Baxter State Park

Scientific Forest Management Area

Forest Management Plan
2012

SFMA Forest Management Plans Chronology

1980 FMP

First BSP generated management plan for the SFMA.

1988 FMP

1998 FMP

2012 FMP

Original Version: *July 1, 2012*
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Preface

Forestry is fundamentally about the future. This statement is as true today as it was when the concept of managing forest resources for current and future yields and generations first came into practice in Europe and Asia many hundreds of years before fingers tapped these words on a computer keyboard. Forestry involves two elements: A) An **ethical** foundation; B) A will to actively **practice** such ethics as informed by scientific and field experience.

Forestry is founded on an **ethic** that places equal value on both the current and future ability of society to realize benefits from forest resources. Such benefits can take many forms including clean water, manufactured forest products like lumber, and opportunities to enjoy recreational and aesthetic rewards of spending time in forested landscapes. These benefits are often mutual attainable and do not require the maximization of one benefit at the cost of all others.

The **practice** of forestry also takes many forms, based on specific forest ecosystem conditions, management goals, and economic and social conditions relevant to a given forest area. It is a practice, like that of a physician, lawyer, or tradesman. It requires academic knowledge and practical skills. Perhaps most important the practice of forestry requires humility on the part of the practitioner. The Forest Guild, a national membership organization of forest practitioners, is guided by a set of 6 principles; principle 4 succinctly explains the role of humility in forestry.

> "Human knowledge of forest ecosystems is limited. Responsible management that sustains the forest requires a humble approach and continuous learning."

The concept of continuous learning was at the heart of the establishment of the Scientific Forest Management Area by Percival Baxter in 1955, and it has guided the management of the forest resource since that time. The establishment of both ecological and benchmark reserves, by Park Resource Manager Jensen Bissell in the 1980s and 90s, is an excellent example of a humble application of the ethics and practice of forestry. The SFMA in general appears, to this albeit admittedly biased observer, to embody the heart of what constitutes forestry which honors both current and future generations.

In 2012 forestry is practiced in what can only be called the ***Information Age of Forestry***. Management decisions must be based on science; and the advent of technology enabling detailed and dynamic analysis of large amounts of data, both spatial and temporal, allows managers to quickly and accurately answer critical questions about forest sustainability over long time spans. Answering such questions is not revolutionary to the profession, but the speed and sophistication of such analysis, afforded by current technology, does represent a revolution.

The comprehensive planning document which follows, strives to provide management staff, advisors, auditors, and the public with a detailed analysis of all aspects of the management of the SFMA. The practitioners of this management hope that their efforts would meet the expectations of Park donor Percival Baxter; of a management program based upon science, which serves as an inspiration to others.

June 30, 2012
Rick Morrill
Baxter State Park Resource Manager

Acknowledgements

The total number of contributors to this comprehensive planning document are too numerous to count and any list will be certain to omit some of these valuable contributors. With that caveat and upfront apology the following is an attempt to credit those who have contributed to this document and the concepts expressed herein.

All such acknowledgements must begin with Park donor Percival Baxter without whose vision and will power there would be no SFMA. Park Resource Managers Jensen Bissell (1986-2005) and Carol Redelsheimer (2005-2010) deserve principle credit for the design and application of an exemplary management program that has received numerous recognitions over the years. The SFMA would not be what it is without the dedication of the many past and current advisory members too numerous to name here. Their expertise, vision, and efforts have shaped the SFMA over three plus decades into what it is today.

The many field staff and contracted foresters who have spent endless hours crisscrossing the woods enduring cold, heat, precipitation, and insect attacks to implement the art and science of forestry practice in the SFMA. The many harvest, trucking and road maintenance contractors who have similarly enable the practice of exemplary forest management. Their long hours and hard work under enumerable difficult working conditions bring the vision of sustainable forest management to fruition.

Many current SFMA advisory have contributed substantial time and effort to specific elements of this current planning process. These include Jeremy Wilson, Ken Laustsen, Rob Bryan, Aaron Weiskittel, and Bob Seymour. Principle among these is Jeremy Wilson whose expertise with complex forest modeling approaches and software systems enabled long term projections of forest conditions under various management scenarios, which forms the basis for answering the basic and critical questions of long term timber resource sustainability. Without Jeremy's work this plan would leave fundamental questions of sustainability unanswered.

Many others have reviewed draft outlines of this document and contributed advice about its structure and composition. SFMA staff are extremely grateful for all such assistance. This planning document is greatly enhanced by their participation and input. Thanks to all those named and unintentionally omitted for their assistance.

Executive Summary

Introduction

Many visitors to Baxter State Park might be surprised to learn that forest products are harvested in a portion of the 209,000+ acre Park, in accordance with directives of Park Donor Percival Baxter. The area, named the Scientific Forest Management Area (SFMA), is located in the Northwest Corner of the Park encompassing nearly 30,000 acres. Percival Baxter established the SFMA in 1955 to in his words...

> *"Become a showplace for those interested in forestry, a place where a continuing timber crop can be cultivated, harvested, and sold, where reforestation and scientific cutting will be employed, an example and an inspiration to others…"*

The SFMA has been recognized for practicing exemplary forest management, receiving Forest Stewardship Council (FSC) certification in 2001. The Park Director, Resource Manager, Forester I, and Forestry Technician oversee active forest management operations in the area. A SFMA advisory committee, comprised of forestry professionals and interested members of the public, help Park staff determine management directions and policy directives.

Forestry involves many things, but planning is perhaps the most important element as the intention expressed in plans and related documentation is what separates forest management from "just logging." With the implementation of this 2012 forest management plan the SFMA has begun working from the fourth version of a management planning document. Over the last several decades plans have been revised on a periodic basis, generally every 10 years. Importantly, management plans cannot be consider static documents, rather they must remain fluid and dynamic to reflect the realities of forest, market, and societal conditions. The 2012 planning process involved review and development of management policies and practices; as well as an analysis of current forest conditions and computer model simulations of future forest conditions under management scenarios.

Management Goals

Forest management planning requires a thorough assessment of the ideas and philosophy that form the foundation of a management program. These ideals must be translated into goals, objectives, and assessment criteria that describe the desired future conditions of the resource. In short the management goals must describe the way managers and stakeholders hope the resource will look in the future.

Goals: Broad generalizations about the future resource conditions that management is designed to culture.

Objectives: Detailed descriptions, pertaining to a specific goal, of what the resource will look like or the management approaches necessary to achieve that goal.

Assessment Criteria: Specific elements of a management program or future conditions that future observers can use to assess the degree to which management goals and objectives have been achieved. These may often be quantitative in nature and are essential to an adaptive management approach.

2012 Management Planning Goals:

- Protect water quality from negative impacts of human/natural disturbances.
- Protect soil productivity from negative impacts of human disturbances.
- Protect, maintain, and culture a diversity of species and habitats across the forest area.
- Conduct management planning and silvicultural treatments so as to ensure the sustainability of high quality forest products.

- Provide steady and predictable revenue source to support forest management and general Park management programs.
- Culture forest conditions that are resistant and resilience to significant natural disturbance events and long term climatic changes.
- Address threats posed by invasive species to the forest resource and natural systems.
- Demonstrate and communicate relevant and accessible examples of forest management practice to the general public and forestry professionals.
- Encourage research efforts that improve forest management practice.
- Provide opportunities for diverse recreation activities while protecting the long term integrity of the forest ecosystem.

Resource Assessment:

Forest Resource & Management History

The retreating glaciers left the SFMA with generally flat to rolling terrain, with west to east ridges interspersed with streams and bogs. The highest point in the management area, Wadleigh Mountain, is located in the southeastern corner of the SFMA and rises to 1203 feet above mean sea level. SFMA soils are generally well drained though often rocky and with lower amounts of nutrients and minerals than would be found in productive agricultural soils. A variety of soil types are present with Ragmuff, Monarda, Chesuncook, Monson, and Telos the most common respectively. The productivity of these soils as it relates to growing trees is largely a function of soil drainage, with better drained soils being more productive. More than 50% of the SFMA is underlain with soils that are moderately well drained or better. Disturbance is a fact of life in the forest and the current forest is the product of past disturbance events including wildfires early in the 20th century, and the spruce budworm outbreak of the 1910's and 1970's. These events each shape the forest in unique ways.

The SFMA is marked by a diversity of forest conditions that span a broad spectrum of natural community types. Within the SFMA boundaries are a range of vegetation assemblages, structures, and development stages. This diversity is complimented by the array of management designations termed "Management Unit Classes." About 66% of the area is open to some type of management activity, while 14% of the total forest area is designated with reserve status and is not open to management manipulations. An area equal to that of the reserves (15%) is classed as riparian management zones (RMZ), a designation which includes areas that will be operated and those that will be set aside as Riparian Reserves. The SFMA is dominated by softwood and mixedwood stand types with the majority of stands in mature conditions often with established understories of mixed softwood and hardwood regeneration. Operational areas currently average stocking levels of 15 cords/ac while reserve and RMZ areas have between 25 and 30 cords/ac.

The SFMA has been managed using both even-age and multi-age silvicultural systems. The average annual harvest over the last 30 years has been about 6,000 cords. Much of this silvicultural work has been completed with cut-to-length harvesting systems which leave nutrients on site and minimize ground disturbance. Harvest crews are contracted and are offered housing in one of two SFMA crew camps on the south and north ends of the forest.

Northern Maine hosts breeding populations of Canada lynx a federally listed threatened species. While much of northern Maine hosts robust lynx habitat the SFMA generally does not. Past harvest practices have not created the expansive areas of densely regenerated softwood forest found elsewhere. The SFMA and areas to the west and east are home to several species of invasive vegetation. Populations are being monitored and cooperative cross boundary control efforts have been initiated to address this threat.

While the SFMA is principally intended to serve as a demonstration forest there are many recreational uses and users of the area. Over 20 miles of hiking trails cover the SFMA providing remote backpacking and hiking opportunities where gently rolling hills contrast with the rugged terrain of much of the rest of the Park. Overnight camping is permitted at 4 backcountry lean-tos. Hunting and fishing are by the far the most popular recreational activities in the SFMA. Users are able to access the SFMA via the 70 miles of vehicle and foot traffic only forest management roads.

Society & Community

Regional economies are reliant upon multiple industries and service sectors. The forest products role in the region is important, but has been reduced in recent decades from the dominant position held in the middle of the last century. Local communities have been impacted by this decline in the form of lowered income levels, reduced employment, and the loss of young people who leave the area in search of work elsewhere in Maine or out of state. The recreation and service based elements of the economy have grown in recent years, but they will likely never equal the high paying manufacturing jobs that were lost earlier in the last century. The communities surrounding the SFMA are resilient ones with and have shown the ability to adapt to new economic situations.

Economy & Markets

The SFMA is in a remote location in northern Maine, roughly 50 miles from a significant settled area. Reliable markets are available for most SFMA products but some offer only slim profit margins due to low product values and the high cost of transportation. SFMA management is focused on producing high quality and high value forest products that have proven to be valuable over the long term. The markets of the most significance to the SFMA are those for softwood sawlogs and for hardwood pulp. These two markets represent approximately 80% of annual SFMA product sales. While all markets are subject to fluctuations, sometimes quite dramatic as occurred in 2008, these principle markets have generally remained profitable for the over the last planning period and this trend is anticipated to continued.

Management Planning

The management planning process is designed to develop a plan that combines existing management strategies with a landscape level approach that seeks to orchestrate management actions across the entire land base over a defined period of time. Individual stand prescriptions and harvest schedules will result from planning that seeks to balance current and future stand level forest conditions with the “big picture”.

Silviculture

The application of silvicultural systems in the SFMA has to date largely been determined based on field inspections of stand conditions and an attempt to fit the most appropriate silvicultural tool to these conditions. Going forward the development of harvest schedules and the assignment of silvicultural systems to specific management units will result from the integration of long term model scenarios and field based assessments of the most appropriate silvicultural approach for a given management unit. Current management planning has established an overall goal of having 1/3 of the operational area managed with a multi-age system, and the remaining 2/3 of the area allocated even-age management. Of the even-age area roughly1/2 will be managed with a standard shelterwood approach while the other half will be split amongst the different even-age systems.

Monitoring

Forest management requires the ability to evaluate the results of actions over time. In forest systems meaningful comparisons normally require baseline data representing past conditions, often

measured in decades for the more subtle changes, like those due to climate. The SFMA has several monitoring programs and approaches to address these needs.

- Spatial data tracking of silvicultural treatments and harvest volumes.
- Temporary Forest Inventory Data
- Continuous Forest Inventory Data and Analysis
- Temperature Loggers
- Amphibian Monitoring Stations
- MFS insect trapping

Forest Modeling & Results

Attempts to project current forest conditions into the future under alternative management scenarios requires both art and science, as neither models nor data inputs are ever perfect. However, modeling exercises are essential to planning efforts designed to answer basic forestry questions about long term forest conditions and sustainability. During 2011-12 a substantial modeling effort was conducted. Temporary and CFI data were utilized to create a model portfolio. This portfolio was used to create long term projections of SFMA forest conditions under different management scenarios using Remsoft optimization software. These projections enable sustainability assessments over more than one rotation period.

The results of this modeling work indicate that annual harvest levels of between 5,000-6,000 cords can be sustained for the next 50-70 years. After this period an increase in harvest is projected as additional volume from regenerated stands comes online. Overstory removal treatments will be common over the next 20 years as established regeneration in shelterwood treated stands is released. Multi-age treatments will continue to be part of the treatment program. Growing stock volumes in operational units are projected to increase over coming decades as regenerated stands grow quickly after release with 25 cords/ac becoming average. Under this management scenario about 30% of the total SFMA area will be in a non-operated management designation. Due to the percentage of multi-age treatments fully 50% of the SFMA area will be managed for mature and late successional characteristics.

*This modeling work is on-going and additional analysis is planned for 2012. Adjustments to the results presented in this document will be made as needed.

The results of this modeling work indicate that projected management activities align with management goals. Achievement of many of the stated goals and objectives cannot be properly measured in a single planning period, nor are achievements permanent. Rather, a consistent evaluation of how current conditions and trends align with management goals is necessary. If forestry is about planning, then planning is about adaptation and adjustment to what actually occurs on the ground during the planning period. Forests are dynamic systems and the social and economic conditions under which forest management occurs are similarly unpredictable. Thus any efforts to plan for the future of a forest resource must be designed to accommodate change.

The comprehensive planning document which follows, strives to provide management staff, advisors, auditors, and the public with a detailed analysis of all aspects of the management of the SFMA. The practitioners of this management hope that their efforts would meet the expectations of Park donor Percival Baxter; of a management program based upon science, which serves as an inspiration to others.

Table of Contents

A. General Property Administration 13
A.1 Property History 13
A.2 Deed Conditions 13
A.3 Administration and Finance 14
A.4 Legal and Regulatory Framework 16
A.5 Data Structure and Management 19
A.6 Forest Management Certification 20
B. Management Goals, Objectives, and Assessment Criteria 20
B.1 Water and Soil Quality 20
B.1a Goal: Protect water quality from negative impacts of human/natural disturbances. 21
B.1b Goal: Protect soil productivity from negative impacts of human disturbances. 21
B.2 Biodiversity/Habitat/Forest Structure & Composition 21
B.2a Goal: Protect, maintain, and culture a diversity of species and habitats across the forest area. 21
B.3 Sustainable Timber Supply 22
B.3a Goal: Conduct management planning and silvicultural treatments so as to ensure the sustainability of high quality forest products. 22
B.4 Financial Stability 23
B.4a Goal: Provide steady and predictable revenue source to support forest management and general Park management programs. 23
B.5 Forest Protection 23
B.5a Goal: Culture forest conditions that are resistant and resilience to significant natural disturbance events and long term climatic changes. 23
B.5b Goal: Address threats posed by invasive species to the forest resource and natural systems. 23
B.6 Demonstration, Education, and Research 24
B.6a Goal: Demonstrate and communicate relevant and accessible examples of forest management practice to the general public and forestry professionals. 24
B.6b Goal: Encourage research efforts that improve forest management practice. 24
B.7 Public Recreation 24
B.7a Goal: Provide opportunities for diverse recreation activities while protecting the long term integrity of the forest ecosystem. 24
C. Landscape and Societal Context 24
C.1 Climate and Biophysical Regions 24
C.2 Natural Disturbance Agents and Regimes 28

C.3 Historical Land Use 30
C.4 Human Communities 34
C.5 Forest Industry and Product Markets 36
D. Resource & Management Assessment 39
D.1 Resource Assessment Summary 39
D.2 Resource Area Description 40
D.3 Topography, Geology, and Forest Soils 41
D.4 Water and Wetland Resources 42
D.5 Management Overview 43
D.6 Silviculture and Operations History 43
D.7 Operational Areas 48
D.8 Riparian Management Zones 49
D.9 Reserve Areas 50
D.10 Forest Types, Stand Structures, and Age Classes 51
D.11 Biodiversity, Habitat, and Forest Dynamics 52
D.12 Threatened, Endangered, and Special Concern Species 54
D.13 Forest Protection 57
D.13a Native Pest and Pathogen 57
D.13b Exotic/Invasive Species 59
D.13c Atmospheric Pollution 60
D.13d Climate Change 60
D.13e Wildland Fire 60
D.14 Management Access & Facilities 61
D.15 Public Recreation Use 62
D.16 Non-Timber Forest Products 66
D.17 Stakeholder Involvement & Engagement 66
D.18 Boundary Line Status 67
E. Condition of Lands beyond Ownership Boundaries 67
E.1 Current Land Uses and Conditions 67
E.2 Pertinent Ecological and Social Conditions 68
E.3 Interaction with Nearby Properties 68
E.4 Invasive Species and Abutting Properties 68
F. Forest Management & Planning 68
F.1 Water Quality and Soil Productivity Protection 68

F.2 Silvicultural Systems and Application 70
F.3 Harvesting Techniques and Equipment 72
F.4 Provisions for Monitoring Forest Growth and Dynamics 73
F.4a Temporary Forest Inventory Data 74
F.4b Continuous Forest Inventory Data and Analysis 74
F.4c Ecological Monitoring Data 78
F.5 Forest Protection 80
F.5a Native Pest and Pathogen Management 80
F.5b Invasive Species Management 81
F.5c Wildland Fire Management 81
F.5d Response to Climate Change 81
F.6 Reserve Area Management 82
F.7 Riparian Management Zone Management 83
F.8 High Conservation Value Forest Resources 90
F.9 Post Disturbance Salvage Policy 90
F.10 Biodiversity and Wildlife Habitat Management 91
F.11 Protection of Rare, Threatened, and Endangered Species 92
F.11a Management Implications of Lynx Recovery Plan 92
F.11b Management Implications of Atlantic Salmon Recovery Plan 92
F.11c General Management Considerations Regarding R,T&E Species. 93
F.12 Transportation Access System 93
F.13 Forest Modeling 99
F.13a Description of Modeling Process 99
F.13b Methods 100
F.13c Results, Analysis, & Future Management Actions 103
F.14 Adaptive Management Approach 109
F.15 Product Markets & Fiscal Management 109
F.15a Product Markets 109
F.15b Projected Revenue 110
F.15c Projected Expenses 111
F.16 Critical Management Directions and Considerations 111
G. Forest Communities & Forest Workers 111
G.1 Contractor Relations 111
G.2 Worker Safety 112

G.3 Staff and Contractor Training 112
G.4 Stakeholder Involvement & Engagement 112
G.5 Volunteers 112
G.6 Contract Development 112
G.7 Local Markets and Access 113
H. Demonstration & Education Planning 113
H.1 Forest Ecology & Management Trail 113
H.2 Public Tour Events 113
H.3 Website Development 114
H.4 Research Activities 115
I. Public Recreation Planning 115
J. Future Plan Updates 115
J.1 Future Planning Goals and Needs 115
K. Appendices 116
K.1 Maps 116
K.2 Policies & Procedures 117
K.2a Post Disturbance Salvage Policy 117
K.2b Stand Damage Policy 118
K.2c Spill Control Procedure 119
K.3 Commonly Used Abbreviations 120
L. Management Plan Timeline: 121

A. General Property Administration

A.1 Property History

A.2 Deed Conditions

As a part of Baxter State Park, the Scientific Forest Management Area (SFMA) is governed by trust communications. The communications represent the sentiments of conversations written over 50 years ago, but the sincere intent of Baxter's words remain as clear today as more than half a century ago. The philosophies, management procedures and plans detailed within and appended to this plan are extensions of these communications:

Baxter Communications to Governor Muskie, Senate and House of Representatives, 97th Legislature – 1955

"This 3,569 acre area will be available both for recreation and for scientific forestry management and can be made to produce a continuing crop of timber to be harvested and sold as are potatoes or any other product of the soil."

"It long has been my purpose to create in our forests a large area wherein the state may practice the most modern methods of forest control, reforestation and production…. This new 3569 acres is an excellent location for this purpose."

"In my travels in foreign lands I have seen beautiful great forests that for centuries have been producing a crop of wood without depletion. In Sweden, Norway, Finland, Germany, Chile, Russia and elsewhere what has been done by scientifically controlled forestry can be done in Maine. I now make it possible for the state to try a major experiment here at home, an experiment that can mean much for our future timber supply, which all admit is the chief natural resource of our State."

"The terms of this gift are identical with those of the three thousand five hundred sixty-nine (3,569) acres; Public Park, Public Forest, Public Recreational and Scientific Forestry Purposes and Reforestation. I want this township to become a show place for those interested in forestry, a place where a continuing timber crop can be cultivated harvested and sold; where reforestation and scientific cutting will be employed; an example and an inspiration to others. What is done in our forests today will help or harm the generations who follow us."

"This Township six (6) Range ten (10) is what is termed by woodsmen 'good growing land'. An area with an abundance of wildlife, especially moose. Fishing and hunting will be allowed un the general Fish and Game Laws of the State.

Private and Special Laws1955, Chapter 61

"All harvesting of said products shall be done according to the most approved practices of Scientific forestry and all revenue derived from the sale of said products shall be used by said state for the care, management and protection of Baxter State Park as now or hereafter defined."

Private and Special Laws 1955, Chapter 171

"The trees harvested may be cut and yarded on the premises but no manufacturing operations shall be carried on within said township. All revenue derived from the sale of timber shal be used by the State IN TRUST for the care, management and protection of Baxter State park as now and hereafter defined and the said twenty-five thousand twenty-five (25,025) acres forever shall be held by said State as Trustee in Trust…"

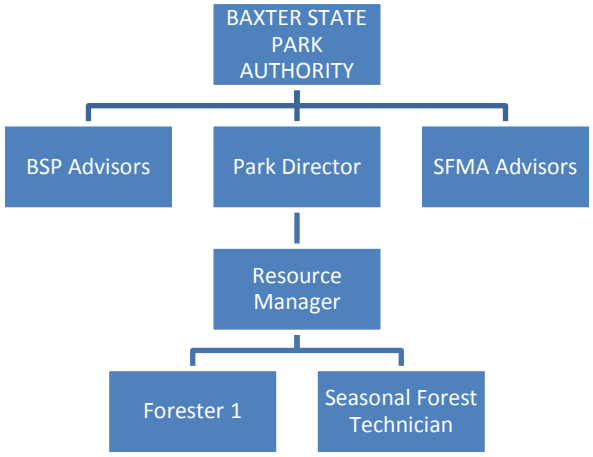
Private and Special laws 1955, Chapter 2

"The State of Maine is authorized to clean protect and restore areas of forest growth damaged by Acts of Nature such as blowdowns, fire, floods, slides, infestation of insects and disease or other damage caused by Acts of Nature in order that the forest growth of the Park may be protected, encouraged and restored."

A.3 Administration and Finance

Administration

The SFMA represents about 14% of the land area of Baxter State Park and is administered by the following individuals and groups:



Baxter State Park Authority – Composed of the Commissioner of Inland Fisheries and Wildlife, the Director of the Maine Forest Service and the Maine Attorney General, this body holds complete and total responsibility for the administration, policy and management of Baxter State Park.

Park Director – Holds responsibility for the operation, management and administration of Baxter State Park. As needed, develops and proposes policy management, personnel actions, and long term management planning for review and action by the Authority.

Resource Manager - Holds responsibility for the long-term planning and day-to-day management and operations on the SFMA as well as other administrative responsibilities within Baxter State Park as determined by the Park Director.

Forester 1 – In concert with the Resource Manager, conducts and directs field operations within the SFMA.

SFMA Advisors – This standing committee of 15+- volunteer citizens serves at the pleasure of the Authority and works closely with the Resource Manager to provide continuity, expertise and advice on a wide range of issues regarding management of the SMFA.

BSP Advisors – This standing committee of 15 volunteer citizens serves at the pleasure of the Authority and works closely with the Park Director to provide continuity, expertise and advice on a wide range of issues regarding management of the 'forever wild' portions of the Park.

Finance

In the 1990's SFMA management began a steady transition from a stumpage based payment system to a service-based system, completing the transition in the 1994-95 operating year. The marketing of forest products from the SFMA is influenced by the distance to markets, private control and use fees required for the use of the Telos/Pinkham road systems, and the poor quality and low value of many of the marginal forest products presently generated by SFMA silviculture. In contrast, the value of spruce, fir and white pine log volume promises to remain strong into the foreseeable future and provides tremendous opportunity for the application of sound silviculture and stand improvement.

The SFMA is in many ways one of the most difficult marketing locations in Maine. Distance often is a limiting factor on all markets, both domestic and foreign. Although traditionally the flow of labor and products from the Webster area has been strongly influenced by Canada, marketing efforts should reflect Baxter's intent to provide Baxter Park as a gift to the people of Maine. *Accordingly, marketing shall seek to utilize domestic markets. Small volumes of specialty products, limited market opportunities or significant price differentials shall constitute situations in which foreign markets should be considered.*

Importantly trust provisions prohibit the SFMA from establishing a processing facility[1]. Consequently, the earning potential of the SFMA is based on the ability to increase the yield and quality of wood products available on the SFMA. The wood products resulting from current harvesting are primarily sold on a weight basis. Other means of payment measures should be evaluated when seeking a premium on the value of future harvests that include a higher percentage of larger softwood stems.

The implementation of such a system, including marketing of 20 to 30 million pounds of wood products per year, generates considerable cash flow, with most income passing through to pay for harvesting service costs. Gross revenues from a typical year of SFMA operations equal roughly 35% of the annual expenditure levels of the Baxter State Park operating budget. Until 1995, the SFMA was operating primarily on a stumpage basis and collected only revenues from the harvest contractor. These revenues were deposited directly into the Park's operating account and were reflected in the year-end financial reports. After the shift to a service cost contract in 1995, the large amounts of gross revenues inflated the Park's overall budget by 50%, mostly with pass-through money. To alleviate this situation, in fiscal year 1996 the Bureau of Budget established a new "Enterprise Fund" account to gather and distribute gross wood products revenues from mills and distribute service cost and road toll payments. At the end of each operating season and near the end of each fiscal year (usually in May) net revenues from SFMA operations are transferred from the Enterprise Fund to Baxter State Park's operating account. In both 2011 and 2012 a $30,000 balance has been left in the account to provide an operating cushion until cash flows resume with summer harvesting activities.

[1] Private and Special Laws, 1955, Chapter 171, regarding T6,R10, "The trees harvested may be cut and yarded on the premises but no manufacturing operations shall be carried on within said township".

SFMA staff, equipment, and many management activities are incorporated into general Park budget funds. The needs of the SFMA management program are considered alongside those of the rest of the Park. SFMA specific budget lines are reviewed annually.

A.4 Legal and Regulatory Framework

Baxter State Park and the Scientific Forest Management area is committed to absolute compliance with all pertinent regulations and statues from all levels of government. Park staff are continuously attempting to improve knowledge of these topics to ensure compliance goes above and beyond required standards. Baxter State Park is subject to a variety of Federal and State regulations related to forest management operations in the SFMA. The principle relevant regulations/statutes and international agreements are listed below. It should be noted that Baxter State Park in its entirety has been consider under the laws of Maine to be except from LURC jurisdiction. Forestry practices in the SFMA seek to meet or exceed all LURC regulations in all categories.

Federal and International Level:

Endangered Species Act:

"The Endangered Species Act (ESA) provides a program for the conservation of threatened and endangered plants and animals and the habitats in which they are found. The lead federal agencies for implementing ESA are the U.S. Fish and Wildlife Service (FWS) and the U.S. National Oceanic and Atmospheric Administration (NOAA) Fisheries Service. The FWS maintains a worldwide list of endangered species. Species include birds, insects, fish, reptiles, mammals, crustaceans, flowers, grasses, and trees.
The law requires federal agencies, in consultation with the U.S. Fish and Wildlife Service and/or the NOAA Fisheries Service, to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat of such species. The law also prohibits any action that causes a "taking" of any listed species of endangered fish or wildlife. Likewise, import, export, interstate, and foreign commerce of listed species are all generally prohibited."[2]

Clean Water Act (Section 404 wetland protection):

"Section 404 of the Clean Water Act (CWA) establishes a program to regulate the discharge of dredged or fill material into waters of the United States, including wetlands. Activities in waters of the United States regulated under this program include fill for development, water resource projects (such as dams and levees), infrastructure development (such as highways and airports) and mining projects. Section 404 requires a permit before dredged or fill material may be discharged into waters of the United States, unless the activity is exempt from Section 404 regulation (e.g. certain farming and forestry activities).[3]

Occupational Safety and Health Act:

[2] http://www.epa.gov/lawsregs/laws/esa.html 2012
[3] http://water.epa.gov/lawsregs/lawsguidance/cwa/wetlands/laws_index.cfm 2012

"Under the OSH Act, employers are responsible for providing a safe and healthful workplace. OSHA's mission is to assure safe and healthful workplaces by setting and enforcing standards, and by providing training, outreach, education and assistance. Employers must comply with all applicable OSHA standards. Employers must also comply with the General Duty Clause of the OSH Act, which requires employers to keep their workplace free of serious recognized hazards".[4]

National Historic Preservation Act:

"With passage of the National Historic Preservation Act in 1966 (NHPA), Congress made the Federal Government a full partner and a leader in historic preservation. While Congress recognized that national goals for historic preservation could best be achieved by supporting the drive, enthusiasm, and wishes of local citizens and communities, it understood that the Federal Government must set an example through enlightened policies and practices. In the words of the Act, the Federal Government's role would be to "provide leadership" for preservation, "contribute to" and "give maximum encouragement" to preservation, and "foster conditions under which our modern society and our prehistoric and historic resources can exist in productive harmony."[5]

Archaeological and Historic Preservation Act:

"Section 3
(a) Whenever any Federal agency finds, or is notified, in writing, by an appropriate historical or archeological authority, that its activities in connection with any Federal construction project or federally licensed project, activity, or program may cause irreparable loss or destruction of significant scientific, prehistorical, historical, or archeological data, such agency shall notify the Secretary, in writing, and shall provide the Secretary with appropriate information concerning the project, program, or activity."[6]

Americans with Disabilities Act (ADA):

"Barriers to employment, transportation, public accommodations, public services, and telecommunications have imposed staggering economic and social costs on American society and have undermined our well-intentioned efforts to educate, rehabilitate, and employ individuals with disabilities. By breaking down these barriers, the Americans with Disabilities Act (ADA) will enable society to benefit from the skills and talents of individuals with disabilities, will allow us all to gain from their increased purchasing power and ability to use it, and will lead to fuller, more productive lives for all Americans.

The Americans with Disabilities Act gives civil rights protections to individuals with disabilities similar to those provided to individuals on the basis of race, color, sex, national origin, age, and religion. It guarantees equal opportunity for individuals with

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[4] http://www.osha.gov/law-regs.html 2012
[5] http://www.achp.gov/overview.html 2012
[6] http://www.nps.gov/archeology/tools/Laws/ahpa.htm 2012

disabilities in public accommodations, employment, transportation, State and local government services, and telecommunications."[7]

Lacey Act:

"In response to growing concerns over illegal logging, on May 22, 2008 the U.S. amended the Lacey Act, when the Food, Conservation, and Energy Act of 2008 expanded its protection to a broader range of plants and plant products (Section 8204. Prevention of Illegal Logging Practices. The requirements under the new Amendments are two-fold. First, the Lacey Act now makes it illegal to import into the United States plants that have been harvested contrary to any applicable Federal Law, State Law, Indian Tribal Law, or Foreign Law. If a plant is found to have been harvested in violation of the laws of the country where it was harvested, that plant would be subject to seizure and forfeiture if imported into the U.S. The Lacey Act also makes it unlawful, beginning December 15, 2008, to import certain plants and plant products without a Plant and Plant Product import declaration. This Plant and Plant Product Declaration must contain (among other things) the Genus, Species, and Country of Harvest of every plant found in commercial shipments of certain products, a list of applicable products (along with other requirements and guidance) can be found on the USDA APHIS website."[8]

U.S. ratified treaties, including CITES:

"CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival. Because the trade in wild animals and plants crosses borders between countries, the effort to regulate it requires international cooperation to safeguard certain species from over-exploitation. CITES was conceived in the spirit of such cooperation. Today, it accords varying degrees of protection to more than 30,000 species of animals and plants, whether they are traded as live specimens, fur coats or dried herbs."[9]

Maine State Level:

Natural Resources Protection Act
Forest Practices Act (FPA)
Liquidation Harvesting
Statewide Standards for Timber Harvesting in Shoreland Areas
Fire Safety
- Chapter 2 Rule, Spark Arrestors
- Open Burning Guidelines

Forest Health
- Chapter 1 Rule, White Pine Blister Rust, Quarantine on Currant and Gooseberry
- Chapter 4 Rule, Silvicultural Treatment Designation and New Market Withdrawal

[7] http://www.ada.gov/q%26aeng02.htm 2012

[8] http://en.wikipedia.org/wiki/Lacey_Act_of_1900 and http://en.wikipedia.org/wiki/Illegal_logging 2012

[9] http://www.cites.org/eng/disc/what.php 2012

Boundary Paint Marking Standards
PL c 432 Boundary Paint Law
Boundary Paint Marking Standards Chapter 24 Rules Basis Statement
Forester Licensing Law
Erosion and Sedimentation Control Act
Protection and Improvement of Water Act
Maine Human Rights Act
Maine Revised Statute Annotated (M.R.S.A.), Title 12

A.5 Data Structure and Management

Forest management requires the management and coordination of large amounts of information. The explosion of computer technology and software in the natural resources profession has resulted in the availability of more data than ever. From GPS and GIS to forest simulation models and inventory analysis systems, technology is an essential ingredient to a rigorous and science based forestry practice. The challenge of practicing forestry in the information age requires answers to three basic questions.

- **What data is required and how will it be collected?**
- **How will data be stored and catalogued?**
- **How will data be accessed and utilized to inform management?**

In the case of the SFMA a large amount of data is collected and or catalogued on an annual or periodic basis covering a variety of information types including:

- Temporary forest inventory
- Continuous forest inventory
- Amphibian monitoring
- Water and air temperatures
- Forest composition and structure
- RTE species and habitats locations
- Silvicultural operations locations and timing
- Infrastructure maintenance activities locations and timing
- Recreational use and activities

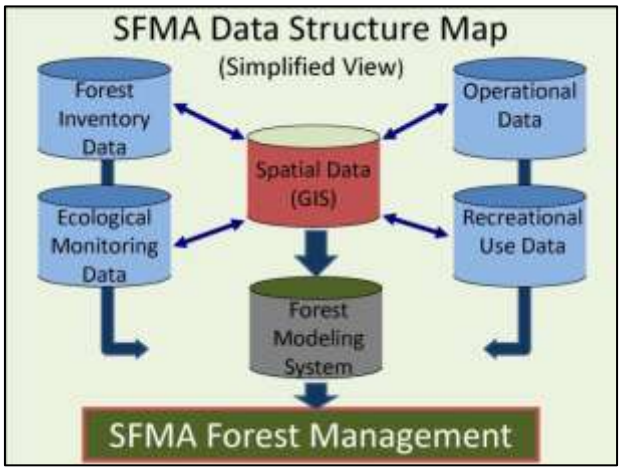


Figure A.1 SFMA data structure map.

Most of these datasets are organized either through a spatial GIS platform (ArcGIS as of 2010) or relational database (Microsoft Access as of 2010). The joining of spatial and non-spatial data is the foundation of a comprehensive forest management planning process. A variety of questions (queries in database terminology) can be asked of well-organized datasets. Such analysis enables the creation of forest models that can help managers answer both basic and complex questions about short and long term forest management topics (Figure A.1).

A.6 Forest Management Certification

The SFMA has been recognized for practicing exemplary forest management, receiving Forest Stewardship Council (FSC) certification in 2001. Baxter State Park and the SFMA staff are committed to the concepts and ideals as set forth in the 10 Principles of the FSC certification program. SFMA staff are continually searching for ways to improve the standard of forest management practiced in the Park. Under FSC rules a full re-assessment of the SFMA management program is conducted by a certifying body every 5 years. The most recent of these 5 year audits took place in the summer of 2011. A smaller scale audit is conducted annually to ensure continued compliance with FSC principles and successful remediation of any deficiencies found during previous audits.

The SFMA has also been recognized as practicing sustainable forest management by the Forest Guild under the "Model Forest Program. While not as rigorous as the FSC program, in terms of field audits, the Forest Guild program requires a similar level of commitment to the principles of long term forest stewardship. A description of the SFMA can be found on the Forest Guild Model Forest Program webpage.

B. Management Goals, Objectives, and Assessment Criteria

Forest management planning requires a thorough assessment of the ideas and philosophy that form the foundation of a management program. These ideals must be translated into goals, objectives, and assessment criteria that describe the desired future conditions of the resource. In short the management goals must describe the way managers and stakeholders hope the resource will look in the future.

Goals: Broad generalizations about the future resource conditions that management is designed to culture.

Objectives: Detailed descriptions, pertaining to a specific goal, of what the resource will look like or the management approaches necessary to achieve that goal.

Assessment Criteria: Specific elements of a management program or future conditions that future observers can use to assess the degree to which management goals and objectives have been achieved. These may often be quantitative in nature and are essential to an adaptive management approach.

While Percival Baxter did not express detailed management goals and objectives like those described in this section, he provided two important ingredients of their formulation.

- The basic management philosophy of a forestry practice: based on scientific principles, capable of producing economically desired goods, and designed to serve as a model to the public and the profession.
- The ability of managers to fulfill these broad goals without the hindrance of a prescriptive mandate that might limit options and stifle the creativity of those tasked with fulfilling these goals.

B.1 Water and Soil Quality

B.1a Goal: Protect water quality from negative impacts of human/natural disturbances.

B.1a1 Objective: Follow all Maine Forest Service water quality BMPs relating to timber harvesting and road construction.

B.1a2 Objective: Consider ways to balance the forest age structure at the watershed and riparian feature scale when planning timber harvests, especially regeneration treatments.

***Criteria**: Consider limiting areas regenerated in any 30 year period to less than 50% of a watershed and/or logical area adjacent to riparian features.*

B.1a3 Within Riparian Management Zones, employ guidelines pertaining to no harvest or limited harvest areas during silvicultural treatments

Criteria*: Evaluate harvest compliance with guidelines during harvest inspections and post-harvest using remote sensing technology.*

B.1b Goal: Protect soil productivity from negative impacts of human disturbances.

B.1b1 Objective: Minimize soil compaction due to management activities.

Criteria*: Harvest layouts seek to minimize area in equipment trails.*

B.1b2 Objective: If biomass harvest is conducted ensure adequate retention of nutrients and stand structures.

Criteria: *Harvest removals are conducted in accordance with published Forest Guild biomass harvesting guidelines of the Northeast.*

B.2 Biodiversity/Habitat/Forest Structure & Composition

B.2a Goal: Protect, maintain, and culture a diversity of species and habitats across the forest area.

B.2a1 Objective: Protect habitats of rare, threatened, and endangered species.

***Criteria**: Ensure that all known occurrences of such species are documented to greatest extent possible by Park staff or outside experts (e.g. in GIS datasets and written reports).*

***Criteria**: Ensure that datasets containing such locations (e.g. MNAP and BSP GIS datasets) and occurrences are consulted during planning of management activities with the potential to disturb populations/habitats.*

***Criteria**: Utilize existing pertinent habitat management guidelines when planning and implementing management activities.*

B.2a2 Objective: Protect rare forest types containing areas and features with significant late successional characteristics (consult FSC guidelines for definitions of such features).

***Criteria**: Ensure that all known occurrences of such conditions are documented to greatest extent possible by Park staff or outside experts (e.g. in GIS datasets and written reports).*

***Criteria**: When preparing treatment sites for management actions ensure proper evaluation for presence of unique late successional forest features and revise actions and plans accordingly.*

***Criteria**: When important late successional features are identified consult FSC guidelines regarding management options.*

B.2a3 Objective: Through active and passive management create diversity of stand structures and species assemblages across forest area consistent with site specific characteristics.

B.2a4 Objective: Integrate habitat requirements of wildlife species at the landscape level into management planning

***Criteria**: When planning management actions evaluate and work to minimize potential impacts on habitat connectivity.*

***Criteria**: When planning management actions consider how to enhance late successional forest characteristics.*

***Criteria**: When planning management actions consider how to balance diverse wildlife habitat requirements.*

B.2a5 Objective: Integrate habitat requirements of wildlife species at the stand level into management actions and treatment prescriptions.

***Criteria**: When preparing treatment sites for management actions ensure proper evaluation for presence of unique habitat features and revise actions and plans accordingly.*

***Criteria**: When implementing management actions ensure proper retention of special habitat features like snags and den trees.*

B.3 Sustainable Timber Supply

B.3a Goal: Conduct management planning and silvicultural treatments so as to ensure the sustainability of high quality forest products.

B.3a1 Objective: Pursue forest-wide area regulation approach to manage forest age/size structure in order to provide regular supply of timber for harvest.

B.3a2 Develop and maintain comprehensive management planning and harvest schedules.

B.3a3 Objective: Reduce exposure to disturbance agents by diversifying forest conditions through use of varied silvicultural systems.

B.3a4 Objective: Apply silvicultural systems and principles appropriate to the given forest type, age, and site conditions when planning and implementing treatments.

B.4 Financial Stability

B.4a Goal: Provide steady and predictable revenue source to support forest management and general Park management programs.

B.4a1 Objective: Schedule revenue generating management activities consistent with goal of long term and steady revenue generation.

B.4a2 Objective: Ensure accurate accounting of all forest management costs to permit evaluation of management profitability.

B.5 Forest Protection

B.5a Goal: Culture forest conditions that are resistant and resilience to significant natural disturbance events and long term climatic changes.

B.5a1 Objective: Reduce potential of large scale wind disturbance by developing spatial diversity of stand structures.

B.5a2 Objective: Reduce stand and forest susceptibility to spruce budworm outbreaks through diversification of age structure and reduction of vulnerable balsam fir stocking.

B.5a3 Objective: Within a planning context develop management strategies designed to promote resistance, resilience, and adaptation of the forest ecosystem to changes in climate.

B.5b Goal: Address threats posed by invasive species to the forest resource and natural systems.

B.5b1 Objective: Develop regional relationships, education efforts, and response programs to reduce likely hood of introductions.

B.5b2 Objective: Achieve early detection of invasive species through active monitoring.

B.5b3 Objective: Deploy appropriate and timely response to mitigate or eliminate or contain invasive species.

B.6 Demonstration, Education, and Research

B.6a Goal: Demonstrate and communicate relevant and accessible examples of forest management practice to the general public and forestry professionals.

B.6a1 Objective: Facilitate field tours and information sessions designed for forestry professionals.

B.6a2 Objective: Provide on the ground opportunities for general Park visitors to learn the basic principles and practices of forest management.

B.6a3 Objective: Develop web and print materials designed to communicate the principles and practices of the SFMA forest management program.

B.6b Goal: Encourage research efforts that improve forest management practice.

B.6b1 Objective: Collaborate with research community to develop research activities that help answer questions pertinent to the management of SFMA

B.6b2 Objective: Provide field sites for research activities.

B.7 Public Recreation

B.7a Goal: Provide opportunities for diverse recreation activities while protecting the long term integrity of the forest ecosystem.

B.7a1 Collaborate with State IF&W to ensure hunting and fishing regulations are compatible with long term stability of game species populations.

B.7a2 Manage public access via road systems to ensure equitable access from regions both east and west of SFMA.

B.7a3 Provide for unique and exemplary hunting and fishing opportunities.

B.7a4 Provide opportunities for non-motorized recreational access.

C. Landscape and Societal Context

C.1 Climate and Biophysical Regions

Baxter State Park straddles the transition zone between coniferous dominated boreal forests to the north and deciduous dominated temperate forest to the south. Species assemblages common to both areas are found in the SFMA though the boreal species are more common. The SFMA is distant

enough from the Maritime influences of coastal Maine that winter low temperatures can easily reach -20 °F and summer high temperatures often climb above 90 °F.

The following description for the Caribou Maine region based on historical NOAA climate data provides a general description of the average climate conditions in the SFMA.

Caribou features a humid continental climate (Köppen Dfb), with long, cold, snowy winters, and warm, humid summers. Nights are cool even in summer, and can turn bitter in winter. The average seasonal snowfall for Caribou is approximately 116 inches (2.9 m). The record snowfall for Caribou is 197.8 inches (5.0 m) set in the winter of 2007-2008.[citation needed] Monthly mean temperatures range from 9.5 °F (−12.5 °C) in January to 65.6 °F (18.7 °C) in July. There are 44 nights per winter that drop to 0 °F (−18 °C) or below. Freak measurable snowfalls have occurred as early as late October and as late as early May, but in typical years the first significant snowfall occurs in late November or early December, and the last significant snowfall occurs in late March or early April.[10]

Climate data for Caribou, Maine[11]

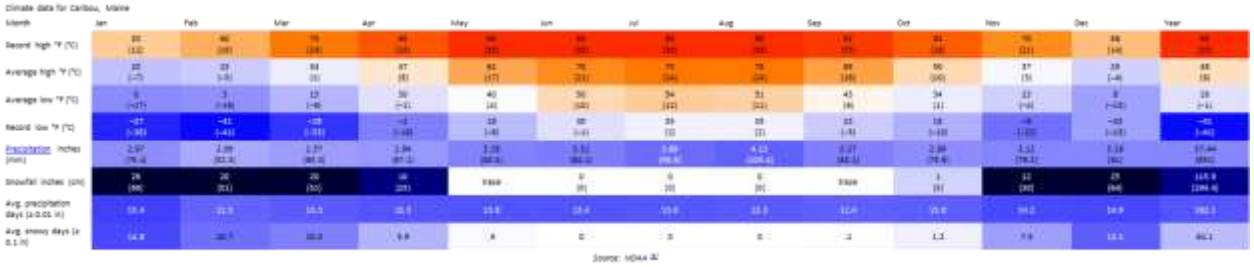


Figure C.1 Climate data for Caribou, Maine.

