Legal, Institutional, and Economic Indicators of Forest Conservation and Sustainable Management: Review of Information Available for the United States

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Abstract

This review looks at the Nation's legal, institutional, and economic capacity to promote forest conservation and sustainable resource management. It focuses on 20 indicators of Criterion Seven of the so-called Montreal Process and involves an extensive search and synthesis of information from a variety of sources.
It identifies ways to fill information gaps and improve the usefulness of several indicators. It concludes that there is substantial information about the application of such capacities, although that application is widely dispersed among agencies and private interests; which in turn has led to differing interpretations of the indicators. Individual chapters identify a need to further develop the conceptual foundation on which many of the indicators are predicated. While many uncertainties in the type and accuracy of information are brought to light, the review clearly indicates that legal, institutional, and economic capacities to promote sustainability are large and widely available in both the public and private sectors.

Keywords: Criterion and indicators, economic capacity, institutional capacity, legal capacity, Montreal Process, sustainable management

Introduction

The United Nations 1992 Conference on Environment and Development directed worldwide attention to the importance of sustainably managing forests for the needs of present and future generations. The Conference's 144 participating nations acknowledged the importance of such management by adopting a nonbinding statement of forest management principles (Sitarz 1994). Canada, the United Nations, and the Conference on Security and Cooperation in Europe subsequently sponsored an International Seminar of Experts on Sustainable Development of Boreal and Temperate Forests (in Montreal, Canada, 1993). The seminar provided a forum for a discussion about measuring and tracking progress toward goals of forest sustainability, with special reference to temperate and boreal forests. The seminar in Montreal and subsequent related meetings (collectively termed the Montreal Process) provided the conceptual basis for regional and international initiatives to develop criteria and indicators for guiding and tracking ecological, social, and economic conditions involving forests. The Santiago Declaration (in 1995) established the criteria and indicators of forest sustainability recommended by the Montreal Process. The 12 nations (Argentina, Australia, Canada, Chile, China, Japan, Mexico, New Zealand, Republic of Korea, Russian Federation, United States, and Uruguay) whose representatives signed the Santiago Declaration participate in a policy-level working group and a technology advisory committee. These nations account for 60 percent of worldwide forest area and 35 percent of the world's population (Montreal Process Working Group 2003).

The United States participates actively in the Montreal Process, and has made a political commitment to use criteria and indicators to track progress in forest sustainability. In 1997, the United States issued the First Approximation Report for Sustainable Forest Management: Report of the United States on the Criteria and Indicators for the Sustainable Management of Temperate and Boreal Forests (U.S. Department of Agriculture, Forest Service 1997). The report set in place the foundation for future assessments of management and monitoring capabilities across the United States, a process that led to the National Report on Sustainable Forests—2003 (U.S. Department of Agriculture, Forest Service 2004). The USDA Forest Service had the lead role in developing the 2003 report, doing so in partnership with 11 other Federal agencies, a number of State agencies, and a variety of nongovernmental organizations, including the Roundtable on Sustainable Forestry (a partnership of public and private organizations and individuals promoting the national goal of sustainable forests through implementation of a set of criteria and indicators for sustainable forest management) (Roundtable on Sustainable Forestry 1998).

The framework for determining conditions of forest sustainability consists of 7 criteria collectively described by 67 indicators. *Criteria* of sustainability are goals or standards that describe broad public values regarding forests; they represent categories of conditions or processes that are considered essential to forest sustainability. *Indicators* are measurable conditions that can be used to determine the status of criteria. By quantitative or qualitative measurements, they describe specific circumstances attendant to criteria and can demonstrate trends when measured periodically (Montreal Process Working Group 2003, National Research Council 1999). The seven criteria (and number of related indicators) are as follows:

- Conservation of biological diversity (Criterion One—9 indicators)
- Maintenance of productive capacity of forest ecosystems (Criterion Two—5 indicators)
- Maintenance of forest ecosystem health and vitality (Criterion Three—3 indicators)
- Conservation and maintenance of soil and water resources (Criterion Four—8 indicators)
- Maintenance of forest contribution to global carbon cycles (Criterion Five—3 indicators)
- Maintenance and enhancement of long-term multiple socioeconomic benefits to meet the needs of society (Criterion Six—19 indicators)
- Legal, institutional, and economic framework for forest conservation and sustainability (Criterion Seven—20 indicators).

Review and Evaluation Process

Focus and Scope of Review

Criterion Seven, namely "legal, institutional and economic framework for forest conservation and sustainability," is the focus of this review. Interest in forest sustainability is made evident by legal, institutional, and economic frameworks that are adopted and implemented by nations. It is via such frameworks that nations (and the individuals that collectively compose them) express their interest in and expectations for the use, management, and protection of forests. While ecological and related biophysical conditions may receive much attention, it is the legal, institutional, and economic conditions established by nations that are the practical basis for identifying and addressing concerns about forest sustainability by means of appropriately designed and properly implemented policies and programs.

This review addresses 12 of the 20 indicators associated with Criterion Seven. Because the other eight indicators addressed capacity to conduct and apply research, they were not addressed by this review. Grouped within three major categories, the indicators of concern are as follows (Montreal Process Working Group 2003):

Legal framework—The body of laws and customary rules that direct actions of citizens. The extent to which the legal framework (laws, regulations, and guidelines) supports the conservation and sustainable management of forests, including the extent to which it:

- Clarifies property rights, provides for appropriate land tenure arrangements, recognizes customary and traditional rights of indigenous people, and provides means of resolving property disputes by due process (Indicator 48)
- Provides for periodic forest-related planning, assessment, and policy reviews that recognize the range of forest values, including coordination with relevant sectors (Indicator 49)
- Provides opportunities for public participation in public policy and decisionmaking related to forests and public access to information (Indicator 50)
- Encourages best-practice codes for forest management (Indicator 51)
- Provides for the management of forests to conserve special environmental, cultural, social, and scientific values (Indicator 52).

Institutional framework—The public and private organizations that are responsible for implementing policies and programs to promote sustainable forest management. The extent to which the institutional framework supports the conservation and sustainable management of forests, including the capacity to:

- Provide for public-involvement activities and public education, awareness, and extension programs, and make available forest-related information (Indicator 53)
- Undertake and implement periodic forest-related planning, assessment, and policy review, including cross-sectoral planning and coordination (Indicator 54)
- Develop and maintain human skills across relevant disciplines (Indicator 55)
- Develop and maintain efficient physical infrastructure to facilitate the supply of forest products and services and support forest management (Indicator 56)
- Enforce laws, regulations, and guidelines (Indicator 57).

Economic framework—The expression of private self-interest in forest sustainability via responses to market systems that are tempered by society-imposed rules and limitations. The extent to which the economic framework (economic policies and measures) supports the conservation and sustainable management of forests through:

- Investment and taxation policies and a regulatory environment that recognizes the long-term nature of investments and permits the flow of capital in and out of the forest sector in response to market signals, nonmarket economic valuations, and public policy decisions in order to meet long-term demands for forest products and services (Indicator 58)
- Nondiscriminatory trade policies for forest products (Indicator 59).

Procedure and Direction of Review

Presentation of information—The review of information available to describe conditions associated with each indicator is structured as follows:

Rationale and interpretation—The importance of the indicators and the type of information that potentially could be gathered to describe them is presented. Each indicator's rationale for importance was taken with little alteration from the reasoning suggested by the Montreal Process Technical Advisory Committee (Montreal Process Technical Advisory Committee 2000). For clarity, definitions of key words and phrases found in each indicator were developed.

Conceptual or theoretical background—The conceptual background and theoretical principles considered to be foundations or fundamental reasons for the substance of each indicator are briefly presented.

Current capacity and capability—The results of reviews of capacity-related information for each indicator are presented. In most cases, the information is structured in the following way: private sector capacity, Federal Government sector capacity, State government capacity, and local government capacity. The exception to this format is our discussion of Indicator 48 (property rights and land tenure). For each indicator, a summary of information about current capacity is presented.

Issues and trends—Expected changes in major conditions associated with each indicator are discussed. The issues and trends identified are the result of a review of a portion of the literature devoted to subjects involving the indicator.

Adequacy of information—Descriptions of major information deficiencies (both in quantity and in quality) involving each indicator are presented, as are recommendations for addressing such deficiencies. Although the presentations vary by indicator, information deficiencies are presented for the following subjects:

- Measurement information (what to measure and how to measure it)
- Extent of activity information (how much activity occurs)
- Responsible organization information (who is obligated to engage in the activity)
- Coordination information (extent of cooperation involving activities)
- Procedure information (what processes are followed)
- Investment and incentive information (what resources are devoted to the activity)
- Effectiveness information (consequences of undertaking the activity)
- Monitoring information (condition and trends of activity).

Appropriateness of indicator—Information is presented regarding the usefulness of each indicator as currently depicted and the extent to which each indicator complements (or competes with) other indicators. In most cases, suggestions are made for revising the language of an indicator or merging some indicators.

Capacity and capability focus—The review concentrates on the identification of information and information sources that are capable of depicting the current and future condition or status of each indicator. More particularly, the review focuses on information that describes the capability or potential of legal, institutional, and economic frameworks to promote desired conditions of forest sustainability; the consequences of exercising or implementing such capacity are of lesser concern here. For example, Indicator 49 suggests in part that there must be legal means of providing for periodic forest-related planning, which from a capacity perspective leads to information about the number, type, and currency of laws that require planning activities. Similarly, Indicator 57 suggests in part that there must be institutions to enforce laws, regulations, and guidelines, which from a capacity perspective suggests information about the organizations that are responsible for implementing enforcement activities (information about number of agencies, level of financing, magnitude of professional staffing). The information review sought to avoid focusing on information describing the results of legal, institutional, and economic capacities being exercised or implemented (for example, number of forest plans prepared, effectiveness of enforcement activities). Similarly, a concerted effort was made to avoid judgments about the negative or positive value of consequences resulting from implementing a given capacity.

Comprehensive forest-wide concern—The review attempts to identify measures of legal, institutional, and economic capacity that might be applied to forests in general, regardless of ownership or responsible party. Responsibility for forests rests with a very large number of complex organizations. At the Federal Government level, responsibility for forests is embodied in authorities with many departments, agencies, and bureaus, including the U.S. Department of Interior, Bureau of Land Management, U.S. Department of Interior, National Park Service, U.S. Department of Agriculture, Forest Service, and U.S. Environmental Protection Agency. Similarly numerous and varied are State government organizations engaged in decisions about the use, management, and protection of forests. Also, there exist a variety of private sector organizations that are responsible for forests, including land trusts, interest groups, industrial forestry enterprises, and millions of owners of nonindustrial private forestland. To fully identify the legal, institutional, and economic capacities associated with this myriad of public and private responsibilities is beyond the scope of this review, but we have tried to present an adequate review of these capacities. For each indicator, the results are presented in four major categories, namely private sector capacity, Federal Government capacity, State government capacity, and local government capacity.

Indicator descriptors—Indicators should be stated in language that is easy to understand and descriptive of the subject in question. They should be based on important principles or concepts, measurable, relevant to stakeholders, sensitive to change, and of an appropriate scale. Furthermore, the information used to describe their status should be sufficient in quantity and quality, capable of being aggregated and analyzed, and gathered in a cost-effective way (U.S. Department of Agriculture, Forest Service 2002; Garcia and others 1999; Williams and others 1998).

The indicators considered here are not all stated with adequate clarity. In most cases, we have suggested new language in the hope that this will increase the efficiency of future information-gathering efforts. The following revisions are suggested:

- *Provides for appropriate land tenure arrangements, and provides means of resolving property disputes by due process* (Indicator 48)
- *Provides for periodic planning, assessment, and policy reviews that embrace various forest values and fosters the coordination of forest plans and assessments with other sectors* (Indicator 49)
- *Provides opportunity for citizens to participate, in an informed manner, in decisions affecting forests* (Indicator 50)
- *Encourages the application of best forestry practices considered suitable for specific forest conditions* (Indicator 51)

- *Provides for conserving and managing special values afforded by forests, including amenity, commodity, ecological, and spiritual values* (Indicator 52)
- *Provides for educational activities focused on various segments of the citizenry and the general public* (Indicator 53)
- *Provides for periodic planning, assessment, and policy reviews that embrace various forest values and fosters the coordination of forest plans and assessments with other sectors* (Indicator 54; merge with Indicator 49)
- *Develop and maintain professional and related human skills across relevant disciplines and resource orientations* (Indicator 55)
- *Develop and maintain physical infrastructure necessary to manage and protect forests and to make available the range of goods and services that forests are capable of providing* (Indicator 56)
- *Enforce laws and regulations and ensure implementation of guidelines* (Indicator 57)
- *Provides for policies and programs that promote the long-term flow of capital into and out of public and private forest sectors in response to changes in market and nonmarket forces* (Indicator 58).

The usefulness of Criterion Seven indicators suggested by the Montreal Process could be enhanced even further if more substantial changes were made in their number, descriptions, and relationships. Suggestions for improvements can come from a number of sources, including publications in which various organizations address legal, institutional, and economic conditions relevant to forest sustainability (Canadian Council of Forest Ministers 1997; Eeronheimo 2001; Heinz Center for Science, Economics and the Environment 2002; International Tropical Timber Organization 1992; Ministerial Conference on the Protection of Forests in Europe 1994; Oakley 1997; U.S. Interagency Working Group on Sustainable Development Indicators 2001). We suggest that Indicator 58 (investment, tax, and regulatory environment) and Indicator 59 (forest products trade) be moved to Criterion Six. If this is done, Criterion Seven will focus only on *legal and institutional capacity* for forest sustainability. Criterion Seven will then include only the following:

"Specifically, is the current legal and institutional framework capable of providing for . . .

- Dependable land tenure and land ownership arrangements
- Comprehensive planning of forest uses, management, and protection
- Development and use of comprehensive forest management guidelines
- Coordination of policies and programs among and between public and private organizations
- Long-term monitoring and review of policies, programs, and forest resource conditions
- Processes for anticipating and dealing with conflict and dissension
- Sustained long-term investments in forests, commensurate with desired benefits
- Diverse kinds of public and private programs to exert influence over forests
- Opportunity for beginning and lifelong education of resource professionals
- Access to a wide range of information and information sources by students and citizens
- Research and development focused on critical issues involving forest use, management, and protection."

External review and comment—Our discussions of the indicators were reviewed as follows: First, each discussion was reviewed by three individuals (one indicator by two reviewers) who had the option of submitting their comments anonymously. The reviewers were selected on the basis of their previous experience with and understanding of the subjects addressed by an indicator. They were asked to focus their comments on gaps in information, accuracy of information, and fairness in presentation of information. Second, the draft reports for each indicator were reviewed at two national workshops (in Portland, OR and Washington, DC), where workshop participants were given an opportunity to discuss and subsequently suggest improvements in the report on each indicator (Roundtable on Sustainable Forestry 2002). Third, the draft documents were made available for comment by the general public via access to various Web sites used by the USDA Forest Service during the process of preparing the National Report on Sustainable Forests—2003 (U.S. Department of Agriculture, Forest Service 2004). All reviewer comments were evaluated and, as appropriate, incorporated in revised documents for each indicator.

Recommendations for future reviews—There is significant uncertainty about the amount, currency, and accuracy of information available for describing the capacities pertinent to 12 of the indicators within Criterion Seven. If legal, institutional, and economic frameworks relevant to forest sustainability and conservation are to be better understood and made useful for policy and management decisions, this uncertainty needs to be addressed. Therefore, recommendations are made for undertaking future examinations of the information available for describing capacities for each indicator, assigning such reviews to specific units in government or the private sector, and

providing the financial and professional resources necessary to carry out such reviews.

Difficulties Encountered by Review

The review of information reporting on legal, institutional, and economic capacities was at times hindered by the wide scope of the subject matter embraced by each indicator and the often huge gaps in information available to describe indicator capacity. The following are brief descriptions of difficulties that surfaced during the course of the review and evaluation.

Definition and specification—The language of the material reviewed was often ambiguous or problematic. This lack of clarity and specificity posed significant challenges to information-gathering efforts. An anonymous reviewer suggested that many of the indicators are ". . . examples of how easy it is for a committee to prepare huge lists of ambiguous material that no one can understand or measure." Although removing all ambiguity from an indicator is an unrealistic goal, the language of an indicator should convey a common understanding of the subject matter in question. Specific examples of definition problems encountered are:

Subcriteria definitions—Major criterion subcategories within Criterion Seven include references to legal and institutional conditions. The distinction between the two is murky, especially as "institutional" may well include legal considerations (an institution can be either an organization or an established law or custom). Indicators 49 (planning . . .) and 54 (planning . . .), and Indicators 51 (codes . . .) and 57 (guidelines . . .) were especially troublesome in this respect. Where the search for information about legal considerations ended and the search for information about institutional considerations began was not always apparent. Furthermore, the use of the phrase "legal framework" suggests that laws resulting from it are objectively interpreted and administered. The reality is that administrative discretion and political influences often affect administrative processes.

Indicator language—Words and phrases included in many indicators were often found to be ambiguous, ill-defined, and poorly constructed. Examples of this include "public participation" (Indicator 50), "best-practice codes" (Indicator 51), "conserve special values" (Indicator 52), "public education" (Indicator 53), "cross-sectoral planning" (Indicator 54), and "efficient physical infrastructure" (Indicator 56). Some would find the language used to describe individual indicators contradictory (for example, "management of forests" and "preserve special values" (Indicator 52). In other cases, confusion exists because certain phrases are not widely used (or accepted) in most forestry settings in the United States (for example, "best-practice codes").

Indicator substance—Phrases used to describe some indicators are presented as though their scientific and technical foundations are clear and fully agreed to. This is not always the case, and where it is not, this has implications for information gathering. For example, physical infrastructure (Indicator 56) is generally thought of as underlying large-scale capital assets (for example, roads, bridges, communications systems). However, some authorities suggest that forests (in a biological sense) should be regarded as the biophysical infrastructure required to support various values associated with forests (for example, wildlife, timber, water). If biota is considered part of infrastructure, the information gathering task becomes even more challenging.

Scope and extent—The review was also made difficult by the often extreme breadth or narrowness of the subject matter suggested by some indicators. This lack of consistency in scale (or breadth) often posed a challenge to determining when sufficient information had been accumulated and properly evaluated. Specific examples of scoping problems encountered are:

Organizational scope—Laws and organizations affecting forests are numerous and have great influence over the use, management, and protection of forests. Determining which legal and institutional frameworks are relevant to descriptions of capacity was difficult. For example, the USDA Forest Service has major forest resource responsibilities, the USDI Bureau of Land Management has less responsibility in this area, and the National Oceanic and Atmospheric Administration has still less. Should the influence of each of these organizations be discussed? Similarly, some laws focus directly on forests (for example, the National Forest Management Act of 1976) while others are less directly focused but nevertheless affect forests (for example, the Coastal Zone Management Act of 1972). The extent to which information-gathering activities were made to be "forest centric" determined much about the extent of the reach for information.

Forest benefit scope—The range of benefits (or values) provided by forests is extensive (for example, water, range, recreation, timber, aesthetics, wildlife). Words or phrases included in some indicators appeared to favor the seeking of information about certain forest benefits. For example, "encouraging best practice codes (BMPs)" (Indicator 51) and "enforce regulations and guidelines" (Indicator 57) traditionally have signified a major focus on water resources. Similarly, "conserving special values" (Indicator 52) appears to exclude consideration of commodity values associated with forests as special values. And "infrastructure capacity"

(Indicator 56) suggests a focus on the infrastructure required for wood-based products and their processing, leaving little room for consideration of infrastructure required to provide other forest values and related management activities (for example, water supplies, recreation activities, forest protection).

***Indicator scope*—**Nearly every indicator overlapped another indicator and often overlapped indicators in the other criteria, thus creating to a potential for duplication in gathering and evaluating information (see individual indicator write-ups for details). Such overlapping was especially obvious in the case of public involvement and public participation in Indicators 50 and 53, forest planning and assessment in Indicators 49 and 54, and investment and trade policies in Indicators 58 and 59.

***Indicator scale*—**Indicators at times differed widely in scale. This led to a narrow focus for information gathering in some cases and to very wide-ranging information gathering in others. For example, "maintain human resource skills across disciplines" (Indicator 55) is reasonably narrow, but "investment, tax, and regulatory environment" (Indicator 58) is extremely broad.

Rationale and interpretation—The rationales for the indicators were at times difficult to interpret and in some cases may not be supported by evidence or experience (the rationale for each indicator was taken with only minor modification from conclusions reached by the Technical Advisory Committee of the Montreal Process). Phrases such as "formal legal mechanisms are needed to conserve special forest values," "tax policies are critical to maintenance of forestland," "forests are managed more sustainably if citizens have opportunity to influence policies and programs," "forest practice codes are integral to forest sustainability," and "a well-informed public promotes civic participation in forest activities" create many uncertainties (Montreal Process Technical Advisory Committee 2000).

Information availability and quality—The availability and quality of information relevant to the indicators was in most cases very unpredictable. In some cases, an information base simply did not exist, while in other cases information was outdated, incomplete, or unreliable (information to describe trends was especially difficult to locate). When information was available, it was often difficult to aggregate across geographies, across agencies or organizations, across public and private sectors, or vertically from local to national levels. Specific suggestions for future investigations are presented for each indicator. This review also suggested that there is a need for further development of the conceptual bases on which many of the indicators are predicated.

Major Findings and Conclusions

The review of capacity information for the 12 indicators associated with Criterion Seven sought information from many sources. What are the major findings of the review? The following observations regarding current capacity to describe Criterion Seven indicators are suggested:

- Legal capacity for accomplishing forest sustainability is substantial, although often highly dispersed, is frequently in conflict (within and between governments), and is often subject to the widely differing interpretations of an appreciable number of Federal, State, and local units of government. The extent to which this potential capacity is actually exercised by implementing agencies is highly variable in intensity and consistency. The private sector is often responsible for responding to (implementing) publicly established legal capacity (for example, best-practice codes, conservation of special values).
- Institutional capacity for accomplishing forest sustainability is also substantial, although it is also highly dispersed, frequently in conflict (within and between governments), and often subject to widely differing interpretations by public and private organizations. The expression of this institutional capacity is often limited by constraints on access to financial and human resources. The private sector represents significant institutional capacity, especially in terms of public education and human resource skills.
- Economic capacity for forest sustainability is substantial, as are the fiscal and tax incentives that promote positive outcomes in market behavior. In recent years, economic incentive capacity has been broadened considerably, and is now often applied to both commodity and noncommodity goods and services provided by forests. The legal capacity to constrain private-sector responses to markets is substantial, especially with respect to the application of forest practices.

Is the Nation on a trajectory away from sustainability and, if so, does the cause of this flight rest with faults in our legal, institutional, and economic frameworks? The answer can only be a nebulous "yes," in some cases, and "no," in other cases. Interpretation of the overall legal, institutional, and economic capacity for forest sustainability at the national level is difficult. The information describing the indicators that are used to monitor Criterion Seven is sending very mixed messages. On the one hand is a clear indication that legal, institutional, and economic capacities to promote sustainability are large and widely available in both public and private sectors. Yet on the other hand the information regarding the actual application of these capacities in favor of sustainability interests is often quite mixed and frequently clouded by uncertainty.

Fortunately, capacity reviews focused on Criterion Seven are likely to continue in the future. With a significant investment in the gathering of additional information and the refining of existing information, these uncertainties could become of lesser concern. The Nation may then have a better basis from which to sense the direction its legal, institutional, and economic frameworks are tending, and the extent to which they facilitate or hinder forest sustainability and conservation.

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Information Review and Evaluation:

Legal Framework

Property Rights and Land Tenure (Indicator 48)

Calder M. Hibbard and Paul V. Ellefson[1]

The full text of Indicator 48 is as follows: *Extent to which the legal framework (laws, regulations, guidelines) supports the conservation and sustainable management of forests, including the extent to which it* ***clarifies property rights, provides for appropriate land tenure arrangements, recognizes customary and traditional rights of indigenous people, and provides means of resolving property disputes by due process*** (Montreal Process Working Group 2003).

Rationale and Interpretation

In many regions of the world, lack of clear and appropriate land tenure arrangements are the greatest cause of unsustainable forestry. Stable property rights and the assurance that these rights will be protected, or disputed through due process, are essential for sustainable forest management. It is suggested that those who depend on forests for daily subsistence and livelihood, or have a connection to forests over long periods of time, will take responsibility for better long-term care of the land if they can own the forest or can be assured of access to needed forest resources (Montreal Process Technical Advisory Committee 2000, Montreal Process Working Group 2003).

Useful information for measuring this indicator can be obtained by compiling laws and customs that address property rights, land tenure arrangements, and the rights of indigenous peoples. Also germane are summaries and assessments of laws and customs that provide access to processes considered necessary for the successful resolution of disputes over property. If they are prepared carefully, these compilations can allow for subsequent determination of how well various interpretations of property rights are being implemented and the extent to which they are successful in fostering long-term protection of ownership rights in forests and forestland. They can also facilitate the identification of deficiencies, duplications, and overlapping responsibilities, so that corrective action can be taken (Montreal Process Technical Advisory Committee 2000).

Indicator 48 suggests a number of concepts and principles that are to be identified and assessed. Definitions of these concepts are as follows: *property rights* are claims, titles, or interests in property that are enforceable by law, custom, or tradition; *land tenure arrangements* are instruments or relationships used by people, governments, or corporate bodies to establish control over, occupy, or use property; *customary and traditional rights* are claims, titles, or interests in property that are enforceable by custom, legend, inheritance, tradition, or folklore; and *due process means of resolving property dispute* are means of guaranteeing procedural fairness where actions of one party would deprive another of liberty or property (Gifis 1984).

Conceptual Background

Property is a social notion that expresses the political and economic order of society wherein governance systems legitimize, protect, and challenge the interests of one party over another (Hanna and others 1996). Property is generally viewed as a bundle of rights, rules, and responsibilities that expresses the relationships between rights holders, rights regarders, and rights protectors (Warren 1998). Rights consist of power, privilege, or demand inherent in one person and expressed over another. Any change in the structure of rights usually involves an increase in the rights of some and decreases in the rights of others. Current theories suggest that rights are exercised under at least three different property regimes: private property, common property, and public-State property (Warren 1997) (table 1). Over time, notions of property may move from one category to another, often as a reflection of society's changing values and the scarcity of certain types of property. Notions of property can change in response to many different conditions, including market behavior, social and political sentiments, scientific knowledge, and new technologies. Property rights are most accurately regarded as a social construct that survives only as long as society maintains the will and desire to enforce it (Marchak 1998).

Characteristics (or components) that are used to define and evaluate property rights include the concepts of completeness and exclusivity, transferability, and enforceability (Field 2001, Rideout and Hessein 1997). Completeness refers to the degree to which ownership rights may be attenuated, such as through mineral rights, water rights, and utility easements. Exclusivity complements the concept of completeness and refers to the degree to which all benefits and costs accrue to the owner. Exclusivity and completeness have little meaning if the resource is migratory, enforcement of property rights is too expensive to be practical, or the property is located in a jurisdiction without a fully developed legal system (Rideout and Hessein 1997).

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Table 1—Rights, responsibilities, and rules in three example property regimes

Characteristic	Property regime		
	Private property	Common property	Public-State property
Resource rights	Exclusion, disposal, use, enjoyment	Exclusion, disposal, use, enjoyment	Exclusion, disposal, use, enjoyment
Right holder(s)	Individual or corporation	Identifiable, interdependent group or community	State (government on behalf of citizens)
Responsibilities (liabilities) of right holder(s)	Refrain from socially unacceptable uses	*Group:* Refrain from socially unacceptable uses *Member:* Respect intra-group rules	Maintain social objectives; determine rules
Expectation of right regarder	Expect socially acceptable uses	Expect socially acceptable uses	Expect socially acceptable uses
Responsibilities (liabilities) of right regarder	Observe rules set by right holders; refrain from preventing use	Observe rules set by right holders; refrain from preventing use	Observe rules; refrain from preventing use
Rules and regulations	Determined by individual or corporation	Determined by identifiable interdependent groups or community	Determined by statutes, rules, common law
Enforcement and protection	State	*Intra-group:* group and State *External:* State	State

Note: Additional property regimes are "common pool resources" and "open access resources."
Source: Bromley (1991); Warren (1997).

Where property rights and property are transferable, this creates an incentive to maintain maximum market values.

An efficient and well-established property rights system provides security that rights will be recognized in the future by potential competitors for these rights and that the rules are well understood. In the United States, the concept of property rights is a storied and continually evolving set of ideas and constructs. Much of the present comprehension of property rights has its origin in English Common Law, emanating from the Magna Carta, but little of what is considered property rights is codified into law in the United States. Property rights in the United States are restricted by the police powers of the State and by each level of government's power of taxation, eminent domain, and escheat (Warren 1997). Property rights are constitutionally addressed under the Fifth Amendment of the Bill of Rights, which states that "No person shall be deprived of life, liberty, or property, without due process of law; nor shall private property be taken for public use, without just compensation." It is important to note that property rights are not given direct protection under this clause, but are afforded due process only when they are addressed.

Property rights in forests are expressed as relationships between individuals and groups with respect to forestland. In the context of the sustainability of forests, property rights include the ability to exclude or control access; enjoy or treasure; dispose of, alienate, or transfer; manage or manipulate; and use, withdraw, consume, or transform (Warren 1997). The existence of property rights can provide for or detract from sustainable forest resource use and management. Without some set of agreed-to and enforceable property rights forest owners may fail to invest in productive activities involving their forests. This lack of private investment may have deleterious effects on economic efficiency and sustainability (Zhang 1999). On the other hand, the state may wish to weaken the property rights of some in order to enhance benefits that it views as important to many or all citizens. This problem of proper benefit allocation inevitably leads to compensation and a degree of economic inefficiency (Zhang 1999).

Property rights notions are a construct of Western civilizations. In some instances, traditional and customary rights involving property are not necessarily codified in a Western sense but are respected and observed by the cultural group creating those rights. This is the case in Indian cultures in the United States. In such cultures, rights to resources are intricately tied to historic perspectives on resource use and to social mechanisms for dealing with competition for resources. Diversity of resource control systems is high and often correlated to a particular environmental setting and time (Frykenberg 1977, Vecsey and Venables 1980, Warren 1997). Compounding these perspectives on property rights and land tenure concepts is the reality that government can hold property in trust for certain groups of people. In 1990, nearly 16 million acres of forestland were held in trust for American Indians by the U.S. Government. The latter has a trust responsibility to protect, conserve, utilize, manage, and enhance Indian forestland and the economic and other benefits from Indian forestland, in perpetuity, including the provision of essential primary and secondary roads (U.S. Congress 1990).

Current Legal Capacity

Information clarifying property rights, land tenure arrangements, the rights of Indian peoples, and means of resolving property disputes is extensive and very rich. Unfortunately, the implications of this information for sustainable forestry have not been systematically and comprehensively assessed and analyzed. The most important information sources are found in judicial case law and its interpretation. Other sources include academic and popular presses (especially during periods of uncertainty regarding property rights), periodic surveys of forestland ownership (for example, Birch 1996), and legal case books and databases available from private sources. As interest in the development of new approaches to resolving conflicts over property and property rights has increased, reports describing such mechanisms as land trusts and conservation easements have become more common (Morrisette 2001).

Property Rights and Land Tenure

Federal legal clarifications—Property rights and land tenure arrangements have been dealt with and meaningfully clarified and shaped by Federal courts. The courts have dealt both with disputes between private parties and also with disputes between private and public entities. For example, the ability of States and local governments to zone land as an established aspect of police power has been upheld by the U.S. Supreme Court in *Reinman v. City of Little Rock 237 U.S. 177 (1915), Fischer v. St. Louis 194 U.S. 223 (1904),* and *Bacon v. Walker 204 U.S. 394 (1907).* These rulings were supported by and drawn from public nuisance law. In the last 100 years, the Supreme Court has addressed the Fifth Amendment and what constitutes a taking in a governmental regulatory context. This was first directly addressed in *Pennsylvania Coal v. Mahon 260 U.S. 393 (1922)* in which it is held that "while property may be regulated to a certain extent, if regulation goes too far it will be recognized as a taking." Since this ruling, Federal courts have considered the effects of a regulation on a property's value, usually requiring a complete loss of private value before the action in question is considered a taking (Wiebe and others 1996, 1998). These clarifications are ongoing and evolutionary, with the most recent refinement of partial regulatory takings in *Palazolo v. Rhode Island* set forth by the Supreme Court in June 2001. In this case, the Court ruled that the acquisition of land with notice of a prior regulation does not, in itself, bar the buyer from claiming that the regulation constitutes a taking. A study by the Congressional Research Service found that of 135 Federal takings cases tried between 1990 and 1994, only 21 were found to be takings (Meltz 1995).

