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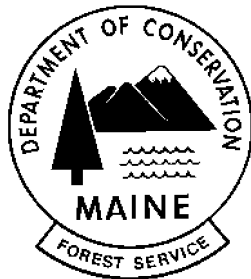


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**The State of the Forest
and
Recommendations for Forest
Sustainability Standards**

Final Report
to the
Joint Standing Committee
of the 119th Legislature on
Agriculture, Conservation and Forestry

June 3, 1999



Department of Conservation
Maine Forest Service
22 State House Station
Augusta, Maine 04333

16 June, 1999

Senator John Nutting
Representative Wendy Pieh
Members of the Committee on Agriculture, Conservation and Forestry

Attached is the final version of a combined report of the State of the Forest and Sustainability Standards as mandated by the 118th Maine Legislature in April of 1998. Following our presentation of the draft report to you in January, we held three public listening sessions in Orono, Houlton and South Paris and solicited written comments during February. We made some revisions to the report based on what we learned during the public comment period. In particular, we have added sections on the following topics:

- Small, non industrial forest landowners (Issues);
- Non-governmental programs supporting sound forest management (Policies in Place)
- Outcome based forest policy (Benchmarks); and,
- The economics of sustainable forest management (Benchmarks).

These reports are the first step in a mandated progression of reports over the next several years. The State of the Forest report discusses major forest issues, with greater detail and analysis of key issues. Since the Maine Forest Service is required to report on the State of the Forest biannually, successive reports will focus on key issues where the most concern and the best data exist. Future reports eventually will provide an assessment at the state level of progress toward achieving sustainability benchmarks.

The Sustainability Standards section of this report proposes benchmarks for three of the seven sustainability criteria: water quality, wetlands and riparian zones; timber supply and quality; and, public accountability of forest owners and managers . The 118th Maine Legislature recognized that developing these standards would take time and thus mandated a five-year timetable for completing benchmarks for the seven criteria and implementing a monitoring system. This schedule makes sense to us. The benchmarks for individual criteria could present some conflict with those for other criteria; however, this could occur regardless of the time table for development and is simply a fundamental characteristic of defining forest sustainability. We will define a process for resolving these conflicts as they arise.

We hope that our report meets with your approval. We would be pleased to meet with the committee at your convenience to discuss any questions that may arise during your consideration of the report.

Thank you for your consideration and support of progressive forest policy.

Sincerely,

Donald J. Mansius,
Acting Director
Maine Forest Service

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PREFACE

This report includes a summary of forest management issues that the Maine Forest Service identifies as important public policy issues. It is followed by a discussion of State programs and policies that are already in place to help address these issues. Finally, this report includes a discussion of new forest sustainability benchmarks as mandated by the 118th Maine Legislature, Public Law Chapter 720, in April 1998.

The development of this report was guided by the principle of balancing ecological concerns and economic opportunities. The mission of the Maine Forest Service, as the implementing agency for State forest policy, is to ensure that the Maine's forests continue to provide a full range of benefits to present and future generations of Maine people. The Maine Forest Service does this by:

- Developing, advocating for, and promoting activities that encourage the sound long term management of forest resources.
- Protecting the forest resource from the effects of fire, insect, disease and misuse. (Misuse may include harvesting without regard for future forest and soil productivity, wildlife habitat, water quality or recreational value.)
- Providing reliable, timely and accurate information about the forest resource.

This report is presented as a practical extension of these functions and expectations for the Maine forest on behalf of Maine citizens.

I. State of the Forest

INTRODUCTION

Maine is the most forested state in the United States. About 17.7 million acres are forested, 89 percent of the state's total land area. The forests of Maine play a major role in shaping the State's economy and environment. Maine's forests provide much of the raw material to fuel Maine's mills and serve as a backdrop for forest-based recreation. Forest-based recreation and manufacturing have had a dominant presence in the Maine forest for over 200 years and today generate over \$6 billion of total economic activity (18 percent of the gross state product). In addition to its economic significance, Maine's forests host a wide array of plant and animal species and play a critical role in maintaining clean water.

Timber harvesting has been a major activity in Maine since the late 1700's, and has periodically generated debate and concern. Recent debate and discussion has focused on whether Maine's forests are managed sustainably. What has the long history of timber harvesting taught us? How do we define forest sustainability, and how do we measure progress in managing for sustainable forests? This report is intended to provide a baseline assessment of what we understand and what we need to do. But these questions can be answered in a simple summary:

- History teaches us that Maine's forest is a resilient resource capable of supporting multiple uses, including timber harvesting, recreation, as well as maintaining a healthy ecosystem with abundant wildlife habitat and clean water, and a strong

industry. More recent research and monitoring tell us we can do a better job of managing Maine's forest for both timber productivity and ecological health.

- Balancing current uses with long term forest ecosystem health is a complex task, and new knowledge is continually adding to our understanding of forest management.
- There is no simple way to prescribe the best forestry that satisfies the biological needs of all the diverse forest conditions in Maine.
- Our understanding of how to best balance timber productivity and ecological health changes and improves over time.

These statements lead us to conclude that both private forest management and public forest policy must be adaptive and flexible. This theme lies at the core of the discussion and actions recommended in this report.

ISSUES

All of the issues discussed in the following text relate to forest structure and forest development in Maine. A basic understanding of these forest dynamics begins with forest regeneration. A distinguishing characteristic of Maine's forests is their ability to naturally regenerate under a variety of timber harvesting practices, natural disturbances, and changing land uses. A combination of soils, climate, and prolific natural seeding by native tree species produces abundant regeneration that is among the most successful across all forest regions of the world.

As the forest grows and develops after regeneration, the key to a healthy and productive forest becomes ensuring that appropriate number of trees occupy every acre and take full advantage of the growth potential of the site. The soils, characteristics of each tree species, and the actions of the forest manager are the dominant ingredients. Landowners make forest management decisions as the forest develops that determine the quantity and quality of forest growth. These actions can be made thoughtfully, with a long term goal of growing a fully developed forest with high quality trees, or they can be made thoughtlessly without care for the future so that the forest loses its highest quality growth for a period of several decades.

A. FOREST PRACTICES

1. Harvest Practices

Forest practices in Maine have generated debate and controversy since the middle of the 19th century. In the last decade, public debate over forest practices has occurred every year since passage of the **Forest Practices Act of 1989**. Recent legislatures have considered forestry bills that would ban clearcutting, require permits and silvicultural justification for clearcuts, reduce maximum clearcut size, establish minimum stocking standards after any timber harvest, require minimum stocking standards for participation in the **Tree Growth Tax program**. And yet, a common vision for Maine's forests has yet to develop from these discussions.

No single issue has catalyzed recent public concern about Maine’s forests more than **clearcutting**. Clearcutting that lacks a silvicultural basis is ecologically more disruptive, creates more profound aesthetic impacts, and often limits future options more so than less intensive harvest methods. But at the same time, research and experience with clearcutting has identified it as a practice with a legitimate role in forest management. Natural disturbances from insect or weather events can require clearcutting as a means to salvage valuable timber crops.

Harvest practices other than clearcutting account for more than 90 percent of all harvesting in the state. Poorly conducted non-clearcut harvests can also have severe impacts on the continuous flow of products and values from Maine’s forests.

Landowners in Maine use three general silvicultural harvesting systems.

Selection harvests remove some trees in all size classes, either singly or in small groups, in order to regenerate and maintain a multi-aged stand structure.

Shelterwood harvests remove trees from a forest stand in two or more stages. The initial harvest removes most of the mature trees, leaving enough trees to serve as a seed source and to provide sufficient shade to produce a new crop.

Clearcut harvests remove essentially all trees in one operation. Regeneration of the next stand can be from natural seeding, planted seedlings, or advanced natural reproduction.

Over the past decade, annual harvest acres in Maine increased from about 400,000 acres to 500,000 acres. During the same period, clearcutting fell from a high of about 18 percent of all harvest acres to about 6 percent in 1997. The 1997 harvest acres were distributed among the three silvicultural harvesting systems as follows:

Selection	75%	379,000 acres
Shelterwood	19%	94,000 acres
Clearcut	6%	<u>31,000 acres</u>
Total harvest acres		504,000 acres

Summary Statement: Maine’s success with regeneration does not alleviate all concerns about future forest growth and development. Assuring forest health and productivity also requires culturing the appropriate number of trees to fully occupy a site. Beyond forest regeneration, the most important factor of forest practices is the proper use of each silvicultural system. Research and experience demonstrate that all silvicultural systems, including clearcutting, have circumstances where they can be used wisely and appropriately.

High-grading

High-grading is the harvesting of higher value, better growing trees while leaving inferior trees behind to occupy the land. Such harvests are not always easy to identify, and can come in many different applications. Repeated, light high-grading can slowly, almost imperceptibly, degrade the quality of a stand.

A 1994 field study of the Forest Practices Act by the Maine Forest Service concluded that high-grading to minimum standards occurred on about 31,900 acres each year (8 percent of all non regeneration harvest acres). The study also reported low quality residual stands (including the stands mentioned above) on about 59,800 acres (16 percent of all non regeneration harvest acres).

Liquidation harvesting

Liquidation harvesting, generally viewed as inconsistent with accepted principles of forest management, often leads to indiscriminate harvesting. It is often a speculative practice resulting in hasty land subdivision, and is characterized by disposition of land with little regard for its continued long-term use as productive forest land.

An 1998 study by the Maine Forest Service examined the nature and extent of timber liquidation in Maine. The study defined liquidation harvesting as the purchase of timberland, followed by the removal of most or all commercial value in standing timber and subsequent attempted resale of the land.

Key findings are:

- Liquidation harvesting occurs throughout the state, predominantly in organized towns.
- Between 3 percent and 12 percent of all harvested acres were identified as liquidation harvests (between 12,000 and 55,000 acres annually).
- Liquidation harvesting is conducted primarily by landowning logging contractors or realtors.
- Liquidation harvests retain some stocking of low-quality timber, but generally do not meet the definition of clearcuts under the Forest Practices Act.
- The majority of timber liquidations are smaller than 150 acres, and are sold within two years of initial purchase.

Further, MFS has found through its Forest Practices Act enforcement efforts that much of the land sold to non-industrial landowners during the breakup of larger ownerships (e.g., the Diamond lands) has been liquidated by contractors. A number of these parcels have been the focus of FPA enforcement efforts, with settlement agreements obtained. The underlying cause of such liquidations and violations appears to be that the new owners, paying higher than average prices, wanted to immediately recover their investment by harvesting heavily.

Summary Statement: Both high-grading and liquidation harvesting fail to meet any definition of good forest practices. Their use reduces both the quality and productivity of the forest for long periods of time, often several decades. The number of acres harvested by these methods is cause for concern. It is fortunate the resilience and regeneration success of Maine's forests prevent such practices from having an indefinite impact on forest productivity and quality.

2. Intensive Forest Management Practices

Some landowners in Maine use **intensive** or “**high-yield**” **forest practices** to improve the **growth** and future yield of young stands. The goal of these practices is to obtain a high level of volume growth and quality per acre by concentrating growth on a limited number of desirable trees. They typically include significant capital investments in young developing forests, with no immediate commercial yield. High-yield practices in Maine include 1) using **herbicides** to release natural or planted softwood regeneration from competing hardwood regeneration, 2) **precommercial thinning** - the spacing of over crowded saplings to a density that allows faster growth of the best quality trees, and 3) **planting** seedlings of local or genetically improved stock.