Maine is divided into 19 biophysical regions under a system developed by Janet MacMahon in the 1990's. This classification system is based on biophysical criteria such as climate, geography, soil, and physiography, and vegetation conditions. The SFMA is dominated by the Central Mountains region while the northwest portion of the SFMA includes the Arrostock Hills region. This generalized classification system is a useful way to explain the key landscape characteristics that influence the ecosystems commonly to these areas The following descriptions, excerpted directly from MacMahon, 1998, of the Biophysical Regions portray the range of conditions found in the SFMA and surrounding area.

[10] http://en.wikipedia.org/wiki/Caribou,_Maine, May 20, 2012.
[11] http://en.wikipedia.org/wiki/Caribou,_Maine, May 20, 2012.

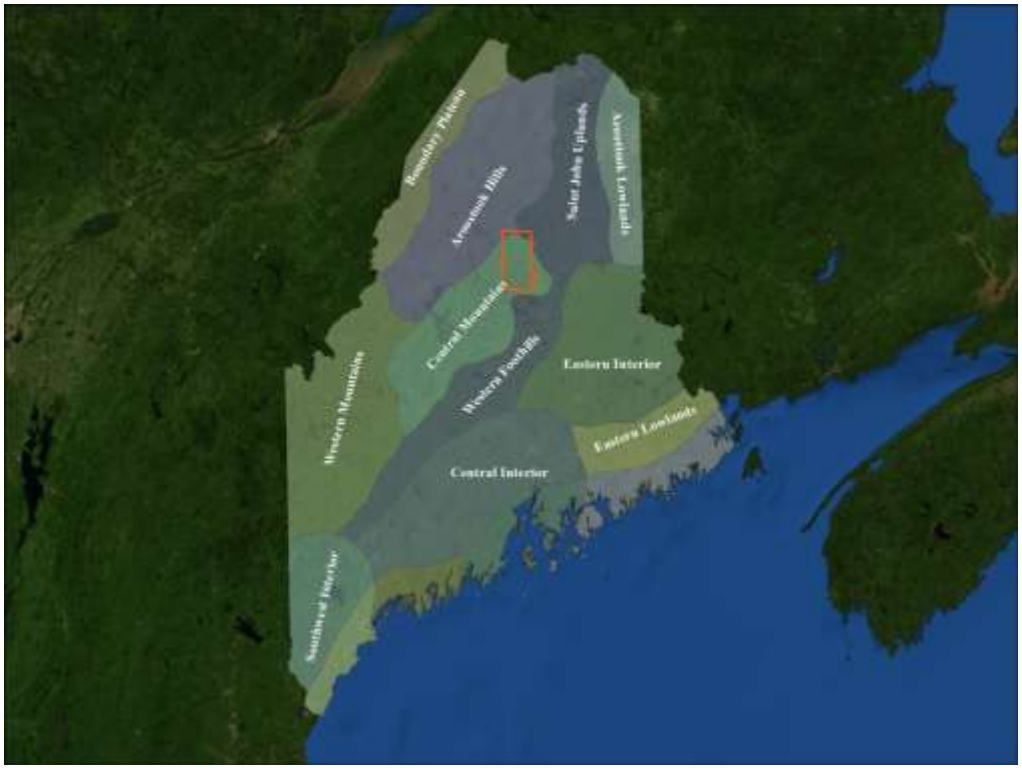


Figure C.2 Biophysical regions of Maine.

Central Mountains Region[12]

Physiography: The Central Mountains Region includes the Katahdin group and surrounding foothills. It also includes the highlands surrounding Moosehead Lake. The region contains the greatest relief in the state with elevations ranging from 600' to 5268'. Topographic highs include Baxter Peak (5268'), White Cap (3644'), Baker Mountain (3520'), Traveler (3541'), North Turner (3323'), South Turner (3122'), and Big Spencer (3230'). Bedrock is dominated by the Katahdin Pluton, which is composed of granite and granodiorite. A series of smaller plutons composed of gabbro and other ultramafic rocks underlies the Whitecap Mountain area. Bedrock of the surrounding hills is composed primarily of weakly metamorphosed pelites and sandstones. Melange and metavolcanic outcrops occur northeast of Moosehead Lake.

Climate: The climate of the Central Mountains resembles that of the Western Mountain Region except that summers are slightly milder, winters are slightly colder, and the frost-free season (approximately 100 days) averages 10 days longer. Mean maximum July temperature is 77° F and mean minimum January temperature is 1° F. As in the Western Mountains, annual precipitation is variable because of an orographic effect. Average annual precipitation is 38", while average annual snowfall is 120", the highest in the state.

Surficial Geology and Soils: The most extensive bedrock outcrops in the state occur in

[12] **Passage excerpt from** McMahon, Janet. 1998 (July). An Ecological Reserves System Inventory. Augusta, Me. Me. State Planning Office. 122 pp.

this region. The remaining landscape is covered with thin drift and till with scattered eskers and glaciofluvial deposits. Some of the deepest deposits occur in the ribbed moraine southeast of the Katahdin mountains, where coarse-textured Hermon soils predominate. As in the Western Mountains, the higher peaks are covered with cryic Saddleback and Enchanted soils, although these are not extensive. Where bedrock is near the surface, fine-textured, somewhat excessively drained Monson loams have developed. At lower elevations, in till derived from metasedimentary rocks, well-drained Elliottsville loams occur. Wetter and deeper Telos and Monarda soils are typical of valleys and flatter areas.

Vegetation and Flora: The Katahdin area is known for its alpine vegetation. Disjunct woody species that occur here and nowhere else in Maine include Arctostaphylos alpina, Betula glandulosa, Betula minor, Cassiope hypnoides, Loiseleuria procumbens, Phyllodoce caerulea, Rhododendron lapponicum, Salix arctophila, Salix argyrocarpa, and Salix herbacea. Woody species richness is high (132 species) on Mount Katahdin relative to the surrounding area.

As in the Western Mountains, the region is dominated by spruce-fir forests in poorly-drained valleys and on ridges, and northern hardwoods at middle elevations.

Aroostook Hills Region[13]

Physiography: The Aroostook Hills Region extends from the Saint John River near Madawaska south to the Patten area. The western boundary is delineated by the 1000' contour line and the eastern boundary is defined by the calcareous bedrock and tills that underlie the Aroostook Lowlands. The region is characterized by gently rolling terrain with elevations averaging between 800' and 1000'. Scattered mountains occur in the Winterville area and on a small pluton north of Shin Pond. Topographic highs include Pennington Mountain (1578'), Green Mountain (1687'), and Mount Chase (2440'). Unlike the Saint John Uplands and Aroostook Lowlands, lakes and peatlands are abundant. Bedrock of the region is almost entirely composed of weakly metamorphosed interbedded pelites, sandstones, and some limestone. Intrusives include a belt of metavolcanic rock that cuts across the central portion of the region and the quartz diorite pluton that underlies Mount Chase.

Climate: Except for maximum July temperature, which averages 78° F throughout the region, climate varies considerably from north to south. Winter temperatures, annual precipitation, and snowfall are lower in the north. On average, the length of the frost-free season is 20 days shorter in the central portion of the region than either the north or the south. The average minimum January temperature ranges from 4° F near Patten to -5° F near Squaw Pan. Average annual precipitation ranges from 43" in Patten to 35" in Squa Pan and average snowfall ranges from 120" in Patten to 100" in the north. The climate is intermediate between the Saint John Uplands and the Aroostook Lowlands.

Surficial Geology and Soils: The eastern portion of the region has extensive but scattered deposits of glaciolacustrine sediments on which cedar swamps and peatlands have developed. The western portion is covered with thin drift and pockets of deeper till. Shallow (10"-20")

[13] Passage excerpt from McMahon, Janet. 1998 (July). An Ecological Reserves System Inventory. Augusta, Me. Me. State Planning Office. 122 pp.

excessively drained Thorndike silt loams occur on ridge tops, well to moderately well-drained Plaisted silt loams and Chesuncook loams occur on upper slopes, and finer poorly drained Aurelie and somewhat poorly drained Daigle soils are typical of valleys in the northern portion of the region. In the south, shallow course-grained Lyman or fine-grained Monson soils are characteristic of higher elevations, with somewhat poorly drained Colonel fine sandy loams and Telos loams below. Deep poorly drained Monarda loams are widespread in the valleys.

Vegetation and Flora: The western boundary of the region coincides with a vegetation transition zone where species characteristic of temperate regions are replaced by those of more boreal affinity. In addition to this transition zone, two peatland types, eccentric bogs and concentrically patterned raised bogs, reach their western limit in Maine here. This is apparently a topographic rather than a climatic limit – the total number and area of peat lands are generally less in mountainous well-drained terrain. Raised bogs are confined to the limited number of flat basins that are scattered among the hills and mountains, while eccentric bogs occur on the gentle slopes rising from these basins. Forest ecosystems are more diverse in the Aroostook Hills Region than in western portions of Aroostook County.

C.2 Natural Disturbance Agents and Regimes

The forested landscape of the Park is a complex ecosystem of diverse soil types, landforms and plant communities. Although the process is often too slow for humans observations to easily notice, the plant and forest communities of the Park are in a constant state of change. Occasionally, significant natural events occur either singly or in combination to produce immediate and striking change. In the case of a spruce-budworm epidemic, this change takes place over a ten year period, but in the case of a forest fire or a windstorm event, big changes can happen overnight. Fire, wind, insects and disease are four of the most primary forces affecting constant change on the SFMA's ecosystem and forest structures.

These forces almost always function in some type of complex interrelationship – significant areas of windthrown timber may be a result of land aspect, disease agents that weaken trees, or a significant rain event that reduced the ability of the roots to hold firm in soaked soils. Significant fires are often influenced by periods of drought and previous disturbance events such as windthrow or logging, which deposit branches and tree tops on the forest floor where they become combustible fine and course fuels. Disease or insects, normally endemic in the forest, may explode to epidemic populations when forest structures mature to a certain point or drought or extended high rainfall alters conditions in the forest. When enough trees die in a given area from insects or disease, fuel loads are increased as are the chances of a wildland fire event.

Wildland Fire

Fire is an integral part of the forest ecosystem of the Park. The structures of many of the forest stands in the Park express the effects of fires that occurred over the past century. The average frequency and primary causes of fire in the Acadian forest have been, and will continue to be the subject of study and debate. Lorimer[14] and Wilson[15] have both contributed to our understanding

[14] Craig G. Lorimer; The Presettlement Forest and Natural Disturbance Cycle of Northeastern Maine, *Ecology*, Vol 58, No 1 winter, 1977.

about fire in the forests of the Park and their work suggests that fire occurrence, intensity and size is often part of a complex interrelationship with other natural disturbance factors such as wind, insects and disease. Together, these researchers suggest that any black and white interpretation of the Acadian forest disturbance regime is simplistic and reality is inherently much messier, with macro and micro-site influences playing significant roles in how disturbance plays out on the landscape. This complexity is ensured with the recognition that small scale gap dynamics will be overlaid atop larger scale less frequent stand replacing events, to create a complex mosaic of stand conditions.

The largest known fire in the Park occurred in June of 1903. Beginning on the south shore of Webster Stream and perhaps started by an escaped campfire, this fire burned southward in a large swath that extended through the central Wassataquoik basin and south to South Turner Mountain. Logging slash remaining from the Davis and Love operations of the 1880's in combination with other unrecorded weather and insect events may have increased the intensity of the fire in the Russell Pond area. Today, the composition of tree species in the stands ranging from the Scientific Forest Management Area through South Branch Pond to Russell Pond reflect the effects of this fire. A striking example of this can be seen on the Pogy Notch trail when the trail crosses through a patch of forest skipped or missed by the fire. This small area contains large sugar maple, red spruce, yellow birch and beech in contrast to the big tooth and quaking aspen, paper birch and balsam fir more prevalent in the land affected by the fire. The largest recent fire in the Park was the 1977 fire that extended from the West Branch of the Penobscot near Abol Bridge up to Foss and Knowlton Pond and east to Stump Pond and the Park Tote Road. This fire of over 2,500 acres was well covered in the media and involved a large organized suppression action led by the Maine Forest Service. The June fire began in a large area of windthrown timber that resulted from a strong wind and rain event in the fall of 1974. The final lines of the fire did not extend far outside the original lines of the windthrown timber.

After past logging and fires, Park forests are now generally relatively mature. In this condition large fires may be relatively unlikely, although the potential for dry periods, extended drought, or significant wind events and the likely return of the spruce budworm, all suggest that this status could change suddenly. While the Park is a large area, it is not particularly large in the context of natural events such as fire.

Wind

Wind is a constant force of change within the SFMA and the regions landscape. Tree mortality due to wind events can occur at both large and small scales. Wind can drive forest dynamics at both stand replacing scales as well as those of individual tree and small gap levels. Unlike certain cyclical insect disturbance agents wind events cannot be predicted in advance. Certain topographic locations are more vulnerable than others and return intervals of events may vary accordingly. Similarly, certain stand structures are more vulnerable than others. While the extent and severity of individual events may be difficult to predict the influence of wind on the forests of the Park is perhaps the most constant source of disturbance and change.

Craig G. Lorimer and Alan S. White; Scale and Frequency of Natural Disturbance in the Northeastern US; Implications to early forest successional habitats and regional age distributions; *Elsevier*, Forest Management and Ecology, 185 (2003),p. 41-64

[15] Jeremy Wilson; Nineteenth Century Lumber Surveys for Bangor, Maine: Implications for Pre-European Settlement Forest Characteristics in Northern and Eastern Maine*; Journal of Forestry*, July August 2005, p 218-223.

Insects and disease

Similar to wind, insects and disease are an integral part of the ecology and function of the natural communities occupying the Park landscape. Spruce bark beetles (*Dendroctonus rufipennis),* the bronze birch borer *(Agrilus anxius),* the saddle prominent (*Heterocampa guttivitta),* the satin moth (*Leucoma salicis*), are a few of the hundreds of insects that have affected Park trees. Along with a host of bacterial diseases or complexes, insects and disease play an important, continuing and important role in the ecology of the Park. Some species have the capacity to erupt suddenly to epidemic population levels and have significant effects on forest structures over large regions. The Spruce budworm (*Choristoneura fumiferana)* is an example of such a species. This insect, endemic to forests in the northeastern US and Canada, periodically erupts into to epidemic levels, usually beginning in Quebec Province CA, and sweeps eastward toward the Atlantic. Despite its misleading name, the insect has primarily evolved to feed on the emerging new growth of balsam fir and white spruce, but in the large populations of epidemics, will feed on and effect red spruce. Examinations of unlogged old growth stands in Maine, including stands within the Park, reveal relatively high percentages of red spruce compared to balsam fir, suggesting that repeated cycles of the spruce budworm may tend to purge softwood stands of balsam fir, leaving the less susceptible and longer-lived red spruce. The cyclical nature of the spruce budworm is fairly well known, but not at all well understood, with an expected cycle of 30-60 years with individual episodes lasting 6-10 years. Maine experienced serious spruce budworm outbreaks between 1916-26 and again between1973-86. In both events, the reason for the end of the outbreak is not unknown. Both events resulted in the mortality of a significant percentage of balsam fir and red spruce in the region. Following the 1973-86 outbreak, mortality rates of spruce-fir stands with stocking of more than 50% balsam fir were approximately 71%[16].The sudden decrease in live stocking of softwood stands often was followed by more pronounced windthrow and later by elevated fire occurrence. Experts suspect that the next outbreak of the spruce budworm is likely within the next 10-20 years. Although this event will likely have significant effects on the forests of the wilderness portion of the Park, it is considered a natural event and the Park will make no effort to interfere with the progress of the event other than to protect Park facilities and public safety, and maintain access to roads and trails. In the Scientific Forest Management Area, more active measures may be taken to protect managed forest stands and the standing timber inventory.

Severe Weather Events

Although wind is a weather factor, its continuous effect on the Park suggests it deserves the unique attention provided above. Other elements of weather; rain, snow, ice, drought, and even extreme cold, can all play a part in affecting Park management. Of primary concern to the SFMA management is the duration and intensity of rain events due to the powerful erosive effects of water on the landscape – particularly in terms of soil erosion on equipment trails, and washouts to roads. Ice storms like the 1998 fall event can have significant impacts on forest conditions through damage to tree crowns and deformation of saplings.

C.3 Historical Land Use

[16] Lloyd C. Irland, John B. Diamond, Judy L. Stone, Jonathan Falk, Ellen Baum; *The Spruce Budworm Outbreak in Maine in the 1970's- Assessment and Directions for the Future*; Bulletin 819, October 1988, Maine Agricultural Experiment Station, University of Maine, Bu

Townships in this area of north central Maine were first delineated in 1833 by surveyors for the State Land Agent. This was during the so-called "Pine Era" in the State of Maine. The survey notes make frequent reference to "scattered timber pine, long and handsome", spruce, fir and hardwood growth, and describe streams that fed the Allagash watershed. It was not long before people began making determined efforts to access and capture this vast resource:

"In 1841 Hastings Strickland and Amos Roberts constructed two dams, one on dry land about 200 yards below Telos to be used for regulating the flow of water into the East Branch and another at the outlet of Chamberlain to raise the fifteen-mile stretch of water. As they had predicted, the 1842 East Branch drive went to market on an ample supply of Allagash water."[17]

In 1841, as water flowed, so flowed wood, and the change of watershed supply had vast implications regarding the supply of wood to Penobscot mills and as importantly, the supply of water for Allagash and St. John river drives. Clear evidence of late 1800's logging activity exists in the SFMA in the form of very old pine stumps, existing trees and snags with axe-cut faces still clearly evident and mechanical parts and debris such as the boiler from a log-hauler resting in a stand of fir along Webster Stream. For obvious reasons, activity appeared to be restricted to areas relatively close to the major water courses and ponds of the SFMA, but is clear that even these early activities began to significantly change the forest.

In 1903, sections of the SFMA, primarily in T6,R9, were burned in an extensive fire. This fire was part of a larger complex of fires that erupted across the northeast under widespread dry conditions:

"...but the spring of 1903 brought five weeks of drought in northern and eastern Maine and set the scene for one of the worst conflagrations since the Mirimichi Fire of 1825. By May 21 the forests along the northeastern border were ablaze...A narrow escape on a B & A express prevented heavy loss of life as flames engulfed the towns of Sherman and Crystal, and only a change of wind saved Patten, Presque Isle, and Fort Fairfield."[18]

The 1903 complex of fires was typical of a series of fire events beginning with the onset of significant settlement and extending well into the 20th century culminating in the devastating fires of late 1947. It could be argued that these fires are social more than physical events. Studies by Lorrimer[19] indicate the natural fire cycle (catastrophic stand replacement fires) of the spruce/fir forests of northern Maine to be from 800 to 2000 years. Evidence indicates that one reason behind a series of severe fire periods in northern New England and Maritime Canada is the complex mixture of heavy fuel loading (from logging, insect epidemics, and clearing for settlements), drought conditions, and plentiful source of ignition from untended campfires, lightning, and brush and debris burning.

The Eastern Corporation acquired majority interest in T6, R10 in 1911, and by 1944 owned full interest in the T6, R10 & the portion of T6, R9 that today form the SFMA. A timber inventory

[17]Pg 67, Aroostook, A Century of Logging in Northern Maine, Judd, Richard W.,University of Maine Press, 1989.

[18]Pg 211, Aroostook, A Century of Logging in Northern Maine, Judd, Richard W., University of Maine Press, 1989.

[19] The Presettlement Forest and Natural Disturbance Cycle of Northeastern Maine, Lorrimer, Craig G., Reprinted from ECOLOGY, Vol.58, No.1, Winter 1977.

and harvest plan of T6, R10 was developed by the J.W. Sewall Company in 1942. The inventory described a mixture of generally young softwood forest, rebounding from the severe 1916-20 spruce budworm epidemic that decimated softwood growth over much of northern and eastern Maine, and poorer quality mixedwood and softwood growth developing upon land covered by the 1903 fire. A sparse but irregular stocking of softwood logs and pulp, primarily within the more mixedwood stands, had survived the budworm and in the late 1940's the Eastern Company conducted harvest operations in the township to capture this volume. Apparently guided by diameter and species requirements, the harvest varied in intensity over the area. The stumps and tote-roads from this operation are still clearly apparent in the forest today. By 1950 the recent harvest of the late 40's, together with the 1903 fire and the 1916-20 spruce budworm combined to form the three most apparent influences upon the forests of the SFMA.

In 1955 the Eastern Company's interest in T6, R10 & 9 was sold to Percival P. Baxter, and subsequently conveyed to the State of Maine by Baxter in two separate deeds to ***".....to be forever held...for State Forest, Public Park, and Public Recreational Purposes and for the Practice of Scientific Forestry and Reforestation..."***[20]. These deeds conveyed all interest except a 25-acre dam lot on Webster Stream at the outlet of Webster Lake owned by the East Branch Improvement Co., and certain easements of rights-of-way. The dam lot and associated easements were subsequently conveyed to Baxter State Park in 1982. The actual area determined by planimetry of maps, prepared from aerial photographs, is 29,537 acres; the deeded acreage of the parcels conveyed is 28,594 acres.

When the 97th Maine Legislature accepted these townships as the 26th and 27th additions to Baxter State Park, the Park was operated in a different fashion than it is today. Although Percival Baxter was then 79 years old he remained active in guiding the operations and management of his gift to the people of Maine. Resource management operations within the Park were funded by a combination of fees charged for camping and legislated appropriations from the General Fund. If specific or unexpectedly thorny problems cropped up, Baxter often personally supplied the necessary funds to resolve the conflict or need. In 1955, the establishment of the SFMA proposed a type of management and structure that was both philosophically foreign and structurally and economically difficult for the existing Park management to accomplish. As a result, although the area was managed and developed for recreation similarly to other areas within the Park, no real effort to effect the mandates of the Deeds of Trust was attempted on the SFMA for nearly two decades.

On June 12, 1969, former Governor of Maine and Park donor Percival P. Baxter died at the age of 92. Following Baxter's death, his will made available trust fund monies to be used for the care and maintenance of Baxter State Park. The availability of these funds significantly changed the operational structure of the Park in a short period of time; the staff increased in three years to levels similar to the present, and more importantly, the Park ceased to require any General Fund appropriations and began to operate in an independent fashion combining trust fund earnings and use fees to fund Park operations.

In 1972 the Great Northern Paper Company announced plans to exercise “cutting”, or harvest rights on timber inside the southern boundary of the Park. In obtaining land for the Park from industrial landowners reluctant to reduce their supply of raw materials, Baxter often was forced to allow the companies the option to harvest the timber from the land for a certain period into the future. This arrangement, allowing subsequent harvest after establishment as Park land, was not uncommon throughout the 31 years of Park establishment. The announcement to harvest within such a heavily used area of the Park raised strong concerns within the Authority and subsequently an agreement was

[20] Private and Special Laws, Chapter 171, page 1, 1955,

reached for the Baxter State Park Authority to exchange the harvest rights held by the Great Northern Paper Company adjacent to the southern boundary of the Park for timber of equal consideration from the SFMA. This proposal in turn created considerable public controversy regarding its effectiveness at meeting the former Governor's forest management mandate for the SFMA. Operations commenced on the SFMA, but continued for a short time only - after approximately one-half mile of right-of-way had been cleared, the operation was terminated in March of 1973 with a cash settlement of $725,000 to the Great Northern Paper Company.

The settlement was costly for the Park and severely depleted an Authority-controlled investment fund that had been some years in the making. Nevertheless, the settlement focused attention on the SFMA and spurred the beginnings of an effort toward management effort of the area. For some years, however, the negative feelings generated by the harvesting rights controversy would hamper the Authority and park staff in adopting a consistent and positive position in supporting the development of the SFMA.

In 1976, the Park hired its first forester, to organize the effort to begin management on the SFMA. The delineation of operational boundaries of the SFMA and initial timber cruises were accomplished, followed later by a forest-wide timber inventory, soil survey and the development of a management policy and planning document for the area. Expenses for these efforts were significant, and by 1981, with road construction underway, Park staff was anticipating the capture of some revenue from an ambitious harvest plan. Unfortunately, the beginning of harvest activities coincided with the second major spruce budworm epidemic of the century. Faced with the threat of widespread mortality in spruce and fir, softwood markets plummeted and most Maine mills were swamped with an overwhelming supply of low-cost raw material from salvage operations. As a result, the SFMA recorded no harvest for 1981 and only about 1,400 cord/equivalents in 1982.

With the departure of the Park Forester in 1983, the Baxter State Park Authority initiated a tenure of SFMA management by the Maine Forest Service. From 1983 until 1986, management of the SFMA was conducted by foresters from the Maine Forest Service, initially at no cost but subsequently for a management fee. With the collapse of the spruce budworm epidemic in 1984 and the rebound of softwood markets, the Authority redoubled its efforts at recovering some of the initial investment in SFMA management with a continuing increase in harvest rates. This course of action and the way it was carried out led to considerable controversy in 1985 over the levels, characteristics and appropriateness of harvesting operations on the SFMA. Eventually, in February of 1986, the Authority responded by suspending all operations on the SFMA, terminating its management agreement with the Maine Forest Service, and forming an SFMA Advisory Committee to review the situation and offer counsel on future actions. As a result, the Park resumed the role of active management of the SFMA in 1987 with the hiring of a Resource Manager. In 1988, with a revised management plan, a new harvest permit and contractor and the steady involvement of the SFMA Advisors, road construction activities were resumed, followed by harvest activities in 1989.

The mid-seventies to the late eighties were often difficult years in the management of the SFMA. Forest management was an endeavor new to both the Authority and Park staff and as might be expected, first steps were occasionally missteps. Public observation focused as citizen activism invariably pointed out inappropriate management and after a period of review and resolution, efforts resumed to carry out the Trust mandate of the SFMA. In hindsight, it's always temping to focus on errors in judgment or practice that were made, often without the benefit of the complete context of the times. A more productive approach may be to review the process over time. The Authority has made mistakes in the management of the SFMA, but the initiation of a new enterprise, or the constant effort

to improve an existing one, will always result in some errors in judgment. The test of our performance isn't whether we make mistakes; it's how effective we are at learning from them.

Strong financial markets of the late 80's added strength and value to the Park trust funds and the pressure for revenue was replaced with the more fundamental and long-term goal of establishment of the SFMA as an appropriate example of Baxter's intentions in the Trust Deeds. Harvest and revenue levels remained relatively stable over this period as effort was expended to define an appropriate and long-lasting philosophy of forest stewardship, demonstrated through forest management, that exemplified Baxter's wishes for the area as expressed in his communications to Governor Muskie at the time of the gift, ***"a showplace for those interested in forestry...an example and inspiration to others."*** This period has been marked by consistent involvement on the part of the SFMA Advisors, and in 1994 the Park once again added a Forest Technician/Roving Ranger to assist in the SFMA activities and provide roving coverage for Park-wide staffing contingencies. Tours of the area by public and professional groups have increased steadily, woods labor has stabilized and management has successfully initiated a significant change in harvest technology. In addition, harvests have produced a significant flow of revenues as well as the promise of additional growth on the most promising stems. The SFMA has begun to emerge as a diverse forest mosaic with its own character and aesthetic. The considerations detailed in this plan characterize a gradual shift in management approach that focuses more on the forest as a system than simply a source for commodity extraction. Most importantly, a steady process has begun to fully define and evolve the clear direction provided by Percival Baxter over 40 years ago.

C.4 Human Communities

The SFMA is in a remote location in northern Maine, roughly 50 miles from a significant settled area. The most prominent communities in the SFMA region are to the south in Millinocket, East Millinocket, and Dover-Foxcroft. The communities to the east include Patten, Sherman, and Island Falls. In the north are the towns of Portage Lake, Ashland, and Masardis. There are no significant settlements to the west on the US side of the US/Canada border. The population levels of these communities are generally declining or stable (figure C.2). Income levels are near the State average in the Millinocket area and likely below that in the more rural communities. The age distributions in these areas is generally skewed towards an older demographic. This is exacerbated by the loss of young people who leave the area in search of employment opportunities (Figure C.3).

Statistic	East Millinocket	Millinocket	Maine	National
Population (2009 est.)	1,718	4,898	1,318,301	307,006,550
Population (2000)	1,701	5,178	1,274,923	281,421,906
Population Growth	1.00%	-5.40%	3.40%	9.10%
Income per Capita	$25,616	$23,138	25,371	$26,505

Figure C.3 Population data for Millinocket region.[21]

[21] http://www.areavibes.com/millinocket-me/demographics/ May 24, 2012

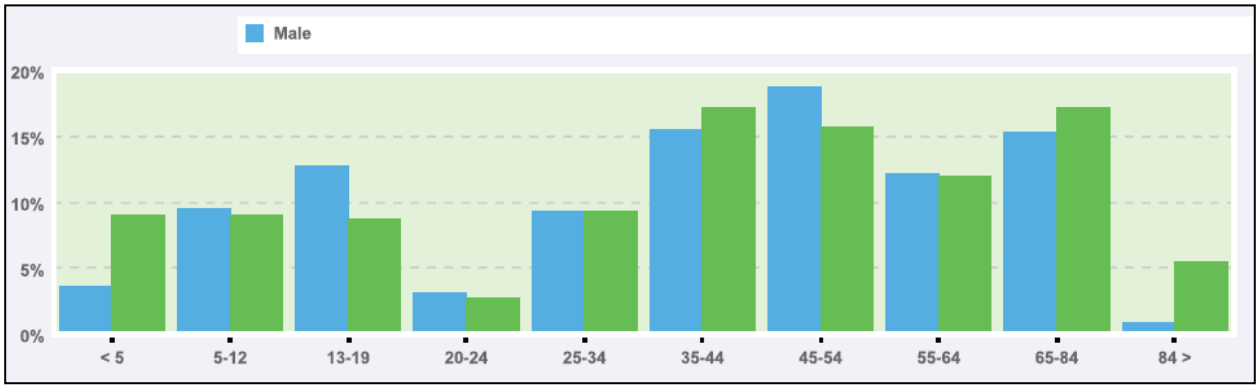


Figure C.4 Age distribution for the Millinocket area.[22]

All of these communities have strong economic ties to both the forest products industry and the outdoor recreation industry. The forest products sector has experienced significant declines in recent decades with respect to milling capacity and employment levels in local facilities. The closing of the paper mill in Millinocket in 2008 was a major blow to the Millinocket area. The closure and subsequent re-opening of the East Millinocket paper mill in 2011 and speculations about the future opening of the Millinocket mill has left considerable uncertainty regarding the future of the mills and associated employment levels. Similar closures of manufacturing facilities in the Patten area have occurred in recent years. Manufacturing is only one part of the forest products sector, with forest managers, loggers, truckers, and support staff, making up significant percentages of area employment levels (Figure C-4). The outdoor recreation industry has increased in importance in response to declines in the manufacturing sector.

[22] http://www.areavibes.com/millinocket-me/demographics/ May 24, 2012

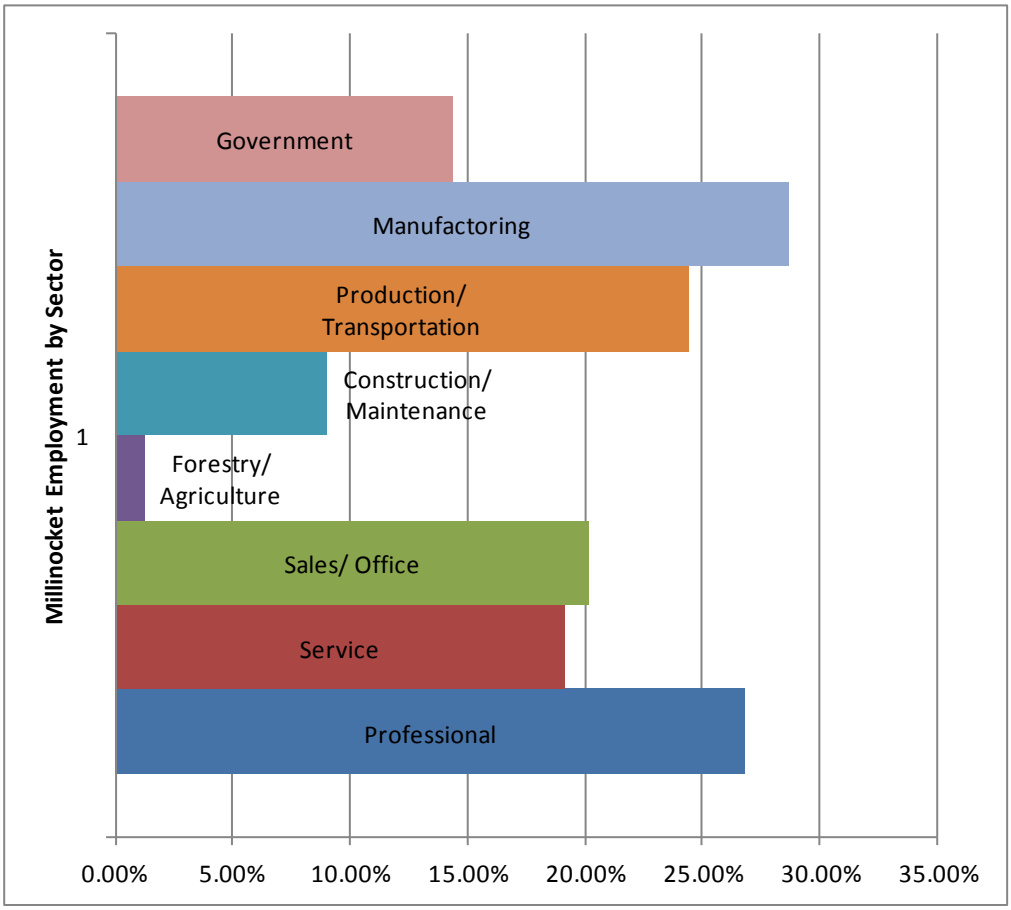


Figure C.5 Millinocket employment statistics by sector.[23]

C.5 Forest Industry and Product Markets

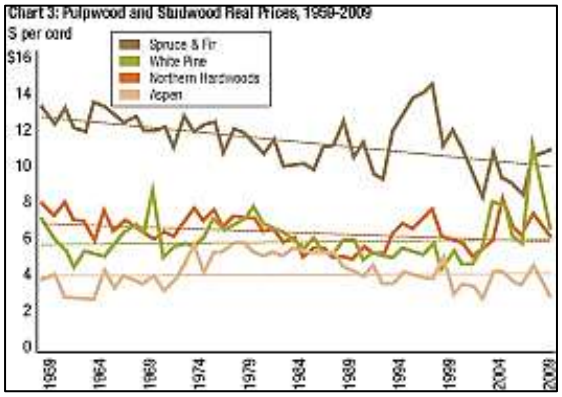
Maine is the most forested State in the US and the SFMA lies in the middle of the northern Maine forest. The Penobscot River region has long been a focus of the forest products industry beginning with the harvest of white pine trees for ship masts in the 1600's, through the peak of the regions pulp and paper industry in the 1960-70's, and continuing to the current year with a fairly diverse set of markets for high and low value products. The last two decades have seen significant changes in the ownership structures of area mills and forest lands. The model of vertically integrated companies like Great Northern Paper and International Paper has been replaced by a separation of the manufacturing facility from the ownership and management of nearby forestland. It is difficult to generalize about the ownership of area mills, some are owned by large and diversified corporations like the "new" Great Northern Paper Co and some continue to be family owned and operated enterprises like Pleasant River Lumber and Ward Clapboard.

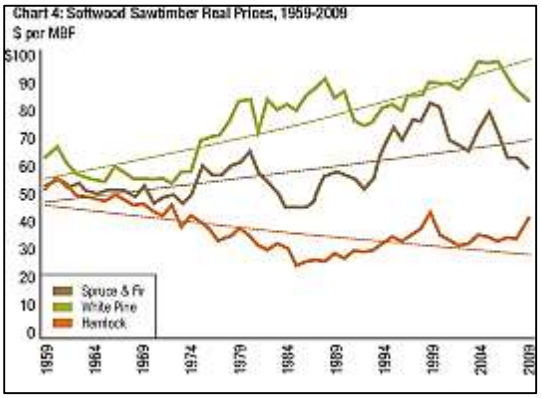
The regions forest products industry and related markets for unprocessed forest products have seen significant volatility in the last decade dominated by the market crash in 2008. This volatility has been marked by the closure of the paper mill in Millinocket in 2008 and the bankruptcy and subsequent sale of the Millinocket and East Millinocket facilities in 2011. 2008 and 2009 saw

[23] Data from http://www.yourcitydata.com/places/Maine/millinocket May 24, 2012

severely depressed prices for all forest products in response to the "Great Recession." However markets improved in 2010 and have remained relatively steady in 2011 and 2012. Over the last 40 years markets for high value sawlog products have generally increased relative to inflation, while softwood pulpwood and small sawlog products have gradually declined. These trends are described accurately and succinctly by Lloyd Irland in a 2011 Article titled "Fifty Years of Maine Stumpage Prices: Trends, Surprises, and Lessons."

"When we study the Maine pulpwood and studwood (small sawlogs used by specialized mills) stumpage price graph (Chart 3), we see a market in decline. Spruce and fir have always been the premier pulpwood species in the Northeast. Yet their prices fell consistently from 1961 to the early 1980s. Prices rose briefly in the 90s, then faded, leaving prices below the long-term trend line by 2006. White pine has been a valuable species, in good grade logs, for generations (Chart 4)."[24]





Irland goes on to describe the potential future of Maine markets and some basic management principles to minimize risk in the face of market uncertainty. Principle among these are managing for individual tree quality whenever possible regardless of species, since current market fashions in wood will almost certainly change over the next 40 years just as they have in the last 40.

"Most people accept that the 1999-2005 peaks in securities markets, housing construction, and wood products were not normal – they represented an unsustainable bubble. A return to those levels will be long in coming. Supply constraints are likely to be tight in most places, though, which could lead to a rise in stumpage prices as the economy begins to recover. But I wouldn't make any decisions premised on rapid increases in stumpage prices in the coming five years.

Analysts (like this author) like to torture readers with graphs and statistical procedures of one kind or another. But the bottom line is quite simple: Maintain diversity in your woodlot. Use market booms to get marginal jobs done. When possible, mark your stands to upgrade stems to the next product class. Think total return and not just annual price changes. Don't try to time the market; instead, cut lightly and frequently.

[24] Irland, C, Lloyd. "Fifty Years of Maine Stumpage Prices: Trends, Surprises, and Lessons." Northern Woodlands Magazine. May 27th 2011. *Permission to use material given May 2012.

When managing for any of the higher value-wood products, a low-grade wood market is critically important. When the demand for solid wood products is in a down cycle, it's crucial that a landowner be able to sell smaller, lower grade, and minor wood species. If you can net just $2.00/ton for biomass, it can add $20-$40 per acre to harvest revenues. This won't buy a ticket to Florida, but it will help pay the taxes. It will enable you to complete thinning and stand-improvement projects."[25]

Figure C.6 SFMA 2011 wood product volumes and buyers.

A variety of markets are available for SFMA products. The profitability of these markets is often marginal given the long haul distances from stump to mill and the cost of harvesting and transportation. The principle markets for the SFMA in 2012 are: Pleasant River Lumber in Dover, Gardner Chipping in Dolby, the East Millinocket Paper Mill, the Premium Lumber concentration yard in Brownville, Huber Engineered Wood Products in Easton, and the Huber Resources Hardwood Log Processing facility in Dolby (Figure C.6). Spruce and fir saw logs are the dominant product in terms of net revenues (Figure C.7) and volumes delivered (Figure C.8). Harwood pulp volumes are substantial, but the net revenues from these products are generally just above break-even levels. Historically, softwood pulp volumes are below those of hardwood pulp but net revenues are greater. However, in the summer of 2012 hardwood pulp prices have surpassed those of softwood pulp, a trend which seems likely to persist for some time in the region.

[25] Irland, C, Lloyd. "Fifty Years of Maine Stumpage Prices: Trends, Surprises, and Lessons." Northern Woodlands Magazine. May 27th 2011. *Permission to use material given May 2012.

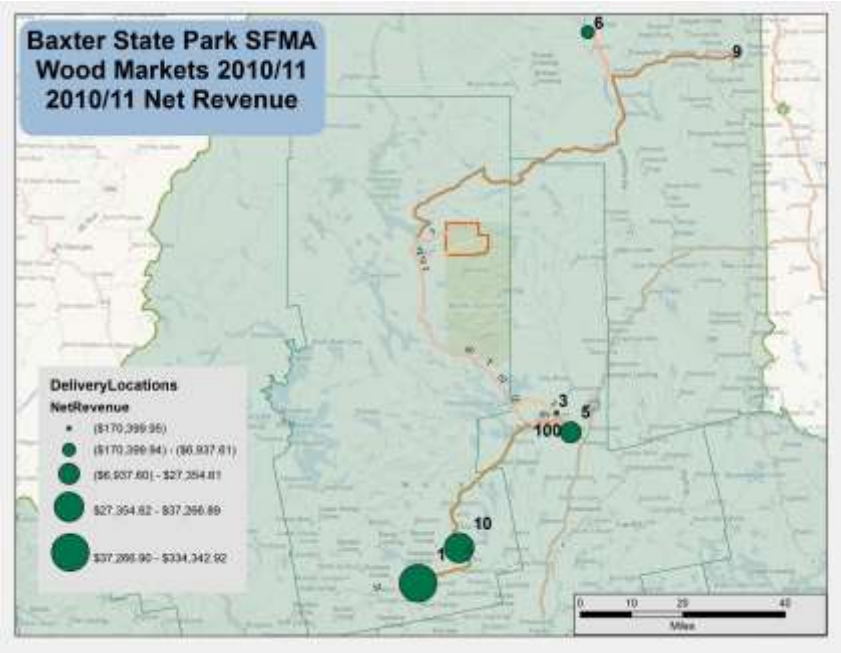


Figure C.8 SFMA wood markets by 2010/11 net revenue values.

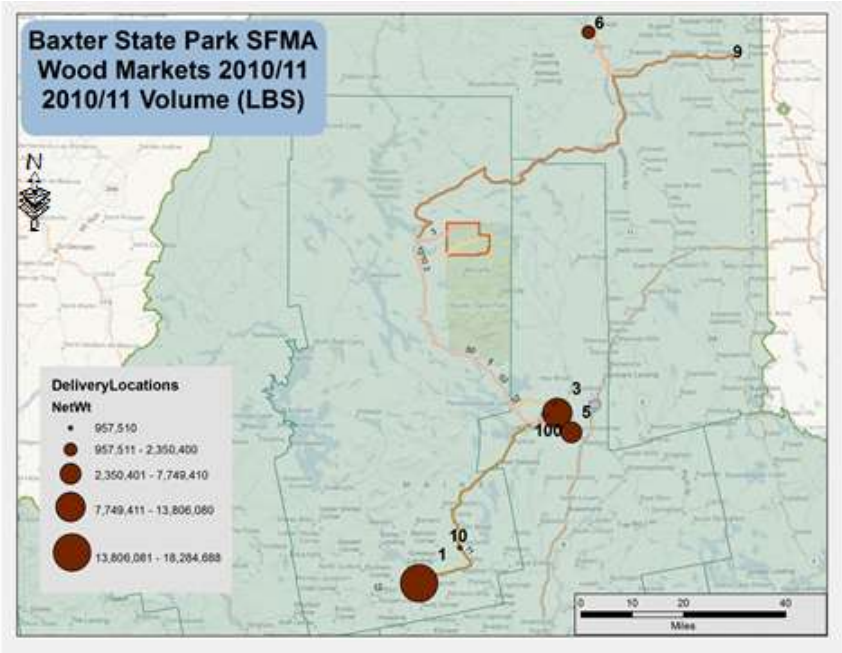


Figure C.7 SFMA wood markets by 2010/11 delivered volumes.

D. Resource & Management Assessment

D.1 Resource Assessment Summary

The following sections describe the forest ecosystem, social and economic conditions pertinent to the SFMA as of 2012. Also included are basic analysis of management activities over the last 30+ years. These descriptions are intended to convey the current condition of the forest resource and those factors that influence its development and management. Section D is not intended to describe or discuss future management directions, plans and activities. Thorough descriptions and analysis of those topics can be found in section F.

D.2 Resource Area Description

The forests of the SFMA as we know them today began to develop about 12,000 years ago as the Laurentide ice sheet melted northward out of New England. Over the next 1000 years the land that would become the SFMA developed a tundra ecology and the first human inhabitants left evidence of their presence. The following 1000 years brought a steady emergence of forest growth:

> *"The development of the first forest in northern New England disrupted the Paleo-Indian culture. Northern boreal forests of spruce and fir support relatively little herbaceous vegetation and therefore offer little subsistence for gregarious herbivores like the caribou. Some of the large herbivores, such as musk ox and caribou, remained on the tundra, drifting gradually northward out to of the region. Many other species simply died out, no longer able to find enough forage."*[26]

Over the ensuing 8000 years, as the climate gradually warmed, the forests of the SFMA developed from the boreal forest now found further to the north into the spruce and fir dominated Acadian or 'spruce flat' forest. This forest is characterized by poor or moderately drained soils over compressed glacial till or areas of shallow soil over bedrock (Leak and Riddle, 1979). U. S. Department of Agriculture Bulleting 544 of 1917 offers of description:

> *"…Spruce, birch, soft maples, white pine, hemlock, and balsam are the characteristic trees in mixture… The presence of black ash, which is usually accompanied by considerable balsam, denotes condition bordering on the swamp type. The presence of sugar maple, on the other hand, denotes a transition to the hardwood lands. White pine of good quality formerly occurred in abundance in this type in both Maine and the Adirondacks…… Spruce attains an intermediate development here, while birch and the better hardwoods are inferior in development as compared with the same species growing on the hardwood lands….. Windfall is not uncommon, and as a result young, even-aged stands of spruce are found occupying the ground where this has taken place….."*

A landmark study by Ralph S. Hosmer in 1902-3 in nearby Squaw Township described a tract of "virgin forest" of 20 acres on somewhat similar sites as the SFMA. Over ninety percent of the stand comprised five species – spruce (65.4%), yellow birch (14.3%), sugar maple (5.7%), paper birch (4.1%), and balsam fir (2.7%).[27] The maximum diameter of spruce measured on the site was 27 inches. In most respects, this description would probably apply reasonably well to the forests of the

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[26] From a synthesis paper on the effect of forest practices in northern forest lands, C.R. Foss, L.S. Deming, S.F Gage, Audubon Society of New Hampshire, 1992

[27] "A Study of the Maine Spruce" by Ralph S. Hosmer, as part of the Maine Forest Commissioner's Report of 1903, Table 4, p. 79.