Much of recent effort to clarify property rights and land tenure arrangements in the United States has been in response to Federal environmental legislation. A number of Federal laws relate to usufructory rights and restrictions on Federal lands (Appendix A). Especially significant examples from a property rights perspective are the Federal Water Pollution Control Act of 1972 (as amended) (especially section 404); the Clean Air Act of 1955 (as amended); the Resource Conservation and Recovery Act of 1976 (as amended); the Comprehensive Environmental Response, Compensation, and Liability Act ("Superfund") of 1980 (as amended); the National Environmental Policy Act of 1969; and the often-cited Endangered Species Act of 1973. Although the last 10 years have seen a number of congressional proposals to protect private property rights and to clarify land tenure arrangements, none of these has been enacted into law.

State legal clarifications—Although the Federal Government has engaged importantly in clarifying matters of property rights, property law and its interpretation has been primarily a State responsibility. State governments have proceeded to establish various laws, rules, and administrative procedures that clarify property rights and land tenure arrangements involving forests, most of which have been in response to perceptions of local infringement on the rights of private property owners (Cheng and Ellefson 1993, Malmsheimer and Floyd 1998). One of the earliest judicial rulings on the matter (1947) involved Washington's forest practice regulatory law, in which the State's right to regulate privately prescribed practices was affirmed by the U.S. Supreme Court (32 Wash. 2d 551, 202 P.2d 906, 70 S. Cr. 147 [1947]) (Ellefson 2000). Property-rights protecting initiatives important to sustainable forestry take many

forms, including nuisance classification laws, right to practice forestry laws, and laws restricting ordinances. In 1996, 31 States had statutory provisions that to some extent protected landowners against possible court findings that their forestry activities constituted nuisances under State law (table 2) (Malmsheimer and Floyd 1998). Ten States had right-to-farm laws that did not specifically apply to forestry, but had other statutes in which forestry activities were categorized with agricultural activities. Eight States had right-to-farm laws, but did not categorize forestry activities as agricultural activities in other statutes.

States have also addressed concerns that local governments may establish ordinances that classify forestry activities as nuisances (table 2). Ten States have State laws (for example, forest practice laws) that prohibit such ordinances; five have laws that prohibit local zoning ordinances that limit forestry activities; and four States have statutory provisions to link local ordinances with broader State forest practice regulatory laws. These laws generally provide a defense of forestry activities, often by banning or partially banning local ordinances that limit forestry practices on private land (Ellefson and others 1995). These laws also restrict classification as nuisances to such things as conducting forestry activities in a negligent manner or causing flooding or pollution. Most State laws restricting local ordinances focused on forestry activities have been enacted since 1989. Three were enacted in the 1970s, 18 in the 1980s, and 10 in the 1990s through 1996 (Malmsheimer and Floyd 1998).

Protecting private property from takings has also been a focus of State laws. In 1996, 18 States had passed such laws (table 3) (Zhang 1996). They were chiefly of two types: assessment laws, which are procedural and require that agencies follow certain review processes and guidelines so that unnecessary takings are avoided; and compensation laws, which are more substantive and provide for the recovery of financial losses resulting from partial takings of private property. In Mississippi, for example, compensation of private forest landowners is required if State regulations reduce the value of the landowner's property by 40 percent or more. All of these State laws have been enacted in the 1990s and generally mimic laws that have been proposed to the U.S. Congress.

Due Process and Dispute Resolution

The concept of due process, like the concept of property rights, has evolved over the years, changing mostly through interpretation by Federal courts. Due process is a historical product tracing back to Britain. The first mention of it was in a statutory rendition of one of the chapters of the Magna Carta in 1354. Federal courts have seen fit to clarify the meaning of due process as it relates to property and land tenure arrangements. The focus has been on interpretation of the Fifth Amendment (previously quoted) and the Fourteenth Amendment "…nor shall any State deprive any person of life, liberty, or property, without due process of law." The Fifth Amendment applied only to the Federal Government until the Fourteenth Amendment was ratified. Importantly, the fact that property rights are protected by due process is of little value unless there is knowledge of what due process entails.

Federal courts have clarified that due process is more than a mandated procedure determined by the legislative branch. Due process " . . . is a restraint on the legislative as well as on the executive and judicial powers of the government, and cannot be construed as to leave congress free to make any process 'due process of law' by its mere will," *Murray's Lessee v. Hoboken Land and Improvement Co. 59 U.S. 272 (1856).* This ruling is supported in other cases including *Trustees of Dartmouth College v. Woodward 17 U.S. 518-82 (1819)* and *Jones v. Robbins 74 Mass. (8 Gray) 329 (1857).* In working with administrative agencies, the court has ruled that the demands of due process do not require a hearing at any particular point in the proceeding, so long as a hearing is held prior to an order becoming effective, *Opp Cotton Mills v. Administrator 312 U.S. 126. 152. 153 (1941).* The court has held that when the Constitution does require a hearing, it must be a fair hearing, held before a tribunal that meets currently prevailing standards of impartiality, *Wong Yang Sung v. McGrath 339 U.S. 33,50 (1950)* and *Arnett v. Kennedy 416 U.S. 134, 170 (1974).* The court has also held that a party must be given an opportunity to present evidence and to know the claims of the opposing party and to meet them, *Margan v. United States 304 U.S. 1, 18-19 (1938), Gonzales v. United States 348 U.S. 407 (1955), United States v. Nugent 346 U.S. 1 (1956),* and *Gonzales v. United States 364 U.S. 59 (1960*).

Federal courts have spoken frequently on how the Fifth and Fourteenth Amendments to the U.S. Constitution are to be implemented. Their rulings set forth certain fundamental principles such as advance notice of alleged claims, hearings prior to decisions, hearing procedures, adequate representation, and the nature of evidence submitted at hearings. These prescriptions, and many more, are the foundations that enable society to meet the intent and spirit of constitutional provisions involving due process. In recent years, however, a number of additional approaches involving conflict management have evolved and have been suggested to be of value for addressing conflict over property. They include various forms of consensus-driven processes (negotiation, facilitation, mediation) as well as many varieties of adversarial drive processes (arbitration, administrative hearings, judicial proceedings). Although judicial proceedings involving formal procedures of due process have been given considerable notoriety in recent

Table 2—State statutory provisions protecting forest practices from identification as nuisances and restricting local government regulation of forest practices, by State (1996)

Region and State	Statutory provisions protecting forest practices from being considered nuisances			Statutory provisions restricting local government ordinances regulating forest practices		
	Statutory provision exists	Potential statutory provision	Statutory provision does not exist	Statutory provision exists: no ordinances	Statutory provision exists: no zoning ordinances	Statutory provision exists: ordinances linked to forest practice law
North						
Connecticut	X					X
Delaware	X					
Illinois		X				
Indiana	X			X		
Iowa	X					
Maine			X			X
Maryland			X		X	
Massachusetts	X					
Michigan	X					
Minnesota		X		X		
Missouri			X		X	
New Hampshire	X				X	
New Jersey	X					
New York			X			
Ohio	X				X	
Pennsylvania	X				X	
Rhode Island	X					
Vermont		X				
West Virginia	X					
Wisconsin	X					
South						
Alabama		X				
Arkansas		X				
Florida			X			
Georgia	X					
Kentucky	X			X		
Louisiana	X			X		
Mississippi	X			X		
North Carolina	X					
Oklahoma			X			
South Carolina	X					
Tennessee	X			X		
Texas		X				
Virginia	X					
West						
Alaska	X					
Arizona	X					
California	X					X
Colorado	X					
Hawaii		X		X		
Idaho	X					X
Kansas			X			
Montana		X		X		
Nebraska			X			
Nevada						
New Mexico		X				
North Dakota	X					
Oregon	X			X		
South Dakota	X					
Utah	X					
Washington	X			X		
Wyoming		X				

Note: Nevada has not enacted a right-to-practice-forestry law that provides protection against nuisance lawsuits.
Source: Malmsheimer and Floyd (1998).

Table 3—State statutory provisions addressing the taking of private property, by State (1996)

State	Statute requiring assessment prior to regulatory implementation	Statute requiring compensation of landowner for regulatory taking	Statute requiring combination of assessment and compensation
Arizona	X		
Delaware	X		
Florida		X	
Idaho	X		
Indiana	X		
Kansas	X		
Louisiana			X
Mississippi		X	
Missouri	X		
Montana	X		
North Dakota			X
Tennessee	X		
Texas			X
Utah	X		
Virginia	X		
Washington	X		
West Virginia	X		
Wyoming	X		

Source: Zhang (1996).

years, other less formal and more collaborative approaches to conflict over property rights have also become available. Unfortunately, a comprehensive review of their application to property rights issues has not been carried out (Moulton 1995).

Rights of Indian Peoples

Indian peoples in the United States have experienced a much different evolution of property rights and land tenure arrangements. Very few Indian tribes ever conceived of the idea of land ownership, and even those few who did thought of it in a much different way than the first arriving Europeans. In 1790, Congress adopted one of the first laws affecting property rights of Indian peoples: the first Nonintercourse Act, which reserved the right to acquire Indian lands to the United States to the exclusion of individuals and States. Some tribes have brought suit for recovery of lands acquired in violation of the 1790 statute, such as *South Carolina v. Catawba Indian Tribe Inc. 476 U.S. 498 (1986).*

United States courts first examined the issue of Indian land ownership and title to lands in *Johnson v. M'Intosh 21 U.S. 543 (1823)*, stating that tribes held their lands by "Indian title" and that tribes had the right to occupy the land and retain possession of it (Nash 1999). A significant statute in the evolution of Indian property rights is the General Allotment Act of 1887. This law legitimized the notion that Indians would assimilate European cultural attitudes more quickly if they were owners of parcels of land and were encouraged to engage in agricultural activities. Each individual was to be given 80 acres of agricultural land or 160 acres of grazing land. The law had limited success, resulting in a large loss of tribal lands. It was subsequently addressed by the Indian Reorganization Act of 1934, which prohibited any further appropriation of land and restored any surplus lands to tribal ownership.

In 1946, the Indian Claims Commission was established to hear claims which had been barred by a 1863 statute that prohibited Indian tribes from making claims against the United States. The Commission was allowed to hear five types of claims including "claims arising from the taking by the United States, whether as a result of a treaty of cession or otherwise, of lands owned or occupied by the claimant without payment for such lands or compensation agreed to by the claimant" 60 Stat. 1049, 25 U.S.C. 70a (Nash 1999). Recently, there has been an increasing level of autonomy in decisionmaking on tribal lands regarding forestland, beginning in earnest with the Alaska Native Claims Settlement Act in 1971. This law was followed by

the Indian Self-Determination and Educational Assistance Act of 1975, which decreased the role of the Division of Forestry within the Bureau of Indian Affairs in forest-related decisionmaking on tribal lands. The 1983 Indian Land Consolidation Act attempted to reduce fractionalization of Indian lands. Finally, the National Indian Forest Resources Management Act of 1990 strengthened the position that Indian forestlands are to be treated as private lands, and not as lands in the public domain (Warren 1998).

Federal statutes and case law affecting land tenure and forest resources on Indian lands are summarized in table 4.

Summary of Conditions

Property rights, land tenure arrangements, and the rights of Indian people have evolved through processes involving law making, traditions, and the operation of private markets. These institutions, and the concepts and principles on

Table 4. Federal statutes and case law affecting land tenure and forest resources on Indian lands

Year	Case or statute
1874	United States v. Cook, 19. S. (Wall) 591 (Declares that Indians possess the right to occupy land in question but do not have title to it and can cut timber for clearance only)
1877	Indian General Allotments Act 25 U.S.C. 331 (Authorizes allotment of reserved lands to individual Indians in tracts of 40, 80, or 160 acres)
1889	Dead and Down Timber Act of Feb. 16, 1889, 25 Stat. 673, 25 U.S.C. 196 (Authorizes sale of dead timber on Indian allotments and reservations for the benefit of Indians residing on reservations)
1910	Indian Allotments Act of June 26, 1910, Stat. 857, 25 U.S.C. 406, 407 (Authorizes Bureau of Indian Affairs to sell timber on allotted and unallotted lands)
1934	Indian Reorganization Act, Act of June 18, 1934, ch 576, 48 Stat. 984, 25 U.S.C. 466 (Authorizes Bureau of Indian Affairs to establish rules and regulations to accomplish sustained yield management of Indian forests)
1971	Alaska Native Claims Settlement Act, 85 Stat. 688 (Revokes reservations and Indian allotment authority in Alaska)
1975	Indian Self-Determination and Education Assistance Act 88 Stat. 2203-2217 (Authorizes Indian citizens' rights to control their direction and the way for doing so)
1980	United States v. Mitchell, 445 U.S. 535 (1887 Act did not establish Federal fiduciary responsibility for management of Indian-allotted forestlands, but 1910 Act had recognized a Federal trust responsibility for the management of Indian forest resources)
1983	Indian Land Consolidation Act, 25 U.S.C. 2201 et seq. (Authorizes reduction in extensive fractionation of individual Indian ownerships)
1990	National Indian Forest Resources Management Act, 104 Stat. 4532 (Authorizes promotion of cooperative Federal and tribal management and protection of Indian forest resources)

Source: Warren (1998).

which they are based, often predate the establishment of the United States. These property rights and tenure arrangements reflect a society's particular set of fundamental values and beliefs; they are evolutionary in the sense that they change as society's values change; are determined by due process of law; are essential to and must be stable for sustainable forest management; and are important to Indian people, who often have significant links with forests.

In light of the background and current conditions discussed above, the following observations seem relevant to the capacity to identify and measure activities involving property rights and associated subjects:

- Property rights and land tenure arrangements are extremely diverse, have evolved through time, and are continuously being defined, interpreted, and revised by all levels of government. Responsibility for private actions involving property is increasingly being associated with issues involving claims of rights to property.
- Property rights and land tenure arrangements have been defined and interpreted mostly in State and Federal case law. In the last decade, especially important case law regarding property rights and compensation has been established by Federal courts.
- Property rights and land tenure arrangements of Indian peoples have largely been the responsibility of the Federal Government. In recent years, Federal attention has focused on the forest resources associated with Indian peoples and the often special importance of forests to Indian culture and way of life.
- Processes for resolving disputes over property rights and land tenure are evolving, although the Constitution (Fourteenth Amendment) provides the foundation for citizen protection against State deprivation of life, liberty, and property. Institutional structures for addressing disputes are many (legislatures, courts, executive agencies), as are approaches for settling disputes (negotiation, arbitration, collaboration, citizen initiative).

Issues and Trends

The literature identifies a number of major issues and trends involving the legal setting for property rights and land tenure arrangements. Examples of this literature (from which the following issues and trends are drawn) are: Binkley and others 1996, Bromley 1991, Ellefson and others 1995, Flick 1994, Goldstein and Watson 1997, Lund 1995, Morales 1991, Moulton 1995, U.S. Congress 1990, Warren 1997 and 1998, Zhang 1996.

- Property rights and land tenure arrangements are increasingly frequent and contentious political topics (more than 100 bills addressing property rights were introduced during the 104th Congress) (Goldstein and Watson, 1997). The reduced space available to the citizenry has fostered interest in protecting rights thought to accompany ownership of property. Also, increases in Federal environmental law since the late 1960s provide an incentive for clarification of activities involving property rights and land tenure.
- Advocacy groups with interests in property issues are increasing, currently numbering more than five hundred with membership in the millions (Lund 1995). Although debates between these groups are often acrimonious and sometimes violent, the discussions that do occur are likely to result in better understanding of and tolerance for a wider variety of property regimes.
- Property rights concepts important to sustainable forestry are often unclear. In the future, however, they may become more stable and consistent as a result of the increased attention devoted to them (statutes, case law, public discussion). Conversely, continuing controversy may foster a climate in which there is growing uncertainty over restrictions on certain forestry activities, increased transaction costs, greater risk of civil and criminal penalties, and confusion resulting from overlapping government jurisdictions.
- State governments are likely to give increasing attention to property rights and land tenure conditions considered important to sustainable forestry. It is likely that new State laws will identify a right to practice forestry, prohibit local ordinances limiting the practice of forestry, and prevent legal rulings that identify forestry practices as nuisances.
- Special property arrangements that support the long-term sustainability of natural resources are increasing in number and acceptability. These arrangements include conservation easements, private and public land trusts, comanagement of private lands, marketing of rights associated with property (development rights), and debt-for-nature swaps.
- Voluntary actions by landowners and incentives provided by government and certain private interests are likely to increase and have further impact on land tenure and on perceptions of rights in forest property. Voluntary adoption of forestry best management practices and provision of fiscal and tax incentives to deter ownership fragmentation are examples.
- Increasingly, laws and regulations that address forestry practices on private lands are being designed to be more sensitive to private interests in private property. It is also increasingly suggested that regulations be consistent with the strong history of public policy in favor of environmental protection or land use control; be rationally based, reasonably constructed, and developed through due process; be convincingly determined to be directly beneficial

to public health and general welfare; and result in benefits that are widely distributed throughout various segments of the public.

- Indian peoples are increasingly seeking and being granted autonomy of decisionmaking with respect to forest resources on Indian lands. This is occurring in the context of the expansion of legal authority of Indian people to determine their own destiny and in the way Indian organizations address issues involving forest resources under their control.

Information Adequacy

Specification

The variables or combinations of variables that can be used to describe property rights, land tenure arrangements, and ways of resolving disputes over such arrangements are many. Definition and scope issues abound. For example, should public lands be part of land tenure discussions? Is the legal framework of concern more than just formal laws, regulations, and guidelines? Should property rights assessments include case law, administrative law, and formal agreements involving property? And how are noncodified customs and traditions to be addressed in reviews of land tenure and property rights?

State forestry agency activities involving gathering and analysis of information regarding property rights, land tenure, and rights of Indian peoples are very limited. In 1999, lead forestry agencies in only seven States (Delaware, Georgia, Hawaii, Louisiana, New Jersey, New York, Texas) specifically stated that they gather and analyze information about these conditions. Of those States, two indicated that the information was abundant; three indicated that it was sufficient; and two indicated that they had access to some, but very little, information of this sort. Four States indicated that the quality of information was adequate; only one (Louisiana) stated that it was excellent (National Association of State Foresters 1999).

Information regarding property rights and land tenure arrangements as they relate to sustainable forestry in the United States is critical to building better understanding of how property ownership influences forest sustainability. Unfortunately, our understanding of these rights and arrangements in the context of forests and forestry is often unclear, primarily because comprehensive information about them has not been gathered or subjected to any methodical analysis. Consider the following concerns over information adequacy:

- *Measures of rights and tenure*—Variables that might be used to measure property rights and land tenure arrangements have not been adequately identified. Are current measures of property rights and land tenure appropriate? What is their origin and how have they changed over the years? What alternatives might provide a more effective representation of property rights and tenure conditions?
- *Documentation of types of property rights and tenure arrangements*—Except in isolated circumstances, information about the types of, frequency of, and trends in land tenure arrangements has not been assembled in any systematic fashion. What are the specific statutory expressions of property rights within all property regimes (Federal, State, local, treaties, land grants)? How consistent are these laws and regulations in their treatment of property rights as these rights relate to sustainable forestry? What major trends are occurring in formal expressions (statutes, rules, treaties, administrative agreements) of concepts of property and land tenure? What is the nature of nonstatutory and nonjudicial expressions of property rights and land tenure (customs and traditions)? How common and how effective are institutions that provide for partial claims to property (easements, trusts)?
- *Societal dispute of claims*—Information about the number and types of claims on property rights involving forests has not been gathered or systematically reviewed for patterns of importance. How many and how intense are the disputes? What is the rationale for the disputes? Is there evidence of stability in certain property rights claims? What disputes require the attention of current legal systems and which disputes cannot be resolved by current systems? How great is the tension between the public good and private claims to property? What is the appropriate balance between the sovereign State and private individuals on matters involving land tenure?
- *Security of rights and tenure conditions*—Information about the extent to which current legal and institutional frameworks provide stability and guarantees of forest property rights has not been gathered and analyzed. How common and how significant are conflicting or overlapping claims on land and resources? How are rights to surface and subsurface resources in forest settings being addressed? To what extent do the claims of Indian peoples to forests cloud private property rights? Are private inholdings within public lands to be considered secure? Do laws providing rights to practice forestry also extend long-term security to forestry investments?
- *Recognition of rights of Indian peoples*—Except in isolated individual cases, information about the type, extent, and status of claims of Indian peoples to forest resources has not been adequately documented and analyzed. To what extent does the legal framework acknowledge and protect property rights claims of Indian peoples and historic land and resource claims? Are the customary

and traditional claims of Indian peoples capable of being codified so that they can be recognized and protected within existing legal processes? Is there sufficient flexibility within existing legal systems to allow rights claims based on nontraditional evidence to be recognized and protected (for example, a religious need to leave no trace of property use)? How are subsistence claims that are based upon historic use to be documented, and can they be resolved through existing legal processes?

- *Resolving disputes by due process*—Information about processes for resolving disputes that involve property rights and land tenure arrangements has not been compiled comprehensively. What types of processes are being used and how effective are they in addressing property rights concerns? Do all current legal frameworks include the elements of due process (notice, opportunity for comment, appeal)? Do procedures (for example, giving notice) adequately involve those who are indirectly as well as directly affected by a claimant's dispute? Are there adequate legal mechanisms for resolving property rights conflicts between Indian people, historic land claims, and other claims to the use and ownership of lands and resources?
- *Stabilizing influences on rights and tenure*—Information about conditions that foster stability and certainty in property rights and land tenure conditions has not been gathered and assessed in any meaningful way. What broad social, political, and economic conditions (interest rates, taxation, technology) favor or detract from certainty respecting property rights and tenure arrangements? What government approaches (fiscal and tax incentives, well-designed regulatory initiatives, right-to-practice-forestry statutes) are most appropriate for securing stability in conditions of property rights? Can those claiming private property rights in forests actually facilitate stability in rights to claimed property (for example, through voluntary acceptance of best forest management practices)? How are tenure arrangements to be established so as to secure the degree of certainty required for long-term investment in forests?
- *Land ownership stability*—Except in a limited number of cases, changes in land ownership patterns, as influenced by property rights and land tenure conditions, have not been assessed systematically. What are current and prospective rates of change in forestland ownership? To what extent is fragmentation or consolidation of ownership affected by property right and land tenure considerations?

Recommendations

The capacity to influence forest sustainability will depend very largely on the existence and functionality of processes and institutions that are available to protect and ensure stability in property rights. Where the latter are in dispute, there must be effective and easily accessible due process that guides disputing parties toward a solution of the issues in contention. In the context of Indicator 48, a number of information voids must be addressed. The following actions seem appropriate:

- *Comprehensive review of legal capacity*—Conduct a comprehensive review of current property rights and land tenure arrangements with a focus on determining whether existing authorities, directions, and policies actually clarify property rights and provide for appropriate land tenure arrangements involving forest resources (examples of information sources are Westlaw and Lexis-Nexis databases, Federal and State appellate court opinions, and statutes of Federal, State, and local governments). This review should also assess the effectiveness of current mechanisms and procedures used to resolve property disputes. Care should be taken to adequately review the ability to clarify the status of customary and traditional rights to forest properties sought by Indian peoples.
- *Responsibility for conducting review*—Assign responsibility for conducting the review of property rights and land tenure arrangements to a specific new or existing research or administrative unit of a Federal agency, a college or university, or a nonprofit organization actively engaged in such work. This responsibility should be assigned to an organization that has a proven track record of understanding property rights issues and a history of proposing workable land tenure arrangements as solutions to disputes over property.
- *Resources devoted to review*—Invest sufficient resources in the review so that the review can provide the type and quantity of information necessary to dramatically improve understanding of current customs, authorities, and procedures for clarifying property rights and land tenure arrangements.

Indicator Appropriateness

Indicator Definition

Indicator 48 contains many words and phrases that are unclear in definition and intent—for example "clarifies," "property rights," "land tenure arrangements," "customary and traditional rights," "indigenous people," and "means of resolving disputes." Each of these words or phrases supposedly embodies an agreed-to set of fundamental concepts and principles, but such is not always the case. Further compounding the specification problem is that new words or phrases are continually being suggested, often without reference to well-established or newly developed principles or concepts. The indicator would benefit from

rewording such as "*provides for appropriate land tenure arrangements, and provides means of resolving property disputes by due process.*"

Relationship to Other Indicators

Relationships between Indicator 48 and other indicators are often unclear, especially where these indicators relate to concepts involving laws and values, public participation, funding, and planning. Specifically, Indicator 48 stands in an unclear relationship to Indicators 38 (investment in forests), 39 (investment in research), 49 (planning and assessment), 50 (public participation), 52 (special values), 53 (public involvement and education), 54 (planning and coordination), 57 (enforce laws and codes), 61 (forest inventories), 64 (value integrative methods), and 66 (human intervention impacts).

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Appendix

Federal Statutes with Implications for Usufructuary Rights and Restrictions on Federal Land

Federal statute
Administrative Procedure Act of 1948
Alaska National Interest Lands Conservation Act of 1980
Alaska Native Claims Settlement Act of 1971
Antiquities Act of 1906
Bald Eagle Act of 1940 (as amended)
Clean Air Act of 1955 (as amended)
Coastal Zone Management Act of 1972 (as amended)
Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (as amended)
Eastern Wilderness Act of 1975
Endangered Species Act of 1973 (as amended)
Federal Coal Leasing Amendments Act of 1976
Federal Land Policy and Management Act of 1976
Federal Onshore Oil and Gas Leasing Reform Act of 1987
Federal Water Pollution Control Act of 1972 (as amended)
Forest and Rangeland Renewable Resources Planning Act of 1974
General Mining Law of 1872
Knutson-Vandenberg Act of 1930
Lacey Act of 1900
Migratory Bird Treaty Act of 1918
Mineral Leasing Act, Potassium Leasing Law, Sulfur Act of 1920
Mineral Leasing Act for Acquired Lands of 1947
Mineral Resources on Weeks Law Lands of 1947
Mining in the Parks Act of 1976
Multiple-Use Sustained-Yield Act of 1960
National Environmental Policy Act of 1969
National Forest Management Act of 1976
National Historic Preservation Act of 1976
National Park Service Organic Act of 1916
National Trails System Act of 1968
National Wildlife Refuge System Administration Act of 1966
North American Wetlands Conservation Act of 1968
Organic Administration Act of 1897
Refuge Recreation Act of 1962
Resource Conservation and Recovery Act of 1976 (as amended)
Surface Mining Control and Reclamation Act of 1977
Surface Resources Act of 1955
Water Resources Planning Act of 1965
Weeks Act of 1911
Wild and Scenic Rivers Act of 1968
Wilderness Act of 1964

Source: Coggins and others (1993); USDA Forest Service (1993).

Forest Planning, Assessment, and Policy Review (Indicator 49)

Paul V. Ellefson and Calder M. Hibbard[1]

The full text of Indicator 49 is as follows: *Extent to which the legal framework (laws, regulations, guidelines) supports the conservation and sustainable management of forests, including the extent to which it* ***provides for periodic forest-related planning, assessment, and policy review that recognizes the range of forest values, including coordination with relevant sectors*** (Montreal Process Working Group 2003).

Rationale and Interpretation

Forests are affected by a wide variety of physical, economic, and social influences, many of which originate beyond the forest community in sectors such as energy, agriculture, transportation, communication, environment, and government. The sustainability of forests is dependent on the ability of society to comprehensively evaluate trends and conditions in these diverse sectors and to subsequently take responsive actions that will ensure the sustained use, management, and protection of forest resources and the communities that depend on them. These actions are typically predicated on well-focused and technically sound plans, assessments, and policy reviews that are sensitive to a range of forest values and are coordinated with a variety of forest-related sectors (Montreal Process Technical Advisory Committee 2000, Montreal Process Working Group 2003).

The focus of Indicator 49 is on the legal capacity available to conduct planning, assessments, and policy reviews. Therefore it will be useful to compile information about laws, rules, and responsible agencies that promote the development of forest plans and the preparation of assessments and periodic policy reviews. These compilations should document the agencies and organizations involved; the frequency with which plans, analyses, and reviews are prepared; the financial and professional resources devoted to these activities; and their ability to accomplish objectives involving conservation and sustainability. Of special interest is information describing the capability of agencies, plans, assessments, and reviews to address a range of forest values and to foster coordination with plans in related sectors (Montreal Process Technical Advisory Committee 2000).

Indicator 49 lists various concepts and principles that are to be addressed. Four of these may be defined as follows: *planning* consists of disciplined procedures undertaken to guide organizations having an interest in forest sustainability (for example, in strategic resource planning, land use planning, and management planning); *assessments* are comprehensive examinations of present and prospective ecological, economic, or political conditions that are likely to affect forest sustainability; *policy review* is the development and examination of options for addressing important issues involving forest sustainability; and *coordination with relevant sectors* is the harmonizing or integration of plans, assessments, and policy reviews originating from diverse ecological, economic, and political structures and conditions important to forest sustainability.

The indicator draws special attention to the legal capacity to engage in "coordination with relevant sectors." A State or nation's forestry sector may be but one of many sectors capable of fostering sustainability and conservation of forests, and there is much potential for coordination in this area (Ellefson 1985, Greeley 1966). For example, there can be coordination of project plans, forest sector plans, and macro or national plans; of plans for different kinds of forest resources (such as timber, recreation, range, and wildlife); of forestry and nonforestry plans (such as agriculture plans and mineral plans); of public and private sector plans (such as those for public timberland investments and private timber processing facilities); and of forestry and nonforestry plans involving functional interests (such as timber management plans and general transportation plans). Identifying the legal capacity that addresses these numerous interfaces and promotes coordination among them is a considerable challenge.

Conceptual Background

Planning Activities

Planning is often considered a central component of forestland management. Statutes and administrative directives governing the use, management, and protection of forests invariably set forth requirements for the development of plans and directives that provide the framework within which managers can operate to accomplish their organizations' missions. Since private and public interests in the use, management, and protection of forests are part of dynamic political and economic systems, plans are subject to periodic review and revision. Coordination of various

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types and levels of plans prepared in response to various local, State, and Federal statutory requirements is an onerous task. An effective approach to coordinating, and in some cases reconciling, plan development and implementation in such an environment is not fully developed.

Plans focused on forest resources are highly variable in their purpose. However, such plans can take the form of a strategic program plan, which sets general direction toward a mission or vision and results from a formalized but modest set of exercises, or can embody the combined responses of an agency to continuing streams of often unexpected issues (Office of Technology Assessment 1990). Examples of the latter are State and Federal agency actions responding to unexpected judicial and legislative directives—actions which when combined constitute a de facto strategic plan. Statewide forest resource plans prepared by lead forestry agencies in State government and the plans required of the USDA Forest Service by the Forest and Rangeland Renewable Resources Planning Act of 1974 and the Government Performance and Results Act of 1993 are examples of strategic plans resulting from more formalized exercises.

Plans can also be very focused in identifying expected outcomes, as in the case of land use and management plans. Of interest are plans that are specific enough to provide clear direction for management activities and concrete enough that success can be measured. They identify potential uses, estimated outputs, and conditions that are desirable and feasible. They explain how management will affect key sites, produce important outputs, and protect vital resources and ecosystems. Land use and management plans tend to be the product of rational planning approaches that require clearly specified objectives, alternatives, decision criteria, and implementation and monitoring procedures. Plans for each administrative unit of the nation's national forests, as prepared by the USDA Forest Service under authorities set forth by the National Forest Management Act of 1976, and plans for each refuge prepared by the USDI Fish and Wildlife Service, as called for by the National Wildlife Refuge System Improvement Act of 1997, are examples of land use and management plans.

