjustments in the forest boundary.

ROAD MANAGEMENT

Roads, skid trails and landings are all part of the forest transportation system. They provide access for activities such as managing timber, improving fish and wildlife habitat, fighting fires, and recreation. Access across and within the Governor Knowles State Forest boundary is on a variety of road types, including federally-owned roads (NPS), state and county highways, town roads and state forest roads. There are approximately 75 miles of state forest roads open for public vehicles and maintained at a level appropriate for a standard vehicle. State Forest roads open to public vehicles are considered state highways by law. There are approximately 5 miles of permanent and temporary state forest roads closed to public vehicles and used for management purposes. These roads are all classified as 'primitive' according to the NR44 road classifications described below. While closed to public vehicles, these roads also provide foot access for hunters and hikers.

STATE FOREST ROAD CLASSIFICATION

There are several types of road classifications outlined in NR 44.07(3). The classifications reflect a range of development and maintenance standards. Road classifications include primitive, lightly developed, moderately developed, and fully developed.

TABLE 2.24 STATE FOREST ROAD CLASSIFICATIONS OPEN TO PUBLIC VEHICLES

Road Type	Approximate Mileage	Planned NR44 Designation
Campground Roads	1	Moderately to Lightly Developed
Foxes Landing Road	1	Moderately to Lightly Developed
Brown Trail	21	Primitive
Red Trail	4	Primitive
Yellow Trail	2	Primitive
Black Trail	3	Primitive
Green Trail	3	Primitive
Forest Roads	1	Lightly Developed
Forest Roads	75	Primitive
Total Mileage	**111**	

Primitive Roads are temporary or permanent seasonal roads with a maximum sustained cleared width normally not exceeding 12 feet, little or no roadbed grading, minimal cut and fill, a surface of primitive or native material.

Lightly Developed Roads are temporary, permanent seasonal, or permanent all–season roads which are primarily single lane with a maximum sustained cleared width normally not exceeding 16 feet, are lightly to well–graded with minimal cut and fill, are surfaced with primitive, native or aggregate materials except in limited special use situations where asphalt may be used, and have a maximum speed design of 15 mph.

Moderately Developed Roads are permanent seasonal or permanent all–season roads which typically are two–lane, but may be one–lane, have a maximum sustained cleared width normally not exceeding 45 feet for two–lane and 30 feet for one–lane, a well–graded roadbed and may have moderate cuts and fills and shallow ditching, have a surface of aggregate, asphalt or native material, and a maximum design speed of 25 mph.

Fully Developed Roads are permanent all–season roads with a cleared width normally of 50 feet or more, a roadbed with cuts and fills as needed, an aggregate, asphalt or other paved surface and designed for speeds exceeding 25 mph.

ROAD MANAGEMENT OBJECTIVES

- Provide a network of roads on the GKSF that meet land management and recreation objectives, while minimizing environmental impacts.
- Maintain state forest roads to the designated road standards and in a sustainable condition.
- Consider scenic values along public road corridors in balance with management area objectives.
- Manage the spread of invasive plant species along road corridors.

ROAD MANAGEMENT

GENERAL ROAD MANAGEMENT PRESCRIPTIONS

- Maintain visibility and clearance along roads that is adequate for the road classification and use.
- Restore roads used in timber harvest operations to non-erosive conditions after harvesting is completed.
- Inspect permanent roads throughout the year for degradation and develop a maintenance schedule.
- Monitor and manage the spread of invasive plant species along roads using Wisconsin's Forestry Best Management Practices for Invasive Species. Control invasive species using appropriate management techniques including but not limited to, herbicides, burning, cutting and mowing.
- Implement Wisconsin's Forestry Best Management Practices for Water Quality as needed to prevent direct impacts to lakes, streams, wetlands and groundwater.
- Annually review the roads open for public use and make adjustments as needed to enhance access for recreational users as allowed by the management area's land use classification.
- All non-state forest road right-of-ways (66 feet) will continue to be controlled and maintained by their current operator (state, county, or town).

ROAD MAINTENANCE

The Governor Knowles State Forest is responsible for the maintenance of all state forest roads with more attention given to roads open for public vehicles. There are approximately 25 miles of roads both within and adjacent to the GKSF that are either county, town, federal, or privately owned. While roads are typically maintained by their respective unit of government, in the case of the Governor Knowles State Forest, many of the primitive forest roads are also recreational trails that lead outside of the property and are part of a regional trail network. Based on maintenance agreements, the GKSF is responsible for maintenance of some of this mileage. This includes approximately 17 miles of county forest roads, 0.25 miles of National Park Service forest roads, 4 miles of township forest roads, and 2 miles of private roads. The GKSF does not have authority for determining the access (open or closed to the public) or the level of development on roads owned by other entities.

ACCESS POLICY FOR PUBLIC VEHICLES

All state forest roads are open to public access with street licensed vehicles unless the road is bermed, gated, or signed closed. State forest roads open to public vehicles are considered state highways by law. State forest roads are closed to ATVs unless designated for such use. The State Forest Superintendent may close a road to public use if it becomes degraded, unsafe, or for law enforcement reasons.

State forests regularly open and close forest roads primarily to conduct forest management activities. Roads open for management purposes are generally open to the public during the management period and a short time thereafter (a total of about two to five years). Following this period they are closed with gates or berms.

The state forest will not maintain roads for the expressed benefit of private individuals or residents, but may, at the discretion of the State Forest Superintendent, consider land use agreements.

AESTHETIC MANAGEMENT FOR ROADWAY CORRIDORS

Forest management techniques can be adjusted along roadways on the forest to ensure the long-term maintenance of scenic conditions is proportionate to the road's level of public use. The DNR Silviculture and Forest Aesthetics Handbook distinguishes three types of aesthetic management zones that can be applied along roadways described as Class A, Class B, and Class C aesthetic management zones. Most roads within the Governor Knowles State Forest fall under the Class C Aesthetic Management Zone.

Class A Aesthetic Management Zones include travel routes with heavy to medium use or roads where the use is for the specific purpose of enjoying scenery. These areas should be developed and maintained to the greatest scenic potential for public enjoyment.

Class B Aesthetic Management Zones include a variety of roads where public traffic use is generally light to medium. Scenic attractiveness is of equal importance and is in balance with other land management objectives.

Class C Aesthetic Management Zones include roads primarily used for management access and where public use does not occur, is infrequent, or is primarily for activities such as hunting, fishing, or berry picking. Aesthetics are considered in the management along these roadways; however, they are secondary to the prescribed land management activities for the area.

NON-METALLIC MINING POLICY

The Department may use gravel, sand, fill dirt, or other fill material from Department-owned lands for Department use. Under certain circumstances other government bodies or agencies may also have access to these materials. Section 23.20 of the Wisconsin Statutes states, "the department may permit any town, county, or state agency to obtain gravel, sand, fill dirt or other fill material needed for road purposes from any department-owned gravel pit or similar facility if this material is unavailable from private vendors within a reasonable distance of the worksite. The department shall charge a fee for this material commensurate with the fee charged by private vendors."

The Governor Knowles State Forest one gravel pit (sand mine) within its boundary, but it is privately owned and operated. Any non-metallic mining in the Governor Knowles State Forest, whether by the Department or as authorized under s. 23.20, Stats., is regulated under the reclamation requirements of NR 135, Wis. Adm. Code, - except for sites that do not exceed one acre in total for the life of the mining operation or are otherwise exempt under s. NR 135.02(3), Wis. Adm. Code. Site reclamation under NR 135 is administered by the county, or in some cases municipal, regulatory authority.

NR 135 requires mining sites to be reclaimed according to a reclamation plan to meet uniform state reclamation standards. Most Department of Transportation (DOT) projects are exempt from NR 135 but subject to WisDOT's own mining site restoration requirements as provided in s. NR 135.02(3)(j), Wis. Adm. Code. In general, DOT and its contractors would be discouraged from non-metallic mining on the state forest property. The use of state-owned land by the state and municipalities for gravel pits and sand will continue on a case-by-case basis. Non-metallic mining at new sites will not be permitted where a Geological Feature of Importance has been identified.

IMPORTANT GEOLOGIC FEATURES

Based on general broad-scale bedrock maps, the northern one-third of the GKSF overlies Late Precambrian volcanic or metamorphic bedrock, and the southern portion of the property is over Cambrian sandstone (Dott and Attig 2004, WDNR In Prep.). Bedrock is between 50 and 100 feet from the surface throughout and is primarily covered with sand and gravel deposits. Because many of the unique geological features on the forest contain sand and gravel deposits, they would be subject to extraction and other disturbances if not protected on public land. The Department recognizes the importance of setting aside and preserving representative examples of these non-renewable geological features to serve as a base for geological and ecological educational programs and as a baseline against which to compare sites that become disturbed in various ways.

CULTURAL RESOURCES MANAGEMENT

The cultural resources management plan for the Governor Knowles State Forest recognizes that cultural resources, such as archaeological sites, historic structures, and tribal heritage areas, are significant resources and provide important clues to the historic use of state forest lands.

PREHISTORIC, HISTORIC AND OTHER CULTURAL RESOURCES

To date, approximately 40 prehistoric and historic archaeological sites have been recorded within Governor Knowles State Forest, and many more are as yet unidentified. A number of these sites are burial sites, including burial mounds, and historic Indian and Euro-American cemeteries. Other archaeological sites would be expected to occur along the elevated margins of the river's waterways, especially at the confluence of rivers, and at the inlets and outlets of rivers on lakes.

Additionally, a number of historic structures (e.g., buildings, dam remnants, etc.) have been recorded within the forest, and as yet unidentified and unrecorded historic structures are likely present as well.

All of these sites and structures are protected against unauthorized disturbance by various state (e.g., Wis. Stats. 44.40 and 157.70) and/or federal legislation (e.g., Section 106).

There have been no intensive surveys to identify cultural resources; therefore, many GKSF archaeological sites (and likely some historic structures as well) remain undiscovered and unreported. Archaeological sites would be expected to occur along the elevated margins of the river's waterways, especially at the confluence of rivers, and the inlets and outlets of rivers on lakes.

TRIBAL RESOURCES

The GKSF lies within the ceded territory of the Ojibwe Tribes and is located within proximity to Tribes of the St. Croix Band of the Lake Superior Ojibwe as well as the Mille Lac Band of Ojibwe in Minnesota.

Ceded Territories and Tribal Use

Prior to the arrival of Europeans in North America, Native American tribes were independent, sovereign nations. The Ojibwe Tribes ceded some lands in the northern one-third of Wisconsin to the United States Government in the Treaties of 1837 and 1842 (Appendix D). In those treaties, they reserved their rights to hunt, trap, fish, and gather within various publicly-owned lands. These treaty rights, affirmed under Lac Courte Oreilles Indians v. State of Wis., 775 F. Supp. 321, 323 (W.D. Wis. 1991), are currently being exercised and implemented by the Ojibwe Tribes for subsistence, medicinal, cultural, religious and economic purposes.

CULTURAL RESOURCES MANAGEMENT GOAL

The goal of the Governor Knowles State Forest is to identify and manage cultural resources to provide future generations an opportunity to appreciate and experience the forest's diversity of human history, and the delicate ecological relationship between people and the land. In addition, the treaty rights of the Ojibwe Tribes, affirmed under Lac Courte Oreilles Indians v. State of Wis., 775 F. Supp. 321, 323 (W.D. Wis. 1991) are preserved for subsistence, medicinal, cultural, religious and economic purposes for both current and future generations.

CULTURAL RESOURCES MANAGEMENT OBJECTIVES

- The protection and preservation of areas, objects, and records of cultural importance will be coordinated with the Department Archaeologist in consultation with interested tribal communities, institutions, and/or other interested parties. This consultation will include (but is not necessarily limited to) notification to interested parties of activities and potential impacts in areas of known concerns. Opportunities for involvement in research of sites of known cultural importance will be made.
- Protection of cultural resources will be coordinated with the Wisconsin Historical Society (WHS) as required by applicable state and federal historic preservation laws and regulations.
- Protection of burial sites will follow Section 157.70 of Wisconsin Statutes, and the Department's "Burials, Earthworks, and Mounds Preservation Policy & Plan" (WDNR 2008).
- The Governor Knowles State Forest Superintendent will consult with Tribal and GLIFWC (Great Lakes Indian Fish and Wildlife Commission) representatives regarding state forest management issues on a government-to-government basis as required under Wisconsin Administrative Code NR 44.04 (7)(c).
- As needed, approved future facility development sites (parking lots, buildings, etc.) will be inspected prior to construction to locate and evaluate any evidence of significant archaeological or historic material in compliance with Section 44.40 of the Wisconsin State Statutes, and Manual Code 1810.1.
- All accommodations necessary will be made to avoid adverse impacts on cultural sites that may be affected by management activities.
- Cultural resources may be developed for scientific and educational purposes to the extent that the integrity of the resource is maintained.
- The implementation of treaty rights for hunting, gathering, fishing, and trapping are preserved for subsistence, medicinal, cultural, religious and economic purposes.

GENERAL LAND AND FOREST MANAGEMENT POLICIES AND PROVISIONS

The following section describes general policies and provisions that are applied to all lands of the Governor Knowles State Forest that are under state ownership.

FOREST INVENTORY AND RECONNAISSANCE

The state forest uses a forest inventory system to gather and record information on its land. The database created from the inventory captures the physical description of these areas (dominant forest cover type, soils, ecological attributes, stand origin, guidelines, restrictions and goals). Reports are generated to summarize forest stands that are scheduled for management review. The acreage listed for review is considered the forest's "sustainable harvest" meaning those lands are due for a decision regarding management. Some stands inventoried, such as passive management zones contained in some native community management areas, are excluded from the management schedule. Forestry staff conduct field exams to verify whether stands schedule for management are ready for the prescription. If stands are not yet ready for management, the reconnaissance database is updated and rescheduled for future review. Stands rescheduled for future review are still considered accomplishments toward the forest's annual sustainable harvest acreage. For stands that are ready for management, forestry staff consult with other Department programs such as endangered resources, fisheries, and wildlife to ensure an integrated resource approach prior to establishing the proposed practice. When establishing the practice, silvicultural guidelines and BMPs for water quality and invasive species are followed. After a management practice is completed, the forest reconnaissance database is updated. In the future, the state forest will be using a Continuous Forest Inventory (CFI) system in conjunction with the reconnaissance system. This system will track growth, mortality, and management of forested lands and allow for more concise management of state forest lands. Using the Continuous Forest Inventory system will not change the objectives stated in the master plan.

BEST MANAGEMENT PRACTICES FOR WATER QUALITY

All management activities within the state forest will follow, as a minimum standard, the guidelines in *Wisconsin's Forestry Best Management Practices for Water Quality: Field Manual for Loggers, Landowners and Land Managers* (DNR PUB-FR-093-2010).

FOREST PEST CONTROL

As stated in Wisconsin Statute 26.30, it is the public policy of the state to control forest pests threatening forests of the state. Within the Governor Knowles State Forest, any significant forest pest event will be evaluated with consideration given to the property management goals and the potential threat of the pest to other landowners. Responses to significant infestations from other forest pests, including but not limited to the Emerald Ash Borer, may include timber salvage or pesticide treatments. Any response to a significant pest outbreak will be evaluated by an interdisciplinary team of scientists and communicated through press releases and notices to interested parties.

INVASIVE SPECIES CONTROL

Invasive non-native species have become recognized in recent years as a major threat to the integrity of the state forests. These species have the ability to invade natural systems and proliferate, often dominating a community to the detriment and sometimes the exclusion of native species. Invasive species can alter natural ecological processes by reducing the interactions of many species to the interaction of only a few species. The GKSF has an integrated invasive species plan for the property. This document outlines various factors in managing for invasive species such as early detection and inventory, mapping, control, monitoring and research and education. The plan is used as a guide to managing for the invasives on the state forest. In addition, Best Management Practices (BMPs) for Invasive Species will be incorporated into management practices on the property.

If detected, invasive species may be controlled using appropriate and effective methods, including but not limited to the use of herbicides, cutting, or hand removal. Control methods may be restricted in certain sensitive management areas. Before initiating control measures, the management prescriptions for the area being treated will be referenced.

CHEMICAL USE

Approved herbicides and pesticides may be used for various purposes on the forest, such as but not limited to control invasive plants, to control plant competition in forest regeneration areas, to control undesirable vegetation in or around recreational facilities, or for insect control except as restricted in the management prescriptions in this master plan. All Department procedures and herbicide and pesticide label requirements will be followed.

ENDANGERED, THREATENED AND SPECIES OF SPECIAL CONCERN PROTECTION

The Governor State Forest supports several Natural Heritage Inventory (NHI) listed threatened, endangered, and special

concern species, both plants and animals. Rare animal species include one beetle, nine birds, four butterflies, three dragonflies, six fish, one mammal, two moths, four mussels, and two turtle species. Of these, five are State Endangered, nine are State Threatened, and three are protected by the federal Endangered Species Act. There are 14 rare plant species known from the GKSF, including one State Endangered, three State Threatened, and ten Special Concern species.

Several of the native community management areas and the habitat management areas are designed to protect rare species habitats. In addition, all management prescriptions in the master plan will consider the needs of these species and the potential impacts to the species and their habitat. Management actions being planned on the state forest are checked against an up-to-date database of listed species to assure that no Department actions result in the taking of any known endangered or threatened resource. Property managers routinely work with Department biologists and ecologists to protect rare species where they are known to occur. Please refer to Appendix B for a listing of the Endangered, Threatened, and Species of Special Concern found on this property.

FIRE SUPPRESSION

As stated in Wisconsin Statutes 26.11, "The Department is vested with power, authority and jurisdiction in all matters relating to the prevention, detection and suppression of forest fires outside the limits of incorporated villages and cities in the state except as provided in sub (2), and to do all things necessary in the exercise of such power, authority and jurisdiction." Forest fire suppression actions within the state forest will consider the property management goals and the threats of the fire to life and property. Appropriate techniques will be used in each event to provide effective fire suppression while minimizing resource damage. Selected areas of the state forest are periodically used for fire equipment training purposes.

FOREST CERTIFICATION

In 2004, Wisconsin state forests were dual certified under Forest Stewardship Council (FSC) and Sustainable Forestry Initiative (SFI) standards. In addition to ensuring that raw materials are certified sustainable, the process also provides a wide array of ecological benefits through management plans that provide protection of rare, threatened, and endangered species and protection of representative examples of ecosystems. In 2009, the state forest program was re-certified under FSC and SFI along with state parks, wildlife areas, fishery areas, and natural areas, bringing the number of certified state owned lands to 1.5 million acres. In addition to state forests, county forests in the GKSF region that are certified include Burnett and Polk under SFI standards and Barron and Washburn under both FSC and SFI standards.

RESEARCH

The Governor Knowles State Forest provides an operational and strategic location for experimental trials and research, especially with regard to tree improvement, genetics, forest health, artificial and natural regeneration, and prescribed fire, and nutrient cycling. The research conducted by Department managers, scientists, and educational partners can be beneficial for the forest, the Department and the general public.

Research conducted by Department managers, scientists, and educational partners can be beneficial for the forest, the Department and the general public. Scientific research that is compatible with the ecological and aesthetic attributes of the site is generally supported. The State Forest Superintendent has the authority to approve or deny requests for research projects on the Governor Knowles State Forest. All research activities will be carried out in locations and using methods that are consistent with the management classifications and management objectives in this property plan.

The state forest has been supportive of research, both on and off the property. The Governor Knowles State Forest has provided housing and field support for researchers from time to time. Robard's Cabin, an acquired cabin near the Saint Croix Family Campground, is an affordable and attractive housing option. Due to the large tracts of public land in this area, it is likely that the state forest will be called upon in the future to provide housing and field support for researchers

AUTHORIZED RESPONSE TO CATASTROPHIC EVENTS

Wildfires, timber diseases, and insect infestations shall be controlled to the degree appropriate to protect the values of each management area. Necessary emergency actions will be taken to protect public health and safety. Appropriate management responses to catastrophic events are determined on a case-by-case basis, and action will be taken as appropriate. At a minimum, salvage of trees damaged by wind, fire, ice, disease, or insects may occur if consistent with the objectives of the management area or as prescribed in the plan for the management area.

GENERAL ADMINISTRATION POLICIES AND PROVISIONS

The following section describes general administration policies and provisions that are applied to all lands of the Governor Knowles State Forest that are under state ownership.

FACILITY MANAGEMENT, DEVELOPMENT STANDARDS, AND DISABLED ACCESSIBILITY

The State Forest Superintendent may close and relocate campsites, renovate facilities, relocate trail segments and post speed limits on trails as deemed necessary.

The State Forest Superintendent may also maintain and construct storage buildings, employee housing, and/or other similar facilities to support the management of the state forest, as is authorized by normal Department facility approval processes. All facilities, roads, and structures providing either public recreation or supporting public recreation activities or other administrative services will be designed and constructed in compliance with state building codes and Department design standards including NR 44. The structure's location and design must also be consistent with the management objectives for the area in which it is located.

All new construction and renovation of facilities will follow guidelines set forth within the Americans with Disabilities Act (ADA). Across the Governor Knowles State Forest, the State Forest Superintendent has the authority to make reasonable accommodations for people with disabilities, consistent with the requirements of the area's land use classification.

INSPECTION OF DESIGNATED USE AREAS

All designated use areas must be inspected semi-annually (Wis. Statutes s. 23.115). Vegetation inspections in designated use areas must be performed semi-annually with one of the inspections performed by a person trained in the identification of hazard trees. Monitoring will pay particular attention to forest infestations that pose a serious threat to forest resources such as: oak wilt, jack pine budworm, pine bark beetles, gypsy moth, forest tent caterpillar, two-lined chestnut borer, emerald ash borer, and invasive plants. Control measures will be performed as needed.

PROPERTY WIDE MANAGEMENT OF DAMS AND FLOWAGES

The Governor Knowles State Forest does not maintain any water control structures. One privately owned hydro-electric dam is located within the property boundary at the Clam Flowage. Maintenance and monitoring are the responsibility of the dam owner, Flambeau Hydro LLC.

CORRECTION CREW ACTIVITIES

If utilized on the state forest, correction crews may perform duties under the guidance of a Corrections Supervisor with all work assignments pre-approved by the State Forest Superintendent. A Memorandum of Understanding between the two agencies will be maintained to describe appropriate work projects on the state forest.

GENERAL ADMINISTRATION POLICIES AND PROVISIONS

REFUSE MANAGEMENT

Refuse is collected by a private contractor from designated sites at campgrounds and other primary use facilities. Recyclables are also collected at the property. Visitors are required to follow a carry-in, carry-out policy for any refuse they bring when no designated refuse or recycling receptacles are available. Burying of refuse is not allowed anywhere on the property.

PUBLIC HEALTH AND SAFETY

All facilities will comply with federal, state, and local health and sanitation codes; such as well testing, campground licensing and wastewater treatment. The State Forest Superintendent has the authority to close campsites or campgrounds, trails, and other facilities on the forest when necessary due to health, safety, or environmental damage concerns.

Within designated public use areas such as campgrounds, picnic areas, parking lots, and high use trail systems, trees or other natural elements that are deemed public hazards will be removed. Safety inspections are done at least twice per year.

EMERGENCY ACTION PLAN

The property maintains on file an emergency action plan that describes staff response and coordination with other agencies to natural disasters as they affect public safety and facilities. It is reviewed annually.

MONITORING THE IMPLEMENTATION OF THE MASTER PLAN

The implementation of this master plan will be monitored on an annual basis to determine progress made in meeting the plan's management objectives. Master plans set specific goals and objectives describing a future desired state. An on-going monitoring program is essential to track whether the plan is achieving the desired results and if funding and staff resources are being allocated most effectively. A well-constructed monitoring program also provides essential data for adaptive management. That is, checking results and making management corrections when needed so as to stay on the best path to achieve the desired result and minimize adverse or undesirable impacts. On a broader scale, some master plan related monitoring data will also contribute to the Department's statewide and regional ecosystem and environmental monitoring programs.

Monitoring and evaluation can be used to improve management results or efficiency, build and maintain credibility with public, validate past decisions and build better decisions in the future , and build certainty where uncertainty exists regarding the impact of management actions or uses. A solid monitoring program will allow the plan to be kept up to date through adaptive management and substantially reduce the need for a major plan revision process every 15 years.

Monitoring reports will be available on the Department's webpage, at the property, and during annual public meetings.

YEARLY MANAGEMENT ASSESSMENT

The property manager will coordinate, schedule, and lead a yearly meeting to document and assess progress on the management actions accomplished during the previous year and plan management activities for the upcoming year. A file is kept with these yearly assessments in preparation for implementation of the Manual Code 9314.1(C), which calls for formal plans to determine progress on implementation and whether the plan is accomplishing intended results.

FUNDING CONSTRAINTS

Many of the initiatives in the master plan are dependent upon additional funding and staffing. Operational funding for state forests is established bi-annually by the state legislature. Development projects follow an administrative funding and approval process outside of the master plan. Therefore, a number of legislative and administrative processes outside of the master plan determine the rate at which this master plan can be implemented.

PUBLIC COMMUNICATIONS PLAN

The public and other governmental agencies will have the opportunity for on-going involvement in the implementation of this master plan. This communication plan describes how the public will be notified about activities and issues on the Governor Knowles State Forest.

Annually the State Forest Superintendent will write a report that summarizes the following:

- For the past year, the primary management and development activities that were completed and other significant issues that were addressed.
- For the coming year, outline any proposed management and development activities and any changing management actions or approaches.

The annual report may also include other information of interest to the public on various topics related to management and use of the forest such as the status of forest insect or disease problems, fires or storm damage, new information on endangered or threatened species, recreational management Issues or new opportunities, and recreational use changes or trends.

The State Forest Superintendent will maintain a list of persons, groups, and governments interested in receiving information about on-going management of the forest. When requested, the State Forest Superintendent will provide the information via U.S. mail, e-mail or direct them to the Department's internet web site.

Annually, the Governor Knowles State Forest will meet with stakeholders to update interested parties on state forest proposed activities.

In the event the Department considers a change to the master plan through a plan variance or amendment, the public will be advised of the proposal and informed of the review and comment process. As appropriate, a public news release will be prepared and stakeholders notified of the comment process.

TRIBAL CONSULTATION

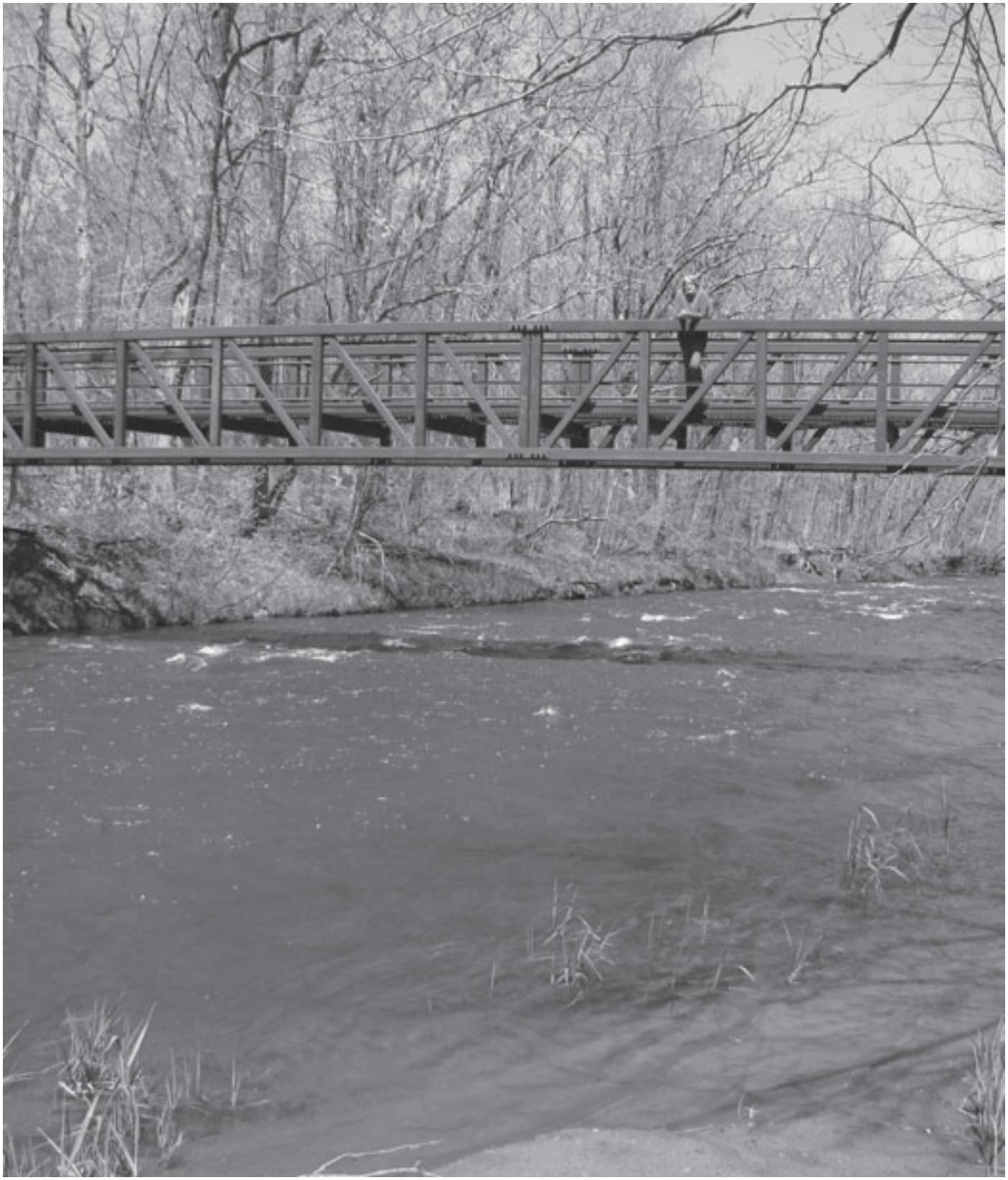
The Governor Knowles State Forest Superintendent will consult at least annually with the St. Croix Band as well as the Great Lakes Indian Fish and Wildlife Commission (GLIFWC) and Voigt Intertribal Task Force on state forest management issues related to Treaty rights. Additional consultation meetings may be scheduled should issues warrant immediate attention.

CONTACT PERSON

The Governor Knowles State Forest Superintendent should be contacted regarding the master plan or other state forest related topics. At the time of this publication, the Governor Knowles State Forest Superintendent contact information is:

Governor Knowles State Forest Superintendent
Wisconsin Department of Natural Resources
325 State Road 70
Grantsburg, WI 54840
715-463-2897

BACKGROUND AND AFFECTED ENVIRONMENT



BACKGROUND AND AFFECTED ENVIRONMENT

SIGNIFICANCE OF THE RPA IN THE MASTER PLANNING PROCESS

The purpose of the Regional and Property Analysis (RPA) is to provide baseline information on the property as well as information on how the property fits into or relates to its larger ecological and social context. The RPA serves as an important source of information for later steps in the master planning process (NR 44). The RPA is prepared during the first phase of the planning process as a stand-alone companion to the master plan. The RPA is organized into four components: Introduction, Regional Assessment, Property Assessment, and Findings and Conclusions.

Regional Assessment

- Provides an overview of the current socio-economic, cultural, ecological, and recreational environment in the region and how they affect the property and its use.
- Identifies significant ecological and recreational needs within the property's region.
- Defines existing and potential social demands or constraints that affect the property that should be considered during the planning process.

Property Assessment

- Provides an overview of the existing conditions on the property, including natural resources, recreational use and facilities, and adjacent land use.
- Describes how the existing conditions relate to management opportunities and needs.

Findings and Conclusions

- Uses the information from the regional and property assessments to draw conclusions about the property's niche, and serves as the basis for the draft Vision Statement and Property Goals.

Combined, these sections consider the economic, ecological, and social conditions, opportunities, and constraints associated with the property on a local and regional scale. State Forest master planning goes beyond forest management, spanning a wide range of issues and uses. Examining the role the GKSF plays in northwestern Wisconsin will contribute to sound, long-term planning.

DESCRIPTION OF THE PROPERTY AND REGION

Located in Burnett and Polk counties in northwestern Wisconsin, the Governor Knowles State Forest (GKSF) encompasses 38,000 acres (of which approximately 20,500 acres are state owned). Originally designated to protect the St. Croix River, the forest is long and narrow, with most of the 55 mile length of the property lying along the St. Croix National Scenic Riverway (managed by the National Park Service). The GKSF is only one mile wide, or less, in most places and is four miles wide at its widest points. It contains a diverse group of natural communities and habitats due to the variety of soils, landforms, and hydrological characteristics. The area surrounding the GKSF is dominated by forests, agriculture, and some notable large wetlands to the east. More than 100,000 acres of Burnett and Polk county forests and five state wildlife areas totaling over 52,000 acres and including the Crex Meadow, Fish Lake, and Danbury State Wildlife Areas, border the forest. It is a popular destination for horseback riders, hunters, hikers, and canoeists and kayakers who come to enjoy the St. Croix River. The GKSF lies within the ceded territory of the Ojibwe Tribes and is located within proximity to tribes of the St. Croix Band of the Lake Superior Ojibwe as well as the Mille Lac Band of Ojibwe in Minnesota.

PAST MANAGEMENT AND USE

The Governor Knowles States Forest, initially named the St. Croix River State Forest, was established by action of the Wisconsin Natural Resources Board in August, 1970. In 1982 the forest was renamed to recognize former Governor Warren Knowles for his active involvement in conservation issues and the outdoor recreation program.

In 1968, public law 90-542, 90th Congress, S119 was enacted and established national policy to preserve "in free flowing condition and to protect the immediate environments for the benefit and enjoyment of present and future generations, certain rivers of the nation which possess remarkable scenic, recreation, geologic, fish and wildlife, historical, cultural or other similar values". Among the rivers designated for such protection is the upper portion of the St. Croix River between the dam near St. Croix Falls, Wisconsin upstream to the dam near Gordon, Wisconsin; its tributary, the Namekagon River, from Lake Namekagon downstream to its confluence with the St. Croix; and the lower portion of the St. Croix River from the

dam near St. Croix Falls, Wisconsin to its confluence with the Mississippi River near Prescott, Wisconsin.

The "Rivers" bill, as this legislation has come to be known, required a cooperative agreement between Northern States Power Company and the federal government (National Park Service). The company agreed to convey without charge, its interest in 100 acres per mile of its river frontage land and to use, manage, and develop lands retained, in a manner complimentary to and consistent with the purposes of the act. Pursuant to agreements reached in accordance with these stated provisions, Northern States Power agreed to donate 4,100 acres of their land to the State of Wisconsin with the contingency that the donation be established as a State Forest. These lands were adjacent to those donated to the National Park Service.

Coordination of the entire river project among the various agencies involved is achieved through the St. Croix Management Commission, which is composed of a representative each from the Minnesota and Wisconsin Departments of Natural Resources, the National Park Service, and the Northern States Power Company.

The majority of the management activities on this forest were initially directed toward recreation due to past use and its association with the St. Croix River. As acquisition has brought more forest land under the ownership of the state, forest management has become a prominent activity. Wildlife related recreation has continued to be high, with hunting, trapping, and wildlife viewing as popular uses. Management to enhance the wildlife habitat is being accomplished through sustainable forest management with the target of achieving a regulated forest.

The previously designated 4,049 acre Kohler-Peet Wildlife Area was incorporated into the newly created St. Croix River State Forest in 1970. In order to carry out the objectives for which Kohler-Peet was acquired, a management plan which included both wildlife and forestry interests, was written and became part of the original St. Croix River State Forest Master Plan (WDNR 1988). In the past, Kohler-Peet Wildlife Area was the most important wintering area for deer in Western Burnett County. Deer utilized the swamp conifers below the escarpment as well as the jack pine on the uplands. Following the 1959 wildfire, the uplands in the Northeast segment were managed for sharp-tailed grouse.

EXISTING ASSESSMENT REPORTS

A varied set of resources were used for this analysis. To assess recreational resources, the Wisconsin Statewide Comprehensive Outdoor Recreation Report (2005-2010) was used, particularly the Great Northwest Regional Profile. The Biotic Inventory and Analysis of the Governor Knowles State Forest (WDNR 2010e) was used for ecological inventories, along with the Natural Heritage Inventory (NHI 2007), Wisconsin Wildlife Action Plan (WDNR 2006d), Ecological Landscapes of Wisconsin (WDNR In Prep), Wisconsin's Biodiversity as a Management Issue (WDNR 1995), and many other sources listed in the bibliography. Analyses reflect the best available data at the time the RPA was written.

REGIONAL ASSESSMENT

REGIONAL LAND USE, OWNERSHIP, PATTERNS, AND TRENDS

The GKSF covers approximately 38,000 acres in Burnett and Polk counties. Since nearly all population, economic, and land use information that is currently available is organized and presented by county, the "region" for this part of the analysis will include all of Burnett and Polk counties along with surrounding Washburn, Barron and St. Croix counties.

Population Centers

The population of the five county region has significantly climbed over the last several decades, from approximately 114,800 in 1970 to over 207,700 in 2008. St. Croix County has experienced the largest population growth in the region over this period, climbing from 34,300 in 1970 to 79,700 residents in 2008. The other four counties have also experienced relatively substantial population growth averaging 45% since 1970 compared to the state average at 22%. The region's population as a whole is projected to increase another 10% through the year 2020, most of that growth occurring in St. Croix County.