SFMA around the start of the *nineteenth* century, although human use of the resource over the next two centuries altered the forest mosaic in many ways.

D.3 Topography, Geology, and Forest Soils

The retreating glaciers left the SFMA with a generally flat to rolling terrain, with west to east ridges interspersed with streams and bogs. The highest point in the management area, Wadleigh Mountain, is located in the southeastern corner of the SFMA and rises to 1203 feet above mean sea level. The lowest areas, in the north and eastern sections of Township 6, Range 10 WELS – where the land begins to slope toward the East Branch of the Penobscot River – are approximately 760 feet above mean sea level. Most of the area lies between 800 – 1000 feet above mean sea level (U.S. Geological Survey, 1955).

CompName	Percent of Area	Drainage Class	Briggs Productivity Class	RS Site Index	Count of Polygons
Adams	0.1%	Somewhat excessively drained	1	67	3
Masardis	0.4%	Somewhat excessively drained	1	67	2
Monson	10.4%	Somewhat excessively drained	1	67	83
Allagash	0.4%	Well drained	1	67	4
Danforth	0.1%	Well drained	1	67	2
Elliottsville	1.5%	Well drained	1	67	8
Chesuncook	19.0%	Moderately well drained	2	67	72
Perham	2.3%	Moderately well drained	2	67	14
Ragmuff	30.9%	Moderately well drained	2	67	56
Cornish	0.2%	Somewhat poorly drained	3	62	4
Daigle	1.5%	Somewhat poorly drained	3	62	10
Telos	9.8%	Somewhat poorly drained	3	62	18
Aurelie	0.1%	Poorly drained	4	55	3
Monarda	19.7%	Poorly drained	4	55	16
Roundabout	0.1%	Poorly drained	4	55	1
Wonsqueak	3.8%	Very poorly drained	5	55	30
TOTAL	**100%**				**326**

Figure D.1 Soil types by percent area in the SFMA.

Most of the SFMA is underlain by sandstones and shales from the older Devonian period, with a thin cover of glacial tills. Overlying these, Wadleigh Mountain is composed of Traveler Rhyolite of volcanic ash origin. Between Wadleigh Mountain and the Traveler Mountains lies the younger Devonian Trout Brook formation composed of sandstones, shales and ironstones. Glacial outwash deposits lie along the Trout Brook valley.

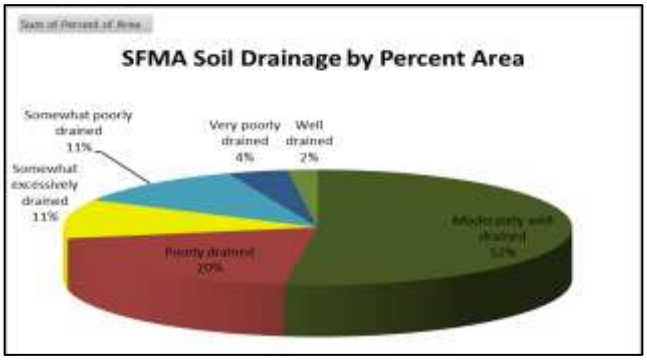


Figure D.2 Soil drainage by percent area.

The forest soils have been shaped by the forces of geologic history with the most recent glaciation serving as the most obvious sculptor of soil deposits and distributions. Governor Baxter correctly described the SFMA as *'good growing*

land', a definition which is primarily tied to soil productivity. SFMA soils are generally well drained though often rocky and with lower amounts of nutrients and minerals than would be found in productive agricultural soils. A variety of soil types are present with Ragmuff, Monarda, Chesuncook, Monson, and Telos the most common respectively (Figure D.1). The productivity of these soils as it relates to growing trees is largely a function of soil drainage, with better drained soils being more productive. Soil depth, parent material, and soil structure also contribute to productivity. More than 50% of the SFMA is underlain with soils that are moderately well drained or better (Figure D.2).

Researchers have quantified the relationship between soil drainage and productivity using site index values to represent productivity. Briggs[28] developed a classification based on this type of relationship and published red spruce site index values for 5 different drainage classes. According to this system over 75% of the SFMA has a red spruce site index value greater than 60 (50 year SI basis) with the remaining area rated as 55 SI (**Error! Reference source not found.**).

D.4 Water and Wetland Resources

The SFMA is home to several significant waterbodies and wetlands which are generally referred to as riparian features in this document. Principle among these features are: Webster Lake, Webster Stream, Hudson Pond, Lost Pond, Frost Pond, and Wadleigh Bog. These areas are important land marks in the SFMA and represent the most significant riparian features in the 30,000 acres. Maine State GIS layers indicate a total of 23 mapped ponds and lakes in the SFMA, of which 6 are named, with a total of over 100,000 feet of total shoreline distance (Figure D.3). These features range in size from 0.1 acres to over 500 acres. All waterbodies provide important aquatic habitat for a variety of fish and migratory bird species including Lake Trout, Brook Trout, Common Loons and many species of diving ducks. Many of the open wetlands may provide habitat for migratory wading birds. The uplands surrounding riparian features provide essential habitat for many species. These areas and the associated SFMA management is described in more detail in sections D.7 and F.8.

Count	MIDAS	Lake Name	GIS Acres	Feet of Shoreline	Elevation
1	0	unnamed pond	1.8	1655.8	NA
2	0	unnamed pond	0.2	533.5	NA
3	**2722**	**Lost Pond**	**12.1**	**2901.9**	**1047**
4	**4228**	**Blunder Pond**	**20.0**	**4094.1**	**1010**
5	6244	unnamed pond	3.0	2853.5	735
6	0	unnamed pond	4.1	5209.3	NA
7	0	unnamed pond	0.1	357.6	NA
8	**2720**	**Thissell Bog**	**9.0**	**10821.4**	**950**
9	0	unnamed pond	0.2	331.1	NA
10	9418	unnamed pond	0.4	753.2	1012
11	0	unnamed pond	1.4	1298.1	NA
12	0	unnamed pond	0.1	325.9	NA
13	9424	unnamed pond	3.0	2230.7	770
14	0	unnamed pond	9.9	12452.4	NA
15	**4238**	**Frost Pond**	**39.7**	**8499.5**	**876**
16	0	unnamed pond	0.5	606.1	NA
17	**2724**	**Hudson Pond**	**121.2**	**12849.7**	**894**
18	0	unnamed pond	0.5	551.9	NA
19	0	unnamed pond	0.2	392.1	NA
20	0	unnamed pond	0.4	695.7	NA
21	0	unnamed pond	1.0	928.8	NA
22	9416	unnamed pond	5.5	1944.4	945
23	**2718**	**Webster Lake**	**515.1**	**38223.7**	**892**
	Total		**749.5**	**110,510.4**	

Figure D.3 GIS data for SFMA lakes and ponds.
***Features are not split along SFMA boundary line.**

[28] Briggs, R. 1994. Site Classification Field Guide. CFRU: TN6 MAFES: 724

When looking at riparian features at a larger landscape level many more large lakes and river systems come into view. The Telos, Chamberlin and Chesuncook lakes to the west are balanced by Grand Lake Matagamon to the east as well as the East Branch of the Penobscot as it snakes south and east towards the confluence with the West Branch. The SFMA is entirely within the East Branch of the Penobscot watershed. It is important to note that the eastern outlet of Telos Lake which drains into Webster stream is an artifact of the 1900th century logging era. A dry natural channel was expanded to the east of Telos Lake and connected to Webster Lake enabling water that would normally flow to the Allagash and St John Rivers to be directed to the Penobscot River system. Known as the Telos cut this engineering project causes increased flows in Webster Stream.

D.5 Management Overview

The SFMA is marked by a diversity of forest conditions that span a broad spectrum of natural community types. Within the SFMA boundaries are a range of vegetation assemblages, structures, and development stages. This diversity is complimented by the array of management designations termed "Management Unit Classes." Approximately 66% of the area is open to some type of management activity, while 14% of the total forest area is designated with reserve status and is not open to management manipulations. An area equal to that of the reserves (15%) is classed as riparian management zone, a designation which includes areas that will be operated and those that will be set aside as Riparian Reserves. Some areas have not yet been assigned to one of these three classes and remain as "Undesignated." This area is about 10% of the total SFMA acreage. Overtime all these remaining acres will be assigned to one of the three MU classes. Summaries statistics about each of these MU designations are included in following sections. Details about management policies for these MUs can be found in section F of this plan.

Mgt. Unit Class	GIS Acres	% Area
Operational	16,223	54%
Undesignated	3,105	10%
Riparian	4,538	15%
Reserve	3,917	13%
Wetland	936	3%
Water	599	2%
ROW	517	2%
Total	29,836	100%
Deeded Acres	29,537	

Figure D.4 Management Unit Classes by acres and % area.

D.6 Silviculture and Operations History

The SFMA has been actively managed since the early 1980s. Over this 30 year period access roads have been constructed to facilitate commercial timber harvesting operations. Timber harvesting has been conducted on over 16,000 acres during this period. The majority of this harvesting has been a type of partial harvest, either a shelterwood establishment treatments or a intermediate thinning treatment. A mixture of other silvicultural approaches have also been applied. The application of silvicultural systems has largely been determined based on field inspections of stand conditions and an attempt to fit the most appropriate silvicultural tool to best reflect these conditions. Silviculture is founded on the principles of forest ecology and the implementation of silviculture in the SFMA has been designed to blend forest management goals with the ecological principles of natural disturbance, forest dynamics, and forest structural components.

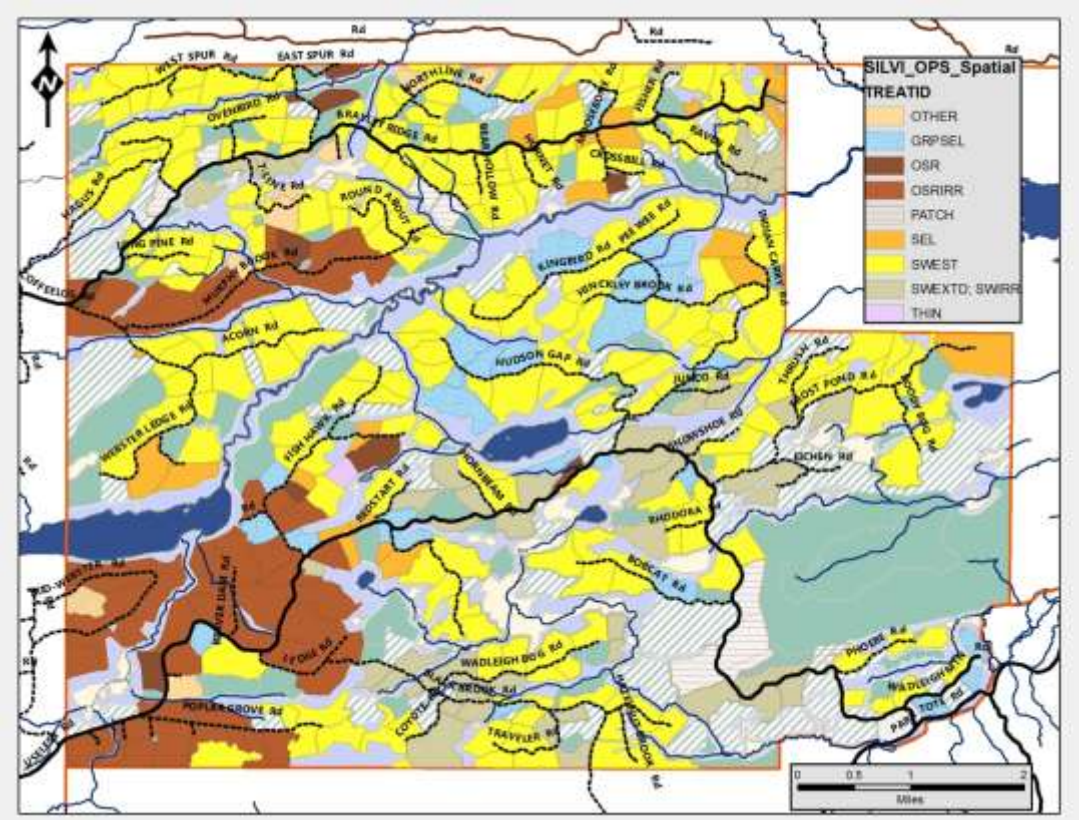


Figure D.5 Map of treatment history from 1982-2012.

Silviculture

Even-Age

The majority of silvicultural treatments have been standard uniform shelterwood establishments with a 30-40% removal to open the canopy enough to stimulate a new cohort of shade tolerant species. In the early 1980's and the days of spruce budworm salvage operations about 1,500 acres was harvested more intensively with an irregular overstory removal/clearcut treatment with variable amounts of advance regeneration present before harvest. These treatments often regenerated to mid-tolerant hardwood species and represent the majority of the young sapling and small pole forest condition. During the last decade, stands first treated in the early 1990s have come back into the harvest queue and the percentage of overstory removals (OSR), as part of the shelterwood system, has increased (Figure D.9). In addition, variations on the standard shelterwood establishment/OSR sequence have been implemented. These include extended shelterwood systems where long lived and stable trees are left after a partial OSR to allow for increased increment growth on those stems while

releasing advance regeneration, as well as an irregular shelterwood where shelterwood establishment, and OSR treatments are applied within the same stand in spatially distinct areas in order to best work with irregular spatial distributions of advance regeneration.

Multi-Age:

During the last 3 decades a variety of multi-age (uneven-age) systems have been applied ranging from traditional single tree selection to "gap" treatments intended to regenerate tolerant species under small canopy openings (Figure D.9). These gap treatments have evolved over time to reflect the equipment available as well as the results of past gap treatments with respect to regeneration establishment and release with canopy openings. In the 1995 to the 2005 many of these

Figure D.7 Canopy Gaps after 1 entry.

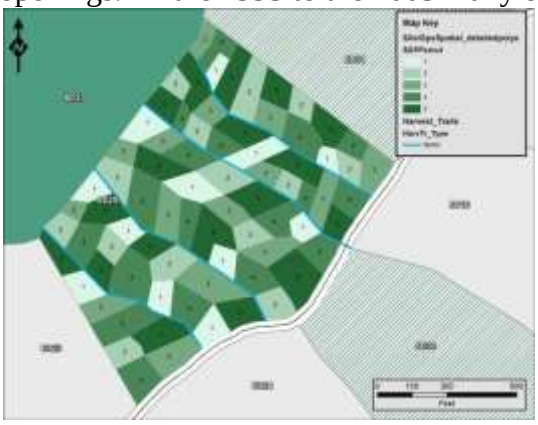


Figure D.6 Canopy Gaps after 5 entries.

treatments we conducted with a small cable skidder often accompanied by a forwarder to increase efficiency. More recently these treatments have been implemented with a CTL system. The size of these gaps can vary depending on the stand conditions and operational requirements. The map in Figure D.7 shows the arrangement of a set of groups like this. This system has generally been applied in mixed wood stands as a means of culturing red spruce that can easily be extirpated from these more productive sites.

A second entry will be completed in the stand 20-30 years in the future, where a second set of openings (labeled as #2's in Figure D.6) have been created to establish yet another age class or cohort. Eventual after 100 years or more the entire stand will have been covered with these openings and the gaps created in the first harvest will be ready to regenerate again to start the cycle over again by establishing a new age group of trees (figure 4). Intermediate thinings may be implemented as the trees within a gap mature. A shelterwood establishment treatment may also be applied before the final OSR treatment. The intention of this system is to enable a perpetual and regular harvest of trees from the same stand. There are many names for this type of silvicultural system one of which is an "irregular group shelterwood." To date these treatments have installed the first entry of gaps, removing overstories to release regeneration. Within the planning period the second round of gaps will begin to be installed in some stands.

Marking and Layout:

Harvest layout using marking of trees to remove or retain has varied over the last 30 years. For most of the period, removals were marked with the help of contracted foresters. In the mid and late 2000's marking decreased due to reduced availability of staff and contactor time to devote towards marking. Since 2010 with a restructuring of SFMA staff positions and an increase in available time marking has been applied where it is most efficient and productive with an increase in marking to leave rather than to cut. Harvest area boundaries are flagged in advance. In 2012 a

Windows operating system Tablet PC with GPS capability has been mounted in the cab of the processor to give the operator a detailed map view of the harvest layout and the progress of harvesting in the stand.

Retention Trees:

Wildlife and legacy trees have long been a focus of SFMA marking and harvest crews with specific trees being marked for long term retention. Over the last 2 decades forest ecology research has increased scientific understanding of stand structures that remain after significant disturbance events. These features offer important habitat for wildlife as well providing important seed source linkages between stages of stand development. As with so much of ecology there is much that remains unknown about the role these structures play in forest ecosystem processes. Descriptions of what species, diameters and stem forms to designate as retention trees are included in harvest prescriptions and are communicated to harvest operators through prescription documents, and/or verbal instructions and marking,

Harvest Volume History:

Since 1981 over 50% of the SFMA has received some type of silvicultural treatment. The average annual harvest over this period has been 5,700 cords with a max of 10,500 cords in 2003/4

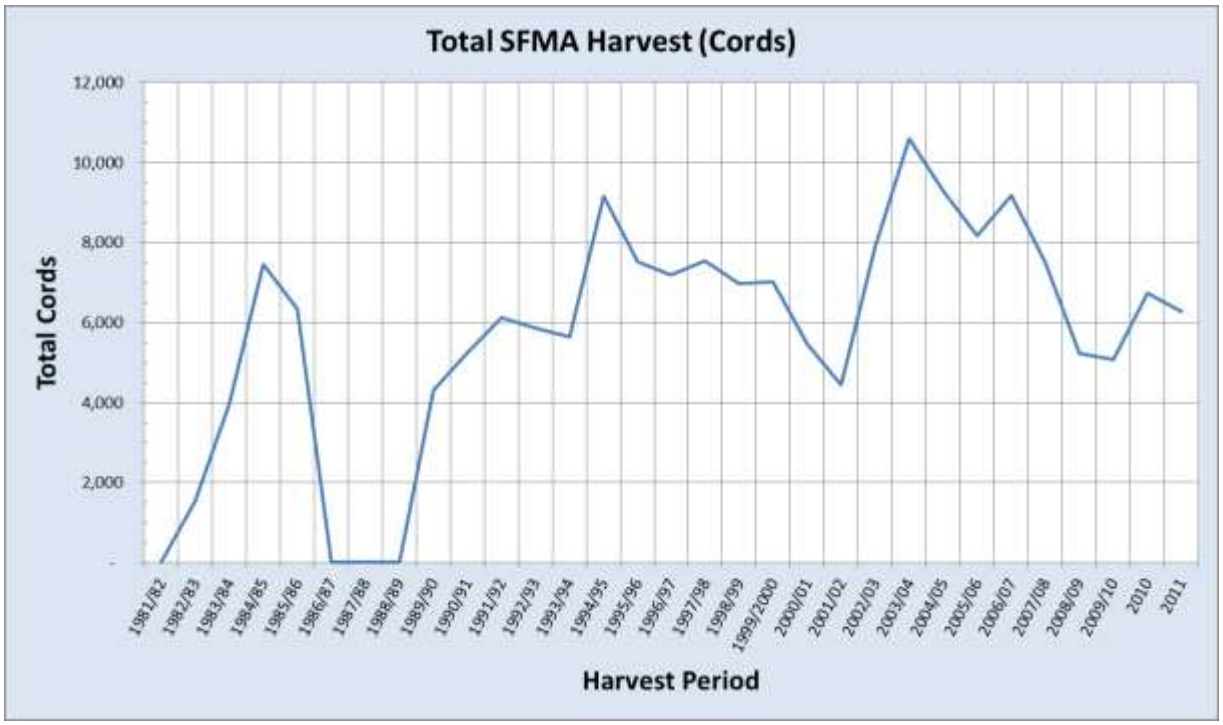


Figure D.8 30 year harvest period annual harvest values.

and a minimum of 1,538 in 1982/83. Annual harvest levels have fluctuated over the 30 year period including a period of no harvest between 1987 and 1989 when the SFMA management was restructured and harvest was temporarily suspended (Figure D.8 30 year harvest period annual harvest values). The average harvest level over this period is equal to the average annual growth estimates established through historic inventory accounting, and an analysis of CFI data collected from 1996-2008.

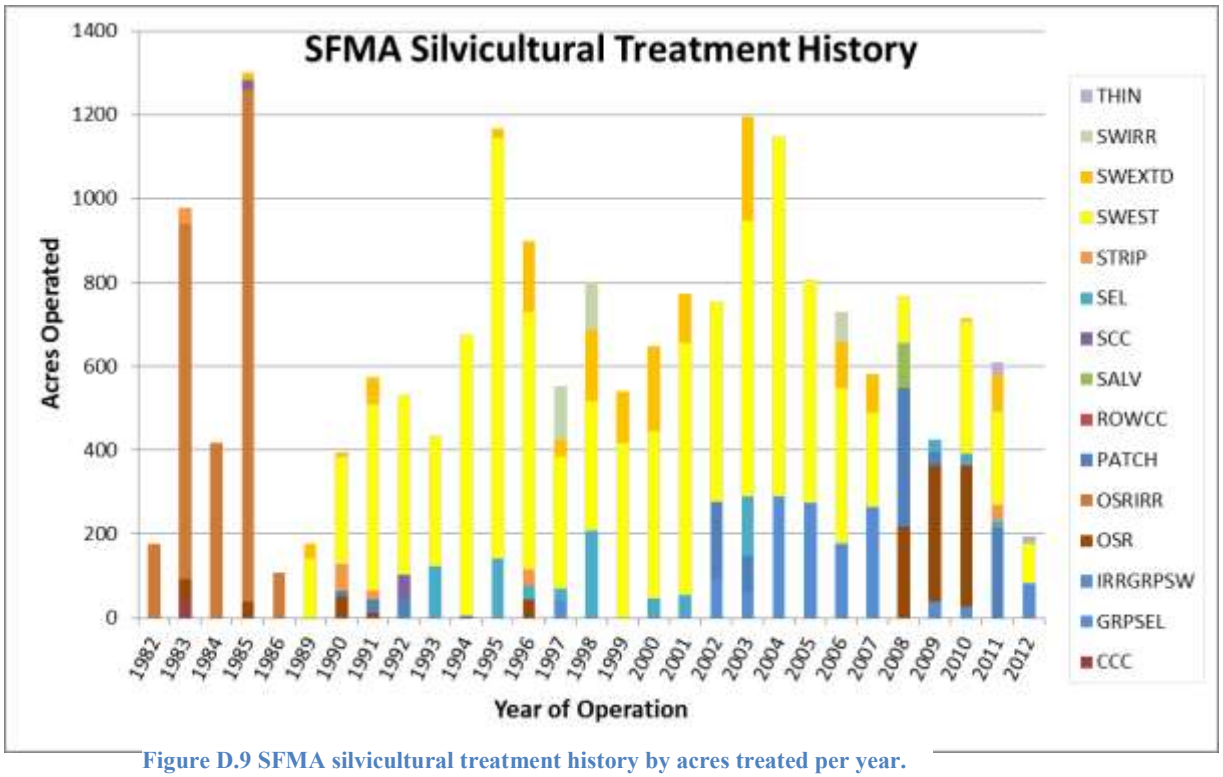


Figure D.9 SFMA silvicultural treatment history by acres treated per year.

Harvest Operations Systems:

Beginning in 1987, after an extensive survey of interested local contractors, the SFMA entered into an agreement with Randy Cyr and Sons of Sherman Mills, Maine, to provide forest operational services including harvesting and forest road construction. Initially, harvesting was accomplished with two 2-person skidder crews. Wood was limbed at the stump, yarded roadside and cut to merchantable lengths with a commercial slasher. The wood was cooperatively marketed (SFMA management worked jointly with Cyr in determining markets and negotiating with buyers) but Cyr held the contracts to deliver wood products and paid Baxter State Park stumpages rates based on the market value of each product. Discussions between Cyr, woods crews and SFMA management were on-going in the late 1980's regarding methods to improve harvesting in the SFMA. In the summer of 1990 and the winter of 90/91, the Swedish firm Rottne provided a crew and single-grip cut-to-length system (processor and forwarder) to conduct test harvests in SFMA stands. The operations were closely evaluated for site impacts, protection of retention trees and regeneration, production, cost, labor benefits and the suitability of the system to expected SFMA silvicultural needs.

After evaluation and extensive discussions between Cyr and SFMA management, Cyr proceeded with the financing and purchase of a cut-to-length system. A training plan and new pricing schedules were developed for the system and in 1992 the system began working on the SFMA. By 1994, skidders were no longer utilized and all harvested volume on the SFMA was cut-to-length. The change to this system was a complex decision and weighed numerous silvicultural, operational, labor and environmental benefits against significantly increased costs. *Cost is only one of many factors in every forest management decision; and SFMA management shall strive to measure cost carefully against the benefits of long-term investment in stand management, site protection and improved working conditions.*

In 1995, illness prompted Cyr to sell his business. It was Cyr's intent to attempt to convey the business, as wholly as possible, to a new owner who would retain the commitment, personnel and infrastructure dedicated to the SFMA. Discussions between Cyr, Pelletier Brothers, Inc., of Millinocket, and SFMA management began in early 1995 and Cyr subsequently sold the business to Pelletier Bros., Inc. In the spring of 1995, a one-year agreement was issued to Pellitier Bros. Inc. with payment negotiated on a service cost basis based on the market value of each product. In early 1996, this agreement was extended to five years. In 1997, the service cost rates were re-negotiated eliminating any differences based on individual forest products. From the perspective of field operations, the transition from Cyr to Pelletier Bros was nearly seamless, with nearly all the same personnel continuing to work on SMFA operations. This relationship has continued to the current period with Pelletier providing harvesting and trucking services for nearly all SFMA wood products. In 2012 Pelletier uses a CAT 521 processor with a fixed head coupled with an 8 wheeled Rottne forwarder capable of hauling about 5-6 cords to an average load.

Over the last decade contractors using cable skidders have conducted work on a small percentage of the land base primarily implementing gap harvests and working in conjunction with a Pelletier operated forwarder to reduce stand damage and increase efficiency. In 2012 the SFMA is in discussions with a cable skidder operator to once again have this type of harvest system in the tool box of options.

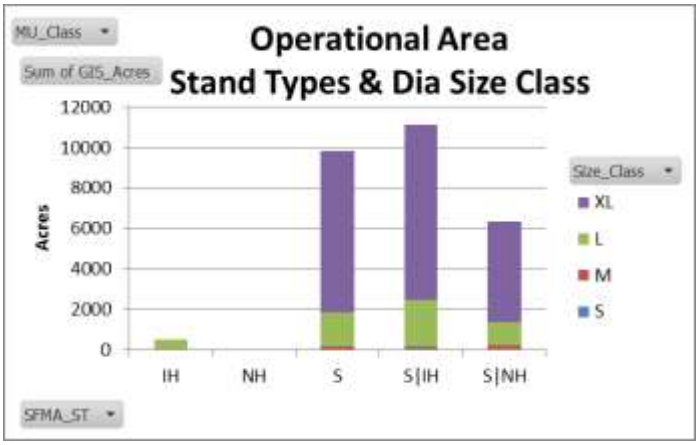


Figure D.10 Acres of operational area stand types and dia size classes.

D.7 Operational Areas

Over 50% of the SFMA is classed as operational, meaning it is open for active management. All operational areas have received some type of silvicultural treatment since the start of Park directed active management in 1981. Operational units have been delineated based on assessments of stand type lines, administrative boundaries. These areas represent all forest stand types and structural conditions. Overall stands are predominantly softwood or mixed-wood types with most acres in the large to extra-large tree diameter size class (Figure K.1). On average operation units have basal area of stems >5" dbh of around 70ft^2, with trees per acres values of 150, and 15 cords to the acre of merchantable volume (Figure D.11).

SFMA Forest Conditions by Management Class						
Row Labels	Avg BA >5 dbh	Avg BA <5 dbh	Avg TPA >5 dbh	Avg TPA < 5 dbh	Avg CordsPA	Sum TotalCords
Operational	71.1	27.5	155.8	642.3	15.1	370,248
Reserve	152.4	20.8	330.5	586.2	32.5	112,238
Riparian	121.1	14.3	211.1	464.1	26.1	118,474
Undesignated	109.5	20.5	197.6	595.2	25.0	70,747
Grand Total	**104.0**	**23.4**	**214.0**	**609.0**	**22.6**	**671,708**

Figure D.11 SFMA average forest conditions by management classes in 2012.

The age class distribution of the operational areas is heavily weighted towards mature age stand conditions. Greater than 60% of the total operational area is >90 years of age with the remaining 40% evenly split between <5, 5-15, and 15-30 year old stands (Figure D.12).

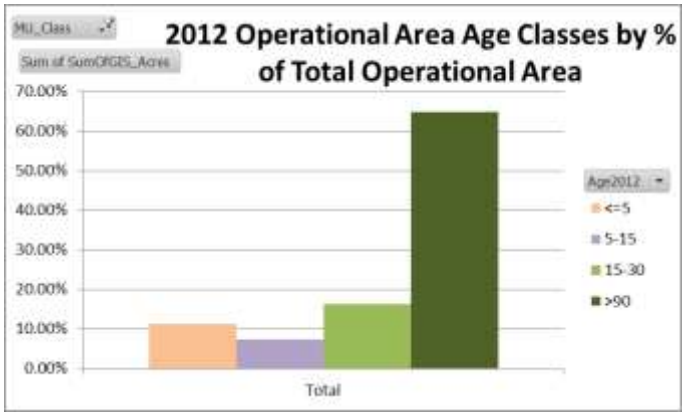


Figure D.12 2012 operational area age class distribution by percent of total area.

D.8 Riparian Management Zones

Riparian features occur throughout the SFMA, in the form of **waterbodies** and **wetlands**. From the perspective of overall resource value and diversity, riparian areas exceed all others in importance. Riparian zones provide an area for concentrated use by terrestrial wildlife, the filtering of runoff and floodwater, nesting and breeding sites for a variety of animals, and a focal point for human recreation within the SFMA. Riparian Management Zones (RMZ) are designed to help minimize and control the impact of management actions, like timber harvesting, on the natural functioning of riparian features and systems. Riparian Management Zones are more than just "stream buffers" based on a regulatory statute in the conventional forestry context.

Riparian areas protect water quality by filtering and slowing movement of spring runoff and heavy rain events and provide streamside shading, leaf litter that serves as a primary source of energy in aquatic food webs, and a source of logs that create in-stream habitat structures, thereby protecting and enhancing habitat for brook trout and other aquatic species. Many species of wildlife frequent the riparian zone, which is vital as winter deer cover, breeding habitat for migratory birds, upland habitat for wood turtles, habitat for numerous reptiles and amphibians, and general wildlife travel corridors.

In 2012 the SFMA has over 4,000 acres of RMZ distributed across the entire management area. The area is dominated by pure softwood stands, which is typical of the lowland forest around riparian features. The average forest condition is mature with trees over 14" in diameter and generally closed canopy.

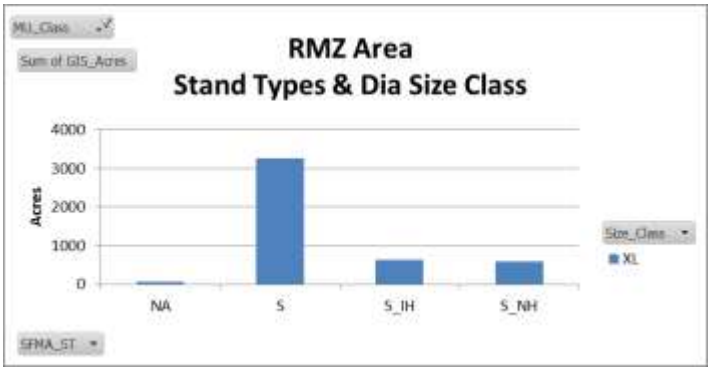


Figure D.13 RMZ stand types and tree diameter class.

D.9 Reserve Areas

Recognizing that exemplary forest management includes the identification and protection of sensitive, rare or unique forest sites and ecosystems, the SFMA includes three faceted system of set-asides within the working forest mosaic.

Three types of Reserve areas are designated in the SFMA:

Special Area Reserves
Selection Protocols: Smaller (usually <100 ac.)
Recognize sensitive, rare or unique forest types or sites
Examples: Vernal pools, enriched hardwood forests, late successional types

Ecological Reserves
Selection Protocols: Larger (usually >100 ac.)
Landscape or watershed scale area with intact ecosystem(s).
Features/sites/structures which together form exemplary and/or rare ecosystems.
May be accompanied by formal plan
Boundaries monumented in the field
Examples: Boody Brook Natural Area, Webster Ledge Reserve

Benchmark Reserves
Selection Protocols: Variable in size, generally comparable to operating block mosaic
Representative of adjacent forest types and well-distributed over the managed forest.
Area in B/R's representative of forest types on a % basis
Orientation should consider opportunities to increase connectivity and ecological integrity (late-successional development) within the forest as a whole.
Examples: Numerous – see SFMA block map – reserves

In 2012 the reserve areas are dominated by softwood intolerant hardwood (S|IH) stand types. This high percentage of S|IH type is due to the fact the large reserves in the Boody Brook are classed as S|IH. The remaining areas are evenly distributed between the pure softwood type and the softwood northern hardwood types. The vast majority of these areas are in the extra-large size class with a small percentage in the large class.

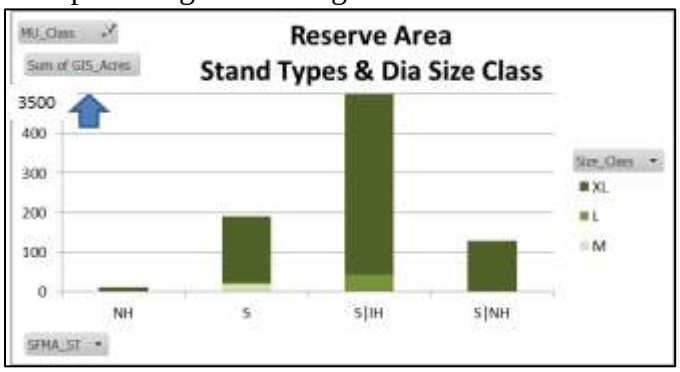


Figure D.14 Reserve area stand types and tree diameter class.

D.10 Forest Types, Stand Structures, and Age Classes

Overall the SFMA is dominated by softwood stand types that have understories with established regeneration and relatively closed overstory canopies. These conditions are common to the reserve and riparian areas as well as the operational units. As individual stands generally two age classes are present with the overstory representing the older cohort and the regeneration the younger. Overall the SFMA is dominated by mature forest over 90 years old. Much of this older forest is the result of stand replacing disturbance events that occurred at the turn of the 20th century in the form of heavy harvest and or wildfire (**Error! Reference source not found.**).

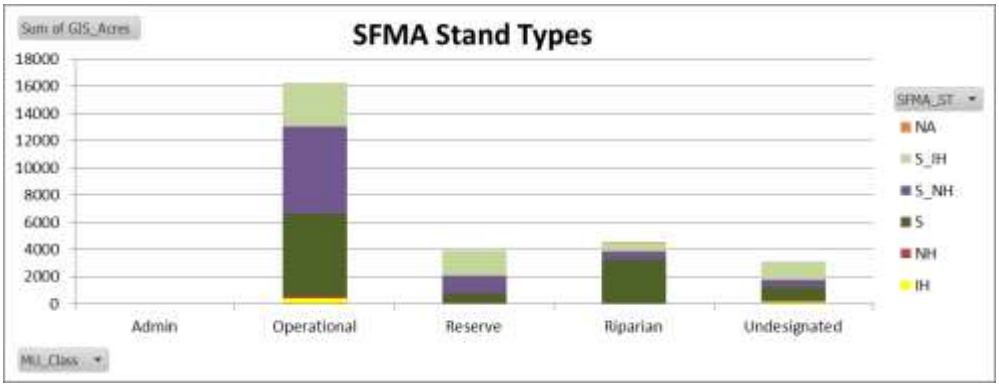


Figure D.15 2012 stand types by MU class.

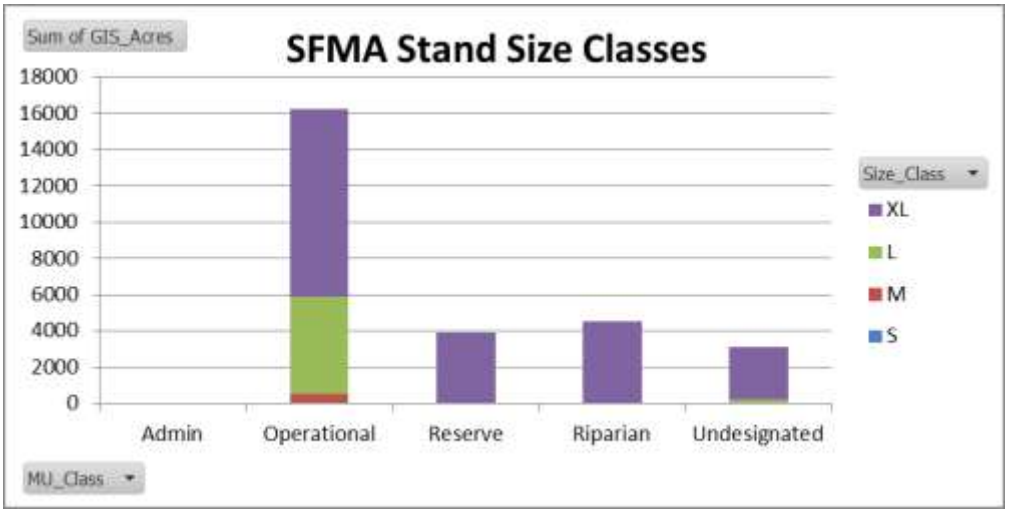


Figure D.16 2012 average tree diameter class by MU class.

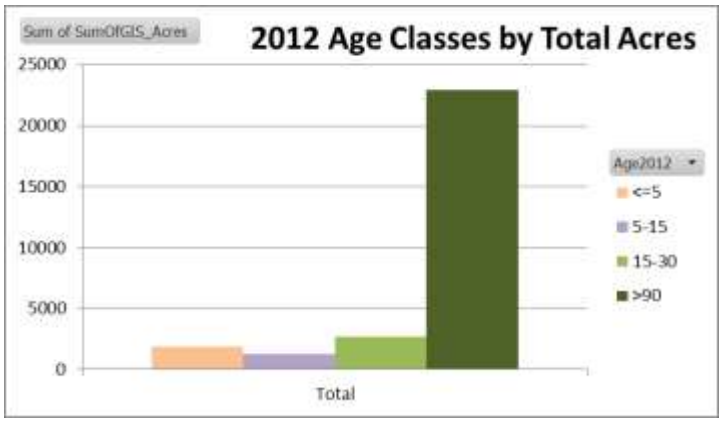


Figure D.17 2012 age class distribution for all SMFA areas.

D.11 Biodiversity, Habitat, and Forest Dynamics

The SFMA is host to a variety of natural communities and wildlife habitats all of which are influenced by and or the result of forest ecosystem dynamics. The mix of stand types and stand structures is dominated by mature softwood conditions. The concept of biodiversity is a complex one that is difficult to define. However, managing for biodiversity is a principle element of contemporary forest management.

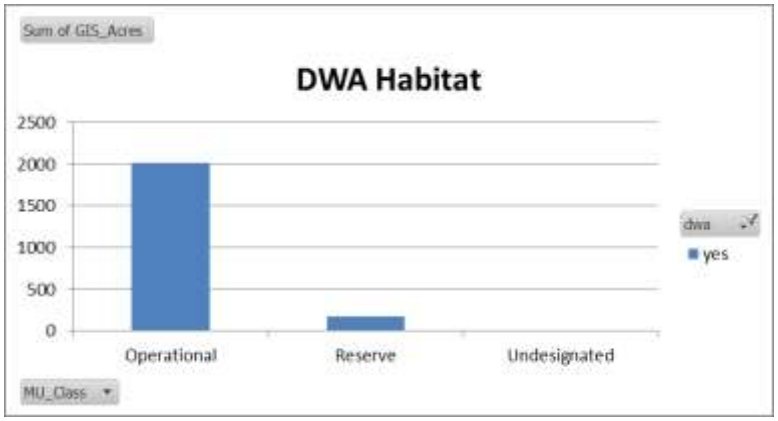


Figure D.18 Deer wintering area habitat* (note RMZ inventory data is limited and does not lead to correct classification of many stands as DWA. Current inventory efforts are designed to fix this issue.)

Approaching this issue from a landscape perspective is critical. The 1999 publication Biodiversity in the

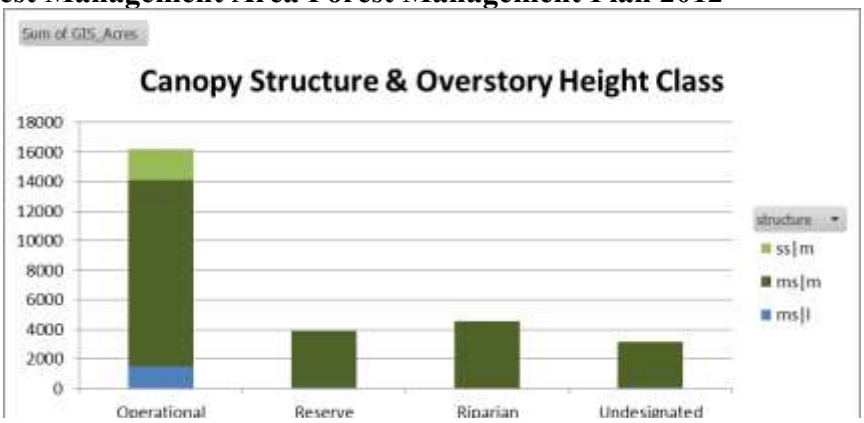


Figure D.19 2012 Canopy structure classification. (see footnote below)

Forests of Maine[29] Flatebo, Foss, and Pelletier suggest, "a primary goal for biodiversity in Maine's managed forest is to ensure that adequate habitat is present over time across the landscape to maintain viable populations of all native plant and animal species currently occurring in Maine." Biodiversity encompasses the concepts of functional wildlife habitat and forest ecosystem dynamics.

There are many metrics that can be helpful in evaluating the current forest conditions with respect to these concepts. The amount of area in suitable deer wintering area habitat (DWA) is one that is of principle concern to wildlife biologists in northern Maine. The SFMA has several thousand acres of DWA in 2012 (Figure D.18) (* Note: RMZ inventory data is limited and does not lead to correct classification of many stands as DWA. Current inventory efforts are designed to fix this issue.) Another metric involves canopy structure and canopy height. The SFMA is dominated by multi-strata structures ("MS")[30] that have average overstory tree heights between 30-70 ft. Only the operational units have conditions that vary from this dominate type.

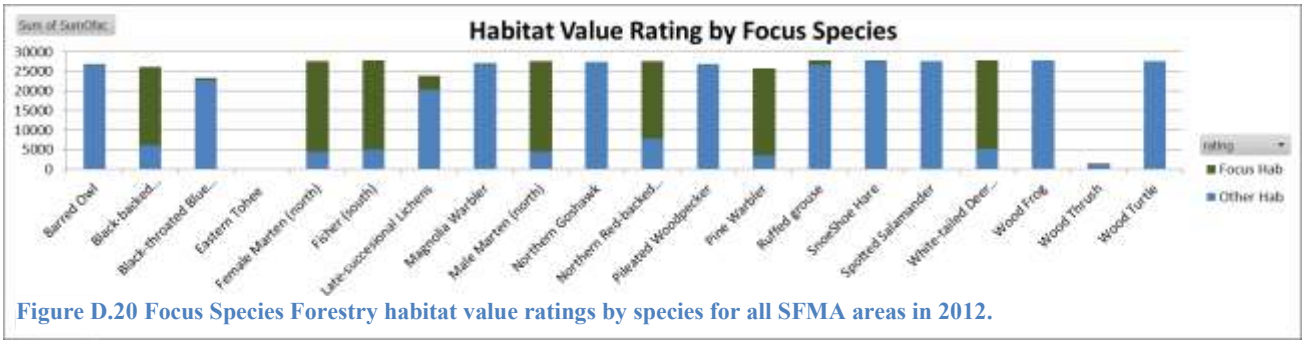


Figure D.20 Focus Species Forestry habitat value ratings by species for all SFMA areas in 2012.

A management approach developed by Maine Audubon termed Focus Species Forestry[31] (FSF) provides useful criteria for the assessment of habitat types and development stages and enables evaluations of habitat suitability for specific "focus species" based on known habitat requirements of those species. Using 2012 inventory data all SFMA stands were evaluated with the FSF system to determine the amount of acres that meet criteria as "Focus Habitat" or "Other Habitat" (Figure D.20). There are many species like martin, fisher, and black backed woodpeckers, for which a majority of

[29] Flatebo, G., C.R. Foss, and S.K. Pelletier. 1999. Biodiversity in the forests of Maine: guidelines for land management. Univ. Maine Coop. Extension Bulletin #7147. 168 p.

[30] Structure classes are adapted from the Spaulding, Griffin, and Shumaker and the Moore and George classification schemes (FTY 477, Spring 2003). The categories are single strata small (ss|s), single strata medium (ss|m), single strata large (ss|l|), multi-strata medium (ms|m), and multi-strata large (ms|l). Stands are assigned based on number of strata detected (>1, multi-strata) and the height of dominant trees (largest 50 tpa height: small <30, medium <70, large>=70).

[31] Bryan, R.R., 2007. Focus Species Forestry, a Guide to Integrating Timber and Biodiversity Management in Maine. Maine Audubon, Falmouth, ME.

the SFMA represents "Focus habitat. Other species like the magnolia warbler and ruffed grouse would find only general habitat in the SFMA. This type of analysis is fairly basic but provides an interesting perspective on the forest composition and structures present in 2012.

Ecological Monitoring

Monitoring stations to gather baseline data and long term trends regarding water and soil temperature as well as amphibian populations were established in the early 2000s. These systems are maintained annually providing a continuous stream of data that will only become more valuable over time. For more on these monitoring efforts and datasets see section F.4c of this document.