Plans developed to guide the use, management, and protection of forests can emerge from statutes that require direct and exclusive consideration of forests as well as from statutes that authorize the development of broader multisector plans. An example of the former is the strategic planning process called for by the Forest and Rangeland Renewable Resources Planning Act of 1974, which requires the preparation of plans that address a variety of interests in forests (for example, wildlife, fish, timber, grazing) and requires interdisciplinary consideration of desired forest conditions. Some multisector plans focus on a specific physical resource, such as air or water, that can be affected by the use and management of forests. Examples of even more broadly construed multisector plans are those required of agencies that are responsible for administering the Endangered Species Act of 1973, the Coastal Zone Management Act of 1972, the Clean Water Act of 1987, and the Clean Air Act of 1990. State governments also develop multiresource plans that affect forests, plans that are often developed in response to the Federal laws just identified.

Judgments about the usefulness of plans and planning processes presumes the existence of standards or measures of goodness. One obvious source of such standards is the statutes that authorize the planning activity. For example, these statutes may require public participation or preparation by interdisciplinary teams. Other commonly advocated standards for plans or planning processes include legal sufficiency, ability to resolve conflict, cost-effectiveness, existence of a foundation of good data and sound analyses, capability to be implemented on the ground, communication of a clear vision, completion on time, active leadership by administrators, and flexibility to accommodate unexpected events. These examples illustrate the range of standards by which the strength and weakness of forest planning activities may be judged (Bryson 1988, Gray and Ellefson 1987, Larsen and others 1990, Teeguarden 1990).

Assessment Activities

Assessments are comprehensive examinations of present and prospective conditions that are likely to affect the use, management, and protection of forests both now and in the future. They are often viewed as supportive of plan development, in that plans generally respond to assessment-identified gaps between current and some desired conditions in the use, management, and protection of forests. Assessments have traditionally been detailed, comprehensive exercises that include thorough analysis of data, although movement is toward assessments that examine broad trends in resource, economic, and social conditions that a forestry agency might adapt to or possibly influence (Sample and LeMaster 1995). Some assessments are developed for purposes of evaluating or monitoring progress toward key goals and objectives that have been identified in a plan. Examples of assessments are the renewable resources assessment required by the Forest and Rangeland Renewable Resources Planning Act of 1974 and prepared every 10 years, the critical habitat assessment for threatened and endangered species required by the National Wildlife Refuge System Administration Act of 1966 (amended 1997), and various statewide resource assessments carried out by the forestry agencies of State governments. These statewide assessments include the criterion and indicators assessments that are being prepared by an increasing number of States (such as Oregon).

Policy and Program Review Activities

Anticipating, evaluating, and developing options for addressing important forest resource issues is the focus of policy and program analyses. Issues requiring analysis are selected on the basis of (for example) their urgency, strategic significance, programmatic importance, geographic scope, fiscal implications, or the expectation of useful results from analysis. The principal users of policy analyses are generally forestry agency executives, although leaders in other branches of government and in the private sector often seek the results of policy analysis. As examples, topics addressed by the policy analysis staff of the USDA Forest Service include payments to States from national forest receipts, water resource policy and the management of forests, and the role of public and private recreation enterprises. Policy analysis is also carried out by the renewable resources and planning staff of the USDI Bureau of Land Management, the planning and evaluation staff of the USDI Fish and Wildlife Service, and the Office of Policy, Economics, and Innovation of the U.S. Environmental Protection Agency. State government forest agencies also have capabilities for policy and program analysis (for example, the Resource Policy Division of the Oregon Department of Forestry).

Current Legal Capacity

Private Sector Capacity

Many private organizations have the capacity to undertake policy and program reviews, often doing so as part of their perception of a private sector mission (not necessarily a legal requirement). For example, industrial forestry concerns periodically prepare policy reviews of their strategic position in forest product markets, and reviews of corporate land ownership strategies. Similarly, private companies considering long-term investment in timberland often undertake careful review and analysis of such opportunities (for example, the Hancock Timber Resource Group). Private organized interest groups also engage in policy review and analysis that can be used to influence development of public policy toward the use and management of forests. Such groups (and an example of each group's reports) include the Society of American Foresters ("Forest wildlife-habitat relationships: population and community responses to forest management" [2002]), the National Association of State Foresters ("A review of the State and private forestry deputy area Washington office" [2002]), the Pinchot Institute for Conservation ("Allocating cooperative forestry funds to States: block grants and alternatives" [2001]), The Wilderness Society ("National forests: Policies for the future" [1988]), and Sierra Club ("Forest fires: Beyond the heat and hype" [2002]). Also representing policy review capacity are special interest group reviews of National Forest Land Management Plans and critiques of plans for the sale of timber from public forests.

Private sector capacity for land management planning is apparent in the development and implementation of management plans for private forests. In 1994, approximately 5 percent of nearly 10 million private landowners were known to have a written plan for the management of their forest property (table 1). Nationally, these plans directed the use and management of forest on nearly 154 million acres of private land. Thirty-seven percent of the plans were prepared by a State government employee (service forester), while landowners (21.7 percent) and consultants (10.7 percent) were the next most-frequent plan preparers. Consultants were responsible for plans applied to more than 25 million acres of private forestland. For 1998, the USDA Forest Service reported the preparation of nearly 28,000 forest management plans (including forest stewardship plans) that were applied to more than 1.8 million acres of private forest (U.S. Department of Agriculture, Forest Service 1999). A national assessment of forest stewardship plans found that 84 percent of landowners with such plans had begun to implement them, applying at least one recommended activity, such as thinning of trees (Esseks and Moulton 2000). In some cases, forest management certification programs require development of a management plan (for example, certification of forest management practices by the Sustainable Forestry Initiative of the American Forest and Paper Association).

The private sector's capacity to prepare land management plans is also reflected in the legal requirements of State forest practice regulatory programs. In some States (for example, California, Oregon, Washington), private landowners who want to conduct timber harvests must first prepare timber harvest plans that prescribe forestry practices considered critical to the sustainability of forest conditions. In the early 1990s, the California Board of Forestry processed between 1,200 and 1,500 such plans per year, while the Oregon Department of Forestry and Washington's Division of Forest Practices processed 15,000 to 20,000 per year and 10,000 to 15,000 per year, respectively (Ellefson and others 1995).

Federal Government Capacity

Planning activities—Federal requirements for planning the use, management, and protection of forests have existed for many years. Early planning activities were usually initiated by agency executives who sought to define broad strategic directions for their agencies. In recent years, however, Federal laws have required planning that is more formal and more intensive. Prior to 1974, Congress did not specifically require any Federal land management agency

Table 1—Forest management plans prepared by private forest owners, by type of owner and type of plan preparer (1994)

Management plan preparation	Owners		Area	
	Number	Proportion	Acres	Proportion
	thousands	*percent*	*millions*	*percent*
Owners with written plan	531.2	5.4	153.6	39.0
Owners without written plan	8,594.1	86.7	226.2	57.5
Unknown status	784.9	7.9	13.6	3.5
Total	9,910.2	100.0	393.4	100.0
Plan prepared by:				
Owner	114.8	21.7	16.7	19.0
Consultant	56.5	10.7	25.5	28.9
Industrial forester	20.6	3.9	8.9	10.1
State government employee	196.2	37.1	16.8	19.1
Extension Service	8.9	1.7	0.9	1.0
USDA Natural Resources Conservation Service	47.3	9.0	4.6	5.2
Other	87.9	16.6	24.0	27.3
Total	532.2	100.7	97.4	110.6

Note: Table totals exceed 100 percent because plans were prepared by more than one type of preparer. Of owners with a written plan, 528,800 were nonindustrial private owners (88.1 million acres) and 2,400 were industrial owners (65.5 million acres).
Source: Birch (1996).

to conduct formal systemwide planning (Coggins and others 1993). Today at least 26 Federal statutes require major agencywide activities involving the preparation of strategic program plans or land use and management plans, and at least 7 of these statutes set planning requirements that are exclusive to forests (table 2). The planning requirements of these 26 statutes are implemented by more than 10 federal agencies and result in the production of plans that vary in geographic scope (national, regional, local) and relevance to the use and management of forests (Coggins and others 1993, Dolgin and Guilbert 1974, Mansfield 1993, Plater and others 1998, Schoenbaum and Rosenberg 1996, West Publishing Company 1997).

Federal statutes requiring plans focused on forests are nearly evenly split between those that require the preparation of strategic program plans and those that require the preparation of land use and management plans (table 2). Some of these statutes require planning that addresses many forest values (water, wildlife, timber, recreation), while those statutes that are not specific to forests tend to have primary concern for a single forest value. Statutes of the latter kind include the Federal Water Pollution Control Act and the Endangered Species Act of 1973. Although a number of statutes require that plans be coordinated with related sectors, in most cases the statutory requirement to do so is unclear. This lack of statutory clarity is also the case with regard to requirements for updating plans, although there are notable exceptions. For example, the National Forest Management Act of 1976 is very clear in this respect (plans must be revised at least every 15 years). In many cases (for example, the Clean Water Act of 1987), statutes require the preparation of an initial plan and are silent on subsequent revision or modification of that plan. Examples of Federal agency strategic and land use and management plans are as follows:

- *USDA Forest Service*—The U.S. Department of Agriculture Forest Service is responsible for operating the National Forest System, for conducting forest resources research, and for providing technical and financial assistance to State and private forestry agencies. A variety of statutes require the USDA Forest Service to prepare strategic program plans as well as land use and management plans. An example of the first kind of statute is the Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA), which requires preparation of a resources assessment (every 10 years), a resources program (every 5 years, looking to conditions 45 years hence), a Presidential statement of policy (to guide budget formulation), and annual reports on progress toward implementation of the planning documents

Table 2—Federal statutes authorizing planning activities involving forests and forestry, by various planning characteristics (2001)

Federal statute requiring some form of planning activity	Primary type of plan required	Range of forest values addressed	Coordination with plans for related forest sectors	Periodic updating of plans required	Major forest ownership category addressed
Planning focus directly and exclusively on forests and forestry					
Cooperative Forestry Assistance Act of 1978	Strategic	Yes	Yes	*	All ownerships
Forest and Rangeland Renewable Resources Planning Act of 1974	Strategic	Yes	*	Yes	All ownerships
Forest and Rangeland Renewable Resources Research Act of 1978	Strategic	Yes	Yes	*	All ownerships
McIntire-Stennis Forest Research Act	*	Yes	*	*	All ownerships
Multiple-Use Sustained Yield Act of 1960	*	Yes	Yes	*	Federal
National Forest Management Act of 1978	Management	Yes	Yes	Yes	Federal
Renewable Resources Extension Act of 1978	Strategic	Yes	Yes	Yes	All ownerships
Planning focus broad, including forests and forestry					
Administrative Procedures Act of 1946	Strategic	Yes	*	Yes	All ownerships
Anadromous Fish Conservation Act of 1965	Strategic	No	*	*	All ownerships
Clean Air Act of 1990	Strategic	Yes	*	*	All ownerships
Clean Water Act of 1987	Strategic	No	Yes	Yes	All ownerships
Coastal Zone Management Act of 1972	Management	Yes	Yes	Yes	All ownerships
Endangered Species Act of 1973	Management	No	No	*	All ownerships
Federal Insecticide, Fungicide, and Rodenticide Act (as amended 1996)	Management	Yes	*	*	All ownerships
Federal Land Policy and Management Act of 1976	Strategic	Yes	Yes	Yes	Federal
Fish and Wildlife Conservation Act of 1980	Management	No	*	Yes	All ownerships
Government Performance and Results Act of 1993	Strategic	Yes	Yes	Yes	All ownerships
Land and Water Conservation Fund Act of 1965	Management	No	*	Yes	All ownerships
National Environmental Policy Act of 1969	Strategic	Yes	Yes	*	All ownerships
National Park Service Organic Act of 1916	Management	No	*	*	Federal
National Trails System Act of 1968	Management	No	Yes	*	All ownerships
National Wildlife Refuge System Administration Act of 1966 (1997)	Management	No	Yes	Yes	Federal
Soil and Water Conservation Act of 1977	Strategic	Yes	Yes	Yes	Private
Surface Mining Control and Reclamation Act of 1977	Management	Yes	*	*	All ownership
Wilderness Act of 1964	Management	No	No	*	Federal
Wild and Scenic Rivers Act of 1968	Management	No	Yes	*	All ownerships

Note: Asterisk indicates statute is not clear on this point.
Source: Plater and others (1998); Schoenbaum and Rosenburg (1996).

(Office of Technology Assessment 1992a).[2] The process requires consideration of all forest values, coordination with other Federal agencies, and cooperation with other levels of government (especially State governments). (Since 1993, the Government Performance and Results Act [GPRA] has preempted strategic planning legislative authorities for most Federal agencies. The program element of RPA has essentially been subsumed by the GPRA; the RPA Assessment now provides the context for the GPRA strategic plan).

The response of the USDA Forest Service to the Government Performance and Results Act of 1993 is another example of strategic program planning. Responding to the act, the 2000 Plan (revised) sets strategic direction for the agency for a 5-year period, with each year's funding being dependent on progress toward accomplishing the goals specified in the plan (U.S. Department of Agriculture, Forest Service 2000a). Four broad goals are identified (ensure sustainable ecosystems, provide for multiple benefits, ensure development and delivery of information, and ensure organizational effectiveness). Each of these goals is given operational clarity by more focused objectives (for example, improve and protect water conditions, improve knowledge base through research and monitoring), time frames for accomplishment, and measures of performance. The strategic plan also sets forth provisions for program evaluations and coordination of overlapping functions.

The USDA Forest Service is also responsible for land use and management planning under authorities specified in the National Forest Management Act of 1976. This act (which is specific to the national forests) sets forth planning processes and calls for the development of guidelines or rules that focus attention on the availability of land for resource management, potential levels of resource use and management, and ways in which a variety of resource management practices are to be carried out. The actual planning process involves 10 steps, including identification of potential uses and estimated outputs, response to issues of public concern, protection of especially valuable resources and ecosystems, and plan implementation and monitoring (Office of Technology Assessment 1992b, U.S. Department of Agriculture, Forest Service 2000b). Plans (identified as Land Resource Management Plans) are to be revised at least every 15 years, must comply with related and relevant Federal environmental and resource statutes, and are to be vertically integrated with other planning levels in the agency (nationwide: strategic plan; region: regional guide; national forest: land resource management plan; and project-level: specific projects). More than 85 national forest plans are to be revised during the period beginning in 1999 and ending in 2004.

- *USDI Bureau of Land Management*—The USDI Bureau of Land Management administers 264 million acres of Federal public land and the mineral rights underlying 564 million acres of Federal public land. The Bureau of Land Management has responded to the Government Performance and Results Act of 1993 by preparing a strategic plan. This plan sets forth 5 overall or "blueprint" goals (serve current and future client groups, restore and maintain health of land, promote collaborative management, improve business practices, and improve human resources management), 43 performance goals (for example, preserve natural and cultural heritage, establish and implement management standards and guidelines), and a variety of results to be accomplished over a 3 to 10-year period (for example, evaluate areas and resources that may warrant special recognition, incorporate comprehensive standards for public land health into existing land use plans). The agency coordinates plan implementation at the national and local level with 14 other Federal agencies (Williams 1987).

  The Bureau of Land Management also engages in land use and management planning. Although this planning is guided by an especially wide range of Federal statutes and Executive orders that in some measure require planning activities and, where so, often require consideration of forests, the agency's major land management planning authority proceeds from the Federal Land Policy and Management Act of 1976.[3] This act requires the Bureau to prepare land use plans that provide management direction for the Nation's public lands. These plans are an integral part of a three-tier planning structure within the agency, namely a national strategic plan (responding to the Government Performance and Results Act of 1993), resource management plans, and plans for areas of critical concern (unique wildlife and special ecosystems). The resource management plans, of which 108 have been developed since 1984, address specific resource

[2] In addition to the multisector laws that guide the planning of resources use and management generally, the USDA Forest Service must give consideration to Federal statutes such as the Alaska National Interest Lands Conservation Act of 1980, Fish and Wildlife Conservation Act of 1980, Archeological Resources Protection Act of 1979, Cooperative Forestry Assistance Act of 1978, Surface Mining Control and Reclamation Act of 1977, Wild and Scenic Rivers Act of 1968, Wilderness Act of 1964, National Forest Roads and Trails Act of 1964, and Multiple Use-Sustained Yield Act of 1960.

[3] In addition to the more multisector laws that guide the planning of resource use and management generally, the USDI-Bureau of Land Management must give consideration to Federal statutes such as the Colorado River Basin Salinity Control Act, Federal Coal Leasing Amendments Act of 1976, Taylor Grazing Act of 1934, Public Rangelands Improvement Act of 1978, and Wild and Free-Roaming Horse and Burro Act (U.S. Department of the Interior, Bureau of Land Management 2000a).

conflicts, reflect public participation and comment, and are accompanied by environmental impact statements.

In response to the Federal Land Policy and Management Act of 1976, the USDI Bureau of Land Management planning process identifies issues and concerns, assesses information, identifies desired outcomes, and specifies allowable uses and actions needed to achieve desired outcomes. Statutory limitations on the implementation of this process include requirements to inventory resource conditions on public lands, involve the public in plan development, comply with multiple-use principles, coordinate plan development and implementation with other Federal, State, local, and tribal governments, give priority designation and protection to areas of critical environmental concern, comply with applicable pollution control laws, and recognize development rights of mining claimants (U.S. Department of the Interior, Bureau of Land Management 2000a, 2000b). The agency's Land Use Planning Handbook requires that special consideration be given to forests and forestry: planning must describe healthy forest conditions and the best management practices that can be applied in order to accomplish such conditions (U.S. Department of the Interior, Bureau of Land Management 2000b).

- *USDI National Park Service*—The U.S. Department of Interior National Park Service is responsible for the management of 83.6 million acres of public land. Using authority granted by the National Park Service Organic Act of 1916 and administrative rules and directives pursuant to the act, it conducts four interrelated planning processes, namely general management planning (agencywide mission and goals), park strategic planning (park-level mission and goals), implementation planning (agencywide and park-level plans of action), and annual performance planning (agencywide and park-level measures of progress). The order in which these processes occur flows from broad-scale general management planning through progressively more specific strategic, implementation, and performance planning (U.S. Department of the Interior, National Park Service 1998). Major principles guiding the agency's planning activities include use of interdisciplinary planning approaches and principles, use of scientific and technical information in decision making, use of peer review panels to address conflicts over validity and interpretation of information, use of alternative dispute resolution processes (internally and externally), and review and analysis of post-litigation decisions to identify ways of improving future decisions (U.S. Department of the Interior, National Park Service 2001).

  Although the agency's planning activity consists mostly of the production of land use and management plans for specific park units, an agencywide strategic program plan has been developed in response to the Government Performance and Results Act of 1993 (U.S. Department of the Interior, National Park Service 2000). This plan focuses on four major goals: preserve park resources, provide for public enjoyment, strengthen cultural and recreation resources, and ensure organizational effectiveness. Eleven strategies for accomplishing these goals are specified and include developing additional partnerships and improving technology and databases. Various cross-agency issues and suggestions for their resolution are presented (for example, working with various federal agencies on ecosystem restoration in south Florida). The agency also identifies management and data issues to be dealt with and describes plans for evaluating programs.

- *USDA Natural Resources Conservation Service*—The U.S. Department of Agriculture Natural Resources Conservation Service is responsible for a wide range of forest resource programs, all of which require some level of planning. These planning activities are conducted in accordance with authorities granted by the Soil and Water Conservation Act of 1977 and the Government Performance and Results Act of 1993. The former requires the preparation (every 10 years) of an appraisal of the Nation's soil, water, and related resources and the development (every 10 years) of a soil and water conservation program. These documents are to be consistent with the findings of resource inventories and assessments, identification and analysis of alternatives, consultation and consensus-building processes, and sound principles of plan implementation and program evaluation. They are to be transmitted to the U.S. Congress, as are annual reports (to accompany proposed budgets) of progress in implementing programs. The agency's mission statement highlights the importance of conservation planning; the agency's planning is to guide it in developing programs that encourage comprehensive planning for management of natural resources on private and other nonfederal land. This resource management planning is to involve processes that integrate social, economic, and ecological resource concerns while also maintaining natural systems and ecological processes. Only two plans and appraisals have been made by the USDA Natural Resources Conservation Service under authorities established by the Soil and Water Conservation Act of 1977.

  The agency's planning activities involving forests are responses to a number of forest and related programs that have been assigned to the agency for implementation. These planning activities give direction to programs that provide for natural resource information, community planning and development, conservation cost-share program assistance, conservation planning and implementation, erosion control and reduction, farmland protection, fish and wildlife habitat improvement, forest improvement and management, range management, stream restoration, water management, water quality improvement,

wetland restoration and protection, watershed planning, conservation technical assistance, emergency watershed protection, and natural resources inventory work. Most of these functions are carried out in cooperation with State governments and typically require State-developed plans prior to their implementation by the agency. Examples are the Forestry Incentives Program, Conservation Reserve Program, and Stewardship Incentive Program, all of which are administered in cooperation with the USDA Forest Service.

The agency also responds to the Government Performance and Results Act of 1993 by preparing an agency-wide strategic program plan (U.S. Department of Agriculture, Natural Resources Conservation Service 2000). The plan identifies 4 major goals (enhance resource productivity, reduce unintended natural resource impacts, protect communities from flood and drought, deliver high-quality services to the public) and 14 specific objectives that give a focus to these goals (for example, enhance forestland productivity, enhance fish and wildlife habitats). Coordination of plan development and implementation with other public and private entities (and especially with State governments) is common and extensive, and involves cooperation on matters related to education, research, data collection, and program delivery. Provisions are made for program evaluations, including advance (1 year) schedules for evaluation in the agency's annual operational plan.

- *U.S. Fish and Wildlife Service*—The Fish and Wildlife Service is responsible for conserving, protecting, and enhancing fish, wildlife, plants, and their habitats for the continuing benefit of the Nation (Goble and Freyfogle 2002). The agency is guided by more than 150 Federal statutes, many of which authorize planning activities that are directly relevant to the use, management, and protection of forests. An example is the agency's role in administering the Endangered Species Act of 1973, a planning role that has been especially important in defining the sustainability of wildlife habitats associated with public and private forests. Among other agency-developed plans that have implications for forest resources are the agency's comprehensive conservation plans for wildlife refuges, its information resources management strategic plan, its endangered species habitat conservation plans, its service-wide strategic and performance plans, and the wildland fire and air quality national strategic plan.

  The agency's long-range strategic program plan is a response to the Government Performance and Results Act of 1993 (U.S. Fish and Wildlife Service 2001a). This plan sets forth 4 mission goals (sustain fish and wildlife populations, conserve habitats through a network of lands and waters, provide for public use and enjoyment, establish partnerships for managing wildlife resources) and 14 long-term goals that implement these mission goals (for example, provide for greater recreational use of wildlife refuges, work with private landowners on eradication of invasive species). Key factors affecting the ability to accomplish these long-term goals are specified (for example, extent of collaboration with partners, extremes in weather and climate conditions), and coordination with other Federal agencies that have responsibilities involving wildlife and wildlife habitats is described (for example, management of the South Florida Everglades, implementation of the Northwest Forest Plan, recovery of endangered species). The plan specifically addresses major wildlife habitat concerns on land not directly administered by the U.S. Fish and Wildlife Service. For example, it calls for the restoration and establishment by 2005 of 280,000 acres of wetlands habitat, 524,000 acres of upland habitats, and 4,150 riparian or stream miles of habitat not directly owned or controlled by the agency.

  The Fish and Wildlife Service also engages in land use and management planning as authorized by the National Wildlife Refuge System Administration Act of 1966 (as amended 1997). This activity includes the development of comprehensive conservation plans for refuges that are part of the National Wildlife Refuge System (U.S. Fish and Wildlife Service 2001b). These plans are to provide a clear and comprehensive statement of desired conditions for each refuge and to provide rationales for management decisions needed to accomplish such conditions, including the management of forests considered important as wildlife habitat. The process of developing comprehensive conservation plans provides opportunity for public involvement and for interaction with other Federal agencies that have responsibilities in relation to the management of wildlife. Implementation of completed plans is also to be coordinated with State conservation agencies, tribal governments, and non-governmental organizations. The U.S. Fish and Wildlife Service expects to complete comprehensive conservation plans for 250 planning areas of the National Wildlife Refuge System by 2006. The plans are to be reviewed and updated at least every 15 years.

- *U.S. Environmental Protection Agency*—The Environmental Protection Agency is responsible for a wide variety of programs that focus on protecting human health and safeguarding the natural environment (air, water, and land) on which life depends. The agency influences the use, management, and protection of forests through statutory authorities that focus on water (wastewater, drinking water, ground water), air (acid rain, global warming, emissions), hazardous wastes, insecticides, endangered species, wetlands, and watersheds. Nearly all of these programs involve planning activities that have implications for forests. For example, States must

develop implementation plans for meeting air and water quality standards promulgated by the agency under the authority of the Clean Air Act of 1990 and the Clean Water Act of 1987. Plans authorized by the latter act and developed to address nonpoint pollutant sources originating in forested areas have been especially important in determining what forest practices are applied on private and public forestland, and how they are applied.

The Environmental Protection Agency has developed a strategic program plan in response to the Government Performance and Results Act of 1993 (U.S. Environmental Protection Agency 2000). The strategic plan focuses on 10 goals (clean air, clean and safe water, safe food, pollution prevention, waste management, global pollutant reduction, quality environmental information, sound environmental science, program compliance, and effective agency management), each of which is further focused by detailed objectives and performance requirements. The plan's development and implementation are coordinated with more than 100 Federal, State, and local agencies, tribal governments, business and industry organizations, and environmental and public interest groups.

The above are examples of Federal agencies that engage in planning the use, management, and protection of forests. Other agencies that are so engaged to some degree are the Council on Environmental Quality (rules governing administration of the National Environmental Policy Act of 1969), Army Corps of Engineers (administration of wetland provisions of the Clean Water Act of 1987), Department of Defense (plans for Department forestlands), Tennessee Valley Authority (TVA forests and private forests), and the USDI Bureau of Indian Affairs.

Assessment activities—Federal agency capacity to undertake comprehensive examinations of present and prospective conditions that are likely to affect the use, management, and protection of forests is significant (table 3). Of the 22 example assessments identified in table 3, two-thirds address a range of forest values, although often only for a specific region or land ownership category (for example, the Interior Columbia Basin Ecosystem Assessment, the Northern Lands Assessment, and the Southern Forest Assessment). Most assessments are conducted in coordination with other agencies and with different ownerships and levels of government, although this coordination is often not clearly stated in statutes or directives. Coordination can be difficult because assessments involving forests can have differing objectives (timber assessments versus endangered species assessments, for example) and are often undertaken by a number of Federal agencies, many of which do not have forests as their primary responsibility (Johnson and others 1999). It is also significant that most Federal assessments are regional or ecosystems based, as when the area of concern for planning is determined by scientifically defined, ecologically based geographic boundaries (for example, Greater Yellowstone Ecosystem, Interior Columbia River Basin, Northern Spotted Owl Forest Ecosystem) (Hardt 1997).

Agency authority for carrying out assessments is set forth by statutes that call for continuous assessments (monitoring) (as in the case of the acid rain deposition program of the U.S. Environmental Protection Agency), periodic assessments at specified intervals (as with the Renewable Resources Assessment of the USDA Forest Service), or intermittent assessments required to address important issues regarding resource use and management (as with the Forest Ecosystem Management Assessment Report of the USDA Forest Service and cooperating agencies). Intermittent assessments frequently have a specific geographic focus, usually a multi-State region. Of the 22 assessments identified in table 3, 17 address conditions on all forest ownerships. However, assessments have often focused on wildlife refuges, national forests, national parks, and Indian forestlands.

Assessments are frequently undertaken in concert with the development of strategic program plans or land use and management plans (for example, the Soil and Water Appraisal and the Conservation Program of the USDA Natural Resources Conservation Service). Information about the conditions and capabilities of resources as provided by assessments has proven to be especially useful in the development of such plans. Although assessments have long been useful as a means of evaluating trends in the use and condition of resources, they are increasingly being used to evaluate progress toward key goals and objectives that are specified in agency plans. They have become especially important sources of information for those making judgments about progress toward goals specified in the agency strategic program plans required by the Government Performance and Results Act of 1993 (Sample and Le Master 1995).

Policy and program review activities—Federal agency capacity for review and analysis of policy and program initiatives focused on forest resource matters is probably quite substantial. Unfortunately, comprehensive documentation (staff levels, budgets, responsibilities) of this capacity does not exist. A review of agency staff directories and organizational charts reveals that policy and program reviews are undertaken at virtually all levels within agencies, namely the departmental level (USDA Office of Budget and Program Analysis), agency level (Policy Analysis Staff, USDA Forest Service), mid-level within agencies (USDA Forest Service regional office analysts and planners), and field or operational levels (USDA Forest

Table 3—Federal environmental and natural resource assessments, by type, administering agency, and source of authority (2001)

Assessment type and title	Principal administering agency	Authority for undertaking assessment
Continuous		
National acid precipitation assessments	U.S. Environmental Protection Agency	Clean Air Act of 1990
Periodic (specified intervals)		
Forest inventory and analysis	USDA Forest Service	Forest and Rangeland Renewable Resources Research Act of 1978
Land use and condition inventory	USDI Bureau of Land Management	Federal Land Policy and Management Act of 1976
Soil and water resource appraisal	USDA Natural Resources Conservation Service	Soil and Water Conservation Act of 1977
Air pollutant assessment	U.S. Environmental Protection Agency	Clean Air Act of 1990
Water quality assessment	U.S. Environmental Protection Agency	Clean Water Act of 1987
Renewable resources assessment	USDA Forest Service	Forest and Rangeland Renewable Resources Planning Act of 1974
Indian forestland assessment	USDI Bureau of Indian Affairs	Indian Forest Resources Management Act of 1990
Regional water and related resources assessment	Water Resources Council	Water Resource Planning Act of 1965
National forest resource assessment	USDA Forest Service	National Forest Management Act of 1978
Wildlife refuge resource assessment	U.S. Fish and Wildlife Service	National Wildlife Refuge System Administration Act of 1966
National park resource assessment	USDI National Park Service	National Park Service Organic Act of 1916
National biological survey	USDI National Biological Service	Various Federal statutes
Intermittent (determined by need)		
Environmental impact statements	Council on Environmental Quality and Proposing Agency	National Environmental Policy Act of 1969
Global climate change effects assessment	U.S. Department of Agriculture	Global Climate Change Prevention Act of 1990
Endangered species review	U.S. Fish and Wildlife Service and others	Endangered Species Act of 1973
Forest ecosystem management assessment report	USDA Forest Service and others	National Forest Management Act of 1978 and others
Northern forestlands assessment	Northern Forest Lands Council and USDA Forest Service	Federal and State statutes
Interior Columbia Basin ecosystem assessment	Multiple Federal agencies	Various Federal statutes
Sierra Nevada ecosystem assessment	USDA Forest Service	Various Federal statutes
Regional impact assessment of climate change	U.S. Environmental Protection Agency	Clean Air Act of 1990
Southern forest resource assessment	USDA Forest Service	Various Federal statutes

Service national forest analysts and planners). Analysis and review capacity also exists within the research units of agencies (USDA Forest Service Resource Valuation and Use Research unit) and agency budget development and coordination units (Division of Budget, Office of Budget, Planning, and Human Services of the U.S. Fish and Wildlife Service). Further complicating judgment about policy and program review capacity is the large number of agencies that carry out reviews of broad-based resource or environmental programs that are not solely focused on (but include) forest programs (Oversight and Evaluation Staff of the USDA Natural Resources Conservation Service).

It appears that there are 200 to 300 policy and program analysts within Federal agencies responsible for programs affecting forests. In the Washington, DC Office of the USDA Forest Service, more than 25 persons have the title of policy analyst, program analyst, or program planner. A survey of four policy and program review units in three different agencies indicates that policy review activity is being focused on a wide range of issues and coordination responsibilities (table 4).