The age profile of the region's population is expected to increase as the "baby boomer" generation ages. Although the overall population in the region is expected to remain relatively constant, the number of deaths is projected to exceed births over the next several decades. This decrease is projected to be offset by a continuation of the in-migration of new residents, many of whom are likely to be older residents. Together, these trends will result in a dramatic increase in the 60 and older age cohort.

The region is sparsely populated and largely rural, with most of the growth and housing development occurring in Polk and St. Croix Counties, which are increasingly serving as "bedroom communities" to Minneapolis and St. Paul, Minnesota. The GKSF is located near Grantsburg, which has a population of approximately 1,460. Nearby communities include Siren, Webster, Danbury, Frederic, Luck, Centuria, Balsam Lake and Spooner to the east, and Balsam Lake, St. Croix Falls, Osceola, and Amery to the South. Spooner is the largest of these communities with a population of approximately 2,200. Minneapolis/St. Paul, Minnesota, approximately 75 miles to the southwest and the source of many visitors, is the largest metropolitan area near the GKSF. Other cities relatively near include Rice Lake, Hudson, Menomonie, Hayward, Superior, Eau Claire, and Duluth, Minnesota.

The overall percent of seasonal homes decreased slightly from 1990 to 2000 in all five counties, while the number of occupied housing units (i.e. used as a permanent residence) modestly increased, primarily in St. Croix County. This is likely the result of some seasonal residents in the region converting their status to permanent residents. Nonetheless, seasonal homes comprise 25% of the housing units in the region (Table 3.1). As is seen elsewhere in the state, with the increase in the number of retirees living here, the size of households has declined (US Census 2000).

Land Use Patterns

Land use in the five county region is primarily a combination of forestry and agricultural, both on private and public lands. Approximately 44% of the region is in forest cover, 27% is in agriculture and 19% is grassland. Less than 1% of the land area is in residential, commercial or industrial uses.

The abundant natural amenities of the region, including lakes, forests, and rivers attract seasonal residents, tourists, and in-migrating retirees. This, in turn, has led to a rise throughout the region in housing adjacent to these amenities. In addition,

TABLE 3.1 SEASONAL HOUSING AND TOURISM

County	Population	# of Housing Units	% Seasonal	% Employed in Tourism
Barron	44,963	20,969	11.0%	8.4%
Burnett	15,674	12,582	45.0%	11.3%
Polk	41,319	21,129	19.9%	6.1%
St. Croix	63,155	24,265	1.2%	6.3%
Washburn	16,036	10,814	35.5%	8.9%

Source: U.S. Census 2002.

the proximity of St. Paul and Minneapolis has made the region attractive to permanent commuter residents, a small but growing segment of the region's land use.

The GKSF is not located near any of the state's interstate highways. It is accessed by State Highway 70 or from the east off State Highways 87 and 35. County Highways F and O are the major roads into the forest. There are approximately 63 miles of township roads in the forest that access private residences and recreation sites.

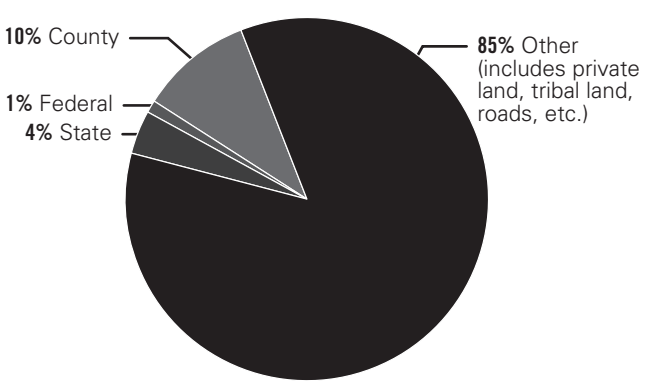
Land Ownership

The vast majority of land ownership in the five county region (85%) is in private ownership and of that, only 1% is private industrial forests (Figure 3.1). Despite the significant level of private ownership, the region remains highly rural with only 1% of the land area in residential, commercial or industrial uses. The remaining 15% of the land is publicly owned, the majority in county forests. Other public ownerships include state and federal.

There are approximately 288,000 acres of county forest in the region. Every county in the region, except St. Croix, has a county forest. The Burnett County Forest lies just east of the northern portion of the GKSF, and the Polk County Forest lies just east of the southern portion of the GKSF. Forest management on the Burnett and Polk County Forests is similar in style to the GKSF.

The largest complex of state owned properties in the region is the Glacial Lake Grantsburg Wildlife Management Complex (GLG), which includes four state wildlife areas: Crex Meadows, Fish Lake, Amsterdam Sloughs, and Danbury State Wildlife Areas totaling 52,000 acres. All of the GLG units, except Amsterdam Sloughs, share a project boundary with portions of the GKSF.

FIGURE 3.1 LAND OWNERSHIP IN BARRON, BURNETT, POLK, ST. CROIX AND WASHBURN COUNTIES



The GKSF is another of the primary state ownerships in this five county region, the bulk of which is located in Burnett County. The total acreage within the GKSF project boundary is approximately 38,000 acres, of which about 20,500 are in state ownership, just less than 2,000 acres are water, and over 9,000 acres are private in-holdings.

Other state ownership in the region includes state fishery areas, other state wildlife areas (not within the GLG), state natural areas and a state park.

Federal ownership is comprised primarily of the St. Croix National Scenic Riverway, which is owned and managed by the National Park Service (NPS). The Riverway includes a corridor of passively managed land that lies adjacent to the St. Croix River totaling approximately 3,000 acres.

Extensive public lands are also found just across the St. Croix River in Minnesota. Collectively, the St. Croix State Park, Chengwatana State Forest, Wild River State Park, and Rock Marsh Wildlife Area comprise over 70,000 acres. Forests dominate much of this acreage.

Information on the management of these properties can be found in the Land Ownership and Management within and Adjacent to the Property section of the Property Assessment found later in this document.

SOCIO-ECONOMIC TRENDS AND CONDITIONS

Forestry and Timber Products

The region's economy has long been centered around the forest products industry, including both the production of raw material and the manufacturing of various equipment and products. Globalization and the divestment of landholdings by large industrial forests are changing the traditional forest products industry. The industry and its raw material supply/demand flows are extremely complex, often described as a "spider web" of interdependence (WDNR 1999). The reduction or expansion of timber supply from an individual property usually does not cause an instant change in price. Over time however, raw material supply will create changes in price.

Timber harvests from state forests are intermingled with timber supplies from other landowners in the region. Changes in the supply of timber (by type or volume) from public lands, particularly county forests, will have an effect on timber prices and wood processing industries; not simply within this region, but throughout the Lake States (WDNR 1999). Table 3.2 shows timber harvests in the Barron, Burnett, Polk and Washburn County Forests in comparison to the GKSF.

TABLE 3.2 ACRES HARVESTED ON COUNTY FOREST AND THE GKSF - COMPLETED SALES*

Forest Ownership	Total Acres	2004	2005	2006	2007	2008	5-Year Average
Barron County	15,945	285	0	0	793	710	358
Burnett County	106,553	1,204	2,378	1,799	673	3,941	1,999
Polk County	17,144	937	568	331	615	884	667
Washburn County	149,004	3,188	2,549	2,014	2,957	3,185	2,779
GKSF	20,500	134	485	0	128	389	227

Source: WDNR, 2009
**A "completed" sale refers to the point in time when the contract obligations are fulfilled, all payments have been made, and associated paperwork is completed.*

From 2004 to 2008, the GKSF sold 1,963 acres of timber with a total sold value of approximately $957,000. Nearly 43,000 cords and 62 thousand board feet of softwood sawtimber have been sold during this five year period. Scrub oak (northern pin oak) accounted for roughly 63% of the cordwood sold, and jack pine accounted for approximately 16%. The remainder of the cordwood sold was miscellaneous hardwoods, aspen, and miscellaneous conifers. The sawtimber consisted of red pine and white pine with most of the volume coming from red pine sawlogs.

From the four county forests mentioned above, approximate acres harvested of each cover type were 8,800 acres of oak/scrub oak, 8,000 acres of red pine, 6,900 acres of aspen, and 3,900 acres of jack pine.

Jobs and Wages

The two largest employment sectors in the region are manufacturing and education and health services (Table 3.3). Not only does this segment of the economy provide a significant number of the jobs, they tend to be among the higher paying jobs in the region. The retail trade sector and arts, entertainment, recreation, accommodation and food service sector are also key employers and, in part, inform the role of tourism in the regional economy. While these sectors are relatively large employers, they also tend to be among the lowest paying jobs in the economy and thus contribute only a modest amount to the region's overall payroll figure. Additionally, these jobs are often part-time and seasonal, contributing to low median wages. Although only about 15% of the lands are publicly owned, the tourism industry still plays a role in the region.

Income

The median household income levels in the five regional counties vary substantially according to their proximity to St. Paul and Minneapolis, Minnesota. Both St. Croix and Polk counties have household income levels above the state median of $40,421, at $54,930 and $41,183 respectively. Barron, Burnett and Washburn counties all fall below the state median at $37,275, $34,218 and $33,716 respectively. This is consistent with non-metropolitan counties elsewhere in the state, particularly those with relatively high percentages of workers in service sectors.

RECREATION RESOURCES

Regional Recreation Supply and Demand

The following sections describe the recreation demand in the region, the supply of opportunities, and trends and issues for future use. Associated tables highlight recreational activities that the region and the Governor Knowles State Forest have in common. Analysis of the GKSF regional recreation is drawn primarily from the 2005-2010 Wisconsin Statewide Comprehensive Outdoor Recreation Plan (SCORP) (WDNR 2006e) which classifies and measures the preferences and needs of a statewide recreating public. SCORP is an invaluable tool in understanding the supply and demand of regional recreation. The plan is updated every five years, and provides information that can help guide recreational planning on state properties. SCORP divides the state into eight planning regions based on a collection of natural resource and tourism assets. The GKSF is located in the Great Northwest SCORP region which includes Douglas, Bayfield, Ashland, Sawyer, Rusk, Barron, Washburn, Burnett, and Polk counties. The Great Northwest has significant natural resource amenities, such as the Namekagon and St. Croix Rivers, which draw recreationists and seasonal homeowners from outside the region. The appeal of this region serves visitors seeking a "wild and remote" outdoor experience (Regional and Property Analysis, Map 3: Regional Recreation).

Region wide data defines and characterizes the differences between areas of the state. Table 3.4 compares the top recreation demands in Wisconsin to the Great Northwest Region. The most popular activities in Wisconsin are water based with nearly 50% of all residents participating in a variety of water sports. The Great Northwest Region has the

highest participation rates in water based recreation in the state. Nature based recreation involves 38% of Wisconsin residents. A typical nature based visitor wants to experience natural surroundings — hiking, camping, visiting wilderness areas. Come winter, snow and ice based activities involve 44% percent of Wisconsin residents.

To analyze recreation supply and demand, it is important to evaluate within the specific context of a given region. Compared to other regions, the Great Northwest Region has a large geographical extent and low population. A metric used to study the relative abundance or scarcity of a recreation resource (recreation location quotient, or RLQ) allows comparison to other regions even though their population and area size differ. The RLQ helps to evaluate what a region's recreation niche may be and where supply is lacking. Overall, the northern half of Wisconsin is providing abundant outdoor recreation for its population, but for its large geographical area, it could be providing more "nature based", "snow and ice", and "viewing and learning" opportunities (see SCORP for descriptions of these categories).

Recreational demand in the Great Northwest Region is largely determined by Wisconsin residents but is also influenced by out-of-state visitors. Minneapolis and St. Paul, Minnesota are about a 1 ½ hour drive from the GKSF. Although more than 300 miles from the forest, residents from the Chicago, Illinois area also recreate here. Popular regional recreational pursuits among these groups include: fishing, sightseeing, camping, picnicking, hiking, birding, boating, and canoeing.

Due to it's rural location in a lesser developed portion of far northwestern Wisconsin, the GKSF provides less intensely used public land than other state forests such as the Northern Highland-American Legion located to the east. Towns are rural and widely dispersed and large areas of public land are available within close proximity to the forest. The Crex Meadows Wildlife Area as well as Burnett and Polk County Forests adjoin the GKSF boundary to the east and the St. Croix National Scenic Riverway runs along the property to the west.

Popular outdoor recreational activities in the Great Northwest Region of the SCORP study that are also available on or near the GKSF include: driving for pleasure, any type of boating, swimming in lakes and streams, snow and ice activities, freshwater fishing, visiting a wilderness or primitive area, day hiking, big and small game hunting, canoeing, and snowmobiling.

TABLE 3.3 EMPLOYMENT BY INDUSTRY IN THE GKSF REGION

	Barron	Burnett	Polk	St. Croix	Washburn	Regional Total
Agriculture, forestry, fishing, hunting and mining	1,691	300	991	1,093	389	4,464
Construction	1,432	610	1,520	2,581	647	6,790
Manufacturing	5,769	1,446	5,780	8,268	1,186	22,449
Wholesale trade	545	143	530	837	155	2,210
Retail trade	2,774	807	2,074	3,761	1,010	10,426
Transportation, warehousing and utilities	920	281	885	2,131	402	4,619
Information	466	112	330	610	80	1,598
Finance, insurance, real estate, rental and leasing	695	235	780	2,471	280	4,461
Professional, scientific, administrative and waste management services	808	244	948	2,357	278	4,635
Educational, health and social services	4,070	1,271	3,968	6,125	1,286	16,720
Arts, entertainment, recreation, accommodation and food services	1,892	778	1,262	2,209	638	6,779
Other services (except public administration)	969	309	853	1,345	381	3,857
Public administration	552	357	632	1,117	413	3,071
Total	**22,583**	**6,893**	**20,553**	**34,905**	**7,145**	**92,079**

Source: US Census, 2000

TABLE 3.4 REGIONAL AND STATE RECREATIONAL PREFERENCES

Activity	% Wisconsin	% Great Northwest
Visiting a Wilderness Area	38.3	62.2
Freshwater Fishing	40.7	49.4
Snow/Ice Activities	44.4	48.7
Day Hiking	35.0	42.7
Hunting (any type)	21.7	37.7
Off-road Driving (with ATV)	23.4	33.9
Developed Camping	32.3	30.5
Canoeing	20.5	29.0
Snowmobiling	18.3	26.5
Primitive Camping	16.0	18.9
Cross-country Skiing	11.4	17.3
Coldwater Fishing	13.9	13.9
Nature based Education	16.3	9.8
Horseback Riding (any type)	9.8	9.2
Off-road Motorcycling	5.9	5.2
Horseback Riding on Trails	8.1	4.1

Source: WI SCORP (2005-2010) (WDNR 2006e)

Water Based Recreation

Recreation along, on, and in our waters is important to the character and quality of life in Wisconsin and supports a vital tourism industry. In Burnett, Polk, Washburn and Barron, the counties surrounding the GKSF, there are a range of water resources including over 100,000 acres of lakes, 6,000 acres of flowages and 3,500 miles of inland shoreline, trout streams and canoe/kayak miles.

The St. Croix River

The GKSF acts as a resource protection zone for the St. Croix National Scenic Riverway. The St. Croix River is a sizeable and significant river resource in Wisconsin. It meanders 154 miles southward from the St. Croix Flowage, in Douglas County, through Burnett, Polk, and St. Croix Counties to its confluence with the Mississippi River at the southern edge of Pierce County.

The St. Croix River was designated as a National Scenic Riverway in 1968 for its outstandingly remarkable scenic, recreational and geologic values. It is one of the last undisturbed, large floodplain rivers in the upper Mississippi River System. The Riverway is an unrivaled combination of exceptional natural and cultural resources and scenic, aesthetic and recreational values.

High water quality, year round water levels for paddling, occasional whitewater drops and the opportunity for multi-day canoe trips with river-side campsites, make this one of Wisconsin's unique recreational resources. The National Park Service owns river accessible campsites on the St. Croix, which provide a more remote camping experience than at a traditional family campground. Regionally, the Flambeau and Namekagon Rivers offer similar paddling experiences. The Bois Brule River offers paddling in the region but it does not offer primitive overnight canoe camping opportunities.

Also part of the National Scenic Riverway and a tributary of the St. Croix, the 98 mile long Namekagon River flows southwest from Namekagon Lake in Bayfield County through Sawyer and Washburn Counties into Burnett County where it joins the St. Croix, 45 miles south of the city of Superior. This narrow, twisting river varies from an intimate cold-water trout stream, closed in by a predominantly coniferous forest, to a slow-moving body of water which flows through marsh and swamp land. It is advertised as "a great alternative to the increasingly busy boundary waters." The National Park Service also maintains primitive campsites along this river as well, most of which are accessible by water only. Most of the river is undeveloped offering the canoeist or kayaker a genuine wilderness experience.

A number of river based paddle sport opportunities exist within the region. High quality water resources and a network of glacial watersheds throughout northern Wisconsin provide water recreation of all types. The St. Croix, Namekagon, Flambeau and Bois Brule Rivers vary in character, size, flow, and surrounding vegetation and land forms.

Additional canoe opportunities exist in the region but are less popular due to factors such as difficult access, frequent low water, poor water quality, and in-stream hazards.

The St. Croix River is somewhat unique in the region due to the diversity of resources and recreational opportunities the river provides. It offers wilderness-like, remote recreational experiences and protected shoreline, but all within the protection of the National Park Service. This scenic river resource presents a blend of fishing, boating, swimming, camping, and wildlife viewing opportunities.

Land Based Recreation

Although water based recreation is a major draw, public land in the region also provides an abundant supply of land based recreation opportunities.

Tourism is a large and growing industry here and the demand for facilities and trails is increasing from visitors to the region (WDNR 2006e). The region has an established set of trails for biking, skiing, hiking, horseback riding, ATV riding and snowmobiling. Trails are located in the Governor Knowles State Forest, state wildlife areas, and local county forests.

Trails in the region tend to be multi-use but are occasionally designated as single use. Most trails are for hiking, biking, horseback riding, and ATV riding in the warm season and cross-country skiing and snowmobile riding along with some ATV use in the winter. Even though these trails allow multiple uses they can, in some cases, create a single use trail situation especially when incompatible recreation use types are allowed on the same trails. For example, even though bicycles are allowed on the Tuscobia Trail, the trail is largely used by ATVs.

The following sections describe the regional supply and demand for some popular land based recreational activities located within a four county subset of SCORP's Great Northwest Region. This subset includes Burnett, Polk, Washburn and Barron Counties. Additionally, since this property is located in such close proximity to Minnesota, there are some instances where recreation data from that state has been included.

Biking

Demand for biking opportunities is high across the state for Wisconsin residents. Mountain or off-road biking is the fifth most popular nature based activity and road bicycling is the sixth most popular activity in a developed setting (WDNR 2006e).

Road Biking

There are few designated bicycle trails in the region and biking on local roads and highways can be challenging as roads are narrow with little to no shoulders. These types of roads make road biking dangerous and less desirable. Burnett County offers several "road routes" totaling 23 miles. These routes provide scenic bicycling opportunities on county and town roads. Demand for road biking is high as the supply of trails was identified as a shortage in the region (WDNR 2006e).

Although not true road routes, biking is allowed on the Tuscobia, Wild Rivers, Cattail, and northern section of the Gandy Dancer State Trail. The trail condition, because they are not paved, may be better suited for mountain bikes, but the trail experience is what a road cyclist would typically be seeking rather than someone looking for an off road experience. However, ATV use on these trails during a portion of the year makes them difficult to use by cyclists. The 47 miles of the southern section of the Gandy Dancer State Trail is more suitable as no ATVs are allowed on this portion of the trail. Within the GKSF, there are no designated road bike routes; however, all paved roads are open to this use.

Mountain Biking

While trails for mountain biking are abundant in parts of the region, biking opportunities near the forest are very limited with Burnett County only providing 19 miles of off-road and mountain bike trails. There are no designated mountain bike trails within the GKSF. With approximately 90 miles of trails in the four counties surrounding the GKSF, there is an insufficient amount of trails for the demand (WDNR 2006e).

Locally, there is not a significant demand for cycling opportunities. Most cycling that occurs on the GKSF is a secondary activity. In other words, visitors do not necessarily come to the GKSF to bike, but when they are here they may bike along some of the paved roads.

Cross-Country Skiing

Northwest Wisconsin is a region rich in Nordic skiing tradition and history, with some of the best cross-country ski trails in the country. Not only are there hundreds of miles of groomed trails, but they provide for a range of skill levels from family-oriented to athletically challenging.

The demand for ski trails in the GKSF region is not extremely high, although a lack of cross-country ski trails within the four surrounding counties was identified in the 2005-2010 SCORP. Historically, snow conditions have been favorable and skiers from southern Wisconsin travel to this region to find snow.

On the forest, there are 8.5 miles of groomed cross-country ski trails. In addition, many of the other recreational trails on the property are available for un-groomed skiing. There are also a few private providers of cross-country ski trails such as the Balsam Branch and Somers Lake ski areas in Polk County, Timberland Hills in Burnett County, as well as several miles of trails owned by different townships and villages in the surrounding four counties.

Hiking

According to the 2005-2010 SCORP report there is a shortage of hiking trails in the Great Northwest Region; however, this shortage may be perceived rather than actual due to the fact that many hikers do not know that all public lands allow hiking, such as on old logging roads within state forests. Many hikers prefer signed and designated trails instead. Additionally, almost all ski trails are open for hiking when there is no snow on the trails.

There are several long distance trails which run through the four county area surrounding the GKSF, including a 9.5 mile section of the Tuscobia Trail. This portion of the Tuscobia is certified as part of the Ice Age National Scenic Trail which travels through 30 counties on state, federal, county and private lands, connecting dozens of communities. Additionally, there are several other long distance trails in the area including the Gandy Dancer, Cattail, Wild Rivers and Stower Trails.

Within the GKSF, there are 40 miles of developed and designated hiking trails. There are also five miles of self-guided interpretive trails which pass through scenic areas highlighting the diverse nature of the forest.

Equestrian Trails and Camping

There are over 160 miles of designated equestrian trails in the four counties surrounding the GKSF (within the Great Northwest Region). One such trail is the Cattail Trail in Polk and Barron Counties. This 19 mile multi-use trail does not provide an equestrian campground. Besides the GKSF, the four county region does not offer very many opportunities for equestrian camping.

Horse trails and camping opportunities are also available across the river in Minnesota. Within 100 miles of the GKSF, there are 432 miles of state trails open to equestrian riders. Within Minnesota's state parks and state forests there are an additional 577 miles. Minnesota State Parks and Forests offer 38 campgrounds designated for horseback riders. Minnesota State Forests (within 100 miles of the GKSF) offer 273 horse campsites. Minnesota State Parks and Recreation Areas include an additional 249 equestrian campsites.

The GKSF has nearly 40 miles of designated equestrian trails. The majority of these miles are loop trails, which are part of the Trade River Equestrian Trail, located in the southern portion of the forest. Each loop trail varies both in length and in which additional uses are allowed. Additionally, there are 26 miles along the snowmobile and winter ATV trail open to horse use. This is a very popular sport on the forest with a very engaged friends group. The forest also has a new equestrian campground which can accommodate riders and provide access to many of the equestrian trails on the property.

Motorized Recreation

ATVs

There are over 800 miles of winter ATV trails and 400 miles of summer ATV trails in the Great Northwest Region. The four county area surrounding the GKSF has only half as many miles with an average of 110 miles in each county (Table 3.5). The trails are highly connected offering many routes over 100 miles in length. Many are multi-use trails and usage is coordinated with snowmobiles and seasons when the trails can be driven on without damage. The Wisconsin Department of Tourism surveyed Wisconsin ATV users and found that the majority travel to areas specifically to ride their ATVs on trails and stay an average of three nights in that location (WDT 2004). This is an important tourism component in regions like the Great Northwest where there are many trails. Twenty ATV clubs exist in the region providing group rides, education, trail maintenance and services to members. The majority of trails are on county and federal land. Camping is available on or near the county forest trails and the Tuscobia State Trail.

Converted from abandoned railroad beds, the Tuscobia, Wild Rivers, Cattail, and northern section of the Gandy Dancer State Trails, offer nearly 250 miles of ATV riding opportunities. The Tuscobia State Trail is a 74 mile multi-use linear trail. The primary use of the Tuscobia is ATV riding in summer and snowmobiling in the winter, but other permitted uses include hiking, biking, and equestrian.

Burnett County administers a 66 mile linear ATV trail system in the northern portion of the county. Trails are open seasonally allowing closures for high fire danger in the early spring. ATVs are allowed on all existing logging roads, fire lanes, and snow trails that are on county forest land from September 16th through November 30th each year, as long as the trails are not bermed, gated, or signed as closed. The primary use of these trails is for hunting access. Polk County has a five mile closed loop ATV trail adjacent to the GKSF in Sterling Township. Use of this trail is prohibited during early spring due to fire danger.

The GKSF allows winter ATV use on its 32 mile snowmobile trail. In the warm weather months, portions of this trail are available for equestrian use. There are no trails on the property open to ATV use during warm, non-snow months.

Snowmobiling

Snowmobiling is a well-established and popular winter activity in Wisconsin. There are roughly 2,700 miles of state-funded

TABLE 3.5 ATV TRAIL MILES BY SEASON

County	Winter	Spring/Summer/Fall	Total
Barron	20	20	40
Burnett	109	52	161
Polk	28	36	64
Washburn	108	52	160
Total	**265**	**160**	**425**

trails in the Great Northwest Region (WDNR 2006e). Of the 2,700 miles of trail in the Great Northwest Region, over 1,000 miles are found within the four counties surrounding the GKSF (Table 3.6).

The GKSF provides 32 miles of snowmobile trail, which serve as the main connection between Burnett and Polk counties' trail systems.

Camping

Camping is a popular recreational activity in the Great Northwest Region. Opportunities vary from primitive campsites to modern RV campgrounds with multiple amenities. Historically, camping in rustic campgrounds has been part of the appeal of the northern forest for vacationers, but lack of electric campsites in the region was sited in the 2005-2010 SCORP as a recreational shortage. Campers desire electricity to power their campers or outdoor appliances. Some say that providing electricity is a quieter option than allowing electrical generators for charging camper batteries. In some cases, campers request an electrical source to power health maintenance equipment (e.g. a breathing apparatus). Additionally, the trend has shifted toward camping with pull-behind car campers and trailers. These larger units often require more space for set-up and parking. Many more campers are demanding these amenities and services. Figure 3.2 shows the current preferences in camping type. Today, 49% of people camping in Wisconsin do so with an RV, whereas 32% are tent campers. RV camping is a growing trend statewide.

Modern amenities and fully developed campgrounds with electric campsites have typically been provided by the private sector as well as county and state parks, whereas the traditional niche for federal and state forests has been to offer rustic, non-electric campsites. Only a few electric sites can be found on the northern state forests and are typically reserved for those with disabilities. This is the case for the two sites at the St. Croix Family Campground and the three sites at the Trade River Equestrian Campground that supply electric hook-ups. Neither of the two campgrounds on the GKSF have showers.

Camping opportunities are limited in the GKSF region (Table 3.7). There are just over 450 campsites available within the four counties surrounding the GKSF. The majority of these sites are publicly owned with no electric hook-ups. Most of the rustic camping opportunities can be found on municipal, county, state, and federal owned lands.

County forests are the largest public supplier of campsites in the region. They offer a greater variety of services such as electric sites, pressurized water, flush toilets, and day use areas than other public campgrounds. Burnett, Washburn,

TABLE 3.6 SNOWMOBILE TRAIL MILES

County	Funded Miles	Unfunded Miles
Barron	275	0
Burnett	237	100
Polk	350	7
Washburn	240	10
Total	**1,102**	**117**

FIGURE 3.2 PREFERENCES IN CAMPING BY TYPE (WDNR 2006E)

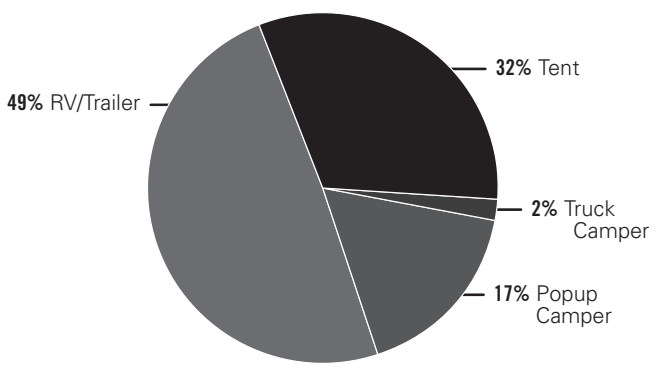


TABLE 3.7 PUBLIC CAMPING OPPORTUNITIES WITHIN BARRON, BURNETT, POLK AND WASHBURN COUNTIES

	# of Electric Tent Sites	# of Non-electric Tent Sites	Total # of Sites	% of Total Sites with Electric
Federal	0	82	82	0%
State	75	81	156	48%
County	142	78	220	65%
Total	**217**	**241**	**458**	**47%**

Polk, and Barron counties have over 220 sites on county forest land. Most of the camping opportunities in the area are in Washburn County to the east of the property.

County family campgrounds within 100 miles of the GKSF in Minnesota are limited. There are only two County campgrounds within this radius and both cater to RV camping with the majority of their sites offering full hook-ups for electric, water, and sewer.

State owned campgrounds in the region are limited. There is only one state park, Interstate State Park, which provides 85 campsites. There are three campgrounds on the GKSF, including one family campground, one equestrian campground, one outdoor group camp, and sites for primitive backpack camping. In total, 76 sites are available. Five sites have electric hook-ups available, but these are reserved for those campers needing electricity to power health maintenance equipment. Even though the property is within close proximity to the St. Croix River, the GKSF does not operate any canoe campsites.

Minnesota State Parks and Forests are the largest public supplier of campsites within 100 miles of the GKSF across the St. Croix River in Minnesota. Amenities range from vault toilets to flush toilets to no toilets; sites with or without electric hook-up; and sites with showers and running water to sites with only hand pumps.

There are currently 492 privately owned campsites within the surrounding four counties of the GKSF. The majority of these sites offer full hook-ups (water/sewer/electric service) for RVs, and pull-through campsites for large vehicles. A number of these private campgrounds offer additional lodging options such as cabins, cottages, or trailer rentals with only a few offering tent camping areas.

There are approximately 111 privately owned campgrounds within 100 miles of the GKSF in Minnesota. The majority of these sites offer full hook-ups which include water, sewer, electric, and sanitary dump services for RVs. A number of these private businesses offer other lodging options such as cabins, cottages but only a few offering tent camping areas.

Within the National Scenic Riverway, which is operated by the National Park Service in St. Croix Falls, there are 115 primitive canoe campsites located along the St. Croix and Namekagon Rivers. Most of these sites are only accessible by boat or canoe and amenities vary from site to site. All of the sites have fire rings, only a few supply primitive toilets, and most do not supply drinking water.

Hunting and Trapping

There are over 500,000 acres of lands available for public hunting in the four county region surrounding the GKSF. Hunting is allowed on all undeveloped public property, private Managed Forest Law (MFL) land designated as open, and on industry owned forest lands in the region. This includes the GKSF, state wildlife lands, and county forests. Burnett County alone has around 150,000 acres of public land open to hunt. Common species in the area include black bear, Canada Geese, ducks, Ruffed Grouse, white-tailed deer, Wild Turkey and Woodcock.

The majority of the GKSF region (Burnett, Washburn and most of Polk and Barron Counties) was in a designated white-tailed deer "Regular Control Unit" for 2009 with only a limited number of antlerless deer tags available for most units. Small portions of Polk and Barron Counties were in a "Herd Control Unit" due to a herd size that exceeded overwintering goals. Additional gun and archery hunting of antlerless deer is allowed to meet herd reduction goals.

The Crex Meadows State Wildlife Area is a 30,000 acre sedge marsh and brush prairie habitat making the area a utopia for wildlife. Management focuses on restoring wetland and brush prairie habitats. With the exception of the 2,400 acre refuge, the entire area is open to hunting and trapping. Crex provides abundant hunting opportunities for deer, bear, waterfowl, and a variety of small game. Trappers have opportunities for nearly every furbearer found in Wisconsin.

Other state wildlife areas in the region that offer hunting opportunities include Fish Lake, Danbury, and Amsterdam Sloughs.

Wildlife Viewing

The SCORP report states that roughly 65% of Wisconsinites enjoy viewing and photographing nature and visiting nature centers.

Crex Meadows Wildlife Area is a major wildlife viewing destination in Wisconsin. Crex is home to 270 species of birds and 600 species of plants and is open year round, with something to do and see during every season. Crex receives more than 100,000 visitors each year. The popularity of Crex is attributed to its large size, spectacular vistas, and great diversity of plants and wildlife. A system of well maintained roads, observation areas, and a rest area provide excellent access and wildlife viewing opportunities. Crex is considered an "important bird area", along with the Fish Lake State Wildlife Area. Crex is also one of the few places in Wisconsin that offers good opportunities for viewing Sharp-tailed Grouse.

Visitors floating the National Scenic Riverway have a unique viewing experience of the GKSF and the surrounding forested river valley. Both aquatic and terrestrial wildlife commonly viewed include bear, deer, otter, beaver, Bald Eagles, Osprey, Red-breasted Mergansers, crayfish, and dragonflies. Many boat landings provide river access and the Riverway provides the scenic route. In 2009, the St. Croix National Scenic Riverway saw over 560,000 recreational visitors (NPS 2010a).

Outdoor Education and Interpretation
There are a few developed facilities for nature education and interpretation in the GKSF region including the Crex Meadows State Wildlife Area Visitor Center, Interstate State Park, and the St. Croix River National Scenic Riverway Visitor Center. Crex Meadows and the NPS Visitor Center are both within close proximity to the GKSF. Additionally, the NPS Visitor Center in St. Croix Falls is 30 miles away. The next closest facilities are the Hunthill Audubon Sanctuary near Spooner, Wisconsin and the Northern Great Lakes Visitor Center in Ashland, Wisconsin.

On the GKSF, opportunities exist to educate visitors, hunters, campers, and river users about recreational opportunities and facilities on the forest, sustainable forest management activities, regulations and safety.

Regional Recreational Trends, Issues, and Needs
According to SCORP, various factors influence visitors' travel, visitation, and recreation participation. Recent changes in our economy are an example. Visitor perceptions of recreation issues specific to the Great Northwest Region include:

- Lack of funding for park and recreation maintenance
- Increasing ATV usage and associated impacts
- Perception of logging on public lands
- Noise pollution from motorized activities
- Possible loss of silent sport facilities
- Loss of public access to lands and water
- Lack of outdoor education centers and naturalists

Additional trends and issues that could affect the GKSF include:

- Conflicts between silent sports and motorized uses
- Conflicts of access management
- Aging population of user groups; changing demographics and interests of future generations; new forms of recreation
- Changes in recreational and seasonal housing
- Increased cost of fuel and travel, perhaps reducing the number of visitors to the GKSF
- Fragmentation of forest lands; loss of habitat and open space due to land development; loss of open industrial lands for public use
- Increased waterfront development

Understanding the supply and demand of recreational resources is an important component of planning for recreational opportunities. If there is a demonstrated shortage of a resource, it is important to know what future demand for that resource will be. If there is a declining demand, it may not be wise to increase the supply. Table 3.8 compares the resource shortage to the level of demand for activities associated with the Great Northwest Region. This table only includes activities that are consistent with the GKSF's mission or activities the forest can support.

REGIONAL ECOLOGICAL SETTING

Ecological Landscape
Ecological Landscapes are areas of Wisconsin that differ from each other in ecological attributes and management opportunities. They have unique combinations of physical and biological characteristics that make up the ecosystem, such as climate, geology, soils, water, or vegetation. They differ in levels of biological productivity, habitat suitability for wildlife, presence of rare species and natural communities, and in many other ways that affect land use and management. Much of the information presented here is taken from The Ecological Landscapes of Wisconsin Handbook, a collaborative effort by Department of Natural Resources (DNR) DNR staff from the Division of Forestry, Bureau of Endangered Resources, Division of Water, and the Bureau of Science Services.

TABLE 3.8 REGIONAL RECREATION SHORTAGES AND DEMAND

Supply Shortages	Level of Demand
Boat Launches - carry-in (kayaking & canoeing)	Increasing
Campgrounds (tent & RV)	Stable & Increasing
Parks (picnicking)	Increasing
ATV Trails	Stable
Cross-country Ski Trails	Stable
Trails - dogsled	N/A
Horseback Riding Trails	Stable
Off-road Truck and Motorcycle Trails	Increasing
Snowmobile Trails	Decreasing
Snowshoe Trails	Increasing
Water Trails (kayaking & canoeing)	Increasing
Bicycle Trails (road biking)	Increasing
Shooting Ranges	N/A

According to the WDNR's system, the Governor Knowles State Forest and its surroundings are located within two Ecological Landscapes, the Northwest Sands and the Northwest Lowlands. The riparian zone adjacent to the St. Croix River and extending inland to the escarpment defines the portion of the GKSF associated with the Northwest Lowlands. The Northwest Sands Ecological Landscape refers to the dry, sandy upland areas of GKSF, above the escarpment. The St. Croix River valley forms a significant portion of the boundary between the Northwest Sands and the Northwest Lowlands Ecological Landscapes.