D.12 Threatened, Endangered, and Special Concern Species

Definitions from Maine Natural Areas Program (MANP) webpage[32]:

Endangered

Rare and in danger of being lost from the State in the foreseeable future, or federally listed as Endangered.

Threatened

Rare and, with further decline, could become endangered; or federally listed as Threatened.

Special Concern

Rare in Maine, based on available information, but not sufficiently rare to be considered Threatened or Endangered.

Possibly Extirpated

Not known to currently exist in Maine; not field-verified (or documented) in Maine over the past 20 years.

The SFMA is home to a variety of habitat types and natural communities. However there are very few rare, threatened and endangered species (RTES) that occur in the SFMA. In the 1980s surveys were undertaken to identify rare botanical species and catalogue wildlife species present[33](Figure D.21). These surveys found only one species of note the calypso orchid that is associated with white cedar swamps and other forested wetland habitats. In 2012 the calypso orchid species is not listed on the MNAP list of species they track with a State rank of S1-S3.

State Rarity Ranks[34]

- **S1** Critically imperiled in Maine because of extreme rarity (five or fewer occurrences or very few remaining individuals or acres) or because some aspect of its biology makes it especially vulnerable to extirpation from the State of Maine.
- **S2** Imperiled in Maine because of rarity (6-20 occurrences or few remaining individuals or acres) or because of other factors making it vulnerable to further decline.
- **S3** Rare in Maine (20-100 occurrences).
- **S4** Apparently secure in Maine.
- **S5** Demonstrably secure in Maine.
- **SH** Known historically from the state, not verified in the past 20 years.
- **SX** Apparently extirpated from the state, loss of last known occurrence has been documented.

[32] http://www.maine.gov/doc/nrimc/mnap/features/rareplant.htm%20 June 20, 2012

[33] Rooney, S.C. 1984 Special Areas Inventory Report of Compartments 5,6,and 11 of the SFMA of BSP.

[34] http://www.maine.gov/doc/nrimc/mnap/features/rank.htm June 20, 2012

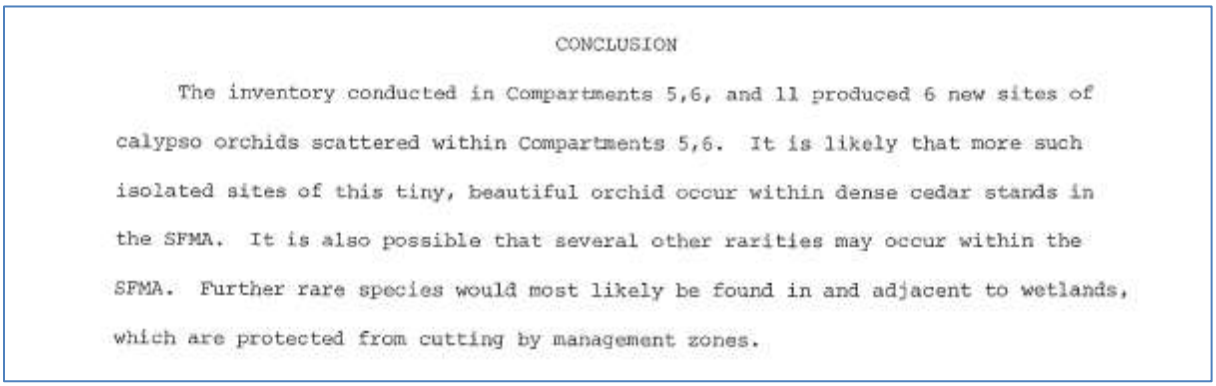
- **SU** Under consideration for assigning rarity status; more information needed on threats or distribution.
- **S#?** Current occurrence data suggests assigned rank, but lack of survey effort along with amount of potential habitat create uncertainty (e.g. S3?).

Note: State Rarity Ranks are determined by the Maine Natural Areas Program.

State Legal Status

- **E** ENDANGERED; Rare and in danger of being lost from the state in the foreseeable future; or federally listed as Endangered.
- **T** THREATENED; Rare and, with further decline, could become endangered; or federally listed as Threatened.

Note: State legal status is according to 5 M.R.S.A. 13076-13079, which mandates the Department of Conservation to produce and biennially update the official list of Maine's Endangered and Threatened plants. The list is derived by a technical advisory committee of botanists who use data in the Maine Natural Areas Program's database to recommend status changes to the Department of Conservation.



CONCLUSION

The inventory conducted in Compartments 5,6, and 11 produced 6 new sites of calypso orchids scattered within Compartments 5,6. It is likely that more such isolated sites of this tiny, beautiful orchid occur within dense cedar stands in the SFMA. It is also possible that several other rarities may occur within the SFMA. Further rare species would most likely be found in and adjacent to wetlands, which are protected from cutting by management zones.

Figure D.21 Quote from 1984 Ecological survey of the SFMA.

Canada Lynx

The Canada lynx was federally listed as threatened species in 2000 across all lower 48 states including Maine in Piscataquis County. Lynx populations in northern Maine are likely to be quite variable based on proximity to desired habitat. Simmons in a 2010 dissertation on Lynx and Martin habitat estimated lynx densities of between 0.4 and 2 animals per 100km^2. The likely density of lynx in the SFMA is on the low end of that range as the habitat of their principle prey species, snowshoe hare, is not abundant in the SFMA.

"Habitat is widespread through northern Maine and includes large areas of young, dense stands of spruce and fir approximately 12-30 years after a major forest disturbance (clearcutting, fire, insect damage). These stands have dense understory vegetation that support high densities of snowshoe hares. Habitat conditions were close to ideal in Maine in the late 1990s and early 2000s as the widespread clearcuts of the 1970s and 1980s attained prime conditions for snowshoe hares. As stands mature and snowshoe hare numbers decline, lynx populations are expected to decline. Lynx habitat used today will not be prime habitat 10 or 15 years later. Careful forest planning is needed to ensure that large areas of regenerating conifers are present on the landscape to preserve populations of lynx and snowshoe hares."[35]

Based on 2012 inventory data the stand structure that comes closest to that desired by snowshoe hare is classed as single strata and moderate height >30ft and<70ft (SS|M). A SS|S rating would be the idea structure class and based on current inventory that condition is very limited. Anecdotally this stand structure does exist in recent OSR treated stands with dense softwood regeneration. However, the area in this condition is likely less than 1000 acres across the entire SFMA. Much more desirable habitat exists outside the SFMA where past management activities have produced ideal stand structures.

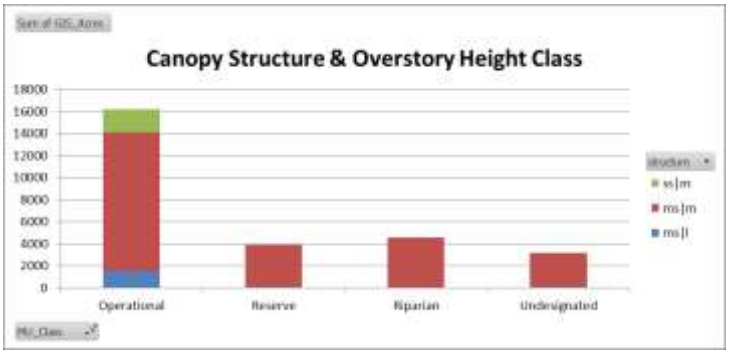


Figure D.22 Canopy structure in all SFMA areas, SS|M is best lynx habitat noted in 2012 inventory data.

Atlantic Salmon

Atlantic Salmon were federally listed as an endangered species in December 2000. The habitat for this species includes the Gulf of Maine as well as the watersheds of many of central, eastern, and northern Maine rivers. The Penobscot River is one of the largest and most important rivers and watersheds for the species. The habitat requirements of Atlantic Salmon are described in the detail in the species recovery plan from 2005.

"*The Atlantic salmon is an anadromous fish, typically spending 2-3 years in freshwater, migrating to the ocean where it also spends 2-3 years, and returning to its natal river to spawn. Suitable spawning habitat consists of coarse substrate (gravel or rubble) in areas of moving water. Eggs*

[35] http://www.fws.gov/mainefieldoffice/Canada_lynx.html June, 20, 2012

incubate slowly due to cold winter water temperatures, hatch in March or April and become fry. Fry remain buried in the gravel for about six weeks. The fry emerge from the gravel about mid-May and start feeding on plankton and small invertebrates. Emergent fry quickly disperse from the redd, develop parr marks along their sides and enter the parr stage. Parr habitat (often called "nursery habitat") is typically riffle areas characterized by adequate cover (gravel and rubble up to 20 cm), moderate water depth (10-60 cm) and moderate to fast water flow (30-90 cm/sec).

Salmon parr spend two to three years in the freshwater environment then undergo a physiological transformation called smoltification that prepares them for life in a marine habitat. Atlantic salmon leave Maine rivers in the spring and reach Newfoundland and Labrador by mid-summer. They spend their first winter at sea in the area of the Labrador Sea south of Greenland. After the first winter at sea, a small percentage return to Maine while the majority spend a second year at sea, feeding off the southwest or (to a much lesser extent) southeast coast of Greenland. Some Maine salmon are also found in waters along the Labrador coast. After a second winter in the Labrador Sea, most Maine salmon return to rivers in Maine, with a small number returning the following year as three sea winter (3SW) fish.

The habitat within the range of the DPS is generally characterized as being free-flowing, medium gradient, cool in-water temperature and suitable for spawning in gravel substrate areas. The watershed structure, available Atlantic salmon habitat, and abundance of Atlantic salmon stocks at various life stages are best known for the seven largest salmon rivers with remnant Atlantic salmon populations. There is less known about the habitat of smaller rivers within the historic range of the DPS, with the exception of Cove Brook."[36]

The East Branch of the Penobscot River is considered critical habitat and the SFMA is entirely within the East Branch watershed. However, the falls at grand pitch on Webster Stream are considered a natural barrier to upstream passage and thus Webster Stream does not provide active habitat. However the portion of Brayley Brook that flows through the north west corner of the SFMA is considered as habitat since it flows into the passable stretch of the East Branch upstream of Matagmon Lake. There is only one significant road crossing along this stream in the SFMA occurring on the Brayley Brook Road.

D.13 Forest Protection

D.13a Native Pest and Pathogen

Spruce Budworm:

[36] National Marine Fisheries Service and US Fish and Wildlife Service. 2005. Recovery Plan for the Gulf of Maine Distinct Population Segment of Atlantic Salmon. National Marine Fisheries Service Silver Spring MD.

The spruce budworm (*Choristoneura fumiferana*) has long been a part of SFMA forest ecology. Stand development in the SFMA consistently reveals the impacts of the spruce budworm outbreak of 1916-1920 and cores of older trees often indicate a possible earlier episode in the mid 1800's. As with most of Maine, the forest stands of the SFMA were significantly changed by the spruce budworm (SBW) outbreak of 1972-84. Susceptible stands on the SFMA were treated by aerial spraying of insecticides, primarily utilizing initial formulations of the biological insecticide *Bacillus thuringensis* or "BT". So strong was the concern that the initial SFMA management plan of 1980 proposed an accelerated road construction and harvest plan targeting the forest-wide harvest of all merchantable fir in 10 years. Most land managers had similar plans and the market was soon glutted with salvage volume and consequently little harvesting actually took place on the SFMA. Rough comparisons of unharvested stands cruised in the 1990's with similar stands cruised in 1978 indicate a drop in percentage of stand basal area occupied by balsam fir from 32% to 7% over the period. The majority of this change was probably due to the spruce budworm.

Maine Forest Insect Pests	
Exotic Invasive	
Insects-Softwood	**Insects-hardwood**
Balsam Woolly Adelgid	Asian Longhorned Beetle
Brown Spruce Longhorn Beetle	Emerald Ash Borer
European Woodwasp	Gypsy Moth
Elongate Hemlock Scale	

Figure D.23 Exotic Invasive forest pests in Maine.

Maine Forest Insect Pests	
Native	
Insects-Softwood	**Insects-hardwood**
Aphids	Aphids
Browntail Moth	Browntail Moth
Balsam Twig Aphid	Birch Casebearer
Browntail Moth	Birch Leafminer
Elm Leaf Beetle	Bruce Spanworm
Cooley Spruce Gall Adelgid	Gypsy Moth
Eastern Spruce Gall Adelgid	Carpenterworms
European Pine Shoot Moth	Elm Leaf Beetle
Hemlock Borer (USFS)	Fall Cankerworm
Hemlock Looper	Hickory Tussock Moth
Hemlock Woolly Adelgid	Maple Bladder Gall Mite
Introduced Pine Sawfly	Oak Leaf Tier
Pine Leaf Adelgid	Oak Twig Pruner
Pine Shoot Beetle	Orangehumped Mapleworm
Pine Spittlebug	Saddled Prominent
Saratoga Spittlebug	Satin Moth
Sawflies, other	Scale insects
Scale Insects	Forest Tent Caterpillars
Spruce Beetle	Variable Oakleaf Caterpillar
Spruce Budworm	
White Pine Weevil	
Yellowheaded Spruce Sawfly	

Figure D.24 Maine native forest insect pests.

> *"In spite of research on the epidemiology of this insect (spruce budworm) over the last 60 years, there is still no generally accepted, single hypothesis explaining the initiation and collapse of outbreaks."* [37]

Although there is much uncertainty regarding the population dynamics of the SBW, there seems to be universal agreement that the insect will eventually return to Maine softwood forests. Various predictions indicate an expected renewal of SBW activity as early as 2005 or as late as 2025.

Other Forest Pests:

[37]L. Irland, J. Dimond, J. Stone, J. Falk, E. Baum. 1988. The Spruce Budworm Outbreak in Maine in the 1970's-Assessment and Directions for the Future, Maine Agricultural Exp. Sta Bulletin No. 819, Pg 4

Numerous other species of forest pests are present in the State and region. Most of these do not rise to the same level of importance as spruce budworm but they are a basic part of the forest ecosystem and influence forest dynamics. Figure D.25 lists the known species in Maine.

Figure D.25 MFS Gypsy Moth quarantine area map.

D.13b Exotic/Invasive Species

Invasive Insects:

North America seems awash in invasive exotic insect species that pose dramatic threats to forest structure and composition as we know it. Ranging from Asian Longhorn Beetle to the Gypsy Moth these species represent a serious threat to forest health (Figure D.23). With the exception of Gypsy moth none of these species have been recorded as present in the SFMA. However if the steady march of these species in the direction of the SFMA is an indication it may just be a matter of time. The presence of Gypsy Moth in the SFMA has led to the inclusion of the entire BSP area in the State Quarantine area.

Invasive Vegetation:

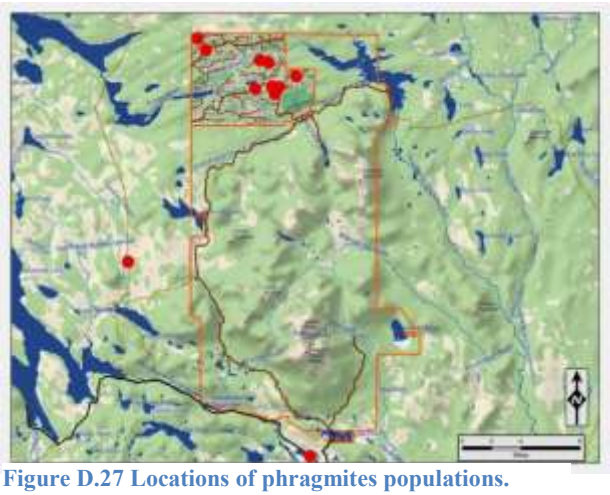


Figure D.27 Locations of phragmites populations.

Terrestrial	
Scientific Name	**Common Name**
Alliaria petiolata	Garlic mustard
Ampelopsis brevipedunculata	Porcelainberry
Berberis thunbergii	Japanese barberry
Cabomba caroliniana	Fanwort
Celastrus orbiculata	Asiatic bittersweet
Cynanchum louiseae	Black Swallowwort
Eleagnus angustifolia	Russian Olive
Eleagnus umbellata	Autumn Olive
Fallopia japonica	Japanese knotweed
Frangula alnus	Glossy buckthorn
Hydrilla verticillata	Hydrilla
Lonicera morrowii	Morrow honeysuckle
Lonicera tartarica	Tartarian honeysuckle
Microstegium vimineum	Japanese stilt grass
Polygonum perfoliatum	Mile-a-minute weed
Ranunculus ficaria	Lesser celandine
Rhamnus cathartica	Common buckthorn
Rosa multflora	Multiflora or Rambler rose

Figure D.26 Terrestrial invasive species in Maine.

Northern Maine rests at on the edge of an extensive and serious invasion of exotic invasive vegetation populations in southern Maine and western New England. To date these species have generally not established substantial populations north of the Millinocket area. However, there are small and scattered populations of phragmites australius or common reed in the SFMA and along the western Park boundary (Figure D.27). These populations are along roadside ditches and most likely are the result of contaminated soil being moved to the site on road building or harvesting equipment.

Small populations of other exotic invasive species exist along the Route 11 corridor including honeysuckle and knotweed.

*(Footnote for Figure D.26 and Figure D.28[38])

Wetland/Aquatic	
Scientific Name	**Common Name**
Egeria densa	Brazilian waterweed
Lythrum salicaria	Purple loosestrife
Myriophyllum spicatum	Eurasian milfoil
Phragmites australis	Common reed
Trapa natans	Water chestnut
Myriophyllum heterophyllum	Variable-leaf milfoil

Figure D.28 Aquatic invasive species in Maine.

D.13c Atmospheric Pollution

Recent research indicates that precipitation based acid deposition levels have decreased over recent decades.[39] Similarly acidity levels of Maine Lakes have also decreased. The implications of these changes for ecosystem health and stability are uncertain. However, this likely represents a reduction of acidity levels that were blamed for regional tree species declines in the 1980-90's.

D.13d Climate Change

Recent increased public awareness and scientific knowledge surrounding climate change has surged to the forefront across the globe. Climate change presents a new challenge to foresters tasked with managing forest resources for multiple objectives. To date, management planning has involved predictions of future stand structure, composition, and economic value, but going forward these elements must be considered in light of the potential for climate changes during the span of a single rotation. There are many predictions regarding the potential future consequences of a warming world climate. Discussion of management responses to climate change is contained in section F.5d.

Recent research indicates an increase in air temperature of 1.1°C from 1950–2006.[40] This increase in temperature has accompanied a region wide increase in summer rainfall and base river flows over the same period. These flow increases have been more pronounced in the period from 1950–2006 than from 1930–2006. These are regional averages, the research indicates that Maine has received lower precipitation levels than other parts of the Northeast. This lower precipitation coupled with increase temperature has led to reduced summer flows, likely due to increased levels of evapotranspiration with the higher temperatures. These research results seem to support anecdotal observations of warmer temperatures especially in winter and shoulder seasons, and of increased intensity of rain events.

D.13e Wildland Fire

Wildland fire is a relatively rare occurrence in northern Maine with large events separated by decades rather than in individual years. However when the combination of low moisture levels, combustible fuels, and an ignition source align regions forests a quite susceptible to significant fire

[38] http://www.maine.gov/doc/nrimc/mnap/features/invsheets.htm June 19, 2012

[39] SanClements M.D., Gretchen P. Oelsner G.P., McKnight D.M., John L. Stoddard J.L., and Nelson S.J. New Insights into the Source of Decadal Increases of Dissolved Organic Matter in Acid-Sensitive Lakes of the Northeastern United States. *Environ. Sci. Technol.*, **2012**, *46* (6), pp 3212–3219

[40] Hodgkins, G. A. and R. W. Dudley (2011), Historical summer base flow and stormflow trends for New England rivers, *Water Resour. Res.*, 47, W07528, doi:10.1029/2010WR009109.

events. While large areas of the SFMA were burned in a series of large fire events in the early 20th century no significant events have occurred since. A 3,000 acre fire occurred in 1977 around Abol Pond with Baxter State Park. This fire began in an extensive area of blowdown timber that had been down and drying for several years. A dry summer and lightning strike provided the other necessary ingredients. This type of scenario could easily be replicated in the SFMA and thus awareness of current weather and fuel conditions is necessary. A comprehensive fire management plan has been developed for all of Baxter State Park including the SFMA.

D.14 Management Access & Facilities

Forest Management Roads

There are currently 70 miles of forest management roads on the SFMA. Access to the SFMA has been developed from two discrete points of entry, north and south of the Webster Lake/Webster Stream watershed that divides the SFMA. A self-registration station at each entrance point provides an opportunity to educate the visitor and catalog use levels to guide management decisions. The bi-polar nature of the access systems in the SFMA (separate systems north and south of the Webster waterway) is a product of the last planning period decision to protect the pristine nature of Webster Stream. Additional experience and consideration of this issue has only strengthened this decision: *the development of forest access in the SFMA shall not include bridging or impacting the Webster Stream corridor with vehicular access.*

The high construction cost of forest roads, especially in remote regions such as the SFMA, provides a strong incentive to maintain the total miles constructed at a level that is adequate but not excessive. During the "development stage" of forest access on the SFMA, (1980-2008), road construction costs accounted for about 40% of annual expenditures. After this initial period of construction, anticipated that road maintenance costs will require about 15% of annual expenditures. The incentive to minimize road miles is countered by the well-documented relationship between average yarding distance required to transport forest products to roadside and logging costs- the longer the yarding distance the higher the costs. Although not a linear relationship (costs usually escalate dramatically after a certain threshold distance is exceeded), the relationship is highly dependent on the type, method and application of logging system used. A strong factor in the decision to implement the current harvesting systems in use on the SFMA was the tendency of forwarder-based systems to minimize (but not eliminate) the effects of yarding distance on

SFMA Area	Count of Rd	Total Rd Miles	Min Rd Length Miles	Max Rd Length Miles	Traffic Type Allow	Road Class
North End	18	15.6	0.2	1.9	FootTraffic	4WD
North End	13	9.2	0.2	1.9	Vehicle	4WD
North End	1	7.5	7.5	7.5	Vehicle	IMPROVED GRAVEL
Subtotal	**32**	**32.3**	**2.6**	**3.8**		
South End	18	20.0	0.1	4.0	FootTraffic	4WD
South End	1	0.1	0.1	0.1	FootTraffic	GRAVEL
South End	1	0.2	0.2	0.2	FootTraffic	IMPROVED GRAVEL
South End	18	19.4	0.1	3.2	Vehicle	4WD
South End	1	12.7	12.7	12.7	Vehicle	IMPROVED GRAVEL
Subtotal	**39**	**52.4**	**2.6**	**4.1**		
Total	**71**	**84.7**	**2.6**	**3.9**		

Figure D.30 SFMA Road mileage data.

Total SFMA Acres (Less water areas)	**29,236**
Total ROW Acres	**517**
% Area in ROW	**1.8%**
Acres/ Rd Mile	**345.0**
Acres/ Rd Mile (Less RMZ acres)	**291.4**

Figure D.29 Road area/mile statistics.

logging costs. Yarding distances in these compartments are quite variable (up to 2,500 feet in some cases), but on average have been acceptable for the current harvesting systems.

Road density is usually measured as a percentage of the land surface covered by roads. On the SFMA, road development is nearly complete. An examination of the amount of area in roads reveals the following statistics depicted in Figure D.29. Total area in ROW is less than 2.0% which is 0.7% less than was predicted in the 1998 management plan. Using the total SMFA acreage (less water acres) there are 345 acres for every mile of road or 291 acres if RMZ area is deducted from the total acres figure.

Management Facilities

The SFMA is in a remote part of the north Maine woods requiring over 1.5+ hours of driving time for those traveling from the Millinocket Area. Contractors and BSP staff working in the SFMA must often stay overnight in order to reduce time lost during commuting. There are 3 facilities in the SFMA: The BSP ranger camp on Webster Lake, the Hemlock Camps off the Wadleigh Mt Road and the North End Camps off the Brayley Ridge Road. The Hemlock and North End camps are outfitted with generators for electricity, drilled wells, gas appliances and heat, and satellite internet service. The Webster Lake camp has a small solar system used to power a base radio system for communication to other Park locations. The camp can also be accessed via a foot trail from the north on the Webster Ledge Road or via boat on Webster Lake. Park staff primarily access the camp using a small power boat stored near the west spur of the Fishhawk Road.

D.15 Public Recreation Use

While the SFMA is principally intended to serve as a demonstration forest there are many recreational uses and users of the area. Over 20 miles of hiking trails cover the SFMA providing remote backpacking and hiking opportunities where gently rolling hills contrast with the rugged terrain of much of the rest of the Park. Overnight camping is permitted at 4 backcountry lean-tos on Webster Lake, Webster Stream, Hudson Pond, and Frost Pond. Hunting and fishing are by the far the most popular recreational activities in the SFMA. Fishing opportunities on the large ponds especially Webster Lake and Frost Pond are attractive and often involve area guides and clients that arrive via float plane to Webster or Matagamon Lakes. Hunting primarily occurs during the months of October and November with deer season being the most popular. A self-registration system on both the Wadleigh Mt and Brayley Ridge Roads requires visitors to sign in providing information on their name, vehicle, and planned activity. Statistics on these registrations have been maintained since the year 2000 and earlier.

The Park has maintained administrative access to the SFMA road system from the Park Tote Road since 2005. This year, the Baxter State Park Authority will be initiating a trial change in access to the SFMA to provide reasonable SFMA access to hunters entering the Park through Matagamon Gate. On or before October 1, 2011, the gates on the Lynx Road will be opened to public access. The Lynx Road is located on the Park Tote Road between Trout Brook Crossing and Wadleigh Brook and connects the Park Tote Road to the Wadleigh Brook Road in the SFMA. This access will include approximately four miles of the Wadleigh Mountain Road back to a newly installed gate at the junction of the Wadleigh Mountain Road and the Frost Pond Road. Hunters accessing the SFMA via the Telos Road and Useless Roads (private) will have access on the Wadleigh Mountain Road east to the Frost Pond Road junction. This change in access will be in place for a two year trial period

though 2012, when the Baxter State Park Authority will consider the impacts of this change and options for future management.

Hiking

The SFMA currently maintains 16 miles of hiking trails including most of the Freezeout Trail and the Wadleigh Brook Trail. This trail system provides access from a drive-in campground at Trout Brook Farm and a trailhead on the Park Tote Road just west of Trout Brook Crossing to a long loop hike through the heart of the SFMA. Trails provide Park hikers with access to campsites within the SFMA including a lean-to and a tent site at Webster Lake, a lean-to along Webster Stream, and a new lean-to at Hudson Pond. In addition to trail access sites, Baxter State Park/SFMA maintains and administers reservations for two additional tent sites on Webster Lake outside of the Park boundaries on land administered by the Bureau of Parks and Lands (through a formal agreement). Although the lean-to at Hudson Pond is moderately accessible from an SFMA forest management road, the primary purpose of all lean-tos and tent sites on the SFMA is to provide rustic stopover points as part of a 2 or 3 day backcountry trip. The SFMA provides one of the few places in Baxter State Park that hikers can plan a multi-day loop trip in moderate terrain.

Canoeing:

Webster Stream is a moderate stream running from 90 to 600+ cubic feet of water per second and provides one of the best remote whitewater canoeing opportunities in Baxter State Park. The stream is roughly 9 miles in length, with 6 miles inside the SFMA boundary. Webster Stream offers a variety of canoeing water with the first 3 miles as class intermittent class 1 and 2 rock gardens grading to 3 miles of quickwater and then abruptly changing to a final 3 miles which includes 8 ledge drops up to class 4. Near the outlet of Webster Stream, at the confluence with the East Branch of the Penobscot and Second Lake Matagamon, exists an un-runnable falls known as Grand Pitch. Webster Stream is well known as a leg of Henry David Thoreau's trip in 1848 with Penobscot Indian guide Joe Poulis. Webster was a difficult enough endeavor that Polis insisted that Thoreau walk while he canoed the stream with water he termed "ver strong".[41]

Streamflow is influenced by rainfall and snowmelt and by gate adjustments at Telos Dam, which feeds 3 mile long Webster Lake from the west via the 1/2 mile long man-made Telos canal. The dam is controlled by the Bangor Hydoelectric Company and serves as the upper end of an extensive water storage system extending up the east branch of the Penobscot, through First and Second Matagamon Lakes, Webster Stream and Webster Lake. Water releases by Bangor Hydro usually occur predictably in the early fall (mid-September) and mid-winter (February). The length and degree of the release is heavily dependent on pond levels in Telos Lake and seasonal temperature and precipitation patterns. Heavy releases can produce flow rates in Webster Stream above 600 cf/sec and at these levels canoeing by any parties is strongly discouraged. In the past, Bangor Hydro maintained a dam keeper at the Telos site, and the gates would occasionally be opened slightly to provide water for passing canoe parties to make the run down Webster Stream during low flow periods in the summer. The residence at Telos Dam was vacated in 1993 since that time dam adjustments have been

[41] Pg 180, The Maine Woods, Henry David Thoreau, Arranged with notes by Dudley C. Lunt, Bramhall House, 1950.

made by individual visits. Currently, typical summer practice is to maintain the flow at a stable, but minimal rate of between 90-130 cf/second. This flow rate approximates natural conditions in the watershed.

Canoeing use is greatest during the spring and early summer months. For many years, either the National or Maine High Adventure arm of the Boy Scouts of America has maintained a summer base lodge on Grand Lake Matagamon. The Telos-Webster Stream trip has been a regular and repeated trip for scout crews staying at Matagamon in July and August and this traffic comprises about 50% of the total summer recreational traffic on Webster Lake. Due to the regular and organized nature of the use and the fact that scout trips generally involve groups of 10-12, the Park Director responded to a request in the mid 1980's for a reserved site in the Webster watershed for High Adventure use by authorizing the High Adventure use of an old logging landing on the north shore of Webster Stream about 1 mile from the outlet of Webster Lake. This designated site was moved in the early 1990's to a former tent site on the south shore of Webster Lake about 1/4 mile east of the Park boundary.

Traditionally, the Webster Stream canoe trip has been a remote trip of at least 2 days duration beginning on Telos Lake or at the "thoroughfare" between Telos and Chamberlain Lakes at Chamberlain Bridge and ending at Matagamon landing near the eastern end of Grand Lake Matagamon. Longer trips could include the East Branch of the Penobscot and continue on to Medway. Current Park policy requires canoeists running Webster Stream to reserve a site on Webster Lake and begin running the stream no later than 10:00 am to ensure time to reach Matagamon Landing or a campsite on Matagamon Lake. This trip requires either guide service assistance or a day's time to shuttle equipment and vehicles at the beginning or end of a trip.

The development of forest management access on the SFMA presents a continuing opportunity to provide easier access to Webster Stream to reduce shuttling and trip time or provide a simpler day trip. This is a complicated issue concerning the intensity, type and orientation of recreational use as well as administrative access control of the watershed and has been the subject of considerable discussion by SFMA Advisors and Park staff. *Based on these discussions and the donor Percival Baxter's intentions regarding the use of Park resources, it is the intent of SFMA management to maintain the traditional, remote nature of Webster Stream and to provide only trail or foot traffic access to the Webster Stream corridor.*

Fishing

Webster Lake (338 acres BSP/188 acres DOC) and Stream provide popular destinations for anglers and are open to general law fishing with a length/species slot restriction on Webster Lake and a catch limit in Webster Stream. These regulations were developed in cooperation with IF&W fisheries biologists based on fish surveys and estimates of use levels with the objective of maintaining healthy native populations, species diversity, and a quality fishing experience for the user. Webster Lake holds healthy populations of brook trout and togue as well as cusk and other species(see data in appendix). Walk-in anglers and trail system hikers apply moderate pressure to Webster Lake and about the first 1/2 mile of Webster Stream during May, June and September.

Park policy requires floatplane pilots intending to access Baxter State Park via Matagamon, Webster or Nesowadnehunk Lakes to notify Park Headquarters 24 hours in advance of the visit. Adherence to this policy is not consistent and Park management will

consider a variety of tools, including communication and enforcement, to improve compliance with this policy. SFMA management shall continue to evaluate the potential for conflicts with float plane and camping use at the Webster Outlet site and consider options for more appropriate float plane use that mitigates or eliminates these conflicts.

Forest management roads and the construction of the Wadleigh Brook Trail have improved the access to Hudson Pond (123 acres) and the potential is likely that fishing use on this formerly very remote pond will increase in the years ahead. Although stable native populations exist in Hudson Pond, the pond is not a naturally productive fishery and should be carefully monitored to evaluate the effect fishing pressure may have on the stability of natural populations. (See sec. D.3., Wildlife Management Actions)

Remoteness, depth, and a lengthy period of brook trout stocking of over 20 years by IF&W of Frost Pond (41 acres), have combined to produce a high-quality fishery for brook trout. Frost Pond has limited reproductive habitat for brook trout and a break in the stocking schedule confirmed that the trout population would eventually collapse without stocking (Mike Smith, personal communication). The quality of the fishery and the proximity of Frost Pond to Grand Lake Matagamon have resulted in impromptu clearing and brushing for access trails from visitors using boats or floatplanes to reach the departure point on Matagamon's south shore.

The development of forest management roads will eventually increase the potential for foot or vehicle access to Frost Pond from the west. *It is the objective of SFMA management to maintain the remote character and quality of Frost Pond*. In this regard, road access will be terminated as far from the Frost Pond riparian zone as possible and the implementation of road blockages and/or winter only access roads will be utilized in the vicinity of Frost Pond.

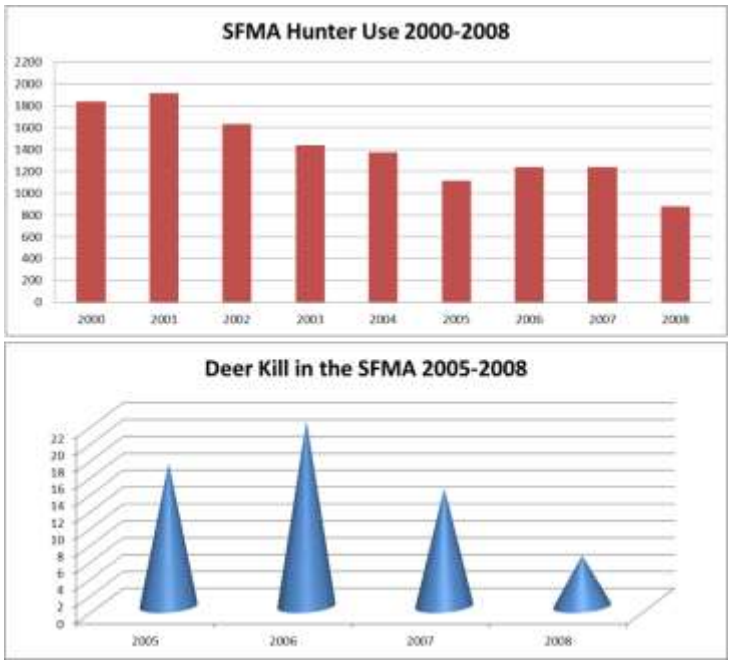


Figure D.31 SFMA hunting use statistics.

Hunting/Trapping

On a user-day basis, hunting/trapping comprise the major recreational use of the SFMA. In 1990, a self-registration system was installed on the two vehicular access points on the western edge of the SFMA to monitor recreational use of the SFMA. During that decade hunter use increased on the SFMA with 1997 data reaching a record 1,503 hunter-days. We suspect that part of the increase is result of communication with users on the regulations requiring self-registration prior to entering the SFMA. In 1990, many users failed to register and had to be reminded of the requirement. Currently, as a result of persistent communication efforts by Park staff, today's users seldom fail to register. Registration problems notwithstanding, the bulk of the increase since 1990 reflects increasing access to areas within the SFMA and the growing popularity (coincident with probable increases in deer populations) of the SFMA with local hunters. In the last decade hunting use

has declined. This is consistent with national trends. The low deer harvests across Maine in recent years has not served to change this trend.

For most hunters using the SFMA, hunting use involves significant vehicle use. We have noted that even during busy periods of hunting use, it is rare to encounter a hunter in the forest more than 1/4 mile from an accessible road. Communication with hunters during the season has indicated that at least some percentage of the users would encourage management to consider closing a significant portion (10-20%) of the SFMA to vehicle access in order to provide an area for a remote, uncrowded hunting experience.

During hunting season, the significant use of personal vehicles poses a threat to new forest road construction completed during the summer months. Forest road construction completed earlier in the year usually softens substantially during the fall rains of November and becomes subject to substantial rutting and damage from unrestrained vehicle use. *To protect new road construction from damage from vehicle use, new road construction of the current year is closed to all access by October 1st.* Closure is effected by placing a large rock or a log across the road with a sign displaying the message "Road Open to Foot Traffic Only". Log truck traffic on new road construction during the following summer compacts the road surface and normally permits all season use of the road during the following fall.

The Park has maintained administrative access to the SFMA road system from the Park Tote Road since 2005. This year, the Baxter State Park Authority will be initiating a trial change in access to the SFMA to provide reasonable SFMA access to hunters entering the Park through Matagamon Gate. On or before October 1, 2011, the gates on the Lynx Road will be opened to public access. The Lynx Road is located on the Park Tote Road between Trout Brook Crossing and Wadleigh Brook and connects the Park Tote Road to the Wadleigh Brook Road in the SFMA. This access will include approximately four miles of the Wadleigh Mountain Road back to a newly installed gate at the junction of the Wadleigh Mountain Road and the Frost Pond Road. Hunters accessing the SFMA via the Telos Road and Useless Roads (private) will have access on the Wadleigh Mountain Road east to the Frost Pond Road junction. This change in access will be in place for a two year trial period though 2012, when the Baxter State Park Authority will consider the impacts of this change and options for future management.

Considering the relatively intensive use of the SFMA by hunters over the last decades, only minor instances of resource abuse have been noted involving occasional littering and illegal fires and a few instances of road closure violations. *As long as resource use remains appropriate, SFMA management will allow hunter use levels to stabilize at intensities determined by the tolerance levels of the users.*

D.16 Non-Timber Forest Products

Currently no active management engages in the production of non-timber forest products. While opportunities in this regard exist in the region the SFMA has not pursued them to date.

D.17 Stakeholder Involvement & Engagement

SFMA management enables a variety of potential avenues for stakeholders to interact with SFMA staff and provide feedback about management approaches and directions. The SFMA was established to serve as a public demonstration forest where public and professional audiences could

view scientific approaches to forest management. From the perspective of the SFMA these are the principle stakeholder groups that the management program strives to incorporate. Many other stakeholder groups exist including tribal groups, contractors, regional environmental organizations, and recreation groups and users.

Box 3.3.1 – Stakeholder Groups consulted during evaluation for certification	
FME Management and staff	Pertinent Tribal members and/or representatives
Consulting foresters	Members of the FSC National Initiative
Contractors	Members of the regional FSC working group
Lease holders	FSC International
Adjacent property owners	Local and regionally-based environmental organizations and conservationists
Local and regionally-based social interest and civic organizations	Forest industry groups and organizations
Purchasers of logs harvested on FME forestlands	Local, state, and federal regulatory agency personnel
User groups, such as hikers, ATV users, and others	Other relevant groups

Figure D.32 SCS 2011 audit report summary list of SFMA stakeholder groups. [42]

In the SFMA, as with all of Baxter Park, the responsibility for policy and decision-making rests with the Baxter State Park Authority. The Park Director works with the Park Resource Manager and staff to develop and implement approved policy and to coordinate and direct forest operations. Policy and management directions are informed and improved through input by the SFMA Advisory Committee a standing committee of fifteen citizens with expertise in environmental and forest resource areas. The Committee meets twice a year, once in the fall in the field and once in the spring indoors to review management activities and operations. This active group of citizens serves to provide representation of a variety of stakeholder groups.

D.18 Boundary Line Status

Boundary lines are maintained on a rolling 10 year basis. Staff are constantly working to maintain the visibility and monumentation of both external and internal property lines. With over 32 miles of line to maintain staff must do a certain amount each year to avoid becoming overwhelmed with work in any one year. Figure D.33 SFMA boundary line maintenance history. shows the amount of line that was maintained in each year show. Adding 10 years provides the next date of maintenance. A small percentage of the line along the southern boundary follows Wadleigh Brook and thus doesn't require maintenance. The Park occasionally coordinates with abutting owners to share in maintenance costs.

Maint Year	Miles
1970	5.76
1998	3.86
1999	3.64
2001	5.79
2003	1.22
2004	1.44
2005	0.82
2008	4.03
2010	2.63
2011	2.96
Total	**32.14**

Figure D.33 SFMA boundary line maintenance history.

E. Condition of Lands beyond Ownership Boundaries

*Section in Process…

E.1 Current Land Uses and Conditions

[42] Table published in 2011 SCS FSC audit evaluation report.

E.2 Pertinent Ecological and Social Conditions

E.3 Interaction with Nearby Properties

E.4 Invasive Species and Abutting Properties

*See section D.12b

F. Forest Management & Planning

The management planning process is designed to develop a plan that combines existing management strategies with a landscape level approach that seeks to orchestrate management actions across the entire land base over a defined period of time. Individual stand prescriptions and harvest schedules will result from planning that seeks to balance current and future stand level forest conditions with the "big picture", the conditions across the management area. A principle element in the planning process is the development of management objectives coupled with measureable criteria to be used in evaluating achievement of those objectives. The planning effort will rely heavily upon the integration of spatial data and forest inventory information. This data package will enable the development of a "forest portfolio" suitable for use with landscape level forest modeling software. Forest models permit managers to develop potential management scenarios and evaluate them using defined measurable criteria to determine achievement of management objectives. Integrating the results of forest modeling tools with practical on the ground knowledge of Park staff will enable the development of a schedule of management actions that balances management objectives over the timeline of the planning document and the longer time scales inherent to forest development in the region. This planning effort will incorporate the best of traditional forestry knowledge with the most current science and technological tools to ensure that the management of the SFMA maintains the high standards set by Governor Baxter and previous forest managers.

F.1 Water Quality and Soil Productivity Protection

Water Quality:

"Forest management in riparian zones has a greater influence on the ecological processes in small streams than in large streams".[43] Managers recognize the critical importance of maintaining shade and minimizing disturbance on 1st and 2nd order streams. SFMA policy and practice is to use 1st and 2nd order streams as boundaries between management blocks, therefore providing a clear opportunity to limit harvest within 50 to 100' of the stream and completely avoid the need for crossing of the stream with equipment or activity. In addition, timber marking of partial harvests approaching the stream should gradually reduce removal intensities as the riparian line is approached.

Although the strong preference is to organize management blocks to avoid the crossing of any 1st or 2nd order stream, on some occasions avoidance of crossing a stream would require additional road construction. In these cases, assignment of reserve status to the block beyond the stream should be considered. If reserve status is not appropriate and harvest activities will involve crossing the

[43] Pg 10, Sustaining Maine's Forests: Criteria, Goals, and Benchmarks for Sustainable Forest Management, Maine Council on Sustainable Forest Management, July 1996.

stream, a minimal number (preferably 1) of stream crossings should be identified in the field and appropriate measures taken to minimize disturbance implemented. Temporary crossings shall utilize portable bridging and/or winter conditions whenever possible. If necessary, stabilization work shall immediately follow the conclusion of use of the crossing. Finally, temporary crossing locations and uses should be noted in the stand history database so the same site can be used again during any subsequent entry.

Research consistently indicates that forest management roads are the leading cause of sedimentation of streams and ponds in forested landscapes. The SFMA is near the endpoint of a 30+ year effort to build and establish an access network of forest management roads. In addition to adherence to accepted Best Management Practices, the following benchmarks shall guide road construction and maintenance in order to protect water quality:

- Primary planning of the overall road system shall seek to minimize the overall number of stream crossings, understanding that this may increase the travel distance for wood products transport;
- Webster Stream shall not be bridged in any way for vehicle traffic;
- When crossing 3rd order and higher streams, wooden bridge-type crossings will be considered over culvert installation to preserve a natural stream bottom and allow more unimpeded water flow;
- Main haul roads will be located on upland sites well away from major watercourses;
- Secondary spur roads approaching watercourses shall terminate as far from riparian zones as possible;
- Secondary spur roads approaching 4th order and higher streams will be closed to vehicle access when operations are not in progress and there exists no management need for vehicle access;
- Road grades approaching stream crossings will utilize open culverts, road dips or other means to ensure water running down wheel tracks or on the road surface does not enter the stream;
- Right-of-Way clearing widths shall be the minimum necessary at stream crossings (normally 20')

Protection of Soil Structure and Productivity:

The maintenance of long-term ecological productivity is reliant on two components under management control: (1) the protection of soil structure and productivity and (2) the retention of levels of all components of natural forest structure including species diversity and some provision that a threshold level of both individual trees and acres of forest structure be allowed to reach full ecological development. This provision would include very long rotation levels for a pre-determined percentage of shade tolerant species and associated flora and fauna. In forest management, soil protection involves allowing for natural levels of nutrient cycling and maintenance of the soil organic horizon.

Maintenance of Soil Organic Horizons:

Management shall consider and work toward utilization of harvesting equipment that reduces soil disturbance (compaction, rutting and soil displacement) during the harvesting process. In concert with low-impact/long reach equipment, management objectives shall provide appropriate general restrictions on the operating season for harvesting including shutdown periods in both early spring and late fall and a mechanism for effectively implementing short-term restrictions on operations based on unusual or extreme weather including precipitation, temperature and wind.

In the establishment of operating blocks management shall consider soil structures and moisture levels and schedule operations, if any, for seasonally appropriate entries. Isolated or numerous inclusions of differing soil or site conditions and wood flow patterns within an operating block will be noted and addressed in the operations planning process and, if necessary, with appropriate field layout.

Any and all concerns regarding soil sensitivity and harvesting operational measures to address such concerns will be discussed with the harvester prior to beginning operations. The education and development of knowledgeable equipment operators capable and willing to make sound on-site decisions regarding the protection of soil resources is of paramount importance in SFMA harvesting operations.

Nutrient Cycling:

"Any activity that removes biomass from the forest alters the forest nutrient balance, either temporarily or indefinitely. Soil nutrient loss studies, particularly the Weymouth Point Study, demonstrate that whole tree clearcutting removes approximately 90% of above-ground nitrogen, phosphorus, potassium calcium and magnesium. While this amounts to less than 5% of total nutrient reserves, it can significantly affect the amount of exchangeable nutrients available for plant uptake. Absent the return of some harvesting residues to a given site, exchangeable nutrients available for plant uptake suffice for less than one rotation on infertile sites. Leaving behind tops and limbs that would otherwise have been removed returned 33% to 61% of the nutrients to the site..."[44]

Management shall maximize efforts to avoid soil damage during harvesting operations. This effort includes the yarding of all wood by forwarders, a general restriction of operations to a 35 week operating year including a 3 week shutdown in late fall and a 14 week shutdown in early spring, and specific restrictions of operations based on extreme weather.