State Government Capacity

Planning activities—State governments have engaged in some form of forest planning activity since the early 1900s. However, the character of these activities has changed dramatically over the years, as have the number and type of State government organizations involved. Early planning efforts were focused largely on protecting forests from fire, insects, and diseases and on promoting investments in timber production as a forest use. By the mid-1980s, State-initiated forest planning activities ranged from the development of comprehensive statewide forest resource plans to the preparation of plans required by forest practice regulatory programs, and from broad water quality plans that influence forests to plans for forest-based rural economic development. Also, forest resource planning activity, which previously had been largely a responsibility of lead forestry agencies of States, had by 2000 become the province of many units of State government. In 2000, each State reportedly had 8 to 10 executive-branch units of State government engaged in some form of planning activity focused on forests (Ellefson and others 2002). Also significant has been the increasingly aggressive posture of Federal agencies in requiring (or encouraging by means of fiscal incentives) the development of multisector plans to address possible impacts of forestry activities on water, air, wildlife, and other resources (such as those required by the Clean Water Act of 1987 and the Coastal Zone Management Act of 1972). The Cooperative Forestry Assistance Act of 1978 also has done much to encourage lead forestry agencies of State governments to develop plans that focus on statewide forest resource conditions.

State government planning activities focused on forests vary greatly in scope and magnitude. States operate within different planning contexts (for example, large State budgets versus small State budgets, large forest area versus small forest area), undertake different planning approaches (issue driven, goal driven, iterative planning), and pursue different goals, objectives, and strategies (Gray and Ellefson 1987). Some States (for example, Minnesota) seek to develop broad strategic plans that consist of a vision, obstacles to attainment of the vison, and a plan for dealing with such obstacles, while others tend to focus on the specifics of land use and management, especially for the forestland that is directly owned and managed by State governments. In yet other States, the aggregate of forest plans prepared by private forest owners as requisites for participation in cost-share programs (such as the Forestry Incentives Program), dedicated easement programs (such as the Forest Legacy Program), or a State's forest practice regulatory program (where rules guide plan preparation) become, in a sense, overall plans for the privately owned forests in those States. Some States (for example, Vermont, Florida, Maine, and Oregon) have seen fit to exert control over land development generally by means of statutes directed at growth management. In these States, forests are thus subject to planning in the sense that certain activities cannot occur within designated forest areas and in the sense that conversion of forests to nonforest uses may be prohibited (Wickersham 1994).

Statewide forest resource planning programs were actively underway in 47 States in 1982 (McCann and Ellefson 1982). In 1985, the Council of State Governments determined that 29 states had completed first-generation plans and were in the process of implementing them (Cole 1985). In 2003, 45 of the 50 States were determined to be involved in a variety of forest resource planning processes, such as State-administered forest planning (39 States), comprehensive statewide forest resource planning (23 States), agency operational planning (38 States), issue- and problem-oriented planning (37 States), and land use allocation planning (10 States). Each State spent, on average, $433,000 in 2003 to support forest resource planning activities, although the majority of States spent less than $250,000 (19 States invested less than $50,000, and 11 States more than $1 million). Planning activities required the professional talent of an average of 4.4 full-time equivalent staff per State. Half of the States regularly seek the public's perspective during the development of comprehensive statewide plans. The primary reasons for undertaking planning activities were to secure a clearer understanding of agency long-term directions and to improve the quality of management and administrative structures (Kilgore and Salk 2003).

Table 4—Federal agency units with policy and program review and evaluation responsibilities, by unit name, mission, staff, and example analyses (2001)

Agency policy analysis and review unit	Mission or responsibilities	Staffing levels and assignments	Example reviews and analyses
Policy Analysis Staff, Programs and Legislation, USDA Forest Service	Bring existing or emerging policy questions to the attention of agency leadership and provide quality analysis of assigned policy questions and program evaluations in a timely and objective manner. Coordinate policy analyses with appropriate parties within and outside the government, including analyses of agencywide direction and standards for economic efficiency evaluation and economic impact assessment.	Nine policy analysts and two support staff	Evaluation of State payments from national forest receipts; role of public and private recreation enterprises; analysis of water resource policy and the management of forests; assessment of policy options for Forest Service participation in forest products certification; and evaluation of agency funding history, including spending trends and nonappropriated funding.
Office of Policy, Economics, and Innovation, U.S. Environmental Protection Agency	Support agency's mission through economic analysis and promotion of innovation needed to achieve better, more cost-effective environmental and public health protection.	Staff assigned to four major offices or centers	Development of guidelines for preparing economic analyses, assessment of U.S. experiences with economic incentives for protecting the environment, and review of options for public involvement in the granting of environmental permits.
Planning and Evaluation Staff, Division of Policy and Directives Management (DPDM), and Division of Economics, U.S. Fish and Wildlife Service	Provide counsel, coordination, education, and liaison services to the agency and serve as coordinating point for internal and external customers, including the public and other governmental bodies requiring assistance.	Ten policy analysts in DPDM, plus support staff	Evaluation of agency policy options (for Director's Orders) for ozone-depleting substances phaseout plan, applicability of the Migratory Bird Treaty Act to Federal agencies, and development of options for the mission, goals, and purposes of the National Wildlife Refuge System.
Oversight and Evaluation Staff, Division of Operations Management and Oversight, Office of Strategic Planning and Accountability, USDA Natural Resources Conservation Service (also Division of Budget Planning and Analysis and Division of Strategic Performance Planning).	Conduct activities to assess quality, accountability, effectiveness, and consistency in the delivery of conservation assistance as defined by laws, executive orders, rules, regulations, and policy so as to improve the use and management of natural resources.	About 30 policy and related program analysts, plus support staff	Develop rational approaches to agency responsibilities regarding the National Environmental Policy Act, assess field staff-prepared designs, plans, and specifications for installation of site-specific practices, and evaluate these for consistency with (1) the agency's mission and strategic plan, and (2) with the products and services developed by cooperating institutes, centers, and collaborating scientists.

Statewide forest plans have been prepared by nearly all States during the last 20 years (table 5). However, many States have failed to update plans they prepared in the 1980s (for example, Connecticut, Massachusetts, New Jersey, and Ohio), while others (for example, Colorado, Iowa, Vermont, and Wisconsin) have proceeded to revise their existing plan or substitute a similar planning document or group of planning documents. Those States that have discarded the notion of a traditional statewide forest plan have focused their planning efforts on: specific forest areas or ownerships (for example, Indiana's Strategy for State Forest Land Properties, Alaska's Haines and Tanana Valley State forest plans, Washington's State land plan); more inclusive natural resource plans prepared by more broadly charged natural resource agencies (for example, Illinois Department of Conservation Strategic Plan); strategic focus involving all forest ownerships and management activities (for example, Minnesota's Forest Resources Council's Vision, Goals, and Actions for Minnesota's Forests, and Kansas and Nebraska's sets of operational or program plans, which include plans for fire, stewardship, and urban and community forestry); plans structured according to criteria and indicators of forest sustainability (for example, Oregon's First Approximation Report, and Hawaii's Criteria and Indicators for Sustainable Forest Management in Hawaii); agency or governing boards' adopted policy directive documents (California's Board of Forestry's Policy Document); and plans for specific forest

Table 5—Status of State government-initiated statewide forest resource plans, by State (2001)

Region and State	Statewide forest resource plan	Most recent version or anticipated update
North		
Connecticut	Yes	1985
Delaware	Yes	2000
Illinois	Yes	1999
Indiana	Yes	1981
Iowa	Yes	1995
Maine	Yes	1985
Maryland	Yes	1988
Massachusetts	Yes	1985
Michigan	Yes	1983
Minnesota	Yes	1991
Missouri	Yes	1991
New Hampshire	Yes	1996
New Jersey	Yes	1983
New York	Yes	1985
Ohio	Yes	1983
Pennsylvania	Yes	1997
Rhode Island	Yes	1984
Vermont	Yes	2000
West Virginia	Yes	2000
Wisconsin	Yes	2001
South		
Alabama	Yes	1988
Arkansas	Yes	1984
Florida	Yes	1983
Georgia	Yes	1985
Kentucky	Yes	1983
South (cont.)		
Louisiana	Yes	1984
Mississippi	Yes	1982
North Carolina	Yes	1987
Oklahoma	Yes	1985
South Carolina	Yes	*
Tennessee	Yes	1985
Texas	Yes	1981
Virginia	Yes	1987
West		
Alaska	Yes	1986
Arizona	Yes	2001
California	Yes	1988
Colorado	Yes	1998
Hawaii	Yes	1983
Idaho	Yes	*
Kansas	Yes	1983
Montana	Yes	1996
Nebraska	Yes	1983
Nevada	Yes	1982
New Mexico	Yes	1988
North Dakota	Yes	2001
Oregon	Yes	2000
South Dakota	Yes	1987
Utah	Yes	1981
Washington	Yes	1985
Wyoming	Yes	1985

Note: As alternatives to statewide forest plans, many States have seen fit to develop plans for specific areas, regions, or landowner classes or have adopted policy statements and broader agency plans to guide State direction on forest use, management, and protection. Therefore, many statewide forest plans have not been updated in recent years. Asterisk indicates information not available.
Source: Carpenter (2002); Kilgore and Salk (2003); McCann and Ellefson (1982); and responses to inquiries made of Federal and State agencies.

management activities (for example, California's Fire Plan, Hawaii's Watershed Protection Plan).

Nationwide reviews of the effectiveness of State forest resource planning programs were undertaken in 1987 and in 2003 (Gray and Ellefson 1987, Kilgore and Salk 2003). The reviews showed that all States had statutory authority to undertake forest planning; that administering agencies and various client groups (for example, legislators, forest industries, environmental groups, and State government budget directors) supported planning; and that the strength of this support increased as planning progressed. Most of these developments were expedited by and consistent with the USDA Forest Service's planning program goals for State governments. Under authorities set forth by the Cooperative Forest Management Act of 1978, the USDA Forest Service sought to have statewide forest plans become the principal guiding documents for State forestry agencies on matters involving long-range direction, operational objectives and targets, budget development, and balance and coordination of diverse forestry programs (U.S. Department of Agriculture, Forest Service 1980). Among the specifically identified benefits of planning were better understanding of the condition of and major trends in forest resources, greater sense of agency mission and long-term program direction, development of more creative strategies to address important issues, increased coordination among disparate programs, more program and investment accountability, and increased political support for the forestry programs of State government.

Assessment activities—State governments have the capacity and statutory authority to undertake comprehensive assessments of conditions affecting the use, management, and protection of forests. This capacity can be expressed in the form of one-time assessments of important issues or ongoing assessments of resource, economic, or social conditions affecting forests. Although no systematic and comprehensive review of assessment programs has been implemented by States, the number of such programs is probably in the hundreds. Examples of recent assessments focused on important issues are those involving proposed expansions of chip or particleboard industries. At least three States have produced comprehensive analyses and recommendations concerning resource and economic conditions relative to these industries: Missouri (Chip Mill Report to the Governor of Missouri, Governor's Advisory Committee on Chip Mills in 2000); North Carolina (Economic and Ecological Impacts of Wood Chip Production in North Carolina, Report of the Southern Center for Sustainable Forests in 2000); and Minnesota (Generic Environmental Impact Statement on Timber Harvesting and Forest Management, Minnesota Environmental Quality Board in 1992). Other examples of State assessment capacity are Washington's Natural Heritage Program Geographic Information System (rare plant species and endangered ecosystems), the Vermont Geographic Information System (rare, threatened, and endangered species), the Pennsylvania Biological Survey (status of plants and animals), the Virginia Forest Resource Assessment (implications of population growth and land use changes for forest resources), the Illinois Critical Trends Assessment (statewide and regional environmental conditions), the Missouri Resource Assessment Partnership (development and dissemination of high-quality natural resource information), the Arizona Land Resource Information System (statewide multipurpose spatial database of resource extent and conditions), and the California Fire and Resource Assessment Program (amount, extent, and condition of forests and rangelands). Many of these State assessments focus on large ecosystem-bounded regions within a State.

State governments also have the capacity to undertake assessments as part of efforts to understand the environmental consequences of certain proposed actions (table 6). State authority to prepare environmental impact statements is typically set forth in statutes, executive orders, or administrative regulations. Sixty percent of States had established these authorities by the early 1980s (Fisher and Phillips 1983). In California, government actions and some private actions may be assessed. In Kentucky, only certain types of development (power plant siting) may be assessed. Minnesota's authority can apply to broad geographic areas (generic environmental impact statements). Many of the environmental impact assessments conducted in connection with environmental impact statement processes have a focus on forest conditions (for example, Minnesota's Generic Environmental Impact Statement on Timber Harvesting and Management). Unfortunately, no nationwide review of the application of such laws in relation to forest management has been undertaken.

Policy and program review activities—State agencies often have the capacity to undertake reviews of important forest resource issues or programs. However, there is little information on the extent and focus of such capacity at the State level. The forest resource policy and program review function is seldom assigned to an individual unit within State government; the function is more commonly spread among several subunits of an agency (for example, fire management, resource management), combined with administrative functions involving personnel, budgeting, legal reviews, and legislative liaison activities, or subsumed by a policy and program unit at a higher organizational level. Approximately 15 States have cabinet or subcabinet-level planning or policy and program review units, and these often have some responsibility to review forest resource programs administered by lower-level forest resource units or divisions (Ellefson and others 2001, 2002). Examples of cabinet and subcabinet units are the Division

Table 6—State environmental impact statement requirements, by State and type of authority (1980)

State and type of authority	Authority
Statutory Authority	
California	California Environmental Quality Act of 1970
Connecticut	Connecticut Environmental Policy Act of 1973
Hawaii	Hawaii Session Laws of 1974, Chapter 343
Indiana	Indiana Public Law 98, 1972
Maryland	Maryland Environmental Policy Act of 1973
Massachusetts	Massachusetts General Laws of 1977, Chapter 747
Minnesota	Minnesota Environmental Policy Act of 1973
Montana	Montana Environmental Policy Act of 1971
New York	New York Environmental Quality Review Act of 1976
North Carolina	North Carolina Environmental Policy Act of 1971
South Dakota	South Dakota Environmental Policy Act of 1974
Virginia	Virginia Environmental Policy Act of 1973
Washington	Washington Environmental Policy Act of 1971
Wisconsin	Wisconsin Environmental Policy Act of 1971
Executive Order Authority	
Michigan	Michigan Executive Directive Number Four, May 1974
New Jersey	New Jersey Executive Order Number 53, October 1973
Utah	State of Utah Executive Order, August 27, 1974
Special or Limited Rule Authority	
Arizona	Arizona Game and Fish Commission Policy of July 2, 1971
Delaware	Delaware Coastal Zone Act of 1973; Delaware Wetlands Law of 1973
Kentucky	Kentucky Revised Statutes Chapter 278.179, April 1979 (relating to power plants)
Mississippi	Mississippi Code of 1972 Title 49 Chapter 27 (relating to wetlands)
Nevada	Nevada Laws of 1971, Chapter 311
New Jersey	New Jersey Coastal Area Facility Review Act of 1974-1975; New Jersey Wetlands Act of 1974-1975
Rhode Island	Rhode Island Environmental Rights Act of 1978

Source: Council on Environmental Quality (1980).

of Environmental Planning and Management of the California State Lands Commission; Office of Planning and Assessment, Indiana Department of Environmental Management; Office of Planning and Development, Connecticut Department of Environmental Protection; and Office of Strategic Planning and Policy, Rhode Island Department of Environmental Management. Policy review units specifically identified as part of a State's lead forestry agency are very few. They include the Fire and Resource Assessment Unit (23 employees) of the California Department of Forestry and Fire Protection, which, in addition to assessing forests and rangelands, also identifies and analyzes alternative management and policy guidelines; and the Division of Resource Policy, Oregon Department of Forestry, which is responsible for program evaluation, resource planning, public affairs, and legislative coordination.

Local and Regional Government Capacity

Local and regional governmental jurisdictions are known to engage in planning, assessment, and policy and program review activities. Unfortunately, no comprehensive assessment of these capacities has been carried out. Forest planning and related activities are initiated by local governments where this is justified by the extent and importance of

forests within those jurisdictions. States that are known to have local governments with planning capabilities are California, Massachusetts, Minnesota, Oregon, and Wisconsin. Some States have regional authorities that conduct planning relevant to forests (such authorities include California's Tahoe Regional Planning Agency and Coastal Commission). In 2000, more than 400 small-scale local government watershed districts were identified in the western United States (three times the 1995 total) (Natural Resources Law Center 1998, 2000). These districts often direct planning attention to forested watersheds.

Summary of Conditions

Forestry and related government agencies in the United States have a long history of engaging in forest planning and assessment activities and of undertaking periodic reviews of forest resource policies and programs. In light of the background and current conditions presented above, the following summary observations may be made about the identification and measurement of legal capacities to carry out such activities:

- Forest resource agencies at all levels engage in some form of planning, assessment, and policy review activities. In general, there appears to be ample statutory and administrative authority to conduct these activities, although the intensity with which these authorities are applied varies widely within and between different levels of government. Whether or not this legal capacity is actually being translated into meaningful plans and their subsequent implementation is largely unknown.
- Planning activities respond to statutes (or administrative directives) that require direct and exclusive consideration of forests, and to statutes that require development of broad multisector plans (for air, water, or wildlife), of which plans for forests are but one part. Multi-sector plans appear to fragment responsibility for administration of forest activities rather than integrate forest values.
- Agencies of many types and with many different responsibilities for forests engage in planning, assessment, and policy review activities. In only a limited number of cases is there evidence of concerted and effective effort to coordinate these activities within and between governments.
- Agencies produce strategic program plans and land use and management plans. In some cases, these plans are aggregations of individual plans and assessments prepared for specific individual forest ownerships or specific geographic areas. This is often true of statewide plans prepared under the authorities of State governments.
- Some agencies, especially State government agencies, appear to be tending away from the development of statewide strategic program plans. Statewide forest resource plans of State governments are frequently very much out of date, and are often being replaced by regional or issue-oriented plans and by criteria and indicator-driven plans.
- Although some agencies separate planning, assessment, and policy review functions organizationally, these functions are usually combined as a single activity assigned to a single administrative unit. Most States appear to have a very limited policy analysis and review capacity, at least in the sense of a specific administrative unit assigned exclusive responsibility for such a function.
- Investments in planning, assessment, and policy review activities involving forests are highly variable in amount and regularity. They are determined by the importance of the forests being managed by an agency and by the willingness of agency leadership to promote the importance and usefulness of planning, assessment, and policy review activities.
- Many agencies employ advanced methods, high investment levels, and qualified professionals in their conduct of planning, assessment, and policy review activities. In general, Federal agencies are more sophisticated in this regard than are State, regional, or local government agencies.
- Assessment activities are very often one-time efforts that respond to major issues involving controversy over proposed resource development or management. However, some assessment activities have become monitoring programs that are conducted on a continuous basis (air quality monitoring) or at periodic intervals (forest inventory and analysis).

Issues and Trends

The literature identifies a number of major issues and trends in forest planning, assessment, and policy review authority and capacity. Examples of this literature (from which the following issues and trends are drawn) are: Bryson 1988, Hardt 1997, Sample and Le Master 1995, and U.S. Department of Agriculture, Forest Service 1990 and 2002.

- Agencies are increasingly seeking the flexibility necessary to anticipate and take advantage of important opportunities represented by forests and are more and more inclined to focus forest planning processes on these opportunities. This change in emphasis is making planning less technical in its emphasis and more focused on the preferences that flow from pubic debate and discussion.
- Individuals and organizations whose interests are affected by forest resource programs are increasingly involved (through various collaborative processes) in the

development of forest plans and the conduct of assessments and policy reviews. The general public has a growing expectation that it will be involved in government forest planning and related activities.

- Legal and administrative authorities for conducting planning, assessments, and policy activities are increasingly fragmented (and often conflicting) as are the agencies responsible for conducting such activities. Coordination of these activities is important but difficult. The diversity in authorities and agencies often results from the need to meet the demands of many different and often competing client groups.
- Planning, assessment, and policy analysis have become more complex, costly, time-consuming, and, in some cases, even redundant. The desire to address all management uncertainties with intensive information gathering and analysis is of growing concern.
- The scope of forest plans and assessments is increasingly defined by scientifically determined, ecologically based geographic boundaries or the political boundaries of multistate regions. This reflects an interest in ensuring the physical sustainability of large forested areas.
- Criteria and indicator approaches are increasingly becoming an organizing pattern for the development of forest plans and the conduct of assessments and policy reviews. Such approaches provide a structure to guide program direction and accountability and provide direction for the gathering of information and its subsequent management.
- Standardized procedures for implementing forest plans and the subsequent monitoring of accomplishment of plan goals and objectives are becoming increasingly common, especially procedures for formally linking plans and the budgetary and fiscal requirements to implement them. This development is largely a response to public skepticism about government and an interest in greater accountability of government generally.
- Access to information, and the capacity to manage and analyze information, are becoming increasingly important, but they are often insufficient in amount, quality, and timing. Increasingly, information gathering is regarded as directly supporting efforts to deal with issues and policy problems. This latter trend is a response to cost concerns as well as to the need for information that will serve a wider variety of purposes (planning, monitoring, public relations, policy development).

Information Adequacy

Specification

The variables or combination of variables that can be used to describe legal capacity to carry out planning, assessment, and policy review activities are numerous. However, determining exactly what information to gather, analyze, and present when making such an assemblage is difficult. In part, this difficulty arises because the language used to describe planning, assessment, and policy analysis activities is often unclear, and because the differences between these activities are often blurry. Even if definition and relationship issues are addressed, concerns about information adequacy continue to arise.

The National Association of State Foresters has assessed the availability and quality of State forestry agency information about the legal setting for planning, assessment, and policy reviews involving forests (National Association of State Foresters 1999). The association reported that 3 States have abundant information concerning legal capacity for planning and related activities, 12 have sufficient information, and the remainder have very little or no information to describe such activities. Five States reported that their planning and assessment capacity was excellent, 12 that it was adequate, and 3 that it was poor.

Questions about information needs in the area of legal capacity for planning, resource assessment, and policy review are as follows:

Extent of activity information—Information about the legal capacity to plan, assess, and carry out policy analyses activities at various levels of government has not been assembled in any systematic and comprehensive sense. What are the requirements for conducting such activities? Who is responsible for conducting them? Are there different requirements at different levels of government? Is there consistency in the requirements between these different levels? Are there legal and constitutional conflicts between governments? What is the status of local planning and zoning initiatives? To what extent do these activities occur in the private sector?

Coordination information—Information about legal requirements to coordinate planning, assessment, and policy analysis activities among and between various levels of government has not been assembled. What coordination is required? Do existing legal requirements allow for cross-sectoral, coordinated planning and policy review? Do they ensure that the cumulative results of local and regional planning will be consistent with national plans and vice versa? Do they allow incorporation of ad hoc planning activities occurring at various times and undertaken by various levels of government?

Procedure and specification information—Information about how planning, assessment, and policy review activities are to be undertaken has not been assembled. Do current statutory requirements prescribe procedures for planning, assessment, and policy review? Are these requirements detailed and rigid, or do they serve as a flexible framework for decisionmaking and action? Is the full intent of the existing laws that address planning, assessment, and policy review activities expressed in current regulations and practices? Do national planning requirements allow for regional and subregional planning? Do requirements specify the need for planning leadership? Do they give guidance to such leadership?

Cumulative effect information—Information about legal requirements for effective linkages between national, regional, and subregional planning, assessment, and policy analysis has not been gathered. How is such coordination encouraged? When aggregated, are accumulated results consistent with principles of sustainable forest management?

Investment and incentive information—Information about resources devoted to planning, assessments, and policy analysis has not been assembled. What is the magnitude of investments in planning, assessment, and policy review activities? Are there legal and administrative processes for allocating resources to these activities and are they sufficient? Are there legal or fiscal provisions for encouraging these activities, and especially for encouraging cross-sectoral planning?

Effectiveness information—Information about the effectiveness of planning, assessment, and policy review activities has not been compiled except in very limited cases. Are there legal or administrative requirements to determine the efficiency and effectiveness of these activities? What are appropriate measures of success? Are there alternative and more effective approaches to planning, assessment, and policy review?

Monitoring information—Information about monitoring that is legally required as part of planning, assessment, and policy analysis has not been compiled systematically. Are there requirements to monitor the results of these activities and to adapt these activities to changing circumstances?

This review indicates that considerable uncertainty exists about the legal capacity of governments to carry out planning, assessment, and policy review activities in connection with management for forest sustainability. No organization or institution has been assigned special responsibility for gathering and preparing timely reports on the status of these activities. Furthermore, the planning and analysis efforts of private forest landowners (industrial, nonindustrial, Indian, nonprofit) and non-Federal public owners have largely been overlooked, and these non-Federal forest landowners control nearly two-thirds of the Nation's forestland.

Recommendations

Our ability to determine the extent to which the legal framework provides for forest-related planning, assessment, and policy review specified in Indicator 49 is limited by a lack of information in various areas. The information voids that need to be addressed are considerable. The following actions seem appropriate:

Comprehensive review of capacity—Conduct a comprehensive review of current legal directives that give authority, direction, and resources to forest resource planning, assessment, and policy analysis and review activities. This review should address the information deficiencies described above and should cover legal directives at Federal, State, and local levels of government. In addition, a systematic review of private-sector capability to carry out these activities should be initiated.

Responsibility for conducting review—Assign responsibility for conducting continuous reviews of planning, assessment, and policy analysis and review capacities to a specific existing or new administrative unit of a Federal agency (for example, the USDA Forest Service's State and Private Forestry unit, or its Policy Analysis unit), to a college or university, or to a nonprofit organization engaged in policy review activities (for example, Resources for the Future, Inc., or the Pinchot Institute for Conservation). The organization chosen should have a proven track record in conducting analyses and reviews of programs at various levels of government and in the private sector.

Devote resources to review—Invest sufficient resources in the review so that the review provides the type and quantity of information necessary to dramatically improve our understanding of abilities to plan, assess, and analyze conditions important to sustainable forestry.

Indicator Appropriateness

Indicator Definition

Indicator 49 suffers from unclear definition of the activities specified, namely forest-related planning, assessment, and policy review. Each of these words or phrases supposedly embodies an agreed-to set of concepts and principles, but this is not always the case. Further compounding the specification problem is that new words or phrases are continually being suggested (for example, policy planning), often without reference to well-established or newly developed principles or concepts. The meaning of "range of forest

values" and "coordination with relevant sectors" is unclear also. The indicator would benefit from rewording: we suggest ". . . *provides for periodic planning, assessment, and policy reviews that embrace various forest values, and fosters the coordination of forest plans and assessments with other sectors*."

Relationship to Other Indicators

Indicators 49 and 54 are closely related. Indicator 49 focuses on legal capacity and Indicator 54 focuses on institutional capacity, but institutional and legal capacities overlap extensively. In fact, institutional capacity can be viewed as the framework supporting legal authorities. For purposes of assessing information resources, Indicators 49 and 54 should probably be merged and renamed as suggested above.

Indicator 49 overlaps other indicators also, particularly as they relate to concepts involving laws and values, public participation, funding, and planning. There is potential for overlap problems in Indicator 49's relationship to Indicators 38 (investment in forests), 39 (investment in research), 50 (public participation), 52 (special values), 53 (public involvement and education), 60 (information and data), 61 (forest inventories), 62 (foreign country monitoring), 64 (value integrative methods), 65 (new technologies), and 66 (human intervention impacts).

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Public Participation and Access to Information (Indicator 50)

Calder M. Hibbard and Paul V. Ellefson[1]

The full text of Indicator 50 is as follows: *Extent to which the legal framework (laws, regulations, guidelines) supports the conservation and sustainable management of forests, including the extent to which it* ***Provides opportunities for public participation in public policy and decisionmaking related to forests and public access to information*** (Montreal Process Working Group 2003).

Rationale and Interpretation

Forests may be managed more sustainably if citizens have responsibility for their use, management, and protection. If, through active influence, citizens are given an opportunity to identify areas of opportunity and concern over forests, they are more likely to support the management of forests and the principles of sustainability as they might be incorporated therein. In a broader context, public participation processes can foster practical and political support for sustainable management. Access to timely, complete, and accurate information about forests, forest resources, and socioeconomic trends will enhance these participatory processes. Public participation can foster political support for sustainable management (Montreal Process Technical Advisory Committee 2000, Montreal Process Working Group 2003).

This indicator gauges capacity for dialogue and interchange between the public and government on forest and forest-related issues. In what follows, we review information about the legal and programmatic capacity for public participation and the effectiveness of public participation in promoting sustainable forest management and conservation in the United States. More specifically, we discuss laws, ordinances, and rules authorizing the development and implementation of public participation processes; descriptive features of implemented public participation processes (number, extent of use, accessibility, required versus optional, notification approaches, process for responding to public comment); opportunities for public initiatives and referendums; legal and administrative opportunities for access to formal administrative and judicial systems for dispute resolution; administrative structures for complying with "freedom of information" requirements; records of formal disputes engaged in and legal actions taken by the public; and surveys of stakeholders and interest groups reporting the adequacy of participatory processes (Montreal Process Technical Advisory Committee 2000).

Conceptual Background

Public participation has become a routine and integral part of the land management and related activities of nearly all public resource agencies. Public participation pertains to those processes by which citizens can engage in the development and implementation of public policies and programs focused on forests. It involves processes that embody democratic principles of interactive bargaining, negotiating, and mediation between constituents and managers. Public participation processes open all phases of management decisionmaking—problem identification, data collection, analysis, alternative formulation, and choice—to public involvement.

Public participation has been described in a multitude of ways. Cortner and Shannon (1993) describe public participation as a "mechanism of politics." The Federal Land Policy and Management Act defines public participation as ". . . the opportunity for participation by affected citizens in rulemaking, decisionmaking, and planning with respect to the public lands, including public meetings or hearings held at locations near the affected lands, or advisory mechanisms, or such other procedures as may be necessary to provide public comment in a particular instance." Daniels and Walker (1998) also describe the function of public participation: ". . . public participation provides a forum whereby scientific information and values of the public and the agency can be integrated so that decisions are viewed as both desirable and feasible."

The difficulties involved in defining the public in public participation are alluded to by Dresang and Gosling (1999): ". . . it is somewhat difficult to separate the discussion of who is participating from how they are participating." Is the public composed of those who provide comments from afar, or is the public composed of those to be directly affected (stakeholders) by the results of an agency's decision, or by the product of a collaborative exercise (Cortner 1995)? The definition of public participation is further muddied by the vast array of approaches by which the public can actually participate in decision processes (engage in the electoral process, testify at hearings and meetings, serve on advisory committees, have direct contact with public officials, express views and opinions through the

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media, and engage in some form of protest action) (Dresang and Gosling 1999).

"Public participation" (as suggested by this indicator) in not the only name for public involvement in decisionmaking related to the use and sustainable management of forest resources. Other words and expressions can denote the same concepts and principles embodied in notions of public participation, including collaboration, public involvement, participatory democracy, community-based involvement, and consensus building. This multiple labeling of the same or similar concepts can complicate efforts to gather and interpret information that satisfactorily describes institutional capacity for "public participation."

Public participation processes are attractive to citizens, public officials, and scholars. Resource managers like public participation processes because these processes ensure that the public has a voice in, and responsibility for, sustainable management of forest resources. Citizens feel that public participation implies local decisionmaking and thus provides for locally appropriate solutions to important resource concerns (Carr and Halvorsen 2001). These and related interests have been incorporated into a variety of goals for public participation, including the achievement of broad notions of democracy (movement from representative to participatory democracy), political equity among client groups, accountability of government officials, specific political goals and objectives, change in fundamental agency behavior, more environmentally sensitive decisions, citizen support for agency missions and activities, better educated and informed interests, and resolution of conflict and political struggles over the use, management, and protection of forests (Cortner 1995). Similar reasons and goals for public involvement have been described by McClaran and King 1999; Shindler and others 1999; Smith and others 1999; Smith and McDonough 2001; Tuler and Webler 1999; and Wellman and Tipple 1990.

Public participation processes are effective in accomplishing desired goals and objectives (such as those listed above) to the extent they are consistent with agreed-to principles of sound participatory management. The following have been suggested as qualities of a well-designed participatory process: inclusive, sincere leadership, innovative and flexible, fosters early and continuous involvement, and results in positive actions toward agreed-to goals (Shindler and others 1999); meaningful representation, appropriate involvement in decisions, thoughtfulness and due consideration, logical procedures and outcomes, and actions consistent with participant desires (Smith and McDonough 2001); good information, good leadership, spectrum of interests involved, incentives to explore creative solutions, welcomes diverse personalities, and fosters a sense of ownership and commitment (Wondolleck and Yaffee 2000); access to processes, power to influence process and outcomes, access to information, promotion of constructive interactions, facilitation of constructive behaviors, adequate and focused analyses, and the enabling of social conditions necessary for future application of participatory processes (Tuler and Webler 1999). There are also factors that can limit the effectiveness of participatory processes. These include mistrust of agency commitment to public participation, complexity of forest management issues, polarization of interest groups, and use of group political power to delay administrative processes (Gericke and Sullivan 1994). Other sources of useful information about public participation processes include Carpenter and Kennedy 1988, Gray 1989, Keltner 1994, Moore 1996, Susskind, McKearnon, Thomas-Larmer 1999, and Williams and Ellefson 1997.