The Northwest Sands Landscape is characterized by heavily forested uplands, forested and unforested lowlands (Table 3.9), and a number of major river systems, including the St. Croix, Namekagon, Yellow, Clam, and Wood Rivers, and the portion of the Trade River that is within the GKSF. Most of the large tracts of forested uplands are publicly owned or owned by private industrial forest entities. There are also several large, publicly owned properties that have a focus on restoration and management of Pine Barrens, Dry Forest Communities and Northern Sedge Meadow. The Northwest Lowlands is characterized by upland forests of aspen and second-growth northern hardwoods, set in a matrix of extensive peatlands dominated by black spruce and tamarack (Table 3.9). The Northwest Lowlands also contain large tracts of publicly owned lands especially within Douglas County. This landscape features a major river system (the St. Croix), extensive areas of forested wetlands and some of the largest tracts of un-fragmented forest cover in Wisconsin. The forested wetlands include peatland types dominated by black spruce and tamarack, and swamp hardwood stands of black ash with white cedar inclusions. Sharing the St. Croix River in common, there are several opportunities to provide ecological corridors and connections between these two Landscapes, further enhancing habitat for both common and uncommon flora and fauna.

Northwest Sands

The Northwest Sands Ecological Landscape is a large glacial outwash system consisting of two major landforms: flat plains or terraces along glacial meltwater channels, and pitted or "collapsed" outwash plains containing kettle lakes. Soils are deep sands, low in organic material and nutrients.

TABLE 3.9 GKSF ACREAGE WITHIN THE NORTHWEST SANDS AND NORTHWEST LOWLANDS ECOLOGICAL LANDSCAPES, FORESTED VS. NON-FORESTED

Ecological Landscape	Forested Acres	Non-forested Acres
Northwest Lowlands	8,542	1,758
Northwest Sands	9,080	1,019

Note: Does not include private acreage.

Historic vegetation at the time of the General Land Office survey was predominantly jack pine and scrub oak forest and barrens. White and red pine forests were also a sizable component of this Ecological Landscape. Numerous barrens occurred in the southwest half of the Ecological Landscape, and a few large barrens within the northeast half. Most of the trees in the barrens were jack pine, but oak savannas also occurred in the south central part of the Landscape.

Current vegetation is a mix of forest, agriculture, and grassland with some wetlands in the river valleys. Pine, aspen-birch and oak equally (27% each) dominate the forested area. The maple-basswood, spruce-fir, and lowland hardwood forest type groups occupy small percentages of the Ecological Landscape. Within the open lands, there is a relatively large proportion of grassland and shrubland, a small but locally significant amount of emergent/wet meadow and open water, and very little row-crop agriculture.

Fire-adapted vegetative communities are a major feature of the Northwest Sands. Historically, fire was prevalent, due to sandy soils and extensive areas over which a wildfire could run unimpeded. As a result, fire-adapted vegetation was abundant. Today this is best expressed in the varied structural permutations of the Pine Barrens community, and the extensive dry forests composed mostly of pines and oaks.

Fire frequencies are derived from a number of historical documents, records and various analyses; each with its own advantages and limitations. Fire frequency can be estimated with some confidence, but fire occurrence records rarely go back for more than a century. Because pre-European settlement fire regimes are important considerations for many fire historians and ecosystem managers, this limitation can be challenging to work with (Dickmann and Cleland 2002).

Another complexity of historic fire use relates to fire cause. It is unclear which, or how many, ignitions were lightning caused and which were human caused with the intent of using fire to accommodate the social needs of the period. This is important when defining natural disturbances. Few would argue that fire was a dominant factor that shaped the Northwest Sands

Ecological Landscape. Whether the fires were natural or not is up for debate.

Fire cycles on barrens communities in the Great Lakes region have been estimated to be from 15-60 years. Lightning may have been a common source of ignitions, but barrens probably were burned regularly by indigenous people to maintain their open, easily traveled structure and to encourage blueberry production. In the jack pine communities of the Great Lakes region, fire intervals are estimated to be from 10-70 years. Fire occurrence in red and white pine communities was less frequent, with return intervals of 100-250 years. Early seral hardwood communities of the Great Lakes region, such as aspen-birch, have fire cycles in the 150-300 year range. Fires in the wetland forest communities were rare with fire cycles in the range of 2,000-6,000 years for white cedar dominated swamps (Dickmann and Cleland 2002).

The clusters of seepage lakes, wet meadows and marshes, and the major river corridors are also highly significant and representative features of this Ecological Landscape, and constitute major conservation opportunities. Several hundred kettle lakes are found in the pitted outwash plain. The headwaters of the St. Croix-Namekagon and Brule River systems are located here among flat plains, sedge meadows, bog complexes, and major barrens. The overall pollution levels of watersheds, streams and lakes that have been ranked (6 out of 23) in the Northwest Sands Ecological Landscape are about average according to the Wisconsin DNR. Groundwater conditions are among the least polluted and most vulnerable in the state for the 16 watersheds that have been ranked.

Ecological Management Opportunities within the Northwest Sands

Within the large publicly owned lands of the Northwest Sands, opportunities exist to provide a continuum of dry upland community types, ranging from relatively open Pine Barrens to closed-canopy Northern Dry Forest. The Pine Barrens type is globally rare, and provides habitat for numerous rare species of flora and fauna.

Grassland birds, as a group, are declining across the Midwest, with several species listed as rare at both the state and federal level. The Northwest Sands is one of the most important areas for grassland bird management in Wisconsin.

This landscape contains an abundance of lakes, streams and wetlands. There are opportunities to restore and maintain the ecological integrity of these features by managing them in conjunction with the adjacent uplands, providing habitat corridors for flora and fauna species.

There are many opportunities for research and monitoring in order to better understand the life histories and habitat needs for rare wildlife species associated with the Northwest Sands. Examples include: rare invertebrates of the St. Croix-Namekagon River system, rare invertebrates associated with Pine Barrens and several vertebrates, including Yellow Rail, Connecticut Warbler, Sharp-tailed Grouse, Franklin's ground squirrel, bullsnake, Blandings turtle, and wood turtle.

High priorities for future field survey attention include Northern Dry Forest and Northern Wet Forest community types.

Northwest Lowlands

The Northwest Lowlands Ecological Landscape forms a triangular wedge in northwestern Wisconsin, bounded on the north by the Superior Coastal Plain and on the south and east by the Northwest Sands. Significant portions of this landscape extend westward into the state of Minnesota. The major landforms are ground and end moraines, with drumlins present in the southwestern portion. Topography is gently undulating. Bedrock outcroppings are rare except in association with the basalt ridge that follows the Douglas County fault line and forms part of the northern boundary of the Northwest Lowlands. Waterfalls, cliffs, exposed bedrock glades, and rock-walled gorges are associated with the bedrock features. Local exposures of sandstones and/or conglomerates occur in some of these gorges. Soils are predominantly loams, with significant acreages of peat deposits in the poorly drained lowlands.

The historic upland vegetation of this Landscape was almost entirely forest, composed mostly of paper birch, fir, sugar maple, aspen, and white spruce, with some white and red pine on the drier ridges. The lowlands supported extensive wet forests of black spruce and tamarack, and some white cedar and black ash swamps. The notes made by the U.S. General Land Office surveyors during the mid-nineteenth century indicate that overall tree densities were high in this Ecological Landscape, and witness trees included many large individuals. The Landscape at that time was likely a mosaic made up of young, recently disturbed forests interspersed with patches of old-growth.

The present-day forests remain extensive and relatively unbroken, occupying about 68% of the landscape according to WISCLAND (WDNR 1993). Forests consist mainly of aspen, paper birch, sugar maple, basswood, spruce, and fir. Minor amounts of white and red pine and red oak are also present.

Older successional stages are currently rare. Large undisturbed peatland complexes are composed of mosaics of black spruce-tamarack swamp, muskeg, open bog, poor fen, shrub swamp, and white cedar swamp. Among the notable sensitive species here are the gray wolf, moose, Gray Jay, lesser purple fritillary, subarctic darner, and bog bluegrass. Many birds and invertebrates with generally boreal ranges are found here. Road density is notably low in the northern section of this Ecological Landscape.

This heavily forested Ecological Landscape occupies a major drainage divide, and contains the headwaters of many streams flowing north toward Lake Superior or south toward the St. Croix River system. Among the important rivers are the St. Croix, Black, Tamarack, Spruce, and Amnicon. Lakes are uncommon, and are typically associated with peatland complexes. Rare aquatic species include the river redhorse, gilt darter, and several dragonflies and damselflies. Water quality is relatively good in this area with the third best ranking for overall watershed pollution levels according to Wisconsin DNR.

Ecological Management Opportunities within the Northwest Lowlands

The Northwest Lowlands contains several large tracts of publicly owned lands, providing an excellent opportunity to maintain large blocks of contiguous forest land and increase the diversity and age of tree species, especially increasing the amount of native conifers in the forest composition.

This Landscape contains wide-ranging wildlife species such as black bear, bobcat, and gray wolf. Maintaining large blocks of contiguous forest land provides significant benefits for these and uncommon wildlife species, such as American marten and moose, both of which are occasionally found in the Northwest Lowlands.

The diversity of aquatic organisms in the St. Croix River system is exceptionally high and protection of the St. Croix's water quality should remain a priority. This can be achieved, in part, by buffering and protecting the seeps that occur along the escarpment at GKSF, which provide significant inputs to the St. Croix River system.

The St. Croix River corridor is an important habitat feature for migratory species of birds which use the forested areas adjacent to the river during spring and fall. With the large amount of public lands within this landscape, there is an opportunity to provide strong protection to the lands adjoining the St. Croix River, its tributaries, and the entire corridor.

The Northwest Lowlands is considered the core area in the state for the continentally declining Golden-winged Warbler. Although the Northwest Lowlands lies primarily north of the GKSF, some of the lowland areas of the GKSF along the river are known habitat for the Golden-winged Warbler.

Plant and plant community survey priorities in this landscape are within the large remote peatlands, spring seepages, and bedrock habitats.

Rare Animals

Wisconsin's Natural Heritage Inventory (NHI) Working List includes those species that are listed either at the Federal or State level. As of September 2007 (WDNR 2007), NHI documented 49 rare fauna within the Northwest Lowlands Ecological Landscape including one mammal, six birds, three herptiles, seven fishes, and 32 invertebrates. These include one federally endangered species, one candidate for future listing, five Wisconsin Endangered species, 10 Wisconsin Threatened species, and 34 Wisconsin Special Concern species. NHI documented 100 rare fauna within the Northwest Sands Ecological Landscape including three mammals, 28 birds, four herptiles, seven fishes, and 58 invertebrates. These include one federally endangered species, one candidate for future listing, five Wisconsin Endangered species, 11 Wisconsin Threatened species, and 79 Wisconsin Special Concern species.

Rare Plants

The rare plant database of WDNR's Natural Heritage Inventory as of September 2007 (WDNR 2007) contains records for 41 vascular plant species occurring within the Northwest Sands Ecological Landscape that are currently listed as Endangered (4), Threatened (9), or Special Concern (22) by the state of Wisconsin. In the Northwest Lowlands Ecological Landscape, the NHI contains records for 21 vascular plant species that are currently listed as Endangered (3), Threatened (5), or Special Concern (13) by the state of Wisconsin.

Conservation Opportunity Areas

Wisconsin's Wildlife Action Plan (WDNR 2006d) identifies several Conservation Opportunity Areas (COAs) within the Northwest Sands and Northwest Lowlands Ecological Landscapes. COAs are places within Wisconsin that contain the best known aquatic and terrestrial habitat to support Wisconsin's rare and declining wildlife species. The GKSF is associated with four of these areas. The terrestrial COAs within the GKSF include Crex Barrens and Wetlands and Fish Lake Barrens and Wetlands, which both contain important habitat features for barrens associated wildlife species. The St. Croix Ridge is highlighted as a COA in part because of the forested terraces and seeps found along the St. Croix River. The St. Croix River itself is an aquatic COA, due to its important aquatic habitats that are used by uncommon fish, mussels and dragonflies.

PROPERTY ASSESSMENT

LAND OWNERSHIP AND MANAGEMENT WITHIN AND ADJACENT TO THE PROPERTY

The GKSF is a long, narrow property that stretches 55 miles near the St. Croix River. The GKSF project boundary encompasses roughly 38,000 acres with numerous private in-holdings. Within the project boundary, approximately 20,500 acres are in state ownership. Although it is one of the largest state owned properties in a region with an abundance of privately owned lands, the GKSF is a relatively small publicly owned property in comparison to the other public ownerships (Regional and Property Analysis, Map 8: Ownership and Management). Burnett and Polk County Forests, and the Sterling Township Forest make up the other public forests in the area, with county forests comprising a majority of the public land in the region. Forest management on these forests is similar in style to the GKSF.

As mentioned above, county forests make up a majority of the publicly owned acreage in the five county region. This includes Burnett and Polk County forests. The Burnett County Forest is 83% forested, with the remaining acreage comprised of wetlands, shrubs, bogs, lakes, streams and grassy openings. The primary forest types are aspen, jack pine, scrub oak, and red pine. Biological communities include Northern Forests, Southern Forests, Oak Savannas, Oak and Pine Barrens, Grasslands, Wetlands, and Aquatic Communities.

Approximately 94% of the Polk County Forest is forested. Forested uplands are comprised of mixed hardwoods, aspen, oak, jack pine, and red pine. The remaining acreage includes open water, wetlands, grassy openings, shrubs and bogs. Biological communities include Northern Forests, Oak and Pine Barrens, Wetlands, and Aquatic Communities.

Forest management on these properties, in terms of management prescriptions and tools available to accomplish management objectives, is very similar to the GKSF, which has comparable soils and forest types. Forest management is guided by the same processes and is conducted under the same management guidelines and silvicultural principles. Pine (jack and red primarily), aspen, and scrub oak are the predominant forest types on all three forests. Rotation ages and pre/post harvest treatments, including site monitoring, site preparation, regeneration techniques (artificial and natural), and intermediate treatments are generally the same. The goals and objectives for each property may vary slightly, but they are all being managed under similar guiding principles.

The Glacial Lake Grantsburg Wildlife Complex (GLG) is the largest state owned property in the region. It includes four wildlife areas: Crex Meadows, Fish Lake, Amsterdam Sloughs, and Danbury State Wildlife Areas totaling 52,000 acres. All of the GLG units, except Amsterdam Sloughs, share a project boundary with portions of the GKSF. Wetland and barrens management practices are employed to a greater degree here than any other wildlife areas in the state, providing habitat for a great diversity of wildlife.

Crex Meadows is the largest unit of the GLG complex. The sheer size of Crex Meadows along with the interspersion of brush prairie, sedge marsh, flowages, and forests provide habitat for a great diversity of wildlife. Two hundred and seventy species of birds use the property along with nearly every mammal found in Wisconsin and a good variety of reptiles, amphibians, and invertebrates. Crex Meadows contains the largest remnant of brush prairie and some of the most extensive sedge marshes in Wisconsin. These two habitat types account for most of the more uncommon species, some of which reach their peak abundance in brush prairie. Crex Meadows is intensively managed using a wide variety of wildlife management practices. Wetland and prairie restoration and maintenance practices are employed to a greater degree here than at any other wildlife area in Wisconsin. To date, 22 miles of dike have been constructed to create 29 flowages which flood 6,000 acres. Water levels are managed with 34 water control structures, eight miles of water transfer ditches, and a diversion pump. Clearing and prescribed burning were used to restore thousands of acres of brush prairie. Approximately, 3,500 acres of brush prairie and sedge marsh are burned annually for maintenance purposes. Firebreak construction, mowing, and herbicide application are also employed to restore and maintain brush prairie habitat. To date, approximately 11,600 acres of GLG have been restored to pine/oak barrens communities. An additional 2,500 acres are planned to be restored to pine/oak barrens communities. Much of the remaining acreage is in marsh/wetlands or is categorized as forest management zones (Engman, pers. commun.).

The National Park Service administers approximately 3,000 acres of National Scenic Riverway adjacent to the GKSF. The NPS corridor is mostly passively managed; however, prescribed fires are being used to maintain native prairie and savanna habitats. The NPS land lies along the St. Croix River.

All of these properties are adjacent, in part, to the GKSF, creating large blocks of publicly owned forestland in a region that is only 44% forested.

Other state ownership in the region includes state fishery areas, other state wildlife areas (not within the GLG), state natural areas and a state park.

Extensive public lands are also found just across the St. Croix River in Minnesota. Collectively, the St. Croix State Park, Chengwatana State Forest, Wild River State Park, and Rock Marsh Wildlife Area comprise over 70,000 acres. Forests dominate much of this acreage.

PHYSICAL ENVIRONMENT

Geology and Topography

Based on general broad-scale bedrock maps, the northern one-third of the GKSF overlies Late Precambrian volcanic or metamorphic bedrock, and the southern portion of the property is over Cambrian sandstone (Dott and Attig 2004, WDNR In Prep.). Bedrock is between 50 and 100 feet from the surface throughout and is primarily covered with sand and gravel deposits. Exposed cliffs are uncommon, and the property does not have the bedrock exposures that are found further south where bedrock is closer to the surface (e.g., Interstate State Park).

The major landforms here differ corresponding to the location of the escarpment. Just west of the escarpment is the start of the Mille Lacs Uplands Subsection (Minnesota DNR 2006); this ecoregion is comprised of a large system of plains and moraines deposited by the Superior Lobe and extending well into Minnesota. The St. Croix River valley makes up the small portion of this ecoregion located within the GKSF. This broad valley was largely shaped by the draining of Glacial Lake Grantsburg followed almost 3,000 years later by the draining of Glacial Lake Duluth, the largest of a series of former glacial lakes that comprised the Lake Superior basin. Later, the St. Croix River and its tributaries continued to influence the valley, deepening the channel and forming additional terraces. This portion of the valley within and along the GKSF is now characterized by forested floodplains, open wetlands, and stream terraces with numerous wet depressions.

A small portion of the southwest edge of the Northwest Sands Ecological Landscape (Bayfield Sand Plains Subsection) is located within the GKSF, just east of the escarpment. This Ecological Landscape represents the most extensive xeric glacial outwash system in the state (WDNR In Prep.). This portion of the Northwest Sands is the former location of Glacial Lake Grantsburg, a large waterbody that had been formed by impounded glacial meltwater. The area later became a spillway and was buried by outwash from Glacial Lake Duluth on its way to the St. Croix River valley. In some areas just east of the GKSF (e.g., at Crex Meadows Wildlife Area), lacustrine deposits from the former lake impede drainage, resulting in extensive wetlands. Topography is nearly level in this portion of the Northwest Sands.

Soils

In general, the GKSF has alluvial soils near the river, sandy outwash soils on the uplands east of the escarpment and a mix of stream terraces, seeps, and some areas of moderately well-drained loamy soils in-between. Soils exhibit extreme differences from the river, over the escarpment, and into the dry sandy uplands. GKSF soil drainage classes range from excessively drained (the most extensive class at 34% of the property acreage) to very poorly drained (22% of the GKSF). There are 88 different soil map units found within the GKSF boundaries.

Hydric muck soils (e.g., Bowstring Muck) dominate the large wetlands in the river valley. In these cases, the muck extends up to the base of the slope, where it can be quite deep (up to 38") and susceptible to physical damage. Much of the river valley contains wet soils or soils subject to flooding. However, there are some areas where sandier soils occupy slight rises between the wet soils of the floodplain and the base of the escarpment, where loamy drift over sandy outwash supports a more xeric community type with numerous scattered wet depressions intermixed throughout.

These wet or poorly drained soils generally have low weight-bearing capacity, making them weaker than upland soils and more susceptible to rutting and other soil disturbances. In addition, it is common for water to be moving through the soil near the surface. Most forest management activities on these soil types should continue to be limited to frozen ground or dry conditions in order to minimize changes to surface and subsurface water movement and to ensure that soil can support equipment traffic. In addition, flooding in the areas of these weak soils creates limited opportunities for recreational activities. Construction of boardwalks and other infrastructure is often required to allow access to these areas.

Soils between the floodplain and the top of the escarpment are a diverse mix of sands and loamy sands, sometimes with abundant cobble interspersed with mucks and other organic soils. Many of the areas contain seeps and streams flowing down the slope. Sometimes there is a thick organic layer over the sands. The steep slopes of these soils can present some difficulty during forest management activities. In addition, areas with springs and seeps should continue to be avoided.

Grayling sand is the most prevalent soil association in the dry areas to the east of the escarpment. These are excessively drained soils found on outwash plains. The texture of these map units is sand down to at least a 60-inch depth. These dry

soils, including Grayling sand, are categorized as dry nutrient-poor sandy soils which have limited opportunities for biomass harvest. One general exception allows for biomass harvests of jack pine on these soils. The sandy nature of these soils also limits the potential for development of some recreational facilities, for example displacement of sandy soils can sometimes hinder the ability to create sustainable recreational trails.

Soil types on the GKSF may be slightly more limiting than on the county forests. Both Burnett and Polk County Forests have less poorly drained soils than the GKSF, so may not be as limited in terms of forest management activities or recreational developments. The county forests have similar limitations in terms of the excessively drained sandy soils as the GKSF.

WATER RESOURCES AND AQUATIC HABITATS

Lakes, Streams, and Wetlands

The St. Croix-Namekagon river system was one of the original eight rivers selected in 1968 to become part of the Wild and Scenic Rivers program administered by the National Park Service. The stretch of the St. Croix along the GKSF is entirely free-flowing and, in terms of its fauna, is part of the longest and most pristine example of a large river ecosystem in the Midwest (WDNR 2002). The river supports a high level of aquatic diversity and is particularly important for uncommon species of fish, mussels, and dragonflies. There are a high number of rare species found in the river, including the State Endangered St. Croix snaketail dragonfly, the State Endangered Purple Wartyback mussel, and several other uncommon aquatic species. The GKSF plays a critical role in contributing to the water quality and overall ecological integrity of the St. Croix River. Land management practices within the GKSF that protect the water quality of tributaries, seeps and wetlands that connect to the St. Croix River, will aid in the maintenance of healthy ecosystems within the St. Croix River.

Four warm water streams cross the GKSF and empty into the St. Croix River: the Trade River, Clam River, Wood River, and Iron Creek. There is a hydroelectric dam at an in-holding in the forest, forming the 412 acre Clam River Flowage. The stretch from the Clam Dam to its mouth at the St. Croix has been designated an Exceptional Resource Water by the Department (WDNR 2010f). The impacts of the Wood River Dam, located outside of the GKSF, are currently under evaluation for impacts to habitat.

Several smaller creeks, brooks and springs flow through the property and empty into the St. Croix River. Nine of these streams are designated Exceptional Resource Waters: Sioux Portage Creek, Ekdall Brook, Bear Brook, Kettle Brook, Brant Brook, East Brook, Pine Brook, Benson Brook, and a portion of Wolf Creek (WDNR 2010f).

There are approximately 18 miles of trout stream within the GKSF (Table 3.10). Brook Trout is the primary species found within these streams, which are either Class 1 or Class 2 Trout Streams. Class 1 streams are high quality waters in which wild trout reproduce sufficiently to sustain populations at or near carrying capacity and no stocking is necessary. Class 2 streams support good survival and some natural reproduction, but not enough to optimize available food and habitat. Stocking is required to maintain a desirable sport fishery on Class 2 streams.

Wetlands are abundant west of the escarpment. Numerous seeps emanate from the escarpment and feed into these tributaries. These seeps are important for biodiversity, and rare plants are associated with them. The GKSF may have the highest number of seeps of any Wisconsin DNR-managed land. Other wetlands include sedge-dominated meadows and large forested wetlands, including Hardwood Swamps, Northern Wet-mesic Forests, and the Floodplain Forests that border the St. Croix River and some of its tributaries.

Ephemeral Ponds are not commonly found in this landscape and not abundant on the property, although a few were noted during the course of the Biotic Inventory for the GKSF (WDNR 2010e).

TABLE 3.10 TROUT STREAMS WITHIN THE GKSF

Stream	Total Length* (miles)	Trout Class	Trout Species Present
Bear Brook	0.5	1	Brook Trout
Benson Brook	1.6	1	Brook Trout
Brandt Brook	0.5	1	Brook Trout
East Brook	0.4	1	Brook Trout
Ekdall Brook	1.3	1	Brook Trout
Kettle Brook	0.4	1	Brook Trout
Lagoo Creek	2.0	2	Brook Trout
Pine Brook	0.7	1	Brook Trout
Sioux Portage Creek	0.9	1	Brook Trout
Trade River	4.4	2	Brown Trout
Wolf Creek	2.2	2	Brown Trout
Cowan Creek**	3.3	2	Brook Trout

** Includes all ownerships within the state forest boundary*
*** The mouth of Cowan Creek where it flows into the Trade River is within the forest boundary*

VEGETATION AND NATURAL COMMUNITIES

Historic Vegetation[1]

Based on data from Finley (1976), the uplands of the GKSF - roughly half of the area - were historically jack pine, scrub (northern pin) oak forest, and barrens. The GKSF was located at the western edge of the largest expanse of barrens in the state corresponding to the current location of the Northwest Sands Ecological Landscape. Fire was a very important ecological driver in the Northwest Sands, and fire was the major determinant of the Pine Barrens (Curtis 1959). Prior to pre-Euro-American settlement, large fires occurred at ten to 50 year intervals, and smaller fires were also common (WDNR In Prep.). In the southern portion of the Northwest Sands, fires may have been more frequent and lower-intensity; here, jack pine was likely less dense than areas further north and the barrens had more red pine, northern pin oak, and bur oak (Radeloff et al. 2000).

A small amount (about 4%) of the area was typed sugar maple-basswood forest, all in the southern most two miles of the property. Finley typed most of the river valley portion of the GKSF as lowland hardwoods, with a few sizeable blocks of swamp conifers. Because of the coarse nature of Finley's data, many smaller features such as wetland inclusions were not identified.

The narrow, linear shape of the GKSF does not lend itself well to a thorough evaluation of the Public Land Survey System tree data due to the low number of witness trees located within the boundary, but general tree abundance can be examined. Based on the witness trees recorded for the area now comprising the GKSF, the top seven most often reported trees (representing 80% of the trees reported) were, in descending order, jack pine, tamarack, pine (undifferentiated), red pine, black ash, bur oak, and balsam fir. Several other species were reported, but each was represented by only eight or fewer trees. Interestingly, very few northern pin oak trees were reported, with pin oak comprising only 1.4% of the witness trees. Bur oak witness trees were reported in both upland and wetland areas, similar to how that species is found now on the property. All three of Wisconsin's native pines were reported with white pine the least reported (about 4% of trees). However, undifferentiated "pine" was the third most prevalent species reported by surveyors and could potentially include any combination of the three species. The river valley is said to have had considerable large, old-growth pine (WDNR 1988).

1 *Much of the information within this section is adapted from the Biotic Inventory and Analysis of the Governor Knowles State Forest (WDNR 2010e).*

Current Vegetation

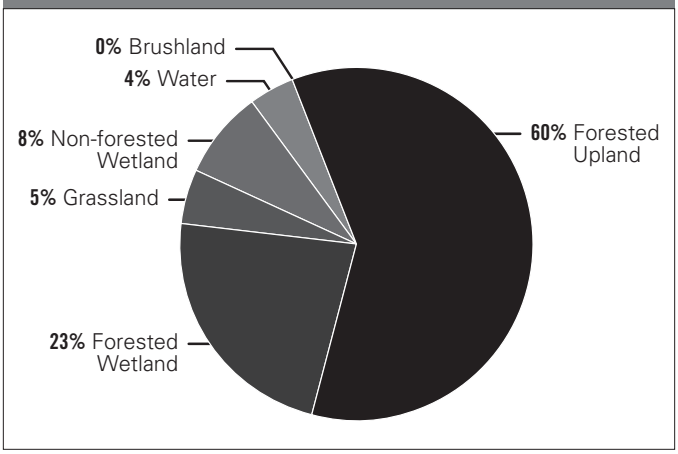
The vegetation of the GKSF has been shaped by numerous factors including flooding, grazing, and fire, as well as various management activities since European settlement. The "tension zone" (Curtis 1959) covers the southern half of the property, and tree species associated with both northern and southern Wisconsin are present.

The GKSF is primarily forested, with 87% of the stands classified as forest according to WDNR forest reconnaissance data (Table 3.11). The forests range from the most xeric sites to the wettest forest types, with many examples in-between. Figure 3.3 illustrates the broad land cover types from forest reconnaissance data.

The broad forest types are likely similar to forests of the mid-1800s; however, the relative abundance of tree species, structure, and age classes are different. Changes in GKSF vegetation since European settlement follow trends similar to many other dry forested habitats in northern Wisconsin. Jack pine is less abundant, while aspen and red pine have both increased in relative abundance. Forests are mostly found in small blocks, largely as a result of the size and configuration of the property. Barrens/savanna communities are small and localized, having largely succeeded to forest following the lack of fire in these areas. Currently, barrens restorations are being conducted on Kohler-Peet Barrens and Sterling Barrens.

Dry oak-dominated forests occupy much of the uplands. Scrub oak (northern pin oak) is the most common forest cover type, comprising more than one-quarter of the acreage. This type often co-occurs with jack pine and may contain several other tree species including white pine, aspen, red maple, and other scattered species, depending on the site. Over half of the

FIGURE 3.3 LAND COVER ON THE GOVERNOR KNOWLES STATE FOREST



Source: WDNR Forest Recon Database

scrub oak is over 80 years old. This type most closely corresponds to the Northern Dry Forest community type. White and bur oak are also present on dry-mesic sites, usually mixed with other species, and bur oak is common in floodplain areas and is mixed with mesic species in a couple of areas (Regional and Property Analysis, Map 7: Property Land Cover).

TABLE 3.11 ACRES OF COVER TYPE ON THE GKSF

Cover Type	Acres	%
Forested Types		
Scrub Oak	5,028	25%
Swamp Hardwood	3,157	15%
Jack Pine	2,271	11%
Aspen	2,259	11%
Red Pine	1,774	9%
Northern Hardwood	957	5%
White Pine	630	3%
Black Spruce	568	3%
Oak	272	1%
Cedar	215	1%
Red Maple	177	1%
Swamp Conifer	139	1%
Bottomland Hardwood	127	1%
Tamarack	106	1%
Fir Spruce	51	0%
Total	17,731	87%
Non-forested Types		
Lowland Brush	1,131	6%
Grassland	933	5%
Marsh, Muskeg, Emergent Vegetation, Lowland Grass	464	2%
Open Water	119	1%
Recreational	32	0%
Right-of-Way	27	0%
Upland Brush	24	0%
Total	2,730	13%
Property Total	20,461	100%

Source: WDNR Forest Recon Database

As with much of the Northwest Sands, jack pine is much less dominant at the GKSF than it was historically. Jack pine-dominated forests now comprise approximately 2,271 acres, with just over 460 acres of this planted in the last ten years. However, jack pine is also a component in several mixed dry stands throughout the property. Jack pine-dominated Northern Dry Forests, with conservative native barrens flora, are known to occur in a few areas visited during the Biotic Inventory. These stands were likely part of a larger Pine Barrens complex in the past.

White and red pines are found scattered throughout the property. Natural origin white and/or red pine dominated forest types (Northern Dry-mesic Forest) are limited to select locations, but white pine is also a component of several mixed forest types. White pine is found as a component on richer mesic sites where it sometimes forms a supercanopy, in dry-mesic forests with oaks and other species, on terraces, and various places within the river valley. About nine percent of the GKSF's forested acres are comprised of red pine. The majority of this red pine is found within plantations; however, scattered natural origin red pines are present in a few sites within the Wilderness Area, including Brandt Brook State Natural Area. Plantations have continued to be established in recent years to meet forest management objectives.

Areas typed as "northern hardwoods" on the GKSF often contain a diverse mix of species that is different from most northern hardwood forests on other state forests. Red maple, elms, box elder, ash, bur oak, white pine, and other species occur in these forest types. Most of these stands are small and occupy areas along mesic slopes or old river terraces. The largest example of this type is found near the Trade River. Other areas typed as northern hardwoods on the GKSF are dominated by silver maple and bur oak and would be classified as the Floodplain Forest community type.

The GKSF has several types of forested wetlands, almost all within the Wilderness Zone. Swamp hardwoods (analogous to the Hardwood Swamp natural community) comprise the largest acreage and are usually dominated by black ash but often have a diverse group of associates such as red maple, white pine, and basswood. Some of the areas of swamp hardwoods form large contiguous stands, such as the large wetland complex that includes the St. Croix Ash Swamp State Natural Area. Although found in much smaller stands, and often found as inclusions within other wetland types, there are several areas of conifer swamp, including areas dominated by northern white cedar, black spruce, and tamarack. All of the forested wetlands can contain seeps and specialized micro-habitats. Non-forested areas make up 13% of the GKSF, based on Forest Reconnaissance data. These areas are mostly shrub

swamps, small open wetlands, areas managed for barrens (two SNAs), and old fields.

Current Forest Management on the GKSF

Timber Sale Establishment and Administration

Timber sale establishment and administration are important and significant management activities on the GKSF. The forest provides a range of qualities of softwood and hardwood timber to the local and regional economy. Timber harvesting involves primarily even-aged management, including regeneration harvests (clearcutting), and is designed to maintain age diversity and wildlife habitat while reducing fuel loads. Annual harvest schedules are determined based on resource need and further refined after consideration of local social and ecological variables. Since 2004, the GKSF has sold an annual average of 383 acres of timber. Traditionally, a majority of the timber harvested on the GKSF has been of the pulpwood grade with a smaller percentage being high grade softwood and low grade hardwood sawtimber. The pulpwood produced on the GKSF varies, with high quality pulp coming from the pines and aspen to the low quality pulp coming from the oaks and red maple. Pulpwood consumers include local firewood buyers and large paper mills throughout Minnesota and Wisconsin. The low quality sawtimber is typically sold to local mills, while the high quality sawtimber is typically trucked to mills further away in both Wisconsin and Minnesota.

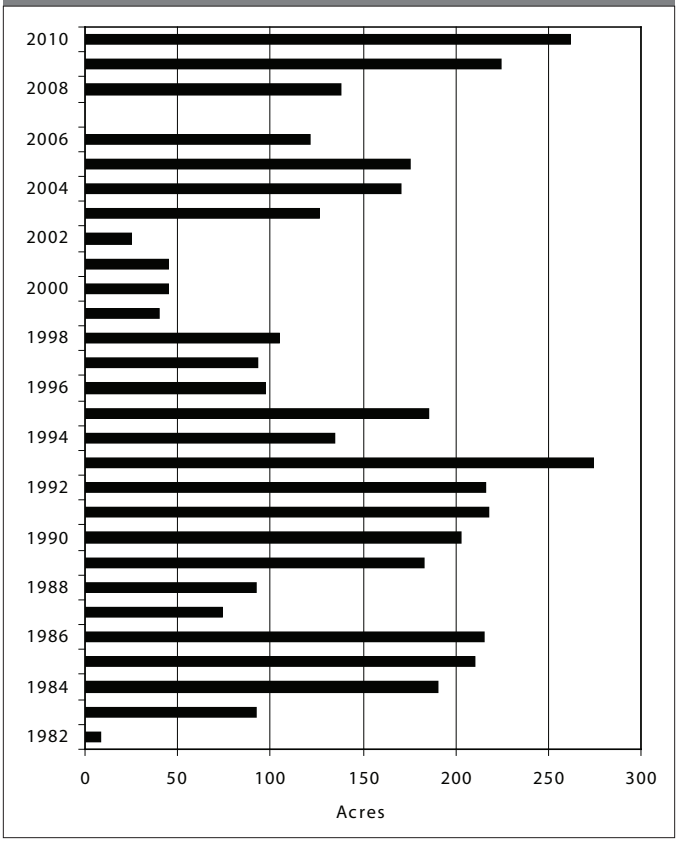
Over the last ten years, the GKSF has experienced an increase in the demand for woody biomass harvesting. Woody biomass harvests result in the removal of more wood or biomass than traditional timber harvests. In biomass harvests, the entire aboveground portion of a tree may be removed, including the trunk, branches, bark, and leaves or needles. Roughly half of the timber sold on the GKSF are biomass harvests, primarily whole-tree chipping operations. Primary consumers of biomass have included paper mills and energy producers in Wisconsin and Minnesota. In 2009, the Department developed Wisconsin's Forestland Woody Biomass Harvesting Guidelines (Herrick et al. 2009). Site specific guidelines restrict harvesting of fine woody material on dry, nutrient poor, sandy soils, which are a major component of the GKSF, and may significantly reduce the opportunity to conduct biomass harvests on the GKSF.

Up to date and accurate forest reconnaissance data is the main tool the GKSF uses to determine the condition of the forest and drives the management decisions. Big efforts were made to update the recon data for the GKSF in recent years. In order to keep all recon data less than 15 years old, the GKSF will need to update roughly 1,300 acres per year. To date, all the stand recon data is less than 20 years old.