F.2 Silvicultural Systems and Application

Silviculture:

Silviculture is founded on the principles of forest ecology, and the implementation of silviculture in the SFMA has been designed to blend forest management goals with the ecological principles of natural disturbance, forest dynamics, and forest structural components. The application of silvicultural systems in the SFMA has to date largely been determined based on field inspections of stand conditions and an attempt to fit the most appropriate silvicultural tool to these conditions.

Going forward the development of harvest schedules and the assignment of silvicultural systems to specific management units will result from the integration of long term model scenarios and field based assessments of the most appropriate silvicultural approach for a given management unit. Current management planning has established an overall goal of having 1/3 of the operational area managed under a multi-age system, and the remaining 2/3 of the area allocated to even-age management. Of the even-age area roughly1/2 will be managed with a standard shelterwood approach while the other half will be split amongst the different even-age systems. The following is a description of the general silvicultural systems employed in the SFMA.

Even-Age:

[44] Pg 7, Sustaining Maine's Forests: Criteria, Goals, and Benchmarks for Sustainable Forest Management, Maine Council on Sustainable Forest Management, July 1996.

Shelterwood System

The majority of even aged silvicultural treatments will fall under some stage of the standard uniform shelterwood system. In general, the rotation age for these systems will be approximately 100 years.

- Shelterwood establishment (SWEST): 30-40% uniform removal to open the canopy enough to stimulate establishment of a new cohort of shade tolerant species.
- Overstory removal (OSR): uniform removal of overstory except for designated retention trees.
- Irregular shelterwood (IRRSW): Where stand conditions are variable a mixing of SWEST and OSR is implemented to apply most appropriate silviculture to given stand conditions.
- Extended Shelterwood (EXTSW): When well-formed and health growing stock of long lived species is present with strong advance regeneration conduct partial overstory removal retaining those stems most likely to be available for harvest at time of commercial thinning of present regeneration cohort.

Clearcutting

- Patch Clearcutting/OSR (PATCH): Patch clearcut/OSR treatment that may both establish new cohort while also releasing established regeneration depending upon the presence/absence of advance regeneration. Applied to management unit in 0.5-3+ acre Generally applied to intolerant hardwood stands. Approximately 100 year rotation length.
- Silvicultural Clearcut (SCC): Regeneration treatment intended to establish new cohort from seed or sprouting. Requires following FPA protocol. Approximately 100 year rotation length.*Clearcutting has not been practiced to date in the SFMA.

Tending Treatments

- Commercial Thinning (THIN): Over the next 10 years few management units in the SFMA will require commercial thinning treatments. However, such treatments will be applied in stands where establishing regeneration is not the intended goal but rather a reallocation of grow space to desirable stems to be grown to larger diameters before planned regeneration treatments occur.
- Pre-Commercial Thinning (PCT): Management units that have receive uniform OSR treatments may be considered for brush saw spacing of best stems by species and form.

Multi-Age:

A variety of multi-age (uneven-age) systems have been applied in the SFMA ranging from traditional single tree selection to “gap” treatments intended to regenerate tolerant species under small canopy openings (Figure D.9).

Irregular Group Shelterwood

- Irregular Group Shelterwood (IRRGRPSW): Area control gap based system where regeneration is established and released within canopy openings. Overtime spatially explicit multiple age classes are present within management unit. Gap sizes can vary depending on the stand conditions and operational requirements. Gap specific rotation length approximately 120 years.

Selection System

- Single Tree Selection (SEL): Traditional BDq approach to marking to a stand structure with multiple ages classes stratified vertically on the same acre.
- Group Selection (GRPSEL): traditional group selection where target stand structure is attained by cutting small groups of trees rather than individuals. Multiple ages classes vertically and spatial stratified.

Marking and Layout:

Harvest layout using marking of trees to remove or retain will be applied on a harvest by harvest basis. Marking should be applied where it is both efficient and productive while offering robust control over treatment application to the forester. Harvest area boundaries should be flagged in advance and care taken to walk entire harvest area in order to identify wet areas and other special features that should be protected from harvest or otherwise afforded unique treatment.

Retention Trees:

Wildlife and legacy trees have long been a focus of SFMA marking and harvest crews with specific trees being marked for long term retention. Over the last 2 decades forest ecology research has increased scientific understanding of stand structures that remain after significant disturbance events. These features offer important habitat for wildlife as well providing important seed source linkages between stages of stand development. As with so much of ecology there is much that remains unknown about the role these structures play in forest ecosystem processes. Descriptions of what species, diameters and stem forms to designate as retention trees are included in harvest prescriptions and are communicated to harvest operators through this document, and/or verbal instructions and marking. A formal retention tree policy is in development and should be finalized in 2013.

F.3 Harvesting Techniques and Equipment

Harvesting technology has changed dramatically over the last 60 years. The long era of animal and human power in woods operations was replaced by combustion engine driven equipment. During the middle of the 20th century this pattern of change has been a constant in the forest products industry where today cable skidders and hand crews are referred to as "traditional" or "conventional" harvesting technology. The introduction of mechanized equipment that replaced the use of hand felling and hooking of chokers to individual logs has increased worker safety while also changing the patterns of harvest layouts. Importantly, the cost and sophistication of new equipment has exploded, forcing many smaller operators out of the woods. The pace of these technological changes promises only to increase over time. In contrast forest management occurs over long periods of time with return intervals of operations to the same stand often spanning 10-40 years or more. The result is that a stand will very likely be treated with a different piece of equipment if not a significantly altered harvest system at each entry.

This reality of constant change presents interesting challenges to forest managers and poses questions that do not have clear answers. Principle among these are:

- What trail spacing and pattern should be installed?
- Will trails become permanent structures or only serve as temporary routes for a single operation?
- Do silvicultural goals drive equipment selection or does equipment dictate the application of silviculture?

- How does the cost of equipment influence logging practice?

Since the mid 1990's the SFMA has primarily employed cut-to-length (CTL) harvest systems. There are many benefits to this system the most important of which relate to the protection of soil productivity and the minimization of residual stand damage. The system easily utilizes slash to reduce soil disturbance and compaction in equipment trails. Careful operators can navigate trails while avoiding damage to residual trailside trees.

In 2011 Pelletier Brothers Inc purchased a new tracked CAT 521 processor with a fixed head to replace the older dangle-head processor. This new machine has a slightly reduced arm reach which is a noted limitation. However, the fixed head means the machine has the advantages of a feller buncher with respect to control over tree felling and the minimization of damage to vulnerable stems especially saplings and small poles. Depending on stand conditions the operator can fell and limb stems in front of the machine so that slash is added directly to the trail where it can offer soil protection and the limbing process occurs where the operator can minimize risk to stems that designated for retention post-harvest. This type of equipment is ideally suited for overstory removals where protection of advance regeneration is a principle silvicultural goal. The combination of single processor and forwarder means that the forwarder can easily keep pace with the accumulation of wood along the trails

Another significant advantage of the CTL system is the almost complete elimination of the requirement for roadside log landings. This is due to the fact that when wood is brought roadside by the forwarder it can be piled in the roadside ditch or generally within the road ROW. In contrast a cable or grapple skidder would generally require a sizable yard in which to pile and sort wood while maintaining space to turn equipment and load trucks. The CTL system only requires a reasonable road ROW, thus minimizing the area removed from production for operational purposes.

While the CTL system would seem to be a virtual panacea for forestry operations it has a very high price tag. The system in use in 2012 in the SFMA comes with a combined price tag of $600-$700,000 for new equipment. The fixed head harvesting head alone costs over $100,000. The sophisticated computer systems that control the complex hydraulic systems are expensive and the both machines require constant maintenance. The high cost of these machines means that logging contractors require constant cash flow to cover high monthly equipment payments and repair bills. The result is that small contractors may not be able to afford such equipment.

The SFMA has utilized small cable skidders in multiage treatments in the past. No cable skidders have worked in the SFMA since 2008. Availability of a variety of equipment systems is desirable from a silvicultural and operations stand point as it provides options in conducting harvests. In 2012, staff are discussing the potential of having a cable skidder operating for 1-2 weeks during dry summer conditions.

F.4 Provisions for Monitoring Forest Growth and Dynamics

Forests develop over long time periods (80-120+ years) in northern Maine and forest management requires conceptualizing the forest ecosystem over a similarly long time line. Managing forest resources requires knowledge and understanding of the current forest but also how that forest will change over time. Change can happen quickly due to natural events, as in the case of a sudden and violent wind storm that can blow down 10's or 1,000's of acres in a matter of minutes, or it can happen over decades or centuries such as species range expansions or contractions due to changes in climate. Change can also happen due to human activities like timber harvesting. Managers must

understand the extent of such changes due to natural and human causes, and their implications for management goals and activities. In order to evaluate change, baseline must be available against which to compare new observed conditions. In forest systems meaningful comparisons normally require baseline data representing past conditions, often measured in decades for the more subtle changes due to climate. The SFMA has several monitoring programs and approaches to address these needs.

F.4a Temporary Forest Inventory Data

The collection of temporary forest inventory data is basic to any forest management program. The SFMA collects several types of data, at different time intervals and stratification systems. Inventory work has been divided into 4 types with an inventory protocol developed for each type.

1. Pre-Harvest Inventory Protocol: To be conducted **only** when existing data is insufficient or new data is otherwise deemed necessary by managers. Inventory of current years harvest units, operational units only. One BAF 20 variable radius point sample per sample center.
2. Immediate Post-Harvest Inventory Protocol: Inventory of current years harvest units, operational units only. One BAF 10 variable radius point sample per sample center.
3. Planning Inventory Protocol: Individual polygon based inventory of: a. Operation units on a rolling 15 year basis; b. Stratified inventory of reserve Units on a rolling 15 year basis; c. Stratified inventory of RMZ Units on a rolling 15 year basis. One BAF 20 variable radius point (VRP) sample per sample center. Selected samples also have one dead and down wood line intersect sample (LIS) originating from the VRP center, and two 1/100ac fixed radius plots (FRP) paired on each end of the LIS.
4. 5 Year Post Harvest Inventory Protocol: Stratified inventory of operational units 5 years after harvest. One 1/100ac fixed radius plot (FRP) measuring trees in 1-4 inch classes. Selected samples also have one dead and down wood line intersect sample (LIS) originating from the FRP center, and a second 1/100ac fixed radius plot on the end of the LIS.

*See the document BSP SFMA Forest Inventory Protocol for complete explanation of inventory methods and protocol.

This system mixes polygon specific inventories of operation units where detailed information about specific units is desired, with stratified inventories of reserve and RMZ units where a courser level of detail is adequate to monitor and describe forest conditions. Regeneration data is collected under a similar stratified approach to broadly describe regeneration levels on a site and overstory basal area level. Line intersect samples of down dead wood are also stratified in order to provide data on this ecologically significant structure as well as providing an assessment of post-harvest mortality in operational units from 5 years post-harvest. Live tree data can be run through forest simulation software in order to provide current inventory estimates for operational planning as well as strategic long term planning with various forest models.

F.4b Continuous Forest Inventory Data and Analysis

The SMFA continuous Forest Inventory (CFI) system is extremely valuable. Considerable effort was expended in 2008-9 when two summer field seasons were devoted to re-measure of the network of CFI plots. A principle advantage of permanent plots is that returning to the same place and measuring the same area and the same trees enables direct comparisons of one point in time to

another point in time. Analysis of this data helps managers determine trends in growth, mortality, and harvest. While many forestry companies have given up CFI systems due to the necessary labor and capital investments it remains the most reliable way to monitor changes in the forest over long time periods.

Since this was the first re-measurement, much was learned – not just about the field work, but also about recording and processing the data after they were gathered. A separate report detailing the processes and the results was prepared by then Resource Manager Carol Redelsheimer and UMaine Professor Robert Seymour. The following results and figures are from their analysis report.

A summary of the data collection process follows:

- 115 fixed-area plots were established from 1996 - 2000; plots were re-measured in 2008-09;
- Trees $\geq$ 4.5" @ dbh (4.5' from the ground) were measured on 0.2-acre circular plots; trees 0.6 - 4.4" dbh were measured on a 0.01-acre circular plot with the same center as the larger plot;
- 111 of the original plots were successfully relocated and re-measured; 4 plots were re-established and 1 new plot was established (but these will not have re-measurement data until the next cycle);
- Using diameter-growth equations fit to species and plot, all trees missed on the initial measurement were "grown" backward to determine previous diameter and all harvested trees were "grown" forward to the date of cutting in order to calculate how much growth occurred before harvest;

Forested acreage was allocated to one of:

- 3 reserve classifications - ecological, benchmark or riparian;
- 3 harvest categories - partial, gap or overstory removal;
- or as undesignated - areas that have not yet been put into the harvest queue or into one of the reserve classifications.

25 species were measured and these were allocated into groups:

IH - intolerant, short-lived hardwood
TH - tolerant, long-lived hardwood
SF - spruce and fir (except black spruce)
PiHe - pine and hemlock
Wet - cedar, tamarack, black spruce, black ash
NC - non-commercial

A summary of trees measured on the 111 relocated plots includes:

5,343 living trees were measured at establishment
3,821 trees survived to be re-measured (*Accretion*)
737 trees were harvested (on 32 plots)
785 trees die of natural causes (*Mortality*)
730 trees grew to merchantable size (*Ingrowth*)
4,551 living trees were measured at the first re-measurement

What do the data tell us?

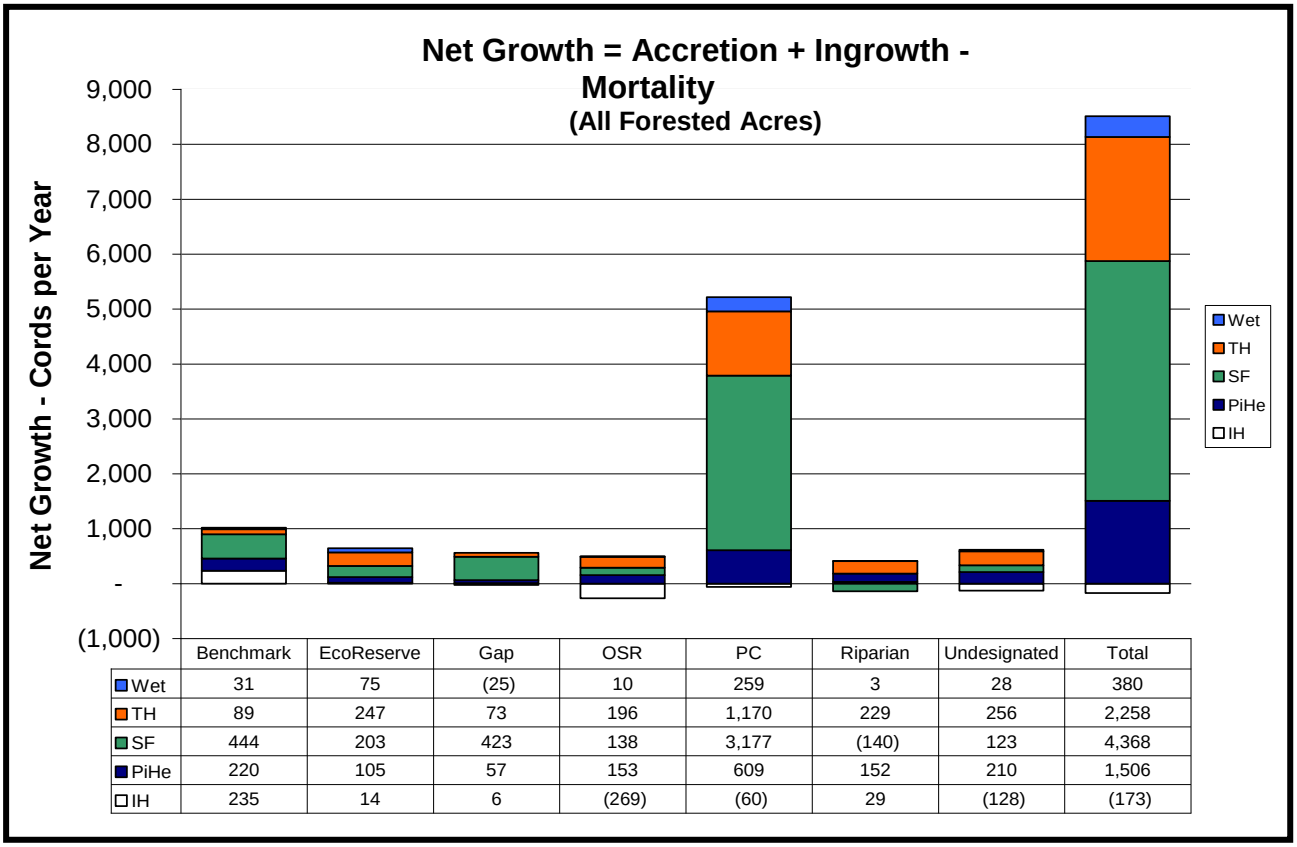
- Twenty- years of forest management has focused on growing red spruce as the preferred species in our mix and the data confirm that we have been doing that:

- Basal area of merchantable-size red spruce is higher than any other species, followed by quaking aspen and white cedar:
- of trees that have grown to merchantable size since the first measurement, red spruce is third most abundant, exceeded only by red maple (second) and balsam fir (highest); and
- Red spruce comprises nearly half of the standing inventory - in the reserve areas as well as in the acres that have been managed.

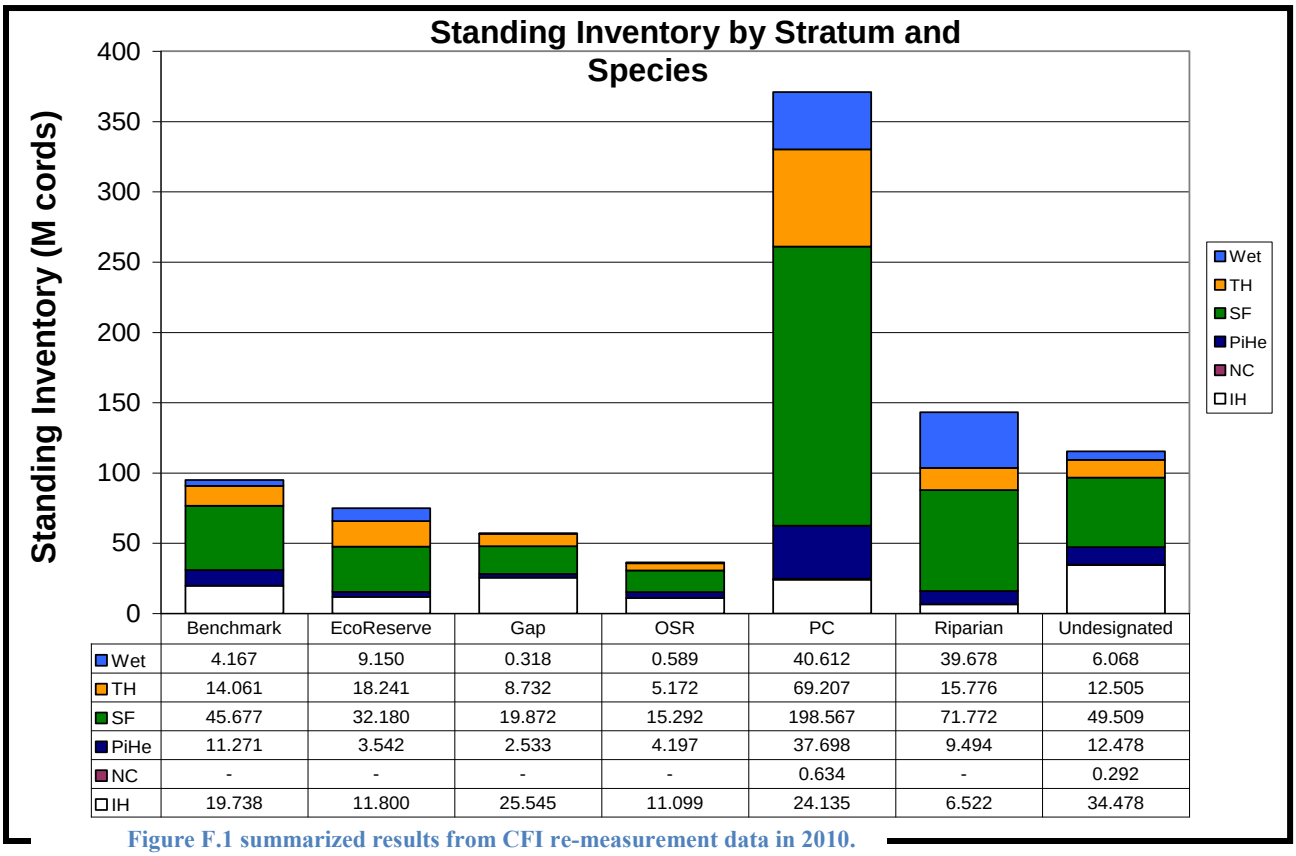
SFMA management has also encompassed reserving areas of high ecological value and that have unique roles to play in maintaining biological diversity across the forest, as well as setting aside examples of "ordinary" acres in order to observe how natural dynamics develop these stands along side our management choices. We have known there are costs versus benefits to this approach to scientific forest management:

- across the forest, trees are growing (accretion) nearly 3/4s of a cord per acre per year;
- across the forest, trees are dying (mortality) at a rate of about ½ cord per acre per year, although mortality is somewhat less in the managed areas;
- about 47% of our current standing inventory is in reserve areas.

*The following tables illustrate the net growth and standing inventory for the SFMA (Figure F.1):



	Benchmark	EcoReserve	Gap	OSR	PC	Riparian	Undesignated	Total
Wet	31	75	(25)	10	259	3	28	380
TH	89	247	73	196	1,170	229	256	2,258
SF	444	203	423	138	3,177	(140)	123	4,368
PiHe	220	105	57	153	609	152	210	1,506
IH	235	14	6	(269)	(60)	29	(128)	(173)



	Benchmark	EcoReserve	Gap	OSR	PC	Riparian	Undesignated
Wet	4.167	9.150	0.318	0.589	40.612	39.678	6.068
TH	14.061	18.241	8.732	5.172	69.207	15.776	12.505
SF	45.677	32.180	19.872	15.292	198.567	71.772	49.509
PiHe	11.271	3.542	2.533	4.197	37.698	9.494	12.478
NC	-	-	-	-	0.634	-	0.292
IH	19.738	11.800	25.545	11.099	24.135	6.522	34.478

Figure F.1 summarized results from CFI re-measurement data in 2010.

Future CFI Data Collection

Additional existing CFI samples in the Frost Pond Forest, the Boody Brook Natural Area, and other locations in the SFMA will be added to the 111 plots currently in the network. Unifying these datasets will strengthen and streamline the system. Based on the significant time and money expended to measure over 100 CFI samples in a 1-2 year time period it has been decided to shift the collection of re-measurement data to an annual schedule. This change is scheduled to begin in late summer 2012. It will take 10 years before all samples are fully on a 10 year cycle but given the long term nature of the dataset this is a small concession. This adjustment will achieve multiple objectives including:

- Reduced costs of hiring special contractors to complete inventory work.
- Increased staff ownership of dataset since portion of measurements conducted every season.
- Better control over data quality through additional time to complete work.

F.4c Ecological Monitoring Data

A variety of ecological monitoring programs have been enacted in the SFMA.

Temperature Loggers:

A system of temperature measuring devices record water and air temperatures at specific sites throughout the SFMA. Data like that shown here for Murphy Brook in 2011(Figure F.2), provide managers with a baseline against which to compare future measurements to evaluate the influence of management actions on riparian systems and/or effects of changes in climate.

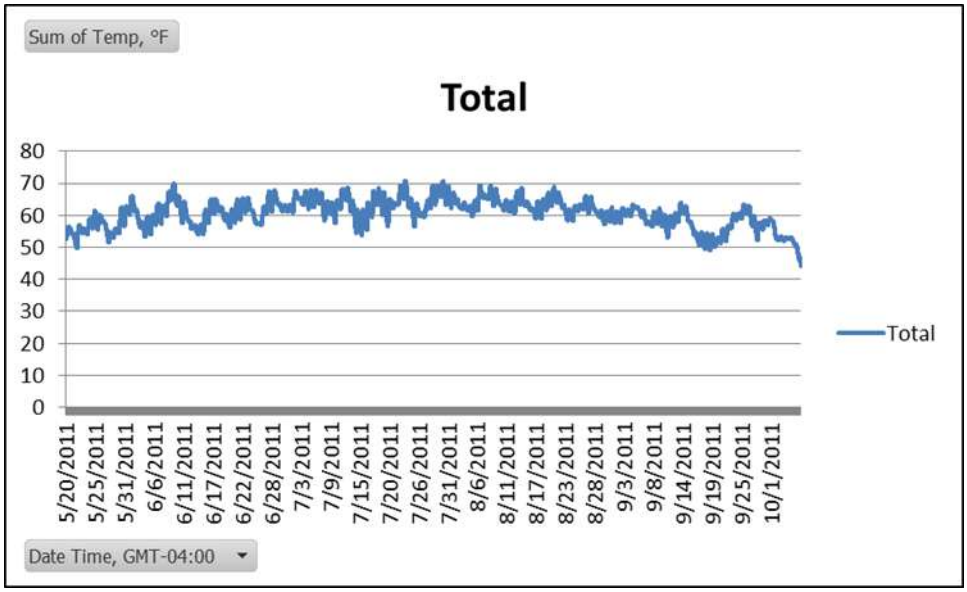


Figure F.2 Water temperature measurements from data logger in Murphy Brook

Amphibian Monitoring Stations:

A network of sampling stations is checked regularly from May through October to collect data on the presence of forest dwelling salamander species. Amphibian species like salamanders are believed to be sensitive to changes in forest conditions and therefore may serve as valuable indicators of forest health. Like the temperature data these measurements will provide future managers with a baseline against which to compare their measurements and assess changes in the forest ecosystem.

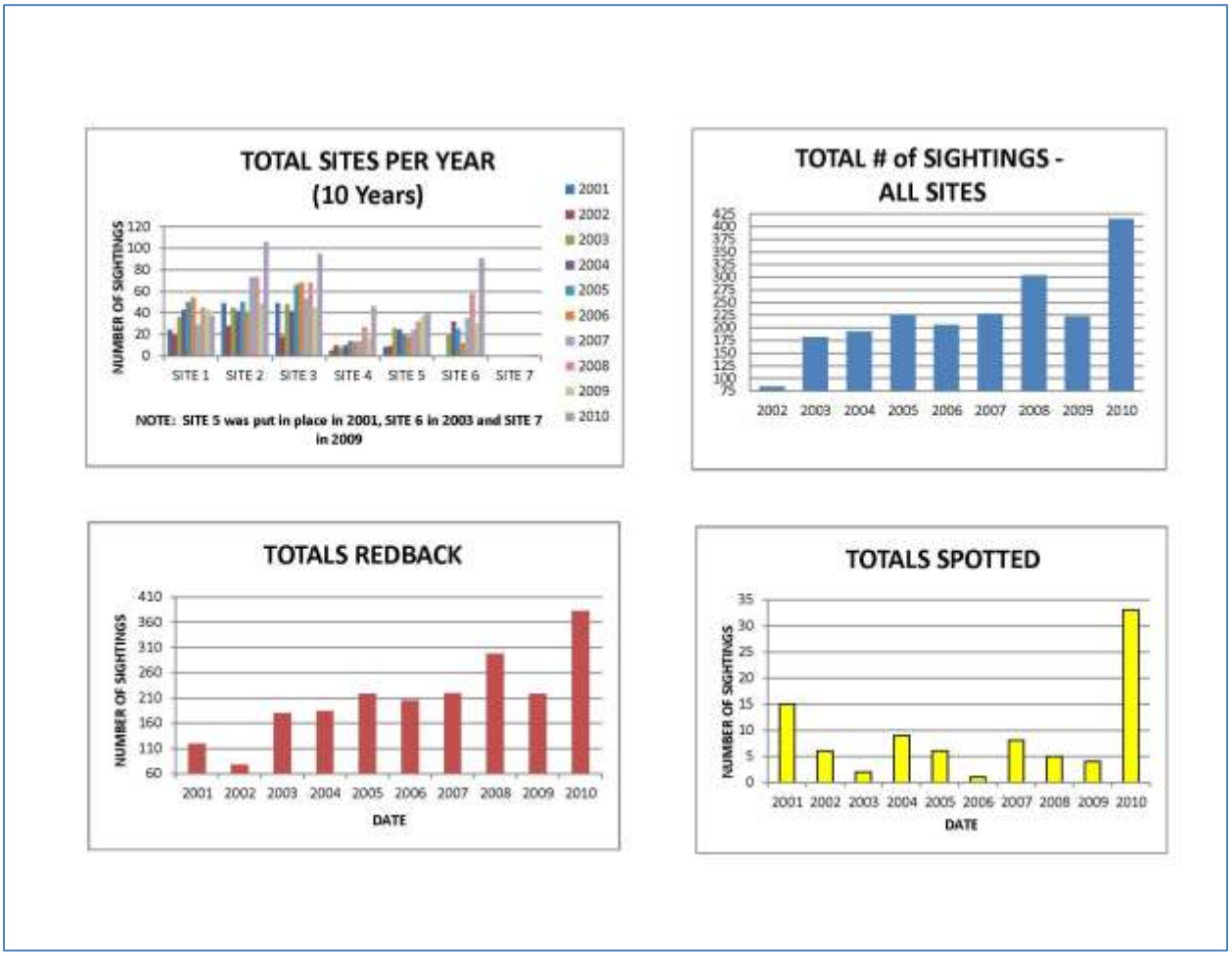


Figure F.3 2001-2010 COA data summaries.

F.5 Forest Protection

F.5a Native Pest and Pathogen Management

Spruce Budworm:

Outbreaks of the spruce budworm are complicated natural events relying on a host of regional factors and conditions that extend well past Maine's boundaries. Short-term forest management activities over relatively small areas such as the SFMA will have little effect on the population dynamics of the spruce budworm, but could significantly alter the impacts of an outbreak on SFMA forests.

The following current practices and efforts in SFMA management are considered positive actions toward mitigating the effects of future SBW outbreaks:

- SFMA management does attempt to promote the establishment and growth of red spruce and white pine over balsam fir whenever possible - current silviculture is strongly biased against retention of mature fir in spruce/fir types.
- Although regenerating fir is abundant in most SFMA stands, our silvicultural approach will tend to remove developing fir in favor of spruce and pine in intermediate treatments, leaving only a small percentage of the fir to reach mature stages of development.
- Although SFMA management will attempt to increase spruce percentages in mixedwood stands, it is not our intent to convert mixedwood stands to softwood stands.
- Stand treatments and management activities will attempt to create a mixed mosaic of stand structures and compositions within the limits of natural stand development and so promote and maintain diverse and stable populations of bird species and other natural pest controls.
- The continued development of forest access increases the ability of SFMA management to assess, treat and salvage stands.
- As the regeneration on SFMA partial harvests develops, overstory removals on true shelterwoods will create a more sharply defined mix of forest structures.
- SFMA management recognizes the role of the spruce budworm in spruce/fir forest ecology and remains alert to signs of unexpected changes.

Conversely, the following current practices and efforts in SFMA management are considered negative actions toward mitigating the effects of future SBW outbreaks:

- The widespread partial harvesting conducted on the SFMA will eventually produce deep crowned softwoods more vulnerable to spruce budworm infestation.
- The inclusion of a significant, well distributed percentage of the landbase in unharvested softwood structure (riparian and reserve areas) may provide a susceptible/vulnerable locus for an emerging outbreak.
- Target stand structures for the SFMA will trend toward a majority of the forest in relatively mature or mature development stages.

Field observation of areas of undisturbed (no discernable prior harvesting or fire history) softwood sites such as the Boody Brook area indicate that in natural ecosystems repeated spruce budworm outbreaks eventually purge mature fir from softwood sites and

promote overstory dominance by less susceptible species with greater longevity such as red spruce, white pine and eastern hemlock. These areas also demonstrate long periods of forest development (200 + years) and high stocking levels. Although natural pests and pathogens are at work in these stands (significant spruce beetle activity in older spruce), no agent has been successful at a stand-replacing disturbance for at least 100 years. *The diversity of structures and species, together with the natural processes of stand development inherent in these stands provides the best model for forest-wide strategies for pest and pathogen protection and should be incorporated as much as possible in overall SFMA management.*

F.5b Invasive Species Management

The SFMA and BSP as a whole are fortunately on the outer edges of significant populations of invasive vegetation that have become well established to the south. However these populations are steadily marching towards the Park as witnessed by the localized populations of *Phragmites australius* in the SFMA as wells as Japanese knotweed and other species to the east of the Park. The current status of species populations means that the Park is in the position of "early detection and rapid response", which many land managers to the south would envy. Currently, localized populations can be identified and quickly eliminated at present levels.

In 2012 Park staff is developing policy and protocols regarding the management of invasive species. While the SFMA has the only significant identified populations of invasive vegetation the issue is one of Park wide concern and relevance. Administrative staff have decided to develop a comprehensive and consistent approach to managing these species wherever they occur in the Park. This planning document is under development in 2012. While it will not be completed in time to inform 2012 treatment period an interim action plan has been developed to enable treatment of scattered areas of *Phragmites australius* in the SFMA during in September 2012. The comprehensive planning document will be completed to inform monitoring and control efforts actions in 2013.

Area Cooperative Efforts:

In April 2012, Park staff organized a meeting of landowners abutting BSP and contractors working on these lands to discuss the issues related to controlling the potential introduction vectors of invasive species. This was a very successful event and all involved plan to work on related topics in 2012 within their respective organizations. This cooperative approach with landowners and managers surrounding the Park is necessary to successful control of invasive species that spread without regard to administrative boundaries and are easily transported on maintenance and harvesting equipment that frequently moves from one landowner to another.

F.5c Wildland Fire Management

*See separate BSP Fire Management Planning document.

F.5d Response to Climate Change

Climate change represents a critical factor for managers to consider when planning for the future especially over long time horizons like full rotation periods. A 2009 report by the University of

Maine Climate Change Institute outlines the likely climate impacts for the State of Maine.[45] The report indicates the region containing the SFMA will likely see temperature changes averaging about 6○F for all seasons, as well as increased precipitation over the next century. Succinct descriptions of the potential impacts on forests and the implications for forest management provide useful background on this topic. Maine Audubon has also published a one page document outlining basic principles relating to forestry and climate change. In general the SFMA can expect to see gradually warming temperatures and in

In a 2007 paper, published in the journal Ecological Applications, Constance Millar and colleagues[46] propose that forest managers consider three options when confronting climate change in the management of forest resources. The options include managing for ecosystem **resistance**, **resilience**, and/ or the capacity for ecosystems to **respond** positively to a changing climate by adapting to a new set of circumstances. Millar proposes that foresters consider trying to increase stand and or forest **resistance** only in cases of high economic or ecological value. Maintaining such a stand would come at the expense of considerable effort and energy. The authors recommend that forests which have a strong likelihood of returning to normal condition after a disturbance and that can accommodate changes in climate should be managed with the concept of **resilience** in mind. Similar to the idea of resistance, resilience may only be feasible in the short term. Both of these approaches can be thought of as mitigation strategies, meant to forestall what may be inevitable changes; the purpose being to reduce the negative impact to ecosystems and human society brought on by such changes. The third concept requires managers to find ways to assist forested ecosystems to **respond** and **adapt** to climate changes and thereby promote long-term ecosystem integrity. Inherent in all three concepts, especially the third, is the idea of spreading risk rather than concentrating it (Millar et al. 2007)

This idea of reducing the potential for catastrophic loss by using a diversity of management approaches is akin to the precautionary principle, which states that when the future is uncertain actions should err on the side of caution, thus reducing the likelihood that unanticipated outcomes will trigger disruptions. Mention of the precautionary principle is limited in forestry literature; however, fisheries management literature contains many references to the concept. A 2007 paper by Gerrodette et al.[47] discusses the importance of the principle in relation to the stability of marine resources, and describes a useful concept termed ―precautionary buffers. At the most basic level the idea requires that prudent management of resources, where uncertainty about sustainable harvest levels exists—due to ecological variables like climate—requires that management consider ―buffering‖ (reducing) harvest levels relative to the level of uncertainty. Applying this concept to forestry might involve a reduction of annual allowable cut to a specific level below the annual volume growth, thus providing a cushion in case of unforeseen ecosystem alterations due to climate change.

F.6 Reserve Area Management

[45] Jacobson, G.L., I.J. Fernandez, P.A. Mayewski, and C.V. Schmitt (editors). 2009. Maine's Climate Future: An Initial Assessment. Orono, ME: University of Maine.

[46] Millar, Constance I. Stephenson, Nathan L. Stephens, Scott L. 2007. Climate Change and Forests of the Future: Managing in the Face of Uncertainty. Ecological Applications, Volume 17, Number 8, pp. 2145-2151.

[47] Gerrodette T, Dayton PK, Macinko S, Fogarty MJ. 2002. Precautionary management of marine fisheries: moving beyond burden of proof. Bulletin of Marine Science: Vol. 70, No. 2 pp. 657–668

When SFMA management transitioned to Park staff in 1987, staff worked to consider the effects of harvesting from an ecological perspective. One conclusion that emerged from this thinking was that past harvesting in northern Maine had tended to affect large areas in a very similar way: road was constructed into a township and then the forest structure over generally all the accessible landscape was altered by harvesting – generally without much variation. This practice seemed to have a few noticeably negative results:

- This practice tended to swap one type of typical forest structure for another, and seemed to decrease any apparent diversity in forest structure and orientation.
- Examples of the original forest structures that existed prior to harvesting were hard to find and there were no representative examples against which one could compare the modified post-harvest forest.
- The chances of any forest developing significant maturity in structural and ecological elements seemed remote.

In an attempt to break this cycle and to provide options for increased understanding in forest management, staff intentionally began to designate blocks of forest as "reserve". These blocks varied in size and generally represented the range of sizes occurring in the operational mosaic – from 5 to 60 acres. Attempts were made to reserve blocks that represented the different forest types and structural elements commonly found in the SFMA so to provide a basis of comparison to harvested units. In the late 1980's, our term "reserve" referred simply to the intent to remove (without a specified time limit) an area from the harvest queue. Staff anticipate that at some point this designation would be revisited over time given current forest conditions and trends. In recent years the word "reserve" has come to be associated with landscape-size ecological values and areas of special ecological significance. This landscape scale concept has been applied to the establishment of the Boody Brook Natural Area and the large reserve around Webster Ledge (264 acres) both of which are designed to serve as large scale areas reserved from active management where natural processes will be allowed to play out over time in the absence of human "tinkering".

The SFMA approached to reserves has evolved to include "real" reserves like the Boody Brook Natural Area as well as a host of smaller "patch reserves" or "micro-reserves". One avenue in current thinking on maintenance of forest biodiversity considers the inclusion of unharvested patches embedded within a harvest mosaic to provide refugia for ecological components that may be lost in the harvested forest. Very few specifics are known regarding patch size and distribution – we would generally be considered to offer a representation of an extreme end of this approach with mega patches in a lightly harvested mosaic.

The long term maintenance of these reserve areas is always a source of lively discussion amongst advisory members and foresters and forest ecologists. Over the next hundred years the reserve areas will change as natural process of disturbance, growth, and regeneration play out. These processes will also occur in the rest of the 200,000 acre Park directly to the south. As this forest matures it will likely dwarf the "large" reserve areas of Boody Brook and Webster Ledge. Will this change in conditions negate the influence and utility of these reserve areas? Will the small size of the benchmark reserves limit their utility as "scientific controls". Such questions are interesting for current managers to ponder but meaningful answers and management decision will have to await the passage of time.

F.7 Riparian Management Zone Management

Riparian Management Zones Overview:

Riparian features occur throughout the SFMA, in the form of **waterbodies** and **wetlands**. From the perspective of overall resource value and diversity, riparian areas exceed all others in importance. Riparian zones provide an area for concentrated use by terrestrial wildlife, the filtering of runoff and floodwater, nesting and breeding sites for a variety of animals, and a focal point for human recreation within the SFMA. Riparian Management Zones (RMZ) are designed to help minimize and control the impact of management actions, like timber harvesting, on the natural functioning of riparian features and systems. Riparian Management Zones are more than just "stream buffers" based on a regulatory statute in the conventional forestry context. Two types of RMZ are defined in the SFMA, a RMZ Reserve and a RMZ Operational. More detail about these two types of RMZ will be provided in the following sections that cover topics relating to management goals, RMZ delineation, and management guidelines.

Riparian areas protect water quality by filtering and slowing movement of spring runoff and heavy rain events and provide streamside shading, leaf litter that serves as a primary source of energy in aquatic food webs, and a source of logs that create in-stream habitat structures, thereby protecting and enhancing habitat for brook trout and other aquatic species. Many animals (Appendix I) frequent the riparian zone, which is vital as winter deer cover, upland habitat for wood turtles, habitat for numerous reptiles and amphibians, and wildlife travel corridors. Shrubby margins provide nest habitat for birds including the Canada warbler, which is in documented decline. Diverse natural communities[48] occur in riparian areas, although these have not yet been inventoried within the SFMA.

Defining Riparian Features:

There are a wide variety of riparian features in the SFMA. The boundaries between the riparian features and the surrounding terrestrial areas are often well defined such as the high water mark of a year round stream channel. The most obvious riparian features are permanent waterbodies such as rivers, streams, ponds, lakes, which generally appear on topographic maps. More subtle are intermittent streams that are less likely to be mapped, as well as beaver influenced ponds that are often temporary in nature. Wetlands are spread across the SFMA and take many forms including peatlands, scrub/shrub wetlands, and emergent marshes. Ephemeral wetlands and hillside seeps represent important wetland and hydrologic features on the landscape. Vernal pools are a special type of wetland and can represent unique and critical habitat for certain amphibian species. Lastly, forested wetlands are another special type of wetland and are perhaps the most subtle and variable type of riparian feature in the SFMA. Forested wetlands are complex systems with boundaries that can be difficult to delineate. These systems can be as small as a 1/10 acre or as large as many hundred. For the purpose of SFMA management and operations planning,

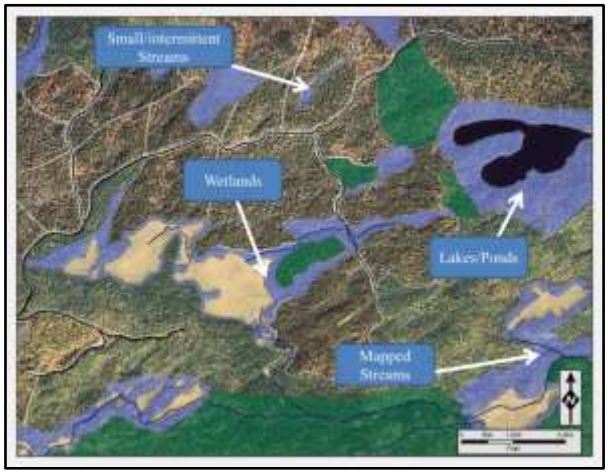


Figure F.4 Types of riparian features in the SFMA.

[48] Gawler, Susan and Cutko, Andrew. Natural Landscapes of Maine: A Guide to Natural Communities and Ecosystems. 2010.

forested wetlands are not considered a riparian feature. In general forested wetlands will not receive a "buffer" in the form of a surrounding RMZ, however they will generally not receive harvest treatment either. An explanation of how RMZ are delineated can be found in following sections.

SFMA Management divides riparian features into 3 categories:

Category 1:
Ephemeral wetlands, intermittent streams, hillside seeps, and other unique hydrologic features.

Category 2:
All ponds, wetlands, and pond/wetland complexes less than 10 acres in size, and all 1st and 2nd order streams.[49]

Category 3:
All ponds, wetlands, and pond/wetland complexes greater than 10 acres in size, and all 3rd and 4th order streams.

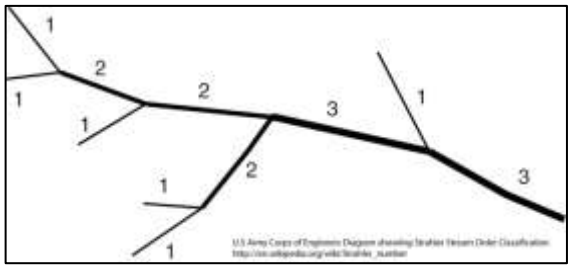


Figure F.5 Strahler stream order classigication diagram

Riparian Management Zone Goals, Objectives, and Evaluation Criteria

1. Water Quality

Goal: Protect water quality from negative impacts of human or natural disturbances.

Objective 1a: Follow all water quality BMPs relating to timber harvesting and road construction.

Criteria 1aI: Ensure that all SFMA staff and contractors are knowledgeable about State BMPs and employ them during management activities

Objective 1b: Consider ways to balance the forest age structure at the watershed and riparian feature scale when planning timber harvests, especially regeneration treatments.

Criteria 1bI: Consider limiting areas regenerated in any 30 year period to less than 50% of a watershed and/or logical area adjacent to riparian features

Objective 1c: Employ guidelines, explained in following sections of this policy, pertaining to no harvest or limited harvest areas within the RMZ during silvicultural treatments

Criteria 1cI: Evaluate harvest compliance with guidelines during harvest inspections and post-harvest using remote sensing technology

[49] "In the application of the Strahler stream order to hydrology, each segment of a stream or river within a river network is treated as a node in a tree, with the next segment downstream as its parent. When two **first-order** streams come together, they form a **second-order** stream. When two second-order streams come together, they form a **third-order** stream. Streams of lower order joining a higher order stream do not change the order of the higher stream. Thus, if a first-order stream joins a second-order stream, it remains a second-order stream. It is not until a second-order stream combines with another second-order stream that it becomes a third-order stream."
http://en.wikipedia.org/wiki/Strahler_number 2012April25

2. Habitat Management

Goal: Protect, maintain, and enhance wildlife habitat attributes within the individual RMZ and at the landscape level.

Objective 2a: Protect habitat of species designated as rare, threaten, endangered or determined to have special significance in the region.

Criteria 2aI: Ensure that all known occurrences of such species are documented to greatest extent possible by Park staff or outside experts (e.g. in GIS datasets and written reports).