Current Legal Capacity

Private Sector Capacity

Private sector legal capacity for public participation may not be directly relevant to this review. Purely private action to seek public participation in policy or program development is typically motivated by private economic self-interest expressed in response to marketplace signals. For example, a company that uses or sells wood products might seek public comment on its proposed strategic plan for the use and management of industrial timberland; an organized special-interest group might seek comment to determine the intensity of public interest in the group's proposed advocacy plans; and a private consulting organization might initiate public participation actions as an agency-imposed requirement of a government contract.

The 1966 Seventh American Forest Congress was one of the Nation's largest private initiatives in public participation. The congress was a citizen initiative designed to " . . . make explicit the nation's demand for ecologically sound, economically viable, and socially responsible management of forests." Through this congress, citizens were able to develop a shared vision, a set of principles, and a variety of recommendations for action. These shared visions, principles, and recommendations were intended to form a cohesive and secure platform for the future of America's forests. Fifty-two roundtables were organized and conducted, 37 collaborative meetings were held, and 575 responses were received from individuals. In total, an estimated 4,000 persons participated in precongress activities. Of this total, 2,600 participated in roundtable sessions, 800 were party to a collaborative meeting, and 575 individuals presented their vision, principles, and next steps for America's forests. More than 6,200 individual statements of vision, principles, next steps, and unresolved issues had been generated prior to the congress. The roundtables

alone generated 2,000 such statements. The national congress itself involved nearly 2,000 persons from all regions of the Nation (Ellefson and MacKay 1996).

Federal Government Capacity

Federal capacity (legal framework) for public participation is largely a product of legislation and rulemaking occurring during the last 50 years. The Administrative Procedures Act of 1946 (as amended in 1976), which set significant requirements for public participation, was soon followed by a number of social welfare laws requiring public sharing of agency responsibilities (examples are the Housing Act of 1954 and the Economic Opportunity Act of 1964, which authorized many War on Poverty programs). In the 1950s and 1960s, growing public sentiment for agency-public interaction generally led citizens and Federal agencies to promote laws, rules, and directives encouraging public participation in natural resource decisions. There were 7 Federal legal mandates for public participation by 1966-67, 23 by 1970-71, and 81 by 1971-72 (Cortner 1995). In 2001, at least 23 chapters of the U.S. Code of Federal Regulations set forth public participation requirements for Federal actions involving forest and related natural resources (see Appendix). These as well as the more general statutory requirements for public participation have had a significant effect on the use and management of forests and related resources. Especially notable in this respect are the Freedom of Information Act of 1966, National Environmental Policy Act of 1969, Federal Advisory Committee Act of 1972, Forest and Rangelands Renewable Resources Planning Act of 1974, Federal Land Policy Management Act of 1976, Government in the Sunshine Act of 1976, National Forest Management Act of 1976, and Negotiated Rulemaking Act of 1990.

Federal statutory requirements for public participation vary greatly in their requirements and administration (see Appendix). Some are very specific (for example, for scenic area management plans involving national forests "the Secretary shall conduct public hearings and shall solicit public comment prior to the final adoption of land use ordinances"), while others are less focused and permit greater agency discretion (for example, reclamation recreation management shall ". . . be developed with appropriate public participation"). In other cases the Federal government requires that State governments must certify that public participation has occurred if Federal funds are to be made available (for example, Land and Water Conservation Fund financial assistance to States; Wildlife Restoration Program financial assistance to States), while in certain situations Federal agencies engage directly in the development and implementation of public participation processes (for example, land and resource management plans for units of the National Forest System). In addition, some laws are focused on public participation in decisions concerning forest conditions in general (for example, Coastal Zone Management plans, Forest and Rangeland Renewable Resources plans, Federal Land Policy and Management plans), while many focus on specific natural resource issues that may be relevant to broader forest ecosystems (for example, endangered species, soil and water conservation, trail systems, wild and scenic rivers).

Federal statutory requirements for public participation are expressed in a variety of ways, including procedures for rulemaking, conditions for agency issuance of permits, requirements for public meetings, public access to information, and processes for developing and implementing plans. From a *rulemaking* perspective, the Administrative Procedures Act (APA) is instrumental in that it grants citizens "the right to petition for the issuance, amendment, or repeal of a federal rule." Although the law does not specify the procedures agencies may use to handle petitions, it does require that agencies provide for public notice and comment of proposed regulations or changes to existing regulations. The process involves agency development of a proposed regulation (generally with limited or no public involvement), publication of the proposal in the Federal Register (along with a procedure for filing comments and a statement of time period during which written comments will be received), review of public comments, and, as the agency considers appropriate, incorporation of public comments in a final rule again to be published in the Federal Register. The act specifies that the period for public comment must be "reasonable" (other statutes, such as the Safe Drinking Water Act, may specify a set period of time for comments), but does not require agencies to conduct public hearings (other statutes, such as the Resource Conservation and Recovery Act, may require hearings). Furthermore, the act does not specify a deadline for issuance of a final rule, but requires agencies to conclude matters "within a reasonable time." Judicial review of agency rulemaking activities is authorized by the Administrative Procedures Act.

Federal capacity for public participation in rulemaking is also fostered by the Negotiated Rulemaking Act of 1990. The latter specifies legal avenues by which the public (generally representatives of interest groups) may engage in various conflict management processes (bargaining, negotiation, mediation) considered relevant to the establishment of rules and regulations. The act provides a framework for facilitating development of a consensus among stakeholders, a framework that reportedly reduces the often-extended period of time involved in rule making activities and the frequency, intensity, and cost of litigation brought forth when stakeholders fail to engage in consensus-building processes. Other benefits attributed to the act

include opportunity to identify innovative rules, greater understanding of real-world impacts of proposed rules, and more successful implementation as a result of cooperative relationships established between an agency and the parties affected by the rules (Ellefson and others 1995).

Provisions for public participation may also be called for by *Federal permitting* processes. For example, the Clean Water Act requires agencies to provide public notice of a permit application for the discharge of water pollutants. However, most environmental statutes do not specifically require opportunity for public comment on permit applications. Instead, agencies may offer public comment opportunities under authority granted by their existing rulemaking processes generally. In some respects, environmental impact statements may be viewed as applications for permits. Therefore, the National Environmental Policy Act provides for public participation in the Federal environmental impact assessment process. Even though the act does not specifically require public participation at all stages in the development of an environmental impact statement, the Council on Environmental Quality has set forth regulations requiring agencies to facilitate public participation throughout the process. Agencies are required to notify the public of their intent to prepare an environmental impact statement and to allow citizens to participate in the various stages of the statement's development. By authority of the Administrative Procedures Act, citizens may also litigate against the preparation of an environmental impact statement.

Another source of institutional capacity to engage the public in agency activities is *public meeting* laws. Two Federal public meeting laws are of particular interest: the Government in the Sunshine Act and the Federal Advisory Committee Act. The former requires "every portion of every meeting" of certain Federal agencies to be posted in advance and open to the public. The law does not require agencies to solicit public participation, but only requires that the public be allowed to attend meetings where government business is discussed. The Federal Advisory Committee Act governs the establishment, operation, and administration of advisory committees, requiring that the public be notified of all meetings and that such meetings are open to the public. The Federal Advisory Committee Act makes no legal requirement for public participation, only providing a guarantee that the public can be present at committee meetings.

Another form of institutional capacity for public participation stems from statutes that provide for *public access to information*. The most prominent of such laws is the Freedom of Information Act, which makes nearly all records of Federal agencies available to the public. Exceptions are information about national defense, internal personnel rules, trade secrets, medical and personnel files, law enforcement records, information used to oversee financial institutions, geologic information, information exempted from disclosure by another statute, and agency memoranda otherwise unavailable by law. The guarantee of access to information was expanded in 1990 by the Disclosure Provision for Research Data Act, which makes available to the general public the results of certain research generated by Federal grants. The Emergency Planning and Right-To-Know Act also guarantees public access to information by enabling citizens to participate in determining who needs an emergency response plan and how such plans should be developed. The law also guarantees public access to a number of types of reports and documents, including the emergency notification of a release, material data safety sheets, emergency and hazardous chemical inventory forms, toxic chemical release forms, and toxic release inventories.

Also relevant to the public's ability to participate in agency processes are a number of Federal laws that require or strongly suggest public involvement in *planning processes*. Examples are the Federal Land Policy and Management Act of 1976, the Forest and Rangelands Renewable Resources Planning Act of 1974, and the National Forest Management Act of 1976. These acts include provisions that require the administering agency to include the public in the development of management plans for specified Federal lands. In the case of the National Forest Management Act, provisions are specifically made for the public to appeal national forestland management plans (Gericke and Sullivan 1994). Forty Washington office appeals decisions regarding land and management plans were made between 1996 and January 2002, and the number of appeal decisions made at the agency's regional levels since 1996 probably approaches 2000 (for example, 14 appeal decisions involved the Bitterroot National Forest, 54 involved the Superior National Forest, and 84 involved the Sawtooth National Forest).

State Government Capacity

Since the 1960s, States have made explicit and specific commitments to citizen accessibility to government by passing laws requiring State agencies and local governments to have open meetings and open records except where it is necessary to protect the privacy rights of individuals. Forty-nine States have open meeting laws that apply to the legislative and executive branches at both the State and local government levels (courts are excluded from open meeting laws). Of these States, 41 require advance notice of meetings, 37 obligate agencies to keep minutes, and 31 do not recognize any action as official unless it occurs at an open meeting. Officials who meet in secret may be personally fined or otherwise punished in 35

States. Complementing open meeting laws are open record laws (freedom of information laws), which all States have established. Such laws establish the right of individuals to see the written records of government, often at a cost to those making the request (Dresang and Gosling 1999). The extent to which open State meeting and open record laws are applied in connection with forest and natural resources issues is unknown.

State governments have also established formal ways in which citizens can take direct action beyond electing officials or trying to influence them once they are in office. Twenty States provide for direct initiatives by which citizens can make or change State laws (table 1). Laws authorizing such initiatives provide that propositions are to be placed on the ballot if a specified number of signatures of registered voters are obtained. In seven States, citizen initiatives are more indirect: a petition may be submitted to the State legislature, which can adopt the proposition as received, place it on a ballot unaltered, or modify it before placing it on a ballot. State referendum procedures are another tool empowering citizen participation. Such procedures enable voters to reject laws enacted by a State legislature or to advise legislatures on important issues. Referendum authority that enables voters to reject laws enacted by a State legislature exists in 23 States. In some States, citizens also have access to advisory referendums (by which voters provide advice to a legislature). During the period 1981-1992, 327 citizen-prompted initiatives appeared on State ballots (California 65 initiatives, Oregon 44, Colorado 24, Arizona 20) (Public Affairs Research Institute 1992). The extent to which initiatives and referendums are used as tools for public participation in matters involving forests and related natural resources is largely unknown. Where used, they often generate significant interest and controversy. Examples are California's 1980s initiatives to limit the application of certain forest practices and Oregon's 2000 initiative requiring payments to landowners for government-imposed regulation that reduces property values (Oregon Secretary of State 2000).

Table 1—Legal authority of State governments for initiatives and popular referendums, State and type of authority (1998)

State	Direct initiative	Indirect initiative	Popular referendum
Alabama			X
Alaska	X		X
Arizona	X		X
Arkansas	X		X
California	X		X
Colorado	X		
Florida	X		
Idaho			X
Illinois	X		
Kentucky			X
Maine		X	X
Maryland			X
Massachusetts		X	X
Michigan	X	X	X
Missouri	X		X
Montana	X		X
Nebraska	X		X
Nevada	X	X	X
New Mexico			X
North Dakota	X		X
Ohio	X		X
Oklahoma	X		X
Oregon	X		X
South Dakota	X		X
Utah	X	X	X
Washington	X	X	X
Wyoming	X	X	

Source: Dresang and Gosling (1999).

State governments also have laws, rules, and administrative directives that specifically require public participation in forest resource decisions (planning, permitting, rule making) and authorize citizen access to government information about forests. Again, the extent of this capacity has not been documented systematically. However, a 1987 survey of citizen groups and various government officials engaged in forest resource planning found that State forest resource planners recognized public involvement as a critical component of statewide planning, and that a high percentage (56 percent) felt that the public participation was adequate and appropriate (Gray and Ellefson 1987). Such findings indicate that there is appreciable legal and institutional capacity for public participation in State forestry matters.

State governments have also seen fit to establish governing or advisory entities through which the public can participate in agency activities. Responsibilities assigned to such bodies can range from providing advice on program development and implementation to being legally responsible for directing and managing a particular unit of government. Often, but not always, these bodies are composed of interested citizens appointed by a State's governor or by the chief administrator of the entity that is to be advised or governed. In 2000, States had created 248 governing or advisory bodies that in some way influence the use, management, and protection of forests (table 2). Variously labeled as "boards" (Wyoming Board of Land Commissioners), "councils" (South Carolina Interagency Council on Natural Resources Policy), "committees" (Michigan Soil Conservation Committee), or "commissions" (West

Table 2—Number of State government governing or advisory bodies influencing the use, management, or protection of forests, by State and unit name (2000)

Region and State	Governing or advisory body					Total
	Board	Council	Committee	Commission	Other	
North						
Connecticut		1				1
Delaware						
Illinois	4	1		1		6
Indiana	1	1		2	1	5
Iowa	1		1	2		4
Maine	6	2		1		9
Maryland	1	2	2	7	1	13
Massachusetts	1					1
Michigan	3	1	1	4		9
Minnesota	3	1				4
Missouri		1	2	8		11
New Hampshire	4	1	1			6
New Jersey	1	2		4		7
New York	2		1			3
Ohio		1		2		3
Pennsylvania	1	3	1	1		6
Rhode Island	1	1				2
Vermont	5	3	1			9
West Virginia	5			1		6
Wisconsin	4	2				7
Total	44	23	10	33	2	112
South						
Alabama	1		1			2
Arkansas				3		3
Florida		1				1
Georgia				1		1
Kentucky	5	3	1	5	1	15
Louisiana		2	1	1		4
Mississippi	1			1		2
North Carolina	1			3		4
Oklahoma	1			3		4
South Carolina		2		2		4
Tennessee				1		1
Texas	1					1
Virginia	8					8
Total	18	8	3	20	1	50
West						
Alaska	3					3
Arizona	1					1
California	4	1		4		9
Colorado	3			1		4
Hawaii		1		4		5
Idaho			1	2		3
Kansas			1	2		3
Montana	2	1	2	1		6
Nebraska				2		2
Nevada	2	1		2		5
New Mexico	1			3		4
North Dakota	5	2	3	2		12
Oregon	5			8		13
South Dakota				2		2
Utah				1		1
Washington	3		1	3		7
Wyoming	1	1	2	2		6
Total	30	7	10	39	0	86
Total	92	38	23	92	3	248

Note: Other units are: Indiana Natural Resources Foundation (Department of Natural Resources); Maryland Environmental Trust; and Kentucky Agricultural Water Quality Authority (Department of Agriculture).
Source: Ellefson and others (2001).

Virginia Commission on Tourism) (examples, table 3), an average of five such entities existed in each State (an average of 3.8 per State in the South and an average of 5.6 per State in the North). Kentucky had the greatest number of advisory-governing bodies whose actions influenced forest conditions (15), with Maryland (13), Oregon (13), and North Dakota (12) following closely behind. Eight States reported only one advisory or governing body each, while one State (Delaware) reported having no such entities involved in forest matters (Ellefson and others 2001, 2002).

The institutional and legal capacity for public participation at the State government level is also reflected by the extent to which citizens have access to and participate in organized interest groups. Comprehensive analyses of citizen group involvement in forest and related resource matters have not been conducted, but information about the impact of interest groups at the State level in policy development generally is enlightening. Thomas and Hrebenar (1990) describe the degree of interest group influence or effectiveness within States as follows:

- *Dominant* (influence is overwhelming): Alabama, Alaska, Florida, Louisiana, Mississippi, New Mexico, South Carolina, and West Virginia
- *Dominant/Complementary* (influence is strong but limited by that of other political actors): Arizona, Arkansas, California, Georgia, Hawaii, Idaho, Kentucky, Montana, Nebraska, Nevada, Ohio, Oklahoma, Oregon, Texas, Utah, Virginia, Washington, and Wyoming
- *Complementary* (influence is balanced with that of other political actors): Colorado, Illinois, Indiana, Iowa, Kansas, Maine, Maryland, Massachusetts, Michigan, Missouri, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Pennsylvania, South Dakota, and Wisconsin
- *Complementary/Subordinate* (some influence exists, but that of other political actors is primary): Connecticut, Delaware, Minnesota, Rhode Island, and Vermont
- *Subordinate* (influence is weak or inconsequential): none

Table 3—State government governing or advisory bodies (examples) influencing use, management, and protection of forests (2000)

Board of Registered Foresters	Environmental Education Council
State Parks Board	Wood Product Competitive Board
Natural Heritage Commission	Geographic Information Systems Council
Pollution Control and Ecology Commission	Board of Licensure for Professional Foresters
Soil and Water Commission	Land Use Regulation Commission
Energy Commission	Coastal Resources Management Council
Wildlife Conservation Board	Board of Pesticides Control
Water Resources Control Board	Environmental Priorities Council
Biodiversity Council	Interagency Council on Natural Resources Policy
Board of Forestry and Fire Protection	Tourism Development Board
Forest Resources Council	Water Monitoring Council
Economic Development Commission	Environmental Science Board
Council on Environmental Quality	Environmental Quality Board
Commission on Water Resources Management	Commission on Hazardous Waste Management
Commission on Animal Species	Board of Environmental Review
Board of Land Use Appeals	Forest, Parks and Recreation Council
Commission on Natural Area Preserves	Board of Surface Mines
Forest Products Commission	Commerce and Economic Growth Commission
Pollution Control Board	State Game Commission
Endangered Species Protection Board	Fish and Wildlife Management Board
Hardwood Development Council	Community Forestry Council
Natural Resources Ethics Commission	Wetlands Trust Board
Rural Development Council	Wildlife and Parks Commission
Environmental Protection Commission	Council on Ecosystem Management
Forestry Commission	
Economic Development Partnership	

Source: Ellefson and others (2001).

Local Government Capacity

Local units of government often follow the lead of their State counterparts on matters of public access to government decisionmaking. In many cases, local units of government are bound by State law on such matters (Dresang and Gosling 1999). Unfortunately, the legal and institutional capacity of local governments to engage citizens in local government actions generally, and forest resource matters specifically, has not been assessed systematically or comprehensively.

Summary of Conditions

Public participation is an important step in determining and accomplishing societal interests in the sustainability of forests. This review suggests the following:

- The public participates in public agency decisions in a variety of ways. Members of the public engage in electoral processes, testify at public hearings and meetings, participate directly in multistakeholder collaboration activities, and engage in challenge or protest actions. The range of approaches to public participation is broad because the resource, social, and political issues associated with forests and their management are diverse.
- The legal capacity needed to engage the public in decisions regarding forest sustainability exists for nearly all State and Federal agencies that have responsibility for forests and related resources. However, the extent to which this capacity is exercised varies considerably within and among levels of government.
- Public participation processes are embodied in various legally established administrative structures and procedures. The latter include rulemaking (citizen right to petition regarding proposed rules), permit issuing (citizen right to know and deliberate issuance of proposed permits), planning (citizen right to participate in design of plans and programs), and information (citizen right to access government information).
- Federal authority to initiate public participation activities emanates from forest resource law (for example, National Forest Management Act), from environmental law (for example, National Environmental Policy Act), and from general government administrative law (for example, Administrative Procedures Act). There is substantial variation in the scope, focus, and intensity of Federal agency capacity stemming from these different legal authorities. Furthermore, Federal legal requirements for public participation are not always comprehensive; they very often focus on a single natural resource sector (for example, wildlife, water, recreation).
- State government authority to engage in public participation and related activities emanates primarily from open meeting and open record laws (only one State does not have an open-meeting law). However, States also authorize public participation in policy development via initiatives and referendums (all States have some form of authority for initiatives and referendums), citizen service on governing or advisory entities (248 such entities focus on forest resource and related agencies), forest resource planning activities, and participation in interest groups that focus the forest resource interests of many citizens.
- Local units of government often follow their State counterparts on matters of public access to government decisionmaking. The capacity of local governments to engage in public participation activities related to sustainable forestry is largely unknown.

Issues and Trends

Many questions remain to be asked about public participation in activities related to the sustainable management of forests. For example, who is the public and what is its proper role? What constitutes participation and when should it occur? What is the proper response of agency officials to resource decisions made with public participation? To what extent does broad citizen involvement promote the elusive "public interest" in forests? What distinctions (if any) should be made between participatory democracy and representative democracy? Should public officials be responsible to elected representatives when determining appropriate policies and directions regarding sustainability? Should legislative authority invested in an agency be devolved to collaborative groups or to a participatory process? Should persons or groups that do not engage in public participation be excluded from future decisions regarding policy selections? Do arrangements for public participation give the public access to the necessary scientific and technical expertise? Is conflict (as opposed to agreement and harmony) inherently bad, and are local solutions necessarily preferable to "top-down" solutions? And is there danger in focusing on well-functioning collaborative processes at the expense of substantive and sound sustainable forestry policies and programs? These and a host of related issues arise whenever the phrase "public participation" is used by professionals and lay citizens (McCloskey 1996, 2001; Wellman and Tipple 1990; Wondolleck and Yaffee 2000).

The effectiveness of public participation processes has also been the subject of discussion and debate. Concerned parties often wonder what constitutes a successful or effective public participation process (U.S. Department of Agriculture, Forest Service 2002). McCool and Guthrie (2001) suggest at least two standards: product-oriented measures of success (preparation of a plan, implementation

of a plan, social and political acceptability) and process-oriented measures of success (two-way learning, responsibility, relationship building, representation of interests). In fact, however, few studies of effectiveness have been conducted. Those that have been carried out suggest that public participation processes often favor highly educated, older males with higher incomes (Carr and Halvorsen 2001) and individuals who represent commodity or environmental interests (Baas 1993). Others have focused on participant satisfaction with public participation processes and the costs associated with such processes. McClaran and King (1999) found that all 96 national forest plans stimulated at least one appeal by 1989 and that the average was 8.4 appeals per plan. At the time of the study, 574 appeals had been resolved at an average cost of $50,000 per plan. Gerlicke and Sullivan (1994) estimated that public participation in national forest planning on 61 national forests cost the Government $61 million and required an average of 16 person-years of time. These costs do not include those incurred by interest groups and individuals who participated in the planning processes.

The literature devoted to issues and trends in public participation in relation to forest sustainability is especially rich. Examples of this literature (from which the following issues and trends are drawn) are: Baas 1993; Carr and Halvorsen 2001; Cortner and Shannon 1993; Daniels and Walker 1998; Lawrence and Daniels 1996; McCloskey 1996, 2001; Moore 1996; Smith and McDonough 2001; U.S. Department of Agriculture, Forest Service 2002; Williams and Ellefson 1997; Wondolleck and Yaffee 2000.

- Declining trust in government institutions generally has often distanced citizens from involvement in civic affairs. Invigorated and more engaging use of public participation may be increasing citizen involvement in government activities and rebuilding a sense of trust in government institutions.
- Multiple fragmented interests and the decline of integrative forces in forest resource decisionmaking have led to policy and program impasses that have fostered an increasing interest among agencies and other interested parties in new approaches for determining how forest resources will be used, managed, and protected. The huge expense and social costs associated with such impasses have been a major stimulus to renewed interest and vigor in public participation. Conflict-laden issues may persist, but there may be a growing sense that citizens are part of a community who have common interests and are actively and cooperatively determining the use, management, and protection of forests.
- Decentralization of agency decisionmaking regarding forests and related resources has fostered greater citizen interest in becoming involved in agency decisionmaking. Citizens who share a sense of community based on their common interest in a physical place appear more likely to become active participants in public participation processes.
- Formal processes (public hearings, advisory committees) for engaging the public in agency decisionmaking are increasingly viewed as adversarial in nature and are therefore limited in their ability to deal with conflict and discord over appropriate directions for forest sustainability. Agencies are increasingly interpreting their public participation authority to be more interactive and collaborative in nature.
- There is increasing disagreement about the relative merits of participatory democracy and representative democracy. For example, there are those who argue that agencies should directly engage citizens to determine agency roles and directions, and there are others who argue that these roles and directions should be determined by elected or appointed political officials. Concern over agency failure to exercise leadership in response to legislative mandates is also at issue.
- The effectiveness of public participation, and the relative merits of approaches that might be used to engage the public in agency decisionmaking, are increasingly unclear. It is uncertain whether public participation leads to a better reflection of the broad public interest in sustainable forestry than do other approaches to determining such interest. Analyses of efficiency and effectiveness are often muddied by unclear expectations about the role of public participation in rulemaking, permit issuance, and planning.
- More attention is being focused on determining who constitutes the public of interest with respect to agency decisionmaking. Efforts are being made to be more inclusive of interested parties, involving more than the most directly affected and most interested ones. However, discovering the appropriate combination of citizen input and professional expertise remains a difficult and unsolved problem within many agencies.
- The extent of application of public participation in sustainable forestry decision making is increasingly of concern, especially where such participation might be applied to private sector actions. Public participation applied to private forestlands implies that property rights and property tenure arrangements have changed. Similarly, the public's right of access to information regarding how private decisions are made also points to privacy and property rights issues.
- Public participation in the form of public access to the courts as a way of addressing issues involving forest sustainability has been common for many years. Laws and legal decisions have directed courts to be more liberal in determining who can bring a suit and the types of issues that can be addressed by citizen advocates.

- Interactive or collaborative public participation processes are increasingly being viewed as effective means of coordinating activities that involve many programs or many landowner categories. They are also being viewed as effective approaches for undertaking joint management activities (for example, Federal and State fire control activities), mobilizing resources (for example, financial and personnel resources), and exchanging information and sharing ideas (for example, multiagency information management).
- Public participation processes are becoming more sensitive to the growing interests of ethnic and other minority groups in forest and related natural resources. The language, traditions, and cultural background of such groups have often limited agency efforts to solicit minority involvement in agency decisionmaking (Baas 1993). Conversely, and often because of language, traditions, and background, such groups have been reluctant to get involved in agency matters.

Information Adequacy

Specification

Information about public participation and public access to information considered important to forest sustainability has been the focus of attention by many public and private organizations. In 1999, the National Association of State Foresters reported that 3 States had abundant information about public participation, 17 had sufficient information, and 3 had little information. It was considered somewhat troubling that 27 States had no information about public participation and public access to information. Four States reported that the quality of their information was excellent, 17 that it was adequate, and 2 that it was poor (National Association of State Foresters 1999). As best can be determined, no other organization has undertaken efforts to determine the nature and timeliness of information about public participation activities in the context of forest resources. Those that have been undertaken have not always been comprehensive or capable of being aggregated and usefully summarized. Furthermore, the available information often lacks a concerted focus on public participation and information-access activities.

Relatively little empirical research has been done on public participation processes, especially in relation to forest and related natural resource issues. In large measure this void results from problems in defining the intent and appropriate scope of public participation, and the lack of consistency in standards for judging the success of public participation processes. Even though many have offered generic criteria for assessing public participation processes (Carr and Halvorsen 2001, Cortner 1995, Shindler and others 1999, Smith and McDonough 2001, Tuler and Webler 1999), the results of research using such criteria often remain unclear and indeterminate. There have been many case studies of public participation, but little compilation of these studies has occurred. Very limited research has been undertaken to connect conflict management and public participation activities, testing the hypothesis that public participation processes provide a venue in which to constructively manage conflict. As an example, Gericke and Sullivan (1994) found that the proportion of forest designated as wilderness and the level of developed recreation use were good predictors of potential levels of conflict, and that the amount of time spent in public participation processes was not a significant factor in predicting levels of conflict.

The voids in information about public participation and public access to information are numerous and represent significant challenges to research. Examples of these information voids are as follows:

Measurement information—Variables that are appropriate for measuring the extent and effectiveness of public participation processes have not been identified and assembled. What are the goals of these processes and how do these affect the variables and measurement techniques applied to them? Do different goals lend themselves to the use of different variables and approaches to measurement? Can the variables used to measure the processes be compared when applied to different processes? How are these variables to actually be measured?

Extent of activity information—Compilation of the Federal legal framework for public participation that is related to forest resources has not been completed. State and local legal requirements for public participation have not been compiled. How extensive are local, State, and Federal authorities for public participation? Are these requirements changing over time? How do public participation processes interact between and within levels of government? How often does the public participate in participation processes? What are their expectations, and are those expectations being met?

Responsible organization information—Public and private entities involved in public participation processes have not been identified comprehensively and systematically. What agencies are involved, what legal authority assigns them responsibility, and is such authority being interpreted accurately? Are there organizational patterns that enhance or hinder the public participation process? Do public participation processes vary among different administering agencies?

Coordination information—Requirements for coordinating public participation among and between governments have not been compiled. How do differing public participation processes affect coordination of citizen interests across sectors, geography, and agencies? Are there legal requirements for coordination? Does the legal framework provide for processes that can be effective mechanisms for cross-sectoral policy integration? Does the legal framework support or discourage collaborative processes in which multisectoral actors come together at multiple levels to formulate and implement policy?

Procedure and specification information—Approaches to public participation in connection with the use and management of forest resources are many; their type and frequency of use have not been compiled or assessed. What degree of autonomy does the legal framework provide to decisionmakers when they work within collaborative and participatory processes? How much flexibility is there within the legal framework for different mechanisms of public participation? How prescriptive are the laws and regulations (for example, do they specify how to conduct public participatory meetings)?

Effectiveness information—The effectiveness of public participation processes has received only limited attention, and conclusions about it have been assembled only in a piecemeal fashion. What indicators should be measured to determine effectiveness? Do such indicators of effectiveness vary from process to process and from entity to entity? How would outcomes that might be expected from participatory democratic processes differ from those that might be expected from a representative democratic process? Are some processes more effective in certain situations than in others (such as collaborative versus public hearings, or legislative versus judicial involvement of citizens)? What types of monitoring might be appropriate to determining the long-term consequences of public participation?

Recommendations

The public's ability to influence forest sustainability will depend a great deal on the public's access to information and to agency decisionmaking processes, as Indicator 50 suggests. A number of information voids must be addressed if the institutional setting for public participation in sustainable forest use and management is to be improved. The following measures for dealing with these information voids would seem appropriate:

Perform comprehensive periodic reviews—Conduct comprehensive periodic reviews of current Federal, State, and local authorities that give direction and resources to public participation processes and public access to information. Guided by the above suggested information deficiencies, the reviews should give special attention to the collection of information concerning the different types of public participation processes, the organizations that implement them, and the effect of participatory activities on the accomplishment of desired forest values.

Assign responsibility for conducting reviews—Assign responsibility for conducting continuing reviews of these authorities to a specific, existing administrative unit of a Federal agency (such as the USDA Forest Service's Programs and Legislation unit, State and Private Forestry unit, or Research and Development unit), a college or university, or other nonprofit organization (such as the Pinchot Institute for Forest Conservation or the National Association of State Foresters). This responsibility should be assigned to an organization that has a proven track record in addressing the complexities of developing and implementing public participation programs involving forests and their sustainability.

Devote resources to reviews—Invest sufficient financial and personnel resources to provide the type and quantity of information necessary to dramatically improve understanding of current abilities to develop and implement public participation activities considered important to sustainable forestry.

Indicator Appropriateness

Indicator Definition

Analysis of the legal capacity to engage in activities suggested or alluded to by Indicator 50 is hampered by the use of undefined words and phrases, including "public," "public participation," public policy," "decisionmaking," and "public access to information." These words or phrases are supposedly grounded in an agreed-to set of concepts, but such is not always the case. For example, the term "public" is at times used to refer to those affected by or interested in a pending resource decision, while at other times it is used to refer to society in general. Also troubling is the inclusion in the Indicator of the phrase ". . . [opportunities for] public access to information." It would probably be better to discuss public access to information in connection with Indicator 53 (public involvement activities and public education). Finally, we propose that Indicator 50 be reworded as follows: ". . . *provides opportunity for citizens to participate, in an informed manner, in decisions affecting forests*."