High-yield forest practices are typically considered “short rotation” practices; that is the mature stand is ready for harvesting in 50 years or less. However, several landowners intend to use high-yield forest practices to establish a more productive stand, harvest smaller trees (pulpwood) in an early initial harvest, and ultimately grow sawlog size trees using longer rotations (60 years or longer). Since these management practices have been used for only 25 years, there is no track record with applied rotation length. About 4 percent (650,000 acres) of Maine's forest land is in high yield management practices. New research is underway to better understand the impacts of high-yield forest practices, particularly as it relates to **biological diversity** and wildlife habitat¹.

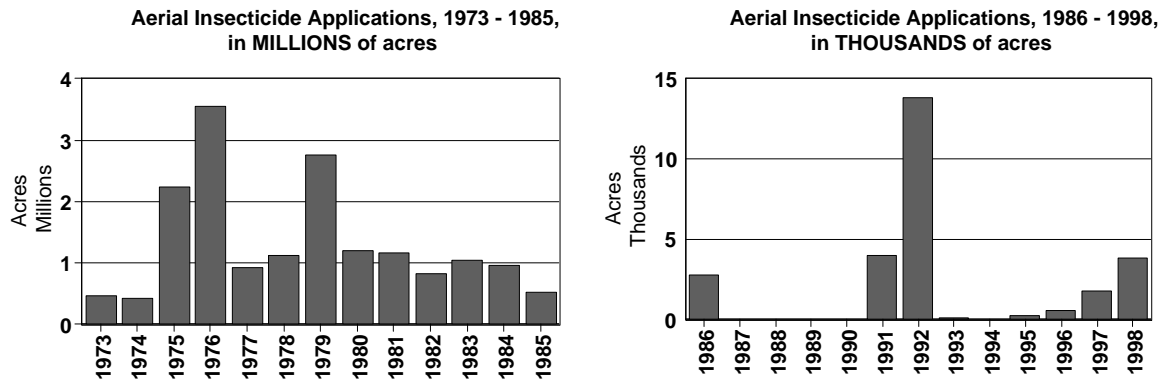
Summary Statement: High-yield forest practices include a broad range of treatments and management approaches, all of which produce substantial increases in forest growth. Research and experience show that some versions of high-yield practices are more compatible with other forest values than others. High-yield practices that utilize native tree species, and are managed for rotation lengths approaching natural stand rotations (60 years or more), are quite different than those utilizing nonnative species and managed for very short rotation periods (30 - 40 years).

3. Pesticides

Although use of chemicals for control of forest and tree pests in Maine extends back to the early 1900's when arsenicals were widely and heavily used to control gypsy and browntail moths in southern Maine, the issue of pesticides in forestry has its roots in the regional **spruce budworm** outbreak of the 1960's-80's and in the methods used to address that situation. In response to the budworm outbreak and associated tree defoliation and mortality, state and federal governments and forest landowners conducted aerial insecticide applications to reduce budworm populations and protect the standing inventories of spruce and fir.

¹ The Manomet Center for Conservation Sciences is conducting the “Shifting Mosaic Project” on 94,000 acres of industrial forest lands to examine the relationships between a broad range of forest practices and biodiversity.

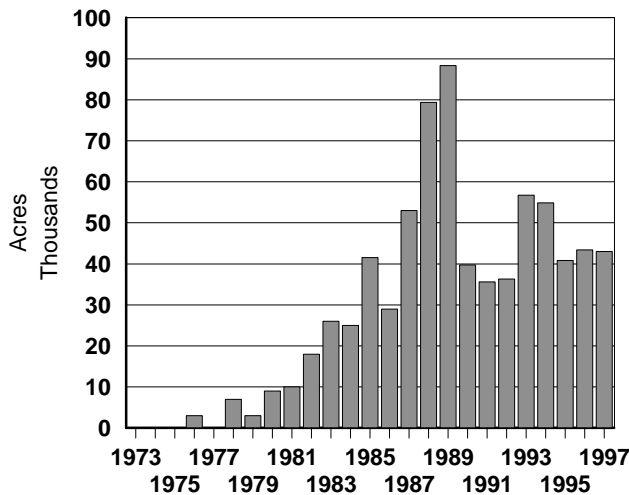
Figure 1. Aerial applications of insecticides in Maine.



Forest use of insecticides for spruce budworm peaked in 1976 when 3.5 million acres were treated, primarily with Carbaryl. Thereafter annual acreage treated decreased (Figure 1) and the active ingredients of the insecticides tended to be less persistent in the environment and more targeted to specific insect pests. With the crash of budworm populations in the mid 1980's, the controversy over the role of the State in forest insecticide projects diminished substantially. The State currently provides technical advice and assistance for forest-related pests such as yellowheaded spruce sawfly, gypsy moth, and browntail moth. In 1998, the MFS provided assistance to private and municipal insecticide treatments on about 3,900 acres.

Herbicides are used in Maine predominantly to release commercially valuable softwood seedlings and saplings from competition with hardwood saplings. They were first used extensively in Maine in the early 1980's in regenerated clearcuts that resulted from spruce budworm salvage harvesting. They are also used to weed undesirable species out of young softwood plantations. Use of herbicides peaked at about 87,000 acres in 1989. Herbicides were applied on 40,000 acres in 1997 (Figure 2).

Figure 2. Aerial application of herbicides for forestry in Maine.



Summary Statement: A broad range of remedies and approaches exist for problems associated with forest insect pests and competing vegetation. Each remedy carries its own risks and benefits. Using pesticides as a matter of last choice is the best approach to managing these problems, but this approach does not eliminate the need for

chemicals. As an example, the Brown Tail Moth infestation has been managed with a broad range of physical and biological treatments, but chemicals are still a critically important tool in controlling the infestation. Forestry use of herbicides generates a strong concern from the public, but forest management applications of herbicide should be viewed in context with use on lawns, golf courses, utilities, and agriculture. Environmental risk should be assessed based on intensity of use and proximity to human habitation.

B. TIMBER SUPPLY

Maine has a diverse forest industry that utilizes all Maine tree species and all quality of trees within each species. Maine's sawmills and paper mills have evolved over the past twenty years to make use of more abundant, lower cost species. As a result, Maine's forest landowners are fortunate to have markets for everything they grow, particularly the low quality wood that must be removed in early thinnings to allow quality wood to mature.

Key issues relative to timber supply are the long-term balance between forest growth and timber removals, and trends in timber quality and their impact on forest based manufacturers. Timber quality is of special concern for hard maple, yellow birch, white birch, ash, oak, and white pine. These species provide solid wood timber sought by the state's hardwood sawmills that produce high quality wood products such as furniture stock, dowels, and wood turnings. It is very important to sustain this part of the forest manufacturing sector, as it greatly diversifies the forest based economy and is less influenced by worldwide commodity trends. The key issue relative to tree quality is understanding the growth trends of these species, and documenting the range of forest practices implemented to enhance growth of quality trees.

In 1995, the USDA Forest Service completed an inventory of Maine's forest resource. This remeasurement, occurring 14 years after the previous inventory in 1982, documented substantial change in the Maine forest. The key items revealed in this inventory were a substantial decline in spruce-fir inventory, and large amounts of tree mortality. The dominant event during this period was the spruce budworm outbreak and salvage harvesting associated with this outbreak. The key underlying question posed by this information was: Is the current harvest level of Maine's forests sustainable? To answer this question, the Maine Forest Service, in partnership with the USDA Forest Service, conducted a long-range computer simulation of Maine's forest growth and harvest. This study, Timber Supply Outlook for Maine: 1995-2045, concludes that:

1. While inventory levels are projected to remain adequate to support current harvest levels over the next fifty years, the current mix of forest management techniques results in a long-term imbalance between growth and harvest. A projected 14 percent annual deficit between growth and harvest will result in a decline in total inventory.
2. The large quantity of tree mortality occurring in the Maine forest presents a clear opportunity to increase the harvestable growth of the forest. The analysis found that an average of 27 percent of Maine's annual forest growth ends up as unutilized tree mortality. Today's forest management activities include a number of practices that

can do a better job of harvesting tree mortality early in stand development and increasing growth and yield in residual stands. These practices include high-quality partial cutting techniques, commercial thinning, precommercial thinning, plantation establishment, and control of brush with herbicide applications. Although some level of tree mortality is desirable from an ecological standpoint, it is quite feasible to modify today's forest management practices so that the long term gap between growth and harvest levels is eliminated.

Tree Species Trends The 1995 USDA Forest Service Inventory documents a decline in the merchantable inventory of red spruce (Maine's most important softwood species), and a corresponding increase in red maple inventory (a lower value hardwood species with good pulpwood value but only marginal lumber value). Part of this trend is certainly explained by the substantial mortality and harvest of red spruce during the recent budworm outbreak. Red spruce can be returned to its historic prominence if red spruce is part of Maine's younger, regenerated forest, and Maine's forest landowners favor the growth and development of red spruce as these younger forests grow. The 1995 Forest Inventory indicates that red spruce continues to be an important component in young forests. We lack the data to answer the second question at this time.

The increased presence of red maple implies that it is gradually replacing other native species of higher value and broader economic importance. Forest management techniques that discriminate against red maple by harvesting it and leaving more valuable species to grow can certainly reverse this trend.

Tree Quality Trends

There are two key aspects to understanding the trends in tree quality:

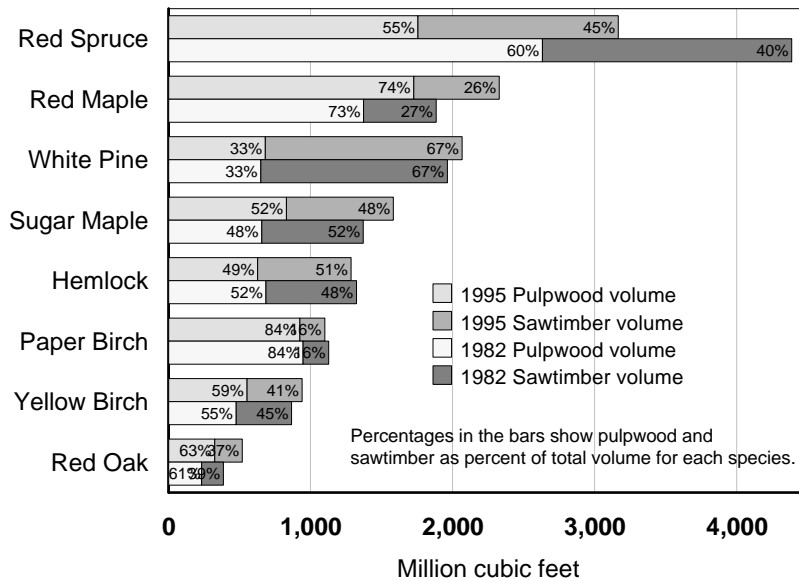
1. Are we fostering the potential of Maine's forests to grow trees of high economic quality (such as large, saw log quality trees valuable species such as sugar maple, yellow birch, ash, pine, and spruce), and spruce; and,
2. Are we managing these trees to grow them into high quality products?

As an example, yellow birch can grow into the highest quality veneer grades by being allowed to grow fast and straight, but also can develop into no more than a pulpwood quality tree if it is deprived of light or damaged during logging.