Criteria 2aII: Ensure that datasets containing such locations (e.g. MNAP and BSP GIS datasets) and occurrences are consulted during planning of management activities with the potential to disturb populations/habitats.

Criteria 2aIII: Utilize existing pertinent habitat management guidelines when planning and implementing management activities.

Objective 2b: Protect rare forest types containing areas and features with significant late successional characteristics (consult FSC guidelines for definitions of such features).

Criteria 2bI: Ensure that all known occurrences of such conditions are documented to greatest extent possible by Park staff or outside experts (e.g. in GIS datasets and written reports).

Criteria 2bII: When preparing treatment sites for management actions ensure proper evaluation for presence of unique late successional forest features and revise actions and plans accordingly.

Criteria 2bIII: When important late successional features are identified consult FSC guidelines regarding management options.

Objective 2c: Integrate habitat requirements of wildlife species at the landscape level into management planning.

Criteria 2cI: When planning management actions evaluate and work to minimize potential impacts on habitat connectivity.

Criteria 2cII: When planning management actions consider how to enhance late successional forest characteristics.

Criteria 2cII: When planning management actions consider how to balance diverse wildlife habitat requirements.

Objective 2d: Integrate habitat requirements of wildlife species at the stand level into management actions and treatment prescriptions.

Criteria 2dI: When preparing treatment sites for management actions ensure proper evaluation for presence of unique habitat features and revise actions and plans accordingly.

Criteria 2dII: When implementing management actions ensure proper retention of special habitat features like snags and den trees.

3. Sustained Timber Production

Goal: Conduct management planning and silvicultural treatments so as to ensure the sustainable harvest of forest products.

Objective 3a: Ensure RMZ are properly integrated in SFMA monitoring programs.

Criteria 3aI: Collect sufficient overstory forest inventory data to enable forest modeling of long term growth and yield within RMZ.

Criteria 3aII: Collect sufficient forest regeneration inventory data to enable forest modeling of long term growth and yield within RMZ.

Objective 3b: Integrate RMZ into comprehensive management planning and harvest scheduling.

Criteria 3bI: Treatments scheduled for RMZ are based on comprehensive management planning approach.

Objective 3c: Apply silvicultural systems and principles appropriate to the given forest type, age, and site conditions when planning and implementing treatments.

Criteria 3cI: All treatments have a detailed prescription which clearly defines the silvicultural goals and application.

Criteria 3dI: Individual trees or areas to be harvested are clearly delineated with the use of flagging and or marking paint to ensure adequate control of harvest area and removals.

4. Recreation and Aesthetic Management

Goal: Maintain the wild and scenic character of shoreline areas of categories 2 and 3 riparian features.

Objective 4a: Minimize visibility of management activities along shoreline areas of categories 2 and 3 riparian features.

Criteria 4aI: Conduct GIS or onsite inspection of treatment zones to determine visual impacts when planning treatments.

Criteria 4aII: Carefully consider the development of management access roads in proximity to riparian features.

Criteria 3aIII: Conduct GIS or onsite inspection of recreation sites to determine visual impacts when planning trail or facility developments.

Riparian Management Zones Delineation:

RMZ in the SFMA have been delineated based on a variety of factors in order to accurately reflect the diversity of ecological processes that influence them as well as the wide array of ecological functions which occur in proximity to riparian features. Importantly these riparian zones, like the features they surround, extend beyond administrative or ownership boundaries and function at the landscape level. Management should consider both the scale and dynamic nature of these riparian features and the terrestrial ecosystems with which they are intertwined.

Applying this approach, the SFMA has abandoned the traditional pre-determined distance approach to establishing riparian boundaries and instead use on-site indicators to drive the location of riparian boundaries. This has resulted in a highly variable streamside buffer on all 3rd order and greater streams (i.e. Webster Stream, Wadleigh Brook, Brayley Brook, Murphy Brook). Ephemeral features may or may not be mapped and thus have at designated RMZ area. These areas will most likely be identified during field inspections and should be mapped and buffered at that time based on

guidelines for category 1 riparian features. Some site indicators used to establish RMZ boundaries are:

- A distinct break in slope or grade approaching the stream or pond signifying a departure from an upland type;
- A change in forest type from typical upland species (red spruce, northern hardwoods) to wetland types (fir, cedar);
- Evidence of travel pathways for wildlife;
- Intact developed structure providing connective pathways between less developed structure;
- Aesthetic sensitivity with recreational corridors;
- Uniform forest structures coincident with existing significant wetlands or heath bogs (black spruce flats, cedar swamps);
- Obvious concentration areas for wildlife.

These guidelines have resulted in the definition of riparian boundaries determined by landscape features, consequently, riparian lines can vary from 50' to well over 1000' from the shorelines of waterbodies.

Riparian Management Zone Reserve Selection Process

The preceding guidelines describe Description of the process by which current RMZ will be reclassified as RMZ Reserve areas. This will be based on: proximity to current designated reserves, habitat importance, operational feasibility due to topography and other stand considers, recreational/aesthetic value to visitors using riparian features.

Section in Process…

General Management Guidelines

Water Quality

1. Follow all State or regional water quality BMPs relating to timber harvesting and road construction.

Habitat Management

2. When special habitats are encountered that have existing specific habitat management guidelines utilize those guidelines in concert with those described in this SFMA RMZ policy (eg. vernal pools and Forestry Habitat Management Guidelines
3. Integrate RMZ habitat attributes into management activities applied to adjacent management units.
4. Strive to minimize potential negative impacts to wildlife habitat connectivity by integrating consideration of travel corridors and pathways into management planning and activities for RMZ and adjacent management units.
5. When preparing treatment sites for management actions ensure proper evaluation for presence of RTE species, unique late successional forest features, and other special habitat features. Revise actions and plans accordingly.
6. When implementing management actions ensure proper retention of special habitat features like snags and den trees.

Sustained Timber Production

7. Ensure RMZ are properly integrated in SFMA monitoring programs.

8. All treatments must have a detailed prescription which clearly defines the silvicultural goals and application.
9. Utilize the most appropriate method to define individual trees and/or areas to be harvested through the use of flagging and or marking paint to ensure adequate control of harvest area and tree removals.

Recreation and Aesthetic Management

10. Conduct GIS and/or onsite inspection of treatment zones to determine potential visual impacts when planning silvicultural treatments or access/facilities development.

Riparian Feature Specific Management Guidelines

Category 1: Ephemeral wetlands, intermittent streams, hillside seeps, other unique hydrologic features.

1. No equipment entry within 25-50+ft of riparian feature edge.
2. Minimize presence of hard stand boundary when RMZ is adjacent to even-age management unit, by feathering stand edge. (Ideally use individual tree marking to accomplish feathered result leaving 60-70% crown closure)

Category 2: All ponds, wetlands, and pond/wetland complexes less than 10 acres in size, all 1st and 2nd order streams.

3. No equipment entry within 75ft of riparian feature edge.
4. Minimize presence of hard stand boundary when RMZ is adjacent to even-age management unit, by feathering stand edge. (Ideally use individual tree marking to accomplish feathered result leaving 60-70% crown closure)
5. Consider using multi-age management in RMZ if operational area is large enough to permit reasonable application of silvicultural system.
6. Consider ways to integrate RMZ habitat attributes into management activities in adjacent management units.

Category 3: All ponds, wetlands, and pond/wetland complexes greater than 10 acres in size, and all 3rd and 4th order streams.

7. No equipment entry within 100ft of riparian feature edge.
8. Minimize presence of hard stand boundary when RMZ is adjacent to even-age management unit, by feathering stand edge of operational unit. (Ideally use individual tree marking to accomplish feathered result leaving 60-70% crown closure)
9. Strongly consider using multi-age management in RMZ if area is large enough to permit reasonable application of desired silvicultural system.
10. Strongly consider ways to integrate RMZ habitat attributes into management activities in adjacent operational management units.

F.8 High Conservation Value Forest Resources

*See separate Boody Brook Natural Area Planning document.
*See separate Frost Pond Forest Planning document.

F.9 Post Disturbance Salvage Policy

General Protocols

- The disturbance threshold necessary to trigger an unscheduled harvest will be determined by operational considerations such as economics and adjacency. At a minimum, the Resource Manager and SFMA staff will evaluate disturbed areas to determine if harvest entry is warranted.

- As with SFMA management generally, silvicultural considerations will guide the development of operational specifications for any harvest after disturbance. *(Note: this was previously connected to bullet statement above.)*

- Excepting rare and unanticipated situations, all harvesting will be carried out with the same considerations of site sensitivity and regeneration protection, as are all SFMA harvests. Maintaining our FSC certification will be an integral part of any post-disturbance operations, just as it is on a regular basis. *(Note: this was previously the second para.)*

- In the event that regeneration is significantly damaged (or eliminated to below contemporary MFS standards) all available means of regeneration will be considered. Natural regeneration from residual overstory trees, suckering or coppicing, will be preferred. If it is deemed that the overstory will be unproductive or that any given site is in danger of colonization by non-tree species, planting will be considered. Artificial regeneration will be with native species and, whenever possible, with seedlings of local provenance. Establishing reasonable species diversity in the developing stand, including existing regeneration and a reasonable expectation of ensuing natural regeneration, will be considered.

- In the event that a disturbance is widespread enough to warrant post-disturbance harvest priorities, they will be developed based on the following considerations:
    - areas where responsive action may prevent additional damage to the Park or loss of timber or other resources
    - highest quality / most valuable timber
    - areas within the timber classification
    - areas of highest damage intensity, accessibility or harvest productivity.

Retention Thresholds

The salvage decision process matrices (see appendix) outline *minimum* retention targets based on management classification and disturbance agent. Areas will not be entered automatically after every natural disturbance. Should a post-disturbance harvest take place, these targets are

intended to maintain certain attributes that will contribute to the structural - and hence ecological – diversity of the developing stand.

F.10 Biodiversity and Wildlife Habitat Management

The 1999 publication Biodiversity in the Forests of Maine[50] Flatebo, Foss, and Pelletier suggest ―a primary goal for biodiversity in Maine‘s managed forest is to ensure that adequate habitat is present over time across the landscape to maintain viable populations of all native plant and animal species currently occurring in Maine. Biodiversity encompasses the concepts of functional wildlife habitat and forest ecosystem dynamics. The authors emphasize that this objective reaches beyond a focus on a just game species or only rare, threatened, and endangered species. This approach requires the simultaneous consideration of habitat for all native species at spatial scales ranging from microsites, to stands, forests, and landscapes and over long time horizons (generally beyond a single planning period. The authors list six key concepts that are easy to understand but require commitment to implement:

1. Think of individual stands as part of the landscape in which they are embedded.
2. Within the mosaic of stand types, sizes, and age classes on the landscape, maintain a component of mature and over-mature forest.
3. Consider what natural disturbance processes have taught us about tools and mechanisms to maintain biodiversity.
4. Maintain biological legacies within stands.
5. Consider what is left behind during a harvest, as well as what is removed.
6. Understand the importance of special habitats and features on the land and adapt management to maintain them.

Fisheries Management

In cooperation with the IF&W, major fisheries resources on the SFMA are regularly surveyed and fisheries biologists meet with Park personnel to discuss the status of the resource and any regulatory changes in creel limits that might be appropriate to maintain the fisheries resource.

Frost Pond is a 37 acre pond providing excellent holding habitat for brook trout but lacking in any reproductive habitat. IF&W began stocking Frost Pond in 1970 with 3100 brook trout. The pond has been stocked 17 times in the 26 years to 1996 with current stocking levels of around 750 fish per stocking. Since Frost Pond is a remote pond without natural reproductive habitat, stocking must be continual and would serve a recreational use only. The consistency of this practice to the overall SFMA approach of following natural ecological processes is questionable and should be reviewed over the planning period.

Forest management roads and the construction of the Wadleigh Brook Trail have improved the access to Hudson Pond and the potential is likely that fishing use on this formerly very remote pond will increase in the years ahead. Although stable native populations exist in Hudson Pond, reproductive habitat is limited and the fishery should be carefully monitored to evaluate the effect fishing pressure may have on the stability of natural

[50] Flatebo, G., C.R. Foss, and S.K. Pelletier. 1999. Biodiversity in the forests of Maine: guidelines for land management. Univ. Maine Coop. Extension Bulletin #7147. 168 p.

populations. Management shall work with IF&W fisheries biologists to ensure that fish population levels in Hudson Pond are adequately maintained.

F.11 Protection of Rare, Threatened, and Endangered Species

Baxter State Park is committed to protecting rare, threatened, and endangered (R,T,&E) species and their habitats within the SFMA. Management considerations regarding 2 federally listed endangered species are consider in detail in following sections. In general, SFMA management strives to integrate considerations of all R,T,&E species at various spatial scales in management planning and operations.

F.11a Management Implications of Lynx Recovery Plan

The SFMA is within the range of the Canada Lynx which is listed as threatened by the USF&W Service. Based on 2012 inventory data the SFMA hosts very little of the stand structure and composition that is desired by snowshoe hare, the principle prey species of the lynx. The large scale clear cutting and softwood release treatments common in northern Maine after the 1970-80's budworm event did not occur in the SFMA. Recent OSR treated stands with dense softwood regeneration in the SFMA may begin to offer habitat suitable for lynx and hare. However these areas are generally less than 50 acres in size and somewhat scattered on the land base, not forming the extensive habitat conditions found elsewhere in the industrial forest landscape. Lynx have large home ranges, approximately 10-15,000 acres, and hare make up as much as 75% of their diet. Thus the SFMA with comparatively little hare habitat is unlikely to serve as a significant source of high quality lynx habitat.

Park staff have conducted winter lynx surveys to try and determine the extent of lynx presence in the SFMA. Past results of these surveys were inconclusive, but seemed to indicate limited presence of lynx in the SFMA. Poor snow conditions in 2011-12 prevented a repeat of this survey, but staff plan to conduct field surveys in winter 2012-13. Results of field surveys will be analyzed in conjunction with updates to SFMA stand condition data in order to accurately assess the quantity and spatial distribution of lynx and hare habitat in the SFMA. As adjacent landowners become more aware of managing for lynx habitat the SFMA will seek to find ways to complement their efforts. However, the SFMA will not pursue active management specifically for lynx habitat especially at the expense of other species and habitat types, which may be less common on the larger landscape.

F.11b Management Implications of Atlantic Salmon Recovery Plan

Within the SFMA those watersheds that drain directly into the East Branch of the Penobscot River are considered to be potential habitat for Atlantic Salmon. Portions of Brayley Brook and the associated watershed area are within this habitat range. Only one major road crossing occurs in this watershed on the Brayley Brook Road. The Half-Mile Bridge crosses a tributary of Brayley Brook. All other stream crossings in the SFMA involve streams in the Webster stream watershed which is not considered as Salmon habitat due to the Grand Pitch Falls.

Crossing in habitat areas need to be maintained to ensure fish passage. Current planned upgrades to the Brayley Brook Rd bridge will ensure adequate passage conditions. Forestry operations within these watersheds will follow existing BMPs designed to mitigate potential sediment movement into waterbodies.

F.11c General Management Considerations Regarding R,T&E Species.

Active monitoring for and awareness of the presence of R,T,&E species is basic to SFMA management practice and planning. At a minimum annual updates of known locations of species and habitats are received Maine Natural Areas Program staff. These datasets are used to inform management planning and operational planning activities. Field staff seek to identify species locations and habitats during inventory and layout activities. Management activities may need to be modified as a result of field discoveries. Over the course of 2013 and 2014 SFMA staff will work to increase and improve the level of staff training and data storage and maintenance systems in order to improve on the existing activities in this area.

F.12 Transportation Access System

Design of Roads:

Our philosophy regarding the design and placement of SFMA forest access roads reflects a number of considerations:

Adequacy for use in the transport of forest products and equipment:

At a minimum, SFMA roads must be adequate to accommodate the needs of normal forest management operations, including log truck, equipment and crew traffic. *As in all areas of forest roads, it is our intent to provide adequate, but not excessive design in the accommodation of these needs.* ROW widths are generally 50' while road widths are generally 16', although terrain features can modify this standard, with occasional turnouts as prompted by terrain and safety considerations. Gravel sources for surfacing are rare to non-existent in the SFMA and roads are normally constructed by hydraulic excavator using on-site materials. After the completion of construction, new roads are closed to vehicle access and allowed to "cure" until the next operating season. Occasionally, the shale-based geology of the SFMA presents material that is suitable for use in minor, specifically directed surfacing efforts. *These areas may be developed as rough surfacing sources to accommodate maintenance and construction needs, but development should be kept to the minimum necessary to provide stable road surfaces and minimize erosion.*

About 25% of the operating year is conducted during the winter period from January to early March. Most, but not all, of the harvesting conducted during this period is from winter roads. Winter roads are constructed to a lower standard than "all-season" roads (and are accordingly less expensive) and usually are not accessible by vehicle after the specific harvest activities are completed. *For this reason, winter roads shall be considered for accessing both stands suitable for winter harvest activities and areas sensitive to increased use provided through vehicle access on all-season roads.*

Construction:

New road construction on the SFMA usually employs a clearing a ROW width of 55'. Immediately after construction the road appears to be quite sufficient in width and sight distance, however, native vegetation begins to re-colonize the ditch line and back slopes almost immediately. Field observation has clearly indicated that a significant percentage of yearly maintenance costs on SFMA roads will involve the mowing or reduction of roadside

brush to keep the roads free of encroaching vegetation. Efforts should be made during this planning period to develop and implement a regular system of vegetation control on SFMA management roads. *In addition, the expectation of future mowing needs should be considered in current road construction design by ensuring that obstacles such as rocks, stumps and slash are removed from the road shoulder and ditch.*

Adherence to "Best Management Practices" in Road Construction:

"Noncompliance of haul road BMPs tends to be a chronic problem that continues long after harvest operations cease because the roads remain. Eighty-nine percent of the observed cases of sediment movement were judged to be long-term impacts."[51] Road construction on the SFMA shall strive to apply recognized "Best Management Practices" in the construction and maintenance of forest roads and State of Maine current water quality BMPs. The prevention of sedimentation and the control of water movement in and around roads demands a recognition of the wide range of possible responses when a variety of soil/site conditions is impacted by the extremes of northern Maine weather. SFMA management should strive to test and develop new and effective structures and procedures to optimize management practices. Important procedures that should be implemented in the construction of SFMA access roads include:

- all-weather road construction during wet periods, especially the fall months, shall be avoided;
- open culverts or road dips shall be installed on long slopes leading to stream crossings;
- ditches and road slopes of all new all-season construction shall be seeded as soon as possible after construction;
- winter roads shall be seeded in the first spring after construction;
- whenever possible, wooden crossing structures shall be used over 3rd order[52] and higher streams to maintain a wide opening and a natural streambed.

[51] Assessing Compliance with BMPs on Harvested Sites in Maine: Final Report, Briggs, Russell D., Kimball, Alan J., Cormier, Janet; Cooperative Forestry Research Unit, Research Bulletin 11, August 1996.

[52] First Order Stream: tributary streams that have no branches. Second Order Stream: the stream segment flowing downstream from the confluence of two first order streams. Third Order Stream: the steam segment flowing downstream from the confluence of two second order steams. Pg. 44, Appendix 2 - Working Definitions, Sustaining Maine's Forests, Criteria Goals and Benchmarks for Sustainable Forest Management, DOC, July 1996.

The use of conservation mix and/or coated seed mixes consisting of fescue/clover/trefoil have generated discussion regarding the introduction of a steady source of naturalizing non-native plants to the forested ecosystem. Although this concern is recognized, no apparent alternative (native seed source of suitable rapid-colonizing plants) exists to effectively stabilize road slopes and ditches. Anecdotal observation suggests that plant populations from roadside seeding reach a peak from 2 to 4 years after seeding and then lose ground to larger, hardier native sedges/grasses/shrubs and trees. However, in areas where roadsides were seeded 15 years ago, small populations of tenacious species (birdsfoot trefoil, *Lotus corniculatus*) have persisted. Tests are in progress using seed from native vegetation gathered from SFMA ditch lines and we should continue to determine and develop more sources of native colonizers to employ to stabilize disturbed sites.

Road Maintenance:

Once roads have been constructed, often at considerable expense the challenge becomes how to maintain the road system in ways that preserve its long term utility for management while minimizing associated costs. In the course of all maintenance activities State of Maine current water quality BMPs should always be followed. The SFMA annual budget for road related maintenance is developed in concert with planned activities and the overall Park budget. The following activities are the most common maintenance actions on SFMA roadways:

Culvert replacement

An inventory of SFMA culverts is partially completed and on-going. This will enable more detailed assessments of culvert replacement activities.

Roadside ditch expansion and dredging

Roadside ditches need to be expanded and dredged on a periodic basis depending on sediment loads.

Road grading and surfacing

The two main access roads Brayley Ridge in the north and Wadleigh Mt in the south should be graded on a semi regular basis roughly every 3 years to ensure that roadside grasses do not compromise the gravel surfaces and make future grading work difficult and costly.

Road mowing

In order to prevent reforestation of existing roads, enable easy management related access, and to make public recreation access more pleasant all passable SFMA roads are mowed on a 3 year basis. Currently a rotation exists for all SFMA roads with roughly a 3rd of the road system being moved annually.

Bridge Repair and Replacement

A variety of crossing structures exist in the SFMA, varying in age, construction, and materials. Crossing structures require general maintenance like brushing to keep the water passage clear of obstructions, while the structure itself may require re-decking, or abutment replacement.

Distribution of Roads:

There are currently 70 miles of forest management roads on the SFMA. Access to the SFMA has been developed from two discrete points of entry, north and south of the Webster

Lake/Webster Stream watershed that divides the SFMA. A self-registration station at each entrance point provides an opportunity to educate the visitor and catalog a database to guide management decisions. The bi-polar nature of the access systems in the SFMA (separate systems north and south of the Webster waterway) is a product of the last planning period decision to protect the pristine nature of Webster Stream. Additional experience and consideration of this issue has only strengthened this decision: *the development of forest access in the SFMA shall not include bridging or impacting the Webster Stream corridor with vehicular access.*

The high construction cost of forest roads, especially in remote regions such as the SFMA, provides a strong incentive to maintain the total miles constructed at a level that is adequate but not excessive. During the "development stage" of forest access on the SFMA, (1980-2008), road construction costs accounted for 40% of annual expenditures. After this initial period of construction, road maintenance costs have replaced those of construction, accounting for 15% of annual expenditures. The incentive to minimize road miles is countered by the well-documented relationship between average yarding distance required to transport forest products to roadside and logging costs- the longer the yarding distance the higher the costs. Although not a linear relationship (costs usually escalate dramatically after a certain threshold distance is exceeded), the relationship is highly dependent on the type, method and application of logging system used. A strong factor in the decision to implement the current harvesting systems in use on the SFMA was the tendency of forwarder-based systems to minimize (but not eliminate) the effects of yarding distance on logging costs.

Safety:

The SFMA attempts to combine log truck traffic on narrow, scenic, forest management roads with pickup and car traffic of recreational users and forest visitors. The potential conflict of this situation is somewhat mitigated by the low level of log traffic necessary to transport SFMA forest products, but nevertheless road safety should be considered through the following practices:

- Educate the users regarding potential truck traffic via roadside signs and information delivered at the entrance self-registration box;
- All roads are named and signed to provide visitors with sense of orientation; to allow visitors to be directed to specific areas; and to allow visitors to relay spatial information to staff more adequately (i.e., "I saw such-and-such at the Hornbeam Road");
- Educate and communicate with truck drivers regarding the likelihood of encountering visitor traffic;
- Maintain sight distances on curves to provide sufficient time for identification and reaction;
- Repair (or clearly mark until repair) any dangerous areas such as culvert wash-outs, bridge failures etc. If necessary, access to these areas may be closed until repairs are complete;
- Placement of temporary warning signs in areas of active operations;
- SFMA management will require groups who wish to tour operations to organize their visit with SFMA staff.

Road Access Policy:

SFMA management policy articulates that public vehicle access will be provided in a manner consistent with Trust Communications and Park donor Percival Baxter's intentions regarding vehicle access within Baxter State Park and to the extent necessary to provide the public the opportunity to view the breadth of forest practices applied the SFMA landscape:

Vehicular recreation access to the SFMA shall be limited to 17 miles of major trunk line access roads:

- ***Wadleigh Mountain Road (south of Webster Lake and Stream)***
- ***Brayley Ridge Road (north of Webster Lake and Stream)***

Other SFMA forest management roads would be either blocked to vehicle access using logs and or rocks or gated to provide limited administrative access for SFMA tours and management work.

Discussion

This issue was reviewed and commented on by an SFMA Advisory sub-committee (Redelsheimer, Fitzgerald, Ahrens; text attached), followed by a discussion by the entire Committee at the May 2001 SFMA field tour and again at an SFMA Advisors meeting on 01/10/02. The major points that have developed from the discussion are:

The Baxter Trust and Communications wording is unspecific, unclear or absent regarding roads and vehicle access within the SFMA. It is unclear whether Baxter ever envisioned a network of forest management roads as a part of the SFMA (in 1955, water was the principal transport system in Maine for timber and pulp). Baxter's statements regarding roads in the Park indicate a distinct bias against vehicular access as a method of accessing Park resources. There is a general consensus that, although Baxter wanted the people of Maine to be able to access the SFMA to view the forest management activities, full vehicular access to all SFMA roads for recreational purposes is neither necessary nor consistent with the donor's wishes.

Damage or resource abuse from vehicular access has not been an issue in the SFMA to date, although effects on wildlife are difficult to determine. The lack of damage or abuse may in part reflect the implementation of de facto policies of road closure.

Subjectively, it seems clear to us as managers that vehicle access has an effect on hunting and trapping pressure on the SFMA.

Several points were discussed regarding hunting in Baxter State Park and the SFMA as a recreational activity:

-In 2001, approximately 50% of the SFMA roads were closed to access. There was no observed negative feedback to this procedure and large areas behind road closures were consistently utilized by hunters.

-In other areas of the Park were hunting is allowed, vehicle access is either non-existent (north of Matagamon Lake, West Branch Lands), or very limited (Togue Pond purchase, T2., R9 lands)

-Subsequent to the Park's purchase of the West Branch Lands, the BSPA decided, after lengthy discussions, to keep the lands open to hunting but to eliminate vehicle access.

-Roads are opened somewhat more during summer months to accommodate tours and management operations.

-For comparison purposes – BSP exclusive of SFMA is 0.17% roaded (surface area in roads). The SFMA will eventually be about 2.5% roaded if all management roads are included. This

proposal will open 17 miles of road to recreational traffic which equates to about 0.38% (about twice the percentage of roaded area in BSP exclusive of the SFMA).

Policy Element: Consistency with Park Donor's wishes

- Vehicular access for recreation will be limited to the SFMA to major trunk line access roads:
- Wadleigh Mountain Road (south of Webster Lake and Stream)
- Brayley Ridge Road (north of Webster Lake and Stream)
- Specific road closures may be effected with semi-permanent closures (rocks and or logs) or gates allowing administrative access for forest management activities (see map)

Policy Element: Public Safety

- Area-wide (entrance gate) closures will be implemented:
- In the event of large scale windthrow or flood damage
- Periods of high fire danger when the burning index is above 46.
- All winter roads and roads with a unsafe bridge, stream crossing or any other hazardous impediment will be closed to vehicle access.
- Areas around active forest management operations (logging, road construction, stand treatment operations) will be closed to recreational vehicle access and no-hunting zones will be posted.
- Roads will be posted to a 20 mph speed limit and off-roadway parking will be required.

Policy Element: Wildlife & Habitat Protection

- New roads (<1 year from construction date) will be closed to vehicular access.
- Any areas of soft roads or high erosion sensitivity will be closed to vehicular access.
- Roads directly accessing unique, threatened, sensitive or rare habitats will be closed to vehicular access.

Road Aesthetics:

Percival Baxter wrote, ***"I want this township to become a show place for those interested in forestry..."***. The forest road network on the SFMA will be the place from which most visitors interested in forestry will view our forest management and judge in their own minds if we qualify as a "show place".

Our observation indicates that the incorporation of aesthetic considerations in the design and construction of forest roads is both inexpensive and effective and in keeping with the "show place" standards set by Percival Baxter.

The design and layout of SFMA roads attempts to incorporate aesthetic considerations in every step of the process. It is our intention to locate roads in such a way that they "fit" and not "fight" the landscape. We attempt to incorporate curves and natural points of interest in our layout and follow up with a neat and orderly construction process capped with roadside seeding. The aesthetics of forest roads is only as good as the aesthetics of the adjacent forest stands. Accordingly, harvest patterns near roads and the incorporation of an appropriate mixture of stand treatments along a road system are also considered. In addition, the accumulation of logging residues is minimized with the current cut-to-length systems in use on the SFMA. Machine trail layout discourages

machine access to harvest blocks directly from main access roads. Trash and refuse are not tolerated anywhere on the SFMA, nor are receptacles provided. Consistent with Park policy, the SFMA is managed on a "Carry-In, Carry-Out" basis.

F.13 Forest Modeling

Attempts to project current forest conditions into the future under alternative management scenarios involves both art and science, as neither models nor data inputs are ever perfect. However, modeling exercises are essential to planning efforts designed to answer basic forestry questions about long term forest conditions and sustainability. During 2011-12 a substantial modeling project was undertaken. Temporary and CFI data were utilized to create a model portfolio. This portfolio was used to create long term projections of SFMA forest conditions under different management scenarios using Remsoft optimization software. These projections enable sustainability assessments over more than one rotation period. These results will be further evaluated in a software package called the Landscape Management System (LMS). This spatially explicit forest simulation software will enable the development of a detailed 10 year harvest schedule that can be updated annually over the period.

F.13a Description of Modeling Process

The SFMA is a moderately large property at 30,000 acres, governed by a complex management program. A variety of forest simulation models are available to forest managers in 2012 that are suitable to project SFMA forest conditions through time under various management scenarios. The principle difference between these models relates to linear programing optimization capability.

Traditional individual tree projection models allow the user to input raw inventory data at the tree level (which can be summarized at the stand or forest level), and project the growth of those trees under simulated management activities like thinning or planting. This type of model generally relies on the user to determine harvest schedules of when and where management treatments will occur. This can be described as a "hunt and peck" method of harvest scheduling where the user has complete control over the schedule. The Forest Vegetation Simulator (FVS) or the Landscape Management System (LMS) are examples of these types of models.

In contrast optimization models use complex linear programing calculations to maximize or minimize a specific management attribute, normally harvest volume, under a set of user defined constraints that represent management targets or regulatory constraints. Software systems can work at the individual stand polygon level or a generalized aspatial strata scale. Users must define expected yields from individual stand strata under anticipated silvicultural regimes such as shelterwood or selection. The process of developing yield curves representing a myriad of forest conditions is often the crux of a modeling project using this system. The Remsoft software package is the most commonly used optimization software in forest industry today.

As part of the 2012 planning process both types of models are being utilized to develop generalized long term harvest strategies and short term spatially detailed harvest schedules. The Remsoft optimization software is well suited to developing long term projections of treatment schedules that span more than one rotation. This enables analysis of critical questions relating to long term results of management activity on forest conditions and harvest sustainability. However, it is difficult to provide all the necessary inputs to an optimization model for it to produce a stand level harvest schedule that is practical and workable under real world conditions of weather, road

maintenance, and market fluctuations, in a management setting as complex as the SFMA. Thus for this modeling exercise the results of a 200 year Remsoft simulation are being used to guide the development of a short-term 10 year harvest schedule in LMS where the user can more accurately assigned treatments and timing in a spatially explicit manner. The LMS modeling work is still on going as of July 2012. While a harvest schedule will be completed by the end of 2012 this schedule will always be a work in progress as any schedule of this type is outdated almost as soon as it is created. Thus the LMS framework is designed to allow for constant updating of the schedule, a constant "work in progress".

F.13b Methods

To complete the modeling exercise described in section F.13a a variety data management activities needed to be completed at the outset. This included the compiling of inventory datasets and the editing of spatial data layers representing SFMA management features. The unification of such data is at the core of a comprehensive management planning process.

F.13b1 Data Inputs

Spatial Data:

Information about where management features reside on a land base is perhaps the most important of all management related information. Beginning in 2010 a systematic revision of all SFMA spatial datasets was undertaken. This work included the following:

- Editing of the management unit layer that represents the delineations of the all the individual management class polygons including operational, RMZ, Reserve, and undesignated units. Gaps, overlaps, and road ROW areas in this dataset were edited out to provide a more accurate assessment of the acreages in each management unit (MU) class.
- SFMA boundaries were GPSd using enhanced GPS technology to better represent the true extent of the SFMA area.
- Spatial and temporal datasets representing the chronology of past silvicultural treatments were reworked into more detailed database structures.
- Updated NRCS soil datasets were used to update MU drainage and site index values based on Briggs[53] drainage/site index tables.
- Stand type classification was conducted using both automated software systems and ortho imagery based visual assessments.

Inventory Data:

The SFMA collects annual forest inventory data representing forest conditions in various management unit classes. Historically these datasets were managed on an individual polygon basis in excel spreadsheets for use in FVS. However, this approach presents serious challenges when datasets are to be viewed comprehensively. Carol Redelsheimer with assistance from Aaron Weiskittel and Robert Seymour begin compiling these individual datasets into a single uniform format in 2009. This work was continued in 2010 and by 2012 all SFMA inventory data is stored in a single relational Access database. The fruits of this laborious work enabled the integration of all types of SFMA

[53] Briggs, R. 1994. Site Classification Field Guide. CFRU: TN6 MAFES: 724

inventory data to accurately describe the forest landscape of the management area. These datasets include:

- Temporary inventory data of operational management units.
- Temporary inventory data of reserve management units.
- CFI data of RMZ units.
- CFI data of Reserve units lacking temporary inventory datasets.
- CFI data of regeneration datasets.

F.13b2 Model Assumptions & Limitations

Forest modeling is an essential element of modern forest management but the modeling systems are far from perfect, and can only be as accurate as the data inputs feed through them. There are many assumptions that underlie the inputs and limitations of the model mechanics for the two types of models used to develop this planning document. Some of the most notable assumptions and limitations are:

Data Inputs

- Despite careful editing and updating, spatial data generally represents an over estimation of true operational acreages as not all not all internal "wet runs" and other non-operable acres within defined operational units have been accurately delineated. Thus polygon based estimates overstate the true available operational area.
- Inventory data for operational units often suffers from poor statistical accuracy as inherent stand variability would require unreasonable sampling densities that cannot be implemented in the field.
- The complex process required to develop yield curves combined with the limited available datasets reduced the ability to stratify inventory data to represent the true range of stand conditions found in the SFMA. Thus the yield curves used in modeling represent simplified portrayals of forest conditions.
- Regeneration inputs are an essential part of long term modeling. The only reliable regeneration data on SFMA stand conditions comes from CFI datasets and only 100 1/100ac samples were available.
- Only 14 CFI plots were available to describe over 3,000 acres of RMZ units.
- LMS utilizes individual MU polygon specific data but overall the model rigor suffers from afore mentioned assumptions and limitations.

Strata2	Site Class	Stand Type	GIS acres	Percent Area
NA1NH	1	NH	17.0	0.1%
NA1S	1	S	450.7	1.6%
NA1S_IH	1	S_IH	100.9	0.4%
NA1S_NH	1	S_NH	965.2	3.4%
NA2IH	2	IH	283.5	1.0%
NA2NH	2	NH	77.0	0.3%
NA2S	2	S	1061.7	3.7%
NA2S_IH	2	S_IH	1066.0	3.7%
NA2S_NH	2	S_NH	1048.0	3.6%
NA3IH	3	IH	88.2	0.3%
NA3S	3	S	238.3	0.8%
NA3S_IH	3	S_IH	322.0	1.1%
NA3S_NH	3	S_NH	112.3	0.4%
OSRIRR19801	1	NH	28.9	0.1%
OSRIRR19801	1	S	136.9	0.5%
OSRIRR19801	1	S_IH	39.6	0.1%
OSRIRR19801	1	S_NH	533.2	1.9%
OSRIRR19802	2	S	279.3	1.0%
OSRIRR19802	2	S_IH	19.7	0.1%
OSRIRR19802	2	S_NH	867.4	3.0%
OSRIRR19803	3	S	49.6	0.2%
OSRIRR19803	3	S_IH	46.0	0.2%
OSRIRR19803	3	S_NH	108.5	0.4%
RESV2IH	2	IH	37.2	0.1%
RESV2NH	2	NH	50.4	0.2%
RESV2S	2	S	510.1	1.8%
RESV2S_IH	2	S_IH	1618.1	5.6%
RESV2S_NH	2	S_NH	1226.5	4.3%
RESV3NA	3	NA	1.4	0.0%
RESV3S	3	S	178.5	0.6%
RESV3S_IH	3	S_IH	251.8	0.9%
RESV3S_NH	3	S_NH	43.2	0.2%
RMZ	3	S	3311.4	11.5%
RMZ	3	S_IH	625.0	2.2%
RMZ	3	S_NH	601.8	2.1%
SWEST1S	1	S	791.0	2.8%
SWEST1S_IH	1	S_IH	256.6	0.9%
SWEST1S_NH	1	S_NH	1434.6	5.0%
SWEST2NH	2	NH	22.5	0.1%
SWEST2S	2	S	2082.0	7.2%
SWEST2S_IH	2	S_IH	840.2	2.9%
SWEST2S_NH	2	S_NH	1319.6	4.6%
SWEST3IH	3	IH	55.0	0.2%
SWEST3S	3	S	1002.0	3.5%

Figure F.6 Remsoft yield curve strata.

Mechanics

- Development of yield curves requires projection of current inventory data over 100+ yr spans using FVS which has noted limitations with respect to long term growth projections. Common rules of thumb hold that model projections greater than 50 years become increasingly unstable and inaccurate.
- Treatments modeled in FVS for yield curve development are also simplified and represent general applications of silvicultural treatments.
- A spatial models will generally over predict the availability of harvest volume, care must be taken to reduce projections by a percentage in accord with management risk aversion. Conservative estimates regarding input data and output are essential.

Despite these noted limitations the results of the modeling efforts are robust and provide reasonably accurate representations of long term and short term forest conditions.

F.13b3 Model Mechanics

The steps in creating and running forest models are complicated and many of the details are necessarily omitted from this type of explanation. It seems that the best way to structure an explanation of this modeling work, for the wellbeing of both the planner and the plan audience, is to provide a bulleted list, roughly in chronological order, of the modeling components and actions.

Remsoft Model Basics

- Strata for Remsoft yield curves defined(Figure F.6)
- Management actions to be modeled defined to include: shelterwood system, selection system based on single tree approach, partial harvest as preparation for selection system, and clearcutting.
- Inventory data from multiple sources representing each strata compiled and projected in FVS under various management scenarios.
- Strata and management action specific yield curves developed for each strata based on FVS projections. Yield curves edited to ensure credible values and congruence across projection period.
- Model set to maximize harvest under specific constraints.

Remsoft Model Constraints

- Constraint: Approximately 1/3 of total harvest area in selection system.
- Constraint: Only 1/3 of RMZ acres open to active management, treatment limited to Selection.
- Constraint: Shelterwood establishment (SWEST) allowed after age 70.
- Constraint: OSR allowed 20 years after SWEST (Approx. 100 year rotation defined).
- Constraint: Selection treatment entries minimum of 20 years apart.
- Constraint: 1/2 of undesignated area available to be treated.

Remsoft Scenarios

Multiple iterations of the same Remsoft portfolio were run with subtle adjustments to the details of the constraints applied. These adjustments were fine-tuned until a final model run, using the constraints listed above, was settled upon as the best attempt to balance maximization of harvest volumes under specific sustainability constraints. This scenario provides the basis for the modeling results discussed in subsequent sections.

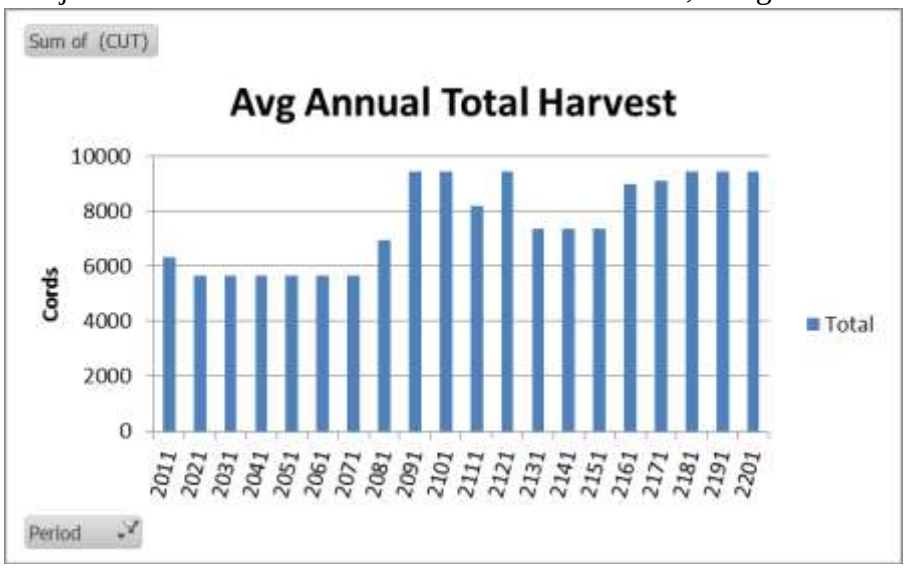


Figure F.7 Remsoft projected annual harvest rate in cords.

F.13c Results, Analysis, & Future Management Actions

Forestry is about the future and thus forest modeling software represents a "holy grail" of sorts to forest managers as it enables one to "see the future forest" to a certain extent. The ability to project current forest conditions through time under various management actions and then compare the results is extraordinarily powerful. However, the results of modeling exercises must be regarded with careful skepticism despite the seeming precise quantitative nature of the inputs and outputs. The assumptions and limitations reviewed previously should give pause to anyone tempted to accept model outputs as the final decision, ready for implementation without further analysis or ground truthing. Model results should be interpreted as a "best guess" and constantly re-evaluated as part of an adaptive management approach. Results presented here are viewed as conservative based on conservative assumptions applied to data inputs and outputs. All of the following results that depict conditions over more than 20 years are from the Remsoft system which was run for 200 years, while the short term projections are from the LMS harvest scheduling approach (still in development fall 2012.

F.13c1 Annual Harvest Rate

SFMA 2012 Mgt Planning	Variables		
Total Managed Acres	19,250		
Percent Even	67%		
Percent Multi-Age	33%		
Rotation Age: Even-Age	100		
Rotation Age: Multi-Age	130		
Years per Period	1		
Even-Age Assumed Entries/Rotation	2		
Multi-Age Assumed Entries/Rotation	5		
Multi-Age Cutting Cycle	26		
	Even-Age	Multi-Age	Totals
Total Acres	12,898	6,353	19,250
Acres Regen / Year	129	49	178
Acres Regen / Period	129	49	178

Figure F.8 Area control variables and calculations.

There are many ways to calculate an annual harvest rate. Analysis of the CFI data discussed in earlier sections is the traditional approach to this type of calculation. CFI data enable a straight volume control based analysis of sustainable annual harvest rates or a combined area and volume approach. Based on 10 years of growth data from one complete re-measurement of CFI samples the

Period	Annual Harvest Vol
2011	6,316
2021	5,684
2031	5,684
2041	5,684
2051	5,684
2061	5,684
2071	5,684
2081	6,976
2091	9,473
2101	9,473
2111	8,199
2121	9,473
2131	7,379
2141	7,379
2151	7,379
2161	9,011
2171	9,136
2181	9,473
2191	9,473
2201	9,473

Figure F.9 Annual projected harvest in cords.

total annual volume growth on operational units is estimated to be around 6,000 cords (Figure F.1). This estimate is useful but it is based on historic growth, mortality, and practices. It does not constitute a true long term projection based assessment of harvest levels designed to achieve management objectives related to age class distributions and stand structures. The long term projections of management possible in the Remsoft modeling environment are a better way to accomplish this type of assessment.

Interestingly, based on Remsoft modeling the estimated annual harvest over the next 70 years is close to this CFI measure of annual growth (Figure F.9). The model projects a mild decrease in harvest over the next decade that must be sustained until 2081 (Figure F.7) when harvest will increase in response to a general achievement of balance in age classes and the increased regular supply of harvestable timber as a result of this regulation. The reduction in harvest is due to the model forcing this regulation and temporarily reducing harvest in the process.

F.13c2 Area Regulation

The concept of an area control approach to forest management and forest planning is relatively simple in the abstract. The basic goal is to regenerate an equal amount of area in each harvest entry thereby balancing the age class structure of the forest over the course of a rotation. Like most theories it works best on paper but becomes messy when applied on the ground. However, for this planning period the area regulation approach has been selected as the preferred method to develop balance in age classes and stand structures; and over the long term provide an even and sustainable flow of timber for harvest.

A basic set of area control calculations for the SFMA are shown in Figure F.8. Calculation details include:

- Total operational acres = 19,250
- Even-age vs. Multi-age area split = 2/3 and 1/3 respectively
- Even-age stands average rotation = 100 years
- Multi-age stands average 130 years avg max age

These assumptions lead to desired regenerated acres per year of 130 for even-age systems and 50 for multi-age. Additional calculations can be done to estimate the area of tending treatments annually in order to arrive at total harvest area estimates for a give year (Figure F.10).

Values Per Year	Total Acres to Treat w/ Tending/Year Even-Age	258
	Total Acres to Treat w/ Tending/Year Multi-Age	122
	Total Harvest Area	558
	Total Area to Regenerate	178

Figure F.10 Total harvest areas under theoretical area control design.

The basic area constraints applied to the Remsoft portfolio do not represent a complete forcing of the model to utilize an area control approach. Rather it was left to the model to develop a regulated harvest on a mathematical basis subject to specific constraints. The resulting aspatial harvest schedule successfully achieves the regulation of age structure over the course of a rotation period and beyond. In 2011 the age structure of the SFMA is out of balance though management over the last 30 years has begun to address this issue, most of the acreage is comprised of 90 year old stands (Figure F.13). By 2091 after the completion of a 100 year rotation the age structure is much more balanced due to an even amount of regeneration treatments each period (Figure F.14). And after 2 complete rotations in 2211 the structure is even better balanced (Figure F.11).