Relationship to Other Indicators

Indicator 50 is clearly and directly related to Indicators 48 (property rights), 49 (planning), 51 (best-practice codes),

52 (special values), 53 (public involvement and education), and 66 (impacts of human intervention). It is less directly related to Indicators 38 (investment in forests), 39 (investment in research), 40 (new technologies), 57 (enforcement), 61 (inventory information), 63 (scientific understanding), and 64 (value integrative methods).

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Appendix

U.S. Code of Federal Regulations Requirements for Public Participation Processes Involving Forest and Related Resources, 2001

TITLE 16 – CONSERVATION

Chapter 1 – National Parks, Military Parks, Monuments, and Seashores

Subchapter I – National Park Service

Sec. 1a-5. Additional areas for National Park System: "Each study under this section shall be prepared with appropriate opportunity for public involvement, including at least one public meeting in the vicinity of the area under study, and after reasonable efforts to notify potentially affected landowners and State and local government."

Subchapter LX – National Military Parks

Sec. 430-g. Advisory Commission: "Notice of meetings and agenda shall be published in local newspapers which have a distribution which generally covers the area affected by the park. Advisory Commission meetings shall be held at locations and in such a manner as to ensure adequate public involvement."

Subchapter LXIX – Outdoor Recreation Programs

Part B – Land and Water Conservation Fund

Sec. 4601-8. Financial assistance to States: "That no plan shall be approved unless the Governor of the respective State certifies that ample opportunity for public participation in plan development and revision has been accorded. The Secretary shall develop, in consultation with others, criteria for public participation, which criteria shall constitute the basis for the certification by the Governor."

Part E – Reclamation Recreation Management

Sec. 4601-33. "Management of reclamation lands shall be developed with appropriate public participation."

Chapter 2 – National Forests

Subchapter I

Sec. 479a. Conveyance of National Forest System lands for educational purposes: "… an opportunity for public participation in a disposal under this section has been provided, including at least one public hearing or meeting, to provide for public comment."

Subchapter II – Scenic Areas

Sec 541b. *Boundaries of scenic-research area; adjustments to subarea boundary; development of management plan; establishment of subareas; management objectives*: "Provided, that, from time to time, the Secretary may, after public hearing or other appropriate means for public participation, make adjustments in the boundaries of subareas to reflect changing natural conditions or to provide for more effective management of the Area and each of the subareas in accordance with the purposes and provisions of the subchapter." "As soon as practicable after December 22, 1974, the Secretary shall, with provisions for appropriate public participation in the planning process, develop a comprehensive management plan for the Area."

Sec. 544d. *Scenic area management plan:* "The Secretary and the Commission shall conduct public hearings and solicit public comment prior to the final adoption of land use ordinances."

Sec. 546a-1. *Administration and management*: "In preparing the management plan, the Secretary shall consult with appropriate State and local government officials, provide for full public participation, and consider the views of all interested parties, organizations, and individuals."

Chapter 5A – Protection and Conservation of Wildlife

Subchapter III – Endangered Species of Fish and Wildlife

Sec. 668dd. National Wildlife Refuge System: "The public should be given a full and open opportunity to participate in decisions regarding acquisition and management of National Wildlife Refuges.""…ensure appropriate public involvement opportunities will be provided in conjunction with refuge planning and management activities."

Chapter 5B – Wildlife Restoration

Sec. 669. Cooperation of Secretary of the Interior with States: "…to encourage State fish and wildlife agencies to provide for public involvement in the process of development and implementation of a wildlife conservation and restoration program."

Sec. 669c. Allocation and apportionment of available amounts: "…provisions to ensure public participation in the development, revision, and implementation of projects and programs required under this paragraph. A State shall provide an opportunity for public participation in the

development of the comprehensive plan required under paragraph (1)."

Chapter 6 – Game and Bird Preserves; Protection

Sec. 698r. Administration: "The secretary shall develop and conduct a program to promote and encourage awareness of and participation in the development of the general management plan for the Preserve by persons owning property in the vicinity of the Preserve, other interested groups and individuals, State, county, and municipal agencies, and the general public." "In preparing and implementing the plan described in paragraph (1), the Secretary shall give full consideration to the views and comments of the individuals, groups, and agencies described in paragraph (1)."

Sec. 698u-5. Advisory Committee: "Meetings shall be held at such locations and in such a manner as to ensure adequate opportunity for public involvement. In compliance with the requirements of FACA, the advisory Committee shall choose an appropriate means of providing interested members of the public advance notice of scheduled meetings."

Chapter 7 – Protection of Migratory Game and Insectivorous Birds

Subchapter I – Generally

Sec. 701. Game and wild birds; preservation: "These protocols may be incorporated into existing actions; however, the MOU shall recognize that the agency may not be able to implement some elements of the MOU until such time as the agency has successfully included them in each agency's formal planning process (such as revision of agency land management plans, land use compatibility guidelines, integrated resource management plans, and fishery management plans), including public participation and NEPA analysis, as appropriate."

Chapter 27 – National Trails System

Section. 1244. National scenic and national historic trails: "The Secretary of the Interior shall – (i) encourage communities and owners of land along the trail, native Hawaiians, and volunteer trail groups to participate in the planning, development, and maintenance of the trail."

Chapter 28 – Wild and Scenic Rivers

Sec. 1274. Component rivers and adjacent lands: "Commission meetings shall be held at locations and in such a manner as to ensure adequate public involvement."

Sec. 1276. Rivers constituting potential additions to national wild and scenic rivers system: "For purposes of such river studies, the Secretary shall consult with each River Study Committee authorized under section 5 of the Michigan Scenic Rivers Act of 1990, and shall encourage public participation and involvement through hearings, workshops, and such other means as are necessary to be effective."

Chapter 32 – Marine Sanctuaries

Sec. 1445a. Advisory Councils, Public participation and procedural matters: "The following guidelines apply with respect to the conduct of business meetings of an Advisory Council: (1) Each meeting shall be open to the public, and interested persons shall be permitted to present oral or written statements on items on the agenda. (2) Emergency meetings may be held at the call of the chairman or presiding officer. (3) Timely notice of each meeting, including the time, place, and agenda of the meeting, shall be published locally and in the Federal Register, except that in case of a meeting of an Advisory Council established to provide assistance regarding any individual national marine sanctuary the notice is not required to be published in the Federal Register. (4) Minutes of each meeting shall be kept and contain a summary of the attendees and matters discussed."

Chapter 33 – Coastal Zone Management

Sec. 1455. Administrative grants: "Management program provides for public participation in permitting processes, consistency determinations, and similar decisions."

Sec. 1455b. Protecting coastal waters: "Opportunities for public participation in all aspects of the program, including the use of public notices and opportunities for comment, nomination procedures, public hearings, technical and financial assistance, public education, and other means."

Sec. 1458. Review of performance: "In evaluating a coastal state's performance, the Secretary shall conduct the evaluation in an open and public manner, and provide full opportunity for public participation, including holding public meetings in the State being evaluated and providing opportunities for the submission of written and oral comments by the public. The Secretary shall provide the public with at least 45 days' notice of such public meetings by placing a notice in the Federal Register, by publication of timely notices in newspapers of general circulation within the State being evaluated, and by communications with persons and organizations known to be interested in the evaluation. Each evaluation shall be prepared in report form and shall include written responses to the written comments received during the evaluation process. The final report of the evaluation shall be completed within 120 days after the last public meeting held in the State being evaluated. Copies of the evaluation shall be immediately provided to all persons and organizations participating in the evaluation process."

Chapter 35 – Endangered Species

Sec. 1535. Cooperation with States: "…provision is made for public participation in designating resident species of fish or wildlife as endangered or threatened; provision is made for public participation in designating resident species of plants as endangered or threatened."

Chapter 36 – Forest and Rangeland Renewable Resources Planning

Subchapter 1 – Planning

Sec. 1600. Congressional findings: "…to serve the national interest, the renewable resource program must be based on a comprehensive assessment of present and anticipated uses, demand for, and supply of renewable resources from the Nation's public and private forests and rangelands, through analysis of environmental and economic impacts, coordination of multiple use and sustained yield opportunities as provided in the Multiple-Use Sustained-Yield Act of 1960, and public participation in the development of the program."

Sec. 1601. Renewable Resource Assessment: "In developing reports … the Secretary shall provide opportunity for public involvement and shall consult with other interested governmental departments and agencies."

Sec. 1604. National Forest System land and resource management plans: "The Secretary shall provide for public participation in the development, review, and revision of land management plans including, but not limited to, making the plans or revisions available to the public at convenient locations in the vicinity of the affected unit for a period of at least three months before final adoption, during which period the Secretary shall publicize and hold public meetings or comparable processes at locations that foster public participation in the review of such plans or revisions."

Sec. 1611 Timber: "Plans for variations in the allowable sale quantity must be made with public participation as required by section 1604(b) of this title."

Sec. 1612. Public participation: "In exercising his authorities under this subchapter and other laws applicable to the Forest Service, the Secretary, by regulation, shall establish procedures, including public hearings where appropriate, to give the Federal, State, and local governments and the public adequate notice and an opportunity to comment upon the formulation of standards, criteria, and guidelines applicable to Forest Service programs." "In providing for public participation in the planning for and management of the National Forest System, the Secretary, pursuant to the Federal Advisory Committee Act and other applicable law, shall establish and consult such advisory boards as he deems necessary to secure full information and advice on the execution of his responsibilities. The membership of such boards shall be representative of a cross section of groups interested in the planning for and management of the National Forest System and the various types of use and enjoyment of the lands thereof." "In accordance with this section, the Secretary of Agriculture, acting through the Chief of the Forest Service, shall establish a notice and comment process for proposed actions of the Forest Service concerning projects and activities implementing land and resource management plans developed under the Forest and Rangeland Resources Planning Act of 1974 and shall modify the procedure for appeals of decisions concerning such projects." "Prior to proposing an action referred to in subsection (a), the Secretary shall give notice of the proposed action, and the availability of the action for public comment by (A) promptly mailing notice about the proposed action to any person who has requested it in writing, and to persons who are known to have participated in the decisionmaking process; and (B)(I) in the case of an action taken by the Chief of the Forest Service, publishing notice of action in the Federal Register; or (ii) in the case of any other action referred to in subsection (a), publishing notice of action in a newspaper of general circulation that has previously been identified in the Federal Register as the newspaper in which notice under the paragraph may be published. (2) Comment – The Secretary shall accept comments on the proposed action within 30 days after publication of the notice in accordance with paragraph (1). (c) Right to Appeal – Not later than 45 days after the date of issuance of a decision of the Forest Service concerning actions referred to in subsection (a), a person who was involved in the public comment process under subsection (b) through submission of written or oral comments or by otherwise notifying the Forest Service of their interest in the proposed action may file an appeal. (d) Disposition of an Appeal. – (1) Informal disposition. – (A) In general;. – Subject to subparagraph (B), a designated employee of the Forest Service shall offer to meet with each individual who files and appeal in accordance with subsection (c) and attempt to dispose of the appeal. (B) Time and location of the meeting. – Each meeting in accordance with subparagraph (A) shall take place – (I) not later than 15 days after the closing date for filing an appeal; and (ii) at a location designated by the Chief of the Forest Service that is in the vicinity of the lands affected by the decision. (2) Formal review. – If this appeal is not disposed of in accordance with paragraph (1), an appeals review officer designated by the Chief of the Forest Service shall review the appeal and recommend in writing, to the official responsible for deciding the appeal, the appropriate disposition of the appeal. The official responsible for deciding the appeal shall then decide the appeal. The appeals review officer shall be a line officer at least at the level of the agency official who made the initial decision on the project or activity that is under appeal, who has not participated in

the initial decision and will not be responsible for implementation of the initial decision after the appeal is decided. (3) Time for disposition – Disposition of appeals under this subsection shall be completed not later than 30 days after the closing date for filing of an appeal, provided that the Forest Service may extend the closing date by an additional 15 days. (4) If the Secretary fails to decide the appeal within the 45-day period, the decision on which the appeal is based shall be deemed to be a final agency action for the purpose of chapter 7 of title 5, United States Code. (e) Stay – Unless the Chief of the Forest Service determines that an emergency situation exists with respect to a decision of the Forest Service, implementation of the decision shall be stayed during the period beginning on the date of the decision – (1) for 45 days, if an appeal is not filed, or (2) for an additional 15 days after the date of the disposition of an appeal under this section, if the agency action is deemed final under subsection (d)(4)."

Chapter 40 – Soil and Water Resources Conservation

Sec. 2004. Continuing appraisal of soil, water, and related resources: "Appraisal shall be made in cooperation with conservation districts, soil and water conservation agencies, and other appropriate citizen groups, and local and State agencies under such procedures as the Secretary may prescribe to ensure public participation."

Chapter 51 – Alaska National Interest Lands Conservation

Subchapter V – Federal-State Cooperation

Sec. 3181. Alaska Land Use Council: "Cooperative agreements established pursuant to this section shall include a plan for public participation consistent with the guidelines…" "The Council shall establish and implement a public participation program to assist the Council to carry out its responsibilities and functions under this section. Such program shall include, but is not limited to – (1) A committee of land-use advisors appointed by the Cochairmen made up of representatives of commercial and industrial land users in Alaska, recreational land users, wilderness users, environmental groups, Native Corporations, and other public and private organizations. To the maximum extent practicable, the membership of the committee shall provide a balanced mixture of national, State, and local perspective and expertise on land and resource use issues; and (2) A system for (A) the identification of persons and communities, in rural and urban Alaska, who or which may be directly or significantly affected by studies conducted, or advice and recommendations given by the Council pursuant to this section, and (B) guidelines for, and implementation of, a system for effective public participation by such persons or communities in the development of such studies, advice, and recommendations by the Council."

Chapter 54 – Resource Conservation

Subchapter V – Resource Conservation

Sec. 3452. Definitions: "The term 'planning process' means the continuous effort by any State, local unit of government, or local nonprofit organization to develop and carry out effective resource conservation and utilization plans for a designated area, including development of an area plan, goals, objectives, policies, implementation activities, evaluations and reviews, and the opportunity for public participation in such efforts."

Chapter 63 – Federal Cave Resources Protection

Sec. 4303. Management actions: "… foster communication, cooperation, and exchange of information between land managers, those who utilize caves, and the public."

Chapter 71 – Atlantic Coastal Fisheries Cooperative Management

Sec. 5104. State implementation of coastal fishery management plans: "... the Commission provides adequate opportunity for public participation in the plan preparation process, including at least four public hearings and procedures for the submission of written comments to the Commission."

Chapter 80 – Neotropical Migratory Bird Conservation

Sec. 6106. Cooperation: "(A) Meetings – The advisory group shall – (I) ensure that each meeting of the advisory group is open to the public; and (ii) provide, at each meeting, an opportunity for interested persons to present oral or written statements concerning items on the agenda. (B) Notice – The Secretary shall provide to the public timely notice of each meeting of the advisory group. (c) Minutes – Minutes of each meeting of the advisory group shall be kept by the Secretary and shall be made available to the public."

TITLE 33 - NAVIGATION AND NAVIGABLE WATERS

Chapter 26 – Water Pollution Prevention and Control

Subchapter I – Research and Related Programs

Sec. 1251. Congressional declaration of goals and policy: "Public participation in the development, revision, and enforcement of any regulation, standard, effluent limitation, plan, or program established by the Administrator or any State under this chapter shall be provided for, encouraged, and assisted by the Administrator and the States. The Administrator, in cooperation with the States, shall develop and publish regulations specifying minimum guidelines for public participation in such processes."

Subchapter III – Standards and Enforcement

Sec. 1329 Nonpoint source management programs: "…describes the process, including intergovernmental coordination and public participation, for identifying best management practices…"

Chapter 27 – Ocean Dumping

Subchapter I – Regulation

Sec. 1414b. Ocean dumping of sewage sludge and industrial waste: "The Administrator shall provide an opportunity for public comment regarding the establishment and implementation of compliance agreements and enforcement agreements entered into pursuant to this section."

Chapter 29 – Deep Water Ports

Sec. 1509. Marine environmental protection and navigational safety: "subject to … and the provision of adequate public involvement, the Secretary shall prescribe and enforce procedures."

Chapter 36 – Water Resources Development

Subchapter V – General Provisions

Sec. 2319. Reservoir management: "The Secretary shall ensure that, in developing or revising reservoir operating manuals of the Corps of Engineers, the Corps shall provide significant opportunities for public participation, including opportunities for public hearings."

TITLE 43 – PUBLIC LANDS

Chapter 12 – Reclamation and Irrigation of Lands by Federal Government

Subchapter I-A – Reclamation Reform

Sec. 390jj. Water Conservation: "The Secretary is authorized and directed to enter into memorandums of agreement with those Federal agencies having capability to assist in implementing water conservation measures to assure coordination of ongoing programs. Such memorandums should provide for involvement of non-Federal entities such as States, Indian tribes, and water user organizations to assure full public participation in water conservation efforts."

Chapter 35 – Federal Land Policy and Management

Subchapter I – General Provisions

Sec 1702. Definitions: "The term 'public involvement' means the opportunity for participation by affected citizens in rulemaking, decisionmaking, and planning with respect to the public lands, including public meetings or hearings held at locations near the affected lands, or advisory mechanisms, or such other procedures as may be necessary to provide public comment in a particular instance."

Subchapter II – Land Use Planning and Land Acquisition and Disposition

Sec 1712. Land use plans: "The Secretary shall, with public involvement and consistent with the terms of this act, develop, maintain and when appropriate, revise land use plans…" "the Secretary … shall provide for meaningful public involvement of State and local government officials." "The Secretary shall allow an opportunity for public involvement and by regulation shall establish procedures, including public hearings where appropriate, to give Federal, State, and local governments and the public adequate notice and opportunity to comment upon and participate in the formulation of plans and programs relating to the management of public lands."

Subchapter III – Administration

Sec. 1739. Advisory councils: "In exercising his authorities under this Act, the Secretary, by regulation, shall establish procedures, including public hearings where appropriate, to give the Federal, State, and local governments and the public adequate notice and an opportunity to comment upon the formulation of standards and criteria for, and to participate in, the preparation and execution of plans and programs for, and the management of, public lands."

Best-Practice Codes for Forest Management (Indicator 51)

Paul V. Ellefson and Calder M. Hibbard[1]

The full text of Indicator 51 is as follows: *Extent to which the legal framework (laws, regulations, guidelines) supports the conservation and sustainable management of forests, including the extent to which it* ***encourages best-practice codes for forest management*** (Montreal Process Working Group 2003)

Rationale and Interpretation

Forest management practices that are well designed and properly applied are fundamental to the sustainability of forest resources. At all levels (stand, landscape, local, regional, national, global), forests depend on the application of forest practices that are capable of ensuring sustained use, management, and protection of important social, economic, and biological values. Exploitive or destructive forest practices may lead to short-term financial or social gains, but they may also cause temporary or irreparable harm to ecological and biological processes in forests and ultimately decrease long-term social and economic welfare. Well-founded best-practice codes, and the forest management practices required by such codes, can ensure sustained forest productivity for market goods, protection of ecological values, and protection of the various social, cultural, and spiritual values offered by forests. Such codes and practices can be among the most important tools for responding to national trends and conditions involving forests (Cubbage and Moffat 1997, Montreal Process Working Group 2003, Montreal Process Technical Advisory Committee 2000).

Useful data for measuring Indicator 51 are compilations and descriptions of laws and programs at national and subnational levels that require the establishment of appropriate practices and harvesting activities, specification of practices and harvesting activities to be applied, and designation of the programmatic means by which such practices are to be delivered to landowners and timber harvesters (for example, fiscal incentives, technical assistance, regulations and ordinances). Similarly useful in describing this indicator are the compilation and description of processes that encourage monitoring of the rate at which these practices are actually being applied and, when appropriate, updated (Montreal Process Technical Advisory Committee 2000).

Concepts and principles that are to be identified and addressed are suggested by the indicator. For the purposes of this review *best-practice codes* can be defined as a set of forest management or harvesting standards (benchmarks, yardsticks, touchstones, measures, criteria) that foster sustainable management of forests for various values and benefits. Best practices are also referred to as best management practices, forest-practice guidelines, forest practice rules, acceptable practices, and management ordinances. To *encourage codes* is to promote the development of best-practice codes (through leadership, organization, funding) and their subsequent application in response to various types of programs (for example, educational, technical assistance, fiscal incentives, tax incentives, regulatory programs).

Conceptual Background

Typically, best-practice codes are summations of various forest practices considered to be technically, economically, and politically acceptable for achieving certain desired conditions of forest sustainability. Their development by public and private agencies usually involves a collaborative process whereby the final sets of best practices are those that produce sustainable forest conditions and, to the extent possible, meet the biological, economic, and social objectives of those engaged in their development. Although initially developed in response to concern over nonpoint forest sources of water pollutants, codes have been developed for nearly all forest practices (for example, roads, pesticides, reforestation, prescribed fire) that are important to the attainment of values associated with forests, such as wildlife, recreation, wetlands, timber, and aesthetic beauty.

Best-practice codes have been developed and implemented by a large number of public and private organizations. The diversity of these organizations has often resulted in the production of a variety of best management codes that reflect the interests and requirements of the sponsoring organizations. In some cases such codes are well coordinated, but in other cases they may be in direct conflict. Privately developed and implemented codes of forest practices include the Sustainable Forestry Initiative of the American Forest and Paper Association (2001a) and the forest certification program of the Forest Stewardship Council (1999). Although some private initiatives have occurred, government organizations, in response to various legal mandates, have been the most active force in pursuing the development and application of best-practice codes.

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The U.S. Environmental Protection Agency, responding to requirements of the 1972 Amendments to the Federal Water Pollution Control Act and the Coastal Zone Management Act of 1972, has been and continues to be a major stimulus in the development of best management practices, especially those developed by State governments. Similarly, the U.S. Fish and Wildlife Service has developed best-practice codes focused on wildlife values, and the USDA Forest Service has developed best management practices for forestlands that are part of the National Forest System (Anderson 2000).

Ultimately, the usefulness of best-practice codes depends on the extent to which they are applied by forest landowners and timber harvesters. In some cases, voluntary acceptance and application of codes is the primary approach to securing their use. Landowner and harvester goodwill and sense of stewardship toward forests is considered the only motivation necessary to accomplish the application of appropriate forest practices. On their own initiative, groups of timber harvesters, nonindustrial private landowners, and industrial timberland owners may band together to develop, adopt, and apply best-practice codes. In certain situations, however, government may need to play a major role. Uninformed or misinformed landowners and harvesters may require information provided by educational initiatives (often provided by State Extension Service programs) or technical assistance programs (provided individually by public or private service foresters) if they are to apply best-practice codes. Government-sponsored fiscal and tax incentives may also be necessary where landowners and harvesters lack the financial resources needed to apply best-practice codes. And where landowners and harvesters are not persuaded of the necessity to apply certain forest practices that are considered essential to sustaining important forest values, a regulatory or mandatory approach has been found necessary.

Best-practice codes and the programs that foster their implementation are dynamic systems that require careful monitoring. Such monitoring can be most useful in determining whether more aggressive delivery of good practices via more or better organized programs is necessary, or whether there are technical problems (such as obsolescence or ineffectiveness) with the forest practices recommended in the best-practice code. Compliance monitoring and effectiveness monitoring have been a key component of most private and public initiatives involving best-practice codes. Some States have conducted six or more cycles of compliance monitoring over a period of 10 to 12 years (National Association of State Foresters 2001).

Current Legal Capacity

Private Sector Capacity

Private organizations representing a variety of interests in sustaining forests have developed and implemented codes of best practices for forest management. Adopted by various forest certification programs, these codes of best forest practices clearly demonstrate the capacity of the private sector to assume responsibility for ensuring the sustainability of forests and the communities that are dependent upon them. The motives for their development and implementation are many, and include improving the performance of forest management activities and the strengthening of the credibility and public acceptance of forestry in general. A significant aspect of all private certification efforts is that they represent voluntary, nonregulatory approaches to the promotion of improved forest practices and forest management systems. Certification of a forest implies that the management practices being applied meet approved standards of a designated authority (Society of American Foresters 1999).

There are more than 25 nongovernmental forest certification programs worldwide plus a number of governmental efforts to develop criteria and indicators of sustainable forest management. Best-practice codes are frequently the most visible on-the-ground expression of sustainable forest management (Confederation of European Paper Industries 2000, Society of American Foresters 1999).[2] In the United States, five major nongovernmental certification programs recommending best practices for forest management have gained considerable attention (table 1). Although the best practices recommended by these programs can differ substantially in content, all programs have standards that in some way address such subjects as planning, management, reforestation, forest operations, special places, pesticides, product utilization, fish and wildlife, and soil and water resources. Programs typically set forth sets of best-practice principles or objectives within which participants are given substantial flexibility to develop more exacting practices considered appropriate to specific resource, economic, and political settings (American Forest and Paper Association 2001a, 2001b; Forest Stewardship Council 2000). The exact nature of the practices being applied in response to these principles has not yet been compiled in a

[2] Examples of international certification programs and activities are the International Standards Organization (ISO) 14001 Environmental Management System (especially ISO TR 14061), Pan-European Forest Certification, Alliance of World Wide Fund for Nature and World Bank, World Business Council for Sustainable Development, Center for International Forestry Research, and programs in various countries, including Austria, Bolivia, Brazil, Canada, Czech Republic, Denmark, Finland, France, Ghana, Indonesia, Latvia, Malaysia, Mexico, Norway, Sweden, Switzerland, and the United Kingdom (Confederation of European Paper Industries 2000, Society of American Foresters 1999).

Table 1—Nongovernmental forest certification programs promoting best-forest-practice standards, by program characteristic (1999)

Program characteristic	Forest Certification Program				
	Sustainable Forestry Initiative Program	Forest Stewardship Council Program	Environmental Management Systems: Forestry ISO 14000: TC 201	Tree Farm Program	Green Tag Forestry Program
Sponsor	American Forest and Paper Association (AF&PA)	Forest Stewardship Council	International Standards Organization	American Forest Foundation	National Forestry Association (NFA) and National Woodland Owners Association
Mission	Promote commitment to sustainable forestry and the measures by which the public can measure this commitment	Improve forest practices through market-based mechanisms	Provide standardized means by which companies can address environmental impacts of their activities	Ensure sustainable forests by providing landowners with information and voluntary verification of sustainable forest practices	Promote landowner recognition of responsibility for sustainable woodland management
Eligible parties	AF&PA members	Interested forest landowners	Organizations involved in environmental management	Owners of 10 or more acres of forestland	NFA members
Forest practice standard key principles	Principles: use responsible forest practices, protect forest health and productivity, protect special forest sites, continuously improve practice of forest management	Principles: comply with laws, establish clear tenure to land, respect indigenous peoples' rights, enhance well-being of workers and communities, ensure wide range of environmental and social benefits, conserve biological diversity, develop forest management plans, monitor forestry activities, conserve natural forests, and plan environmentally for plantations	Principles: give environmental management high priority, communicate externally, comply with laws and rules, assign responsibility for environmental management, promote environmental planning, establish performance discipline, evaluate performance, establish audit systems, encourage vendors to establish environmental management systems	Principles: broaden practice of sustainable forestry; communicate to and involve public; prudently use chemicals; reforest harvested lands; manage for quality water, wildlife, aesthetics, special sites, and biodiversity	Principles: promote forest sustainability by sound management involving planning, tree harvesting, road construction, skidding, post-harvest evaluations, product utilization, chemical applications, community and employee relations, economic viability, and recordkeeping
Forest practice standard audits	Voluntary verification or second- and third-party audits	Third-party audits	First-, second-, or third-party audits	Third-party audits	Third-party audits

Source: Adapted from Society of American Foresters (1999).

comprehensive sense, nor has the effectiveness of the practices been addressed by long-term research activities.

The administration of certification programs varies considerably. Some are directly involved in encouraging the application of best-practice codes (Sustainable Forestry Initiative, Green Tag Forestry Program), while others are international bodies that accredit certification organizations. An example of the latter is the Forest Stewardship Council which (as of 1999) has accredited two national certifiers in the United States, namely Scientific Certification Systems and SmartWood (a program of the Rainforest Alliance), which work through various regionally based organizations. The best-practice codes developed by these regional organizations are required to be consistent with the Forest Stewardship Council's 10 principles of forest sustainability. The Green Tag Forestry Program sets forth principles of best forest practices, and then engages the services of foresters who are members of the Society of American Foresters to guide their application to forests owned by participating landowners. The ISO certification process does not specify principles of best forest practices, but instead allows their development and adoption by organizations seeking certification (Society of American Foresters 1999).

The best-practice standards promoted by programs certifying sustainable forest management conditions are useful to the extent they are actually applied in a forest setting. Except in certain limited cases, information about their ability to actually achieve principles of forest sustainability is limited. However, the acreage of forestland enrolled by the programs in the United States in 1999 is substantial. These programs include the Sustainable Forestry Initiative Program (56.5 million acres), American Tree Farm Program (85 million acres), Forest Stewardship Council Program (4.6 million acres), and Green Tag Forestry Program (2,100 acres) (Society of American Foresters 1999). As interest in encouraging best practices by the use of certification programs continues to grow, the number and sophistication of such programs grow also. The changing conditions created by this evolutionary process pose special challenges to identifying, compiling, and measuring the ability of privately initiated certification programs to encourage the use of best-practice codes (Cook and O'Laughlin 1999). The certification system worldwide has yet to determine who the major organizational players will be and what set of comprehensive codes they will advocate as most useful for accomplishing sustainable forestry objectives. The information management task implied by this endeavor is lessened in some cases by the periodic status reports issued by some sponsoring organizations (for example, American Forest and Paper Association 2001a, Forest Stewardship Council 1999).

Federal Government Capacity

A number of Federal laws and associated Federal rules and administrative directives represent a significant capacity to influence forest practices applied on public and private forestland (table 2). Of the 16 Federal laws listed in the table, all but 3 rely indirectly on State governments to develop and implement best management practice codes that are considered important to the achievement of certain national interests in forests. These laws typically require State actions that favor the establishment of forest-practice codes to be implemented in various State-selected ways (for example, the Clean Water Act required programs for controlling nonpoint-source pollution; the Coastal Zone Management Act required the adoption of enforceable best-practice codes). In nine of the Federal statutes identified, Federal law directly promotes or limits the application of certain practices on all forest ownerships (for example, the Occupational Safety and Health Act states conditions for felling and skidding; the Federal Insecticide, Fungicide, and Rodenticide Act states conditions for pesticide application in wetlands). Only three of the Federal statutes identified call for best-forest-practice codes to be developed specifically for Federal lands (for example, the National Forest Management Act states conditions for growing and harvesting timber in national forests). Most best-practice codes of Federal agencies are included in the land management plans that guide the use and management of Federal public lands.

The following are more detailed examples of laws that authorize the Federal Government to establish and encourage the application of forest practices considered necessary to sustain forests (Brown and others 1993; U.S. Department of Agriculture, Forest Service 1993; West Publishing 1997).

Direct prescriptions—

Occupational Safety and Health Act of 1970: Requires the establishment and implementation of workplace safety and health standards. As examples, the safety standards (or best practices) cover felling, bucking, limbing, loading, skidding, road and bridge building, and the use of explosives. Federal administrative responsibility for rule promulgation and enforcement rests with the U.S. Department of Labor.