Forest Regeneration

Artificial regeneration on the GKSF is accomplished either by planting or seeding. Artificial regeneration is done to ensure adequate levels of reforestation after harvests or to augment the species distribution on the forest. Although planting was done by private landowners on parts of the forest prior to its creation, the first GKSF planting records date back to 1982. The GKSF plants an average of 137 acres per year. Occasionally, some of these acres are re-planting or inter-planting in existing planting sites. The average number of acres planted per year by decade is as follows: 1980s — 133 acres, 1990s — 157 acres, 2000s — 121 acres. The biggest tree planting year was 1993 with 274 acres planted (Figure 3.4). 2007 was expected to be a drought year and is the only year in which no tree planting was done on the GKSF since 1981. Tree planting on the GKSF typically involves some kind of site preparation. The most common site preparation method used is disc trenching. Other site preparation methods that have been used include fire plow furrows, patch scalping, herbicide, roller chopping, and slash raking. Seeding began on the GKSF in 1981 with 291 acres seeded from 1981 through 1983. Seeding also occurred from 2003 through 2008 on 460 acres. Seeding is typically done with jack pine on sites where adequate

FIGURE 3.4 ACRES PLANTED BY YEAR ON THE GKSF



stocking from natural seeding is questionable. Site preparation for seeding typically involves blade scarification with dozers. Regeneration success (planting and seeding) over the last years has been mixed. Common causes of poor survival are heavy deer browse, below normal precipitation, and impacts from sandy (excessively drained) soils. Recent survival on planted and seeded sites is similar to the regeneration efforts of the late 1980s, which coincides with the last major drought for this area. Similar to the late 1980s, recent plantings are being re-planted to ensure adequate stocking and survival. Ultimately, the hope is to manage all the planted sites for natural regeneration in the future, potentially reducing the need to do site preparation, planting, and spraying.

Release involves creating growing conditions that are favorable for certain species while managing away from others or reducing the stocking level of the competition. Prior to 2003, little attention was given to release on the GKSF. Since then, a release program has been implemented and various release techniques are used to ensure adequate survival and stocking of planted areas is maintained. The two techniques used on the GKSF are mechanical and chemical. Mechanical release, or hand release, involves cutting target species of trees and brush in order to give the planted trees adequate space to grow. Chemical release, or spraying, involves applying herbicide on planted sites. On the GKSF this is done with ground equipment and typically involves spraying the entire site (broadcast spray). Applications are made in late summer/early fall after many plants have senesced but prior to the woody competition going dormant. Usually a site only needs to be sprayed once during the life of the stand and within the first few years of establishment.

Fire Management
The GKSF does not have a long history of using fire as a management tool. Fire is a challenging tool to use due to the risk involved and the personnel needed to conduct the burns. Prescribed burning is usually done in the spring when conditions are good for burning. This timeframe also coincides with the active fire season when DNR staff are actively suppressing wildfires; therefore getting approval to conduct burns can be a challenge. Over the last five years, the GKSF used fire in an attempt to create conditions favorable for natural regeneration. Burns have been focused on encouraging white pine and jack pine regeneration. The success of the burns is being evaluated and is on-going.

Non-timber Resource Gathering
Firewood gathering is and has been a popular activity on the GKSF. Special Forest Product Permits are available for $8.00 per cord and tend to be issued for wood that is otherwise non-merchantable (dead or down). The GKSF issues approximately 15-20 permits each year for roughly 120 cords of firewood.

Approximately 10-15 permits are issued each year for Christmas tree harvesting. The GKSF charges $5.00 per tree.

Bough harvesting has not been a significant activity on the GKSF in the past. This activity may be desirable in the future for improving the health of white pines stands while generating income for the harvester.

Forest Management Challenges
Some of the challenges faced by forest managers include: weather events (drought, wind), relatively high deer populations, current and anticipated insect and disease outbreaks, and climate change. Forest managers must be responsive and adaptive to changing conditions in resource management as opportunities and constraints become known.

Current Management Designations
Governor Knowles State Forest contains approximately 20,500 acres of state owned land within the 38,000 acre state forest boundary. There are eight land management classifications currently designated on the GKSF (Regional and Property Analysis, Map 8: Property Ownership) (Table 3.12). The land use classifications are categorized into three groups: Resource Protection, Resource Development, and Recreation Development.

TABLE 3.12 CURRENT MANAGEMENT DESIGNATIONS ON THE GKSF

Resource Protection	Acres	% of Property
Wilderness Area*	7,355	36%
State Natural Areas	1,710	8%
Historic and Archeological Areas	55	<1%
Scenic Areas	150	<1%
Resource Development		
Fisheries Management Areas	150	<1%
Wildlife Management Areas	560	3%
Forest Production Area	10,250	50%
Intensive Recreational Development		
Camping Facilities, Day-Use Area, and Trails	200	1%
Total	**20,430**	**100%**

** 1,320 acres of SNA are within the Wilderness Area but are shown in the SNA row of this table. State-owned acreage only shown in table.*

National Scenic Riverway
The National Scenic Riverway comprises nearly 3,000 acres adjacent to the GKSF, and is managed by the National Park Service. The scenic Riverway area is included here because designation of the St. Croix River was a key factor in the creation of the state forest. A Maximum Protection Zone (MPZ) extends an average of 412 feet back from the river's edge on each side of the river. Within this zone acquisition of property rights and removal of structures, except in incorporated areas, is the purview of the NPS. The MPZ, which is approximately 3,000 acres in size, is maintained in a natural condition with developments only at public access points and canoe campsites.

A limited development zone extends an average of approximately 920 feet back from the MPZ boundary. In the limited development zone, property rights may be acquired to control development and permit land uses that are compatible with the purposes of the Riverway. The types of control used are fee acquisition, zoning, and easement. The state forest can acquire lands within this zone. The NPS may acquire easements where the state is unsuccessful.

Resource Protection
Wilderness Area
One of three state designated Wilderness Areas occurs on the GKSF, running the entire length of the state forest and buffering the land administered by the National Park Service. The boundary of the wilderness area generally encompasses the terrace escarpment (beginning of the steep slope down to the river basin) plus 200 feet inland. When the escarpment is within the 412 foot National Park Service (NPS) Maximum Preservation Zone (MPZ), the boundary lies 200 feet inland from the 412 foot line. Within the wilderness area, no timber harvesting or other manipulations of vegetation are permitted. Vehicular travel is prohibited and existing undeveloped woods roads have been blocked. One exception is that existing developed public and improved state forest roads remain open to vehicular travel. Another exception is that recreational trails within the wilderness area are maintained using motorized equipment. Recreational activities, which do not require roads, trails, or other developments, are permitted.

Fire suppression is accomplished in the wilderness area with the use of hand tools when it is practical. If the use of mechanized equipment is deemed necessary in the suppression effort, prompt and full restoration of the site is accomplished as soon after the fire as feasible.

Insect and disease control may be undertaken only if areas outside the zone are threatened. Salvage of timber damaged or killed by natural disasters is at the discretion of the Natural Resources Board.

State Natural Areas
Twelve Natural Communities are protected within the six designated State Natural Areas (SNAs) on the state forest (Table 3.13). The objective of these areas is to maintain the natural conditions by allowing natural, physical, and biological processes to continue with minimum human intervention. Management to simulate natural forces which shaped the communities, such as fire, is permitted in some of the areas. Development is limited to the extent required to facilitate research and education. All of the GKSF SNAs were dedicated in the late 1970s.

Natural Area #147 - Sterling Barrens (488 acres, 125 acres within the GKSF):

Community Management — Pine Barrens (20 acres); Northern Dry Forest (73 acres); Southern Wet-Mesic Forest (30 acres); Alder Thicket (2 acres)

Located in pitted outwash deposits laid down by glacial meltwater streams, Sterling Barrens contains a jack pine-Hill's oak dry forest interspersed with barrens openings and an extensive wetland of sedge meadow and shrub-carr. The gently rolling barrens openings are interspersed with prairie species. Dominant grasses are needle grass, three-awn grass, Indian

TABLE 3.13 NATURAL COMMUNITIES WITHIN THE SNAS ON THE GKSF

Natural Community	Acres
Pine Barrens	360
Northern Wet-Mesic Forest	320
Floodplain Forest	200
Northern Dry Forest	188
Northern Hardwood swamp	184
Northern Wet Forest	100
Southern Wet Mesic Forest	96
Northern Mesic Forest	90
Northern Dry-Mesic Forest	74
Shrub-Carr	46
Northern Sedge Meadow	30
Alder Thicket	22
Total	**1,710**

grass, and big and little blue-stem. Several rare forbs are at or near their natural eastern range limit. Included in the natural area are the St. Croix River terrace escarpment and a reach of the St. Croix that contains an excellent diversity of aquatic species. The river is lined with bottomland hardwoods of silver maple, elm, black ash, and cottonwood with willow brush. Many dragonfly species are found in this portion of the river. The dry forest on the sandy uplands and the terrace slope is young but has a diverse groundlayer. Adjacent to the river is a sedge meadow dominated by wide-leaved sedges, prairie cord grass, marsh fern, sensitive fern, blue-joint grass, wool grass, ironweed, and Joe-pye weed. Shrub-carr areas consist primarily of willows with white meadowsweet, alder, and occasional tamarack. Low areas support stands of emergent aquatics including arrowhead, cat-tail, three-way sedge, river bulrush, hardstem bulrush, and spike rushes. Breeding bird surveys show Broad-winged Hawk, Red-eyed Vireo, Chestnut-sided Warbler, Ovenbird, and Chipping Sparrow as common nesters. Sterling Barrens is owned by the National Park Service and DNR. The site was originally designated a State Natural Area in 1979 and later expanded to include the St. Croix National Scenic Riverway in 2002.

According to the management plan for this natural area, the management objectives are to maintain the barrens openings on the steeper south facing slopes. In addition, prescribed burns are to be conducted every 5 to 7 years, general inspections should be conducted annually, breeding birds are surveyed at least once every 5 years, no specific problems have been identified, and acquisition within the natural area boundary is complete.

Natural Area #148 - St. Croix Ash Swamp (283 acres, 210 acres within the GKSF):

Community Management - Northern Hardwood Swamp (184 acres); Northern Mesic Forest (26 acres)

St. Croix Ash Swamp features a range of forest types from mesic uplands adjacent to the St. Croix River through extensive low swamp to droughty uplands on the sandy plain above the river valley. The hardwood swamp is composed of basswood, black ash, American elm, yellow birch, white oak, and red maple with scattered white cedar, balsam fir, and white pine. On the forest floor are small pockets of standing water between the mossy hummocks. The flat sandy uplands are wooded with young oaks. The river valley contains very steep sides that rise nearly 100 feet above the swamp. Small spring fed streams and seepages have eroded small pockets and tributary valleys providing diverse microhabitats. The primary soils are Omega sand, Cathro muck, Rifle mucky peat, and Emmett loamy sand. Common nesting birds include Winter Wren, Scarlet Tanager, Veery, Ovenbird, Red-eyed Vireo, and Cerulean Warbler, the latter here at its northern most range limit. St. Croix Ash Swamp is owned by the DNR and National Park Service. It was designated a State Natural Area in 1979 and later expanded to include the St. Croix National Scenic Riverway.

According to the management plan for this natural area, the management objectives are to provide long-term preservation, in an undisturbed condition, examples of a northern hardwood swamp and the St. Croix River escarpment forest. In addition, general inspections should be conducted annually, breeding birds are surveyed at least once every 5 years, no specific problems have been identified, and acquisition within the natural area boundary is complete.

Natural Area #149 - Brandt Brook Pines and Hardwood Forest (418 acres, 140 acres within the GKSF):

Community Management — Northern Dry-Mesic Forest (34 acres); Southern Wet-Mesic Forest (21 acres); Northern Dry Forest (85 acres); a fast, soft, cold water stream

Brandt Brook Pines is an old growth stand of large red pines along the St. Croix River estimated to have originated in the mid 1880s. The northern dry-mesic forest is dominated by red pine with white and jack pines, Hill's oak, basswood, large-toothed aspen, and white birch. A narrow swale of black ash nearly divides the area. On the elevated river terrace above the pines is a dense forest of small oaks while a more mature swamp hardwood forest of oak, black ash, and red maple occurs on the low terrace below the pines. The herbaceous layer contains numerous fern species including bracken, spinulose wood, and ostrich along with common early summer species such as wild geranium and columbine. Brandt Brook, a steep gradient, sandy-bottomed stream deeply incised into the river terrace flows through the site. Fed by numerous seeps, the narrow cold water stream supports native brook trout. Two uncommon birds, Black and White Warbler (Mniotilta varia) and Yellow-throated Vireo (Vireo flavifrons), inhabit the forest. Brandt Brook Pines is owned by the National Park Service and the DNR. It was originally designated a State Natural Area in 1979 and expanded in 2002 to include the St. Croix National Scenic Riverway.

According to the management plan for this natural area, the management objectives are to preserve an excellent example of a northern dry-mesic forest and a fast, soft, cold water stream and its streamshed while permitting resource sensitive recreational and educational uses. In addition, general inspections should be conducted twice a year, breeding birds are surveyed at least once every 5 years, no specific problems

have been identified, and acquisition within the natural area boundary is complete.

Natural Area #150 - Ekdall Wetlands (215 acres):

Community Management — Seeps and Springs; Northern Dry Forest (30 acres); Northern Wet Forest (100 acres); Northern Mesic Forest (20 acres); Southern Wet-Mesic Forest (45 acres); Alder Thicket (20 acres)

Ekdall Wetlands lies in a low terrace, 0.25 to 0.75 mile wide, where the St. Croix River has meandered away from the steep escarpment. The site contains northern wet forest and alder thicket plus a southern wet-mesic forest, here at its northern range limit in Wisconsin. Flat uplands above the escarpment are about 80 feet above the swamp and consist of barrens openings and dense stands of young oaks and jack pine. The escarpment slope also exhibits a continuum from xeric oaks at the summit to more mesic species midslope to swamp species at the wet base. Numerous seeps near the base contribute water to an open swamp of white cedar, tamarack, black spruce, black ash, and alder with scattered balsam fir and yellow birch. Typical understory species are sphagnum moss, Labrador-tea, pitcher plant, cattail, and sedges. Closer to the river are shrub-dominated thickets and small marshy pockets. The soils include wet alluvial land near the river, Cathro muck in the swamp, and sandy soils on the terrace escarpment. Deer use in the area is heavy. Other disturbance includes a ground fire that burned 75 percent of the understory in 1980 and some windthrow in 1977. Ekdall Wetlands is owned by the DNR and National Park Service. It was designated a State Natural Area in 1979 and later expanded to include the St. Croix River.

According to the management plan for this natural area, the management objectives are to preserve a series of seeps and springs emanating from the sides of the St. Croix River escarpment and a large conifer-hardwood swamp and the management of the state-endangered dotted blazing star found on the escarpment ridge top. In addition, general inspections should be conducted twice a year, breeding birds are surveyed at least once every 5 years, the natural presence of beaver throughout the wetlands is an identified problem, and acquisition within the natural area boundary is complete.

Natural Area #151 - Norway Point Bottomlands (330 acres):

Community Management — Floodplain Forest (200 acres); Shrub-Carr (90 acres); Northern Wet-Mesic Forest (10 acres); Northern Sedge Meadow (30 acres); Slow, Soft, Cold Water Stream

Norway Point Bottomlands lies along a bend in the St. Croix River and encompasses five major lowland plant communities including a southern wet-mesic forest at its northern range limit in Wisconsin. Also present are a northern wet-mesic forest, shrub carr, northern sedge meadow, and a 0.3 mile reach of Iron Creek. Closest to the river is a bottomland hardwood forest with silver maple, American elm, white ash, and black ash. Between the floodplain and uplands are swamp hardwoods dominated by black ash with yellow birch and elm. Along the base of the river terrace escarpment are similar hardwoods and white cedar with numerous springs and seeps that feed into Iron Creek. Willow, alder, dogwood, and Spirea dominate the surrounding shrub thickets. The adjacent sedge meadow was historically used for mowing prior to state ownership. Iron Creek is a minnow stream with turbid, acid, and infertile waters. The wetlands provide nesting habitat for waterfowl and the area is home to high beaver and deer populations. Common breeding birds include Eastern Bluebird, Eastern Wood Pewee, Veery, Red-eyed Vireo, Ovenbird, Mourning Warbler, Black and White Warbler, and Pileated Woodpecker. Norway Point is owned by the DNR and National Park Service. It was designated a State Natural Area in 1979 and later expanded to include the St. Croix River.

According to the management plan for this natural area, the management objectives are to preserve examples of mature heterogeneous floodplain forest, shrub-carr, northern sedge meadow, and northern wet-mesic forest for research, education, and interpretation purposes. In addition, general inspections should be conducted twice a year, breeding birds are surveyed at least once every 5 years, maintenance of the trails and boardwalk is an identified problem, and acquisition within the natural area boundary is complete.

Natural Area #152 - Kohler-Peet Barrens and Cedar Swamp (690 acres):

Community Management — Pine Barrens (340 acres); Northern Wet-Mesic Forest (310 acres); Northern Dry-Mesic Forest (40 acres)

Kohler-Peet Barrens is a nearly flat expanse of sandy, open barrens situated within the vast glacial outwash deposits of northwestern Wisconsin and adjacent to the steep-walled St. Croix River Valley. Historically, this region supported Pine Barrens vegetation, which burned repeatedly. Today Hill's oak grubs, jack pine, quaking aspen, and pin cherry are the common trees and many of the oaks have multiple trunks and bushy sprouts, the result of prescribed burning used to maintain the open barrens. The barrens flora is diverse with many species of prairies, barrens, and bracken grassland communities. Four plant species with Great Plains distribu-

tion - blue giant hyssop (Agastache foeniculum), autumn onion (Allium stellatum), Carolina larkspur (Delphinium carolinianum) and hairy four-o'clock (Mirabilis hirsuta) - are found here at their northeastern range limit. Common shrub species include beaked and American hazelnut, New Jersey tea, and prairie red-root. A swamp forest of white cedar with black ash and a sphagnum moss understory is also present and grades into black spruce and tamarack. A wooded river terrace escarpment contains oaks at its dry summit which grades into yellow birch, red maple, and black ash near its base where many springs and seeps emanate. Many rare and uncommon animals of open habitats are found here including the federally endangered Karner blue butterfly (Lycaeides melissa samuelis), Sharp-tailed Grouse (Tympanuchus phasianellus), Eastern Bluebird, Vesper Sparrow, and Field Sparrow. Kohler-Peet Barrens and Cedar Swamp is owned by the DNR and was designated a State Natural Area in 1979.

According to the management plan for this natural area, the management objectives are to manage the barrens for the barrens community, preserve the cedar swamp, and provide research and educational opportunities. In addition, general inspections should be conducted twice a year, breeding birds are surveyed at least once every 5 years, Kentucky blue grass and aspen and firebreak maintenance are identified problems, and acquisition within the natural area boundary is complete.

Historical and Archaeological Areas

The 1988 GKSF Master Plan identified several historical and archaeological sites for preservation, which totaled approximately 55 acres. These sites were defined in the 1988 master plan as, "lands containing buildings, sites, objects and related features which are significant in that they possess high value or quality in illustrating or interpreting the historical and archaeological heritage of Wisconsin and the nation". The presence of these sites on the GKSF impacts management decisions, as adequate protection must be given to them. Physical developments must be limited and associated surveys must be conducted by qualified specialists.

Scenic Areas

There are 13 segments of roads, or roughly 12 miles, that have been classified as Class A Scenic Management Zones (WDNR 2006c). The forest stands under this classification amount to approximately 1,700 acres; however, approximately 150 of the 1,700 acres lie within 100 feet of the roads. The intent of this classification is to protect and maintain the aesthetic qualities, scenic beauty or distinctive landscapes, to the greatest extent possible, for public enjoyment.

Resource Development

Fisheries Management Areas

This area encompasses sixty-six feet on each side of the various trout streams within the state forest, excluding those portions within the wilderness and natural areas. This amounts to approximately 150 acres, or 9.4 miles of stream. The primary trout species found in the streams is Brook Trout. The forest cover within this area is managed to enhance the quality of the streams. Aspen is discriminated against to discourage beaver activity. Timber harvesting and planting are limited to those activities necessary to maintain selected species.

Wildlife Management Area

The previously designated 4,049 acre Kohler-Peet Wildlife Area was incorporated into the newly created St. Croix River State Forest in 1970. In order to carry out the objectives for which Kohler-Peet was acquired, a management plan which included both wildlife and forestry interests, was written and became part of the original St. Croix River State Forest Master Plan (WDNR 1988). In the past, Kohler-Peet Wildlife Area was the most important wintering area for deer in Western Burnett County. Deer utilized the swamp conifers below the escarpment as well as the jack pine on the uplands. Following the 1959 wildfire, the uplands in the Northeast segment were managed for Sharp-tailed Grouse.

Today, the old Kohler-Peet Wildlife Area is an important area for Northwest Lowlands and Northwest Sands species of wildlife including many special concern species and keystone wildlife species. The Kohler-Peet Barrens and Cedar Swamp Natural Area are located within the old Kohler-Peet Wildlife Area and contain many of the same unique and rare plant, animal and habitat associations as the wildlife area (WDNR 2010e). Kohler-Peet Barrens was identified as a priority landscape and a site for management focus for special concern birds (Sample and Mossman 1997). Currently, 580 acres of the old Kohler-Peet Wildlife Area are intensively managed for barrens dependant species through prescribed fire on five burn units. Wildlife and Forestry staff work in cooperation to plan and conduct the burns.

Forest Production Areas

All acres not otherwise designated are currently classified as forest production areas. The forest production areas are managed employing sustained yield principles for the production of forest products. Forest management activities are carried out employing sound forestry methods. Forest protection activities are those required to maintain forest production.

Figure 3.5 shows the primary cover type distribution within the Forest Production classification. Scrub oak (northern pin oak) is the most common primary cover type (31%). Other more common cover types in this classification include jack pine (18%), red pine (15%), and aspen (14%). Over half of the forest production area is typed as hardwood species. Approximately 38% is typed as conifer species. The remaining 7% is typed as non-productive cover types such as grass and brush. Jack pine is the most common conifer type, followed by red pine. Swamp hardwoods make up only 5% of the forest production classification because they are primarily found within the wilderness area.

The main programs administered by the GKSF staff in the Forest Production Areas include: timber sale establishment and administration, forest reconnaissance (recon), artificial regeneration, release, and prescribed burning (see description under Current Forest Management on the GKSF for more detail).

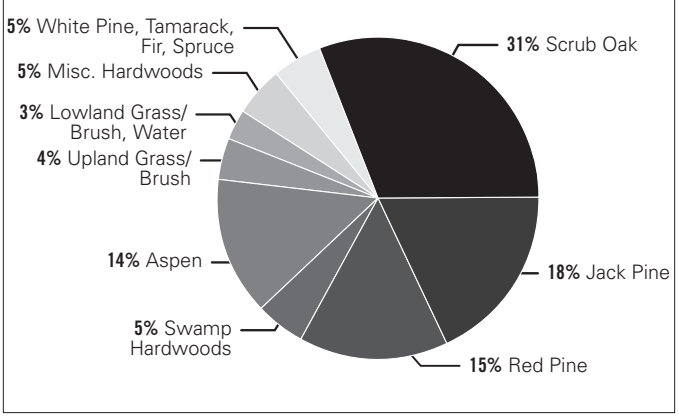
Forest Habitat Type

The Forest Habitat Type Classification System (FHTCS) is one tool in conducting site assessments in forested stands. Habitat typing helps assess true site capability and is a tool used by resource managers to evaluate management options (Kotar et al. 2002).

Habitat types are grouped into 11 regions across the state. The GKSF falls in the region including Polk, Barron, Burnett, and Washburn Counties (known as Region 1). The most extensive glacial feature is the outwash plain which covers much of the state forest. At the time of European Settlement, the entire outwash plain within the region was dominated by pines (jack, red, and white) within communities ranging from barrens to closed canopy forests. Jack pine was the dominant species along the northern half of the outwash plain. Red and white pine dominated communities were more prevalent in the southern and eastern portions of the outwash plain. All three pine communities are now less abundant (Kotar et al. 2002).

Based on the FHTCS the dry, nutrient poor habitat types are the most common types on the state forest occupying approximately 62% of the area. They include PQGCe (Pinus-Quercus/Gaultheria-Ceanothus), QAp (Quercus/Amorpha), PArVAm (Pinus-Acer rubrum/Vaccinium-Amphicarpa), and PArV (Pinus-Acer rubrum/Vaccinium). The growth potential for jack pine on these habitat types ranges from good to very good. The red and white pine growth potentials range from fair to very good. The growth potentials for aspen, white birch, oak (northern pin, red, white, and bur), and red maple ranges from fair to good.

FIGURE 3.5 PRIMARY COVER TYPES WITHIN THE FOREST PRODUCTION MANAGEMENT CLASSIFICATION



Source: WDNR Forest Recon Database

TABLE 3.14 COMMUNITY TYPES ON THE GKSF

Community Type	Last Observed	State Rank	Global Rank
Alder Thicket	1979	S4	G4
Floodplain Forest	1984	S3	G3?
Forested Seep	2008	S2	GNR
Hardwood Swamp	2008	S3	G4
Northern Dry Forest	2008	S3	G3?
Northern Dry-mesic Forest	2007	S3	G4
Northern Sedge Meadow	2007	S3	G4
Northern Wet Forest	2008	S4	G4
Northern Wet-mesic Forest	2007	S3S4	G3?
Oak Barrens	2007	S2	G2?
Pine Barrens	2007	S2	G2
Sand Prairie	2007	S2	GNR
Shrub-carr	2008	S4	G5
Southern Mesic Forest	2008	S3	G3?
Springs and Spring Runs, Soft	2006	SU	GNR
Stream—Fast, Soft, Cold	1979	SU	GNR
Tamarack (Poor) Swamp	1979	S3	G4

Source: Biotic Inventory and Analysis of the Governor Knowles State Forest (WDNR 2010e).

Twenty-six percent of the state forest is classified as Hydric with wetland soil types that include poorly drained muck and mineral soil and organic peats. Swamp hardwoods, white cedar, black spruce, tamarack, lowland brush, and keg are commonly found on these habitat types. Lowland (hydric) habitat types have recently been studied in detail and more detailed type descriptions are currently being drafted that better define the habitat types within the Hydric group.

The remainder of the state forest, or 12% of the area, is classified with a mix of habitat types ranging from dry-mesic to wet moisture regimes with the full range of nutrient regimes. This variability is consistent with the variety of growing conditions found between the escarpment and the St. Croix River. Forest types found on these habitat types include bottomland hardwoods, swamp hardwoods, aspen, white pine, and oak (red, northern pin, white, and bur).

Natural Communities

Thirty-seven high-quality examples of 17 natural communities were documented on the GKSF during the Biotic Inventory (WDNR 2010e). These areas can be considered opportunities to develop or protect High Conservation Value Forests. Most of these areas were new records in the NHI database; the remainder were historical records that were updated with new information. Community types found on the GKSF but not listed in Table 3.14 were represented by stands that were too small, too highly disturbed, or too altered to warrant inclusion in the NHI database.

THREATENED, ENDANGERED, AND SPECIAL CONCERN SPECIES

Plants

The Wisconsin Natural Heritage Database tracks 14 rare plant species known from the GKSF including one State Endangered, three State Threatened, and ten Special Concern species (Table 3.15). Roughly half of these species were either found or relocated during the Biotic Inventory (WDNR 2010e). The other species were not re-located during the Biotic Inventory and, in some cases, have not been seen on the property for decades. One additional plant, prickly hornwort (Ceratophyllum echinatum) is known from within one mile of the GKSF; this is a special concern species found in soft-water lakes, ponds, and reservoirs. No federally-listed plants are known from the GKSF at this time.

These rare plants are found in habitats with widely varying moisture and nutrient regimes, as would be expected given the disparate soils, landforms, and community types present. In general, rare plants were found in the Pine/Oak Barrens,

TABLE 3.15 NHI WORKING LIST PLANTS DOCUMENTED WITHIN THE GKSF

Scientific Name	Common Name	Last Observed	State Rank	Global Rank	State Status
Arethusa bulbosa	Swamp-pink	1975	S3	G4	SC
Asclepias ovalifolia	Dwarf Milkweed	2007	S3	G5?	THR
Carex assiniboinensis	Assiniboine Sedge	2007	S3	G4G5	SC
Carex prasina	Drooping Sedge	1993	S3	G4	THR
Cypripedium parviflorum var. makasin	Northern Yellow Lady's-slipper	1975	S3	G5T4Q	SC
Cypripedium reginae	Showy Lady's-slipper	2007	S3	G4	SC
Dalea villosa var. villosa	Silky Prairie-clover	2008	S2	G5	SC
Deschampsia cespitosa	Tufted Hairgrass	2007	S2	G5	SC
Epilobium palustre	Marsh Willow-herb	2004	S3	G5	SC
Liatris punctata var. nebraskana	Dotted Blazing Star	1989	S2S3	G5T3T5	END
Myriophyllum farwellii	Farwell's Water-milfoil	1971	S3	G5	SC
Ophioglossum pusillum	Adder's-tongue	1966	S2	G5	SC
Poa paludigena	Bog Bluegrass	2008	S3	G3	THR
Talinum rugospermum	Prairie Fame-flower	1994	S3	G3G4	SC

Source: Biotic Inventory and Analysis of the Governor Knowles State Forest (WDNR 2010e).

Forested Seeps, Hardwood Swamp, open wetlands, mesic hardwood forests with moist inclusions, conifer swamps, and roadsides/rights-of-ways.

Dry, sandy habitats support barrens-associated species such as dwarf milkweed, silky prairie-clover, and prairie fame-flower. The GKSF records for silky prairie-clover represent significant proportions of the known occurrences in the state. Silky prairie-clover has a very restricted distribution in Wisconsin and is only known from dry, sandy areas near the St. Croix and Mississippi rivers.

Hardwood Swamps and Forested Seeps on the GKSF also provide rare plant habitat. Bog bluegrass is especially well-represented on the GKSF, with one-third of its documented occurrences in Wisconsin located within the property boundary. This species is mostly found in forests with wet soils, especially near areas with groundwater seepage. This species has been found along the length of the property within the abundant high-quality Hardwood Swamps and forested seeps, and the GKSF probably provides the most extensive habitat for this species of any property managed by the Wisconsin DNR. Showy lady's-slipper was also found in seeps and Hardwood Swamps on the GKSF. Smaller seepage inclusions within other forested natural communities types also contained rare plants on the GKSF.

The GKSF's conifer swamps support rare species. These forested communities include Northern Wet-mesic Forest, Northern Wet Forest, and Tamarack (poor) Swamp. Rare plant species documented in GKSF conifer swamps include showy lady's slipper and marsh willow-herb, a species that uses bogs and fen mats.

Rare plants were also found in small seepage areas and wetland depressions within mesic hardwood forests, as well as some dry-mesic forests on the GKSF. These include drooping sedge and Assiniboine sedge, the latter being especially well-represented on the property.

Only a couple of rare plants are known from the open wetlands of the GKSF to date. Tufted Hairgrass was found in one location in an open meadow with seepages. Assiniboine sedge was found on the GKSF in one small sedge-dominated wetland at the edge of a bottomland forest, although it is much more typically associated with mesic hardwoods where it was found elsewhere on the property.

Animals

The Wisconsin NHI database tracks 32 rare animal species that have been documented on or near (e.g., river species) the GKSF, including one beetle, nine birds, four butterflies, three dragonflies, six fish, one mammal, two moths, four mussels, and two turtle species (Table 3.16). Five of these species are State Endangered, nine are State Threatened, and three species are protected by the federal Endangered Species Act. Herptiles and invertebrates were not surveyed during the Biotic Inventory.

Barrens associates are generally restricted to dry, sandy habitats. These species comprise at least 20% of the rare animal species documented on the GKSF, including all of the butterflies, moths, and the one tiger beetle known from the property. Several of these species are known from the managed barrens on the property, although rare animals were also documented in small barrens "pockets," trailsides, or roadsides. There are several additional rare barrens associates that occur within one mile of the GKSF and for which the GKSF may offer suitable habitat or opportunities to provide connections including the State Endangered phlox moth.

The St. Croix River supports the largest portion (36%) of the rare animal species, including all of the rare dragonfly, fish, and mussel species. Two-thirds of the state-listed species, as well as one candidate for federal listing, the spectacle case mussel, are found in the St. Croix. Several of these species are very susceptible to changes in water quality and rely on the high-quality river habitat for their survival. Management of the areas surrounding the tributaries to the St. Croix has important indirect impacts on these species.

TABLE 3.16 NHI WORKING LIST ANIMALS DOCUMENTED WITHIN THE GKSF

Scientific Name	Common Name	Last Observed	State Rank	Global Rank	State Status	Federal Status
Beetle						
Cicindela patruela patruela	A Tiger Beetle	1996	S2	G3T3	SC/N	
Bird						
Buteo lineatus	Red-shouldered Hawk	2008	S3S4B,S1N	G5	THR	
Coccyzus americanus	Yellow-billed Cuckoo	2008	S3B	G5	SC/M	
Haliaeetus leucocephalus	Bald Eagle	2007	S4B,S2N	G5	SC/P	
Picoides arcticus	Black-backed Woodpecker	2007	S2B	G5	SC/M	
Podiceps grisegena	Red-necked Grebe	1987	S1B	G5	END	
Protonotaria citrea	Prothonotary Warbler	2007	S3B	G5	SC/M	
Seiurus motacilla	Louisiana Waterthrush	2007	S3B	G5	SC/M	
Wilsonia canadensis	Canada Warbler	2008	S3B	G5	SC/M	
Wilsonia citrina	Hooded Warbler	2008	S2S3B	G5	THR	
Butterfly						
Atrytonopsis hianna	Dusted Skipper	1999	S3	G4G5	SC/N	
Callophrys henrici	Henry's Elfin	1988	S1S2	G5	SC/N	
Hesperia metea	Cobweb Skipper	1996	S2	G4G5	SC/N	
Lycaeides melissa samuelis	Karner Blue	2003	S3	G5T2	SC/FL	LE
Dragonfly						
Ophiogomphus anomalus	Extra-striped Snaketail	1994	S3	G4	END	
Ophiogomphus howei	Pygmy Snaketail	1999	S4	G3	THR	
Ophiogomphus susbehcha	Saint Croix Snaketail	2000	S2	G1G2	END	
Fish						
Acipenser fulvescens	Lake Sturgeon	1991	S3	G3G4	SC/H	
Cycleptus elongatus	Blue Sucker	1979	S2	G3G4	THR	
Fundulus diaphanus	Banded Killifish	1978	S3	G5	SC/N	
Moxostoma carinatum	River Redhorse	1979	S2	G4	THR	
Moxostoma valenciennesi	Greater Redhorse	1989	S3	G4	THR	
Percina evides	Gilt Darter	1983	S2	G4	THR	
Mammal						
Canis lupus	Gray Wolf	2008	S2	G4	SC/FL	LE
Moth						
Catocala whitneyi	Whitney's Underwing Moth	1999	S3	G3G4	SC/N	
Papaipema beeriana	Liatris Borer Moth	1997	S2	G2G3	SC/N	
Mussel						
Alasmidonta marginata	Elktoe	1997	S4	G4	SC/P	
Cumberlandia monodonta	Spectacle Case	1988	S1	G3	END	C
Cyclonaias tuberculata	Purple Wartyback	1997	S1S2	G5	END	
Pleurobema sintoxia	Round Pigtoe	1997	S3	G4G5	SC/P	
Turtle						
Emydoidea blandingii	Blanding's Turtle	1996	S3	G4	THR	
Glyptemys insculpta	Wood Turtle	1985	S2	G4	THR	

Source: Biotic Inventory and Analysis of the Governor Knowles State Forest (WDNR 2010e).

Numerous occurrences of several rare bird species were documented on the GKSF. The varied habitats and the property's location within and around the "tension zone" likely contribute to the bird diversity, as the property contains species with both northern and southern affinities. The State Threatened Red-shouldered Hawk was found to be particularly abundant on the GKSF, and there are likely many additional territories from the adjacent NPS land, as well as across the river in Minnesota, as this species is known to be abundant in the forests of the St. Croix River valley (Wovcha et al. 1995, Mossman 1991). Louisiana Waterthrush is present here at the northernmost limits of its range, and it requires specific habitat characteristics. This species nests near flowing water including forested springs, spring runs, or streams (Mossman 1991) within extensive forest habitat, and the GKSF provides many excellent locations for nesting. Other rare birds documented at the GKSF at or near the northernmost limits of their ranges include Hooded Warbler, found here in dry mesic forest, as well as Prothonotary Warbler, a cavity-nesting species of bottomland forests that was found here in Hardwood Swamp, Floodplain Forest and Dry-mesic forests - always near a stream or river. The St. Croix River corridor is well-known for supporting Prothonotary Warbler, and there are likely many additional undocumented populations on National Park Service land. Finally, the GKSF supports rare birds with northern affinities such as Canada Warbler, a bird often associated with forests containing conifers, as well as forested swamps or alder thickets (Epstein 2006), and Black-backed Woodpecker, a species associated with lowland conifer forests and burned jack pine stands (Johnson 2006) that was found in dry forest stands dominated by northern pin oak.

The Federally Endangered Karner blue butterfly (KBB) is known to have occurred historically at the GKSF. Although KBB were not located during limited surveys in 2010, there is potential for them to use the property. The KBB uses wild lupine as its host plant, and there are significant populations of both KBB and lupine found at nearby Crex Meadows Wildlife Area, Fish Lake Wildlife Area and various sites within the Burnett County Forest. The Department is a partner in the U.S. Fish and Wildlife Service's Habitat Conservation Plan for Karner blue butterflies, which was finalized in 1999 (WDNR 2000). Under this agreement, the Wisconsin DNR agrees to adopt certain management restrictions within KBB range, and these restrictions would apply to any populations found within GKSF.