The 1995 Forest Inventory provides some insights into trends for tree quality, but it is not simply a matter of comparing the total number or volume of sawtimber quality trees with the previous inventory. A better indicator is the percent of merchantable trees or inventory growing into sawlog quality stems.

Even though red spruce volume declined from 1982 to 1995, red spruce sawtimber grew from 40 percent to 45 percent of red spruce inventory. Sawtimber percentage of species volume was stable for white pine and paper birch, while sugar maple, yellow birch and red oak show small declines in sawtimber as a percent of inventory for each species (Figure 3).

Figure 3. Trends in pulpwood and sawlog inventory for selected species in Maine.



Another important consideration in growing quality timber is the size of trees being cultured through management. Bigger trees provide more economic opportunities, as well as providing an important biological dimension. More analysis and better information are needed to properly track tree quality in Maine, but we have sufficient knowledge of the forest conditions and common forest practices to identify this as an important issue of concern.

Summary Statement: The current rate of growth in Maine’s forests cannot sustain indefinitely the current level of timber harvest. However, Maine’s forests have a growth potential that has not been fully realized. With investments in intensive silviculture and improved management of natural forest stands, we are capable of fully sustaining and possibly increasing the current harvest level. Activities to improve forest productivity need to be broadly implement over the next two decades.

C. FOREST FRAGMENTATION

Forest **fragmentation** develops from both subdivision associated with suburban sprawl, and from harvest practices that break up uniform forested landscapes into smaller isolated habitats. As a result, this is an issue of statewide concern, tracking the renewed public discussions about suburban sprawl, forest practices, and conversion of shore frontage. As Maine’s population grows and as lifestyles change, the average size of privately owned forest parcels has declined from about 82 acres in 1982 to about 60 acres in 1993.² The number of forest parcels smaller than 50 acres increased by 30

² Birch, 1986. Forest-land Owners of Maine, 1982. USDA Forest Service, Northeast Station, Resource

percent during that time, increasing from 136,800 parcels covering 1.3 million acres to 206,400 parcels covering 1.7 million acres. Most of the increase occurred in parcel sizes ranging from 20 to 49 acres. Corporate ownership declined from 8.6 million acres to 8.4 million acres. Since the 1970's, the creation of a large, private road system in the unorganized territory, changing forest management practices, and the unintended consequences of forest practices regulations have led to a noticeable, but less well documented, change in the size and distribution of forest types and stands.

As forest parcel size decreases, forest management opportunities tend to decline, whether due to changing landowner objectives, the economics of harvesting smaller parcels, local regulations or opposition to logging, or for other reasons. The public values associated with forests, such as traditional open access for recreation, biological diversity, forest productivity, forest-based employment, and others, can all suffer from forest parcel, type and stand fragmentation as well.

Finally, landowners' attitudes about timber harvesting have shifted over the years. More people now choose to live on forested parcels with the intention of having their forests serve as an aesthetic backdrop to their residence, rather than as a source of financial value or contribution to the local economy. Although landowners' attitudes toward timber harvesting may change over time and as the value of all tree species increases, it seems apparent that many acres will drop out of the "wood basket," which could further reduce the wood supply available to Maine's mills.

Summary Statement: Forest fragmentation must be addressed by both the public and private sectors. The difficult issues of smaller parcels and inattentive woodlot owners should be addressed as part of the evolving discussion of suburban sprawl and landowner education. Fragmentation of habitat in the working forest can be more easily addressed by a better understanding of forest ecology and a commitment by landowners to alter their management to address fragmentation. Finally, state policy makers should be vigilant that new regulations and standards do not promote fragmentation.

D. WATER QUALITY IN FORESTED WATERSHEDS

Water quality is one of the key indicators of both forest ecosystem health and forest sustainability. Forests adjacent to water bodies moderate water temperature, filter sediment and contaminants from surface flows, stabilize shorelines, and contribute nutrients to support aquatic food webs. Land management adjacent to water bodies impacts water quality and the ecological integrity of water bodies. For example, stream sedimentation above natural background rates can degrade fish feeding and spawning habitat. Changes in water temperature and chemical characteristics can markedly affect aquatic habitat quality as well.

The challenge in protecting water quality and in particular critical water resources, including fisheries, healthy aquatic systems, and recreational resources, lies in targeting

Bulletin NE-90; and, Birch, 1996. Private Forest-land Owners of the Northern United States, 1994. USDA Forest Service, Northeastern Forest Experiment Station, Resource Bulletin NE-136.

the actual causes of water quality degradation. Forest management may have comparatively less impact on water quality than development and other human uses. However, the importance and prevalence of forestry as the predominant land use across much of Maine, the frequent proximity of forest operations to water resources, and the connectivity of hydrologic and riparian systems suggest that careful attention to forestry impacts on water quality is warranted. Maine has a humid climate with thousands of lakes and ponds, large areas of forested and non forested wetland, and thousands of miles of streams and rivers. The interface between aquatic and terrestrial systems that occurs within riparian zones lends further weight to consideration of these areas in resource management planning.

Historic evaluation of forest operations have highlighted that poorly constructed and maintained access roads and skid trails have been the principal source of sedimentation and siltation of streams from forest operations, while cutting immediately adjacent to water bodies has had impacts on water temperature regimes. In contrast, when appropriately applied, Best Management Practices (BMP's) are generally effective in eliminating most water quality effects of forest operations. Impacts on stream flow from timber harvesting have a significant scientific basis but are less well documented for specific watersheds.

Since the 1970's, Maine has developed a strong public policy framework for protecting water quality from degradation by all uses, including forest management. The suite of policies includes the Natural Resources Protection Act, Land Use Regulation Commission (LURC) protection zones in the unorganized towns, mandatory Shoreland Zoning in the organized towns, and voluntary BMP's for timber harvesting and logging road construction. Most regulatory approaches have emphasized non-prescriptive measures and positive outcomes of preventing discharge of pollutants, including soil, to surface waters. However, forest management activities around all surface water, including small brooks and streams, need to be conducted with more universal use of BMP's and similar approaches to water quality protection.

As scientific research reveals new information current policies should be reevaluated and revised as necessary. The regulatory framework is fragmented, with timber harvesting regulations for shoreland areas varying by jurisdiction, and jurisdictions overlap in some areas. In addition, recent and ongoing research have highlighted the impact of forest management on stream flows, water chemistry and temperature, while the emerging discipline of conservation biology and coincident research attention to biological diversity issues have identified the high ecological value of **riparian zones**. Riparian zones contain many important and sensitive plant communities, provide important wildlife and waterfowl habitat, and serve as a nutrient source for the macroinvertebrates that underpin fishery health.

Summary Statement: Good forest management protects water quality and maintains functioning of aquatic and hydrologic systems, while supporting or enhancing human use of water resources. This link has been a basic foundation of scientific forestry for over 100 years. Substantial progress in Maine has been made over the last two decades to reduce the impacts from poor road construction techniques and inadequate layout of harvest operations. In spite of this progress, significant improvements to

protect water quality can and should be made. Examples include increased use of portable stream crossings and increased protection of smaller, headwater streams.

E. WILDLIFE HABITAT/BIOLOGICAL DIVERSITY

Over the past 10 years, interest has shifted from the conservation of specific wildlife habitats to conservation of biological diversity. Earlier wildlife conservation issues related to forest practices were concerned with conserving specific wildlife habitat elements for game species or endangered species, such as protecting deer winter habitat and bald eagle nest sites.

Biodiversity refers to the variety and abundance of species, their genetic composition, and the communities, ecosystems, and landscapes in which they occur.³ The maintenance and conservation of biodiversity is best characterized as management practices that assure the continued existence of all species of the forest (including tree, shrubs and other vascular plants; lichens, mosses, and fungi; mammals; birds; amphibians and reptiles; insects and other invertebrates). Since it is neither practical or desirable to maintain all these elements on every acre of each forest stand, a critical aspect of this new discipline is examining the forest at the landscape level (500 acres to 25,000 acres). Where the traditional forest policy focus had been at the site or forest stand level, we now recognize the importance of looking at forest conditions and changes over larger areas in order to maintain populations and ecosystem components over time on the landscape, though not necessarily to protect all individual communities and habitats.

Two important efforts are either underway or recently completed that expand our understanding of forest biodiversity in Maine, the Maine Forest Biodiversity Project (completed in January 1999) and the Shifting Mosaic Project (ongoing).

The Maine Forest Biodiversity Project, a collaborative effort involving many stakeholders, worked from 1994 to 1999 toward the general goal of maintaining biodiversity in Maine. Specific activities included: defining biodiversity; assessing forest biodiversity (voids in information, impacts of current land uses, historical records); exploring the feasibility of a proposed system of ecological reserves; identifying forest management options to better conserve biodiversity; and providing educational outreach.

The project produced several broadly accepted findings regarding biodiversity in Maine:

1. Present information does not indicate a biodiversity crisis in Maine in terms of outright loss of species. But considering the number of rare species, the number of species for which we have no information, and the apparent insufficiency of unmanaged, representative ecosystems, neither does present information support complacency. Maine has an opportunity to avoid an acute crisis by developing biodiversity maintenance strategies.
2. Concerns over biodiversity are manifested in Maine mostly at the ecosystem or landscape scale. Eight of the 25 forest community types in Maine are rare; even in

³ Maine Council on Sustainable Forest Management. 1996. Sustaining Maine's Forests: Criteria, Goals, and Benchmarks for Sustainable Forest Management. Maine Department of Conservation, Augusta.

well represented forest community types high-quality natural examples are rare. Older forests of all types are becoming less common.

3. A system of **ecological reserves** would provide for the gathering of data at all levels, to better understand the range of species in the forest and their requirements, and to serve as benchmarks or comparisons to managed landscape to better understand human impacts on the forest. Creation of such a system would have some impact on future sustainable levels of timber harvest.
4. The working forest can be managed to maintain most aspects of biodiversity in an economically viable framework, but specific landscape-level measures need to be developed.

The Manomet Center for Conservation Sciences established the Shifting Mosaic Project in 1995. The Shifting Mosaic Project is a developing model for managing private industrial forestland for both economic and ecological goals. This project has developed to include partnerships with the University of Maine, State natural resource agencies, conservation organizations, and other entities across the US. Using two study sites (52,000 acres in Maine's western mountains and 42,000 acres near Baxter State Park), a team of independent scientists and foresters are testing new ways to integrate the economic goal of a long-term sustained wood flow and the ecological goal of self-sustaining populations of all plant and animal species in the working forest.

Summary Statement: The issues of wildlife habitat and biodiversity present a range of both opportunities and concerns. As a new understanding of forest dynamics emerges, a great opportunity exists to incorporate new knowledge into day-to-day forest management activities. Both timber management and habitat management are based upon change in the forest - trees grow, stands develop, and habitats and biotic communities change within stands and across landscapes. Landowners and managers are finding the common threads of both protecting habitat and promoting timber productivity in many settings across the State.

F. ACCESS FOR PUBLIC RECREATION

Maine's private landowners have a long history of providing forest recreation opportunities to the public. Nearly all of the large industrial and non-industrial lands remain open to traditional activities such as hunting, fishing, trapping, hiking, snowmobiling, camping, and birdwatching, as well as newer activities like mountain biking and ecotourism. This tradition of free and open public access continues, despite pressures to generate revenue to lower the annual carrying costs of owning forest land. Many of the smaller forest ownerships remain open to responsible recreation, although changing landowner attitudes have led to a decline in public access in the southern half of the state.