Endangered Species Act of 1973: Requires prevention of the extinction of endangered species of flora and fauna, and authorizes regulations as deemed necessary and advisable to provide for the conservation of such species. Where necessary for the conservation and survival of such species, recovery plans are to be developed that include site-specific management actions as may be necessary to achieve a plan's goal. Certain harmful actions are prohibited

Table 2—Federal statutes requiring development and application of best-forest-practice standards, by resource focus and landowner application

Federal statute	Major forest (or related) resource of concern	Federal statutory requirements for application of forest-practice code		
		Direct Federal application only to Federal land	Direct Federal application to all forestland	Indirect State action for code development
Clean Air Act of 1990	Air		X	X
Clean Water Act of 1987	Water		X	X
Coastal Zone Management Act of 1972	Comprehensive			X
Endangered Species Act of 1973	Fish and Wildlife		X	X
Federal Insecticide, Fungicide, and Rodenticide Act (as amended 1996)	Comprehensive		X	X
Federal Land Policy and Management Act of 1976	Comprehensive	X		
Fish and Wildlife Conservation Act of 1980	Fish and Wildlife			X
National Park Service Organic Act of 1916	Recreation	X		
National Trails System Act of 1968	Recreation		X	X
National Wildlife Refuge System Administration Act of 1966 (amended 1997)	Fish and Wildlife	X		
Occupational Safety and Health Act of 1970	Comprehensive		X	X
Rivers and Harbors Act of 1890	Water		X	X
Soil and Water Conservation Act of 1977	Comprehensive			X
Superfund Act of 1980	Comprehensive		X	X
Surface Mining Control and Reclamation Act of 1977	Comprehensive			X
Wild and Scenic Rivers Act of 1968	Recreation		X	X

Note: Superfund Act of 1980 is the Comprehensive Environmental Response, Compensation and Liability Act of 1980. Federal Insecticide, Fungicide, and Rodenticide Act includes the Agricultural Worker Protection Standard for the distribution and use of pesticides.
Source: U.S. Department of Agriculture, Forest Service (1993), and West Publishing (1997).

outright; these include actions that result in significant habitat modification or that harass, harm, kill, trap, or involve collection of endangered or threatened species of fish and wildlife. Federal administrative and enforcement responsibility for the act rests with the U.S. Fish and Wildlife Service and the National Marine and Fisheries Service.

National Forest Management Act of 1976: Requires the preparation of land and resource management plans for national forests and requires that such plans include (as examples) guidelines ensuring that timber is harvested only where soil, slope, or watershed conditions will not be irreversibly damaged; there is assurance that lands can be adequately restocked within 5 years after harvest; protection is provided for streams, streambanks, shorelines, lakes, and wetlands; and cut blocks, patches, or strips are shaped and blended with natural terrain. Federal administrative authority for the act rests with the Forest Service, U.S. Department of Agriculture.

Federal Land Policy and Management Act of 1976: Requires the preparation of land-use plans for Federal public lands (land administered by the Bureau of Land Management) that ensure that the use and management of such lands shall be in compliance with applicable pollution control laws, including air, water, noise, and other pollution-control standards or plans; and will minimize adverse impacts on the natural, environmental, scientific, cultural, and other resources and values (including fish and wildlife habitats) of the public lands involved. Federal administrative authority for the act rests with the Bureau of Land Management, U.S. Department of the Interior.

Indirect prescriptions—

Clean Water Act of 1987 (amendments to Federal Water Pollution Control Act): Requires States to prepare a nonpoint-source management program, specifically to identify waters that require action to control nonpoint sources of pollution, to identify nonpoint sources that add significant

pollutants, and to develop plans for identifying best management practices and measures to control each category and subcategory of nonpoint sources. Federal administrative responsibility for the act rests with the U.S. Environmental Protection Agency. Enforcement of the nonpoint-source plans is a State responsibility.

Coastal Zone Management Act of 1972: Requires States to develop plans to implement economically achievable measures for the control of nonpoint sources of pollutants originating in designated coastal regions of the United States. Forest management measures include preharvest planning, streamside management, road construction and reconstruction, site preparation, fire management, revegetation of disturbed areas, and wetland management. States must implement these measures by means of enforceable policies and mechanisms. Federal administrative responsibility rests with the U.S. Environmental Protection Agency and the National Oceanic and Atmospheric Administration. Enforcement of the plans is a State responsibility.

Clean Air Act of 1990: Requires each State to develop a plan that provides for implementation, maintenance, and enforcement of air quality standards in each air quality control region within its boundaries. Implementation involves establishing practices that will prevent significant deterioration of air quality (including visibility) in and near national parks, wildlife refuges, and wilderness areas. Smoke management plans address prescribed burning practices. Although major administrative and enforcement responsibility rests with the U.S. Environmental Protection Agency, States are responsible for administering State plans.

State Government Capacity

State governments also have significant legal frameworks for encouraging the development and implementation of forest practice codes. In 2001, all States had some form of forest practice code, and 60 percent of these codes had been revised one or more times since 1994. The practices set forth by these codes were being applied to forests at a rate of 86 percent (National Association of State Foresters 2001). Many state forest practice codes were established in response to federal laws that require implementable and enforceable programs focused on the water quality impacts of forest practices, although most now address a variety of forest values and the forest practices used to enhance or protect such values. The State-developed codes focused primarily on private forests, although many apply to State-owned public forests (some even to federal lands, although jurisdictional disagreements are common) (Ellefson and others 1995).

State governments have the capacity to direct forest practice codes on a variety of forest values and to implement the codes in a variety of programmatic ways (table 3). In 1992, State-adopted best forest practices focused on water quality, reforestation, timber harvesting, forest protection, wildlife protection, recreation, and aesthetic qualities. Most of the guidelines developed to address these values were delivered via technical assistance programs (28 percent of total program applications), with broader educational and extension programs a close second (27 percent). Other program types employed were fiscal incentives (15 percent of applications), voluntary guidelines (13 percent), regulatory (11 percent), and tax incentives (6 percent). State forestry agencies are unlikely to rely on a single type of program to deliver their forest-practice codes. For example, educational and technical assistance programs were used by 46 and 47 States, respectively, to protect water quality, yet 34 States also used voluntary guidelines and 28 States employed regulatory measures for such purposes.

The number and type of State agencies engaged in the development of forest-practice codes is substantial. In the year 2000, nearly 1,000 State government entities (departments, divisions, bureaus, governing boards) were engaged in some form of forest resource management activity that may very likely lead to the development of codes specifying the best forest management practices to be applied by public and private landowners and timber harvesters (Ellefson and others 2001a and 2002). These State agencies ranged from those with traditional resource conservation and management responsibilities (forests, wildlife, parks, recreation, water), to agencies that have broader environmental and public health responsibilities that might be influenced by forest practices. The capacity of those agencies to foster development and implementation of forest-practice codes rests in large measure on the variety of State laws the agencies are responsible for implementing. State laws applicable to forestry nonpoint-source pollution in 2001 included forest practice and conservation laws (11 States), lake and stream protection laws (27 States), wetland protection laws (23 States), stream crossings laws (23 States), sediment and erosion control laws (29 States), chemical use laws (15 States), persistent problem person (bad actor) laws (12 States), and storm water laws (10 States) (National Association of State Foresters 2001). In implementing these laws, extensive partnering (for example, sharing of knowledge and expertise) occurs among State agencies on matters involving codes of best management practices. In 2001, 32 States reported forestry agencies partnering with a State's environmental protection agency, 38 reported such partnering with a State's water quality agency, and 24 reported such partnering with a State's fish and wildlife agency (National Association of State Foresters 2001).

Table 3—State government programs promoting best-forest-practice standards on private forests, by forestry activity, region, and type of program (1992)

Major forestry activity and type of program	Number of States in region having program type									
	North-east	Lake	Mid-Atlantic	Mid-continent	South-east	South Central	Great Plains	Rocky Mtns.	West	Total
Protect water quality										
Educational programs	6	3	6	5	5	5	5	5	6	46
Technical assistance	6	3	7	5	5	5	5	6	5	47
Voluntary guidelines	5	3	6	4	5	5	1	4	1	34
Tax incentives	1	1	4	3	0	1	3	1	0	14
Fiscal incentives	2	3	5	3	1	4	5	4	2	29
Regulatory programs	6	1	5	1	4	1	0	2	6	26
Promote reforestation										
Educational programs	6	3	6	5	6	5	4	5	6	46
Technical assistance	6	3	6	5	6	5	5	6	4	46
Voluntary guidelines	1	1	3	2	1	1	1	4	1	15
Tax incentives	2	3	3	3	1	1	0	1	2	16
Fiscal incentives	5	2	5	3	4	5	5	5	3	37
Regulatory programs	3	0	4	0	0	0	0	1	6	14
Improve timber-harvesting methods										
Educational programs	6	3	6	5	5	4	5	5	6	45
Technical assistance	6	3	7	5	6	5	5	6	4	47
Voluntary guidelines	4	2	6	1	3	3	2	4	2	27
Tax incentives	2	2	3	1	0	1	0	0	0	9
Fiscal incentives	3	0	4	0	0	1	2	2	1	13
Regulatory programs	4	0	4	0	1	1	0	1	6	17
Protect from wildfire, insects, and diseases										
Educational programs	6	3	6	5	5	5	5	6	6	47
Technical assistance	6	3	7	4	6	5	4	6	6	47
Voluntary guidelines	3	0	3	1	2	3	2	4	2	20
Tax incentives	0	1	3	2	0	0	0	0	0	6
Fiscal incentives	1	1	4	2	1	0	2	4	2	17
Regulatory programs	5	2	3	1	3	2	1	4	6	27
Protect wildlife and endangered species										
Educational programs	6	3	7	5	6	5	4	5	5	46
Technical assistance	5	3	6	5	6	5	5	5	4	44
Voluntary guidelines	4	1	3	1	1	2	2	2	2	18
Tax incentives	0	0	1	2	0	0	0	0	0	3
Fiscal incentives	3	2	5	3	2	4	5	2	2	28
Regulatory programs	4	2	2	0	3	1	1	2	5	20
Enhance recreation and aesthetic qualities										
Educational programs	6	3	6	4	5	5	4	5	3	41
Technical assistance	6	3	7	5	5	5	5	6	3	45
Voluntary guidelines	3	1	2	1	1	2	2	2	2	16
Tax incentives	1	1	1	2	0	1	0	1	1	8
Fiscal incentives	4	1	6	2	2	4	2	3	1	25
Regulatory programs	2	0	1	0	0	0	0	0	5	8

Note: Regional groupings of States are Northeast: CT, ME, MA, NH, RI, VT; Lake States: MI, MN, WI; Mid-Atlantic: DE, MD, NJ, NY, PA, VA, WV; Mid-Continent: IL, IN, KT, MO, OH; Southeast: AL, FL GA, MS, NC, SC; South Central: AR, LA, OK, TN, TX; Great Plains: IA, KS, NB, ND, SD; Rocky Mountain: AZ, CO, MT, NM, UT, WY; West: AK, CA, HI, ID, NV, OR, WA.
Source: Ellefson and others (1995).

State capacity to encourage the use of forest practice codes often depends on informed landowners and professionally astute timber harvesters and professional resource managers (foresters, wildlife managers). In 1995, 25 States had active registration, certification, or licensing programs for timber harvesters (MacKay and others 1996). Of this total, six States had licensing programs requiring persons conducting timber harvesting activities to demonstrate, by written or field examinations, an informed ability to do so. In nearly all cases, an understanding of a State's code of best forest practices was the basis for granting a license. In 2001, 26 States reported certification programs for timber harvesters, and 13 States reported some form of licensing of professional foresters (National Association of State Foresters 2001).

State capacity to develop and encourage the application of best forest practice codes is substantial. In addition, States have demonstrated considerable ability to monitor the rate at which such codes are being applied. In 1997, 34 States conducted compliance monitoring programs to determine whether the codes were being applied (table 4) (Ellefson and others 2001b). Although nearly one-third of the States had not initiated a formal compliance monitoring program, this does not mean that forest practices are not monitored in those States. In some States, monitoring activities (inspections) are carried out when landowners benefit from cost-share practices (such as the Federal Forestry Incentives Program and Stewardship Incentives Program) or when formally designated Tree Farms are reinspected. In States where forestry operations are by law incomplete until approved by an inspector, the required preharvest and post-harvest inspections are considered to be compliance monitoring. Legislative directives often compel compliance monitoring. Montana requires determination of "how current forest practices are affecting watersheds," Minnesota requires "a program for monitoring silviculture practices and the application of timber harvest and forest management guidelines," and Washington requires "annual assessment of how regulations and voluntary processes are working." (Ellefson and others 2001b).

Forest practices most commonly monitored by States are those focused on water quality, riparian areas, and forested wetlands (table 5). In 2000, the results of monitoring were found to be used in a variety of ways, including modification of education and training programs (23 States), targeting of technical assistance programs (20 States), modification of existing guidelines (11 States), and development of additional guidelines (12 States) (National Association of State Foresters 2001). In 1997, the lead (or traditional) State forestry agency was the only agency engaged in monitoring compliance with recommended best forest practices in only 20 States (Ellefson and others 2001b).

Table 4—Characteristics of State programs monitoring compliance with best-forest-practice standards, by region (1997)

Monitoring characteristic	Region			Total
	North	South	West	
	number of States			
Compliance monitoring program:				
Yes	11	13	10	34
No	9	0	7	16
Compliance monitoring conducted:				
All harvested sites	2	2	4	8
Sample of harvested sites	9	12	5	26
Certain sites more intensely	4	2	7	13
Training required to participate in monitoring	10	11	7	28
Incentive provided private landowner to access property	2	0	1	3
Individual landowner compliance information made public	5	7	9	21

Note: Compliance monitoring may be focused on forest-practice guideline programs that are voluntary, mandatory, or both. Nationally, 13 States have compliance monitoring programs that are part of a voluntary practice program (North: 4; South: 8; West: 1); 9 are part of a mandatory program (North: 3; South: 1; West: 5); and 12 involve both voluntary and mandatory programs (North: 4; South: 4; West: 4). (North Region: CT, DL, IA, IL, IN, MA, MD, ME, MI, MN, MO, NH, NJ, NY, OH, PA, RI, VT, WV, WI; South Region: AL, AR, FL, GA, KY, LA, MS, NC, OK, SC, TN, TX, VA; West Region: AK, AZ, CA, CO, HI, ID, KS, MT, NB, ND, NM, NV, OR, SD, UT, WA, WY.)
Source: Ellefson and others (2001b).

Table 5—Forest resource values subject to State government monitoring of best-forest-practice standards, by region (1997)

Subject area	Region			Total
	North	South	West	
	- - - - - - - *number of States* - - - - - - -			
Water quality	11	13	9	33
Riparian	10	11	9	30
Wetland	9	8	7	24
Soil productivity	1	5	7	13
Wildfire, insects and diseases	3	1	9	13
Aesthetics	4	3	5	12
Wildlife habitat	2	1	8	11
Reforestation	3	1	6	10
Cultural-historic resources	2	0	3	5
Recreation	2	0	2	4
Other	1	3	5	9

Source: Ellefson and others (2001b).

Compliance monitoring of forest-practice guidelines has occurred over a number of years in some States. In the South, for example, some States have conducted five or more statewide compliance monitoring surveys, and have often found rates of compliance with recommended best management practices exceeding 90 percent (Greis 2002). Compliance rates for southern States were as follows:

- Alabama (6 statewide surveys, 93 percent compliance)
- Arkansas (2 statewide surveys, 1999 last survey, 80 percent compliance)
- Florida (10 statewide surveys, 1999 last survey, 96 percent compliance)
- Georgia (3 statewide surveys, 1998 last survey, 79 percent compliance)
- Kentucky (1 statewide survey, 35 percent compliance)
- Louisiana (4 statewide surveys, 1997 last survey, 83 percent compliance)
- Mississippi (1 statewide survey, 87 percent compliance)
- North Carolina (2 statewide surveys, 1996 last survey, 95 percent compliance)
- Oklahoma (monitoring program under development)
- South Carolina (5 statewide surveys, 1997 last survey, 90 percent compliance)
- Tennessee (2 statewide surveys, 1996 last survey, 63 percent compliance)
- Texas (4 statewide surveys, 1999 last survey, 89 percent compliance)
- Virginia (10 statewide surveys, 1999 last survey, 90 percent compliance)

Local and Regional Government Capacity

Local units of government have significant capacity to develop and implement forest-practice codes. Hickman and Martus (1991) identified nearly 400 local ordinances nationwide regulating forestry practices. Of these ordinances, more than 70 percent were established since 1980 and half since 1985. Martus and others (1993) identified 522 local ordinances regulating forestry activities in 24 States, with 68 percent of them in northeastern States and 27 percent in southern States. In 1996, there were more than 100 local ordinances directing the application of forest practices in New York alone. As of 2000, county and municipal governments in 10 of the 13 southern States had enacted a total of 346 forest-related ordinances (Georgia and Virginia account for one-half of the total), which is a marked increase from 7 States and 141 ordinances in 1992 (Spink and others 2001). Some State forest-practice laws prohibit or severely restrict local governments from regulating forest practices. Oregon's Forest Practices Act is quite specific in this respect: ". . . no unit of local government shall adopt any rules, regulations or ordinances or take any other actions that prohibit, limit, regulate, subject to approval or in any other way affect forest practices on forestland." Idaho and Washington also restrict local governments from the development of forest-practice codes and their implementation via regulatory means.

The magnitude of local development of forest-practice codes can be better judged in the context of the total number of local political jurisdictions within a State that could possibly adopt best-practice codes and subsequently encourage their implementation. By State, local jurisdictions having such guidelines were as follows: Colorado: 3 of 63 counties; Delaware: 1 of 3 counties; Florida: various of 57 counties; Georgia: 11 of 159 counties; Illinois: 100 of 1,200 municipalities and 1 of 102 counties; Louisiana: 1 of 64 parishes; Maryland: 20 of 23 counties; Michigan: 10-15 of 1,200 townships; Minnesota: 1 of 87 counties; New Jersey: 300 of 567 municipalities and 15 of 21 counties; New York: 70 of 900 municipalities; North Dakota: 7 of 53 counties; Pennsylvania: 13 of 420 municipalities; Vermont: 2 of 251 municipalities; and Wisconsin: 3-4 of 1,500 municipalities and 2 of 72 counties (Ellefson and others 1995). Expanding this information to a nationwide setting, in 1991 about 8 percent of all local jurisdictions had some form of forest-practice guidelines embraced by a regulatory program (the proportion probably would have been higher if nonregulatory initiatives had been considered) (Ellefson and others 1995).

Summary of Conditions

Forestry and related agencies in the United States have recognized the importance of codes that embody best forest practices. Well-designed forest-practice codes, the use of which is actively encouraged, are often critical to ensuring the sustainability of forest resources. In light of the background and current conditions presented above, the following observations are made about the legal capacity to develop and implement such codes:

- Best-practice codes represent a summation of technically effective, economically wise, and politically palatable forest practices considered necessary for sustaining forest conditions and values. They are identified by a variety of terms or labels, including best management practices and forest practice guidelines. They are most often developed in response to a legal requirement.
- Best-practice codes are applied in order to sustain forests generally and to ensure the sustainability of a variety of important forest values and benefits. However, the legal capacity to develop codes has usually been exercised in response to concerns over the quality and quantity of water flowing from forested areas.
- Legal capacity to develop and implement best-practice codes exists among many different types of public and private organizations, with government organizations at various levels being among the more active proponents of the development and implementation of such codes.
- Application of codes by landowners and timber harvesters is encouraged by legal capacities expressed as a variety of programs, including those involving education, technical assistance, tax incentives, fiscal incentives, and regulatory requirements. In most cases, a mixture of different types of programs has proven to be most effective. Regulatory programs focused on privately owned forests continue to be controversial.
- Management practices are monitored so that the effectiveness of best management practice codes can be assessed and rates of application can be determined. The information obtained by monitoring is used to improve programs that encourage the use of forest-practice codes and to delete, add, or modify best management practices to make the codes more capable of sustaining desired forest values.
- Federal agencies have significant legal capacity to develop and promote best-forest-practice codes for direct application to Federal lands and in some cases to nonfederal lands. Directed by extensive legal frameworks, these agencies also encourage State governments to develop and promote the use of best-forest-practice codes (usually by required assessments and the encouragement of the adoption of enforceable mechanisms).
- State government legal capacity to develop and implement codes of best management practices is also very extensive. This capacity is expressed via a number of program types, most common of which are voluntary participation by landowners and timber harvesters. Often in response to Federal incentives, States have also been very active in monitoring the use of codes of best management practices.
- Local units of government exercise legal capacity (ordinances) to develop and implement codes of best management practices. This capacity is highly variable in form and in the degree to which it is exercised.
- Private organizations are active in the development and implementation of best-practice codes. Codes developed and implemented by private organizations are generally part of forest certification programs and are usually designed to advance the interests of the organizing parties. Certification programs are becoming increasingly common, involve sophisticated best-practice standards, and are being applied to ever-larger areas of forestland.

Issues and Trends

The literature identifies a number of major issues and trends involving best management codes and actions taken to encourage their use. Examples of this literature (from which the following issues and trends are drawn) are: Brown and others 1993, Cubbage and Moffat 1997, Dissmeyer 1994, Ellefson and others 1995, Ellefson and others 2001a, Hickman and Martus 1991, Ice and others 1997, Martus and others 1993, Mater 1999, National Association of State Foresters 2001, and Spink and others 2001.

- Legal frameworks supporting best management codes for forest management have been strengthened in recent decades with the establishment of a large number of Federal laws and regulations that directly or indirectly influence the forest practices of public and private landowners. State-initiated programs that legally mandate or regulate the manner in which forest practices may be applied have increased both in number and intensity during the past three decades. Local government laws and regulations have also grown significantly.
- The number of government agencies involved in the development and implementation of codes of best management practices for forestry has increased dramatically over the past three decades. In most cases, each agency's involvement is grounded in its responsibility for a single forest value (for example, air, water, wildlife), a situation that poses significant challenges to coordination within and among governments and to the understanding of different sets of codes by landowners and timber harvesters.

- Educational and technical assistance programs are increasing in intensity and sophistication, enabling landowners and timber harvesters to become more aware of and sensitive to the importance of codes of best forest practices. These programs take many forms, including registration and certification of timber harvesters, licensing of forestry professionals, and certification of forest property by private organizations that have developed standards of forest sustainability.
- The complexity of the codes that set forth best management practices, and the accompanying increase in the cost of applying the recommended or required practices, is increasingly straining landowner and timber harvester acceptance of such codes and the willingness to apply them. This is so even though educational and technical assistance efforts have made landowners and timber harvesters more and more aware of the existence and virtues of the codes.
- Regulatory programs that require the application of codes of forest practices, especially State government programs, continue to be controversial, but they have increased in number, scope, and sophistication over the past three decades. Within a regulatory framework, specific trends and issues include increasing specification of best management practices in law (rather than in administrative rules), growing use of collaborative approaches to rulemaking and program implementation, the increased challenge of coordination among different government regulatory jurisdictions (for example, State and Federal jurisdictions) responsible for forest-practice codes, and development of contingent regulations that provide enforcement authority when voluntary compliance with recommended forest practices does not occur.
- Implementation of Total Maximum Daily Load Limit rules and criteria aimed at further reducing nonpoint-source water pollutants is increasingly of concern to the Federal and State agencies responsible for developing and encouraging the use of codes of best management practices. Among specific issues are definitions of impaired waters, the legal status of silvicultural sources (point versus nonpoint sources), and interagency disagreements about the importance of different sources of water pollutants and how they should be addressed (for example, forests versus agriculture).
- Monitoring the effectiveness of best management practices is becoming increasingly more common and more sophisticated. Challenges posed to monitoring the effect of forest practices on water quality are increasingly being overcome, yet monitoring the impacts of forest practices on many other forest values (for example, biological diversity, forest aesthetics) continues to pose challenges. The results of monitoring are becoming more widely used as a tool to encourage the use of best management practices and to improve the development of codes that embody more technically sound forest practices.
- Increasingly innovative approaches to developing and encouraging the use of codes of best forest practices are appearing on the scene. They are often considered as alternatives to allegedly costly and cumbersome regulatory programs. Included among newer approaches are green certification or stewardship programs, industry-sponsored certification programs (for example, the Sustainable Forestry Initiative), cost-share payments, preferential property and State income tax treatments, technical assistance and extension activities, and conservation easements and land trusts that embody best management practices for forestry.

Information Adequacy

Specification

Information about codes of best management practices and their application has been the focus of attention of many public and private organizations. In 1999, the National Association of State Foresters (1999) sought a better understanding of State forestry agency information concerning codes of best management practices. The Association reported 9 States with abundant information concerning best-practice codes, 16 with sufficient information, and the remainder with very little or no information to describe such codes. As for the quality of information about best-practice codes, 15 States reported it was excellent, 15 that it was adequate, and 4 that it was poor. The Association has also conducted periodic surveys seeking information about the design, application, and monitoring of best management practices being implemented by State governments (National Association of State Foresters 2001).

The American Forest & Paper Association (American Forest & Paper Association 1993), National Council of the Paper Industry for Air and Stream Improvement (NCASI 1994, 1995, 1996), Tetra Tech, Inc. (Tetra Tech 1992), and the Environmental Law Institute (Environmental Law Institute 1997, 1998) have also made concerted efforts to collect information about codes of best management practices. Various research organizations have undertaken analyses to determine the status of best-practice codes and of the programs that are being used to encourage their application (Brown and others 1993, Ellefson and others 1995, Green and Siegel 1994, Hickman and Martus 1991, U.S. Environmental Protection Agency 2001). The World Wide Web provides access to current State-by-State compilations of best management practices and forest-practice codes (for example, Water Quality and Best Management Practices for Loggers at http://www.usabmp.net).

Given the seemingly wide variety and large number of efforts that have been made to compile information about legal and related structures that promote best-practice codes, a logical conclusion might be that an ample supply of information has been accumulated and that informed judgments can be made about legal capacities to establish best-practice codes and focus them in positive ways on forest sustainability. This may be true in the aggregate, but it masks the existence of very serious information shortcomings. For example, current information about best-practice codes is seldom capable of describing the changing legal conditions within which codes are developed and implemented (very little effort has been made to coordinate compilations and analyses over time), and is not always comprehensive or capable of being aggregated and usefully summarized (compilations and analyses are randomly undertaken and typically focused on particular programs, forest values, and selected geographic areas such as some, but not all, States). Available information also often lacks a concerted focus on the effectiveness of current legal structures and the programs they promote (their actual ability to exert influence on sustainability goals is largely unknown). More specifically, information voids of the following types are common:

- *Measurement information*—Information about which variables should be measured and how they should be measured, so as to accurately portray conditions involving codes of best management practices, has not been assembled. What conditions should be measured and subsequently compiled (for example, compliance rates, area of forest covered, number of landowners engaged, forest value focused on by code)? What variables are the best indicators that agreed-to standards of sustainable forest management are being achieved? How often are these variables to be measured? Are special measurement needs associated with different best-practice codes?
- *Extent-of-activity information*—Information about the legal requirements to develop and encourage application of best-practice codes has been assembled in an often uncoordinated way. This has resulted in the collection of information that depicts only current conditions, lacks local, regional, and national consistency, and fails to portray the role being played by private initiatives. What are the legal requirements for developing and encouraging the application of best-practice codes at various geographic levels and by various organizations? How are these requirements changing over time, if at all? Are there differences in requirements at different levels of government? Is there consistency across these requirements? Are there legal and constitutional issues at stake between governments? What is the status of locally developed codes and efforts to encourage their application? To what extent do these activities occur in the private sector? Are compilations as currently carried out useful for guiding policy and program direction?
- *Responsible-organization information*—Only very limited information about which private and public organizations are actively engaged in the development and implementation of best management codes has been assembled. What government agencies are engaged in code development and implementation and at what levels are they engaged? What legal authority assigns them responsibility, and is this authority being interpreted accurately? Do public and private organizations engaging in code development have similar or differing goals and objectives, and do these goals and objectives foster or hinder code development and implementation? What has prompted private organizations to engage in code development and implementation? Are there organizational patterns in the public and private sector that, if known and publicized, would enhance overall application of code development and implementation?
- *Coordination information*—Information about requirements to coordinate development and implementation of best-practice codes among and between various levels of government and various private concerns has not been assembled. Do conflicts exist between the various entities engaged in developing and implementing codes of best management practices? If so, how might they be productively resolved? What are the requirements for coordination? Do they allow for cross-sectoral, coordinated planning and review? Do they ensure that the cumulative results of local, State, and regionally developed codes will lead to outcomes consistent with national requirements and vice versa? Do they allow incorporation of ad hoc code development activities occurring at various times and undertaken at various levels of government?
- *Procedure and specification information*—Information about how best-practice codes are to be developed and encouraged has not been assembled. Do current statutory requirements prescribe procedures for code development and implementation? Are these in a detailed format or in a broad framework giving deference to administrators and rulemaking procedures? Is the full intent of the existing laws that address codes and means for their encouragement expressed in current codes of forest practices? Do national requirements for codes allow for regional and subregional development of such codes? Do requirements specify the need for leadership in their development? Do they give guidance to such leadership?
- *Scope-of-practice information*—Information about best-practice codes for values in addition to water have not been comprehensively assembled. What best management-practice codes have been developed for the range of values associated with forests, in addition to water

quality? What approaches have been used to encourage development and application of this broader range of practices? What legal requirements mandate development of best management practices for the broad range of values associated with forests? Do these legal requirements differ among agencies at the same level of government and between levels of government? Are these differences complementary or competitive? Are there barriers to developing best management practice codes in addition to those focused on water? If so, how might they be overcome?

- *Investment-and-incentive information*—Information about resources devoted to best practice code development and implementation has not been assembled except in some very limited cases. What is the magnitude of investment in public and private code development and implementation activities? Are there legal and administrative processes for allocating resources to these activities and are they sufficient? Are there legal or fiscal provisions for encouraging these activities, and especially for encouraging cross-sectoral code development and implementation activities?
- *Encouragement-and-promotion information*—Information about the appropriateness of various programmatic ways of encouraging the application of codes of best management practices has been compiled for only a few States and regions. What are the type and frequency of programs that might be used to encourage application of best management practices contained in codes? What are the relative efficiency and effectiveness of these approaches in fostering BMP application by landowners and timber harvesters? Are certain categories of landowners and timber harvesters more responsive to certain types of programs? What is the appropriate scale and administrative design for successful implementation of a program? What types of programs tend to reward application of desirable practices rather than punish undesirable practices?
- *Effectiveness information*—Information about the effectiveness of best-practice codes in accomplishing sustainable forestry objectives has not been compiled except in some very limited cases. Are there legal or administrative requirements to determine the efficiency and effectiveness of these codes? What are appropriate measures of success? Are there more effective approaches to accomplishing code development and implementation?
- *Monitoring information*—Monitoring of the application and effectiveness of codes of best management practices, and especially of forest practice effectiveness, has been carried out by a number of organizations (especially State governments) but could be improved. Are there legal requirements to monitor the results of applying codes of best management practices? Is this information from monitoring activities being used to adapt codes to changing circumstances? Is the information being collected and analyzed in such a way that it can be used to fulfill legal requirements assigned to an agency? Are compliance surveys or audits statistically well designed? Are the results of various monitoring efforts capable of being accumulated to portray sound representations of conditions at the landscape, regional, and national levels? What is being done to monitor administrative processes used to manage best-practice codes? How accurately are practices actually being measured? Is the information robust and truly reflective of actual conditions?

Recommendations

The ability to influence forest sustainability will depend a great deal on consistent, long-term application of best-practice codes for forest management as suggested by Indicator 51. In order to improve the legal setting for this application, we must address a variety of information voids. In order to suitably deal with these voids, the following actions would seem appropriate:

- *Comprehensive periodic reviews*—Conduct periodic and comprehensive reviews of current authorities that give direction to and resources for the design, implementation, and monitoring of best-practice codes for forest management. Guided by the above-suggested information deficiencies, the reviews should give special attention to the collection of information concerning the types of best-practice codes, the organizations that implement such codes, the compliance rates for current owners, and the effect of the codes on desired forest values. This information should be gathered at Federal, State, and local levels of government. In addition, a systematic review of private-sector capability to carry out these activities should be initiated.
- *Responsibility for conducting reviews*—Assign responsibility for conducting continuous reviews of best management codes to a specific current or new administrative unit within a Federal agency (such as a USDA Forest Service State and Private Forestry unit or Research and Development unit), a college or university, or other nonprofit organization (for example, the National Association of State Foresters or the National Council of the Paper Industry for Air and Stream Improvement). This responsibility should be assigned to an organization that has a proven track record in addressing the complexities of developing, implementing, and applying best-forest-management codes to public and private forests.
- *Devote resources to reviews*—Invest in the reviews sufficient resources to provide the type and quantity of information necessary to dramatically improve understanding of current abilities to develop and apply best-forest-management codes considered important to sustainable forestry.