Species of Greatest Conservation Need

In addition to the aforementioned rare animals that have been documented in the NHI database, there are numerous additional species that could occur in the GKSF and surrounding landscape. The Wisconsin Wildlife Action Plan (WDNR 2006d) lists all of Wisconsin's Species of Greatest Conservation Need (SGCN) by their degree of association with each Ecological Landscape. Table 3.17 contains species that are either significantly or moderately associated with one or both of the two Ecological Landscapes making up the GKSF. Some of these species may use habitat not likely available on the GKSF, and some species are not tracked by NHI. See the Wisconsin Wildlife Action Plan (WDNR 2006d) for more information on Species of Greatest Conservation Need and their habitats.

Opportunities for Biodiversity Conservation[2]

The best examples of rare and representative native ecosystems, aquatic features, and sensitive species populations have been identified by the DNR as opportunities for biodiversity conservation (WDNR 2010e). The GKSF presents opportunities to maintain 55 miles of native wetland and upland communities with connections to a regionally significant river with excellent biodiversity, as well as connections to many ecologically important areas across the river in Minnesota. Many species, both rare and common, are supported by the GKSF and its surrounding habitats.

Landscape Level Priorities

Ecological Connections

The ecological context of any given site has a strong influence on the site's ecological integrity, so how an area connects to the surrounding landscape is important. The location and shape of the GKSF make it extremely valuable as an ecological connector in different ecosystem types. There are many opportunities to either maintain or restore ecological connections within the GKSF and its surrounding areas. The GKSF was originally established because of its connection to the St. Croix River, and this is still a critical need. The St. Croix River has long been recognized for its biological importance, and the GKSF fills a valuable role by buffering many miles of habitat either adjacent to or within close proximity of the river. The GKSF also contains many seeps, wetlands, and streams that are hydrologically connected to the river, so its management is important to the river's health.

The GKSF is also part of a significant forested corridor, in combination with over 70,000 acres of mostly forested state-managed lands on the Minnesota side of the river and portions of two county forests on the Wisconsin side. This broad corridor occurs in an area otherwise dominated by agriculture, small non-industrial forests, and residential developments. These forests support numerous species with both

2 *Much of the information within this section is adapted from the Biotic Inventory and Analysis of the Governor Knowles State Forest (WDNR 2010e).*

TABLE 3.17 SPECIES OF GREATEST CONSERVATION NEED OCCURRING IN THE NORTHWEST LOWLANDS OR THE NORTHWEST SANDS ECOLOGICAL LANDSCAPES

Common Name	Northwest Lowlands	Northwest Sands
American Bittern (SC)	X	X
American Golden Plover (SC)		X
American Marten (END)	X	
American Woodcock (SC)	X	X
Black Tern (SC)	X	X
Black-billed Cuckoo (SC)	X	X
Blue-winged Teal (SC)	X	X
Blue-winged Warbler (SC)		X
Bobolink (SC)	X	X
Boreal Chickadee (SC)	X	
Boreal Chorus Frog	X	X
Brown Thrasher (SC)	X	X
Bull Snake (SC)		X
Canvasback (SC)		X
Connecticut Warbler (SC)	X	X
Dunlin (SC)		X
Eastern Meadowlark (SC)		X
Eastern Red Bat (SC)	X	
Field Sparrow (SC)		X
Four-toed Salamander (SC)	X	X
Franklin's Ground Squirrel (SC)		X
Golden-winged Warbler (SC)	X	X
Grasshopper Sparrow (SC)		X
Hoary Bat (SC)	X	
Hudsonian Godwit (SC)		X
Le Conte's Sparrow (SC)	X	X
Least Darter (SC)		X
Least Flycatcher (SC)	X	X
Lesser Scaup (SC)		X
Longear Sunfish (THR)	X	
Marbled Godwit (SC)		X
Mink Frog (SC)	X	X
Moose (SC)	X	
Mudpuppy (SC)	X	X
Nelson's Sharp-tailed Sparrow (SC)		X
Northern Flying Squirrel (SC)	X	X
Northern Goshawk (SC)	X	X
Northern Harrier (SC)	X	X
Northern Long-eared Bat (SC)	X	
Northern Prairie Skink (SC)		X
Olive-sided Flycatcher (SC)	X	X
Osprey (SC)	X	X
Pickerel Frog (SC)	X	X
Pugnose Shiner (THR)		X
Red Crossbill (SC)	X	X
Red-headed Woodpecker (SC)		X
Red-necked Grebe (END)		X
Rusty Blackbird (SC)	X	X
Sharp-tailed Grouse (SC)		X
Short-billed Dowitcher (SC)		X
Silver-haired Bat (SC)	X	
Solitary Sandpiper (SC)	X	X
Trumpeter Swan (SC)		X
Upland Sandpiper (SC)		X
Veery (SC)	X	X
Vesper Sparrow (SC)		X
Water Shrew (SC)	X	X
Whip-poor-will (SC)		X
Wilson's Phalarope (SC)		X
Wood Thrush (SC)	X	X
Woodland Jumping Mouse (SC)	X	X
Yellow Rail (THR)		X

Source: Wisconsin Wildlife Action Plan (WDNR 2006d) and Biotic Inventory and Analysis of the Governor Knowles State Forest (WDNR 2010e)

KEY FOR TABLES 14, 15, 16 AND 17

State Ranks		Global Ranks	
S1	Critically imperiled in Wisconsin because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extirpation from the state.	G1	Critically imperiled globally because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.
S2	Imperiled in Wisconsin because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extirpation from the state.	G2	Imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.
S3	Rare or uncommon in Wisconsin (21 to 100 occurrences).	G3	Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g., a single state or physiographic region) or because of other factors making it vulnerable to extinction throughout its range; in terms of occurrences, in the range of 21 to 100.
S4	Apparently secure in Wisconsin, with many occurrences.	G4	Apparently globally secure, though it may be quite rare in parts of its range, especially at the periphery.
SU	Possibly in peril in the state, but their status is uncertain. More information is needed.	G5	Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.
B	Breeding status of the taxon in question	GNR	Not ranked.
N	Non-breeding status of the taxon in question	?	Elements for which NHI is less certain about the rank given. Ranks shown are based on best available information and will be finalized when additional data become available.
		Q	Species with a questionable taxonomic assignment are given a "Q" after the global rank.
		T	Subspecies and varieties are given subranks composed of the letter "T" plus a number or letter. The definition of the second character of the subrank parallels that of the full global rank.

State Status		Federal Status	
SC	Special Concern	LE	Listed endangered
THR	Threatened	C	Candidate for future listing
END	Endangered		
SC/P	Fully protected		
SC/N	No laws regulating use, possession, or harvesting		
SC/H	Take regulated by establishment of open closed seasons		
SC/FL	Federally protected as endangered or threatened, but not so designated by WDNR		
SC/M	Fully protected by federal and state laws under the Migratory Bird Act.		

southern and northern affinities and are likely to be of even greater importance as development pressures continue in the surrounding landscape.

There are also opportunities to connect to other ecosystems in the opposite direction from the river. The two areas managed for barrens on the GKSF could offer opportunities to connect with nearby areas in the future. Kohler-Peet Barrens is within one mile of Crex Meadows where large-scale active barrens management occurs and Sterling Barrens is part of a township with many small barrens remnants in both county and private ownerships. Both of these sites provide habitat and dispersal corridors for native species of barrens flora and fauna.

Finally, there are opportunities within the GKSF to connect ecologically significant sites such as State Natural Areas and other ecologically important sites. Several of the existing State Natural Areas have artificial boundaries that cut across intact wetlands and other natural communities. Consideration could be given to natural community patterns and processes, as well as the landscape context of ecologically important areas and how they connect to other portions of the property. Fragmentation (of the mesic to wet forested areas or areas comprising the barrens to dry forest continuum) should also be avoided wherever possible to preserve the GKSF's ecological integrity.

Old Forests and Old Growth

Old growth stands are often characterized by large trees; a multi-layered, uneven age and size class structure; a high degree of compositional and structural patchiness and heterogeneity; and significant amounts of woody debris and tip-up mounds (WDNR 2006b). The structural diversity found in these forests can support unique assemblages of plants, birds, and other animals and are important for providing the diverse range of habitats needed for sustainable forest management.

The WDNR has identified a need to conserve, protect, and manage old growth forests (WDNR 2004, WDNR 1995), and state and federal lands provide some of the best opportunities to do this. Stands of older forest (greater than 100-120 years old) provide habitat for forest interior wildlife species and represent an increasingly rare feature of Wisconsin's Northern Forests. Old growth opportunities at the GKSF are somewhat limited compared to other state forests in northern Wisconsin because of the size and shape of the property. However, maintaining a mosaic of older forests in the largest blocks possible will provide valuable habitat for associated species of plants and wildlife.

The existing State Natural Areas at the GKSF account for 524 acres of 100+ year old forests and are passively managed. An additional 1,500 acres that are 100+ years old were identified in the Biotic Inventory (WDNR 2010e) and present some of the best opportunities on the GKSF to develop stands with old growth characteristics. Also, old forest sites below the escarpment add to the old forest management zone of the National Scenic Riverway. Specific sites include a red pine-dominated Northern Dry-Mesic Forest at Brandt Brook Pines, Northern Mesic Forest of mixed composition at Sunrise Ferry extensive stands of Hardwood Swamp at various locations, and various types of coniferous forested wetland, particularly at Kohler-Peet Wetlands.

Other sites on the GKSF present opportunities to manage for old forests as a complex of forest types, such as Clam Woods North, where oak-dominated Northern Dry-Mesic Forest is contiguous with Northern Hardwood Swamp and Northern Dry Forest, and at St. Croix Ash Swamp, which has a relatively large block of forested wetlands.

The Department's Old Growth Handbook is meant to provide guidance for old growth management within the DNR and identifies several different categories of old and old growth forest management (see WDNR 2006b for definitions). The GKSF offers opportunities to develop old forests of several different community types and in different old growth management categories. In addition to "reserved" old growth, there may also be good opportunities for "managed old growth" (WDNR 2006b).

The concept of old growth in Wisconsin forest types that originated from fire is not well-understood at this time. Some of these species are not long-lived (i.e., "early successional"), the fire regime is completely altered, and it is unclear how abundant older stands of these types were historically. However, future chapters planned for the Department's Old Growth Handbook will cover pine and oak ecosystems and could provide guidance for some of the areas on the GKSF. It could be useful to have some of these areas available as benchmarks for reference or for evaluating alternative techniques in the future.

High Conservation Value Forests

One principle of forest certification (described earlier in this document) concerns the maintenance of High Conservation Value Forests (HCVFs). HCVFs are areas which possess exceptional ecological qualities and have been specifically designated as HCVF in property management plans. For some ownerships, such as Wisconsin State Forests, HCVF may be referred to using a different designation (e.g. State Natural Area or Native Community Management Area), but a crosswalk has been provided for use by certification organizations. Based on the current draft criteria for defining HCVFs (Forest Stewardship Council 2009), the GKSF has several high quality

natural communities that provide opportunities for maintaining HCVFs (WDNR 2010e).

Community Level Priorities

This section highlights the natural community types for which GKSF has good-quality examples that are relatively large, embedded within a mosaic of other intact communities, and show relatively little evidence of disturbances such as hydrologic alteration, presence of invasive species, or intensive management (with the exception of barrens sites that are intensively managed specifically to maintain communities using restoration techniques). Age, structure, patch size, and ecological context are also especially important considerations for the forested natural communities.

Communities that are especially representative of the two Ecological Landscapes making up the GKSF are also included here. Some of these community types are already protected through SNA designation, although the majority of this acreage is in the Wilderness Area and does not include some of the communities such as the dry forests or mesic hardwoods communities. There are other significant natural community types on nearby landholdings that are not discussed, including Floodplain Forests on National Park Service land.

Aquatic Communities

The St. Croix River is biologically important, and numerous streams feed into the river from the GKSF. Many of these streams exhibit good water quality and have the potential to support rare species. These streams were not sampled for rare animals during the course of the Biotic Inventory, but nonetheless, it will be important to maintain these streams in a high-quality condition.

Barrens / Savanna / Woodland Communities

Collectively, these communities likely dominated the majority of the GKSF uplands prior to European settlement. Many of the historical barrens would have had scattered trees present and would have occurred in a continuum from the most open (Sand Prairie) stands to areas with the highest tree cover (Northern Dry Forest) with other combinations in-between, including barrens and woodland communities. Most examples have either succeeded to other community types or have been converted to other forest types. These communities are globally rare and are associated with numerous rare species.

Department wildlife staff have been actively restoring portions of the GKSF barrens, primarily within existing SNAs. The two existing barrens SNAs are currently maintained without mature trees, and tree species are primarily limited to shrubby or sapling growth forms. In addition, barrens restoration work is ongoing at Crex Meadows and Fish Lake State Wildlife Areas. There are opportunities to manage barrens across boundaries in a way not otherwise possible on the GKSF alone, due to its small size and narrow configuration of much of the dry habitats. Compatible management on the GKSF and nearby wildlife areas should be considered, perhaps including some areas with more tree cover to benefit slightly different species assemblages. There may also be opportunities to partner with landowners in the nearby surrounding landscape to manage in complementary ways, as there are scattered barrens remnants on some of the nearby public and private lands.

Conifer Swamps

Good quality examples of several types of conifer swamps are found on the GKSF, including Northern Wet Forest, Northern Wet-mesic Forest, and Tamarack (poor) Swamp. Although none of these communities are abundant on the GKSF or are present in very large acreages, they were all found to be of good quality and located in a favorable context. On the GKSF, these communities contribute to a larger matrix of wetland communities in the river valley. They can support rare and unusual species and are sensitive to disturbances, including changes in hydrology. Because there are few examples and they contribute to the ecological integrity of the river valley, they all warrant continued protection.

Forested Seep

Forested Seeps are particularly abundant on the GKSF and are found in many places, especially where the base of the slope meets the river terrace. The GKSF probably has a higher concentration of these features than any other state-managed land. They support high plant diversity and likely support several amphibian species and numerous invertebrates. They also contribute to the high water quality of the streams to which they feed. There is a need to provide for the continued long-term ecological integrity of Forested Seeps, as these features are highly susceptible to damage. Land use practices that lead to soil or hydrological disturbance should continue to be avoided.

Hardwood Swamp

These forested wetlands make up much of the forested matrix within the St. Croix River valley where there are some large stands that often intergrade with other wetland types. There are few opportunities to maintain Hardwood Swamps in most of the Northwest Lowlands Ecological Landscape. These forests are susceptible to physical damage and changes in hydrology. Emerald ash borer appears to be a significant threat to their continued existence, and it is unclear how other species such as red maple and balsam fir will be able to fill the void left by the anticipated large-scale decline of Wisconsin's ash species. The GKSF offers opportunities to monitor these

areas and provide large benchmarks or control stands not possible in the surrounding landscapes.

Mesic Hardwoods

Because of its soils and landforms, the GKSF has only a few small areas that would be typical of the classic northern hardwood forests found throughout much of northern Wisconsin. However, there are some areas, often associated with former river terraces or on mid-elevation slopes where mesic hardwood species occur. These forests are difficult to classify and do not fit well into either the NHI Community Classification or Forest Habitat Classification (Kotar et al. 2002) systems. These interesting variants are likely the result of a combination of factors, including soil characteristics and their location within the "tension zone". These forests feature the unusual combination of bur oak alongside sugar maple and herbs typically associated with nutrient-rich mesic habitats. These stands were classified as Southern Mesic Forests for the purposes of the Biotic Inventory. They typically occur within a diverse mosaic of other types on the GKSF.

Notable mesic hardwood examples are found near the Trade River in a matrix of drier forest mixed with areas of seeps and streams upslope from the river floodplain. The diversity of habitats in this area corresponds to species diversity for both plants and animals, and this area was found to have the most diverse assemblage of rare birds found on the property.

Northern Dry Forest

Occurring on the driest, most nutrient-poor sites, these forests are characteristic of the Northwest Sands Ecological Landscape that comprises much of the sandy uplands of the GKSF. Many examples of this community type in the Northwest Sands have been converted to red pine plantations and now exhibit reduced structural and species diversity. Most of the GKSF's remaining examples of this type are dominated by northern pin oak, as jack pine was harvested from many of these stands 30 years ago when jack pine timber markets were favorable and the jack pine was starting to decline (Wallis, pers. commun.). Currently, there is one relatively large example dominated by jack pine north of the Clam Dam. Fire suppression and succession have limited the floristic diversity of many dry forests in the state. In many cases, the herb layer becomes dominated by Pennsylvania sedge to the exclusion of other species, thereby reducing the site's biodiversity. The dense Pennsylvania sedge mat also makes natural tree regeneration a challenge, necessitating intensive practices such as blade scarification to re-establish trees following harvest in areas managed for timber. Restorable savanna/woodland openings are few on the GKSF, and none are currently in a protected status.

There are opportunities on the GKSF to explore alternative management on some examples of this type. Consideration could be given for increased use of fire to manage these forests, whether stands are to be managed for timber production or for conservation purposes. There are still some good examples to manage for a barrens/savanna/woodland continuum, including the area north of Clam Dam, as well as the area just east of Sterling Barrens. In stands that are to be managed with timber as a primary objective, additional consideration could be given to the understory flora.

Northern Dry-mesic Forest

High-quality examples of Northern Dry-mesic Forests are limited to a few locations on the GKSF; the best examples are in and around the Brandt Brook Pines State Natural Area and another near the north end of the property by Pease Hill. These stands contain older trees, abundant conifers of natural origin, and areas of high crown closure. These sites offer opportunities to develop older forests of an uncommon type on the property. They may also provide a seed source to potentially re-establish the missing pine component in some of the adjoining forests. Active management may be needed as a tool if the goal is to maintain some examples of these communities over time in the absence of fire, and this could be a good area for using non-traditional management techniques including managed old growth.

Non-forested Wetlands

Non-forested wetlands occur at several locations within the river valley. There are fairly extensive areas of shrub swamp (Alder Thicket, as well as other wetlands dominated by willows or other shrubs) and other areas dominated by grasses and sedges. The GKSF sedge meadows, with a few exceptions, are often small wetland inclusions surrounded by other natural community types within the river valley. Non-forested wetlands are important components of the vegetation mosaic in the river valley and contribute to plant and animal species diversity. The biggest threats to these areas are invasive species such as reed canary grass, changes to hydrology, and sedimentation. The wetlands embedded within the extensive habitats of the Wilderness Area may have the best long-term viability.

Unique Microhabitats within Managed Areas

Forests often contain important microhabitats for rare or uncommon plants and animals, and there are often opportunities to provide for these species within managed stands (WDNR 2009). The features present will vary based on the soils, landform, natural community present, and numerous other factors. Seeps and springs, permanent or ephemeral waterbodies or wetlands, and isolated wetlands should continue to be protected by continuing to follow Wisconsin's

Forestry Best Management Practices for Water Quality (WDNR 2003). Moist and dry cliffs (i.e. with exposed bedrock) are rare on the GKSF, but these and other features such as ravines could also be important for certain species if present. For the GKSF, in particular, small areas with diverse and/or rare and unusual native flora in dry and dry-mesic managed forests are worthy of protection and could be accommodated during routine management activities. Maintaining certain structures within all managed forests such as cavity trees, coarse and fine woody debris, and large, old trees can be important "biological legacies". Most recently, some of these features are being recognized for their importance to bat species (e.g., Taylor 2006), some of which are currently in decline statewide.

POTENTIAL FUTURE IMPACTS TO BIODIVERSITY[3]

Invasive Species

Invasive species are a threat to the GKSF and the surrounding landscape, including nearby National Park Service lands. These species can out-compete and displace native species, leading to ecological simplification, habitat loss, and limiting management options. Detection and management techniques are needed to prevent the introduction of these species and control their spread whenever possible. Controlling outbreaks of new invasives in an area while they are small and localized, especially in ecologically important areas, is likely the most effective strategy. Early control measures are needed, wherever possible, to avoid the major infestations that have become highly difficult to control in many other parts of the state.

Invasive plants were documented during the Biotic Inventory (2007-2009) (WDNR 2010e), and an inventory of invasive plants had been previously conducted on the property in 2006, although much of this effort was focused along roads, trails, rights-of-way, and intensive use areas (Anderson 2006). Based on the 2006 inventory, an Invasive Plant Management Plan was developed for the property in 2008. The GKSF staff, along with support from others in the region, are implementing the plan. The species below represent the biggest threats to native communities on the GKSF at this time; this is not meant to be a comprehensive list of invasive species for the property.

Garlic mustard (Alliaria petiolata), known to spread rapidly through forested habitats, has been documented on the property. Department staff have worked to treat known populations soon after they were discovered in an attempt to either eliminate populations or slow their spread. This plant threatens all but the most open/dry habitats on the GKSF and early detection and control is important. A five acre patch is located adjacent to Sterling Barrens and runs for approximately two miles along the St. Croix River. This patch is being treated on an annual basis. A large patch of garlic mustard was documented along the Lagoo Creek Hiking Trail (Anderson 2006). The plants were removed by NPS staff and continue to be treated on an annual basis. It will be important to monitor infestations to prevent additional plants from producing seed.

Spotted knapweed (Centaurea spp.) is found in many areas of the GKSF along roadsides and near horse and walking trails. Centaurea biebersteinii is the most common problem statewide, although there are several other non-native Centaurea species that can also be aggressive. This invasive plant is found mostly in dry, disturbed open areas and is a threat to barrens, sand prairies, and dry forest communities. It has been found at Sterling Barrens, and there is potential for it to become worse there. Elsewhere in the property, care is especially needed when conducting timber sales near an infested area, particularly those with site preparation techniques that involve soil disturbance.

Leafy spurge (Euphorbia esula) and cypress spurge (Euphorbia cyparissias) are invasive plants that spread aggressively and are often found in dry habitats such as those occupying much of the GKSF. These species are currently found along roadsides, old fields, and horse trails on the GKSF and can be very difficult to control once established.

Common buckthorn (Rhamnus cathartica) and glossy buckthorn (Frangula alnus) are non-native shrubs that can sometimes grow into 20 foot tall trees. Both species spread aggressively by seed and can be very difficult to eradicate. Both species can grow in all but the driest habitats on the GKSF, although glossy buckthorn is most often associated with wetlands. Because these species are often spread by birds that ingest the seeds along with their fruit, they can be found in numerous isolated locations. These plants are found in several areas on the property, including scattered locations within the large wetlands of the river valley. Sites that are most threatened include the conifer swamps and other portions of the Kohler-Peet Wetlands, Trade River and Forest, and Sunrise Ferry. Any of the high-quality forested seeps along most of the length of the property could potentially be impacted by these species.

Non-native honeysuckles (Lonicera spp.) are also invasive shrubs whose seeds are spread by birds. They typically impact forests but can be found in many habitats. In northern Wisconsin, they are often found along streams in sunny locations, as well as roadside and disturbed areas. These species are present but probably not yet widespread on the GKSF, although they have been documented at a high-quality barrens

3 *Much of the information within this section is adapted from the Biotic Inventory and Analysis of the Governor Knowles State Forest (WDNR 2010e).*

site, and a large area of non-native honeysuckles was documented by Anderson (2006) near the Trade River horse trail crossing.

Reed canary grass (Phalaris arundinacea) is found in many wetlands throughout the state. Statewide, approximately 40% of wetlands are dominated by solid stands of reed canary grass, making it probably the most invasive plant in the state. It thrives in open wetlands but often spreads into Floodplain Forests and other forested wetlands and will respond whenever light conditions are favorable such as following a timber harvest. Once well-established, it forms dense stands that out-compete native vegetation. Tree regeneration is a challenge in dense reed canary grass stands. Reed canary grass is extremely difficult to contain or control once established. This species is found in spotty patches throughout the GKSF outside of forested areas mostly near streams, in wet depressions, and along the river on National Park Service land. An extensive infestation occurs near Wolf Creek at the southern end of the property.

The non-native Phragmites, or common reed (Phragmites australis), is a large wetland grass that is difficult to control. In some portions of the state (especially near Lake Michigan), entire wetlands have become completely dominated by this species. Phragmites was only found in small patches during the Biotic Inventory, although many of the large wetlands were not checked thoroughly. Phragmites plants seen during the Biotic Inventory were likely the native sub-species based on plant location, morphology, and habit. However, several large patches of non-native Phragmites are known to occur nearby at the Crex Meadows Wildlife Area.

Numerous aquatic invasive species have been identified in the St. Croix River including Chinese and Japanese mystery snail, rusty crayfish, curly-leaf pondweed, and zebra mussel. While none of these species have been confirmed in tributaries within the GKSF, if environmental conditions are suitable they could potentially become established. Threats from new aquatic invasives will always be a possibility.

Several invasive insect species may also impact the GKSF in the future. The Division of Forestry's Forest Health Program assists with monitoring for these species and providing management guidance. Two of the non-native species that are likely to impact the GKSF in the future are European gypsy moth (Lymantria dispar) and emerald ash borer (Agrilus planipennis). Gypsy moth continues to move west across the state and is not yet in high numbers near the GKSF. Gypsy moth can defoliate several tree species, with oak often the most heavily impacted. Emerald ash borer was known from six counties in Wisconsin as of this writing, with 11 counties under quarantine, and it likely occurs undetected in others. This beetle attacks all species of ash in Wisconsin and, with enough time, can lead to almost complete ash mortality in a given stand. This will be a particular concern for much of the GKSF occupying the St. Croix River valley where large stands of ash dominate numerous ecologically important areas and rare species habitats. Large-scale loss of ash in this area, whether through emerald ash borer-caused mortality or harvesting, is a concern and may potentially lead to non-forest cover, elevated water tables, or an increase in exotic plants such as reed canary grass and glossy buckthorn (WDNR 2010a).

Ecological Simplification and Habitat Loss

Ecological simplification, or homogenization, of both overstory (Schulte et al. 2007) and understory (Rooney et al. 2004) species has been identified as a major threat to northern and southern forests in the Lake States. Forests throughout this region have exhibited reduced species diversity, structural diversity, and functional complexity and have altered spatial patterns due to factors such as land uses, invasive species, and lack of fire regime. Even passively managed areas have been shown to have compromised ecological integrity and diversity as a result of stressors such as invasive species and high levels of deer herbivory (Rooney et al. 2004).

Another factor that has led to ecological simplification is the use of plantations in forest management. Many examples of native dry forest and barrens communities were replaced by plantation monocultures in the coarse-soiled areas of Wisconsin, as these stands often provide a consistent level of timber production. Red pine is often the preferred species for planting, rather than jack pine. Jack pine acreage has decreased dramatically over the last few decades in Wisconsin, and it is now considered an underrepresented forest type (WDNR 2010c, WDNR 2010d). In contrast to statewide trends, the acreage of jack pine on the GKSF has increased over the last decade and is expected to continue on that trend in the future (WDNR WisFIRS Report #207).

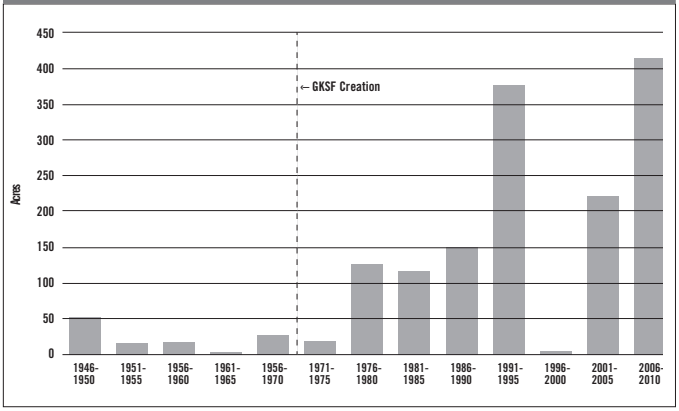
Pine plantations have been a component of the forest management program on the GKSF since the early 1980s. The full spectrum of stocking levels (number of planted trees surviving per acre) exists on these planted sites, resulting in a wide range of stand conditions from stands with a variety of native species to stands consisting primarily of red pine. This variability can be attributed to a number of factors including pre-planting site conditions, aggressive natural regeneration, toleration of low seedling survival rates, weather extremes, and budgetary and/or staffing constraints. As a result, plantation management techniques that may benefit both common and uncommon species (as described in WDNR 2010b) have

been applied to varying degrees in many of the pine plantations on the GKSF. Red pine continues to be planted at a relatively constant rate on the GKSF (Figure 3.6).

Although red pine plantations can be an acceptable form of sustainable forest management and are often desirable from an economic standpoint, there are ecological tradeoffs with this type of management. Plantations are simplified in terms of both structural and species diversity (WDNR 2010c, WDNR 2010b), and the replacement of natural mixed forests with monocultures negatively impacts biodiversity (Hunter and Schmiegelow 2010). In some instances, plantation management may not be an appropriate forest management tool because of the likely impacts to biological diversity. Converting more complex natural communities to plantations eliminates or drastically reduces habitat for many native species, both rare and common, and greatly simplifies community structure and composition. The extent of those impacts will vary depending on site conditions, acreage of plantations, tree spacing, site preparation techniques, the presence of gaps or other structures that might enhance diversity, the site's context within a larger ecological landscape, and other factors. Where plantations do exist, there are techniques to improve their ability to provide habitat (WDNR 2010b, Lindenmayer and Franklin 2002).

Herbicides are often used during plantation management to ensure seedling survival. On the GKSF, herbicides have been used for plantation site preparation or to control competing vegetation (release the established seedlings). As the use of herbicides can negatively impact a site's flora and further reduce biological diversity, some level of monitoring is likely needed where this technique is used to better understand the impacts.

FIGURE 3.6 GOVERNOR KNOWLES STATE FOREST RED PINE PLANTATION ACREAGE BY YEAR ESTABLISHED



Source: Division of Forestry WisFIRS (Wisconsin Forest Inventory and Reporting System), accessed May 6, 2010.

Deer Herbivory

Herbivory by white-tailed deer has been identified as having major impacts on tree and herb species in northern forests of the Lake States (e.g., Schulte et al. 2007, WDNR 2006c, WDNR 2004, Rooney et al. 2004, Rooney and Waller 2003, Alverson et al. 1988), and the Michigan Society of American Foresters (2006) recently released a position statement addressing the need to control the impacts caused by white-tailed deer. In addition to direct impacts on plants, deer density has been shown to negatively impact species richness and abundance levels of songbirds that nest in the intermediate canopy layer (DeCalesta 1994, McShea and Rappole 2000). Excessive deer herbivory is known to inhibit reproduction of certain trees, especially those species that are preferred forage, as well as species growing in areas where deer "yard" during portions of winter months. Northern white-cedar and hemlock are, perhaps, most notably impacted by heavy deer browse, and regeneration of both species is now severely limited throughout the state. Many other tree species are impacted in varying degrees as well. Heavy herbivory can also subject several forest herbs and shrubs to pressures they cannot withstand, resulting in loss of vigor, population size and reducing the number of species present through extirpation of species from the site. Because of the long linear nature of the GKSF, it would be challenging to manage deer via habitat on a landscape scale, and control of deer densities may be the only option.

The Hayward State Nursery conducted a deer repellent trial on several state forests including the GKSF. On the GKSF, a variety of deer repellents were used on a couple of tree species within plantations. The results were compared and recommendations developed. The results showed that repellents can be effective on small scales; however, the costs of large scale application are significant so the use of repellents may not be a feasible option.

Oak Wilt

Oak wilt is caused by a fungus, Ceratocystis fagacearum, that effects water movement within oak trees, often killing the trees. Species in the red oak group are most susceptible; this group includes northern pin oak, one of the major dominants in the dry forests of the GKSF. The fungus was thought to be native, but the most recent science suggests that it is not (Cummings Carlson, pers. commun.). It has been in the state for at least 100 years and is widespread throughout the southern part of the state. In recent years; however, it has been identified more commonly in the north, and it is known from both of the counties comprising the GKSF. Oak wilt is

often not a major concern for woodland or barrens restoration areas where open canopy conditions are favored, and dead oak trees can make long-lasting wildlife cavity trees. It can, however, have significant impacts to forested stands with a heavy oak component. Management and planning efforts for the GKSF will need to consider oak wilt along with other ecological and cultural factors.

Altered Ecological Processes and Habitat Degradation

Fires have been suppressed statewide for many decades. In addition to active suppression policies, land use factors continue to have strong influences on the fire regime (Cardille and Ventura 2001). Land uses affect the ability for fires to spread, and the presence of houses and other developments often necessitates quick containment to protect human life and property. With the exception of infrequent and usually quickly contained wildfires, fires that would significantly impact natural communities are now limited to those used by managers as a tool for restoration or maintenance of early successional habitat on a relatively small acreage statewide.

In northwestern Wisconsin, fires were likely very frequent prior to Euro-American settlement. Frequent, low intensity fires likely occurred in the southern part of the Northwest Sands (Radeloff et al. 2000), and several of the GKSF's natural communities originated from fire and are difficult to maintain without it. There may be opportunities to use fire as a management tool where it is not already being used, especially for communities dominated by shade-intolerant species such as jack pine, red pine, and some of the oaks.

Site preparation techniques can impact rare plant species, and care is needed when they are used in either planted or naturally-regenerated stands. Chemical treatments, such as broadcast spraying with herbicides, may negatively impact or eradicate conservative native plants, including rare plants, or the host plants needed by rare animals, so they should be used with caution. Physical site preparation, such as blade scarification, is commonly used to prepare the seedbed and control competing vegetation, but it can have dramatic impacts on understory plants. Like all mechanized activities that disturb the soil, there can be a risk of introducing non-native invasive species. Past mechanical site preparation methods used on the GKSF include: Bracke scarification, roller chopping, furrowing, blade scarification and disc trenching. Scalping and roller chopping have not been used in the last decade or more on the GKSF. Typically blade scarification and disc trenching disturb 40-60% of the soil on a site. Furrowing disturbs 50% or less of the soil depending on site characteristics. Since any amount of disturbance or equipment operation can impact rare plant or animal species, care is needed when they are used in either planted or naturally-regenerated forest stands. The long-term effects of scarification on the ground flora have not been well documented or monitored in Wisconsin. Long-term monitoring is needed on these sites, and care is warranted in areas with high plant diversity, and/or rare species.

The GKSF supports excellent examples of Forested Seeps, streams, and many other high-quality natural communities in the Wilderness Area. The streams often feed into tributaries of the St. Croix River. In many places, the slope drops off sharply from the escarpment to the river valley, and there is potential for both natural (sloughing) and human-caused (e.g. rutting and channelization) erosion and sedimentation to these high-quality areas. It will be important to continue to use caution when intensively managing areas near the edge of the escarpment. There are some areas where the bluff line recognized for management purposes is slightly different from the geological bluff line or where the bluff line is indistinct; in these cases forestry activities may now be occurring on Forested Seeps or other bottomland areas. Determining the location of the true bluff line is an important master planning consideration. Erosion from recreational trails, including horse trails, can negatively impact natural communities. An example of this was noted near the Trade River during the Biotic Inventory.

Climate Change

The following information related to potential future impacts from climate change is summarized from the 2010 Statewide Forest Assessment (WDNR 2010c). Based on observed and modeled climate change, Wisconsin will likely become warmer in the decades to come. Effects could be most dramatic in the northern half of the state. Wisconsin's forests occupy a unique position in the Great Lakes region because many of its tree species exist on the edge of their natural ranges. Transitions are likely as temperature and precipitation change. Some species, both plants and animals, could be pushed outside of their genetic limits, and others afforded a more favorable growing environment. The spread and persistence of invasive and exotic species are likely to increase if climate change results in additional stress on Wisconsin's native vegetation. Increased winter temperatures and frequencies of extreme precipitation events will likely result in additional tree stress and increases in the amount and frequency of forest disease and pest infestations in Wisconsin. The combination of higher temperatures and land use changes could increase the fuel loads in Wisconsin's forest increasing the likelihood of wildfire and the need for the strategic use of prescribed fires and other fuel reduction management activities.

WILDLIFE RESOURCES

Habitats Supported by the Northwest Lowlands and Northwest Sands Ecological Landscapes

The wildlife resources and habitats on the GKSF are supported by two Ecological Landscapes, the Northwest Sands and the Northwest Lowlands. The riparian zone adjacent to the St. Croix River and extending inland to the escarpment defines the portion of the GKSF associated with the Northwest Lowlands. The Northwest Sands Ecological Landscape refers to the dry, sandy upland areas of GKSF, above the escarpment.

Within the Northwest Lowlands, the wetlands and forested uplands are important to both resident and migratory birds, and several other species of wildlife. The State Forest is located at the heart of the Mississippi River Flyway, providing cover and resting habitat in a forested setting for neotropical migratory birds that nest farther North in Minnesota and Canada. The property also provides nesting habitat for forest-interior birds such as Red-shouldered Hawks and species on the northern edge of their range, including the Hooded Warbler and Louisiana Waterthrush. Forested Seeps are abundant at GKSF, and are important for invertebrate and amphibian species, thus an important winter habitat for mink. Alder thickets associated with forested seeps provide critical habitat for Woodcock, especially during migration. Conifer swamps in the river valley support core habitat for keystone species such as bobcat. The adjacent St. Croix River and associated wetlands are important for many species of reptiles, including painted, snapping, spiny softshell, and common map turtles. Bull frog, wood frog, spring peeper, eastern gray tree frog, American toad and blue spotted salamander are some of the common species of amphibians found on the property.