State and private programs and policies designed to encourage landowners to keep their lands open and available for public recreation are generally regarded as success stories that other states could do well to emulate. These success stories include the

Great Ponds Act, **limited landowner liability laws**, privately-managed recreation programs such as North Maine Woods, and state and private landowner relations programs. The Tree Growth and **Farm and Open Space** tax laws do not require public access; however, enrolled lands, by remaining undeveloped, offer recreational opportunities that may not otherwise exist under ad valorem taxation. Nonetheless, a number of issues continue to arise that require resolution. These issues include conflicts between motorized and non-motorized recreational activities, pressures for more wild, unmanaged forest areas, and the conversion of scenic and shorefront areas to residential uses. Several task forces convened over the years have identified these issues and recommended a number of actions to address them⁴. However, follow-up action has been fragmented. The challenge for the future will be to maintain an ongoing dialogue between forest landowners, forest users and the public agencies, with concerted, coordinated actions designed to reduce conflicts and maintain the long tradition of reasonable public recreational access to private lands.

G. SOIL PRODUCTIVITY

Protecting and, where needed, enhancing soil productivity is important in sustaining forests. Healthy associations of soil flora and fauna and forest vegetation constitute an important pathway in forest nutrient cycles and thus maintain forest productivity. Timber harvesting can significantly affect soil properties, including nutrient cycles and structure. Organic horizons, biotic legacies of micro- or macro flora and fauna, and root systems are all soil components of critical importance for forest productivity and health, but can be depleted or damaged through careless harvesting. Poor management of soil conditions can impair forest regeneration and stimulate development of competing vegetation, including raspberries, pin cherry, and fireweed, severely limiting forest productivity.

Although formal soil Best Management Practices are in early stages of development, a wide variety of known measures can minimize harvesting impacts - from logging on frozen soils to modifying equipment selection, harvest layout, slash treatment and silvicultural prescriptions. As an example, there is some indication that whole tree harvesting, if used repeatedly on sites with shallow or infertile soils, will deplete soils by interrupting the supply of leaves, twigs and branches that replenish organic matter and nutrients in the soil; however, retention trees, shelterwood or uneven-aged systems, and long rotations can mitigate some of these effects. Fertilization of forest stands to correct nutrient deficiencies is not a common practice in Maine, and has been limited largely to land application of biosolids and other mill residues.

Other major issues related to forest management and soil productivity are minimizing soil loss through erosion (see Section D), protecting soil nutrient cycles, and avoiding excessive biomass removals that deplete important nutrients such as calcium. Soil acidification may also be an issue of concern. Sustaining soil productivity requires maintaining proper soil structure, texture, organic matter, and adequate nutrient levels. Forest management practices that maintain soil nutrient cycles and structure generally protect other resource values as well.

H. AESTHETICS

⁴ Examples include the Governor's Council on Outdoor Recreation, Maine Commission on Outdoor Recreation, Northern Forest Lands Council, and "A Report on the Program of Landowner Relations."

Forests cover 89 percent of Maine's total land area. The visual amenities of this vast, forested landscape define in large part the state's character and identity. Whether in the wildness of the northern regions or the settled landscape of southern regions, sustaining the visual quality of Maine's forests is important to our quality of life. Average citizens typically assess the health and integrity of the forest based on how it looks. The citizens of Maine have often expressed their concerns over the condition of Maine's forests through this filter of aesthetics.⁵

Although scenic quality is highly subjective, most people agree that forest management can profoundly impact the forest aesthetic, both positively and negatively, up close and from a distance⁶ (Palmer *et al.*, 1995).

Mitigating the negative short-term impacts of timber harvesting is an important way that landowners can communicate to the general public a strong stewardship ethic. Issues requiring attention include the development of voluntary Best Management Practices for aesthetics, as has been done in Minnesota, encouraging forest landowners to consider minimizing negative visual impacts when making management decisions, and training loggers to modify practices to limit visual impact.

Timber harvesting operations that fail to minimize the most visually offensive aspects of logging and associated activities create conditions that communicate wastefulness, sloppiness, and site destruction to the general public. On the other hand, harvest practices that focus on good utilization and slash treatment, proper log yard and road construction and closeout, and limited residual stand damage are often those with the least impact to visual quality.

I. SMALL NON INDUSTRIAL PRIVATE LANDOWNERS

Small non industrial private forest (NIPF) landowners⁷ control the management of about 5.5 million acres (one-third of Maine's forest land), mostly in the southern and central regions of the state.⁸ Their management decisions affect to a significant degree the present and future condition of the state's forest based economy, including the wood supply, as well as the quality of life in rural settings, recreational opportunities, biological diversity, and the many other functions and values of forests.

Small non-industrial landowners face a wide range of challenges, that in number and impact are disproportionately burdensome with smaller ownerships. These may include infrequent income from timber harvests, often occurring a decade or more apart, poor access for forest management and disproportionately high costs of improving access, costs of researching and maintaining boundaries, constraints to forest management options due to lot size, shape, and/or influences from neighboring properties, infrequent contact and lack of a consistent relationship with professional foresters, and in some cases a high proportion of family resources invested in forest land and timber ("land

⁵ Northern Forest Lands Council. 1994. Summary of Public Comment on "Finding Common Ground." Northern Forest Lands Council: Concord, NH. mimeo.

⁶ Palmer, J. *et al.* 1995. Esthetics of Clearcutting: Alternatives in the White Mountain National Forest. *Journal of Forestry*, May 1995. pp. 37-42.

⁷ Defined as non industrial private landowners owning more than 10 acres and less than 1,000 acres.

⁸ Birch, 1996, *op. cit.*

rich, cash poor”). Additionally, more populated areas of the state have a varied landscape history, which on individual lots may include a history of repeated high-grading and/or agricultural abandonment, and frequently no past history of long-term, scientific forest management.

Taxation policies also impact small NIPF landowners unfavorably. For example, federal income tax laws work against small NIPF landowners in that generally they cannot deduct against income their current management costs (e.g., thinning and pruning) that could be considered investments in future productivity, whereas larger landowners generally can deduct these costs in the year they are incurred. Other ownership costs, particularly property taxes, occur annually, but income from timber harvesting is intermittent. Non-timber forest income, especially from maple syrup, wreath brush, hunting leases, and the like, require additional knowledge and often investment to produce a return.

Finally, landowners may be faced with reconciling multiple uses on relatively small parcels, including recreation, wildlife, wood for home use, and use of the property as a residence or as a buffer from neighbors. Small NIPF landowners often have very different motivations for owning and managing land than larger landowners. Timber production, with its relatively high visual impact to the landscape and attendant increased risk of misuse of forest access, often does not rank high on the list of their reasons for ownership. Landowners’ stated intentions indicate a low probability that their land will be harvested within the current decade.⁹

Small NIPF landowners also present a special challenge to forest policy makers. Land use regulations (e.g., water quality laws and the Forest Practices Act) provide a necessary safety net to protect important **public trust resources**; however, the burden may be disproportionately felt by small landowners, a disproportionately large percentage of whose ownership may include a protected resource affecting forest management options. Public incentives to forest management on small ownerships (e.g. cost-sharing programs, Tree Growth tax law) have focused on increasing access to professional advice and easing ownership costs. However, these efforts may meet with reduced long term success if landowners do not perceive a decreased financial pressure to harvest heavily, or, alternatively, remain unconvinced that timber harvesting is compatible with other, more dearly held ownership objectives. Increased awareness and acceptance of professional forestry options and services are slow in developing, as are visible examples on the landscape of highly successful, multi-resource forest management on small ownerships.

Summary Statement: Small non industrial private landowners have different motivations and objectives for owning and managing forest lands than do large non industrial and industrial landowners. Public policies often aimed at modifying the behavior of large industrial landowners and logging contractors can have the unintended consequence of discouraging NIPF landowners from practicing forest **stewardship**, primarily when landowners believe that future restrictions will limit management options. These unintended consequences are generally thought to include high grading, forest liquidation and land use conversion, but they also include landowners’ conscious decision not to manage their lands at all. Both extremes have

⁹ Birch, 1996, op. cit.

negative impacts on the future forest. Forest policies should actively encourage stewardship on NIPF lands while maintaining a regulatory safety net to protect important public trust resources.

J. A STABLE PUBLIC POLICY

One consequence of Maine's extensive forest policy debates both in the legislature and by referendum is the creation of an air of uncertainty for landowners and confusion on the part of the public. All forest interests express great concern about change, yet the debate itself has promoted change. A stable and predictable forest policy from the State of Maine is necessary to reduce the uncertainty and fear.

- Incentives for Forest Investments:** For all forest landowners, a commitment to grow healthy, high-quality forests requires an investment of time and money with a very long-term payback. Many landowners express the fear that these commitments will be undercut by changing public policy. Perhaps the most explicit example of this is Maine's Tree Growth Tax (TGTL) program. Participation in the TGTL requires a commitment by the landowner to manage the enrolled forest land and to maintain the lands as forest land. The law provides penalties when landowners do not fulfill their part of the TGTL commitment. Yet nearly every year, legislative proposals to substantially change the program are debated. While it can be argued the program has not been changed substantially, the nature of the annual debate combined with actual but modest changes results in an atmosphere of uncertainty. This issue has increased in importance as public debate over forest practices has intensified. In general, policy instability promotes a short-term approach to forest management that contradicts the public policy goal of ensuring long-term, sustainable forest management.
- Stable Ownerships and Landowner Accountability:** Public concern over stewardship of Maine's forests has driven the many forest policy debates. The frequent changes in forest ownerships that have characterized the past decade raise more questions of landowner commitment and follow-through. Increasing and often conflicting demands upon the forest's resources, the complexity of forest ecosystems, and the public's desire for well-managed forests all point to a need for competent, professional forest management at all levels, and for continuous improvement in knowledge and practice.

Summary Statement: Maine's recent and ongoing debates over forest practices referenda and legislation have not fostered a stable public forest policy. While regulatory programs can prevent specific abusive practices, the more desirable goal of achieving forest management excellence requires a different approach. The key to building public trust in forest management lies in establishing and maintaining a policy framework of publicly accessible and credible accountability measures by which forest landowners and managers demonstrate their commitment to and achievement of an ecologically and economically healthy forest. Further, as our knowledge base increases, forest landowners and managers must demonstrate a commitment to continuous improvement through education and incorporation of research into practice.

II. Policies in Place

This section outlines existing policies and programs that address in some part the previously identified forestry issues.

Protecting Water Quality and other Resources

Regulatory Programs

Regulatory programs governing water resources are administered by Maine Department of Environmental Protection (DEP), largely under Title 38 MRSA. This broad law sets out DEP's responsibilities to protect state waters, and includes several provisions relevant to forest management. Fundamentally, the law's Section 413 prohibits the discharge of pollutants, including rock, sand, and dirt, to any and all surface and subsurface waters of the State without a license from DEP. Other sections 1) set forth Maine Forest Service's responsibility to develop, publish, and distribute Best Management Practices guidelines to prevent non point source pollution from wood harvesting and forest management activities, 2) prohibit depositing forest products refuse into state waters, 3) prohibit log driving and storage, other than from islands to the mainland (with a permit).