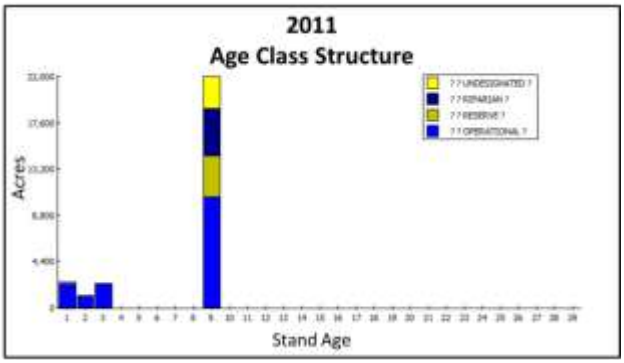


Figure F.13 Remsoft model 2011 age class structure

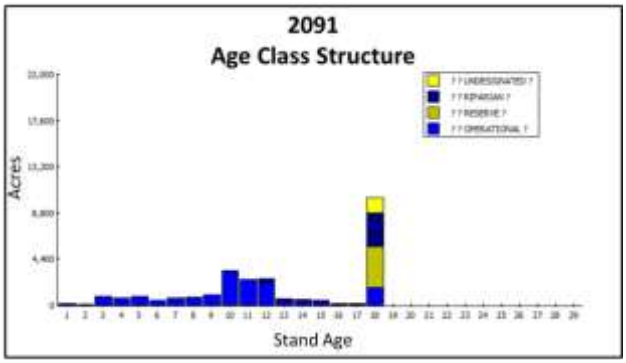


Figure F.14 Remsoft model 2091 age class structure

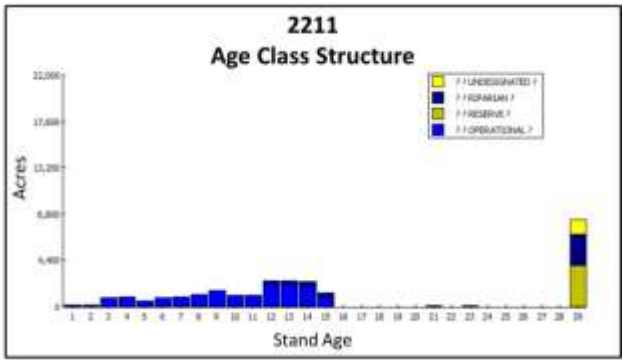


Figure F.11 Remsoft model 2211 age class structure

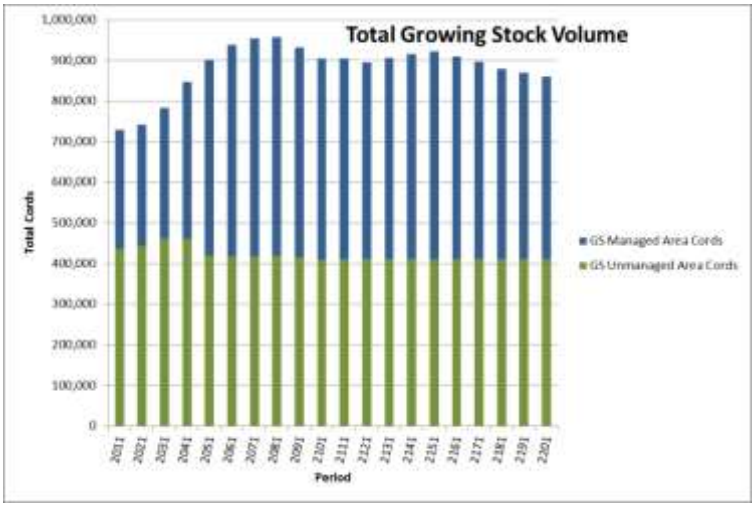


Figure F.12 Standing volumes in both managed and unmanaged areas.

F.13c3 Standing Volumes

Model predictions regarding the influence of management on standing volumes show a steady increase in standing volume in the managed portion of the SFMA and a subtle decline in unmanaged (Figure F.12). This decline is due to the fact that over the projection period a percentage of the RMZ and Undesignated MU acres that are classes as "unmanaged" in 2011 come under management over the course of the next 75 years. In reality a volume decline could also be expected in the unmanaged areas due to stand mortality common in over mature stands, though this type of mortality is not integrated into the modeling. The average per acre volume in operational areas increases over the first rotation from about 15 cords/ac to 25 cords/ac.

F.13c4 Silvicultural Systems & Harvest Volumes and Revenue

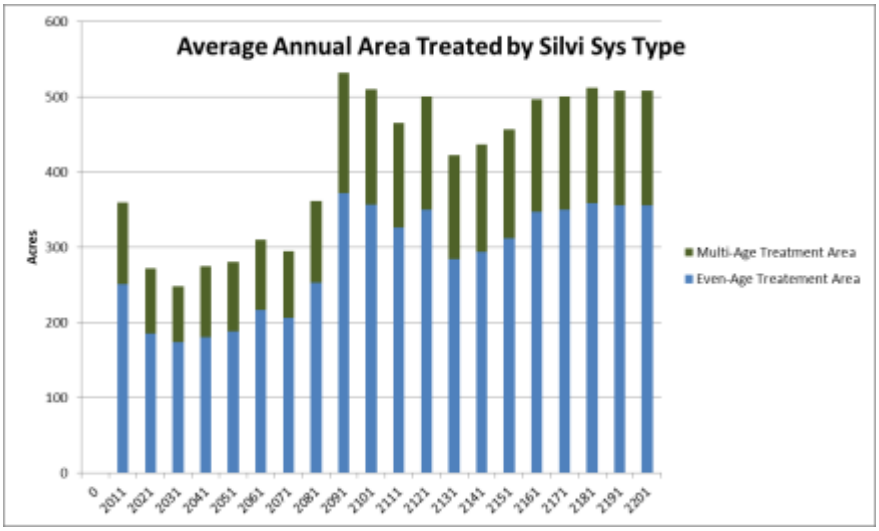


Figure F.15 Annual acres treated with either MA or EA systems.

The modeling incorporates a fairly simple set of silvicultural treatments including, shelterwood establishment (SWEST), shelterwood overstory removal (OSR), clear cut (CC), a partial harvest designed to transition a stand to multi-age management (PART), and a multi-age treatment (GROUP). While the yield curves created to simulate a stand under a multi-age management regime were designed in FVS as a single tree selection treatment, they it should be a reasonable representation of the area control approach to multi-age management commonly applied in the SFMA. The allocation of acreages to these systems in the model was partly controlled through area based constraints. The average annual area treated under the two approaches reflects this desired split of roughly 1/3 multi-age and the remaining area in a type of even-age management (Figure F.15).

A more detailed examination of the

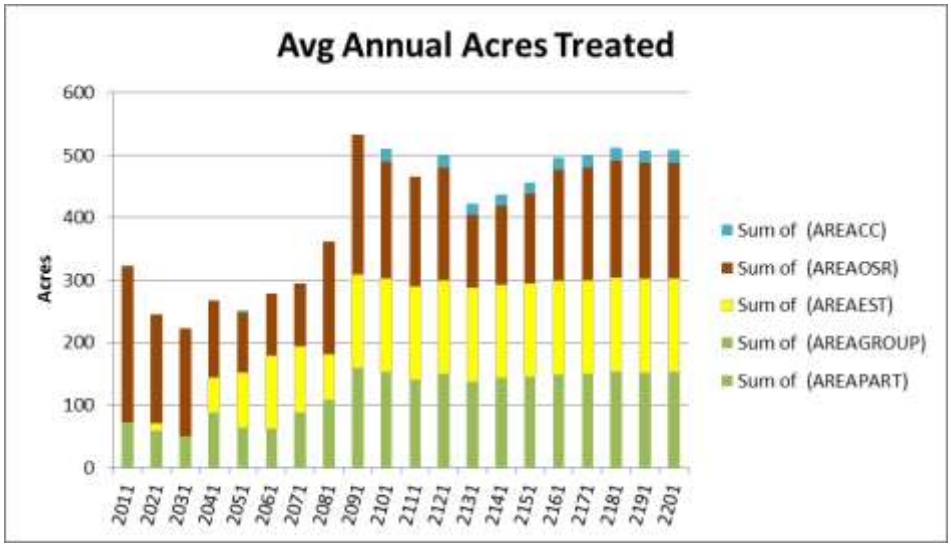


Figure F.16 Annual acres treated by treatment type.

projected application of silviculture shows a front loading of OSR treatments in the first 3 periods with almost no SWEST during that time. Then gradually over the remaining part of the rotation all treatment types begin to be applied evenly, reflecting the achievement of regulation over forest conditions and their position in a silvicultural sequence. This stays true for the following rotation with treatments applied evenly due to the regulated forest condition.

F.13c5 Age Class/Structure/Development Stages

As discussed in the preceding section on Area Regulation the model predicts a reasonable regulation of the age structure of the managed forest by the close of the first rotation period (Figure F.14). The unmanaged area will be allowed to develop an age structure independent of human intervention. The stand structures that will develop under this management regime will be diverse. It is estimated that nearly 1/3 (8,000acres) of the total SFMA forest area will be held as unmanaged forest; a combination of reserves, RMZ reserves, and non-operable undesignated area that will be assigned to one of those categories. Thus a significant part of the forest will likely develop a complex vertical and horizontal structure typical of old forest in the region. At the same time roughly 1/3 (6,000acres) of the operational area will receive multi-age treatments of one type or another resulting in similar complex stand structures. The result will be a total of approximately 14,000 acres representing 50% of the total forest area managed either actively or passively to develop mature and complex stand structures.

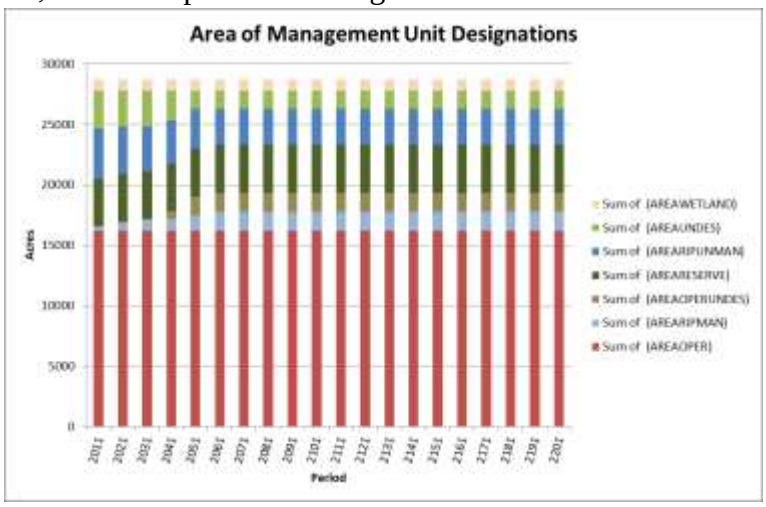


Figure F.17 Anticipated management unit class areas.

F.13c6 Habitat

The steady application of OSR treatments will generate young forest, generally dominated by softwood species, which may be suitable for hare and lynx. However, even with an increase in suitable habitat acres, it is questionable about the viability of lynx populations in the SFMA given the relatively small size of these young stands and the dispersed spatial distribution across the forest. When the distribution of age classes is applied in a spatial setting the viability of this habitat supporting lynx populations diminishes. The same is not likely to be the case for

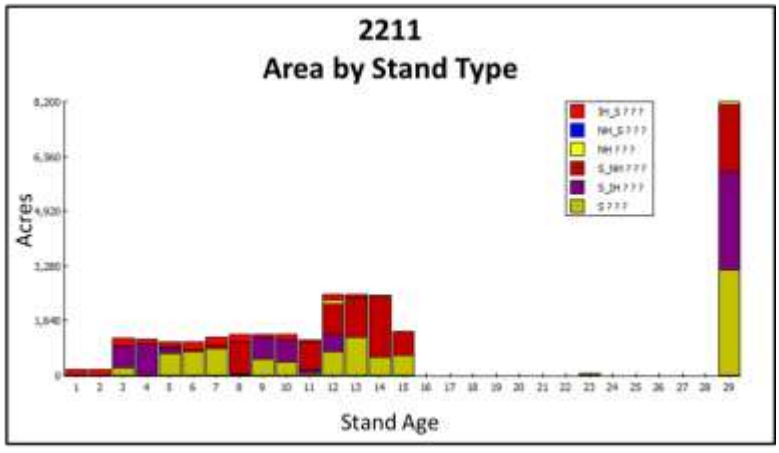


Figure F.18 Anticipated area in stand types in 2211.

mature forest species like martin and fisher. The matrix of reserves, multi-age stands and even-age stands in different stages of development will provide ample mature forest habitat. The limited harvesting of RMZ will mean many of those habitat corridors do not experience intense human caused disturbance, though that does not mean they will remain unchanged as many RMZ are prone to impact from other disturbance agents such as wind and SBW.

Section in Process…

F.13c7 Vulnerability

The design of the Remsoft portfolio for the SFMA does not allow for sophisticated analysis of forest vulnerability to different disturbance agents. However, basic assessments of stand structures and species composition can enable generalized assessments. The development over 1-2 rotations of diversified age classes, and assumed tree height and diameter classes, present a diverse set of conditions across the SFMA. This diversity will presumably offer a spatially explicit resistance to large scale wind events as different size classes maybe more or less impacted by an event, meaning that while some forest may experience severe wind throw it is unlikely that the entire forest will suffer the same disturbance uniformly. This same pattern of landscape scale stability should hold true for most types of disturbance.

The high percentage of balsam fir saplings, in 2012, means that at some point a budworm outbreak will likely cause large scale mortality of the balsam fir. How exactly the next outbreak and the susceptibility of SFMA stand conditions coincide is unknown but the impact of an outbreak hinges significantly on this interaction. The opportunity to salvage such material will exist but the market dynamics will determine the feasibility of salvage operations. More detailed modeling designed to answer just this question should be conducted before the end of the current planning period to address this uncertainty.

Section in Process…

F.13c8 Forest Carbon Estimates

Section in Process…

F.13c9 2012-2022 Harvest Schedule

The Remsoft modeling was designed to answer long term forest sustainability questions rather than develop a detailed harvest schedule. LMS will be used to develop a detailed 10 year harvest schedule during 2012. This 10 year schedule will be based on the 200 year Remsoft simulation and the management direction it provides. The 2012-2022 harvest schedule will include a significant amount of SW OSR treatments as well as multi-age treatments. The exact acreages treated and volumes removed will necessarily vary from the 10 year average portrayed in the Remsoft results. Averages over the 10 years should mirror the Remsoft results.

When results from the LMS modeling work are prepared they will be added to this section.

Section in Process…

F.13c10 Summary of Model Analysis and Achievement of Objectives

When results from the LMS modeling work are prepared they will be added to this section.

Section in Process…

F.14 Adaptive Management Approach

If forestry is about planning, then planning is about adaptation and adjustment to what happens according to plan and what deviates from plan predictions. Forests are dynamic systems and the social and economic conditions under which forest management occurs are similarly unpredictable. Thus any efforts to plan for the future of a forest resource must be designed to accommodate change. Static planning and plans will serve as little more than bookends on a dusty shelf.

The diverse elements of this plan should be re-evaluated as new scientific information develops to ensure that management activities and directions are founded on the best available knowledge. Economic and social elements must also be adjusted as new markets develop and community dynamics change.

An adaptive approach also requires constant evaluation of the results of management activities. This should include everything from model predictions harvest volumes to regenerations successes or failures under silvicultural treatments. Review of management results should occur at a basic level each year through the assessment of the management goals, objectives and crieteria outlined in section B of this document. The elements of that section provide managers with a description of what the future resource should look like. The true condition must be compared to this desired one and necessary adjustments either to actions or to management thinking should be completed accordingly. There is no strict timeline suggest for this type of review but some effort should be made each year.

F.15 Product Markets & Fiscal Management

F.15a Product Markets

Early in the 1990's SFMA management began a steady transition from a stumpage based payment system to a service-based system, completing the transition in the 1994-95 operating year. The marketing of forest products from the SFMA is influenced by the distance to markets, private control and use fees required for the use of the Telos/Pinkham road systems, and the poor quality and low value of many of the marginal forest products presently generated by SFMA silviculture. In contrast, the value of spruce, fir and white pine log volume promises to remain strong into the foreseeable future and provides tremendous opportunity for the application of sound silviculture and stand improvement.

Markets:

The SFMA is in many ways one of the most difficult marketing locations in Maine. Distance often is a limiting factor on all markets, both domestic and foreign. Although traditionally the flow of labor and products from the Webster area has been strongly influenced by Canada, marketing efforts should reflect Baxter's intent to provide Baxter Park as a gift to the people of Maine. Accordingly, marketing shall seek to utilize domestic markets. Small volumes of specialty products, limited market opportunities or significant price differentials shall constitute situations in which foreign markets should be considered.

State and Domestic Forest Product Sales Policy:

It is the first priority of Baxter State Park to sell forest products harvested in the Scientific Forest Management Area to intrastate mills and markets.

Baxter State Park may exercise the option to sell forest products harvested in the Scientific Forest Manager Area to mills and markets outside the State of Maine when one or more of the following conditions are met:

- Utilization standards allow increased volume to be processed into higher value products.

  For example: a smaller top size or greater butt rot allowance allows more spruce to be sold as sawlogs versus pulpwood or a tie-log market allows low-grade hardwood logs to be sold as sawlogs versus pulpwood.

- Markets exist for species products that do not exist in Maine.

  For example: red pine poles.

- Net delivered price at Maine markets is 10% or more below the net delivered price at a non-Maine market.

- On a rolling five-year average the Park will not exercise this option for more than 30% of the annual allowable cut.

Payment Basis

It is important to remember that the SFMA is not a part of a processing facility, and in accordance with the Trust communications, never will be[54]. Consequently, the earning potential of the SFMA is based on our ability to increase the yield and quality of wood products available on the SFMA. The majority of current and anticipated harvest activities through this planning period are expected to concentrate primarily on stand improvement harvests that remove at-risk or low value components of the stand. Generally, stems with good potential for future growth in size and value are retained. Consequently, residual average stand diameters are almost always higher than pre-harvest averages. The wood products resulting from current harvesting are primarily sold on a weight basis. Other means of payment measures should be evaluated when seeking a premium on the value of future harvests that include a higher percentage of larger softwood stems.

F.15b Projected Revenue

Any projection of future harvest revenues must be viewed with a significant degree of skepticism. Market fluctuations are to be expected and can wreak havoc with assumed product values. Significant natural disturbance events could dramatically alter harvest levels for certain time periods. Despite these acknowledged uncertainties an evaluation of potential revenues from silvicultural operations is a critical element to an evaluation of the SFMA forest management program. The Remsoft modeling process described in this document provides a basic level of information upon which to base harvest revenue projections. A review of historic net product values provides a conservative estimate of an average of $40.00/cord for SFMA products harvested and

[54] Private and Special Laws, 1955, Chapter 171, regarding T6,R10, "The trees harvested may be cut and yarded on the premises but no manufacturing operations shall be carried on within said township".

brought to market. Using this value to estimate harvest revenues in "real dollars", a projection emerges that is shows revenue levels fairly consistent with recent revenue years (Figure F.19).

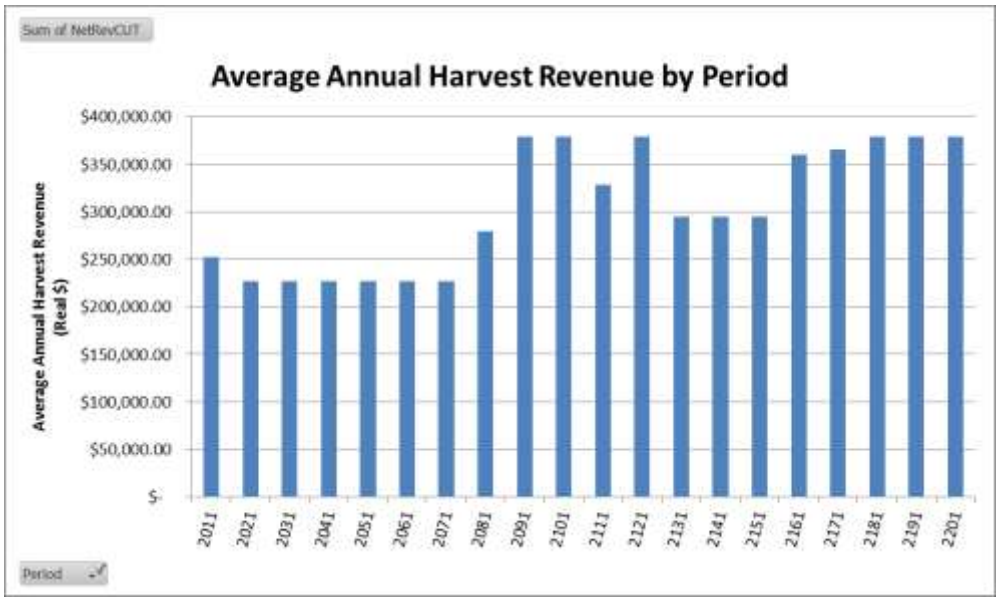


Figure F.19 Average annual harvest revenue in real dollars by period.

A more detailed analysis of revenue projections for the upcoming 10 year planning period will be possible using LMS projection data. This will involve more detailed revenue estimates based on specific product mixes and harvest area data. Comparison of these estimates with the generalized and long term Remsoft values, will offer valuable ground truthing of the Remsoft results.

Section in Process…

F.15c Projected Expenses

The true costs associated with management can be difficult to tease out of a complex organization like Baxter State Park. However, such information is essential to complete an evaluation of the profitability of management activities and directions. SFMA staff are committed to completing this type of analysis and plan to undertake a detailed analysis project during the winter of 2012-13. Results from this work will be added to this planning document when they become available.

Section in Process…

F.16 Critical Management Directions and Considerations

Section in Process…

G. Forest Communities & Forest Workers

G.1 Contractor Relations

Operational work in forest stands has the unique quality of changing an already dynamic system. Every woodsman knows that the fundamental satisfaction of good forest work comes from the observation of the effects of forest work over time. Most importantly, we realize that after working on the same land for many years, one inevitably invests part of one's soul in the land and forest. We believe that the best management possible comes from this feeling - the type of management capable of producing ***"...an example and inspiration to others".*** Woods workers often return to sites worked years before to see how the forest has changed. *SFMA management encourages a long-term approach by forest workers*. Our approach to harvesting and stand management will very likely provide a committed contractor the opportunity to re-enter stands harvested years before to experience the benefits of earlier management The major hurdle in maintaining long-term employment of quality individuals is the remote location of the SFMA. This remoteness often requires a commitment of woods workers to reside away from their homes during the work week (3 to 4 nights/week). The SFMA has lost talented and committed individuals because their need to be with their families understandably outweighed their commitment to work on the SFMA. It is unlikely that this conflict will ever be overcome, but a determined effort should be made to minimize it.

G.2 Worker Safety

Field workers in the SFMA whether BSP staff or private contractors assume elevated risks in all work tasks given the remote nature of the area and the distance to definitive medical care. This risk should not preclude the completion of work responsibilities, but it does require constant attention to personal and teammate safety. A variety of safety procedures and protocols are defined in the BSP Standard Operating Procedures (SOP) manual. All BSP staff and contractors are expected to follow these SOP directives that pertain to their work responsibilities.

G.3 Staff and Contractor Training

Section in Process…

Training is a time consuming but essential element to a robust forest management program as well as a safe working environment. All BSP staff attend regularly scheduled trainings on pertinent safety topics. These include areas like ladder safety, wilderness first aid, and chainsaw operation.

SFMA staff regularly attend State and regional workshops and conferences related to forestry and other management topics. These training events serve to ensure that staff are informed about the latest science and theories within the forestry and land management fields. In addition to silviculture topics SFMA staff pursues training in road construction and water crossings, as well as forest ecology related topics.

G.4 Stakeholder Involvement & Engagement

Section in Process…

G.5 Volunteers

Section in Process…

G.6 Contract Development

Section in Process…

G.7 Local Markets and Access

Section in Process…

H. Demonstration & Education Planning

The SFMA was created to serve as a demonstration forest for interested members of the forest professional and the general public alike. To this end SFMA staff work to develop and host tours for diverse audiences. Staff often participate in conferences and workshops as presenters and give lectures at educational institutions. Unfortunately, the remote location of the SFMA makes it difficult for many audiences to visit the forest in person.

Section in Process…

H.1 Forest Ecology & Management Trail

An interpretive trail located along the Park tote road along the "management mile" near trout brook crossing, has been in development for several years. The specific details of this trail and the interpretive features and topics it will include are still in development in fall 2012. Plans to open the trail in summer 2013 are on schedule.

Section in Process…

H.2 Public Tour Events

SFMA staff regular lead tours of the forest to see different aspects of the management program ranging from silvicultural operations to reserve area management. Tours for forestry professionals are common as are those for forestry students. Tours for groups such as students, teachers and the general public can be arranged. While staff time is limited and not every request can be accommodated, tours for small groups of the general public have occurred in the past. Tours for forestry groups and other interested parties can be arranged by contacting the Park Resource Manager (207-723-9616).

H.3 Website Development

The SFMA website has been revised in 2012 and is intended to serve as a principle means of disseminating to diverse audiences information about forest management as it is practiced in the SFMA. The re-designed website is organized into 3 principle categories each with specific sub-categories (Figure H.1).

- Forest Management.
  - Forest Ecology
  - Silviculture
  - Operations
  - Monitoring
  - Management Planning
  - Fiscal Planning
  - Certification.
- Demonstration and Education
  - Interpretive Trail
  - Tours
  - Virtual Tour
  - Maps
- Recreation
  - Access
  - Hunting and Fishing
  - Hiking and Camping

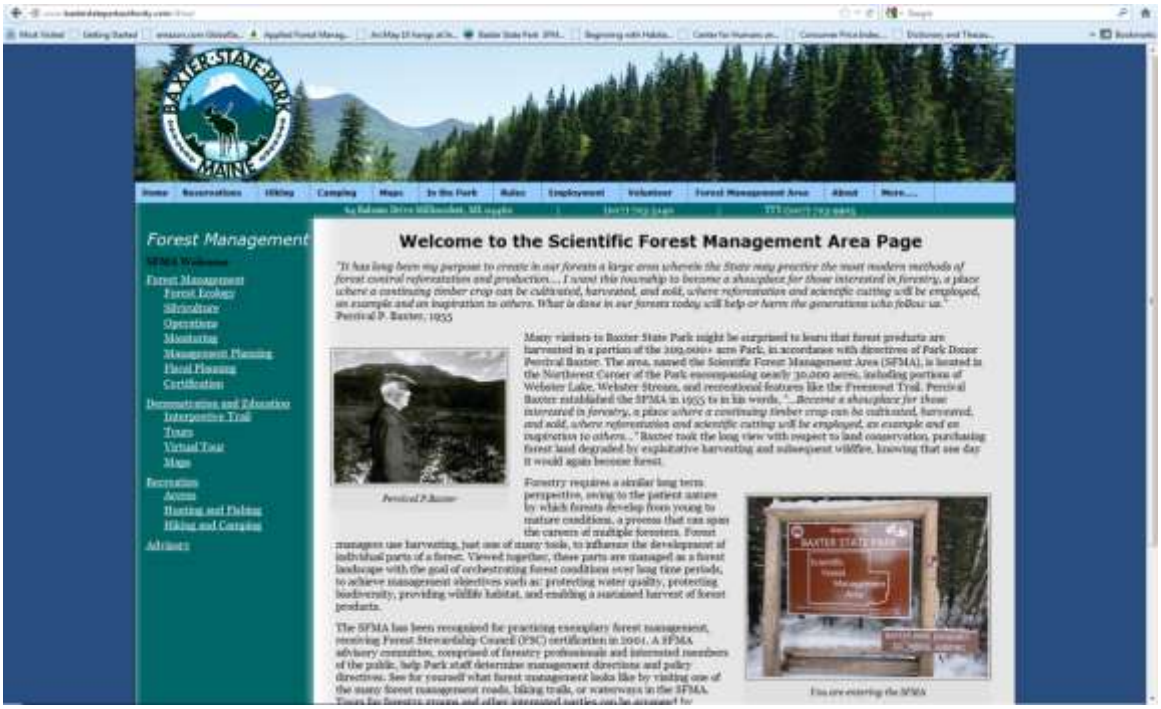


Figure H.1 SFMA website homepage 9/12/2012

The SFMA webpage will continue to be updated and expanded. The remote nature of the SFMA requires that public outreach efforts utilize current information technology as an effective means of communicating the SFMA approach to forest management.

H.4 Research Activities

The SFMA has been the focus of various research projects over the last several decades. Most recently research by UMaine graduate students Tero and Birch helped explore the details of both the Boody Brook Natural Area and the SFMA approach to multi-age management. Current research activities include applications of new remote sensing technologies and techniques. The SFMA is an ideal location for researchers given the mandate for science based management, availability of robust spatial and inventory datasets, availability of housing for field staff, and well developed road access throughout the area. SFMA staff regularly collaborate with UMaine faculty and students to facilitate new research activities in the SFMA and the rest of the Park.

I. Public Recreation Planning

Section in Process…

J. Future Plan Updates

Numerous sections in this document conclude with the text "*Section in Process…"* indicating that staff intend to add additional content to the topic and discussion. There are many sections where future work is intended. Principle among these are the following.

F.5 Forest Protection—All sections, focused on SBW and invasive species.

F13c6 Habitat
F13c7 Vulnerability
F13c8 Forest Carbon Estimates
F13c9 Harvest Schedule
F13c10 Summary of Model Analysis and Achievement of Objectives

F15 –Products Markets and Fiscal Management—All Sections, see notes in F15c.

I Public Recreational Planning

J.1 Future Planning Goals and Needs

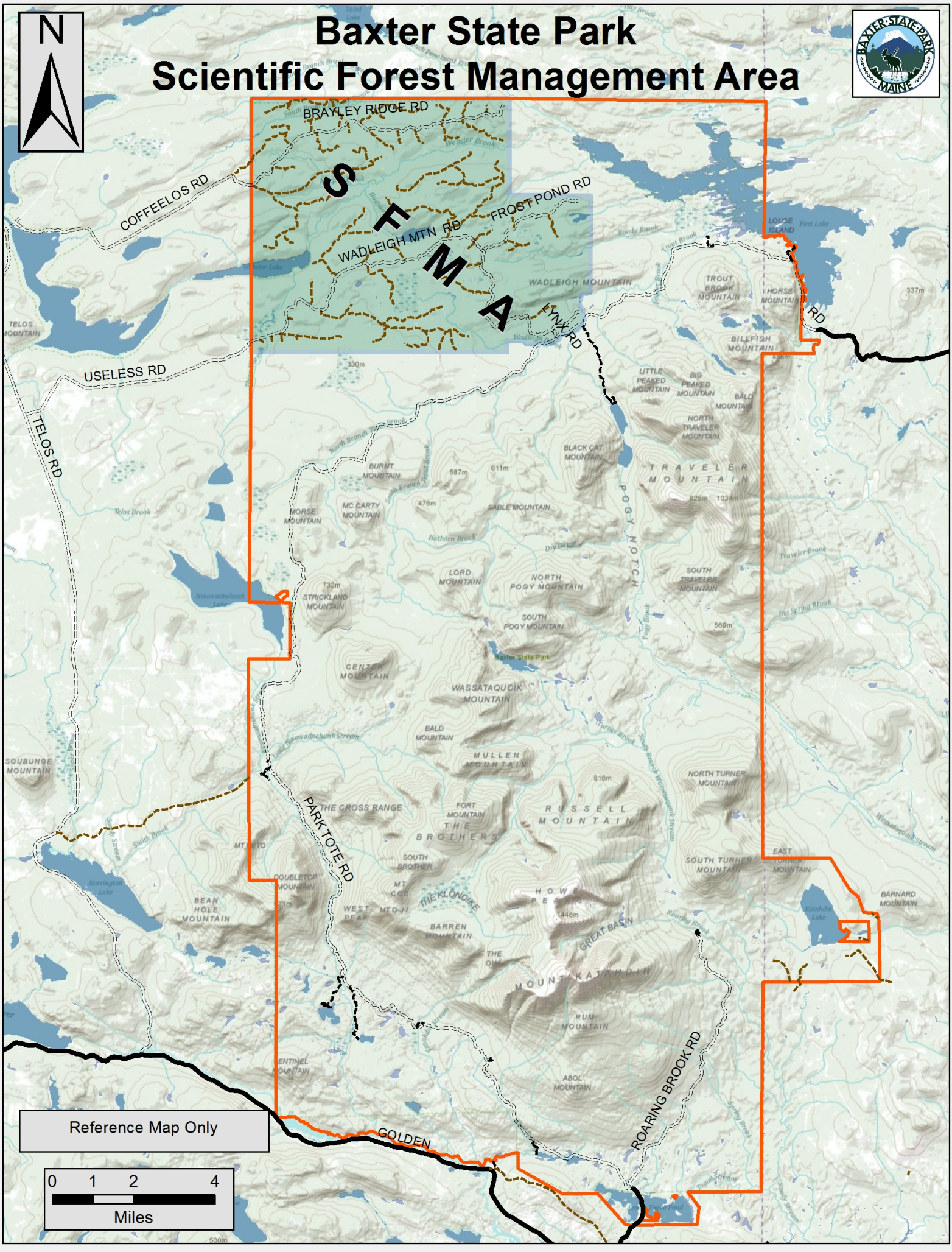
Section in Process…

K. Appendices

K.1 Maps

The following maps are included in order as listed to serve as reference for the reader.

1. **SFMA Location Map**
2. **SFMA Soil Series Map**
3. **SFMA Soil Drainage Map**
4. **SFMA Stand Type Map**
5. **SFMA Harvest History and Monitoring Sites Map**
6. **SFMA MNAP R,T,&E Sites Map**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FROST POND RD
WADLEIGH MTN RD
WADLEIGH MOUNTAIN
FINN RD
USELESS RD
TELOS RD
PARK TOTE RD
ROARING BROOK RD
GOLDEN
RD
TELOS MOUNTAIN
LOUSE ISLAND
First Lake
TROUT BROOK MOUNTAIN
HORSE MOUNTAIN
BILLFISH MOUNTAIN
LITTLE PEAKED MOUNTAIN
BIG PEAKED MOUNTAIN
BALD MOUNTAIN
NORTH TRAVELER MOUNTAIN
BLACK CAT MOUNTAIN
TRAVELER MOUNTAIN
BURNT MOUNTAIN
MC CARTY MOUNTAIN
SABLE MOUNTAIN
POGY NOTCH
LORD MOUNTAIN
NORTH POGY MOUNTAIN
SOUTH TRAVELER MOUNTAIN
STRICKLAND MOUNTAIN
SOUTH POGY MOUNTAIN
Baxter State Park
CENTER MOUNTAIN
WASSATAQUOIK MOUNTAIN
BALD MOUNTAIN
MULLEN MOUNTAIN
NORTH TURNER MOUNTAIN
SOUBUNGE MOUNTAIN
THE CROSS RANGE
FORT MOUNTAIN
THE BROTHERS
RUSSELL MOUNTAIN
SOUTH BROTHER
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BEAN HOLE MOUNTAIN
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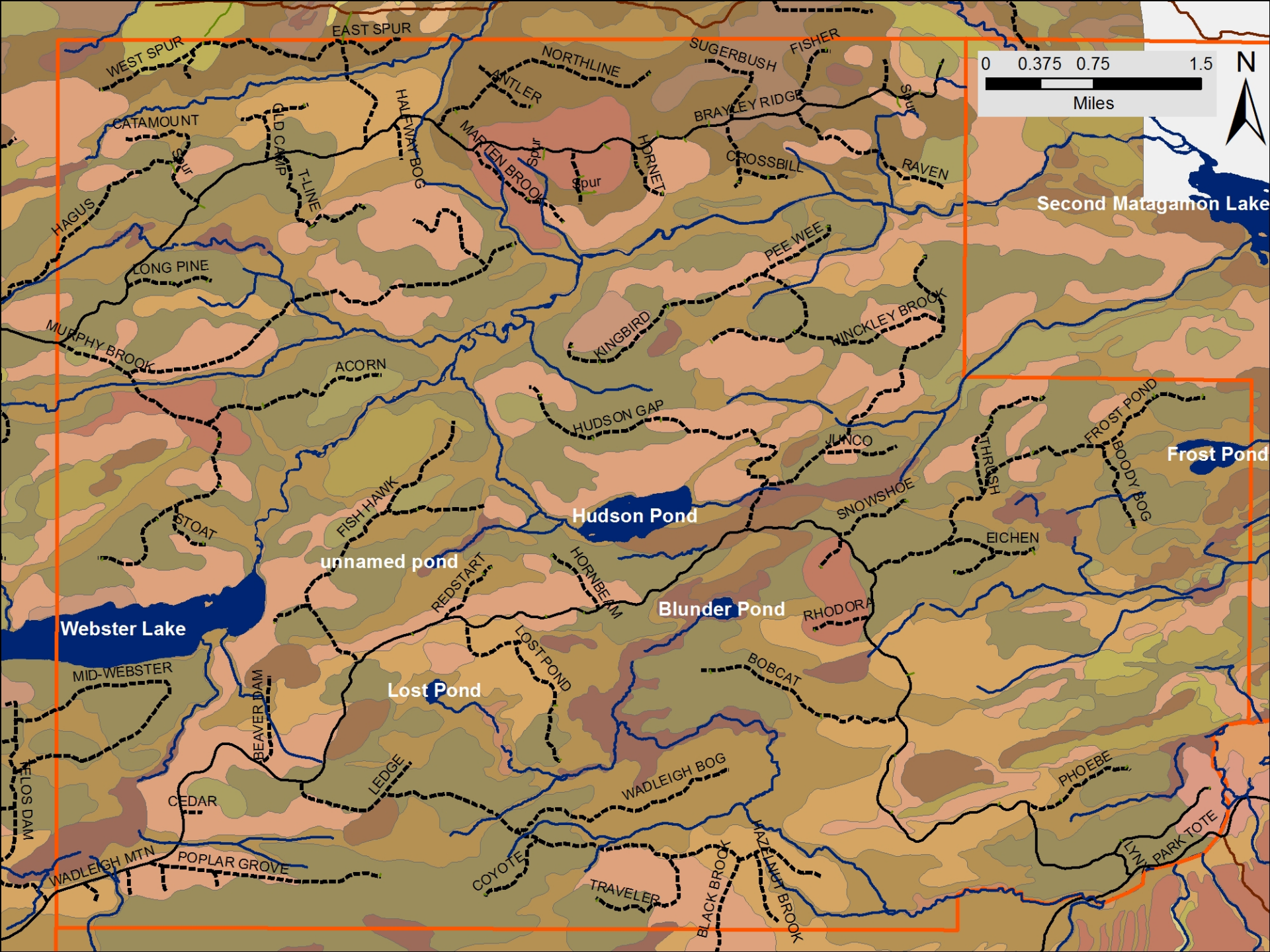
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HORNET
CROSSBILL
RAVEN
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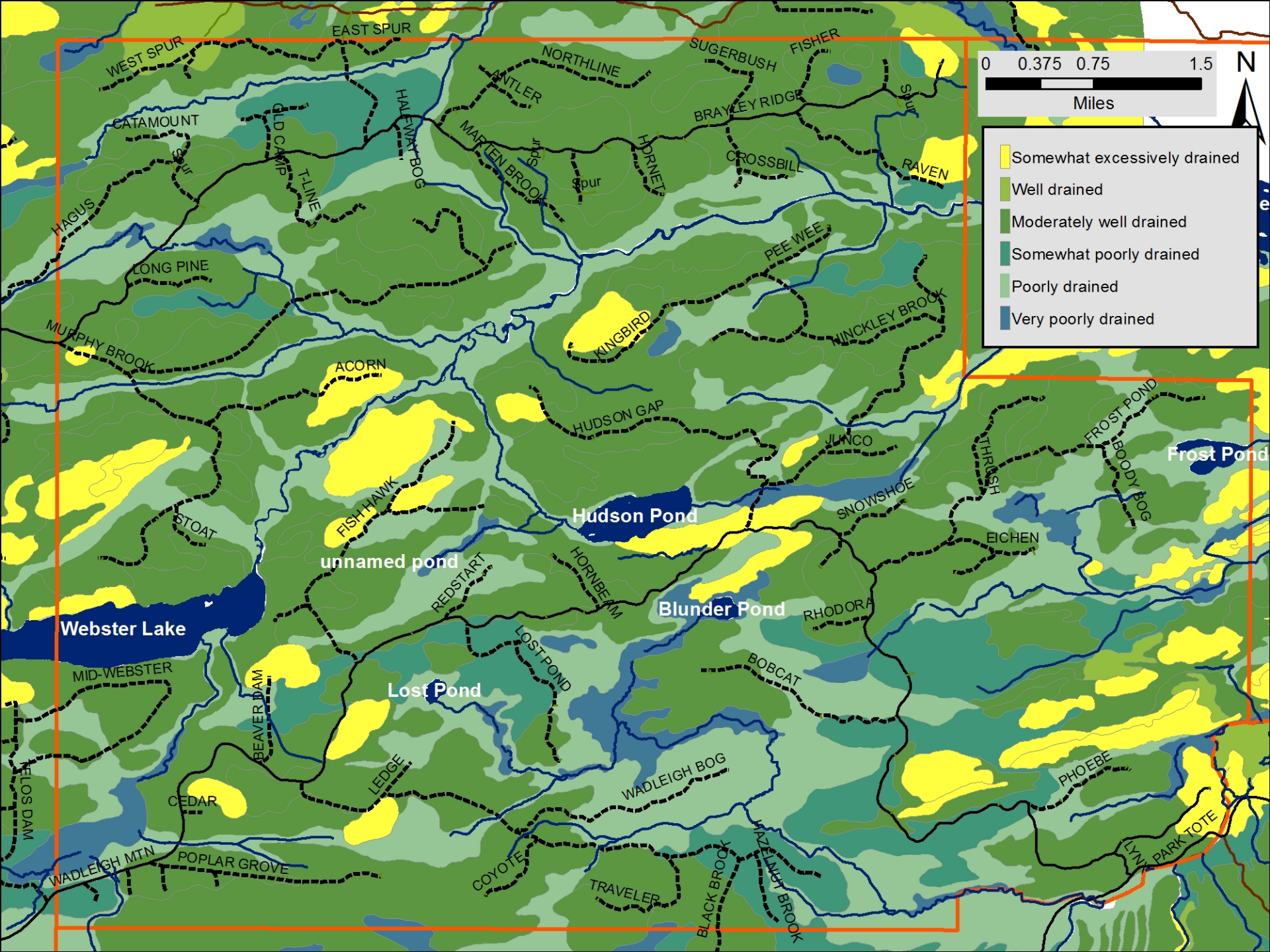
HAGUS
T-LINE
LONG PINE
PEE WEE
MURPHY BROOK
KINGBIRD
WINCKLEY BROOK
ACORN
HUDSON GAP
JUNCO
THRUSH
FROST POND
BOODY BOG
Frost Pond
STOAT
FISH HAWK
Hudson Pond
SNOWSHOE
EICHEN
unnamed pond
REDSTART
HORNBEAM
Blunder Pond
RHODORA
Webster Lake
LOST POND
BOBCAT
MID-WEBSTER
BEAVER DAM
Lost Pond
LEDGE
WADLEIGH BOG
PHOEBE
CEDAR
PARK TOTE
WADLEIGH MTN
POPLAR GROVE
COYOTE
TRAVELER
BLACK BROOK
HAZELNUT BROOK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Well drained
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Somewhat poorly drained
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Very poorly drained
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SUGERBUSH
FISHER
ANTLER
BRAYLEY RIDGE
CATAMOUNT
OLD CAMP
HALEWAT BOG
MARTEN BROOK
HORNET
CROSSBILL
RAVEN
HAGUS
T-LINE
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PEE WEE
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KINGBIRD
WINCKLEY BROOK
ACORN
HUDSON GAP
JUNCO
THRUSH
FROST POND
BOGGY BOG
Frost Pond
FISH HAWK
Hudson Pond
SNOWSHOE
STOAT
EICHEN
unnamed pond
REDSTART
HORNBEAM
Blunder Pond
RHODORA
Webster Lake
LOST POND
BOBCAT
MID-WEBSTER
Lost Pond
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LEDGE
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CEDAR
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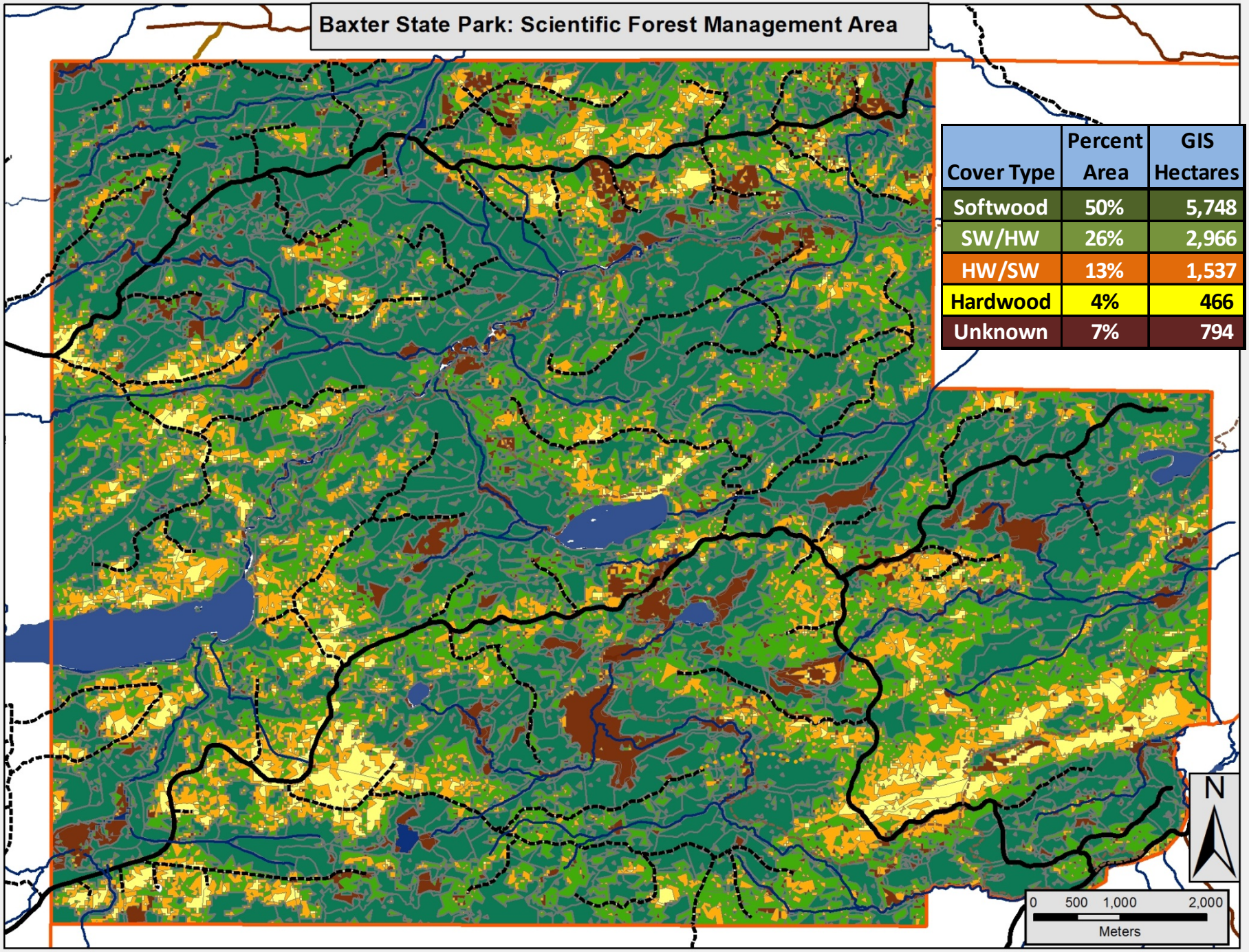
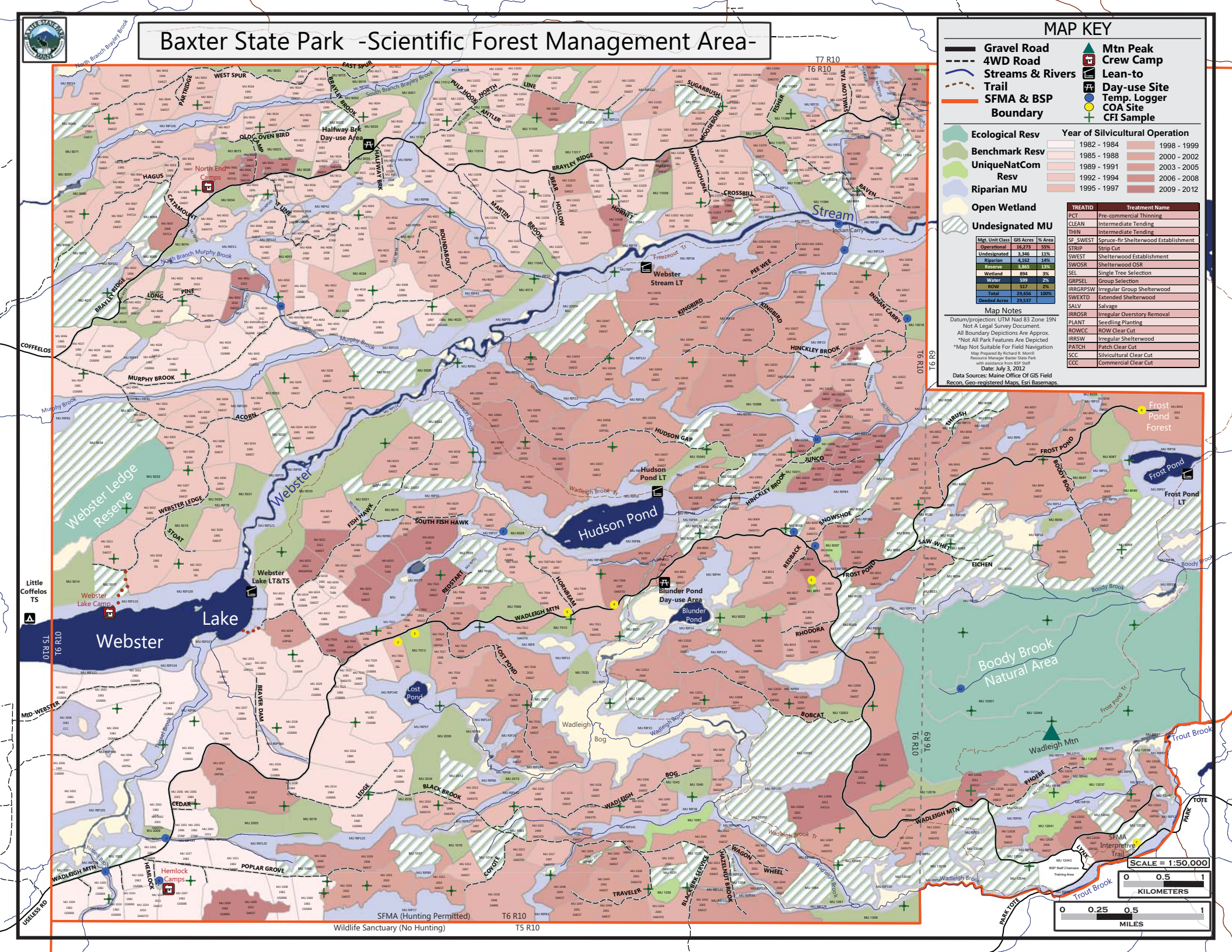
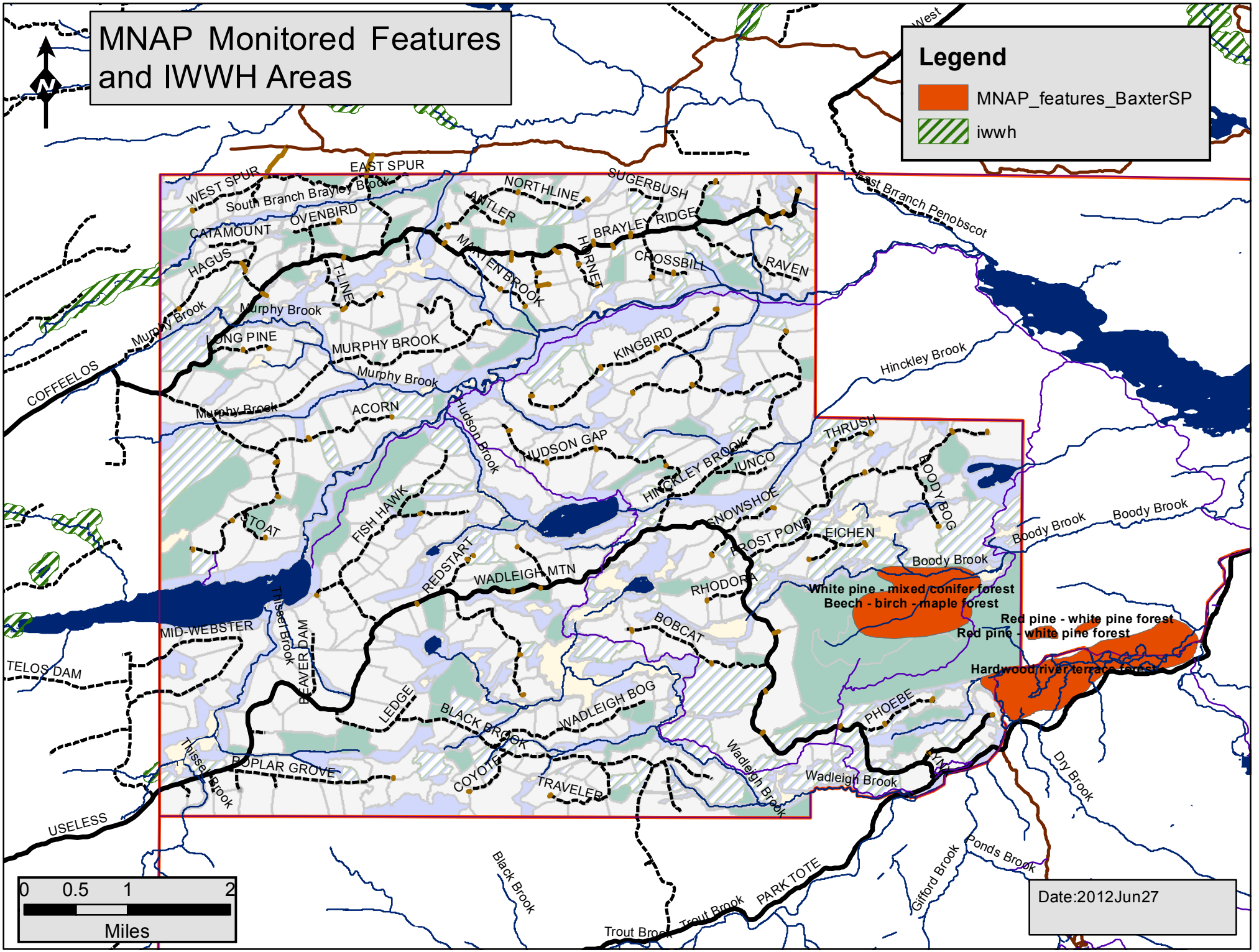
COYOTE
TRAVELER
BLACK BROOK
HAZELNUT BROOK
PARK TOTE