The Northwest Sands portion of the GKSF provides barrens-type habitats and the wildlife species associated with them. Large areas of oak forest and natural-origin pine support forest-interior birds, while under-represented forest types, such as old forest, are increasingly important to uncommon bird species. Northern Dry Forest stands, especially those containing abundant jack pine, provide habitat for the special concern Connecticut Warbler, and represent an increasingly rare community type. Several species of grassland birds use the open, upland areas of the GKSF and with appropriate management, the possibility exists to provide additional habitat for other birds, including rare species such as Sharp-tailed Grouse, Upland Sandpiper and Northern Harrier. Aspen-birch areas support Ruffed Grouse and numerous species of songbirds. Several species of reptiles use the open uplands, including eastern hognose snake, bull snake, prairie skink, western fox snake and common garter snake. Blanding's Turtle utilizes the property's barrens type communities.

Within both Ecological Landscapes, the property supports a host of other resident and seasonally-present wildlife species that are important to both the ecological and social values of the property. Being bordered by other public lands creates a substantial block of habitat, supporting wide-ranging species such as the gray wolf and black bear.

Raptors

Some of the raptor species on the GKSF include several nesting pairs of Bald Eagles, Great Horned Owls, Barred Owls, Northern Saw-whet Owls, Sharp-shinned Hawks, Broad-winged Hawks, Cooper's Hawks, and Red-shouldered Hawks. Red-shouldered Hawks are known to nest on National Park Service land in the river bottoms along the Lagoo Creek Hiking Trail.

Mammals

Furbearers include beaver, otter, muskrat, mink, fisher, raccoon, red and gray fox, coyote, bobcat and all three species of weasel. Gray wolves are present throughout the property, and four known packs use parts of GKSF as home territories. Small mammals include voles, shrews, mice, ground squirrels and bats.

Invertebrates

Invertebrates at the GKSF include rare species of dragonflies and mussels, which use the St. Croix River, and several species of uncommon butterflies and moths which depend on barrens habitats for their host and nectaring plants.

Game Management

The forest lies within deer management unit 10 which has a goal of 25 deer per square mile of deer range. Deer density goals are not determined by the master plan, but are set through the statutory review process, and are updated every three to five years. Deer numbers over the last ten years have been close to or above the goal (plus or minus 20%). With a large public land base and high hunter density in unit 10, deer goals are considered attainable. High deer densities are well-documented in the state and present many risks to the long-term health of the forest. Managing deer numbers will be important to achieving forest management objectives.

Black bear is a wide-ranging big game species found on the property. The GKSF falls within bear management D, which has some of the highest bear densities in the state.

Wild Turkeys inhabit the GKSF and utilize a wide variety of habitats from oak/pine forest to forested seeps. The GKSF has a good population of Wild Turkey and is part of turkey management unit four.

Small game species commonly found on the property include gray, red and fox squirrel, snowshoe hare and cotton-tail rabbit. Upland game birds dependant on early successional habitats are Ruffed Grouse, Woodcock and occasionally Sharp-tail Grouse.

Habitat Needs and Capabilities

- Within the dry uplands, identify opportunities to manage a complex of successional stages on a landscape level, ranging from open Pine Barrens to mature Northern Dry Forest. This management objective includes jack pine stands mixed with oak and natural red pine, and will benefit special concern species such as Connecticut Warbler and several species of invertebrates.
- Maintain large blocks of mature, closed canopy forest to benefit forest interior birds and woodland species of amphibians.
- Perpetuate and maintain rotational blocks of early successional forest (including aspen-birch) and habitat types that mimic structural attributes of early successional habitats (e.g. shrub-carr and alder thickets), which are important for species such as Ruffed Grouse. Species of Greatest Conservation Need associated with this structural/serial stage include the Golden-winged Warbler, Veery and Woodcock.
- Maintain the structural and functional integrity of wetlands including the riparian zones within the forest and their associated drainages. Wildlife species that will benefit from this management include Red-shouldered Hawk, Louisiana Waterthrush and Woodcock.
- Manage the old Kohler-Peet Wildlife Area to include both wildlife and forestry interests. Wildlife Habitat Needs and Capabilities include: Maintenance and restoration of Pine Barrens to increase the size of the management block, including opportunities adding to existing habitat on nearby public lands, such as Crex Meadows; maintain the large block of mature, swamp forest to benefit forest interior birds and keystone wildlife species; perpetuate and maintain rotational blocks of early successional forest including aspen-birch and jack pine-oak for many special concern wildlife species; refrain from using intensive tree planting practices and broadcast applications of non-selective herbicides.

RECREATIONAL FACILITIES AND USE

Outdoor recreation is a primary objective of the state forest, which provides a variety of recreational opportunities including trail based activities such as hiking, horseback riding, cross-country skiing, and snowmobiling; camping including equestrian camping; and other nature based activities such as nature study and wildlife viewing (Regional and Property Analysis, Map 9: Property Recreation). Although these areas have been developed to accommodate intensive recreational uses, modified forest management has taken place in some of these areas.

Camping

The Governor Knowles State Forest offers various types of camping experiences. There are three campgrounds on the property, including one family campground, one equestrian campground, one outdoor group camp, and sites for primitive backpack camping. In total, 76 sites are available (Table 3.18). All of the camping opportunities are rustic, with no electricity or flush toilets available (note: electricity is available at a small number of sites, but only for campers with disabilities that necessitate the use of electricity).

In 1999, the newly constructed St. Croix Family Campground was opened to offer campers a rustic, family camping opportunity. Prior to the development of the St. Croix Campground, no family camping opportunities were available on the property.

Historically, equestrian camping was allowed in a partially open area along the bank of the Trade River. This area had been used long before the state forest was established. The Trade River area on the forest had a long history of equestrian use and camping even without a developed location. In 2003, sanitary facilities were provided with vault toilets and a pressurized/artesian well system to provide water for the users and their animals. The new Trade River Campground was constructed and opened in September of 2008. The former Trade River Campground is now operated for day use only.

The Sioux Portage Group campground was developed in the early 1980s on the north end of the forest. The group camp is operated by reservation only and for a single group at a time.

Backpack camping was originally allowed along the hiking trail. A special camping permit was required, but there were no restrictions on location. In 1996, four designated sites were developed and continue to be available with a special camping

TABLE 3.18 CAMPING OPPORTUNITIES ON THE GKSF

Campground	Type	# of Sites
Trade River	Rustic equestrian	40
St. Croix	Rustic family	31
Sioux Portage	Outdoor Group	1 (60 campers)
Backpack	Primitive	4
Total # of Sites		**76**

permit. Backpack camping is now restricted to the designated sites.

Remote site hunter camping is allowed during the gun deer season, using a free camping permit. After the permit is issued, hunters are allowed to set up their camp in their desired location as approved by the property staff.

Equestrian Camping
The Trade River Equestrian Campground opened in September 2008 and provides rustic horse camping. This 20 acre campground offers 40 sites, including one host site and three sites with electricity (reserved for campers with a necessity for electricity due to medical reasons). Amenities include drinking water, fire rings, picnic tables, vault toilets, a dump station, manure pits, and overhead tie lines for horses. This is a first-come, first-serve campground and reservations are not accepted. Equestrian camping is allowed throughout the year, but because equestrian use is low during the main summer months (not ideal for horses), general camping (non-equestrian users) has been allowed from June 15 - August 15 and October 15 - April 1. This campground is heavily used (in early spring and late fall), primarily due to the fact that the Trade River area has been used by horseback riders for over 50 years. When the Trade River Equestrian Campground opened, the camping area along the Trade River was converted into a day use area.

In general, use of the campground has been very high, but only in early spring and late fall. The Trade River Horse Campground opened in 2008. Attendance was counted between the months of April through October. For the 2008 season, the campground filled to 10.6% of capacity. In 2009, the capacity increased to 12.4%. Instances when capacity becomes an issue are when large groups of equestrian users occupy the campground and displace individual users. Visitors have expressed an interest in more electric sites, as they typically bring RVs or other vehicles that can hook-up to electric service. Use of the campground by non-equestrian users (during the time periods mentioned above) has not been very popular. In addition, some visitors have expressed an interest in remote equestrian camping opportunities along the equestrian trail.

Family Camping
The St. Croix Family Campground (60 acres) is the only family campground on the property. This campground was opened in 1999, and provides a rustic camping experience for tent and recreational vehicle (RV) camping. There are 31 sites, including one host site and two handicap accessible sites with electricity (none of the other sites have electricity). Amenities include fire rings, picnic tables, tent pads, vault toilets, a pressurized drinking water system, and a dump station. Campers can access the St. Croix River via hiking trails or by driving a short distance, and the Wood River via the Wood River Interpretive Trail.

This campground tends not to be heavily used. Over the past five years there has been an overall drop in attendance. For the 2005 season, occupancy was at 28% of capacity, whereas in 2009 it decreased to only 9% of capacity. This may be due to the lack of direct access to the St. Croix River, because users need to hike to or drive to the river from the campground. A lack of amenities may also be contributing to the low use of the campground, especially the lack of electric hook-ups. The majority of visitors to the St. Croix Family Campground come with RVs or pop-up campers and would prefer electrical hook-ups.

Outdoor Group Camp
There is one outdoor group camp area, the Sioux Portage Group Camp. The site is five acres, can accommodate up to 60 campers, and is available only by reservation. Amenities include fire rings, picnic tables, short loop hiking trails, a pressurized drinking water system and vault toilets. This is an accessible facility.

Similar to the St. Croix Family Campground, the outdoor group camp is not heavily utilized due to its distance from the St. Croix River (900 feet away).

Primitive Backpack
Backpack camping is allowed at four designated sites. Sites are located along the Benson Book, Foxes Landing, Lagoo Creek, and Sioux Portage hiking trails (one designated site along each of these trails). A free permit is required. All campsites are primitive; there are no drinking water or toilet facilities available. Similar campsites are available along the St. Croix River within the St. Croix National Scenic Riverway (operated by the NPS); however, these sites do not require a permit.

The use of the backpack campsites has been low, likely due to the fact that they are not located along the river as the NPS sites are.

Canoe Camping
No canoe campsites are offered on the GKSF, but within the St. Croix National Scenic Riverway, the NPS operates 115 designated primitive canoe campsites located along the St. Croix and Namekagon Rivers. This is one of the primary draws for visitors to the GKSF area. Camping is allowed only in official established sites and there is a three night limit. Most of these sites are only accessible by boat or canoe and amenities vary from site to site. All designated campsites have fire rings, only a few supply primitive toilets and picnic tables, and most do

not supply drinking water. Sites are either individual, which accommodate eight people and three tents, or group which accommodate 16 people and six tents. Some walk-in sites are available for tents only and can be accessed from several parking areas, five of which are near the GKSF (Norway Point Landing, Nelsons Landing, Sandrock Cliffs, County O Landing, and Sunrise Ferry Landing) (NPS 2010b).

Day-Use Areas

Most of the day-use areas on the GKSF are associated with recreational trail heads and tend to be used for wildlife viewing, hunting, bird watching and berry picking. Most have a map board, map supply and trail log for users to sign in on. The day-use areas at Sand Rock Cliffs, Norway Point Landing, Raspberry Landing and Highway 70 Wayside are on or adjacent to GKSF trails and facilities and in most cases are shared by both the Department and the National Park Service.

Trade River Day-Use Area

This ten acre area, formerly the Trade River Campground, has water, sanitary facilities, and tie lines for horses. Trail pass self-registration is available at the site.

Highway 70 Wayside

This area is located on the south side of Highway 70 near the St. Croix River. Facilities include vault toilets, running water, a canoe landing, and picnic and campsites. The state forest maintains the road, parking area, buildings, well, picnic area, and the canoe landing. The NPS administers the canoe campsites and a picnic area on the bank of the St. Croix River.

Recreational Trails

There are over 130 miles of recreational trails on the GKSF (Table 3.19). Trail uses include hiking/interpretive, horseback riding, cross-country skiing, and snowmobiling. Snowshoeing, un-groomed skiing, and hunting are also allowed uses on many of these trails.

Hiking and Interpretive Trails

The expanse of the GKSF is ideal for hiking. There are 40 miles of developed and designated hiking trails on the state forest. These developed trails are split into six segments, all of which generally follow along the St. Croix River and vary in difficulty from easy to rugged. Amenities are typically found at the trail segment breaks and can include parking areas with maps and information, restrooms, and access to boat or canoe landings.

Loop trails are limited to the Brandt Pines Ski and Interpretive Trail and the St. Croix Family Campground hiking trails. The St. Croix Family Campground hiking trails (4 miles of looping trails) are directly associated with the campground and provide interpretive opportunities and lead hikers to either the St. Croix or Wood Rivers.

There are also five miles of self-guided interpretive trails which pass through scenic areas highlighting the diverse nature of the forest. These include the Cedar, Brandt Pines, and Wood River trails.

Equestrian Trails

Popular throughout the region, horseback riding is an extremely popular recreational activity at the GKSF. The forest

TABLE 3.19 RECREATIONAL TRAILS ON THE GKSF

Trail Name	Allowed Uses	Miles	Fees	Designation
Benson Brook Hiking Trail	hiking, backpack, camping	8.0	N	non-motorized
Brandt Pines Ski & Interpretive Trail	classic skiing, interpretive skiing/hiking	8.5	trail pass	non-motorized
Cedar Interpretive Trail	interpretive hiking	0.5	N	non-motorized
Foxes Landing Hiking Trail	hiking, backpack, camping	6.1	N	non-motorized
Kohler Peet Trail	hiking	7.9	N	non-motorized
Lagoo Creek Hiking Trail	hiking, backpack, camping	6.6	N	non-motorized
Snowmobile, Winter ATV, & Horse Trail	snowmobiling, winter ATVing, equestrian riding	58.0	Y	motorized
Sioux Portage Hiking Trail	hiking, backpack, camping	7.5	N	non-motorized
Wood River Interpretive Trail	interpretive hiking	0.8	N	non-motorized
Trade River Equestrian Trail	equestrian riding, hiking	31.6	trail pass	non-motorized*

* Some loops open to licensed vehicles and snowmobiles.

offers 40 miles of designated equestrian trails (designated in 1991) in relation to the equestrian campground. These popular trails are located in the southern half of the forest and wind through a variety of terrain. The forest works in cooperation with Polk County to provide continuous access as some of the trail loops traverse onto county land. A short portion of the designated trail allows licensed vehicle and snowmobile access. In addition to the 40 miles of designated equestrian trails, horseback riding is also allowed on state forest roads.

A trail pass is required for riders 16 years of age and older. Trail passes can be obtained through self registration at the Trade River Day-Use Area or the Trade River Campground. Other amenities at these areas include access to drinking water, sanitary facilities and tie lines for the horses. The day-use area provides parking and access to the horse trail. The equestrian friends group is very active and supportive of the equestrian trails and campground at the GKSF.

In terms of use, some parts of the equestrian trail tend to be very heavily used, while others are not. This may be due in part to the lack of amenities at the parking lot on the northern end of the trail. This parking lot does not provide water which may limit some riders.

Cross-Country Ski Trails
The Brandt Pines Ski Trail provides over eight miles of groomed classic cross-country skiing opportunities. The trail is made up of a series of loop trails and varies in skill levels from easy to moderate. A warming shelter is located on the northern end of the trail loop. This trail is also opened for interpretive hiking during the non-snow season. In addition, hiking trails and forest access roads may be used for skiing, but are not groomed, and are utilized throughout the year for forest and recreation management activities.

Use of the Brandt Pines Ski Trail has been fairly low. This may be due in part to the fact that users need to buy a trail pass to use the trail. The un-groomed ski trails are typically only used by local residents.

The GKSF is currently planning to develop a portion of the Brandt Pines Trail to provide for skate skiing.

Snowmobile Trails
There are 32 miles of snowmobile trail on the state forest, which are important connectors to regional trail systems in Burnett and Polk Counties. "Corridor 45" is part of the statewide snowmobile trail system. It enters the forest at the south end near Wolf Creek, travels through a variety of terrain and forest types, and exits the forest on the north side of the Fish Lake Wildlife Management Area, serving as a connector between the Burnett and Polk County trail systems. Two short segments of snowmobile trail exist on the forest near the Clam Flowage. Grooming is contracted with local clubs, in cooperation with the county snowmobile associations. The snowmobile trail has recently been re-routed to address safety concerns.

The snowmobile trail is heavily used on good snow years and the property has been able to manage the use.

Snowshoe Trails
Opportunities for snowshoeing are available using forest access trails and roads throughout the forest. There are no signed or designated trails specific to snowshoeing. Snowshoeing is prohibited on the Brandt Pines Ski and Interpretive Trail once it is groomed for the ski season.

ATV Trails
Winter ATV use is allowed along the 32 mile snowmobile trail on the GKSF, but only when trail conditions support the use. This trail connects to the Polk County snowmobile trails to the south and to the Burnett County snowmobile trails north of the property. ATV use may only occur when the trail is posted open to ATVs. There are no trails on the property open to ATV use during warm, non-snow months. Currently, ATV riding is further restricted, because the re-route of the snowmobile trail traverses private property, and those private landowners have not yet given their permission for ATVs to use the trail.

Multiple-Use Trails
There are approximately 62 miles of woods roads (primitive roads) and eight miles of trails (lightly developed, undesignated trails) on the property, which are used for forest management activities, and have historically been used informally as multiple-use trails, mainly for hunting, hiking and sight-seeing. Portions of the trail that do restrict some uses are always gated, bermed, or signed.

Boating, Canoeing and Kayaking
The St. Croix River and Clam River Flowage are the primary boating, canoeing and kayaking attractions for the forest. All water based recreation along the St. Croix River is managed by the NPS. The St. Croix River is somewhat unique in the region due to the diversity of resources and recreational opportunities the river provides. It offers wilderness-like, remote recreational experiences and protected shoreline, but all within the protection of the National Park Service. This scenic river resource presents a blend of fishing, boating, swimming, camping, and wildlife viewing opportunities. The GKSF provides access to the St. Croix River via several hiking trails and at the Highway 70 Wayside.

The Riverway provides recreational opportunities for both canoes and boats alike, but it is known for its quiet water canoeing. The St. Croix River changes from narrow to broad and shallow to deep, providing many recreational experiences on its 150 mile length. Canoes dominate upstream, canoes and small fishing boats tend to use the middle stretch, and motorized boats dominate the downstream section (NPS 2010b).

The GKSF also manages a parking area at the Clam River Flowage located on the north end of the property. This area provides public access for fishing, boating, canoeing, kayaking, waterfowl hunting, and wild rice harvesting. Burnett County provides the public boat landing for access to this flowage.

Hunting and Trapping

Hunting and trapping are major recreational pursuits at the GKSF. Diversity of wildlife habitat and abundant populations of game animals are available. Popular game species for hunters include deer, bear, Turkey, small game, waterfowl, and upland game birds. Hunting is allowed along all trails and forest roads except in the designated campgrounds and associated interpretive trails. Parking lots and town and county roads provide easy access throughout the forest, along with 40 miles of forest access trails. The GKSF is able to accommodate hunting throughout all of the open hunting seasons.

Opportunities exist for hunters to camp on the GKSF. This dispersed camping experience is offered during the gun-deer season by permit only. The primitive areas do not include any amenities such as access to water or toilets.

Wildlife Viewing

The GKSF is listed as Stop #20 on the Great Wisconsin Birding and Natural Trail. Neighboring wildlife areas, such as Crex Meadows, see thousands of visitors each year. Many of those visitors travel to locations on the state forest and other public properties in the area in search of multiple habitats and viewing experiences. The GKSF offers diverse natural communities and habitats to explore.

Fishing

Users have a variety of opportunities to fish for numerous species, especially in the St. Croix River and the Clam River Flowage. Other resources include the Wood River, Clam River, Trade River, Cowan Creek, Wolf Creek, and numerous smaller streams.

Trout sport fishing within the state forest is very limited. Most of the streams are short spring heads with self-sustaining populations, but are too small to provide the habitat necessary to grow trout to a desirable size for sport angling. However, these populations are fairly unique glacial relics, surviving on their own with minimal genetic pollution or habitat alteration from human activities. Wolf Creek offers better than average fishing for a mixture of native and stocked brown trout. Trade River is a large stream with a stocked brown trout fishery.

The St. Croix River is a warm water fishery. The stretch near the GKSF is recognized as one of the finest smallmouth bass fisheries in the country (NPS 2010b).

Education and Interpretation

A small amphitheater in the St. Croix Campground serves as a location for interpretive programs, most of which are typically presented by NPS staff. There are also three self-guided interpretive nature trails, totaling approximately five miles. Additional educational opportunities are available outside of the GKSF at the NPS Marshland Visitor Center (also a boat landing and picnic area), which is approximately one mile from the St. Croix Family Campground, the Crex Meadows Visitor Center, and at Interstate State Park.

Parking Areas

There are 22 parking areas throughout the forest (over 570 stalls) to facilitate access to the various recreational facilities (Table 3.20).

RESEARCH

A variety of entities have been doing research on the GKSF. Research has been related to topics such as biomass harvesting, small mammals, disease and insect infestations, bird breeding populations, and local area sand dunes.

OVERVIEW OF CULTURAL RESOURCES

To date, approximately 40 prehistoric and historic archaeological sites have been recorded within Governor Knowles State Forest, and many more are as yet unidentified. A number of these sites are burial sites, including burial mounds, and historic Indian and Euro-American cemeteries. Other archaeological sites would be expected to occur along the elevated margins of the river's waterways, especially at the confluence of rivers, and at the inlets and outlets of rivers on lakes.

Additionally, a number of historic structures (e.g., buildings, dam remnants, etc.) have been recorded within the forest, and as yet unidentified and unrecorded historic structures are likely present as well.

All of these sites and structures are protected against unauthorized disturbance by various state (e.g., Wis. Stats. 44.40 and 157.70) and/or federal legislation (e.g., Section 106).

TRIBAL RESOURCES

The GKSF lies within the ceded territory of the Ojibwe Tribes and is located within proximity to Tribes of the St. Croix Band of the Lake Superior Ojibwe as well as the Mille Lac Band of Ojibwe in Minnesota.

CEDED TERRITORIES AND TRIBAL USE

Prior to the arrival of Europeans in North America, Native American tribes were independent, sovereign nations. The Ojibwe Tribes ceded some lands in the northern one-third of Wisconsin to the United States Government in the Treaties of 1837 and 1842 (Appendix D). In those treaties, they reserved their rights to hunt, trap, fish, and gather within various publicly-owned lands.

ADMINISTRATIVE AND OTHER NON-PUBLIC USE FACILITIES OR STRUCTURES

Administrative and Operations Buildings

The Grantsburg Ranger Station on Highway 70 in Grantsburg houses the state forest staff and serves as a public contact station. The building also houses the Grantsburg fire response unit staff. The location has three other non-public structures which are used for maintenance shops and storage, one of which is the 1930's era ranger station built with the assistance of the Civilian Conservation Corps (CCC).

Robard's Cabin (a.k.a. the St. Croix Family Campground Shop) is a building that was acquired as the result of a land acquisition. The cabin is located near the St. Croix Family Campground and is a story and a half building with a single attached garage. This building is used primarily for storage of equipment and supplies. It also serves as an additional office workspace and has been known to house researchers from time to time.

Managed Roads

State forest roads on the property include Foxes Landing Road and the road traversing the St. Croix Campground and Highway 70 Wayside. All other roads are state, county or town roads. Foxes Landing Road is a 0.9 mile long gravel road and is maintained through a use agreement with the Town of West Marshland. The Town plows and grades the road, as needed, at a cost of approximately $550 per year. Repairs to the road are done as needed at the state forest's expense. The campground road is 0.4 miles of fully developed road (asphalt) going into and through the campground and wayside area.

In addition, there are approximately 62 miles of woods roads and eight miles of trails (not designated for any specific recreational use) throughout the property, which are used for forest management activities and also provide recreational trail opportunities such as hunting, hiking, or sight-seeing.

TABLE 3.20 PARKING AREAS ON THE GKSF

Parking Lot Name/Location	Number of Stalls	Surface
Brandt Pines Main	23	Gravel
Brandt Pines North	20	Sand
Nelson Landing	45	Gravel
Clam Flowage	22	Gravel
Sioux Portage Hiking	13	Gravel
Sioux Portage Outer	18	Gravel
Sioux Portage Inner	14	Gravel
Highway 70 Wayside North	60	Paved
Highway 70 Wayside South	51	Gravel
St. Croix Campground	18	Paved
Wood River Interpretive	5	Gravel
Robard's	30	Sand
North Benson	16	Gravel
County O	15	Gravel
North Horse Trail	73	Gravel
Evergreen	4	Gravel
Trade River Campground	6	Limestone
Trade River Day Use	28	Sand
Trade River West	12	Sand
Meyers	30	Sand
West River Road	67	Sand
Paint Mine	4	Gravel

FINDINGS AND CONCLUSIONS

This section presents the findings and conclusions from the Governor Knowles State Forest Regional and Property Analysis. The first two sections of this section summarize existing conditions and trends on the forest and in the region. Specific trends addressed include the ecological significance and capability of the property, as well as the property's recreational needs, opportunities, limitations and significance. This section does not include every finding or draw every conclusion; rather it provides a summary of the major findings.

The findings and conclusions presented here will help guide the Governor Knowles State Forest's future management, use, and development by highlighting significant opportunities and limitations on the property, and defining the reasonable range of management alternatives considered in the master planning process. As planning for the property continues, conclusions will ultimately help define the property's future recreation amenities and uses, forest resources, and natural landscape.

Located in northwestern Wisconsin, in Polk and Burnett Counties, the GKSF is a long, narrow property that stretches 55 miles near the St. Croix River. The GKSF project boundary encompasses roughly 38,000 acres with numerous private in-holdings. Within the project boundary, 20,500 acres are in state ownership. Although it is one of the largest state owned properties in a region with an abundance of privately owned lands, the GKSF is a relatively small publicly owned property in comparison to the other public ownerships. Burnett and Polk County Forests make up the majority of public land in the area. Forest management on these forests is similar in style to the GKSF. The Glacial Lake Grantsburg Wildlife Complex (GLG), comprised of four State Wildlife Areas totaling over 52,000 acres, also contributes to the public land within the region. Crex Meadows is the largest of these wildlife areas. Wetland and barrens management practices are employed to a greater degree on these wildlife areas than any other wildlife area in the state, providing habitat for a great diversity of wildlife. The National Park Service administers 3,000 acres of National Scenic Riverway along the St. Croix River. The NPS corridor is passively managed and lies along the St. Croix River. All of these properties are adjacent, in part, to the GKSF, creating larger blocks of publicly owned forestland in a region that is only 44% forested. The presence of the county forests, Glacial Lake Grantsburg complex of state wildlife areas, and the GKSF also provide opportunities for more landscape scale management across property boundaries, including forest management, wildlife and habitat management, and the management of a variety of natural communities.

ECOLOGICAL SIGNIFICANCE AND CAPABILITY OF THE GOVERNOR KNOWLES STATE FOREST

Summary of the Property's Ecological Significance and Capability

The GKSF contains numerous ecologically important attributes that will be of significant importance during the master planning process. The property's ecological characteristics are largely defined by the two Ecological Landscapes which meet along the escarpment that runs the length of the property: the Northwest Sands and Northwest Lowlands. East of the escarpment, fire-adapted vegetative communities are prevalent and consist of varied structural permutations of the Pine Barrens community and extensive dry forests composed mostly of pines and oaks. West of the escarpment, there are clusters of seeps, forested wetlands, wet meadows and marshes, and numerous streams that feed into the St. Croix River. The GKSF may have the highest concentration of seeps of any Wisconsin DNR-managed land. One of the most ecologically significant features on the forest, and the reason for its establishment, is its proximity to the St. Croix River.

The GKSF plays a critical role in contributing to the water quality and overall ecological integrity of the St. Croix River. The GKSF was established to protect the river, following its national recognition as one of the eight original Wild and Scenic Rivers in the U.S. The stretch of the St. Croix adjacent to the GKSF is entirely free-flowing and, in terms of fauna, is part of the longest and most pristine example of a large river ecosystem in the Midwest (WDNR 2002). The river supports exceptional aquatic diversity, including a high number of rare species such as the State Endangered St. Croix snaketail dragonfly and several others. Within the GKSF, numerous seeps and streams emanate from the terrace adjoining the river valley, ultimately feeding into the river. Nine of the GKSF streams that feed the St. Croix are designated Exceptional Resource Waters (WDNR 2010f). A portion of the Clam River, a warm water stream that crosses the GKSF and empties into the St. Croix River, has also been designated as an Exceptional Resource Water (WDNR 2010f).

The location and shape of the GKSF make it extremely valuable as an ecological connector. In addition to its ecological relationship to the St. Croix via 55 miles of the National Scenic Riverway, the GKSF is part of a significant forested corridor crossing portions of two states in an area otherwise dominated by agriculture, small non-industrial forests, and residential developments. These forests support numerous species, both rare and common, and of both northern and southern

affinities, and are likely to be of even greater importance if development pressures continue in the surrounding landscape. From a management perspective, the presence of the county forests, Glacial Lake Grantsburg complex of state wildlife areas, and the GKSF provide opportunities for more landscape scale management across property boundaries, including forest management, wildlife and habitat management, and the management of a variety of natural communities. The property also provides potential future opportunities to connect barrens remnants and restorations; these habitats are mostly limited to tiny fragments in many places in Wisconsin where they still exist. Finally, there are opportunities within the GKSF to connect ecologically significant sites such as State Natural Areas and other ecologically important sites. Several of the existing natural areas have artificial, non-ecologically based boundaries that cut across intact wetlands and other natural communities, and there are excellent opportunities on the property to modify the borders in an ecological manner, connecting these habitats and increasing their long-term viability.

Forested seeps are particularly abundant on the GKSF and found in numerous places, especially where the base of the escarpment meets the river terrace. The GKSF probably has a higher concentration of these features than any other state-managed land. These areas support high plant diversity and likely support several amphibian species and numerous invertebrates. They also contribute to the high water quality of the streams to which they feed. These areas are very susceptible to physical and hydrological damage.

The vegetation of the GKSF has been shaped by numerous factors including management history, weather events, fires, landforms, and soils. Changes in forest vegetation since European settlement follow trends similar to other dry forest habitats in northern Wisconsin. Today, forests occur in smaller blocks, many barrens communities have succeeded to forests, and oak dominated forests occur on much of the uplands. Pine Barrens and pine-oak dominated dry forest were once widespread across northwestern Wisconsin, providing habitat for a suite of plant and animal species. Following a long history of land use changes and fire suppression, many of these communities have become simplified and fragmented. As a result, many characteristic species of flora and fauna are no longer common within the Northwest Sands. The GKSF contains some good quality, species-rich barrens remnants, as well as a few good examples of dry forest with native herb species. Although these areas are often small, they offer opportunities for restoration and demonstration, especially given the current rarity of barrens communities statewide, regionally, and globally. Several rare species are associated with these communities on the GKSF.

The GKSF contains extensive areas of good-quality forested wetlands. Hardwood Swamps are common and can be extensive, and there are several areas of good-quality conifer swamps. These natural communities often occur within a diverse wetland mosaic within the river valley with numerous interesting microsites such as seeps, streams, and open small wetlands throughout. All of these are known to harbor rare species. In addition to several smaller areas of high-quality wetlands, the Kohler-Peet Wetlands is particularly notable for its large size and the wide variety of forested and unforested wetland types present.

Forest Management Capability

Based on land management classifications of the 1988 master plan, active forest management has been occurring on roughly half of the GKSF. The forest has an abundance of northern pin oak dominated stands with 25% of the GKSF typed as scrub oak. Oak is an ecologically important species and serves the needs of many wildlife species on the forest. In the past, oak has been easy to regenerate, but with the level of oak wilt present on parts of the forest, the pending arrival of gypsy moth, and the high deer densities, oak management will become more challenging in the future. Future planning will need to address this challenge. Jack pine was historically more common on the GKSF and surrounding lands than it is today. Currently, jack pine represents only 11% of the acreage on the forest. Opportunities exist to increase the jack pine acreage on upland sites which are well suited for pine production. Red and jack pine acreage has been gradually increasing on the GKSF in recent years and will provide opportunities to manage for high quality sawtimber and pulpwood in the future. Mixed stands of oak, aspen, and jack pine are not uncommon on the GKSF and collectively make up roughly 50% of the forest types. Swamp hardwoods is the second most common forest type on the GKSF. Although the swamp hardwood stands are generally productive, management in them has been limited due to many of them being located in the "wilderness zone". These forests are ecologically sensitive and are often associated with many other wetland types. These forests also protect the water quality of the St. Croix River, the primary reason the state forest was established. An additional consideration is the impact that Emerald ash borer will have as it is a significant threat to swamp hardwoods. It is unclear how other species such as red maple and balsam fir will be able to fill the void left by the anticipated large-scale decline of Wisconsin's ash species.

Even-aged management has been the primary harvest method for the dry forest types. While natural regeneration is reliable on some sites, artificial regeneration and various site preparation techniques have been used on other sites. Pine plantations have been a component of the forest manage-

ment program on the GKSF since the early 1980s and red pine continues to be planted at a relatively constant pace. Although the artificial regeneration has been reliable over the years, there are important tradeoffs from a biodiversity perspective. The potential impacts of plantations and some site preparation techniques include reduced habitat for native species and a simplified community structure. There are also potential impacts from not employing artificial regeneration techniques, such as increased difficulty in regenerating jack pine and decreased forest productivity. Due to the variety of potential impacts, it will be important for the master planning team to assess the current use of artificial regeneration techniques on the GKSF and determine the best course of action for the future, including the location and acreage of plantations that balances the ecological, economic and social factors.

Soils are another factor in forest management capability, and the soils of the GKSF exhibit extreme differences from the river, over the escarpment, and into the dry sandy uplands. This range of soil types impacts the ability to manage forests. GKSF soil drainage classes range from excessively drained to very poorly drained. The wet or poorly drained soils are generally more susceptible to rutting and other soil disturbances. Most forest management activities on these soil types will continue to be limited to frozen ground or dry conditions. In addition, the steep slopes and seeps make some areas inaccessible for forest management activities year round. Grayling sand, which is an excessively drained soil, is the most prevalent soil association in the dry, upland areas to the east of the escarpment. While there are less potential impacts such as rutting, dry soils such as these are categorized as dry nutrient-poor sandy soils which have limited opportunities for biomass harvest according to Wisconsin's Forestland Woody Biomass Harvesting Guidelines (Herrick et al. 2009).

Capability of the Property to Support Regional Ecological Needs and Opportunities

Natural Communities

Several natural community types are present on the property, and offer management opportunities for biodiversity conservation, including the restoration and maintenance of high-quality examples of Northern Dry Forest, Northern Dry-mesic Forest, Southern Hardwood Forest, Hardwood Swamp, various types of conifer swamp, barrens/savanna/woodlands, Sedge Meadow, other non-forested wetlands, Forested Seep and several aquatic communities. Some of these community types are represented on six designated State Natural Areas found on the GKSF, and there are additional sites located within and outside of the wilderness designation and on surrounding properties.

The GKSF is located on the western edge of what was formerly the largest expanse of barrens in the state. Barrens communities likely dominated the GKSF uplands prior to European settlement. Fire played a major role in maintaining the barrens landscape, and most have succeeded to forests due to the lack of fire on the landscape. Barrens are globally rare and associated with numerous rare species. Active restoration work is occurring on the GKSF primarily within the previously designated 4,049 acre Kohler-Peet Wildlife Area, as well as the Sterling Barrens SNA. Once part of GLG, the Kohler-Peet Wildlife Area was incorporated into the GKSF in 1970. Currently, 580 acres of the old Kohler-Peet wildlife Area are intensively managed for barrens dependant species through prescribed fires, which are typically planned and conducted cooperatively by Wildlife and Forestry staff. Active barrens restoration is also occurring at the Crex Meadows and Fish Lake State Wildlife Areas. There is an opportunity to manage Barrens communities across property boundaries (state and county lands in the region) to provide larger blocks of habitat in a way that would otherwise not be possible on the GKSF alone due to its size and configuration. There may be additional opportunities to manage barrens on the GKSF, as well as on other public and private lands in the area. In addition, there are opportunities to consider increasing the use of fire as a management tool, particularly to maintain and increase the Northern Dry Forest acreage. The Northern Dry-Mesic Forests offer opportunities to develop older forests of an uncommon type on the property. The Southern Mesic Forests offer some unique assemblages of mesic hardwood species. The abundant wetland and aquatic communities on the property provide habitat for numerous plants and animals, and contribute to the high water quality of the St. Croix River.

Threatened, Endangered, Species of Special Concern, and Wildlife Species of Greatest Conservation Need

The habitat found within the forests and water resources (rivers, seeps) on the property support many rare species, including threatened, endangered, and special concern plants and animals. Fourteen rare plant and 32 rare animal species have been documented on (or near, e.g. river species) the GKSF. There is potential for additional rare species to occur here, including numerous Species of Greatest Conservation Need (SGCN) from the Wisconsin Wildlife Action Plan (2006d) that are known to be associated with the two Ecological Landscapes that make up the property. Surveys were not conducted for herptiles or rare invertebrates during the Biotic Inventory, and there is potential to document rare species in these taxa groups based on the habitats present. The GKSF also contains forested habitat for uncommon bat species and surveys have only recently begun along the St. Croix River.

Rare species were found in a wide variety of habitats at the GKSF, as would be expected given the wide range of high-quality community types present. The St. Croix River, itself, supports the largest portion of the rare animals known from the area comprising the GKSF, including all of the rare dragonfly, fish, and mussel species. Two-thirds of the state-listed animals, as well as one candidate for federal listing, are found in the St. Croix. The GKSF has an important role in contributing to the quality of the river and thereby protecting those species, and it will be important to consider any potential impacts to water quality during planning and management activities.