Other relevant sections of DEP statute include:

Erosion and Sedimentation Control Law - 38 MRSA §420-C

The Erosion and Sedimentation Control Law was enacted in 1996 to regulate activities involving filling, displacing or exposing soil anywhere in the organized areas of the state. The law's intent is to emphasize prevention of soil erosion and movement off-site during these activities

The law requires a person conducting an activity to take measures to prevent unreasonable erosion of soil or sediment beyond the project site or into protected resources, as defined under the Natural Resources Protection Act (38 MRSA §480). The law requires that erosion control measures be in place before an activity begins, be maintained, and remain in place and functional until the site is permanently stabilized. Forest management activities and associated road construction are deemed to be in compliance, provided that they are conducted in accordance with the standards of the Land Use Regulation Commission.

Natural Resource Protection Act (NRPA) - 38 MRSA §480-A to 480-Z

The NRPA (enforced by Department of Environmental Protection) regulates work in and adjacent to protected natural resources, including lakes, ponds, rivers, streams, brooks, tidal areas, fresh water wetlands, vernal pools, and mountain areas above 2,700 feet in elevation. Activities regulated under the NRPA include disturbing soil, placing fill, and building permanent structures in or adjacent to these areas. Forestry related activities that require a permit include: any road building or excavating within 100 feet of lakes, ponds, rivers, streams, non-forested wetlands, and tidal areas; new bridge construction or new culvert installation for road crossings of portions of lakes and ponds, rivers, streams, non-forested wetlands, and tidal areas; harvesting operations above 2,700 feet in elevation; and construction of permanent crossings or fords across stream beds.

Mandatory Shoreland Zoning Act - 38 MRSA §435 - 449

The goal of the Mandatory Shoreland Zoning Act is to protect resources along Maine's streams, rivers, lakes and tidal waters. The law targets development along the immediate shorelines of these resources, and requires municipalities to adopt and enforce shoreland zoning ordinances. Municipal shoreland zoning ordinances must be as stringent as a model ordinance adopted by the Board of Environmental Protection.

The law applies to all areas within 250 feet of lakes, ponds, rivers, tidal areas, and freshwater wetlands and areas within 75 feet of certain streams. Forestry related activities that are covered under shoreland zoning requirements include timber harvesting, road construction, and the creation of skid trails and log yards. In general, the law regulates timber harvesting and associated activities within the shoreland zone by setting minimum performance standards.

Land Use Regulation Commission - The Land Use Regulation Commission serves as the planning and zoning board for the roughly 10.5 million acres of unorganized territories in Maine. Operating under a comprehensive plan and land use standards, LURC has zoned the land under its jurisdiction into three major districts: Protection Districts, Management Districts, and Development Districts. Mandatory Shoreland Zoning does not apply to LURC jurisdiction, but the goals of shoreland zoning are incorporated into LURC's law and land use plan. LURC land use standards affect timber harvesting, road construction, water crossings, and other land management activities that impact water quality in protection districts and development districts.

Non Regulatory Programs

Best Management Practices

BMP's are voluntary guidelines designed to reduce erosion and sedimentation of water bodies from logging activities. They were developed by the Maine Forest Service and the Department of Environmental Protection and are based on standards of the Land Use Regulation Commission. Careful application of BMP's can provide significant assurance of water quality protection on logging jobs.

Note on Statewide Timber Harvesting/Nonpoint Source Pollution Standards

The 118th Legislature (Public Law Chapter 648) directed the Maine Forest Service, in consultation with the Department of Environmental Protection and the Land Use Regulation Commission, to develop recommendations for statewide standards to minimize the impact of timber harvesting on nonpoint source pollution. Inconsistencies in timber harvesting requirements with respect to waterbeds, between organized and unorganized towns, and between different statutes and rules, have been highlighted in several documents.^{10,11} The uniform timber harvest standards, as proposed, would:

- Adopt one "stream" definition statewide;
- Establish consistent standards statewide for land management roads, skid trails, shade and filter strips in proximity to waterbeds; and,
- Extend protections to small, headwater, and unmapped streams.

¹⁰Maine Council on Sustainable Forest Management, op. cit.

¹¹Maine Forest Service, 1990. An Analysis of Inconsistencies in the Regulation of Forest Management.

The standards are based on current LURC and DEP shoreland zoning rules. As proposed, the new standards would be administered and enforced by the Maine Forest Service. The report was submitted to the 119th Legislature in January 1999, and is currently undergoing additional review.

Maine Forest Service, in cooperation with LURC and DEP, is also developing a field procedure to monitor implementation of BMPs on timber harvesting operations, as outlined in the January 1999 report. Improved, random monitoring to assess trends in BMP utilization and evaluate possible impacts to water quality will serve as a regular follow-up to a 1996 report¹², which determined that BMP use and effectiveness varied considerably statewide. BMP monitoring is proposed to become a larger part of routine field inspections of harvest operations as well.

Promoting Stable Land Uses

Forest Taxation Policies

Maine's Tree Growth Tax Law (TGTL) has the policy goal of "encouraging forest landowners to retain and improve their holdings of forest lands upon the tax rolls of the State and to promote better forest management by appropriate tax measures in order to protect this unique economic and recreational resource."¹³ The TGTL is founded on the principle that forest land should be taxed according to its productive capacity to grow trees, rather than at its speculative, highest and best use value. It is both a method of more properly assessing forest land to take into account the unique characteristics of forests and a method of current use assessment. The assessed value is based on the capitalized value of the land, given its capacity to grow timber.

Tree Growth Tax Enrollments¹⁴ - Enrollment in the Tree Growth Tax program is entirely voluntary for forest landowners. The number of acres enrolled in the program has remained remarkably steady in recent years, with total enrolled acreage currently at 11.2 million acres statewide - about 2/3 of the total commercial forest land in the state. The number of parcels enrolled in the program has hovered at or near 20,000 for several years. A large number of landowners withdrew from the program between 1993 and 1994, resulting in an enrollment decline of about 600,000 acres. This large withdrawal was probably triggered by a number of legislative changes to the program in 1993 that included a repeal of the personal use exemption for parcels less than 100 acres in size.

Tree Growth Tax Issues - The policy goal of the TGTL is to "encourage forest landowners to retain and improve their holdings of forest lands... and to promote better forest management..."¹⁵ Since its inception, the TGTL has been controversial, as evidenced by frequent legislative proposals to change the program. Nonetheless, the program has helped to keep a large portion of Maine's wood basket in management. Above all, it minimizes the effects of the ad valorem property tax, which acts as a disincentive to long-term investment in forest ownership and management. It

¹²Briggs, R.D., Kimball, A.J., and Cormier, J. 1996. Assessing Compliance with BMPs on harvested sites in Maine. CFRU Res. Bull. 11. College of Natural Resources, Forestry and Agriculture. Maine Agric. and Forest Exp. Sta. Misc. Rpt. 400. Orono, ME. 35 p.

¹³36 MRSA, § 572.

¹⁴Data collected by Maine Revenue Services and the Maine Forest Service.

¹⁵ 36 MRSA §572.

encourages forestry investments by taxing the value of the annual growth on standing timber, rather than the entire inventory of standing timber on a woodlot. To some extent, it also shields land from development pressures. Numerous commissions, study groups, policy analysts, and others have identified stability as the key element of any tax policy affecting forest lands. Frequent changes to TGTL can alienate current participants and discourage new participants, both of whom might be encouraged either to liquidate their timber asset to recover their equity and/or convert the land to another use. Neither is in the best interests of the state.

Three key issues affect the program and require constant attention. First and most important is the loss of revenue to municipalities. Municipal support for the program depends in large part on stable reimbursement levels by the state to the municipalities. A legislative commitment to sound forest policy implies a commitment to maintaining municipal reimbursement at statutory levels. This has been the case for the past biennium, but it was a significant source of tension for many years. Second, some interests perceive the TGTL as a property tax avoidance scheme. The Maine Forest Service disagrees with this assessment. The TGTL is the correct way to tax forest land. The few landowners who may be sheltering their property in the program will eventually be identified and removed as the TGTL requirement for management plans for all properties takes effect. Finally, program critics assert that some enrolled landowners are not doing a good job of managing their lands, contrary to the law's purpose. The management planning requirements, coupled with the accountability imposed upon foresters through the forester licensing law, can address this issue in part; however, additional accountability measures may be necessary to maintain public confidence in the program. The TGTL is not a panacea for all forestry issues. The program can only create the appropriate taxation environment to foster stewardship - other policy tools are necessary to address abusive management.

Controlling Forest Practices

Regulatory Programs

Forest Practices Act

Maine adopted the Forest Practices Act in 1989. This law defined a clearcut, and authorized the Department of Conservation to establish rules to regulate the use of clearcutting. The first set of rules was adopted in 1990, and established limitations on the size, regeneration requirements, and standards for separation zones for all clearcutting in Maine. This law also initiated a harvest notification program and formalized harvest reporting requirements to the Maine Forest Service.

After operating with the law and rules for 8 years, the MFS reported to the legislature that there were opportunities to improve and simplify the law for better enforcement. In addition, new information about forest management through the research of the Manomet Center for Conservation Sciences (Report MCDCF-97001) indicated that the initial law and rules promoted forest fragmentation. The law was modified in 1998, with major rule revisions developed and proposed for legislative review in 1999.

The rule changes increase agency oversight of individual clearcuts over 75 acres in size by requiring that a MFS forester visit each site and confirm that a management plan,

including proper silvicultural justification for the clearcut, demonstrates compliance with the rule before any harvesting occurs. The MFS believes these rule changes maintain or increase the overall standards of performance when using clearcutting, while addressing in part concerns that the law promotes a biologically fragmented forested landscape.

Voluntary Programs

Forest Stewardship Program

The Maine Forest Stewardship Program provides technical and financial assistance to small, NIPF landowners to plan and implement resource management plans on their woodlots. Cost-share practices include: soil and water conservation practices such as road-related BMP implementation; riparian and wetland protection practices; reforestation and tree planting; woodland thinning, pruning and weeding; fisheries and wildlife habitat improvement; forest recreation enhancement. Non industrial landowners with stewardship management plans have given thought to how they will attain their objectives on their woodlot, and have management plans prepared by trained resource professionals. In return, landowners agree to maintain the practices for at least ten years.

Tracking Conditions and Changes in the Maine Forest

Forest Monitoring/Information Programs

Annualized Inventory: Tracking timber supply and quality, forest biodiversity, and forest practices:

The 118th Maine Legislature authorized and funded an annual forest inventory and assessment program. This new program will be in partnership with the US Forest Service's Forest Inventory and Analysis program, which also has a new Congressional mandate for annualized forest inventory nationwide. Maine will be the first state in the northeast to participate in the annualized forest inventory, starting in April of 1999. The annualized data collection will combine remote sensing and detailed sample plots. The program will inventory 20 percent of Maine's forest annually, completing a full assessment cycle every five years.

This new assessment program will provide significant improvement to the public knowledge of both the natural changes and harvest activities happening in the Maine forest. The new data will substantially improve trend assessment for issues identified in this report, by being more timely and better focused on critical information. In addition, the new assessment program will be an important tool for determining wildlife habitat trends. An advisory committee representing a broad base of technical expertise has been convened to direct this program.

Annual Forest Assessment and Reporting Requirements

Under authorization of the Forest Practices Act, the Maine Forest Service collects annual data on timber harvesting, other forest management activities, and the import/export of forest products. These data are used by the Maine Forest Service to provide reliable, timely and accurate information about the utilization and condition of Maine's forest resources.