Baxter State Park: Scientific Forest Management Area



Baxter State Park -Scientific Forest Management Area-




MNAP Monitored Features and IWWH Areas
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EAST SPUR
WEST SPUR
South Branch Brayley Brook
OVENBIRD
CATAMOUNT
HAGUS
T-LINE
NORTHLINE
ANTLER
MARTEN BROOK
SUGERBUSH
BRAYLEY RIDGE
THORNE
CROSSBILL
RAVEN
East Brranch Penobscot
Murphy Brook
LONG PINE
MURPHY BROOK
KINGBIRD
COFFEELOS
ACORN
Hudson Brook
HUDSON GAP
Hinckley Brook
THRUSH
HINCKLEY BROOK
JUNCO
BOODY BOG
SNOWSHOE
FROST POND
EICHEN
Boody Brook
White pine - mixed conifer forest
Beech - birch - maple forest
Red pine - white pine forest
Red pine - white pine forest
Hardwood river terrace forest
STOAT
FISH HAWK
REDSTART
WADLEIGH MTN
RHODORA
BOBCAT
MID-WEBSTER
Thisset Brook
BEAVER DAM
TELOS DAM
LEDGE
BLACK BROOK
WADLEIGH BOG
PHOEBE
Wadleigh Brook
Dry Brook
POPLAR GROVE
COYOTE
TRAVELER
USELESS
Black Brook
Trout Brook
PARK TOTE
Gifford Brook
Ponds Brook
0 0.5 1 2
Miles
Date:2012Jun27

K.2 Policies & Procedures

K.2a Post Disturbance Salvage Policy

Protocols for Harvest Following Natural Disturbance

General Protocols

- The disturbance threshold necessary to trigger an unscheduled harvest will be determined by operational considerations such as economics and adjacency. At a minimum, the Resource Manager and SFMA staff will evaluate disturbed areas to determine if harvest entry is warranted.

- As with SFMA management generally, silvicultural considerations will guide the development of operational specifications for any harvest after disturbance. *(Note: this was previously connected to bullet statement above.)*

- Excepting rare and unanticipated situations, all harvesting will be carried out with the same considerations of site sensitivity and regeneration protection, as are all SFMA harvests. Maintaining our FSC certification will be an integral part of any post-disturbance operations, just as it is on a regular basis. *(Note: this was previously the second para.)*

- In the event that regeneration is significantly damaged (or eliminated to below contemporary MFS standards) all available means of regeneration will be considered. Natural regeneration from residual overstory trees, suckering or coppicing, will be preferred. If it is deemed that the overstory will be unproductive or that any given site is in danger of colonization by non-tree species, planting will be considered. Artificial regeneration will be with native species and, whenever possible, with seedlings of local provenance. Establishing reasonable species diversity in the developing stand, including existing regeneration and a reasonable expectation of ensuing natural regeneration, will be considered.

- In the event that a disturbance is widespread enough to warrant post-disturbance harvest priorities, they will be developed based on the following considerations:
    - areas where responsive action may prevent additional damage to the Park or loss of timber or other resources
    - highest quality / most valuable timber
    - areas within the timber classification
    - areas of highest damage intensity, accessibility or harvest productivity.

Retention Thresholds

The following matrices outline *minimum* retention targets based on management classification and disturbance agent. Areas will not be entered automatically after every natural disturbance. Should a post-disturbance harvest take place, these targets are intended to maintain certain attributes that will contribute to the structural - and hence ecological – diversity of the developing stand.

MANAGEMENT DESIGNATION: TIMBER

Management focus: long-term timber management

These areas are under active timber management. Retention targets for standing dead and down dead stems are identified as part of the management process.

DISTURBANCE TYPE	MINIMUM RETENTION TARGETS[♣]			DAMAGE CRITERIA	NOTES
	< 25% merchantable BA damaged	25%-50% merchantable BA damaged	>50% merchantable BA damaged		
WIND	Standing live: retention based on appropriate silvicultural treatment, determined at time of harvest. These situations will be treated as normal operating procedure.	Standing live: 50%, as long as residual stand can be reasonably expected to be windfirm; otherwise 5%. Use care in determining survivability of stems with damaged crowns/boles. Retain all cull.	Standing live: 5% of prior stocking. Retain large, potentially wind firm stems; or others only if standing dead targets are unavailable. Retain all cull.	tipped > 45°; top broken > 10%; bole split or cracked; obvious root-rack	Landform considerations will influence decisions to harvest as well as season of operations.
	Standing dead & cull: 100%, except in trails or where cutting necessary for safety reasons.	Standing dead: 4% of prior live stocking; 1 tpa >24"dbh and 3 tpa >14" dbh, if possible. All cull.			
	Down green: whatever portions of down dead targets unavailable and all cull.	Down green: whatever portions of down dead targets unavailable and all cull.			
	Down dead: 3 logs/ac >12" dib and >6' length as class 1&2 decay logs. All cull.	Down dead: 3 logs/ac >12" dib and >6' length as class 1&2 decay logs. All cull.			
FIRE	Standing live: retention based on appropriate silvicultural treatment, determined at time of harvest. These situations will be treated as normal operating procedure.	Standing live: 5% of prior stocking. Retention based on appropriate silvicultural treatment determined at time of harvest. Use care in determining survivability of slightly damaged crowns/boles.	Standing live: 5% of prior stocking. Retain large, potentially wind firm stems; or others only if standing dead targets are unavailable. Retain all cull.	bole scorched/ crown green; bole scorched / crown <25% brown; bole scorched / crown >25% brown; bark burned through / crown brown;	Moderate to severe burns may increase erosion probability significantly. Any post-fire harvest must include extra measures to maintain soil stability, including reductions in harvest intensity, if appropriate.
	Standing dead & cull: 100%, except in trails or where cutting necessary for safety reasons.	Standing dead: 4% of prior live stocking; 1 tpa >24"dbh and 3 tpa >14" dbh, if possible. All cull.			
	Down green: whatever portions of down dead targets unavailable and all cull.	Down green: whatever portions of down dead targets unavailable and all cull.			
	Down dead: 3 logs/ac >12" dib and >6' length as class 1&2 decay logs. All cull.	Down dead: 3 logs/ac >12" dib and >6' length as class 1&2 decay logs. All cull.			
INSECT & DISEASE	Standing live: retention based on appropriate silvicultural treatment, determined at time of harvest. These situations will be treated as normal operating procedure.	Standing live: 50%, as long as residual stand is not at imminent risk of mortality from disease agent and can be reasonably expected to be windfirm; otherwise 5%. Retain all cull.	Standing live: 5% of prior stocking. Retain large, potentially wind firm stems; or others only if standing dead targets are unavailable. Retain all cull.	crown <25% defoliated; crown 25% - 75% defoliated; crown >25% brown; pitch tubes; fruiting bodies;	Post-disturbance harvests will be strongly influenced by stand type, structure and age, as well as extent of disturbance. Our protection-forest approach may help reduce I&D calamities.
	Standing dead: 4% of original live stocking; 1 tpa >24"dbh and 3 tpa >14" dbh, if possible.	Standing dead: 4% of original live stocking; 1 tpa >24"dbh and 3 tpa >14" dbh, if possible.			
	Down green: whatever portions of down dead targets unavailable and all cull.	Down green: whatever portions of down dead targets unavailable.			
	Down dead: 3 logs/ac >12" dib and >6' length as class 1&2 decay logs. All cull.	Down dead: 3 logs/ac >12" dib and >6' length as class 1&2 decay logs. All cull.			

[♣]Reference: Biodiversity in the Forests of Maine - Guidelines for Land Management, Flatebo, Foss, Pelletier, p 31

MANAGEMENT DESIGNATION: RIPARIAN

Management focus: protection of water quality, stream bank and streamside structure, wildlife corridors, late successional habitat

These areas border lakes, ponds, streams, bogs, and swamps within the SFMA. SFMA management does not include these areas in timber harvest calculations, but salvage harvests are appropriate when such activity does not impede the development of a multi-layered forest structure.

DISTURBANCE TYPE	MINIMUM RETENTION TARGETS[♣]		DAMAGE CRITERIA	NOTES
	25%-50% merchantable BA damaged	>50% merchantable BA damaged		
WIND	Standing live: 50%. Use care in determining survivability of slightly damaged crowns/boles.	Standing live: retain large, potentially wind firm stems; or others only if standing dead targets are unavailable. Use care in determining survivability of slightly damaged crowns/boles. Retain all cull.	tipped > 45°; top broken > 10%; bole split or cracked; obvious root-rack	Landform considerations will influence decisions to harvest as well as season of operations.
	Standing dead: 4% of prior live stocking; 1 tpa >24"dbh and 3 tpa >14" dbh, if possible. All cull.			
	Down green: whatever portions of down dead targets unavailable and all cull.			
	Down dead: 3 logs/ac >12" dib and >6' length as class 1&2 decay logs. All cull.			
FIRE	Standing live: 50%. Use care in determining survivability of slightly damaged crowns/boles.	Standing live: retain large, potentially wind firm stems; or others only if standing dead targets are unavailable. Use care in determining survivability of slightly damaged crowns/boles. Retain all cull.	bole scorched/ crown green; bole scorched / crown <25% brown; bole scorched / crown >25% brown; bark burned through / crown brown; crown >50% dead	Moderate to severe burns may increase erosion probability significantly. Any post-fire harvest must include extra measures to maintain soil stability, including reductions in harvest intensity, if appropriate.
	Standing dead: 4% of prior live stocking; 1 tpa >24"dbh and 3 tpa >14" dbh, if possible. All cull.			
	Down green: whatever portions of down dead targets unavailable and all cull.			
	Down dead: 3 logs/ac >12" dib and >6' length as class 1&2 decay logs. All cull.			
INSECT & DISEASE	Standing live: 4% of prior live stocking. Retain large, potentially wind firm stems of unsusceptible species. Retain all cull.	Standing live: retain large, potentially wind firm stems; or others only if standing dead targets are unavailable. Retain all cull.	crown <25% defoliated; crown 25% - 75% defoliated; crown >25% brown; pitch tubes; fruiting bodies;	Post-disturbance harvests will be strongly influenced by stand type, structure and age, as well as extent of disturbance. Our protection-forest approach may help reduce I&D calamities.
	Standing dead: 4% of original live stocking; 1 tpa >24"dbh and 3 tpa >14" dbh, if possible.			
	Down green: whatever portions of down dead targets unavailable.			
	Down dead: 3 logs/ac >12" dib and >6' length as class 1&2 decay logs. All cull.			

[♣]Reference: Biodiversity in the Forests of Maine - Guidelines for Land Management, Flatebo, Foss, Pelletier, p 31

MANAGEMENT DESIGNATION: ECOLOGICAL RESERVE

MANAGEMENT FOCUS: retain landscape or watershed scale area with intact ecosystem(s).
These areas represent features, sites, structures that collectively form distinctive and/or rare ecosystems.

DISTURBANCE TYPE	MINIMUM RETENTION TARGETS						DAMAGE CRITERIA	NOTES
	PRIMARY RESERVE	SECONDARY RESERVE		TERTIARY RESERVE				
		25%-50% merchantable BA damaged	>50% merchantable BA damaged	< 25% merchantable BA damaged	25%-50% merchantable BA damaged	>50% merchantable BA damaged		
WIND	Standing live: 100%.	Standing live: 50%. Use care in determining survivability of slightly damaged crowns/boles.	Standing live: retain large, potentially wind firm stems; or others only if standing dead targets are unavailable. Use care in determining survivability of slightly damaged crowns/boles. Retain all cull.	Standing live: retention based on appropriate silvicultural treatment, determined at time of harvest. These situations will be treated as normal operating procedure.	Standing live: 50%, as long as residual stand can be reasonably expected to be windfirm. Use care in determining survivability of stems with damaged crowns/boles. Retain all cull.	Standing live: 5% of prior stocking. Retain large, potentially wind firm stems; or others only if standing dead targets are unavailable. Retain all cull.	tipped > 45°; top broken > 10%; bole split or cracked; obvious root-rack	Landform considerations will influence decisions to harvest as well as season of operations.
	Standing dead: 100%	Standing dead: 4% of prior live stocking; 1 tpa >24"dbh and 3 tpa >14" dbh, if possible. All cull.		Standing dead & cull: 100%, except in trails or where cutting necessary for safety reasons.	Standing dead: 4% of prior live stocking; 1 tpa >24"dbh and 3 tpa >14" dbh, if possible. All cull.			
	Down green: 100%	Down green: whatever portions of down dead targets unavailable and all cull.		Down green: whatever portions of down dead targets unavailable and all cull.	Down green: whatever portions of down dead targets unavailable and all cull.			
	Down dead: 100%	Down dead: 3 logs >12" dib and >6' length per acre as class 1&2 decay logs. All cull.		Down dead: 3 logs/ac >12" dib and >6' length as class 1&2 decay logs. All cull.	Down dead: 3 logs/ac >12" dib and >6' length as class 1&2 decay logs. All cull.			
FIRE	Standing live: 100%.	Standing live: 50%. Use care in determining survivability of slightly damaged crowns/boles.	Standing live: retain large, potentially wind firm stems; or others only if standing dead targets are unavailable. Use care in determining survivability of slightly damaged crowns/boles. Retain all cull.	Standing live: retention based on appropriate silvicultural treatment, determined at time of harvest. These situations will be treated as normal operating procedure.	Standing live: 5% of prior stocking. Retention based on appropriate silvicultural treatment determined at time of harvest. Use care in determining survivability of slightly damaged crowns/boles.	Standing live: 5% of prior stocking. Retain large, potentially wind firm stems; or others only if standing dead targets are unavailable. Retain all cull.	bole scorched/ crown green; bole scorched / crown <25% brown; bole scorched / crown >25% brown; bark burned through / crown brown;	Moderate to severe burns may increase erosion probability significantly. Any post-fire harvest must include extra measures to maintain soil stability, including reductions in harvest intensity, if appropriate.
	Standing dead: 100%	Standing dead: 4% of prior live stocking; 1 tpa >24"dbh and 3 tpa >14" dbh, if possible. All cull.		Standing dead & cull: 100%, except in trails or where cutting necessary for safety reasons.	Standing dead: 4% of prior live stocking; 1 tpa >24"dbh and 3 tpa >14" dbh, if possible. All cull.			
	Down green: 100%	Down green: whatever portions of down dead targets unavailable and all cull.		Down green: whatever portions of down dead targets unavailable and all cull.	Down green: whatever portions of down dead targets unavailable and all cull.			
	Down dead: 100%	Down dead: 3 logs >12" dib and >6' length as class 1&2 decay logs. All cull.		Down dead: 3 logs/ac >12" dib and >6' length as class 1&2 decay logs. All cull.	Down dead: 3 logs/ac >12" dib and >6' length as class 1&2 decay logs. All cull.			
INSECT & DISEASE	Standing live: 100%.	Standing live: 4% of prior live stocking. Retain large, potentially wind firm stems of unsusceptible species. Retain all cull.	Standing live: retain large, potentially wind firm stems; or others only if standing dead targets are unavailable. Retain all cull.	Standing live: retention based on appropriate silvicultural treatment, determined at time of harvest. These situations will be treated as normal operating procedure.	Standing live: 50%, as long as residual stand is not at imminent risk of mortality from disease agent and can be reasonably expected to be windfirm. Retain all cull.	Standing live: 5% of prior stocking. Retain large, potentially wind firm stems; or others only if standing dead targets are unavailable. Retain all cull.	crown <25% defoliated; crown 25% - 75% defoliated; crown >25% brown; pitch tubes; fruiting bodies;	Post-disturbance harvests will be strongly influenced by stand type, structure and age, as well as extent of disturbance. Our protection-forest approach may help reduce I&D calamities.
	Standing dead: 100%	Standing dead: 4% of original live stocking; 1 tpa >24"dbh and 3 tpa >14" dbh, if possible.		Standing dead: 4% of original live stocking; 1 tpa >24"dbh and 3 tpa >14" dbh, if possible.	Standing dead: 4% of original live stocking; 1 tpa >24"dbh and 3 tpa >14" dbh, if possible.			
	Down green: 100%	Down green: whatever portions of down dead targets unavailable.		Down green: whatever portions of down dead targets unavailable and all cull.	Down green: whatever portions of down dead targets unavailable.			
	Down dead: 100%	Down dead: 3 logs >12" dib and >6' length as class 1&2 decay logs. All cull.		Down dead: 3 logs/ac >12" dib and >6' length as class 1&2 decay logs. All cull.	Down dead: 3 logs/ac >12" dib and >6' length as class 1&2 decay logs. All cull.			

MANAGEMENT DESIGNATION: BENCHMARK RESERVE

MANAGEMENT FOCUS: retain unmanaged representative forest types.

These areas are designated from the timber management designation and set aside to represent forest cover types and structures typical to the SFMA.

DISTURBANCE TYPE	MINIMUM RETENTION TARGETS		DAMAGE CRITERIA	NOTES
	< 50% merchantable BA damaged	>50%% merchantable BA damaged		
WIND	Standing live: 100%.		NA	If adjacent blocks are being harvested, every attempt will be made to avoid removing trees that have fallen from the benchmark block.
	Standing dead: 100%			
	Down green: 100%			
	Down dead: 100%			
FIRE	Standing live: 100%.		NA	Moderate to severe burns may increase erosion probability significantly. Any post-fire erosion potential should be monitored and corrected where necessary to prevent downstream sedimentation.
	Standing dead: 100%			
	Down green: 100%			
	Down dead: 100%			
INSECT & DISEASE	Standing live: 100%.		NA	Harvesting would take place only if disturbance is severe enough to compromise substantially the original stand stocking and if it will not threaten the underlying attributes.
	Standing dead: 100%			
	Down green: 100%			
	Down dead: 100%			

MANAGEMENT DESIGNATION: REPRESENTATIVE SITE

MANAGEMENT FOCUS: protection of unusual forest features.

These areas represent unusual sites and/or stand structures on the SFMA, predicated by soil or topographic conditions. They are typified by enriched hardwood sites, hardwood seepage foress, cedar swamps and vernal pools. Harvesting would take place only if the disturbance were severe enough to compromise substantially the original stand stocking and if it does not threaten the underlying attributes. Down volume retained, should be as large as possible, preferably >12" dbh.

DISTURBANCE TYPE	MINIMUM RETENTION TARGETS		DAMAGE CRITERIA	NOTES
	< 50% merchantable BA damaged	>50%% merchantable BA damaged		
WIND	Standing live: 100%.	Standing live: retention based on appropriate silvicultural treatment, determined at time of harvest. These situations will be treated as normal operating procedure.	tipped > 45°; top broken > 10%; bole split or cracked; obvious root-rack	Harvesting would take place only if disturbance is severe enough to compromise substantially the original stand stocking and if it will not threaten the underlying attributes. Trees that fall into adjacent blocks may be harvested, even if the representative site is not being harvested.
	Standing dead: 100%	Standing dead & cull: 100%, except in trails or where cutting necessary for safety reasons.		
	Down green: 100%	Down green: whatever portions of down dead targets unavailable and all cull.		
	Down dead: 100%	Down dead: 3 logs/ac >12" dib and >6' length as class 1&2 decay logs. All cull.		
FIRE	Standing live: 100%.	Standing live: retention based on appropriate silvicultural treatment, determined at time of harvest. These situations will be treated as normal operating procedure.	bole scorched/ crown green; bole scorched / crown <25% brown; bole scorched / crown >25% brown; bark burned through / crown brown;	Harvesting would take place only if disturbance is severe enough to compromise substantially the original stand stocking and if it will not threaten the underlying attributes.
	Standing dead: 100%	Standing dead & cull: 100%, except in trails or where cutting necessary for safety reasons.		
	Down green: 100%	Down green: whatever portions of down dead targets unavailable and all cull.		
	Down dead: 100%	Down dead: 3 logs/ac >12" dib and >6' length as class 1&2 decay logs. All cull.		
INSECT & DISEASE	Standing live: 100%.	Standing live: retention based on appropriate silvicultural treatment, determined at time of harvest. These situations will be treated as normal operating procedure.	crown <25% defoliated; crown 25% - 75% defoliated; crown >25% brown; pitch tubes; fruiting bodies;	Harvesting would take place only if disturbance is severe enough to compromise substantially the original stand stocking and if it will not threaten the underlying attributes. Trees that fall into adjacent blocks may be harvested, even if the representative site is not being harvested.
	Standing dead: 100%	Standing dead: 4% of original live stocking; 1 tpa >24"dbh and 3 tpa >14" dbh, if possible.		
	Down green: 100%	Down green: whatever portions of down dead targets unavailable and all cull.		
	Down dead: 100%	Down dead: 3 logs/ac >12" dib and >6' length as class 1&2 decay logs. All cull.		

MANAGEMENT DESIGNATION: TIMBER

DISTURBANCE TYPE: *WIND*

Management focus: long-term timber management

These areas are under active timber management. Retention targets for standing dead and down dead stems are identified as part of the management process.

DISTURBANCE SCALE	DESCRIPTION	HARVEST ENTRY?	MAXIMUM VOLUME HARVESTED	MINIMUM VOLUME RETAINED	EQUIPMENT	SEASONAL RESTRICTIONS
LIGHT	10% or less merchantable BA damaged	YES	standing: 100% of non-recoverable down: 100%	standing: 4 TPA w/ 2 TPA > 10" diameter down: 0% salvage volume	hand crew or processor - all wood forwarded, exc. possibly during winter months	Landform dependent
MODERATE	11-25% merchantable BA damaged	YES	standing:100% of non-recoverable down: 70%	standing: 4 TPA w/ 2 TPA > 10" diameter down: 0% salvage volume	hand crew or processor - all wood forwarded, exc. possibly during winter months	Landform dependent
HEAVY	25 - 50% merchantable BA damaged	YES	standing: 95% of non-recoverable down: 95%	standing: 4 TPA > 12" standing dead down: 5% orig stocking (>12")	hand crew or processor - all wood forwarded, exc. possibly during winter months	Landform dependent
SEVERE	> 50% merchantable BA damaged	YES	standing: 95% of non-recoverable down: 95%	standing: 4 TPA > 12" standing dead down: 5% orig stocking (>12")	hand crew or processor - all wood forwarded, exc. possibly during winter months	Landform dependent

Damage criteria: tipped >45 degrees;
broken > 10% from top
bole split or cracked
obvious root-rack
crown > 50% dead

These areas are under active timber management. Targets for retention of dead standing and dead down stems are identified as part of the management process.

Reference: Biodiversity in the Forests of Maine - Guidelines for Land Management, Foss, Flatebo, Pelletier, p 31

DISTURBANCE TYPE: INSECTS & DISEASE
MANAGEMENT DESIGNATION: TIMBER

Management focus:

These areas are under active timber management and provide the primary acres for timber and wood fiber production. Targets for retention of standing and down stems are determined during the prescription narrative process and targets(particulary down dead specified below may already been met during pre-disturbance harvest activities

DISTURBANCE DESCRIPTION

Individual Tree Damage:
Can be infinite mixtures of damage (see damage criteria below) based on intensity of event.
Spatial Variation:
Damage likely to vary over the landscape based on stand type, soils, season and topograghy
Temporal Variation:
Limited temporal variation - wind events likely to occur within a 12 hour period.

Damage criteria: : Crown <25% dead
Crown > 25 and <75% dead
Crown > 75% dead
Regeneration dead or dying
Bole defect: conk, canker
split, crack etc.

HARVEST SPECIFICATIONS

Harvest? Yes. Disturbance threshold necessary to trigger salvage determined by operating considerations such as economic thresholds, adjacency and targets listed below

Retention Targets:

Standing Live- Whatever portions of Standing Dead targets are unavailable. Reasonable species representation

Standing Dead- 4% of original stand stocking as cavity structure with 1 tpa > 24" and 3 tpa > 14" dbh (if possible)

Down Green- Whatever portions of Down Dead targets are unavailable.

Down Dead- 3 logs > 12" diameter and > 6" length as class 1 and 2 decay logs.

MANAGEMENT DESIGNATION: RIPARIAN

DISTURBANCE TYPE: *WIND*

Management focus: protection of water quality, streambank and streamside structure, wildlife corridors, late successional habitat

These areas border lakes, ponds, streams, bogs, and swamps within the SFMA. SFMA management does not include these areas in timber harvest calculations, but salvage harvests are appropriate when such activity does not impede the development of multi-layered forest structure.

DISTURBANCE SCALE	DESCRIPTION	HARVEST ENTRY?	MINIMUM RETENTION TARGETs	EQUIPMENT	SEASONAL RESTRICTIONS
LIGHT	10% or less merchantable BA damaged	Situation dependent	standing: 100% down: 4 TPA > 10" dbh	hand crew or processor - all wood forwarded, exc. possibly during winter months	Landform dependent
MODERATE	11-25% merchantable BA damaged	Situation dependent	standing: 100% down: 6 TPA > 10" dbh	hand crew or processor - all wood forwarded, exc. possibly during winter months	Landform dependent
HEAVY	25 - 50% merchantable BA damaged	YES	standing: 100% down: 6 TPA > 10" dbh	hand crew or processor - all wood forwarded, exc. possibly during winter months	Landform dependent
SEVERE	> 50% merchantable BA damaged	YES	standing: 100% down: 6 TPA > 10" dbh	hand crew or processor - all wood forwarded, exc. possibly during winter months	Landform dependent

Damage criteria: tipped >45 degrees;
broken > 10% from top
bole split or cracked
obvious root-rack
crown >50% dead

♣ Except as needed for trails and access.

MANAGEMENT DESIGNATION: RIPARIAN

DISTURBANCE TYPE: *FIRE*

Management focus: protection of water quality, streambank and streamside structure, wildlife corridors, late successional habitat.

These areas border lakes, ponds, streams, bogs, and swamps within the SFMA. SFMA management does not include these areas in timber harvest calculations, but salvage harvests are appropriate when shuch activity does not impede the development of uneven forest structure.

DISTURBANCE SCALE	DESCRIPTION	HARVEST ENTRY?	MINIMUM RETENTION TARGETS	EQUIPMENT	SEASONAL RESTRICTIONS
LIGHT	10% or less merchantable BA damaged	NO	NA	NA	NA
MODERATE	11-25% merchantable BA damaged	NO	NA	NA	NA
HEAVY	25 - 50% merchantable BA damaged	YES	Standing live: 50%. Use care in determining survivability of slightly damaged crowns/boles. Standing dead: 4% of original stocking; 1tpa >24"dbh and 3 tpa >14" dbh, if possible. Down green: whatever portions of down dead targets unavailable. Down dead: 3 logs >12" dib and >6' length as class 1&2 decay logs.	Hand crew or processor - all wood forwarded, except possibly during winter months.	Landform dependent
SEVERE	> 50% merchantable BA damaged	YES	Standing live: retain only if standing dead targets are unavailable. Use care in determining survivability of slightly damaged crowns/boles. Standing dead: 4% of original stocking; 1tpa >24"dbh and 3 tpa >14" dbh, if possible. Down green: whatever portions of down dead targets unavailable. Down dead: 3 logs >12" dib and >6' length as class 1&2 decay logs.	Hand crew or processor - all wood forwarded, except possibly during winter months.	Landform dependent

Damage criteria:
tipped >45 degrees;
broken > 10% from top
bole split or cracked
obvious root-rack
crown >50% dead

MANAGEMENT DESIGNATION: ECOLOGICAL RESERVE

DISTURBANCE TYPE: *WIND*

Management focus: retain landscape or watershed scale area with intact ecosystem(s).

DISTURBANCE SCALE	DESCRIPTION	HARVEST ENTRY?	MAXIMUM VOLUME HARVESTED	MINIMUM VOLUME RETAINED	EQUIPMENT	SEASONAL RESTRICTIONS
LIGHT	10% or less merchantable BA damaged	N0	standing: 0 down: 0	standing: 100 down: 100		
MODERATE	11-25% merchantable BA damaged	N0	standing: 0 down: 0	standing: 100 down: 100		
HEAVY	25 - 50% merchantable BA damaged	N0	standing: 0 down: 0	standing: 100 down: 100		
SEVERE	> 50% merchantable BA damaged	NO	standing: 0% down: 0	standing: 100 down: 100		

Damage criteria: : tipped >45 degrees;
broken > 10% from top
bole split or cracked
obvious root-rack

These areas represent features, sites, structures that collectively form distinctive and/or rare ecosystems.

DISTURBANCE TYPE: FIRE
MANAGEMENT DESIGNATION: REPRESENTATIVE RESERVE

Management focus:
These areas represent unusual stand structures, soils and/or topography. Currently, there are six representative reserves on the SFMA, including enriched hardwood sites and vernal pools. These are relatively small areas, currently ranging in size from 1.6 acres to 38 acres with an average of 12 acres.

DISTURBANCE	DESCRIPTION
Individual Tree Damage: Can be infinite mixtures of damage (see damage criteria below) based on intensity of event. Spatial Variation: These are relatively small areas and spatial variation, while very possible, is less likely than with larger landscape settings. Temporal Variation: Limited temporal variation - fire events likely to occur within a 7day period.	
Damage criteria: : bole scorch/crown green bole scorch/crown <25% brown bark burned through/crown brown bole scorch/crown brown	
HARVEST SPECIFICATIONS	
Harvest? (see below) Retention Targets:	Possibly. These areas have unusual stand structures predicated by soil or topographic conditions. If salvage does not threaten the underlying unusual attributes, then damaged timber may be salvaged

Standing Live-	Retain only if standing dead targets are unavailable. Consider reasonable species representation Use care in determining survivability of slightly damaged crowns/boles
Standing Dead-	4% of original stand stocking as cavity structure with 1 tpa > 24” and 3 tpa > 14” dbh (if possible)
Down Green-	Whatever portions of Down Dead targets are unavailable.
Down Dead-	3 logs > 12" diameter and > 6" length as class 1 and 2 decay logs.

Moderate to severe burns may significantly increase erosion probabilities.
Any timber harvest after a fire should consider the threat of erosion and include measures to maintain soil stability including reductions in salvage intensities, delaying harvest until soils are snow covered or frozen, and/or seeding and installation of erosion reduction structures such as waterbars.

K.2b Stand Damage Policy

SFMA Harvest Damage Policy

Harvest crews working in the SFMA will conduct all operations in a manner that prevents damage to the forest. This includes, but is not limited to, protection of live trees, plants and soil from damage by wheels, tracks, booms, bunks and other equipment parts. When topography, weather, soil type or other natural or man-made conditions may contribute to unintended stand damage, the contractor or harvest crews shall notify the BSP Resource Manager or the BSP Forestry Technician.

The following guidelines will be observed during both harvest planning and operations.

Regeneration & Growing Stock

- Consider species composition, stem size and density, and season when determining type of harvest equipment to use in a stand.
- Minimize trail widths, yet cut wide enough to accomodate movement of equipment without touching trees on either side of the corridor.
- Keep equipment on trails, except as necessary to turn around or to reach trees to be harvested.
- Fell trees in a place and/or manner that limits impact on other trees. Impacts include, but are not limited to, uprooting, scraping off bark or breaking off leaders and limbs.

Soil Productivity

- Consider soil type and condition when determining type of harvest equipment to use on the site.
- Plan and/or identify trail locations prior to start of harvest:
    - consider topography and, where appropriate, the predominant lean of the stand,
    - avoid wet areas,
    - avoid steep areas.
- Minimize the length and number of trails needed to accomplish harvest objectives.
- Limit disruption of soil organic layers.
- Operate on sensitive soils when dry or frozen.
- Place limbs and tops in trails where necessary to reduce compaction or mixing of soil layers.
- Where necessary, revegetate or stabilize steep trail sections with brush.

Erosion Control

- Locate and construct trails to a standard sufficient to prevent and withstand accelerated erosion.
- At a minimum, utilize standards set forth in the Maine Forest Service Best Management Practices Manual.

- **BSP Resource Manager: 207-723-8194 (office) 207-731-3621 (cell)**
- **Richard.Morrill@maine.gov**
- **BSP Forestry Technician: 207-723-8194 (office) 207-731-7353 (home)**
- **Deidra.E.Brace@maine.gov**
- **Baxter State Park: 207-723-9616**

K.2c Spill Control Procedure

SFMA SPILL CONTROL & REPORTING PROCEDURES

This procedure applies to all chemicals and petroleum products and other potentially hazardous materials that are brought onto or used in the SFMA. Contractors, subcontractors, contractor and/or subcontractor employees, permittees, and BSP employees are responsible for compliance with the following safety and environmental policies and procedures.

Definitions:

Spill: An unintended spill or leak of any amount of any chemical or petroleum product into the environment.

Reportable spill: Any release of 1 gallon or more of any chemical or petroleum product that comes into contact with the ground or that enters or may enter a watercourse or other sensitive site. (Sensitive sites include, but are not limited to, areas near potable water supplies, open water or wetlands.)

Prevention

Oils, fuels, hydraulic fluids, coolants, etc. are hazardous materials common to timber harvest operations. Avoiding spills is the best way to minimize impacts on personal safety and the environment.

Contractor shall not service skidders, trucks or other equipment at locations where pollution of waters of the State of Maine is likely to occur.

- Use appropriate containers for collecting and storing oils, fuels, coolants or hazardous wastes. Store these materials in designated areas and remove them from the site when no longer needed.

- All equipment used in the SFMA will be kept clean and in good condition. Inspect hoses, fuel trucks, fuel tanks, etc. routinely for leaks and make necessary repairs immediately.

- Maintain and repair all equipment at a minimum distance of 330 feet or 100 meters from watercourses.

- Place mobile fuel storage tanks a minimum of 330 feet or 100 meters from watercourses and position them safely and securely. Inspect and maintain storage tanks regularly.

Spill kits or other absorbent materials for mopping up spills will be kept readily available. Hay or sawdust may be adequate for very small spills. Commercially available waste containment kits should be kept on hand for larger spills.

Spill Response Procedures

1. Ensure the safety of all personnel. Use personal protective equipment appropriate for the situation.

2. Stop the spill. Act quickly to shut off pumps, close valves, etc.

3. Contain the spill. Block off culverts or ditches as necessary to prevent material from reaching surface waters. Surround the spill with absorbent materials. If a commercial spill kit is not available, hay, sawdust, earth, peat, straw, sand or other absorbent material may be used.

4. Cleanup the spill. Remove contaminated materials from the site and dispose of properly. BSP authorization must be obtained prior to placing contaminated soil on a road or other area for aeration.

5. Correct the problem that caused the spill.

6. If a product reaches surface waters, contain the material as best as you can, cleanup as much as possible and report the event to the BSP Resource Manager or Director as quickly as practicable.

7. For reportable spills, complete the SFMA Hazardous Materials Accidental Spill Report within 8 hours of occurrence.

BSP Resource Manager: 207-723-8194 (office); 207-731-3621 (cell)

BSP Headquarters: 207-723-9616

State of Maine Spill Reporting
(for BSP personnel)

Emergency: Oil/fuel spills: 800-482-0777

Emergency: Chemical spills: 800-452-4664

DEP Bangor office: 207-941-4570

DEP Presque Isle office: 207-764-0477

SFMA Hazardous Materials Accidental Spill Report

Contractor crews and employees working in the SFMA will report all incidences of accidental spills of hazardous materials. This includes, but is not limited to, hydraulic fluids, anti-freeze, bar & chain oil, gasoline and diesel fuel.

Accidental spills ≥1 gallon will be reported on this form within 8 hours of occurrence. Accidental spills ≥ 3 gallons will be reported on this form within 8 hours of occurrence and will also be reported via a spill report delivered to BSP personnel within 24 hours of occurrence.

For proper clean-up action, see the attached Hazardous Materials Spill Action Plan.

Date	Time of Spill	Cause of Spill	Material Spilled & where	Estimated Volume	Clean Up Action Taken	Company & Crew initial

BSP Resource Manager: 207-723-8194 (office); 207-731-3621 (cell) **BSP Headquarters: 207-723-9616**

K.3 Commonly Used Abbreviations

Section in Process…

Stand Size class classification system details.

Stand Type			Size Class			
FSF Habitat	Ecosystem_Type	Type_ID	S	M	L	XL
Aspen Birch	Intolerant HW	1	Trees >5" dbh total BA< 15ft^2	Conditions between "S" and "L"	Trees >12" dbh total BA >15ft^2	Trees >16" dbh total BA >15ft^2
Northern Hardwoods	Northern HW	2	Trees >5" dbh total BA< 15ft^2	Conditions between "S" and "L"	Trees >12" dbh total BA >15ft^2	Trees >16" dbh total BA >15ft^2
Oak Pine	Softwood	3	Trees >5" dbh total BA< 15ft^2	Conditions between "S" and "L"	Trees >12" dbh total BA >15ft^2	Trees >20" dbh total BA >15ft^2
Hemlock	Softwood	4	Trees >5" dbh total BA< 15ft^2	Conditions between "S" and "L"	Trees >12" dbh total BA >15ft^2	Trees >20" dbh total BA >15ft^2
Spruce Fir	Softwood	5	Trees >5" dbh total BA< 15ft^2	Conditions between "S" and "L"	Trees >12" dbh total BA >15ft^2	Trees >16" dbh total BA >15ft^2
Northern White Cedar	Softwood	6	Trees >5" dbh total BA< 15ft^2	Conditions between "S" and "L"	Trees >9" dbh total BA >15ft^2	Trees >12" dbh total BA >15ft^2

Figure K.1 Size class classification system details

L. Management Plan Timeline:

Jan 2012 – Mar 2012… Modeling work & resource assessment analysis, and Mgt Objectives development
Mar 2012 – May 2012…Finalize model projections results and analysis, continue text revisions
May 2012 – July 2012…Complete draft document,
July 2012 – Dec 2012…Submit Plan for review by BSPA and SFMA Adv, finalize text edits, post document and summaries online.

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