Dry, sandy habitats support several rare plants such as dwarf milkweed, silky prairie-clover, and prairie fame-flower. There are opportunities to maintain these species through barrens management, and they could also be accommodated during forestry activities. In addition, at least 20% of the rare animal species documented on the GKSF are known from these dry habitats, including all of the butterflies, moths, and one tiger beetle. There is potential for additional species including rare reptiles, as well as several other rare invertebrates, to be using these dry habitats, although they have not been documented to date. These species can be maintained through continuing ongoing restoration activities, as well as avoiding spraying sensitive plants with herbicides.

The diversity of forest types present on the GKSF supports numerous rare bird species. Some species are found at particularly high densities, including Red-shouldered Hawk, a rare forest raptor that occupies many areas west of the escarpment. Curtis' (1959) "tension zone" is located along a portion of the property, and rare birds with both northern and southern affinities are found on the property. Keeping the forested corridor intact should allow these areas to continue to provide habitat for numerous species of both migratory and resident birds.

Wet forests of the GKSF, often containing Forested Seeps and other specialized habitats, support numerous rare species. Bog bluegrass is especially well represented in Hardwood Swamps and seeps, and other rare plants were found in small seepage areas and wetland depressions, sometimes within mesic hardwood forests. The flowing water associated with the forests west of the escarpment support high numbers of Louisiana Waterthrush, a rare bird that is present here at the northernmost limits of its range. The seeps and special microsites present in these areas are particularly vulnerable to compaction and disruptions in hydrology, and there are many areas along the east side of the escarpment that are not suitable for heavy equipment, as seeps surrounded by deep, mucky soils are present along much of its length. In most cases, areas with springs and seeps are protected through the implementation of BMPs for Water Quality and tend to be avoided because frozen ground conditions are typically not realized. In addition, activities near the top of the bluffline can impact areas down slope.

General Ecological Needs and Opportunities

Its shape and location make the GKSF valuable as an ecological connector in different ecosystem types. The GKSF was

established because of its connection to the St. Croix River and presents opportunities to maintain 55 miles of native wetland and upland communities with connections to a regionally significant river with excellent biodiversity. Seeps, which are particularly abundant on the property, not only contribute to the high water quality of streams they feed (which ultimately lead to the St. Croix), but also support high plant diversity and many important amphibians and invertebrates. Seeps are highly susceptible to damage through disturbance to soils and hydrology, so it is critical that future management continues to protect these resources to ensure that seeps and the various tributaries within the GKSF that lead to the St. Croix will be protected.

Invasive species are becoming a concern across the state and the GKSF is no exception. Primary invasive species are glossy and common buckthorn, spotted knapweed, garlic mustard, non-native honeysuckles, leafy (and cypress) spurge, reed canary grass, and phragmites. The GKSF has an Invasive Plant Management Plan which identifies priorities, control, and monitoring in order to limit the loss of critical habitat and site quality. Continual updating of the GKSF Invasive Plant Management Plan (a separate piece from the master plan) will be critical in order to maintain an up-to-date inventory of invasives on the property and a prioritized control plan. Rapid response to control and maintaining awareness will limit the introduction, establishment, and spread of invasive species. Management options for controlling invasive species should be considered within recreational developments (campgrounds and trails) and during various land management activities.

Stands of old forest are rare statewide (WDNR 2010c), and the WDNR has identified a need to "conserve, protect, and manage old growth forests and, where feasible, encourage their appropriate representation on the variety of ownerships" (WDNR 2004). State and federal lands provide some of the best opportunities to do this. The GKSF provides opportunities to develop forest stands with old growth attributes of several different types and with different ecological characteristics even though opportunities here are somewhat limited compared to other state forests in northern Wisconsin because of the size and shape of the property. Although opportunities are limited, it will still be important to consider older forests as part of a complex of forest types; a mosaic of older forests in blocks large enough to provide valuable habitat for associated species of plants and wildlife. Currently the designated State Natural Areas, sites within the Wilderness Zone (including the NPS property), and other sites identified in the Biotic Inventory offer the best opportunities to develop stands with old growth characteristics.

The GKSF is associated with four Conservation Opportunity Areas (COAs) identified in the Wisconsin Wildlife Action Plan (2006d). The terrestrial COAs within GKSF include Crex Barrens and Wetlands, and Fish Lake Barrens and Wetlands, which both contain important habitat features for barrens-associated wildlife species, and the St. Croix Ridge, highlighted in part because of the forested terraces and seeps found along the St. Croix River. The St. Croix River itself is an aquatic COA, due to its important aquatic habitats that are used by uncommon fish, mussels, and dragonflies.

RECREATION NEEDS, OPPORTUNITIES, SIGNIFICANCE, AND CAPABILITIES OF THE GOVERNOR KNOWLES STATE FOREST

Summary of the Property's Recreational Significance

The GKSF has much to offer for recreational enthusiasts. The forest's original designation and development was strongly oriented to serving recreational needs, due largely to a history of recreational activity in the area and on the adjacent St. Croix River.

The GKSF is one of the largest state owned properties in the five county region and is situated in a largely rural, sparsely populated area. The largest metropolitan area, Minneapolis/St. Paul, Minnesota, is approximately 75 miles away. The GKSF is easily accessed by State Highway 70, and local county roads, well away from the busy interstate highway and more intense development. Although it is one of the largest state owned properties in the region, the GKSF is a relatively small publicly owned property in comparison to the other public ownerships. These factors present visitors with a smaller, less intensely used, more natural landscape with opportunities for wild and remote recreational experiences. While these attributes may be draws for many visitors, the recreational environment of the GKSF is different than other state forests and state parks, many of which have lakes, rivers, and flowages within their property boundaries and provide access to and recreation on the waterways. Although nearly 55 miles of the GKSF lie along the St. Croix River, the Riverway itself is not owned or operated by the GKSF which sometimes limits the draw for recreationists to come to the GKSF.

Recreationists who come from throughout Wisconsin to utilize the forest include seasonal and year-round residents, tourists, and migrating retirees. The GKSF also serves recreation enthusiasts from Minneapolis, St. Paul, and Chicago. Activities that are popular with visitors from these tourism markets include horseback riding, canoeing, boating, fishing, hunting, sightseeing, camping, picnicking, hiking, and birding. The GKSF is well positioned, in terms of location, setting and resources, to accommodate some of the projected changes in recreational demand that are described in SCORP (WNDR 2006e) including

birding, geocaching, picnicking, snowshoeing, walking, wildlife viewing/photography, and driving for pleasure.

The connectivity and nearness to other public lands in the region enhance the visitor experience and recreational potential in an area which is predominantly rural. The GKSF, along with the St. Croix National Scenic Riverway and nearby state wildlife areas and county forests provide a variety of recreational opportunities including camping, hunting, wildlife viewing, hiking, horseback riding, cross-country skiing, snowmobiling, canoeing and kayaking, fishing, birding, and nature study. The GKSF plays a recreational role in the region by contributing to the base of public lands available for recreation. In addition, this connectivity enables the forest and neighboring public lands to complement each other's recreational services and amenities.

From a regional perspective, the scenic qualities and diverse resources of the St. Croix River are one of the defining elements of the GKSF area. The St. Croix National Scenic Riverway is owned and operated by the National Park Service. The GKSF's original designation and development was strongly oriented to protecting the river and serving the recreational needs, due largely to a history of recreational activity in the area and on the adjacent St. Croix River. Today, most of the 55 mile length of the GKSF lies adjacent to the Riverway. Some visitors to the GKSF are there with the ultimate goal of recreating on the St. Croix River, but find additional recreational opportunities to enjoy on the GKSF such as camping and trail based activities. Although the Riverway is not managed by the GKSF, the state forest still plays a role in protecting the integrity of the undeveloped and scenic recreational experience of the Riverway. A portion of the river corridor located within the GKSF boundary is managed as a Maximum Preservation Zone by the National Park Service.

From a property perspective, the primary draw to the GKSF itself is equestrian use. Opportunities for equestrian trail use and camping are somewhat limited in the four counties surrounding the GKSF. There are 160 miles of trails, but very few equestrian camping opportunities. There are many more opportunities across the St. Croix River in Minnesota. Because opportunities are somewhat limited in the region, equestrian use has become an important niche of the GKSF. The equestrian trails and campground are extremely popular on the property and one of the main reasons why people come to enjoy the GKSF. The forest offers 40 miles of designated equestrian trails in the southern half of the property which provide continuous access onto trails that traverse Burnett and Polk County Forest land. A 40 site equestrian campground is also very popular on the GKSF and has been heavily used since it opened in 2008. In addition, there is a very active equestrian friends group which is very supportive of the equestrian trails and campground at the GKSF.

The GKSF also plays a role as a provider of hunting, trapping, and wildlife viewing opportunities in an area where these activities are very popular. The GKSF, state wildlife areas, and county forests provide an extensive acreage of public lands available for these recreational pursuits. Crex Meadows State Wildlife Area is extremely popular for wildlife viewing. Because of their proximity to one another, many visitors who come to the area to view wildlife at Crex Meadows also end up recreating at the GKSF. In fact, Brandt Brook Pines State Natural Area, located within the GKSF, is also listed as a site on the Great Wisconsin Birding and Nature Trail. The forest's location within the Mississippi Flyway, along with sustainable forestry and wildlife management, will continue to provide niches for wildlife and wildlife watchers and allow the GKSF to play a role as a provider of public land in an area where hunting, trapping, and wildlife viewing are popular.

Summary of the Property's Recreational Capabilities and Limitations

Recreation Use Trends

Predicted population growth in the GKSF region is relatively low in comparison with other regions within the state, but there is an expected increase in the older segment of the population, namely those 60 years old and older. Nearby towns are rural and widely dispersed. Although only about one hour from Minneapolis/St. Paul, Minnesota, the GKSF's fairly remote location with few major highways or population centers causes recreational demand within the forest to be relatively low and focused on the St. Croix River and the equestrian use opportunities. These factors likely mean that future growth in recreational use levels on the property will be relatively low compared to other forests and parks across the state.

Although recreational demand on the GKSF is relatively low, there are some benefits to this, as it offers an alternative to busier, more developed properties, and offers a quiet setting for activities such as birding, nature study, hiking, skiing, and snowshoeing. There is also less potential for user conflicts.

While the predicted population growth is relatively low, the population will continue to become older with the number of retirees increasing. These older recreators generally enjoy quieter, lower impact activities such as viewing birds, driving for pleasure, and ice fishing. In contrast, the large urban area of Minneapolis/St. Paul, located about one hour away, is home to a younger population and is the source of many visitors to the GKSF. Younger generations tend to participate in more high impact activities such as developed camping, mountain biking

and ATV riding. Therefore, there may be a need to diversify or enhance recreational opportunities and facilities on the GKSF to better meet the demands of both younger and older visitors.

Capability of the Property to Support Enhanced Recreational Opportunities

The physical nature of the property impacts its ability to support additional or enhanced recreational opportunities. One factor is the long, linear nature of the property. On one hand, the linear shape of the GKSF is ideal for recreational trails such as hiking, horseback riding, cross-country skiing, and snowmobiling, and allows for multiple access points to resources such as parking lots, roads and other amenities. On the other hand, the physical layout of the property with a considerable number of private in-holdings causes there to be spatial limitations for where recreational opportunities can expand.

In addition, the soils within the GKSF are limited in their ability to support additional recreational developments. The soils exhibit extreme differences from the river, over the escarpment, and into the dry sandy uplands. Drainage classes range from excessively drained to very poorly drained; two extremes which are not ideal for recreational developments including sustainable recreational trails.

Other considerations include the Maximum Protection Zone (MPZ) and the Limited Development Zone (LDZ) within the St. Croix National Scenic Riverway. Any new or enhanced developments within the MPZ, such as recreational trails, will require approval by the National Park Service. Further, similar developments within the LDZ, must be presented to the National Park Service for consultation prior to development.

In general, recreational use of the GKSF is fairly low, with the primary attractions being equestrian use and water based recreation on the St. Croix River (not managed by the GKSF). Traditional camping and recreational trails (aside from the equestrian trails) are lightly used, with the exception of the

snowmobile trail which is heavily used during good snow seasons and part of a regional trail network. Although there are some opportunities for increasing the use of recreational facilities at the GKSF, the physical limitations of the property in terms of space and soils will constrain the extent and location of expansions. Any changes in the master plan will need to fit within the capabilities and limitations of the property and be consistent with the niche of the Governor Knowles State Forest.

Equestrian Trails and Camping

As described above, horseback riding and horse camping are extremely popular activities on the forest. In terms of trail use, portions of the trail are heavily used while others are not. One opportunity to increase use on certain parts of the trail may be to provide water and/or other amenities at the parking lot on the northern portion of the Barrens Loop Horse Trail. Because no amenities are provided at this parking lot, it may currently be deterring some riders.

The property has been able to support the demand for equestrian camping, but there has been an expressed interest for electricity at the campground as visitors typically bring RVs or other vehicles that can hook-up to electric service. Capacity is typically not an issue, but there are some instances when large groups of equestrian users displace individuals. An equestrian group camp, potentially at the north parking lot mentioned above, would be one option for addressing this issue. Users have also expressed a demand for remote equestrian campsites along the trail and there may be opportunities to provide this type of use.

The property has an active friends group that is very engaged in the equestrian amenities on the property and would continue to serve as an important partner in future decisions related to the equestrian trails and campground.

Camping

Camping is very popular in the region, but preferences are shifting to more developed amenities and recreators tend to

use RVs and pop-up campers more than tents. County forests are the largest public provider of campsites in the region and generally provide more electric sites than other public campgrounds. Nearly 500 private campsites are available in the region. Nonetheless, camping opportunities are considered somewhat limited in the region.

On the GKSF, use of the St. Croix Family Campground, the Sioux Portage Outdoor Group Camp, and the primitive backpack sites has been low. A primary reason is that none of these sites are directly on the St. Croix River which is the primary draw for visitors to the area. Another factor may be the rustic nature of the campgrounds, which do not offer electricity, flush toilets, or showers, all of which are growing demands for campers. Adding some of these additional amenities, primarily electric hook-ups, may increase use of the campgrounds; however, it is unknown at this time if the investment in additional amenities would have a significant increase in use. Improving campsites to better accommodate larger camping units such as RVs or pop-ups may also make the GKSF a more desirable place to camp.

One option for increasing use of the outdoor group camp would be to move it to a different location near the Clam Flowage. Moving this campground closer to a water feature may make it more desirable for users. As the GKSF determines ways to increase use of its campgrounds, perhaps accommodating some level of more developed camping facilities, the management challenge will be to maintain the forest's more rustic and remote character.

Recreational Trails

The supply of road and mountain bike trails in the region is low, and the demand for these types of trails in the region is increasing. Currently, the only opportunity for biking on the GKSF is on the paved roads; there are no designated biking trails. Locally, there is not a significant demand for cycling opportunities, but some visitors do bike on the paved roads when they visit the GKSF. If demand for biking off of paved roads were to increase, there may be an opportunity to allow biking on a portion of the hiking trail near the family campground. The trail is solid surface and wide enough to support both hikers and cyclists and could serve as a family bike trail for campers; however, potential user conflicts and safety issues may limit the feasibility of this option. Other opportunities for mountain bike trails on the GKSF are limited because of the flat, sandy terrain, which is not appealing to mountain bikers, and the escarpment area which has abundant seeps and springs making it prohibitive for sustainable mountain bike trails.

A lack of cross-country ski trails was identified for the region, but the demand is not significant. Use of the 8.5 mile groomed ski trail at the GKSF has been fairly low, and typically only locals use the other, un-groomed trails for skiing. Because both use and demand are fairly low, there is likely not a need to explore options for additional cross-country skiing opportunities on the GKSF. However, the GKSF is currently planning to improve the Brandt Pines Ski Trail so that skate skiing can be accommodated in addition to the current classic skiing use. If use of the skate skiing portion of the trail is popular, consideration may be given to expand skate skiing opportunities.

The GKSF has about 40 miles of developed and designated hiking trails, but similar to cross-country skiing, use of the hiking trails is also considered to be somewhat light. From a regional perspective, a shortage of hiking trails has been identified for the Great Northwest Region. Opportunities may exist to expand the hiking trails in a way that makes them more inviting to visitors, for example, by locating them near historic sites, creating more shorter loop trails (i.e. 1 - 1.5 mile loops), or to provide more interpretive signage. If determined to be appropriate, these enhancements would only be done if proper locations were available with soils to support the development.

The demand for ATV trails in the Great Northwest Region is considered stable and the demand for snowmobile trails is actually decreasing. There are many opportunities for ATV and snowmobile riding in the region, and the GKSF offers 32 miles of snowmobile/winter ATV trails which connect to Polk and Burnett County Forest trails. The 32 mile snowmobile trail is only open for winter ATVing when trail conditions can support the use and the trail is posted open. Providing ATV and snowmobile trails is not a significant niche for the GKSF because of the abundance of opportunities in the surrounding counties and because demand is limited. Maintenance of trail connections to Polk and Burnett County Forest trails is important. The combination of very wet and very sandy soils limits the ability to develop sustainable motorized trails on the GKSF.

Water Based Recreation

Water based recreation on the GKSF is fairly limited. Some opportunities are available on the Clam Flowage and the Wood River, but the primary draw for visitors to the area is the St. Croix River which is owned and operated by the NPS. The GKSF provides access to the St. Croix National Scenic Riverway via hiking trails and at the Highway 70 Wayside.

Although the St. Croix River is not managed by the GKSF, the state forest provides a recreational backdrop for the Riverway by protecting the viewshed and maintaining the experience for the river users. In many cases, people are at the GKSF because of the St. Croix River. Future changes in water based

FINDINGS AND CONCLUSIONS

recreation on the GKSF itself are not likely; however, the property should continue to maintain access to the Riverway and work in partnership with the National Park Service.

CONCLUSIONS

The Governor Knowles State Forest is a gem in a predominately rural region of northwest Wisconsin. The property is notable for its proximity to several public properties including federal, state, and county land and serves niches found on all ownership types. The St. Croix River is the major natural feature, and the primary reason for establishing the state forest.

Significant ecological features including its extensive outwash sand plain, seeps, streams, wetlands, forests, and other natural communities offer management opportunities to meet a wide range of social, ecological, and economic needs. The GKSF presents opportunities to maintain 55 miles of native wetland and upland communities with connections to a regionally significant river with excellent biodiversity.

The GKSF plays a critical role in contributing to the water quality and overall ecological integrity of the St. Croix River. Within the GKSF, numerous seeps and streams feed into the river. Seeps are particularly abundant on the GKSF; found here at a higher concentration than likely any other state-managed land. Continued protection of these seeps and streams will ultimately help to protect the water quality of the St. Croix, and also support the high plant diversity and many important amphibians and invertebrates.

The property also serves as an ecological connector because of its adjacency to the St. Croix River, its presence within two Ecological Landscapes (the Northwest Sands and Northwest Lowlands), and its location as a long linear forested corridor in a largely rural area. Over 17,000 acres of varied forest cover types provide the opportunity for the production of high quality forest products, while also maintaining and enhancing the ecological integrity of the state forest. In some cases, soils limit the forest management capability on the property. Wet, poorly drained soils below the escarpment are prone to rutting, and the very dry, nutrient poor soils on the upland have limited opportunities for biomass harvest. From a management perspective, the presence of the county forests, Glacial Lake Grantsburg complex of state wildlife areas, and the GKSF provide opportunities for more landscape scale management across property boundaries, including forest management, wildlife and habitat management, and the management of a variety of natural communities. The property also provides potential future opportunities to connect barrens remnants and restorations; these habitats are mostly limited to tiny fragments in many places in Wisconsin where they still exist.

Recreation on the forest is primarily nature based, with opportunities for horseback riding, camping, hunting and trapping, wildlife viewing, hiking, skiing and snowmobiling. Connectivity with other public lands provides additional, compatible recreation opportunities. The primary draws to the property are the St. Croix River and the equestrian trails and campground. While the GKSF does not offer any camping or recreational opportunities related the St. Croix River itself, it does serve as a recreational backdrop to the St. Croix offering additional recreational opportunities and protecting the scenic qualities that make the St. Croix popular. The use of the equestrian trails and campground are extremely popular on the forest and a primary reason why people come to the GKSF. Traditional camping and other recreational trails are lightly used, with the exception of the snowmobile trail which is heavily used during good snow seasons and part of a regional trail network. Although there are some opportunities for increasing the use of recreational facilities at the GKSF, the physical limitations of the property in terms of space and soils combined with the relatively low demand for increased opportunities mean that future changes in recreational developments on the GKSF will not be significant.

Given its unique natural features, varied forest cover, and presence of the St. Croix River all within a remote, sparsely populated part of the state, Governor Knowles State Forest has the potential to continue to provide significant social, ecological, and economic benefits now and into the future.

APPENDICES

APPENDICES

A. GOVERNOR KNOWLES STATE FOREST MASTER PLAN DESIGNATION PROCESS FOR STATE NATURAL AREAS

Generally, natural areas are tracts of land or water harboring natural features that have escaped most human disturbance and that represent the diversity of Wisconsin's native landscape. They contain outstanding examples of native biotic communities and are often the last refuges in the state for rare and endangered plant and animal species. State Natural Areas (SNAs) may also contain exceptional geological or archaeological features. The finest of the state's natural areas are formally designated as State Natural Areas.

The Wisconsin State Natural Areas Program oversees the establishment of SNAs and is advised by the Natural Areas Preservation Council. The stated goal of the program is to locate, establish, and preserve a system of SNAs that as nearly as possible represents the wealth and variety of Wisconsin's native landscape for education, research, and to secure the long-term protection of Wisconsin's biological diversity for future generations. SNAs are unique in state government's land protection efforts because they can serve as stand alone properties or they can be designated on other properties, such as a state forest. By designating SNAs within the boundary of the Governor Knowles State Forest, two different, legislatively mandated Department goals are being accomplished. This arrangement makes abundant fiscal sense because the state does not have to seek out willing sellers of private lands to meet the goals of multiple Department programs. This avoids duplicating appraisal and negotiation work and provides dual use of land that is already in public ownership.

The process to establish a SNA begins with the evaluation of a site identified through field inventories conducted by DNR ecologists, including the Biotic Inventory and Regional and Property Analysis. Assessments take into account a site's overall quality and diversity, extent of past disturbance, long-term viability, context within the greater landscape, and rarity of features on local and global scales. Sites are considered for potential SNA designation in one or more of the following categories:

- Outstanding natural community
- Critical habitat for rare species
- Ecological reference (benchmark) area
- Significant geological or archaeological feature
- Exceptional site for natural area research and education

DESIGNATION PROCESS OF SNAS

Step 1: Assessments	Step 2: Preferred Alternative	Step 3: Proposed Master Plan
Biotic Inventory SNA GAP analysis	The highest rated biotic sites and those with potential for filling gaps are proposed for special designation.	Native Community Management Areas Habitat Management Areas

Step 1: Results from both the SNA GAP analysis and the Biotic Inventory, which were conducted on the GKSF within the last few years, were used to decide which areas would be SNA opportunity areas.
The data gathered via the Biotic Inventory identifies and evaluates the natural communities, significant plant and animal populations, and selected aquatic features and their associated biotic communities. This report emphasized important protection, management, and restoration opportunities, focusing on both unique and representative natural features of the GKSF property and surrounding landscape.

The SNA GAP analysis looks at representation for each primary natural community in each Ecological Landscape and determines if an adequate number of ecological reference areas are in place to capture the variation across the landscape.

Step 2: Using both the Biotic Inventory and SNA GAP analysis, the GKSF Preferred Alternative took sites ranked high and proposed them for special designation. Several of these sites were proposed as Native Community Management Areas, and a few were proposed as Habitat Management Areas, based on their overlap with other complimentary objectives.

Step 3: Management classifications were formally assigned to each of the areas, designating them in either Native Community Management Areas or the Habitat Management Areas. After the management goals were developed, the team reassessed the boundaries to assure that each forest stand was in the correct management area. Using information from the Biotic Inventory, the SNA GAP Analysis, and an examination of the draft objectives for each area, experts evaluated each site for potential State Natural Area designation.

Once approved by the Natural Resources Board, sites are formally "designated" as SNAs and become part of the Wisconsin State Natural Areas system. Designation confers a significant level of recognition of these sites' natural values through state statutes, administrative rules, and guidelines.

IMPACT TO MASTER PLAN PROCESS

The process for selecting and designating SNAs is determined by cooperative efforts between two programs within the DNR: The Division of Forestry and the Bureau of Endangered Resources. The master planning process for state forests requires that the goals set by the Division of Forestry be considered before the Bureau of Endangered Resources submits candidate sites for SNA designation. This is done so that all sites are evaluated for timber production, which is outlined as a Division of Forestry priority. As a result, SNAs are considered overlays to land management areas. In this way, the same piece of land can achieve the goals of two different Department programs. Management activities for each SNA reflect the general management prescriptions for the area in which the SNA is located. For example, a SNA located within an area managed for white pine will follow the objectives for that land management area, rather than a separate SNA management plan. The exact same timber management would occur with or without SNA designation.

Land Management Impact by Designation of SNAs

State Natural Areas are considered overlays to the Native Community and Habitat Management Areas of the GKSF. The State Natural Area designation does not change the underlying management objectives, prescriptions, or authorized activities outlined in this master plan for each land management area. There are no additional management prescriptions associated with these State Natural Areas.

SNA Management Activities

State Natural Areas are not exclusively passive management. Between 2003 and 2007, over 200 SNAs all over Wisconsin have had some type of active management. Examples of management activities include invasive species removal, burning and fuel reduction, brushing, trail development, ditch filling, and planting. Timber harvesting is not a primary focus of a SNA, but it is often necessary to achieve the desired ecological goals of a specific habitat. During the same five years, 29 commercial timber operations were conducted on SNAs to achieve the ecological goals of the site. Regardless of any designation, wildfires on state forests would be actively suppressed, safety measures would occur in developed areas, and insect and disease outbreaks would be considered for control.

Recreational Impacts

Impacts would be minimal because the recreation opportunities for any given area were determined before consideration as a SNA. State Natural Areas are not appropriate for intensive recreation and such areas were automatically ruled out as potential sites during the development of the preferred alternative. However, SNAs can accommodate low-impact activities such as hiking, bird watching, and nature study. Examples of existing facilities within SNA sites include hiking and cross-country ski trails.

BENEFITS FOR A PARTNERSHIP BETWEEN STATE FORESTS AND THE STATE NATURAL AREAS PROGRAM

The SNA program has standardized methods for conducting long-term monitoring of ecosystems and also has a network with a broad range of researchers, from aquatic biologists and botanists to zoologists that can be encouraged to conduct research on the state forest to enhance our understanding of the FRSF ecosystem. The experts in the Division of Forestry have experience in monitoring the trees and other plants, while SNA ecologists have expertise in monitoring terrestrial invertebrates, fungi and lichens, ground layer plants, mammals, reptiles and amphibians, and birds. Together an exceptional collaborative monitoring program could be developed.

- The SNA program can bring a broad range of educators together to assist in understanding and interpreting the ecology of the GKSF.
- The SNA program can lend its expertise to help create ecological interpretive signs and trail guides for better understanding of the full range of biological diversity on the GKSF.
- The SNA Program can assist in conducting land management activities such as invasive exotic species control, brushing and conducting prescribed burns.
- The Division of Forestry would not lose any of its management or decision-making authority, but gain the ability to provide a broader range of opportunities that would help fill its mission by collaborating with the SNA Program.
- An outside forest certification audit of the State Forest Program concluded that cooperation between the Division of Forestry and the State Natural Areas Program was commendable. This cooperation should continue to maintain such a high rating by future auditors.
- With a joint consideration, the same piece of land can achieve the goals of two different programs. If there were a lack of teamwork, the SNA Program would still pursue sites to fulfill its goals.

B. ENDANGERED OR THREATENED SPECIES AND SPECIES OF SPECIAL CONCERN

ANIMALS

Table B.1 lists animals on the Governor Knowles State Forest which are endangered, threatened or of special concern, based on the Natural Heritage Inventory (NHI) database. The listing includes both state and federal designations. The aim of a "Special Concern" designation is to focus attention on certain species before they become threatened or endangered. Species of Greatest Conservation Need (SGCN) are also indicated.

TABLE B.1 ENDANGERED, THREATENED, OR SPECIAL CONCERN ANIMALS ON THE GOVERNOR KNOWLES STATE FOREST

Scientific Name	Common Name	State Status	Federal Status	SGCN
Cicindela patruela patruela	A Tiger Beetle	SC/N		X
Buteo lineatus	Red-shouldered Hawk	THR		X
Coccyzus americanus	Yellow-billed Cuckoo	SC/M		X
Haliaeetus leucocephalus	Bald Eagle	SC/P		X
Picoides arcticus	Black-backed Woodpecker	SC/M		X
Podiceps grisegena	Red-necked Grebe	END		X
Protonotaria citrea	Prothonotary Warbler	SC/M		X
Seiurus motacilla	Louisiana Waterthrush	SC/M		X
Wilsonia canadensis	Canada Warbler	SC/M		X
Wilsonia citrina	Hooded Warbler	THR		X
Atrytonopsis hianna	Dusted Skipper	SC/N		
Callophrys henrici	Henry's Elfin	SC/N		
Hesperia metea	Cobweb Skipper	SC/N		X
Lycaeides melissa samuelis	Karner Blue	SC/FL	LE	X
Ophiogomphus anomalus	Extra-striped Snaketail	END		X
Ophiogomphus howei	Pygmy Snaketail	THR		X
Ophiogomphus susbehcha	Saint Croix Snaketail	END		X
Acipenser fulvescens	Lake Sturgeon	SC/H		X
Cycleptus elongatus	Blue Sucker	THR		X
Fundulus diaphanus	Banded Killifish	SC/N		X
Moxostoma carinatum	River Redhorse	THR		X
Moxostoma valenciennesi	Greater Redhorse	THR		X
Percina evides	Gilt Darter	THR		X
Canis lupus	Gray Wolf	SC/FL	LE	X
Catocala whitneyi	Whitney's Underwing Moth	SC/N		X
Papaipema beeriana	Liatris Borer Moth	SC/N		X
Alasmidonta marginata	Elktoe	SC/P		
Cumberlandia monodonta	Spectacle Case	END	C	X
Cyclonaias tuberculata	Purple Wartyback	END		X
Pleurobema sintoxia	Round Pigtoe	SC/P		
Emydoidea blandingii	Blanding's Turtle	THR		X
Glyptemys insculpta	Wood Turtle	THR		X

Key:

State Status

END endangered
THR threatened
SC special concern
SC/P fully protected
SC/N no laws regulating use, possession, or harvesting
SC/H take regulated by establishment of open closed seasons
SC/FL federally protected as endangered or threatened, but not so designated by WDNR
SC/M fully protected by federal and state laws under the Migratory Bird Act.

Federal Status

LE listed endangered
C candidate for future listing

PLANTS

The table below lists plants on the Governor Knowles State Forest which are endangered, threatened or of special concern, based on the Natural Heritage Inventory (NHI) database.

TABLE B.2 ENDANGERED, THREATENED, OR SPECIAL CONCERN PLANTS ON THE GOVERNOR KNOWLES STATE FOREST

Scientific Name	Common Name	State Status
Arethusa bulbosa	Swamp-pink	SC
Asclepias ovalifolia	Dwarf Milkweed	THR
Carex assiniboinensis	Assiniboine Sedge	SC
Carex prasina	Drooping Sedge	THR
Cypripedium parviflorum var. makasin	Northern Yellow Lady's-slipper	SC
Cypripedium reginae	Showy Lady's-slipper	SC
Dalea villosa var. villosa	Silky Prairie-clover	SC
Deschampsia cespitosa	Tufted Hairgrass	SC
Epilobium palustre	Marsh Willow-herb	SC
Liatris punctata var. nebraskana	Dotted Blazing Star	END
Myriophyllum farwellii	Farwell's Water-milfoil	SC
Ophioglossum pusillum	Adder's-tongue	SC
Poa paludigena	Bog Bluegrass	THR
Talinum rugospermum	Prairie Fame-flower	SC

Key:

State Status

END endangered
THR threatened
SC special concern

Federal Status

LE listed endangered
C candidate for future listing

C. WILDLIFE SPECIES OF GREATEST CONSERVATION NEED

The tables below list priority vertebrate Species of Greatest Conservation Need (SGCN) and their natural community associations within the Northwest Sands and Northwest Lowlands Ecological Landscapes. Only SGCN with a high or moderate probability of occurring are shown. Numbers indicate the degree to which each species is associated with a particular habitat type (3=significant association, 2=moderate association, and 1=low association). Combinations of natural communities labeled as "Important" or "Major" that are also assigned as either "3" or "2" are also Ecological Priorities, as defined by the Wisconsin Wildlife Action Plan. Highlighted species were found in WI, and bolded species have been documented in MN (within one mile of the St. Croix River).

NORTHWEST SANDS

TABLE C.1 WILDLIFE SPECIES OF GREATEST CONSERVATION NEED WITHIN THE NORTHWEST SANDS ECOLOGICAL LANDSCAPE

	Major															Important					Present				
	Coldwater streams	Coolwater streams	Emergent Marsh	Emergent Marsh - Wild Rice	Inland lakes	Northern Dry Forest	Northern Dry-mesic Forest	Northern Sedge Meadow	Northern Wet Forest	Oak Barrens	Open Bog	Pine Barrens	Submergent Marsh	Surrogate Grasslands	Warmwater rivers	Alder Thicket	Impoundments/Reservoirs	Northern Hardwood Swamp	Northern Wet-mesic Forest	Warmwater streams	Ephemeral Pond	Floodplain Forest	Northern Mesic Forest	Shrub Carr	Submergent Marsh - Oligotrophic
Species that are Significantly Associated with the Northwest Sands Landscape																									
American Bittern			3	1				3			3			1		1								1	
American Woodcock						1	1	1	1	1	1	1		1		3		2	1		1	1	2	3	
Bald Eagle				1	3								2		3		3					1			
Banded Killifish					2															1					
Black Tern			3	2	2			2					2				2								
Black-backed Woodpecker						2	1		3		1	1							1				1		
Black-billed Cuckoo						1	1	1	1	2		2				3		1				2	2	3	
Blanding's Turtle	2	2	3	3	3			2		3		3	3		2	2	3			2	3	2		2	3
Blue-winged Teal			3	2	2			2					2	2	1		2				1	2			
Bobolink								3			2			3											
Boreal Chorus Frog			3		3			3		3	3	3					3				3				
Brown Thrasher						1				3		3		2											
Bullsnake										3		3													
Connecticut Warbler						3	1		2		2	2													
Field Sparrow										2		2		2											
Franklin's Ground Squirrel										3		3		2											
Golden-winged Warbler						2	2		2		2	1				3		2	1				2	3	
Gray Wolf						2	3	1	3	2	2	2				3		2	3			2	3	2	
Greater Redhorse					2										2		2			3					
Le Conte's Sparrow								3			2			3											
Least Darter					2										2					2					
Least Flycatcher						2	2											2	1			2	3	1	

	Major															Important					Present				
	Coldwater streams	Coolwater streams	Emergent Marsh	Emergent Marsh - Wild Rice	Inland lakes	Northern Dry Forest	Northern Dry-mesic Forest	Northern Sedge Meadow	Northern Wet Forest	Oak Barrens	Open Bog	Pine Barrens	Submergent Marsh	Surrogate Grasslands	Warmwater rivers	Alder Thicket	Impoundments/Reservoirs	Northern Hardwood Swamp	Northern Wet-mesic Forest	Warmwater streams	Ephemeral Pond	Floodplain Forest	Northern Mesic Forest	Shrub Carr	Submergent Marsh - Oligotrophic
Species that are Significantly Associated with the Northwest Sands Landscape																									
Lesser Scaup			1	2	2								3		2		2								
Nelson's Sharp-tailed Sparrow								3																	
Northern Flying Squirrel						2	3		3			1						2	3			2	3		
Northern Harrier			1	1				3		2	2	2		3		1								1	
Northern Prairie Skink						2	2			3		3													
Osprey				1	3								1		3		3								
Pugnose Shiner					2															2					
Red Crossbill						3	3		1			2											1		
Red-headed Woodpecker						1	1			2		1										2			
River Redhorse															2										
Sharp-tailed Grouse								2		3	1	3		2										1	
Short-billed Dowitcher			3										1				2								
Trumpeter Swan			3	3	2			1			1		3		1		2								
Upland Sandpiper								1		2		2		3											
Veery						1	2		2							3		3	1			2	2	3	
Vesper Sparrow										3		3		1											
Water Shrew	3	3			2			1	3		1				1	2	1	3	3	2		2	2	1	
Whip-poor-will						2	2			2		2										1	1		
Wood Turtle	3	3						2	2	3		3	3		3	3		2	2	3	2	3	3	3	
Yellow Rail								3			3														
Species that are Moderately Associated with the Northwest Sands Landscape																									
American Golden Plover			2					1						2			2								
Blue-winged Warbler						1				1												2		2	
Canada Warbler						1	2		2							2		3	3				2	1	
Canvasback			1	2	2								3		3		2								
Dunlin			2												2		2								
Eastern Meadowlark														3											
Four-toed Salamander	2	2	3					2	2		3					3		2	3		3	3	3	3	
Gilt Darter															3					3					
Grasshopper Sparrow										2		1		3											
Hudsonian Godwit			3										1				1								
Lake Sturgeon					3										3		3								
Marbled Godwit			3										1	2			1								
Mink Frog	2	3	3	2	3			3	1		3		3		3	2	3	1	1	3	2		1	2	2
Mudpuppy	2	1			3										3		3								

	Major															Important					Present				
	Coldwater streams	Coolwater streams	Emergent Marsh	Emergent Marsh - Wild Rice	Inland lakes	Northern Dry Forest	Northern Dry-mesic Forest	Northern Sedge Meadow	Northern Wet Forest	Oak Barrens	Open Bog	Pine Barrens	Submergent Marsh	Surrogate Grasslands	Warmwater rivers	Alder Thicket	Impoundments/Reservoirs	Northern Hardwood Swamp	Northern Wet-mesic Forest	Warmwater streams	Ephemeral Pond	Floodplain Forest	Northern Mesic Forest	Shrub Carr	Submergent Marsh - Oligotrophic
Species that are Moderately Associated with the Northwest Sands Landscape																									
Northern Goshawk						1	2											1	1				3		
Olive-sided Flycatcher						1	1		3		2	1				1			2					1	
Pickerel Frog	3	3	3		2			3	2		2		3		3	2	3		2	3	3	2	2	2	
Red-necked Grebe			3	1									2												
Red-shouldered Hawk						1	2											1	1		3	3	2		
Rusty Blackbird			2								2					2					2	3		2	
Solitary Sandpiper	2	2	3					1			2					1				2	3	3		1	
Wilson's Phalarope			3					3					2												
Wood Thrush							1		1									1	1			2	2		
Woodland Jumping Mouse						1	1	1	2		1	1				1		2	2		2	2	3	1	

Key:

1 = Species is (and/or historically was) only minimally associated with the Ecological Landscape, restoration of this Ecological Landscape would only minimally improve conditions for the species.