Landowner Notifications: Landowners must notify the Maine Forest Service before starting harvesting operations. Information provided the landowner includes location of harvest, dates of harvest, and anticipated acreage to be harvested.

Landowner Reports - Confidential Report of Timber Harvest: Any landowner who conducts a commercial timber harvest must report to the Maine Forest Service the following: species harvested; the volume harvested and stumpage prices received; location and size of harvest; harvesting methods employed.

Wood processors and importer/exporters: Sawmills, paper mills, and other manufacturers that process timber must submit annual reports detailing by species the amount of timber processed and the county where the timber was harvested. In addition, any individual or firm that imports or exports forest products to or from Maine must provide an annual report on the origin of the forest products and their destination.

Non-governmental programs supporting sound forest management

A number of private and non-governmental initiatives support the goal of promoting sound forest management. Some programs have been in place for many years, while others have just begun to have an impact on the Maine landscape. Landowners' participation is voluntary. All of these programs have the potential to improve forest landowner's performance and the odds that Maine's forests will continue to provide a wide array of benefits, values and services well into the future. Some programs are designed with the goal of communicating to consumers that a landowner's or company's lands are well-managed. The challenge for consumers of forest products who seek to purchase products from well-managed forests is to investigate and understand the basis for claims of sustainability or sound management and to make an informed decision. The programs listed below provide just a sample of what is available.

- Independent, Third Party Certification

Independent, third party certification (also known as "green certification") involves an independent evaluation of a landowner's forestry practices according to strict environmental and socio-economic performance standards. Standards are developed through an open, public process. Forest operations that are awarded certification may label their products as originating from a well-managed source. A few Maine landowners and land managers have chosen to seek independent, third party certification of their forest management practices in recent years. At the time of this report, one major landowner has nearly one million acres certified, and one major landowner is seeking certification. Two forest management consulting firms have also received certification, offering the benefits of certification to small, NIPF landowners. In addition, a major purchaser of sawlogs has recently been certified to handle green certified logs in a "chain-of-custody" agreement.

- Sustainable Forestry Initiative

The Sustainable Forestry Initiative (SFI) is a program administered by the American Forest and Paper Association that promotes specific standards for sustainable forest management. The SFI national standards were developed to address public concerns identified by focus groups and incorporated recommendations from foresters, conservationists and scientists. SFI has developed a forest management verification process for forest landowners based on these standards. A legislative resolve was passed in 1998 that encouraged the development and implementation of a third-party process to verify compliance with forestry-related performance standards. In Maine, an independent oversight panel will examine and publicly report on the strength and thoroughness of verifications conducted under the SFI process. Also, the national SFI standards have been reviewed and modified by independent experts to reflect Maine's specific sustainability issues. It is anticipated that SFI's standards will continuously evolve as the science supporting sustainable forest management advances.

- American Tree Farm

The American Tree Farm program has the longest history in Maine, with its origins dating back over 50 years. The Tree Farm program recognizes private forest landowners (particularly the small, non industrial landowners) who have committed to a higher level of forest management than their peers. Criteria for membership in the Tree Farm family include a commitment to producing a continuous crop of trees with the added benefits of improved wildlife habitat, watershed protection, outdoor recreation, and aesthetic value. Landowners must own at least 10 acres of woodland, have a written forest management plan, and must be inspected regularly by a licensed forester to ascertain that the landowner is following the plan and the principles of the Tree Farm program. Over 1,880 Maine landowners managing 7.6 million acres participate in the program.

III. Forest Sustainability Standards¹⁶

Introduction

The 118th Legislature directed the Maine Forest Service to “establish a process to assess forest sustainability” (Public Law Chapter 720). Assessing forest sustainability is a continuous improvement process, one in which available information, our understanding of the forest, economic pressures, and public values evolve over time.

“Sustainable forest management enhances and maintains the biological productivity and diversity of Maine’s forests, thereby assuring economic and social opportunities for this and future generations. It takes place in a large ecological and social context and achieves a balance between landowners’ objectives and society’s needs.”¹⁷

Sustaining the forest is a complex task that involves many variables, including ecological processes, landowner objectives, and market forces. Sustaining the forest will require an adherence to traditional uses and values, while recognizing the many changes that will occur in the forest. There is no simple path to follow to achieve this result. The structure and outline below is intended to advance the pursuit of forest sustainability in Maine. The 118th Maine Legislature identified seven criteria of forest sustainability and a timeline for developing benchmarks of sustainability:

- **Criterion 1: Soil productivity (2001)**
- **Criterion 2: Water quality, wetlands and riparian zones (1999)**
- **Criterion 3: Timber supply and quality (1999)**
- **Criterion 4: Aesthetic impacts of timber harvesting (2003)**
- **Criterion 5: Biological diversity (2002)**
- **Criterion 6: Public accountability of forest owners and managers (1999)**
- **Criterion 7: Traditional recreation (2003)**

As specified by the Legislature, this report proposes sustainability benchmarks for criteria 2, 3, and 6. Benchmarks for the remaining criteria will be completed by 2003.

The Role of Sustainability Benchmarks

The role of sustainability benchmarks are intended to serve as clear, measurable expectations of performance or outcomes from Maine’s forests and forest landowners. These benchmarks are not intended to serve as regulatory standards. They encompass a broad set of conditions and should be used as a framework to measure trends and achievement on a statewide basis. The format for these benchmarks is:

- Define a goal.
- Identify a measurable indicator(s) for the goal.
- Set a standard of performance (benchmark) or status for the indicator.
- Outline how this benchmark will be tracked, measured, or assessed.

¹⁶In this document “sustainability standards” and “sustainability benchmarks” are used interchangeably.

¹⁷Definition created by the Maine Council on Sustainable Forest Management, 1996

These sustainability goals are applicable to all of the forests of Maine, with each indicator being relevant to as broad a forest condition as possible.

THE ECONOMICS OF SUSTAINABLE FOREST MANAGEMENT¹⁸

Sustainable forest management is not a free lunch. Achieving an optimal level of goods and services from the forest will change the mix and distribution of costs and benefits to landowners, loggers, recreationists, other forest users, and society in general. Every use, benefit and service cannot be accommodated on every acre across the forested landscape. There will be “winners” and “losers” from any policy direction that is chosen, including the status quo. The keystone of optimizing the value of Maine’s forests lies in striking the appropriate balance between achieving ecosystem health, economic viability, and human well-being.

A complete understanding of the costs and benefits of achieving these benchmarks is not possible at this time. We have limited knowledge of the full range of costs and benefits that will accrue to different parties, and we have limited ability to value many of the non-market benefits of healthy forest ecosystems (although economists continue to refine tools to value ecosystem services). In general, though, we believe that society in general will stand to benefit, while forest landowners, loggers, managers and wood processors are likely to incur additional costs, at least in the short term, as they undertake any necessary transitional measures to achieve sustainability goals, particularly those forest landowners, loggers and managers not currently operating at a high standard. We do not minimize the challenges faced by landowners, land managers, loggers, wood processors, and forest-dependent communities in adjusting to what may be a new management paradigm for some, but adjustments will be necessary and will occur no matter which path is chosen.¹⁹ We believe that sustainability, under the definition used in this report, and as described above, represents a set of conscious choices about the future, for the benefit of Maine people. Ultimately, Maine citizens will decide which proactive steps to take in planning the future.

Although we cannot assign specific benefits and costs at this time, we plan to address economic issues more fully as we develop the process of assessing indicators of sustainability and measuring benchmarks of progress. This plan includes identifying the public and private costs of data collection and analysis.

While some may find efforts to achieve sustainability unsatisfying or unfounded in the absence of full knowledge, we believe there is ample evidence that the attempt to make progress is preferable to complacency about the future of Maine’s forest resources.

Ensuring Sustainability

The complexity of the sustainability criteria, as well as the array of indicators, dictates that no simple action can be mandated as public policy. There are no silver bullet

¹⁸A fuller examination and discussion of these issues has begun in the state of Minnesota. The discussion in this section is based in part on a review of Vasievich, J. Michael and Chris Edgar. 1998. Economic Implications of Proposed Forest Management Guidelines for Minnesota: A Report to the Minnesota Forest Resources Council. MFRC Report #SE-0998. 28 September 1998.

¹⁹See, for example, Gadzik, C.J., J.H. Blanck and L.E. Caldwell. 1998. Timber Supply Outlook for Maine: 1995-2045. Maine Department of Conservation, August.

solutions. There is tremendous public policy value in setting sustainability standards and monitoring progress in meeting those standards. Landowners and managers have clear public expectations, state and federal agencies have clear priorities and goals. Independent certification programs will have more specific measures to meet state level concerns. Where problems are identified, all available tools, both public and private, must be considered to develop a corrective plan.

Outcome Based Forest Policy

During the recent Forest Practices Act rulemaking process, it became clear to both the Maine Forest Service and a number of stakeholders that we have reached the limits of what a command and control regulatory framework has to offer. Command and control regulation has many limitations and may result in unintended consequences, such as forest fragmentation and premature harvesting to recover equity in a forest investment. The Maine Forest Service believes that the state should begin to focus more on outcome-based forestry regulation, on the premise that this approach will do more to promote, stimulate and reward excellent forest management yet still provide a baseline of regulatory protection for critical public resources. These sustainability benchmarks, coupled with other initiatives including the annualized forest inventory, represent the initial steps of the transition toward outcome based forest policy.

Forest Policy Statement for Sustainability Benchmarks

These sustainability benchmarks recognize and support environmentally and economically sound forest practices and promote their application as a beneficial and desirable use of Maine’s forest resources. Further, management and harvesting of Maine’s forest resources makes vital contributions to the State’s economy, environment and quality of life. By proposing these sustainability benchmarks, the State of Maine sets clear public expectations for measurable outcomes from Maine’s private and public forest lands, with the goal of providing a more stable and predictable public policy that supports and encourages long-term investment in the Maine’s forests.



Criterion 2: Water Quality, Wetlands and Riparian Zones

The scope of these benchmarks is limited currently to water quality as influenced by forest management in and around wetlands and riparian zones, including issues of sedimentation, water temperature, and the biological integrity of water bodies. Issues related to wildlife and plant communities in the riparian zone and wetlands will be addressed by 2002 under the biological diversity criterion.

The Maine Forest Service also plans to subject these benchmarks to further technical review by scientists from state agencies, academia, industry, and stakeholder groups. Particular attention will be paid to the effects of forest management on three areas: wetland hydrology and biology; vernal pools; and impacts to and assessment of headwater perennial or intermittent streams. Therefore, these benchmarks may be altered or expanded as that work evolves and as further review may indicate. Actions proposed for the Maine Forest Service (BMP monitoring) and other partners (e.g.,

in-line stream monitoring), as well as ongoing monitoring and research by other agencies and organizations, are likely to provide additional information that could serve as the basis for further refinement.

It must be recognized in reviewing these indicators and benchmarks that forests in Maine are diverse in their composition, ownership, and their proximity to and inputs from adjacent land uses. Watersheds in different parts of the state may include forestry, as well as agricultural, residential, industrial, and other land uses. In addressing forest sustainability, impacts from forest management on water quality, wetlands, and riparian zones may or may not be readily separable from influences of other land uses, and comparisons among watersheds or water bodies may be difficult. Hence, additional analysis and technical review may be required to develop meaningful, measurable benchmarks for forestry activities from the five indicators.

Goal: Maintain or, where necessary, restore the chemical, physical and biological integrity of aquatic ecosystems in forested areas.

Indicator 2.1: Percent of water bodies in forest areas (e.g. stream kilometer, lake hectares) in which the aquatic life is **as naturally occurs** (see glossary term).

Process Benchmark 2.1.1: The Department of Environmental Protection should continue to develop and refine a statewide water quality monitoring system that can measure this indicator, and which relies on interagency partnerships to achieve by 2000.

Process Benchmark 2.1.2: The Maine Forest Service and the technical advisory group responsible for developing biodiversity benchmarks should review and if necessary modify this indicator for use in the biodiversity benchmarking process by 2002.

Process Benchmark 2.1.3: The agencies charged with developing such a statewide water quality monitoring system should identify the current conditions and trends in this indicator and recommend interim/provisional benchmark(s) by 2003, and final benchmarks defining desired future conditions by 2005.

Rationale: The resident biological community is a key indicator of the health of aquatic ecosystems. In particular, organisms living at the bottom of water bodies or in the water column are sensitive to a variety of changes in water and habitat qualities, including silt, oxygen levels, temperature, nutrients and hydrologic regime. Certain fish species can tolerate only a narrow range of temperatures at different times in their life cycles.



Indicator 2.2: Percent of harvested acres on which Best Management Practices for the protection of water quality are utilized effectively.

Benchmark 2.2: The percentage of harvested acres on which Best Management Practices for the protection of water quality are utilized effectively will increase from 47 percent in 1995 to 75 percent by 2005.²⁰

²⁰St. Peter, T. 1996. Memo to Forestry Advisory Team, 19 August 1996. 47 percent of BMPs rated at "C"

Rationale: This indicator serves as a proxy for assessing water quality in forested ecosystems, based on the assumption that forest management operations effectively utilizing Best Management Practices coupled with progressive management approaches can minimize the effects of forest management on water quality.²¹ This assumption will be revisited as more data become available from BMP utilization and water quality monitoring processes.

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**Indicator 2.3:** Percent of water bodies in forest areas (e.g. stream kilometers, lake hectares) with significant variation from the historic range of variability found in relatively undisturbed watersheds in pH, dissolved oxygen, levels of chemicals (electrical conductivity), sedimentation, nutrients or temperature change.

**Process Benchmark 2.3.1:** The Maine Forest Service, Department of Environmental Protection and other partners should identify by 2000 a means to establish a statewide water quality monitoring system that can measure these parameters and quantify this indicator.

**Process Benchmark 2.3.2:** The agencies charged with developing such a statewide water quality monitoring system should identify the current conditions and trends in the referenced water quality parameters and recommend interim/provisional benchmark(s) by 2003, and final benchmarks defining desired future conditions by 2005.

**Proxy Indicator 2.3.a:** Number of and stream miles affected by water quality law violations attributed to forest management operations.

**Proxy Benchmark 2.3.a.1:** The number of water quality law violations attributed to forest management operations will show a continuous decline, relative to enforcement effort, from the 1992-96 average of 50 per year.<sup>22</sup>

**Rationale:** Monitoring these water quality parameters over large areas of forest land can provide an initial indication of the impact of activities within or outside such areas on ecosystem health. It may indicate the extent to which forest management affects water quality; however, it is difficult to isolate the impacts of different land use activities when they occur within the same general area.

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Indicator 2.4: Percent of mapped, perennial first and larger order stream kilometers with acceptable levels of large woody debris and snags within riparian zones.

Process Benchmark 2.4.1: The Maine Forest Service and the technical advisory group charged with developing forest sustainability benchmarks for biological diversity should identify a range of acceptable levels of large woody debris and snags that should be retained within riparian zones by 2002.

or above. The method of aggregating a rating of effective utilization may change, so the current rating serves only as a rough indicator of the situation in 1995; however, the need for improvement was clearly demonstrated.

²¹Briggs, R.D., Kimball, A.J., and Cormier, J. 1996. op. cit.

²²Michael Mullen and William Galbraith, 1997, personal communications.

Process Benchmark 2.4.2: The Maine Forest Service should develop a methodology to measure this indicator using forest inventory data coupled with digital hydrological data by 2004.

Rationale: This indicator provides a measure of the extent to which riparian zones are managed to account for essential stream functions and processes, including the provision of nutrients and substrate for in-stream biological activity, control and routing of water and sediment, and habitat features.

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**Indicator 2.5:** Percent of stream kilometers in forested watersheds in which stream flow and timing has significantly deviated from the historic range of variability found in relatively undisturbed watersheds.

**Process Benchmark 2.5.1:** The agencies charged with developing a statewide water quality monitoring system should assemble existing data sets, identify the current conditions and trends in this indicator and recommend interim/provisional benchmark(s) by 2003, and final benchmarks defining desired future conditions by 2005.

**Proxy Indicator 2.5.a:** Percent of stream-flow gauging stations in forested watersheds in which a statistically determinable trend in stream flow and timing can be determined.

**Rationale:** This may indicate the extent to which water supply conditions are affected by forest management. Some historical data are available for larger, main stem rivers; however, data appears to be lacking for many lower order streams.

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**Criterion 3: Timber Supply and Quality**

A critical need in assessing timber supply is a source of forest information that is more timely and better focused on answering important forest policy questions than the historic USDA Forest Inventory program. In 1999 Maine is initiating a new annual forest inventory in partnership with the USDA Forest Service. This new inventory will provide detailed, timely data about Maine’s timber quantity and quality. Collecting data annually will allow for frequent periodic analysis that refine important trends in the forest. As demonstrated in the Timber Supply Outlook for Maine: 1995-2045, timber supply issues must be assessed over long periods of time. In addition, evolving forest practices take many years to implement and even longer to show measurable results in the forest.

Forest-based recreation and manufacturing generate about 18 percent of Maine’s annual gross product. An adequate supply of timber from Maine’s forests is essential to sustaining rural communities that depend on these economic outputs from the forest.

**Goal: To ensure that Maine’s future timber supply is of sufficient quantity and quality to support a diverse and economically healthy forest manufacturing sector.**

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**Indicator 3.1:** Ratio of projected growth and harvest, as determined by modeling current management practices and trends in forest development.

**Benchmark 3.1.1:** The ratio of projected growth and harvest for the statewide forest resource will show improvement from the current ratio of 86 percent<sup>23</sup> by 2005.

**Benchmark 3.1.2:** The ratio of projected growth and harvest for major geographic & ownership divisions will show improvement from current projected levels by 2005.

**Benchmark 3.1.3:** The ratio of projected growth and harvest for distinct categories of tree species and quality will show improvement from current projected levels by 2005.

**Process Benchmark 3.1.1:** The MFS will simulate future forest development using computer modeling and report 50-year projections of growth to harvest ratios every five years. It will base simulations on the latest forest assessment data, harvest activity levels, and projected market demand.

**Rationale:** Projecting future timber supply based solely on trends in total inventory ignores age class structure of the forest, and in the past has misled analyses and planning due to existing age class imbalances. Projecting the ratio of net growth to harvest over time is a more useful indicator of long-term sustainable harvest levels. Although short-term fluctuations may be sustainable or even desirable in addressing age class imbalances, statewide harvest exceeding growth for long periods is not sustainable, since it may seriously constrain future economic, ecologic, and forest management options.



**Indicator 3.2:** Acres by forest type and landowner category that are suitable and available for management and harvest.

**Benchmark 3.2.1:** The number of forest acres available for management and harvest will support projected harvest and growth.

**Process Benchmark 3.2.1:** MFS will document the number of acres by forest type and landowner category where forest management or timber harvesting are limited by regulation, easement or other restrictions.

**Rationale:** Changes in land use patterns or ownership patterns may erode the productive forest land base, fragment forest ecosystems, shift forest production away from processing facilities, and dislocate local economies.



**Indicator 3.3:** Amount of tree mortality occurring that could otherwise be used through the application of sound silvicultural forest practices.

**Benchmark 3.3.1:** Forest landowners and managers will implement practices to reduce measurable tree mortality by 20 percent by 2009.

**Benchmark 3.3.2:** State policy will encourage landowners to implement yield-increasing practices that adhere to sustainability principles and are consistent with landowner objectives. As a result, growth rates should increase 1 percent per year until potential sustainable harvest levels increase by 25 percent from those documented in Timber Supply Outlook for Maine: 1995-2045.

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<sup>23</sup>Gadzik, C.J., J.H. Blanck and L.E. Caldwell. 1998. op. cit. The analysis also supports other benchmarks for this criterion.

**Rationale:** “Capturing mortality” in forest stands is a function of utilization practices, markets, precommercial silvicultural investments (planting/thinning), timing of intermediate commercial harvests, availability and treatment of quality growing stock, rotation length, and other factors. Maximum sustainable harvest level is equivalent to net growth, which in turn can be increased by higher **accretion** (growth of merchantable trees), hastened **ingrowth** of saplings to merchantable size classes (through management of growing space), and decreased mortality/increased utilization, primarily of poorer quality or at-risk trees. Practices that favor these trends can substantially improve harvest yields from individual stands, as well as overall sustainable harvest. Some level of mortality in stands is desirable from an ecological standpoint in providing snags and coarse woody debris that represent important habitat and nutrient sources.

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Indicator 3.4: The ratio of sawlog and veneer volume to total volume for Sugar Maple, Yellow Birch, White Birch, White Pine, Red Oak, Red Maple, and Red Spruce.

Benchmark 3.4.1: Increase the quality of trees growing in the Maine forest. All harvest of commercial forest products should be guided by silvicultural principles that promote long-term productivity of the forest, and high quality growth. As a result, the ratios of sawtimber volume to total volume for important species will increase 10 percent by 2009.

Rationale: Landowners and Maine’s citizens reap substantial economic benefits from growing and harvesting high quality timber. Higher quality provides the potential for greater economic gains and increased flexibility for marketing forest products. As the real value of forest products increases, landowners have greater ability to achieve sustainability of forest values and manage their ownerships for the long term.



Criterion 6: Public Accountability of Forest Owners and Managers

Public concern over stewardship of Maine’s forests has driven the many forest policy debates. The frequent changes in forest ownerships that have characterized the past decade raise more questions of landowner commitment and follow-through. Increasing and often conflicting demands upon the forest’s resources, the complexity of forest ecosystems, and the public’s desire for well-managed forests all point to a need for competent, professional forest management at all levels, and for continuous improvement in knowledge and practice.

While regulatory programs can prevent specific abusive practices, the more desirable goal of achieving forest management excellence requires a different approach. The key to rebuilding public trust in forest management lies in establishing and maintaining a framework of publicly accessible and credible accountability measures by which forest landowners and managers can demonstrate their commitment to and achievement of an ecologically and economically healthy forest. Further, as our knowledge base increases, forest landowners and managers must demonstrate a commitment to continuous improvement through education and incorporation of research into practice.

Goal: To broaden the practice of sustainable forestry and build public confidence by establishing and maintaining reasonable accountability measures.

Indicator 6.1: Percentage and number of acres harvested where management planning, harvest layout, silvicultural prescription, and harvest operations are conducted under the direct supervision of a Licensed Professional Forester.

Benchmark 6.1.1: The percentage of acres harvested annually under the direct supervision of a Licensed Professional Forester will increase from 74 percent (372,579 acres) in 1997 to 85 percent (estimated 429,000 acres) by 2005.