2 = Species is (and/or historically was) moderately associated with the Ecological Landscape, restoration of this Ecological Landscape would moderately improve conditions for the species.

3 = Species is (and/or historically was) significantly associated with the Ecological Landscape, restoration of this Ecological Landscape would significantly improve conditions for the species.

NORTHWEST LOWLANDS

The GKSF contains only a small portion of the Northwest Lowlands Ecological Landscape, and there are significant concentrations of several species in that portion of the property that do not show up in the table - see the rare animals section for more information (e.g. Red-shouldered Hawk).

TABLE C.2 WILDLIFE SPECIES OF GREATEST CONSERVATION NEED WITHIN THE NORTHWEST LOWLANDS ECOLOGICAL LANDSCAPE

	Major				Important									Present								
	Northern Sedge Meadow	Northern Wet Forest	Open Bog	Warmwater rivers	Alder Thicket	Boreal Forest	Coolwater streams	Emergent Marsh	Northern Dry-mesic Forest	Northern Mesic Forest	Northern Wet-mesic Forest	Submergent Marsh	Warmwater streams	Coldwater streams	Ephemeral Pond	Impoundments/Reservoirs	Inland lakes	Moist Cliff	Northern Dry Forest	Northern Hardwood Swamp	Shrub Carr	Surrogate Grasslands
Species that are Significantly Associated with the Northwest Lowlands Landscape																						
American Bittern	3		3		1			3													1	1
American Woodcock	1	1	1		3	1			1	2	1				1				1	2	3	1
Black-backed Woodpecker		3	1			2			1	1	1								2			
Black-billed Cuckoo	1	1			3	1			1	2									1	1	3	
Boreal Chorus Frog	3		3					3							3	3	3					
Brown Thrasher																			1			2
Canada Warbler		2			2	3			2	2	3								1	3	1	
Connecticut Warbler		2	2			1			1										3			
Four-toed Salamander	2	2	3		3	2	2	3		3	3			2	3			1		2	3	
Gilt Darter				3									3									
Golden-winged Warbler		2	2		3	1			2	2	1								2	2	3	
Gray Wolf	1	3	2		3	3			3	3	3								2	2	2	
Greater Redhorse				2									3			2	2					
Lake Sturgeon				3												3	3					
Le Conte's Sparrow	3		2																			3
Least Flycatcher						2			2	3	1								2	2	1	
Louisiana Waterthrush							3							3								
Mink Frog	3	1	3	3	2	1	3	3		1	1	3	3	2	2	3	3			1	2	
Northern Flying Squirrel		3				3			3	3	3								2	2		
Northern Harrier	3		2		1			1													1	3
Olive-sided Flycatcher		3	2		1	2			1		2								1		1	
River Redhorse				2																		
Veery		2			3	3			2	2	1								1	3	3	
Water Shrew	1	3	1	1	2	3	3			2	3		2	3		1	2			3	1	
Wood Turtle	2	2		3	3		3			3	2	3	3	3	2					2	3	
Woodland Jumping Mouse	1	2	1		1	2			1	3	2				2				1	2	1	

	Major				Important									Present								
	Northern Sedge Meadow	Northern Wet Forest	Open Bog	Warmwater rivers	Alder Thicket	Boreal Forest	Coolwater streams	Emergent Marsh	Northern Dry-mesic Forest	Northern Mesic Forest	Northern Wet-mesic Forest	Submergent Marsh	Warmwater streams	Coldwater streams	Ephemeral Pond	Impoundments/Reservoirs	Inland lakes	Moist Cliff	Northern Dry Forest	Northern Hardwood Swamp	Shrub Carr	Surrogate Grasslands
Species that are Moderately Associated with the Northwest Lowlands Landscape																						
American Marten		1				3			3	3	1								1	1		
Black Tern	2							3				2				2	2					
Blue-winged Teal	2			1				3				2			1	2	2					2
Bobolink	3		2																			3
Boreal Chickadee		3				2					1											
Eastern Red Bat	2	2	2	2	2	2	3	2	2	2	2	2	2	3	3	1	2		2	2	2	
Hoary Bat	2	2	2	2	2	2	3	2	2	2	2	2	2	3	3	1	2		2	2	2	
Longear Sunfish				2									2				2					
Moose	2	2	2	2	3	3	1	3	1	2	3	3	2	1		2	3		1	3	3	
Mudpuppy				3			1							2		3	3					
Northern Goshawk						2			2	3	1								1	1		
Northern Long-eared Bat	2	1	2	2	2	1	3	2	2	2	1	2	2	3	3	1	2		2	2	2	
Osprey				3								1				3	3					
Pickerel Frog	3	2	2	3	2		3	3		2	2	3	3	3	3	3	2				2	
Red Crossbill		1				1			3	1									3			
Rusty Blackbird			2		2			2							2						2	
Silver-haired Bat	2	2	2	2	2	2	3	2	2	2	2	2	2	3	3	1	2		2	2	2	
Solitary Sandpiper	1		2		1		2	3					2	2	3						1	
Wood Thrush		1							1	2	1									1		

Key:

1 = Species is (and/or historically was) only minimally associated with the Ecological Landscape, restoration of this Ecological Landscape would only minimally improve conditions for the species.

2 = Species is (and/or historically was) moderately associated with the Ecological Landscape, restoration of this Ecological Landscape would moderately improve conditions for the species.

3 = Species is (and/or historically was) significantly associated with the Ecological Landscape, restoration of this Ecological Landscape would significantly improve conditions for the species.

D. NATURAL RESOURCES USED BY LOCAL NATIVE AMERICAN TRIBES

The Ojibwe[1] had long lived in the Lake Superior region (portions of modern-day Minnesota, Wisconsin, Michigan, and Canada) by the time European explorers first entered the area. At that time, the Ojibwe lived a semi-nomadic lifestyle, moving seasonally from camp to camp, harvesting from the earth (aki[2]) vital foods, medicines, utility supplies, and ceremonial items.

As more Europeans moved into the Lake Superior region in search of timber and minerals, the United States government obtained vast parcels of land from the Ojibwe through cession treaties. In many of these treaties, the Ojibwe retained the rights to hunt, fish, and gather in the ceded territories to meet economic, cultural, spiritual, and medicinal needs — in essence, to sustain their lifeway. Tribal negotiations for these rights were fastidious and purposeful, and only through the guarantee of these rights, did the tribes agree to sign the treaties. Today, these reserved usufructory rights are often referred to as treaty rights.

Treaties that reserved these rights include the Treaty of 1836, ceding land in Michigan's Upper and Lower Peninsulas and parts of the Upper Great Lakes; the Treaty of 1837, ceding land in north central Wisconsin and east central Minnesota; the Treaty of 1842 ceding land in northern Michigan and Wisconsin and the western part of Lake Superior; and the Treaty of 1854, ceding land in northeastern Minnesota and creating reservations for many Ojibwe tribes.

For many years following the ratification of these treaties, the Ojibwe continued to hunt, fish, and gather as always. However, over the years, as states passed various conservation laws, state game wardens enforced these laws against tribal members. Members exercising their treaty rights off reservation within the ceded territories were frequently cited and convicted in state courts. Many members paid fines, endured the confiscation of their rifles and fishing gear, and suffered incarceration.

Though the Ojibwe have always believed in the continued existence of their treaty rights, it was not until the 1970's, as part of a general resurgence of tribal self-determination, that Ojibwe governments and their members more aggressively and more formally challenged state conservation laws and enforcement activities. These challenges gave rise to many federal and state court decisions which reaffirmed Ojibwe off reservation treaty rights on public lands in the ceded territories[3].

The courts confirmed the Ojibwe's understanding of their treaty rights: The treaties provide a "permanent" guarantee "to make a moderate living off the land and from the waters … by engaging in hunting, fishing and gathering as they had in the past."[4] In essence, the courts found the Ojibwe treaties to be legally binding agreements to be respected within the framework of the United States Constitution, which defines treaties as the "supreme law of the land."

In addition, the courts recognized that by reserving the rights to engage in hunting, fishing, and gathering, the Ojibwe also retained their sovereignty to regulate tribal members exercising these treaty rights. Sovereignty refers to the right of inherent self-government and self-determination. Thus, tribal self-regulation is a requisite of treaty rights implementation.

As the courts reaffirmed the Ojibwe's ceded territory treaty rights, a number of tribes[5] in Michigan, Minnesota and Wisconsin chose to enhance their self-regulatory infrastructures through the formation of the Great Lakes Indian Fish and Wildlife Commission (GLIFWC)…[GLIFWC] assists its member tribes with issues such as the application of tribal self-regulation within the off-reservation ceded territories, identification and condition assessment of treaty resources, negotiations and consultation with state and federal government agencies regarding the management of treaty resources within the ceded territories, and litigation pertaining to the treaties of member tribes.

Excerpted from Danielsen and Gilbert 2002 Nontimber Forest Products in the United States

1 There are several terms used in reference to the Ojibwe people. The Ojibwe people often call themselves Anishinaabe which in their language means Indian person or original people. The anglicized word for Ojibwe is Chippewa.
2 Ojibwe language
3 See People v. Jondreau, 384 Mich 539, 185 N.W. 2d 375 (1971); State of Wisconsin v. Gurnoe, 53 Wis. 2d 390 (1972); U.S. v. Michigan, 471 F.Supp. 192 (W.D. Mich. 1979); Lac Courte Oreilles v. Voigt (LCO I), 700 F. 2d 341 (7th Cir. 1983), cert. denied 464 U.S. 805 (1983); Lac Courte Oreilles v. State of Wisconsin (LCO III), 653 F.Supp. 1420 (W.D. Wis. 1987); Lac Courte Oreilles v. State of Wisconsin (LCO IV), 668 F.Supp. 1233 (W.D. Wis.1987); Lac Courte Oreilles v. State of Wisconsin (LCO V), 686 F.Supp. 226 (W.D. Wis. 1988); Lac Courte Oreilles v. State of Wisconsin (LCO VI), 707 F.Supp. 1034 (W.D. Wis. 1989); Lac Courte Oreilles v State of Wisconsin (LCO VII), 740 F.Supp. 1400 (W.D. Wis. 1990); Lac Courte Oreilles v. State of Wisconsin (LCO VIII), 749 F.Supp. 913 (W.D. Wis. 1990); Lac Courte Oreilles v. State of Wisconsin (IX), 758 F.Supp. 1262 (W.D. Wis. 1991); Lac Courte Oreilles v. State of Wisconsin (X), 775 F.Supp. 321 (W.D. Wis. 1991); U.S. v. Bresette, 761 F.Supp. 658 (D. Minn. 1991); Mille Lacs Band v. State of Minnesota, 861 F.Supp. 784 (D. Minn. 1994); Mille Lacs Band v. State of Minnesota, 952 F.Supp. 1362 (D. Minn. 1997); Mille Lacs Band v. State of Minnesota, 124 F.3d904 (8th Cir. 1997); State of Minnesota v. Mille Lacs Band, 119 S.Ct. 1187 (1999).
4 LCO III, 653 F.Supp. 1420, 1426 (W.D. Wis. 1987).
5 GLIFWC's current member tribes include: in Wisconsin -- the Bad River Band of the Lake Superior Tribe of Chippewa Indians, Lac du Flambeau Band of Lake Superior Chippewa Indians, Lac Courte Oreilles Band of Lake Superior Chippewa Indians, Red Cliff Band of the Lake Superior Chippewa Indians, St. Croix Chippewa Indians of Wisconsin, and Sokaogon Chippewa Community of the Mole Lake Band; in Michigan -- Bay Mills Indian Community, Keweenaw Bay Indian Community, and Lac Vieux Desert Band of Lake Superior Chippewa Indians; and in Minnesota -- Fond du Lac Chippewa Tribe and Mille Lacs Band of Chippewa Indians.

E. GLOSSARY OF TERMS

Active Management: These areas apply primarily in the forest production areas and use general forest management prescriptions. Activities are achieved through clearcutting, selective cutting, thinning, timber stand improvement, natural or forced regeneration, herbicide treatments, and/or prescribed burning. These activities would be consistent with standard silvicultural practices associated with the forest timber types found in the area and are generally scheduled in the property's reconnaissance (inventory). Each management area will have a goal and objective consistent with site capabilities and forest cover types. While species composition would remain relatively consistent during the life of the master plan, the age class distribution would change due to timber harvesting. Forest users should expect to see ongoing annual vegetation manipulation.

Adaptive Management: A dynamic approach to forest management in which the effects of treatments and decisions are continually monitored and used, along with research results, to modify management on a continuing basis to ensure that objectives are being met.

Basal Area: The basal area of a tree is usually defined as the cross-sectional area at breast height in square feet.

Biological Diversity: The variety and abundance of species, their genetic composition, and the communities, ecosystems and landscapes in which they occur. Biological diversity also refers to the variety of ecological structures, functions, and processes at any of these levels.

Community Restoration: The practice of community restoration recognizes that communities, species, structural features, microhabitats, and natural processes that are now diminished or absent from the present landscape have a valuable role to place in maintaining native ecosystems. Under some definitions, community restoration means moving the current composition and structure of a plant community to a composition and structure that more closely resembles that of the presettlement vegetation.

DNR Silviculture and Forest Aesthetics Handbook: Silviculture is the practice of controlling forest composition, structure, and growth to maintain and enhance the forest using a unified, systematic approach. The management recommendations are basic guidelines intended to encourage vigor within all developmental stages of a forest, whether managed in an even-age or uneven-age system. The practice of silviculture is an art and a science which recognizes the specific ecological capabilities and characteristics of the site for both short-term and long-term impacts. Integrated resource management objectives, such as aesthetics, wildlife, endangered resources, biological diversity, timber production, and the protection of soil and water quality are part of this system.

DNR Old Growth and Old Forests Handbook: These management recommendations provide basic, adaptive guidelines based on research and general scientific and silvicultural knowledge of the species being managed. The recommendations are subject to purposeful, on-the-ground modification by the land manager. Old growth forests are rare in Wisconsin and are valued for many ecological, social, and economic purposes. Current forests will change with time, and can provide an opportunity to restore old growth forests at the stand level, and in some places at a landscape scale. The Department of Natural Resources formally recognized and encouraged the management of old growth forests in Wisconsin's Biodiversity as a Management Issue. Wisconsin's state land master planning process, formalized in Chapter NR 44, Wis. Adm. Code, includes old growth forest as a critical consideration.

Extended Rotation Stands: Stands that can be either even or uneven-aged. They are managed well beyond the economic rotation to capture ecological benefits associated with mature forests. These stands are carried beyond their normal economic rotation age and are harvested before reaching pathological decline.

Forest Cover Type: A category of forest usually defined by its vegetation, particularly its dominant vegetation as based on percentage cover of trees.

Forest Structure: Forest stands can be characterized by their structural features, including type and density of dominant tree species, type of understory (ground vegetation), and amount of standing and fallen dead trees. These attributes undergo a predictable pattern of change as stands age, and together they can be used to classify stands into young, mature, and old stages.

Invasive Species: These species have the ability to invade natural systems and proliferate, often dominating a community to the detriment and sometimes the exclusion of native species. Invasive species can alter natural ecological processes by reducing the interactions of many species to the interaction of only a few species.

Managed Old Forest: Designated forests (relict, old growth, or old forests) where future active management is limited, and the primary management goal is the long-term development and maintenance of some old growth or old forest ecological

attributes within environments where limited management practices and product extraction are allowed.

Managed Old Growth: The primary management goal is the long-term development and maintenance of old growth characteristics within environments where limited but active land management, including logging is allowed. Practices which could be considered include insect control, salvage logging, prescribed fire, and prescribed logging.

Passive Management: A management technique that means the goals of the native community management area are achieved primarily without any direct action. Nature is allowed to determine the composition and structure of the area. For example, patches of large woody debris and the accompanying root boles (tip-up mounds) that are characteristic of old growth structure are best achieved through natural processes. Passive management, however, does not mean a totally hands off approach. Some actions are required by law, such as wildfire suppression, consideration of actions when severe insect and disease outbreaks affect trees, and hazard management of trees along trails and roads. Other actions, such as removal of invasive exotic species, are necessary to maintain the ecological integrity of the site.

State Natural Areas: Tracts of land or water harboring natural features that have escaped most human disturbance and that represent the diversity of Wisconsin's native landscape. They contain outstanding examples of native biotic communities and are often the last refuges in the state for rare and endangered plant and animal species. They may also contain exceptional geological or archaeological features. The finest of the state's natural areas are formally designated as State Natural Areas.

Sustainable Forestry: The practice of managing dynamic forest ecosystems to provide ecological, economic, social, and cultural benefits for present and future generations.

Type 1 Recreational Use Setting: Objective of this setting is to provide a remote, wild area where the recreational user has opportunities to experience solitude, challenge, independence and self-reliance.

Type 2 Recreational Use Setting: Objective of this setting is to provide a remote or somewhat remote area with little development and a predominantly natural-appearing environment offering opportunities for solitude and primitive, non-motorized recreation.

Type 3 Recreational Use Setting: Objective of this setting is to provide readily accessible areas with modest recreational facilities offering opportunities at different times and places for a variety of dispersed recreational uses and experiences.

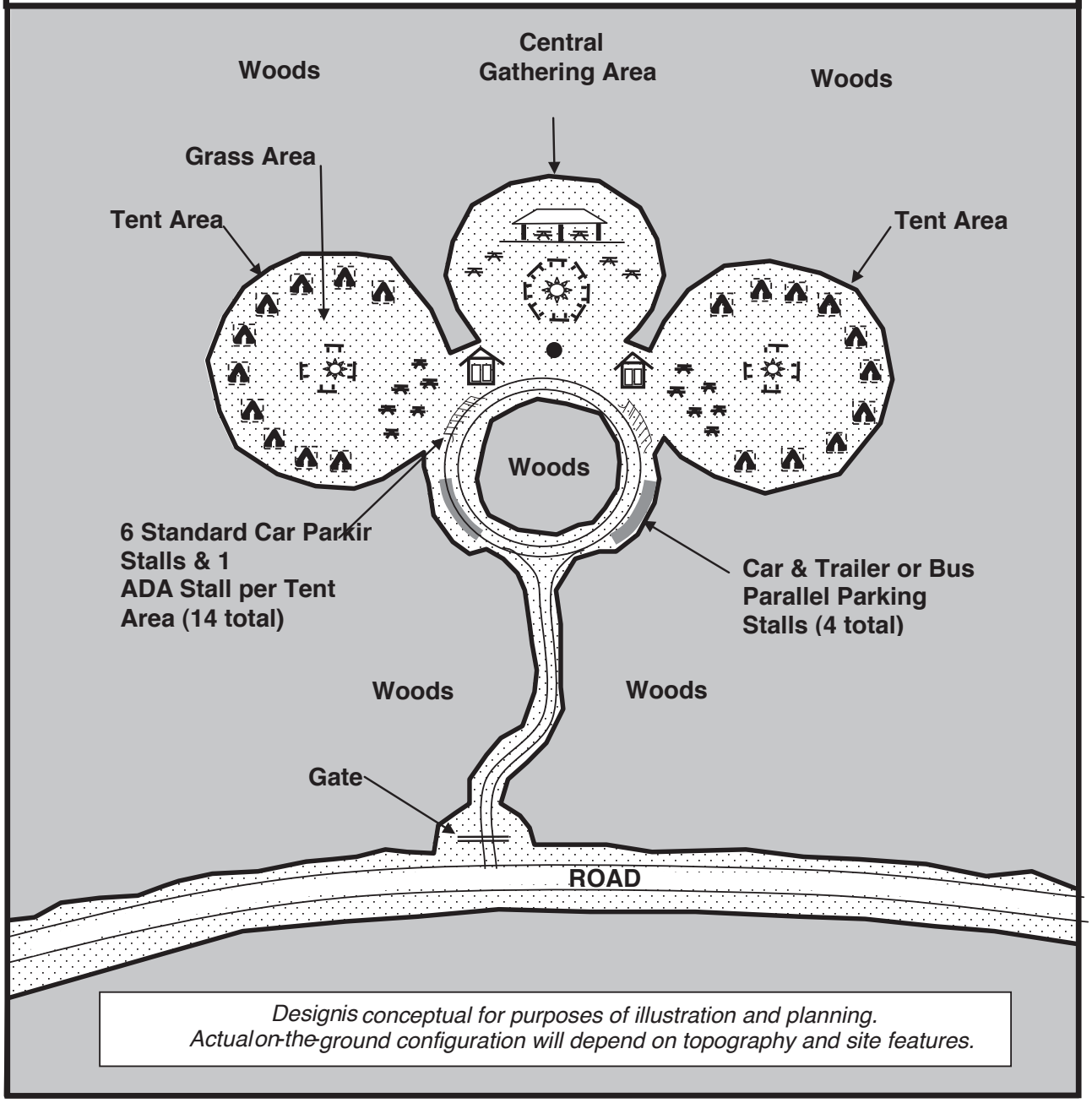
Type 4 Recreational Use Setting: Objective of this setting is to provide areas offering opportunities for intensive recreational use activities and expectations. Facilities, when present, may provide a relatively high level of user comfort, convenience and environmental protection.

F. GROUP CAMP CONCEPT

Rustic Outdoor Group Camping Area

To be developed in a semi-remote location within the forest, near a water source.

MAXIMUM OCCUPANCY - 60 CAMPERS



Designis conceptual for purposes of illustration and planning.
Actualon-the-ground configuration will depend on topography and site features.

G. REFERENCES

Alverson, W.W., D.M. Waller, and S.L. Solheim. 1988. Forests Too Deer: Edge Effects in Northern Wisconsin. Conserv. Biol. 2:348-358.

Anderson, D. 2006. Governor Knowles State Forest Invasive Plant Inventory Final Report.

Cardille J.A. and Ventura S.J. 2001. Occurrence of Wildfire in the Northern Great Lakes Region: Effects of Land Cover and Land Ownership Assessed at Multiple Scales. International Journal of Wildland Fire 10: 145–154.

Cummings Carlson, Jane. Personal communication. 12 August. 2010.

Curtis, J. T. 1959. The Vegetation of Wisconsin. University of Wisconsin Press, Madison, WI. 657 p.

De Calesta, D.S. 1994. Effect of white-tailed deer on songbirds within managed forests in Pennsylvania. J. Wildl. Manage. 58(4):711-718.

Dickmann, Donald I. and David T. Cleland. Draft 2002. Fire return intervals and fire cycles for historic fire regimes in the Great Lakes Region: a synthesis of the literature. Available online: http://www.ncrs.fs.fed.us/gla/reports/LSFire-Cycles.pdf

Dott, R.H. Jr. and J.W. Attig. 2004. Roadside Geology of Wisconsin. Mountain Press Publishing Company. Missoula, Montana. 345 p.

Engman, Pete. Personal communication. 08 September. 2010.

Epstein, E. 2006. Canada Warbler. In Atlas of the Breeding Birds of Wisconsin, eds. N.J. Cutright, B.R. Harriman, and R.W. Howe. The Wisconsin Society for Ornithology. p 258-259.

Finley, R.W. 1976. Original Vegetation Cover of Wisconsin. Map compiled from General Land Office Notes. University of Wisconsin Extension, Madison, WI.

Forest Stewardship Council. 2009. Draft 7 FSC-US Forest Management Standard. Minneapolis, MN.

Herrick, S.K., J.A. Kovach, E.A. Padley, C.R. Wagner, and D.E. Zastrow. 2009. Wisconsin's Forestland Woody Biomass Harvesting Guidelines. PUB-FR-435-2009. WI DNR Division of Forestry and Wisconsin Council on Forestry; Madison, WI. 51 pages.

Hunter, M.L. Jr. and F.K. Schmiegelow. 2010. Wildlife, Forests, and Forestry: Principles of Managing Forests for Biodiversity. 2nd edition. Prentice Hall, Upper Saddle River, NJ. 259 pages.

Johnson, R. 2006. Black-backed Woodpecker. In Atlas of the Breeding Birds of Wisconsin, eds. N.J. Cutright, B.R. Harriman, and R.W. Howe. The Wisconsin Society for Ornithology. p 258-259.

Kotar, J., J.A. Kovach, and T.L. Burger. 2002. A Field Guide to the Forest Communities and Habitat Types of Northern Wisconsin. 2nd Edition. Madison, Wis.

Lindenmayer, D.B. and J.F. Franklin. 2002. Conserving Forest Biodiversity: a Comprehensive Multiscaled Approach. Island press, Washington, D.C. 351 pages.

McShea, W.J. and J.H. Rappole. 2000. Managing the abundance and diversity of breeding bird populations through manipulation of deer population. Conservation Biology 14(4):1161-1179.

Michigan Society of American Foresters. 2006. Position statement on white-tailed deer management in Michigan. http://michigansaf.org/Business/PosStates/Deer.htm

Minnesota Department of Natural Resources. 2006. Mille Lacs Uplands: Subsection profile. In 'Tomorrow's habitat for the wild and rare: An action plan for Minnesota Wildlife, comprehensive wildlife conservation strategy'. Division of Ecological Services, Minnesota Department of Natural Resources, St. Paul, MN.

Mossman, M.J. 1991. Breeding birds of the St. Croix River, Wisconsin and Minnesota. Passenger Pigeon 53:39-77.

National Park Service [NPS]. 2010a. NPS Stats. National Park Service Public Use Statistics Office. U.S. Department of the Interior. Available online: http://www.nature.nps.gov/stats/viewReport.cfm. Accessed 05 October 2010.

National Park Service [NPS]. 2010b. Saint Croix National Scenic Riverway: Things to Do. U.S. Department of the Interior. Available online: http://www.nps.gov/sacn/planyourvisit/things2do.htm. Accessed 29 October 2010.

Radeloff, V.C., D.J. Mladenoff, and M.S. Boyce. 2000. A historical perspective and future outlook on landscape scale

restoration in the northwest Wisconsin pine barrens. Restoration Ecology 8:119-126.

Rooney, T. P. and D. M. Waller. 2003. Direct and indirect effects of deer in forest ecosystems. Forest Ecology & Management 181: 165-176.

Rooney, T.P., S.M. Wiegmann, D.A. Rogers, and D.M. Waller. 2004. Biotic impoverishment and homogenization in unfragmented forest understory communities. Conservation Biology 18: 787-798.

Sample, David W., and Michael J. Mossman. 1997. Managing habitat for grassland birds - a guide for Wisconsin. Wisconsin Department of Natural Resources, Madison, WI, PUBL-SS-925-97. 154 pp. Jamestown, ND: Northern Prairie Wildlife Research Center Online. http://www.npwrc.usgs.gov/resource/birds/wiscbird/index.htm (Version 03JUN2002).

Schulte, L.A., D.J. Mladenoff, T.R. Crow, L. Merrick, and D.T. Cleland. 2007. Homogenization of northern U.S. Great Lakes forests as a result of land use. Landscape Ecology 22:1089-1103.

Taylor, Daniel A.R. 2006. Forest Management and Bats. Bat Conservation International.

U.S. Census Bureau, Census 2000. Available online: http://factfinder.census.gov/

Wallis, Mike. Personal communication. 03 August. 2010.

Wisconsin Department of Natural Resources [WDNR]. In Prep. DRAFT Ecological Landscapes of Wisconsin. State of Wisconsin, Dept. of Nat. Resources, Handbook. 1805.1. Madison, WI.

Wisconsin Department of Natural Resources [WDNR]. 1988. Governor Knowles State Forest Master Plan. Madison, WI.

Wisconsin Department of Natural Resources [WDNR]. 1993. WISCLAND (Wisconsin Initiative for Statewide Cooperation on Landscape Analysis and Data) Land Cover GIS Layer. Madison, WI: Wisconsin Department of Natural Resources.

Wisconsin Department of Natural Resources [WDNR]. 1995. Wisconsin's biodiversity as a management issue: a report to Department of Natural Resources managers. Wisconsin Department of Natural Resources, Madison, WI. RS-915-95.

Wisconsin Department of Natural Resources [WDNR]. 1999. Wisconsin's Northern State Forest Assessments: Socioeconomics in Northwest Wisconsin. WDNR, Madison, WI.

Wisconsin Department of Natural Resources. 2000. Wisconsin Statewide Karner Blue Butterfly Habitat Conservation Plan and Environmental Impact Statement. Wisconsin Department of Natural Resources. Madison, WI. PUB-SS-947-00. 74 pages.

Wisconsin Department of Natural Resources [WDNR]. 2002. The State of the St. Croix Basin. PUBL-WT-555-2002. Madison: WDNR. 139 p.

Wisconsin Department of Natural Resources [WDNR]. 2003. Wisconsin's Forestry Best Management Practices for Water Quality: Field Manual for Loggers, Landowners and Land Managers. PUB-FR-093-2003. Madison, WI.

Wisconsin Department of Natural Resources [WDNR]. 2004. Wisconsin's Statewide Forest Plan: Ensuring a Sustainable Future. Available on the WDNR Web site: dnr.wi.gov/forestry/assessment/.

Wisconsin Department of Natural Resources [WDNR]. 2006b. Old-growth and Old Forests Handbook. In preparation. Madison, WI.

Wisconsin Department of Natural Resources [WDNR]. 2006c. Silviculture Handbook. Madison, WI.

Wisconsin Department of Natural Resources [WDNR]. 2006d. Wisconsin Wildlife Action Plan. Available online: http://dnr.wi.gov/org/land/er/wwap/plan/.

Wisconsin Department of Natural Resources [WDNR]. 2006e. The 2005 - 2010 Wisconsin Statewide Comprehensive Outdoor Recreation Plan. Madison, WI. PUB-PR-026-2006.

Wisconsin Department of Natural Resources [WDNR]. 2008. Burials, Earthworks, and Mounds Preservation Policy & Plan.

Wisconsin Department of Natural Resources [WDNR]. 2009. Silviculture Handbook, Marking Guidelines Chapter. State of Wisconsin, Department of Natural Resources, Handbook. 2431.5, Ch. 24.

Wisconsin Department of Natural Resources [WDNR]. 2010a. Emerald Ash Borer and Forest Management. Available online: http://www.dnr.wi.gov/forestry/fh/PDF/EABWIManagementGuidelines.pdf.

Wisconsin Department of Natural Resources [WDNR]. 2010b. Silviculture Handbook, Red Pine Chapter. State of Wisconsin, Department of Natural Resources, Handbook. 2431.5, Ch. 32.

Wisconsin Department of Natural Resources [WDNR]. 2010c. Wisconsin's Statewide Forest Assessment. Available online: http://dnr.wi.gov/forestry/assessment/strategy/assess.htm

Wisconsin Department of Natural Resources [WDNR]. 2010d. Wisconsin's Statewide Forest Strategy. Available online: https://dnr.wi.gov/forestry/assessment/strategy/overview.htm

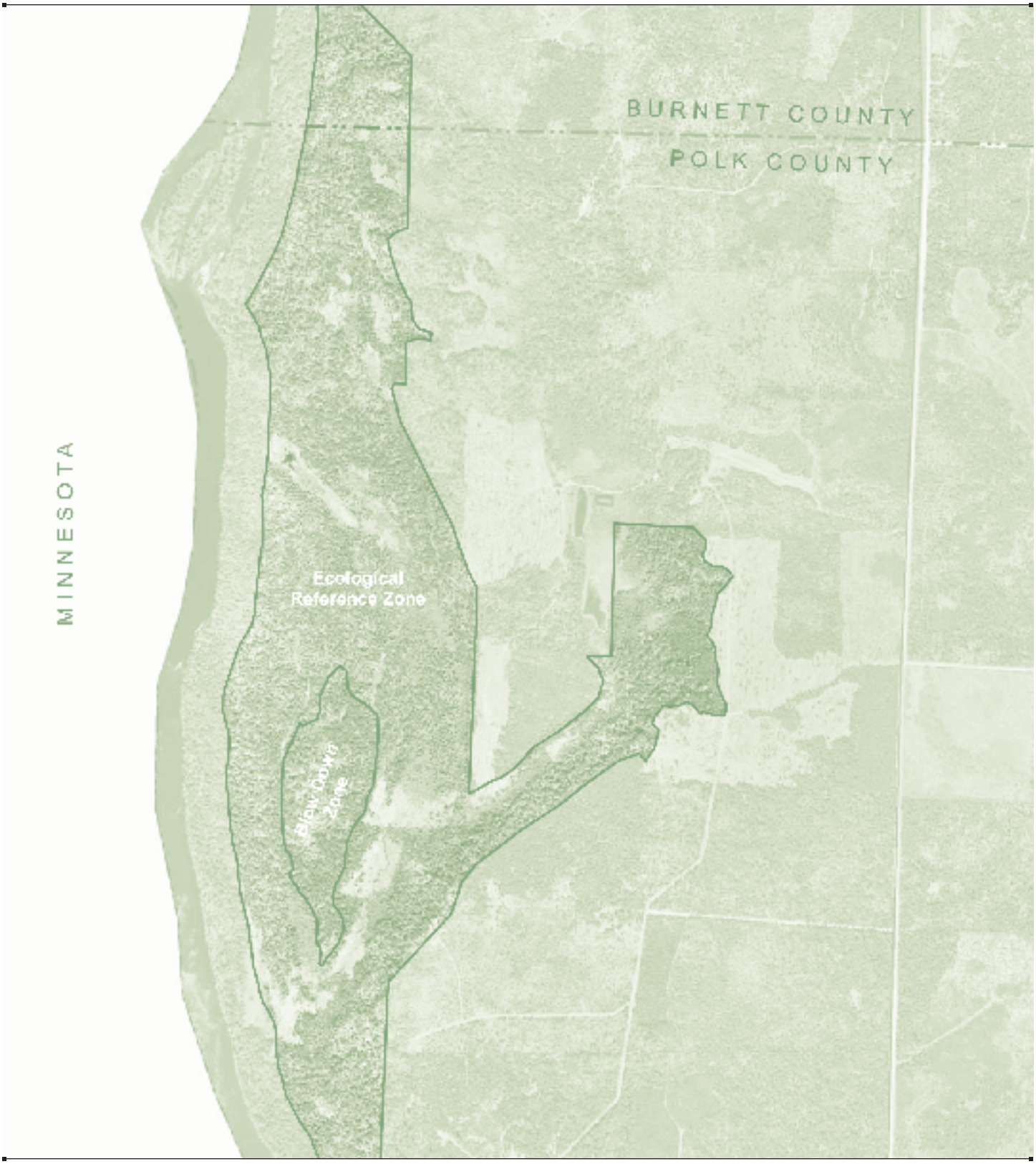
Wisconsin Department of Natural Resources [WDNR]. 2010e. Biotic Inventory and Analysis of the Governor Knowles State Forest. Madison, WI.

Wisconsin Department of Natural Resources [WDNR]. 2010f. Wisconsin's Outstanding and Exceptional Resource Waters Designation. Available online: http://dnr.wi.gov/org/water/swims/datasets/OERW/index.htm

Wisconsin Department of Tourism [WDT]. 2004. Economic & Demographic Profile of Wisconsin's ATV Users. Executive Summary. Co-op Research Program.

Wisconsin Natural Heritage Inventory Working List. 2007. Wisconsin Natural Heritage Inventory Program, Bureau of Endangered Resources, Wisconsin Department of Natural Resources. Madison, WI. (See dnr.wi.gov/org/land/er/wlist for the most recent version of the list)

Wovcha, D.S., B.C. Delaney, G.E. Nordquist. 1995. Minnesota's St. Croix River Valley and Anoka Sandplain: A Guide to Native Habitats. University of Minnesota Press, Minneapolis, MN.



WISCONSIN
DEPT. OF NATURAL RESOURCES

PRINTED ON RECYCLED PAPER
PUB-FR-485-2012

DIVISION OF
FORESTRY