Benchmark 6.1.2: The percentage and number of acres harvested annually on small ownerships (under 1,000 acres) under the direct supervision of a Licensed Professional Forester will increase from 38 percent (60,330 acres) in 1997 to 50 percent (estimated 80,000 acres) by 2005.

Rationale: Oversight of timber harvesting by a Licensed Professional Forester generally improves the implementation of a site-specific management and harvest plan, gives appropriate attention to Best Management Practices, ensures compliance with applicable laws and regulations, and results in effective execution of operations and closeout of the site, thereby protecting the landowner’s interests.

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**Indicator 6.2:** Number of acres (or number of landowners) under management certified by valid, independent, third party certifiers of sustainable forest management.

**Benchmark 6.2.1:** The number of acres (or number of landowners) under management certified by valid, independent, third party certifiers of sustainable forest management will increase significantly from the current level.

**Rationale:** Independent, third party certification systems provide a publicly credible means of assuring that forest management is conducted with consideration of and attention to sustaining all of the critical public values of forests as well as social and economic factors.

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Indicator 6.3: Percent and number of timber harvesters who have received training and certification from the Certified Logging Professional Program or an equivalent training system.

Benchmark 6.3.1: The percentage of timber harvesters who have received training and certification from the Certified Logging Professional Program or an equivalent training system will increase from an estimated 58 percent in 1997 to 90 percent by 2005.

Rationale: Certified Logging Professionals are trained to work safer, conduct business in an ethical manner, and pay attention to public values during harvest operations. Although not a guarantee, having a CLP logger conduct a harvest can lead to better results on the ground and ensure achievement of the landowner’s objectives.

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**Indicator 6.4:** Total acres of non industrial forest land with management plans meeting Maine Forest Stewardship Program guidelines.

**Benchmark 6.4.1:** The number of acres of non industrial forest land with management plans meeting Forest Stewardship Program guidelines will increase from a cumulative total of 1,777 parcels and 162,664 acres in 1997 to 4,000 parcels and 400,000 acres by 2005.

**Rationale:** Forest management plans are an important indicator that landowners have given thought to how they will attain their objectives, and that these forests will be managed for continued future benefits. Under the Forest Stewardship guidelines, Forest Management Plans must be prepared by a Licensed Professional Forester to a minimum standard, assess the ownership’s forest and wildlife resources, and give recommendations for management activities that will address the landowner’s objectives over the ten-year life of the plan. The Maine Forest Stewardship Program provides technical and financial assistance to small, non industrial landowners to plan and implement resource management plans on their woodlots. Cost-share practices include: soil and water conservation practices such as road-related BMP implementation; riparian and wetland protection practices; reforestation and tree planting; woodland thinning, pruning and weeding; fisheries and wildlife habitat improvement; forest recreation enhancement. In return, landowners agree to maintain the practices for at least ten years.



## GLOSSARY

**Accretion:** Growth, usual basal area or volume increment, of existing merchantable trees over a given period; a component of stand growth.

**Advanced regeneration:** Trees that have become established naturally under a mature forest canopy and are capable of becoming the next crop after the mature crop is removed.

**As naturally occurs:** Conditions with essentially the same physical, chemical and biological characteristics as found in situations with similar habitats free of measurable effects of human activity (38 MRSA § 466 subsec. 2).

**Benchmark:** Intermediate objectives for attaining goals.

**Biological control:** The use of natural means such as diseases, competitors, or predators to control unwanted pests.

**Biological diversity (biodiversity):** The variety and abundance of species, their genetic composition, and the communities, ecosystems, and landscapes in which they occur. It also refers to ecological structures, functions, and processes at all of these levels. Biological diversity occurs at spatial scales that range from local through regional to global.

**BMP (Best Management Practices):** Practices designed to be the most effective and practicable means to prevent or minimize environmental degradation, particularly nonpoint source water pollution.

**Clearcut:** A harvest in which all or almost all of the trees are removed in one cutting.

**Commercial thinning:** A silviculture treatment that “thins” out an overstocked stand by removing trees that are large enough to be sold as commercial products. It is carried out to improve the health and growth rate of the remaining crop trees.

**Criterion:** A category of conditions or processes by which sustainable forest management may be assessed. A criterion is characterized by a set of related benchmarks which are monitored periodically to assess change.

**Ecological integrity:** The completeness of the composition, structure, and processes that are characteristic of the native states of a system. Ecosystems with high ecological integrity continue to express the evolutionary and biogeographic processes that gave rise to the current biota, have a species composition, diversity, and functional organization expected from natural habitats of the region, and are resilient to environmental change and disturbance occurring within their natural range of variability.<sup>24</sup>

**Ecological reserve:** An area that is not managed for timber or other commercial products and where natural processes take place with little or no human manipulation.

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<sup>24</sup>Committee of Scientists. 1998. Sustaining the People's Lands: Recommendations for Stewardship of the National Forests and Grasslands into the Next Century. Draft report of the Committee of Scientists to the Secretary of Agriculture, 25 October 1998.

**Even-aged management:** Timber management actions that result in the creation of stands of trees in which the trees are essentially the same age. Regeneration in a particular stand is obtained during a short period at or near the time that a stand has reached the desired age or size for regeneration and is harvested. Cutting methods producing even aged stands include clearcutting, patch clearing, strip clearcutting, shelterwood, and seed tree.

**Farm and Open Space Tax Law:** Provides for the tax valuation of farm land based on the current use value as agricultural land. Provides for incremental reductions in valuation of Open Space land that restrict uses to conserve scenic resources, public recreation opportunities, promote game management, or preserve wildlife habitat. In both cases the municipal tax assessor determines the 100 percent valuation.

**Forest management:** Manipulation of the forest to achieve certain objectives, such as timber production, wildlife habitat enhancement, maintaining forest health, or conserving biodiversity.

**Forest Practices Act:** The Maine Forest Practices Act (FPA) was adopted in 1989 to: 1) ensure adequate regeneration of commercial tree species within five years of completion of any timber harvest, 2) regulate the size and impact of clearcut timber harvesting. The law defines a clearcut, and authorizes the Department of Conservation to develop rules to establish performance standards for clearcuts.

**Fragmentation:** The process, through cutting or natural processes, of reducing the size and connectivity of stands that compose a forest or landscape. Fragmentation has two negative components for biota: loss of total habitat area, and smaller, more isolated remaining habitat patches.

**Herbicide:** A pesticide used for killing or controlling the growth of plants.

**High-grading:** An exploitive logging practice that removes only the best, most accessible, and commercially valuable trees in the stand, often resulting in a poor-quality residual stand.

**High-yield forest practices:** The management of stands where spacing (stocking), density and species composition are controlled via significant investment in precommercial treatments such as planting or spacing, for the purpose of increasing timber yields to at least 0.8 cords/acre/year (mean annual increment).

**Ingrowth:** Volume (or basal area) of saplings reaching merchantable size over a given period; a component of stand growth.

**Growth:** A measure of the change in volume of a stand over time; generally, Gross Growth is a function of Accretion plus Ingrowth, while Net Growth equals Gross Growth minus Mortality.

**Limited Landowner Liability Law:** Protects landowners who provide public access to their land from liability for injury to any person using the land for recreational activities.

**Liquidation harvesting:** The purchase of timberland followed soon thereafter by the removal of most or all commercial value in standing timber, and subsequent attempted resale of harvested land.



**Maine Council on Sustainable Forest Management:** Was established by Executive Order of Governor Angus King in April 1995. The Council was charged with four tasks: 1) Define forest sustainability in practical terms feasible for implementation by all landowners; 2) Recommend criteria and goals to ensure a sustainably managed forest; 3) Recommend a methodology for the Department of Conservation to monitor landowner's progress toward achievement of forest sustainability goals; and 3) Review and assess Maine's forest practices rules and regulations for their adequacy in achieving sustainable forest management, and recommend changes where necessary. The Council issued its final report in July 1996, "Sustaining Maine's Forests: Criteria, Goals, and Benchmarks for Sustainable Forest Management".

**Natural regeneration:** The reestablishment of a plant or plant age class from natural seeding, sprouting, suckering, or layering.

**Nonpoint source (NPS) pollution:** Pollution that enters a water body from an ill-defined or diffuse origin within a watershed and does not result from discernible, confined or discrete sources.

**Overmature:** In even-aged management, those trees or stands past the mature stage.

**Partial cut:** A process whereby only part of a stand is removed during each harvest operation. Partial cutting is not considered a regeneration method.

**Pesticides:** Any substance or mixture of substances intended to prevent, destroy or repel any undesirable animal species, usually an insect. A pesticide may also be any substance or combination of substances intended for use as a plant regulator, defoliant, or desiccant.

**Planting:** A technique for the artificial reestablishment of trees on a harvested or non-forested site.

**Precommercial thinning:** Removing some of the trees from a stand that are too small to be sold for timber, to reduce stocking in order to concentrate growth on the remaining trees.

**Public trust resources:** Natural resources that remain in the public domain, even though they may occur on privately-owned lands. Examples include air, water, fish and wildlife.

**Regeneration:** Seedlings or saplings existing in a stand; or the act of establishing young trees naturally or artificially. Renewal of a forest by either natural or artificial means.

**Relatively undisturbed:** Forested sites with intact soil duff layers that have not experienced harvesting for at least 20 years.

**Riparian zone:** The land immediately adjacent to a perennial or intermittent body of water. Riparian zones can 1) store water and help reduce flooding; 2) stabilize stream banks and improve water quality by trapping sediment and nutrients; 3) shade streams and help maintain water temperature for fish habitats; 4) provide shelter and food for birds and other animals; 5) support productive forests which can be periodically harvested; and 6) can be used as recreational sites.

**Shelterwood:** A silvicultural system characterized the gradual removal of the residual stand in a series of partial cuts. The initial harvest removes most of the mature trees, leaving enough trees to serve as a seed source and to provide sufficient shade to produce a new crop.

**Silviculture:** The art and science of controlling the establishment, growth, composition, health, and quality of forests to meet the diverse needs and values of landowners and society on a sustainable basis.

**Spruce budworm:** An insect larva that feeds on and in buds and young shoots of spruces and fir trees. An important forest defoliator that can cause extensive damage.

**Stewardship:** The administration of land and associated resources in a manner that enables their passing on to future generations in a healthy condition.

**Sustainable forestry:** Forest management that enhances and maintains the biological productivity and diversity of Maine's forests, thereby assuring economic and social opportunities for this and future generations. It takes place in a large ecological and social context and achieves a balance between landowners' objectives and society's needs.

**Sustained yield:** A regular and continuing supply of timber (or other desired goods or services) to the full capacity of the forest and without impairing the capability of the land.

**Thinning:** A cutting made in an immature stand of trees to reduce stand density primarily to improve growth of the remaining trees, enhance forest health, or recover potential mortality.

**Tree Growth Tax Law:** Provides for the tax valuation of forest land on the basis of the land's productivity value, rather than on fair market value. The State tax assessor determines tree growth valuation for each forest type on a county basis. Municipalities apply their own tax rate to the tree growth valuation to determine taxes due on the land.

**Uneven-aged management:** Actions that maintain a forest or stand of trees composed of intermingling trees that differ markedly in age. Cutting methods that develop and maintain uneven-aged stands are single-tree selection and group selection.

**Uneven-aged stand:** A stand of trees that contains at least three well-defined age classes intermingled on the same area.