Indicator Appropriateness

Indicator Definition

Unclear definitions of the activities specified by Indicator 51 are troublesome, especially the elusiveness of the Indicator's major descriptive words and phrases, such as "encourages" and "best-practice codes." These words or phrases supposedly embody an agreed-to set of concepts and principles around which information-gathering efforts can take place. Such is not always the case, as is highlighted by the need to define "encourages" and "best-practice codes" earlier in this review. The former is taken to mean conditions promoting the development of codes (leadership, organization, funding) and their application via one or more types of programs (for example, educational, technical assistance, fiscal incentives, tax incentives, regulatory), while the latter is viewed as a set of management or harvesting standards (benchmarks, yardsticks, touchstones, measures, criteria) that foster sustainability of forests for various values.

Lacking a clear understanding and definition of Indicator 51 makes the exercise of determining legal capacity to "encourage best-practice codes for forest management" difficult at best and makes the products of such compilations of questionable value. Rigorous attention to definitions would enable analysts to clearly focus attention on questions such as: Do we have the capacity to establish codes, and, once established, how is their application programmatically encouraged? Compounding the definition problem is the reality that many researchers, analysts, and administrators consider "codes" to be synonymous with legal regulations, and regard "best practices" equivalent to best management practices (BMPs), forest-practice guidelines, or acceptable practices. We suggest that the use of the word "code" in the context of forest practices is very much out of date and quite misleading. A more appropriate specification of the Indicator would be ". . . *encourages the application of the best forestry practices considered suitable for specific forest conditions*."

Relationship to Other Indicators

Indicator 51 overlaps other indicators, particularly as they relate to laws and values, public participation, funding, and planning. Clearly, there is potential for confusion in Indicator 51's relationship to Indicators 38 (value of investment), 54 (planning and coordination), 57 (enforce laws, regulations, and guidelines), 58 (investment in forests), 60 (information and data), 61 (forest inventories), 62 (foreign country monitoring), 63 (scientific understanding), 64 (value integrative methods), 65 (new technologies), and 66 (human intervention impacts).

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Information Review and Evaluation:

Institutional Framework

Public Education and Extension (Indicator 53)

Paul V. Ellefson and Calder M. Hibbard[1]

The full text of Indicator 53 is as follows: *Extent to which the institutional framework supports the conservation and sustainable management of forests, including the capacity to* ***provide for public involvement activities and public education, awareness, and extension programs, and make available forest-related information*** (Montreal Process Working Group 2003).

Rationale and Interpretation

A well-informed and knowledgeable citizenry provides a foundation of support for successful, sustainable forest management. Such support is dependent on access to legal and institutional conditions capable of promoting the organizations and programs necessary to inform the public about forest resource sustainability, and then to engage the public in decisions regarding resource sustainability. To do this requires recognition that different groups of citizens have different information needs (for example, elementary school children, high school students, forest landowners, and timber harvesters need different kinds of information). It also requires recognition that such information can be communicated in many ways (for example, by written and electronic media, and by classroom and field instruction). Further, it requires awareness of the surprising number of public and private organizations that are both able and willing to communicate needed information (for example, environmental organizations, trade organizations, environmental education foundations, federal and State extension services) (Montreal Process Working Group 2003, Montreal Process Technical Advisory Committee 2000).

Brief definitions of three concepts that are central to Indicator 53 are: *provide for public education and awareness*—provide access to information enabling the general public to be aware of and take responsible actions regarding concepts of forest sustainability; *provide for extension programs*—provide access to educational initiatives (and methods) implemented by various partnering organizations seeking to meet the forest sustainability information needs of various audiences (Reed and others 1997); and *make available forest and related information*—provide access to professionally guided, technical forestry assistance focused on the on-site information needs of individual landowners, managers, and operators (for example, timber harvesters and private woodland owners) (Sampson and DeCoster 1997).

Indicator 53 suggests the review of a very broad spectrum of material. In order to facilitate the review undertaken herein, certain subjects are excluded. For example, the indicator refers to providing opportunity for *public involvement activities,* but this subject is not discussed here because the legal and institutional capacity for public involvement in the decisionmaking process is addressed in depth in our discussion of Indicator 50 (opportunities for public participation). Also, this review does not discuss capacity to educate professional resource managers, a subject that is discussed in connection with Indicator 55 (develop and maintain human resource skills).

Useful data for measuring Indicator 53 include compilations and descriptions of laws and programs that promote public education on matters concerning forest sustainability and conservation. Examples of useful information are number of full-time-equivalent employees assigned to relevant extension, public education, and environmental education programs; number of schools (grades K through 12) with active educational programs relevant to sustainable forestry; number of school districts with defined curricular standards for teaching about forest resource sustainability; number of forest landowners and timber harvesters who attend outreach education programs focused on sustaining forest resources; number of plans prepared and implemented as a consequence of technical forestry assistance to landowners; and number of periodicals and web sites providing information about forest resource sustainability (Montreal Process Technical Advisory Committee 2000).

Conceptual Background

An informed citizenry and knowledgeable owners and managers of forests are central requirements for the sustainability of forest resources. If citizens, owners, and managers are well informed, they will in all likelihood have expectations that are consistent with the sustainability of forest resources and will take actions individually and collectively that are compatible with principles of sustainability. The great breadth and amount of existing knowledge about forest resources, and the great range of potential audiences for information about forests pose significant challenges for educational programs. It is also necessary to consider what organizations should be responsible for presenting educational information about the sustainability of forest resources.

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The recipients (or targets) of educational activities differ in their informational needs. These recipients range from the members of the general public who have only a perfunctory interest in forest resources to landowners who seek advice about protecting forests from a particular species of destructive insect. The information sought can be very general (such as information about who owns forests and why they desire ownership) or very specific (such as advice about designing roads and skid trails for timber harvesting operations). Information can be communicated to intended audiences in a variety of ways—possibly in publications, videos, and films, and by means of satellite communication, workshops, formal lectures, or the like. And educational activities can take place in different settings, including the K through 12 classroom, long-distance learning via satellite, and hands-on experience in a demonstration forest.[2]

Educational initiatives involving forest resource sustainability are undertaken by an extremely diverse set of public and private organizations. Nearly every Federal agency has some responsibility to inform the public or segments thereof about conditions that affect forests. The U.S. Environmental Protection Agency's efforts to implement the National Environmental Education Act of 1990 is an example, as is the longstanding involvement of the U.S. Department of Agriculture in extension programs guided by statutes such as the Morrill Act of 1862, the Smith-Lever Act of 1914, and the Renewable Resources Extension Act of 1978. State governments have statutory requirements and programs that often mirror Federal laws and programs in both the breadth of subject material addressed and the number of agencies engaged in conveying such material. A most notable educational and extension partnership involves State governments, local governments, and land grant universities. Private organizations also present great numbers of educational programs, many of which address forest sustainability. The National Wildlife Federation and the Audubon Society are prominent examples of private organizations with strong environmental education initiatives.

[2] Environmental education can be communicated by means of *formal education* or *informal education*. Formal education takes place in traditional and highly structured settings—typically in elementary and secondary schools, colleges, and universities. Formal environmental education initiatives directed at students in elementary and secondary schools (grades K-12) commonly involve curriculum development and the provision of supplementary educational materials. Formal post-secondary educational initiatives may focus on technical career preparation, preservice teacher education, and professional continuing education. Informal environmental education occurs outside or beyond formal education systems, possibly on an *ad hoc* basis, and is often sponsored by businesses, government agencies, nonprofit organizations, and the media (newspapers, magazines, television, and computer networks) (U.S. Environmental Protection Agency 1996).

Educational efforts aimed at informing citizens, landowners, and managers about principles of forest sustainability must convey an appropriate message. Because information can be used to further a set of preferred values regarding forest sustainability, many organizations are extremely sensitive to the need to provide "factual" or "value-neutral" information to audiences. Their credibility, and in some cases their very existence as an organization, is dependent on avoiding bias or prejudice in the information they provide. Certainly, such organizations are generally free to make their case; information and arguments presented by opposing organizations will frequently set the record straight. Again, most organizations seek to present value-neutral information that can be used by the public, landowners, and managers when making individual or collective decisions about forest sustainability.

Current Institutional Capacity

The Nation's institutional capacity to offer educational experiences focused on forest and related resources is represented by the involvement of many different public and private organizations. Unfortunately, a systematic and comprehensive review of the totality of this capacity has never been undertaken. Such a review would require attention to State, local, and tribal governments; nongovernmental organizations; universities, colleges, and schools; Federal Government; business, industry, and foundations; and various types of media. The following is a brief examination of the capacity represented by some of these organizations.

Private-Sector Capacity

Private-sector capacity to undertake public education, extension, and technical assistance efforts is extensive. More than 80 private national organizations claim responsibility for educational initiatives that focus on an extremely wide range of audiences, with forest resource messages that are equally diverse in substance and method of delivery (appendix A). The private sector has the capacity to distribute information about forests via more than 180 different periodicals that in some manner address public and professional interests in the sustainability of forests (appendix B). Internet Web sites offer similar potential.

At this time, the extent and intensity of private involvement in educational and technical assistance programs can be suggested only by examples. The programs are many and varied, but most involve partnering between and among various public and private groups that have an interest in public education on matters involving forest sustainability. Examples of programs currently being implemented are: the *Tree Farm System* (American Forest Foundation—

70,000 properties and 20 million forest acres); *forest owners association*s (National Woodland Owners Association—42,000 landowners and 3.4 million forest acres); *industry landowner assistance programs* (approximately 7 million forest acres); *landowner cooperatives* (approximately 20 cooperatives in the Midwest and Northeast); *cross-boundary initiatives* (such as the Applegate Partnership [Oregon], Gulf Coastal Ecosystem Partnership [Mississippi], and Monadnock Landscape Partnership [New Hampshire and Massachusetts]); *land trust and conservation easement partnerships* (such as the Land Trust Alliance, Trust for Public Land, The Nature Conservancy, and Conservation Fund); *stewardship forestry organizations* (such as the Institute for Sustainable Forestry [California] and the Mountain Association for Community Economic Development [Kentucky]); *K-12 student education (*such as Project Learning Tree [more than 600,000 K-12 educators and more than 40 million students since 1980], Project WILD, and Project WET; the *National Environmental Education Enhancement Project* (nearly 20 States encouraged and guided by private-interest groups partnering with government resource and environmental agencies); *associations and interest groups* (such as the North American Association for Environmental Education, National Wildlife Federation [Backyard Wildlife Habitat Program], National Audubon Society, Society of American Foresters [Walk-in-the-Forest Program], and Sierra Club [Adopt-a-Watershed Program]); and *foundations* (the Pew Charitable Trusts, Rockefeller Brothers Fund, and American Forest Foundation) (American Forest Foundation 1993, Best and Wayburn 2001, Siegel 1993, U.S. Department of Agriculture Forest Service 1997, U.S. Environmental Protection Agency 1966).

Private educational initiatives are also significant elements of various privately sponsored forest certification programs. The intent of the educational element of these programs is to inform private forest landowners about principles of sustainable forest management and to encourage the application of forest management practices that are consistent with these principles. Various organizations sponsor certification programs that are generally similar in the broad standards they set forth for forest sustainability, but vary in terms of the specific practices required to meet such standards. Examples of private organizations sponsoring certification programs are the Forest Stewardship Council (Principles and Criteria for Forest Stewardship), American Forest and Paper Association (Sustainable Forestry Initiative), American Forest Foundation (Tree Farm Program), and National Woodland Owners Association (Green Tag Program) (Mater 1999).

Federal Government Capacity

Federal agencies have substantial legal authority and institutional capacity to undertake educational programs focused on forest sustainability. At least 19 Federal laws authorize such programs, and at least 7 of these laws appear to be focused primarily on forests (for example, Renewable Resources Extension Act of 1978), while 5 are basically enabling statutes that authorize educational programs in general (for example, the first and second Morrill Acts of 1862 and 1890) (table 1). The other statutes identified here focus primarily on agriculture and conservation education (three) and environmental education in general (for example, the National Environmental Education Act of 1990), yet they represent significant potential for encouraging better understanding of the sustainability of forest resources. In summary, legal authority for Federal agencies to establish and implement education programs focused on forest resource matters does not appear to be wanting.

Federal programs that represent institutional capacity for education relevant to forest sustainability are numerous and varied (appendix C). At a minimum, there are nearly 120 programs implemented by at least 5 cabinet-level departments or agencies (more than 50 in the Department of Agriculture, 3 in the Department of Commerce, 1 in the Department of Energy, more than 10 in the Department of the Interior, and nearly 40 in the U.S. Environmental Protection Agency). These programs vary in mission, scope, and education delivery vehicle, but all have some educational element relevant to forest resource sustainability. Some are purely educational and informational (for example, the National Agricultural Library or the National Technical Information Service), while others are oriented toward research, development, and promotion (for example, the Natural Resources and Sustainable Agricultural Systems program). Some programs are actually combinations of many other programs (for example, the Forest Taxation Program), and may have multiple objectives ranging from regulation and enforcement to direct on-site resource management. The budgets associated with these programs range from a few hundred thousand dollars to hundreds of millions of dollars. The programs accomplish their mission via various delivery mechanisms, such as the dissemination of technical information, the provision of specialized services, regulatory and directive methods, advisory services and counseling, training and education, and capacity-building grants. Without question, Federal educational programs relevant to forest sustainability are very far-reaching and present a wide range of significant information (Ellefson and others 2001, 2002).

Public education—Broad segments of the general public are often unaware of or misinformed about the use, management, and protection of forests. However, it seems clear that there is substantial virtue in communicating to the public the important role that forests play in our lives. If this information is communicated, the public may gain a

Table 1—Federal statutes authorizing major public educational programs involving forests and related natural resources (2002)

Federal statute	Major focus of educational efforts authorized by statute			
	Primarily forests and related natural resources	Primarily agriculture and conservation (including forests)	Primarily environmental (including forests)	Primarily enabling and authorizing
Morrill Act (first 1862; second 1890)				X
Hatch Act (1887)				X
Smith-Lever Act (1914)				X
Clarke-McNary Act (1924)	X			
Bankhead Jones Act (1935)		X		
Norris-Doxey Cooperative Farm Forestry Act (1937)		X		
Federal Insecticide, Fungicide, and Rodenticide Act (1948 as amended)			X	
Clean Water Act (1948 as amended)			X	
Smokey the Bear Act (1952)	X			
Clean Air Act (1955 as amended)			X	
McIntire-Stennis Act (1962)	X			
Youth Conservation Corps (1970)	X			
Federal Advisory Committee Act (1972)				X
Rural Development Act (1972)		X		
Cooperative Forestry Assistance Act (1978)	X			
Renewable Resources Extension Act (1978, 1988, 1990)	X			
Stevenson-Wydler Technology Innovation Act (1980)				X
Forest Stewardship Act (1990)	X			
National Environmental Education Act (1990)			X	

heightened awareness of forests, treat them with greater respect, and encourage investment in their sustainable management. Unfortunately, much of the forestry community's focus is on immediate and highly visible political issues involving forests, with only minimal attention directed to the general public's need for a more basic understanding of forests and forest sustainability (Best and Wayburn 2001). Many existing Federal laws explicitly or implicitly authorize educational programs that have a general educational component.

No comprehensive assessment of Federal forestry educational programs focused on the general public has been prepared, although the U.S. Environmental Protection Agency has made various attempts to do so (U.S. Environmental Protection Agency 1996). Therefore, Federal capacity for educating the public will be illustrated by reference to the following examples:

- *Natural Resources Conservation Education Program (NRCEP)*—The NRCEP is a joint effort of the USDA Forest Service and National Association of State Foresters. The program seeks to increase awareness, knowledge, and appreciation of natural resources and ecosystems, help develop the critical thinking skills needed to recognize the complexity of resource issues and make realistic choices, and encourage individual responsibility for conserving natural resources and using them wisely. NRCEP funds are used mainly to work with partners to jointly fund conservation education projects throughout the United States. A national program that is implemented locally, NRCEP funds environmental education projects, strengthens partnerships between funded organizations, and collaborates on local projects. Other sponsors and partners include the U.S. Environmental Protection Agency, National Environmental Education Training Foundation, National Forest Foundation,

American Forest Foundation, several agencies within the Department of the Interior, the Natural Resources Conservation Service, and a host of local and State organizations (Best and Wayburn 2001, U.S. Department of Agriculture, Forest Service 1994, 1997).

- *Project Learning Tree (PLT)*—This national, not-for-profit, environmental education program is funded by State boards of education, private companies, professional associations, individual donations, and State and Federal agencies. The program seeks to improve by educational means public understanding of natural resource issues in order to promote public participation in decisionmaking processes involving natural resources. PLT works with more than 50,000 teachers each year in partnership with the Environmental Protection Agency and the National Environmental Education Advancement Project. Complementary to PLT are Project WET (focused on water and related resources) and Project WILD (focused on wildlife conservation; since its inception in 1980, Project Wild has engaged more than 600,000 educators and more than 40 million students). Although all three projects relate to natural resource issues, PLT focuses more directly on forests (Best and Wayburn 2001, U.S. Department of Agriculture, Forest Service 1994, 1997).
- *National Environmental Education Advancement Project (NEEAP)*—The NEEAP seeks to implement and shape environmental education programs by serving as a conduit between environmental education leaders and their counterparts in other States, and between state and national organizations and expertise. Organizations participating as partners in the program include the U.S. Environmental Protection Agency, National Fish and Wildlife Foundation, North American Association for Environmental Education, National Association of Conservation Districts, and National Wildlife Federation. NEEAP provides leadership clinics, workshops, seed funding, informational services, and networking opportunities for participating States (U.S. Environmental Protection Agency 2002).
- *North American Association for Environmental Education (NAAEE)*—This is a consortium program funded by the U.S. Environmental Protection Agency (approximately $2 million annually) and coordinated with a wide range of public and private organizations. The association focuses on information dissemination, education reform and innovation through training, and the expansion of partnerships. The consortium is an active sponsor of projects such as the National Conservation Training Center, the North American Association for Environmental Educators, the National Water Education for Teachers (WET) Project, and the North American Association for Environmental Education (U.S. Environmental Protection Agency 2002).
- *Environmental Education Outreach Program (EEOP)*—Administered by the USDA Forest Service, EEOP is a summer environmental education program taught by student interns. The program's major objectives are to meet with youth from diverse ethnic and socioeconomic backgrounds; to identify their concerns and knowledge about natural resources and the environment; to expose young people from inner-city areas to information about the environment, natural resources, and careers in natural resources; and to identify appropriate approaches for outreach to and education of youth of diverse ethnic, socioeconomic, and geographic backgrounds (Best and Wayburn 2001, U.S. Department of Agriculture, Forest Service 1994, 1997).
- *Environmental Education Grants Program (EEGP)*—Administered by the U.S. Environmental Protection Agency's Office of Environmental Education, the program provides grants for the purpose of enhancing the public's awareness, knowledge, and skills needed to make informed decisions that affect environmental quality. Since 1992, the Office has received between $2 million and $3 million in grant funding per year and has awarded about 1,700 grants, mostly to K-12 school programs. Many of these programs focus on forest and related resources (for example, Friends of Urban Forests—California; Forest Wildlife Information Center—Pennsylvania; Project Learning Tree—New Hampshire; Meet the Wilderness—Colorado; Natural Resources Education Council—North Carolina). In addition to EEGP, the Office also administers the National Environmental Education and Training Foundation (NEETF), which encourages public-private partnerships to support environmental education initiatives, and annually awards challenge grants of from $5,000 to $40,000 each (U.S. Environmental Protection Agency 2002).

The focus of many public environmental education organizations is the development and distribution of classroom-ready teaching aids. Many of the latter are monitored for balance and scientific accuracy by the National Project for Excellence in Environmental Education. Examples of organizations or projects providing these educational resources are the National WET Project, the Groundwater Foundation, and Project Learning Tree. Some Federal agencies also provide classroom teaching aids (for example, the wetlands curriculum and guides provided by the Office of Water, U.S. Environmental Protection Agency).

Extension initiatives—The Smith-Lever Act of 1914 created an extension service that made it possible for land-grant colleges to extend information to all citizens of a State through the cooperative efforts of local, State, and Federal governments (Sampson and DeCoster 1997). The partnership was originally named the Agricultural Extension Service, but its name was changed to Cooperative

Extension Service to better reflect the involvement of the various institutions engaged in extension work. The cooperating units of government work to combine their resources in support of university-based extension programs, one area of which embraces natural resources and environmental management, including forest resources. Historically, the design and implementation of extension programs have been directed to meeting the long-term information needs of clients (by developing knowledge needed to solve problems); providing unbiased, credible information; avoiding making decisions for clients (instead generating alternatives and explaining consequences); engaging in policy education (but avoiding formulation and implementation); pursuing flexibility to meet individual client needs (by avoiding rigid curricula); and delivering information through well-qualified experts. This cultural setting is a basis for typical extension roles, namely problem-solving education, research implementation, technology transfer, building human capacity, and seeking feedback on research needs (Reed and others 1997).

National legal authority for implementing extension forestry programs is rooted in the Morrill Act (1862 and 1890), Hatch Act (1887), Smith-Lever Act (1914), and Renewable Resources Extension Act (1978). The forestry extension programs authorized by these laws are administered and coordinated nationally by the USDA Cooperative State Research, Education, and Extension Service (CSREES). Recognizing the disparate program objectives of extension and the many agencies seeking to accomplish these objectives, the CSRESS promotes extensive partnering opportunities among a wide variety of public and private organizations (for example, USDA Forest Service, USDA Natural Resources Conservation Service, USDI Fish and Wildlife Service, U.S. Environmental Protection Agency, State foresters, rural conservation districts, forestlandowner associations, and various environmental interest groups) (Biles 1996, Hamilton and Biles 1998, Reed and others 1997, and U.S. Department of Agriculture, Cooperative State Research, Education, and Extension Service 2000).

A principal funding mechanism for supporting forestry, range, recreation, wildlife, and wood products extension is the Renewable Resources Extension Act (RREA) of 1978. In 1999, RREA was federally funded at a level of about $3 million (States contributed an additional $27 million in the form of funding and in-kind services) and provided support for more than 711 extension staff-years, distributed among major program components as follows: forestland 42 percent, rangeland 12 percent, fish and wildlife 23 percent, outdoor recreation 5 percent, and environmental and public policy 19 percent (table 2). The extension efforts of the forestland program component were focused on forest production activities (36 percent of extension staff years), environmental quality concerns (16 percent), utilization of forest products (23 percent), environmental education (16 percent), and continuing education of resource professionals (10 percent) (table 2). Reed and others (1997) reported the areas of expertise of 545 extension foresters, each of whom was permitted to claim 3 areas of expertise. Selected areas of expertise and percentages of extension foresters claiming such expertise were:

- *Forest management*—33 percent.
- *Wood products, natural resource stewardship, urban and community forestry*—10 percent each.
- *Timber harvesting, economics and policy, wildlife and fisheries, watersheds, agroforestry, environmental and youth education, forest health and protection, Christmas trees, windbreaks, range management*—less than 5 percent each.
- *Wood energy, maple syrup production, forest fire prevention*—less than 1 percent each.

Technical assistance—Federal agencies have legal and institutional capacity to provide technical assistance on matters involving forest resources, but State forestry agencies do most of the program implementation. Technical assistance commonly refers to on-site assistance (such as forestland management advice) provided by technical professionals (such as forest resource professionals). The agencies that provide such assistance are often the same ones that provide public education and extension services. Examples of Federal technical assistance programs are as follows (Best and Wayburn 2001, National Research Council 1998, Sampson and DeCoster 1997, U.S. Environmental Protection Agency 1997, U.S. Department of Agriculture, Natural Resources Conservation Service 2002):

- *Forest Stewardship Program*—provides planning and management technical assistance. Administered by the USDA Forest Service and State forestry agencies.
- *Resource Conservation and Development Program*—provides for technical assistance. Administered by the USDA Natural Resources Conservation Service and the USDA Farm Service Agency.
- *Conservation Planning*—provides technical assistance. Administered by the USDA Natural Resources Conservation Service and local conservation districts.
- *Conservation Technical Assistance Program*—provides technical and planning assistance in connection with resource conservation practices. Administered by the USDA Natural Resources Conservation Service.
- *Cooperative Forestry Assistance Program*—provides technical assistance to State forestry agencies. Administered by the USDA Forest Service.

Table 2—Renewable resources extension staffing, by region, program component, and national program objective (1999)

Region and program component	National program objective (extension staff-years)					
	Production	Environmental quality	Utilization	Environmental education	Continuing education	Total
North						
Forestland	32.3	19.9	23.9	18.5	10.4	105.0
Rangeland	3.0	4.2	4.0	2.4	1.7	15.3
Fish and wildlife	9.1	14.6	1.5	22.8	11.3	59.3
Outdoor recreation	1.4	2.8	4.0	3.9	3.1	15.2
Environmental and public policy	10.8	19.3	3.6	22.8	9.6	66.1
Total	56.6	60.8	37.0	70.4	36.1	260.9
South						
Forestland	49.4	16.3	23.0	16.9	12.6	118.2
Rangeland	7.5	2.1	0.3	0.4	0.2	10.5
Fish and wildlife	18.5	8.4	7.3	13.3	3.5	51.0
Outdoor recreation	1.5	2.8	2.7	5.6	1.7	14.3
Environmental and public policy	3.8	12.0	3.2	9.8	4.6	33.4
Total	80.7	41.6	36.5	46.0	22.6	227.4
West						
Forestland	26.6	10.3	20.1	10.9	6.4	74.3
Rangeland	22.8	6.4	6.8	17.5	3.6	57.1
Fish and wildlife	19.3	13.5	2.2	13.6	1.9	50.5
Outdoor recreation	0.6	0.0	3.4	0.1	0.3	4.4
Environmental and public policy	4.8	10.6	5.8	13.6	2.1	36.9
Total	74.1	40.8	38.3	55.7	14.3	223.2
National Totals						
Forestland	108.3	46.5	67.0	46.3	29.4	297.5
Rangeland	33.3	12.7	11.1	20.3	5.5	82.9
Fish and wildlife	46.9	36.5	11.0	49.7	16.7	160.8
Outdoor recreation	3.5	5.6	10.1	9.6	5.1	33.9
Environmental and public policy	19.4	41.9	12.6	46.2	16.3	136.4
Total	211.4	143.2	118.8	172.1	73.0	711.4

Source: USDA Cooperative State Research, Education, and Extension Service (2000).

- *Pollution Prevention Technical Assistance Program*—provides technical assistance to help businesses and State agencies enhance pollution prevention programs. Administered by the U.S. EPA Office of Pollution Prevention and Toxics.
- *Environmental Pollution Technical Assistance*—programs providing technical assistance on a wide range of environmental topics. Administered by the U.S. EPA Office of Science Policy, National Center for Environmental Assessment, National Risk Management Research Center, and others.

State and Local Government Capacity

Information about State legal and institutional capacity to engage in public education, extension activities, and

technical assistance has not been assessed comprehensively, although modest assessments have been undertaken (for example, Ellefson and others 1995). In many cases, Federal and State education and technical assistance programs are close partnerships, and this makes separate identification of State and Federal emphasis and investments in these programs quite difficult. A classic example is the longstanding partnership of Federal, State, and local governments engaged in the implementation of extension programs.

In 1992, State educational and technical assistance programs offered to private forest landowners for the purpose of encouraging forest sustainability existed in virtually all States and focused on nearly all types of major forestry activity that would benefit from such programs (table 3). For the most part these programs were implemented by agencies with a long tradition in forestry (for example, State forestry agencies and land grant universities), although State wildlife management agencies in all 50 States reported in 1985 that they offered education and technical assistance opportunities to private forest landowners interested in State government management of wildlife and fish habitat associated with forests (Wigley and Melchiors 1987). In 2000, 12 cabinet-level units of State government and 58 first-tier subcabinet-level units implemented programs that provided information about forest resource management to private landowners. Six governing or advisory bodies of State government were also so engaged. In three States, extension is combined with a State forestry agency that also offers on-site technical assistance to landowners (Ellefson and others 2001, 2002).

Table 3—Number of State government education and technical assistance programs promoting best-forest-practice standards on private forests, by forestry activity, region, and type of program (1992)

	Number of States in region having program type									
Major forestry activity and type of program	North-east	Lake States	Mid-Atlantic	Mid-Continent	South-east	South Central	Great Plains	Rocky Mtn.	West	Total
Protect water quality										
Educational programs	6	3	6	5	5	5	5	5	6	46
Technical assistance	6	3	7	5	5	5	5	6	5	47
Promote reforestation										
Educational programs	6	3	6	5	6	5	4	5	6	46
Technical assistance	6	3	6	5	6	5	5	6	4	46
Improve timber-harvesting methods										
Educational programs	6	3	6	5	5	4	5	5	6	45
Technical assistance	6	3	7	5	6	5	5	6	4	47
Protect from wildfire, insects, and diseases										
Educational programs	6	3	6	5	5	5	5	6	6	47
Technical assistance	6	3	7	4	6	5	4	6	6	48
Protect wildlife and endangered species										
Educational programs	6	3	7	5	6	5	4	5	5	46
Technical assistance	5	3	6	5	6	5	5	5	4	45
Enhance recreation and aesthetic qualities										
Educational programs	6	3	6	4	5	5	4	5	3	42
Technical assistance	6	3	7	5	5	5	5	6	3	45

Note: Regional groupings of States are Northeast: CT, ME, MA, NH, RI, VT; Lake States: MI, MN, WI; Mid-Atlantic: DE, MD, NJ, NY, PA, VA, WV; Mid-continent: IL, IN, KT, MO, OH; Southeast: AL, FL, GA, MS, NC, SC; South Central: AR, LA, OK, TN, TX; Great Plains: IA, KS, NB, ND, SD; Rocky Mountain: AZ, CO, MT, NM, UT, WY; West: AK, CA, HI, ID, NV, OR, WA.
Source: Ellefson and others (1995).

Cooperative Extension Service programs are an integral part of the educational matrix in all States (Biles 2001). In 2001, staff persons assigned to forest and related extension service responsibilities averaged 7.8 per State, although the number ranged from 1 person each in 9 States to as many as 35 persons each in 1 State (table 4). States with a relatively large number of persons officially engaged in extension activities are Oregon (35), Minnesota (21), Washington (20), Pennsylvania (19), New Hampshire (17), and Kentucky (15). It should be noted, however, that these numbers are not full-time staff equivalents; rather they are simply the number of people reported to have an official role, however large or small, in a State's extension service program. Each State has an average of six full-time-equivalents devoted to extension activities focused specifically on forestland (and supported by the Renewable Resources Extension Act) (table 5). Again, the level of staffing varies considerably among States—it is highest in California (39.8 staff years), Mississippi (22.0), Georgia (20.5), North Carolina (19.6), and Missouri (15.3); and lowest in Connecticut (0.0), Delaware (0.1), New Mexico (0.2), and Colorado (0.5). State extension staffing is concentrated primarily on forest production (2.2 full-time-equivalents per State), and utilization (1.3 full-time-equivalents per State) (table 5) (U.S. Department of Agriculture, Cooperative State Research, Education, and Extension Service 2000).

State governments also implement a variety of K-12 environmental education programs that often include requirements leading to a better understanding of forests and related resources. In 1998, nearly all States had a statewide administrative structure (office, board, center, or committee) that fostered environmental education; most benefited from some reasonably stable source of funding (Ruskey and others 2001) (table 6). However, in only 12 States is K-12 environmental instruction required by law or administrative policy. Where this is the case, most States have also developed a master environmental education plan and a suggested environmental education curriculum (table 6). Typical of State-mandated initiatives are those in Wisconsin, where an environmental education law enacted in 1990 was patterned, in part, after the Council of State Governments' Model State Environmental Education Law (Council of State Governments 1993). Wisconsin has a State environmental education coordinating board, an environmental education grants program, State environmental education centers, and mandatory environmental literacy assessment of students and teachers. Other States have developed sophisticated support systems for teachers. An example is Michigan's EE-Link (developed and administered by the University of Michigan, supported by the U.S. Environmental Protection Agency), which allows educators to gain Internet access to environmental information, including organized instructional materials (U.S. Environmental Protection Agency 1996).

Table 4—Number of forest resource and related Cooperative Extension Service staff, by State (2001)

State	Number of extension staff	State	Number of extension staff	State	Number of extension staff
Alabama	7	Louisiana	9	Ohio	10
Alaska	1	Maine	1	Oklahoma	5
Arizona	1	Maryland	4	Oregon	35
Arkansas	12	Massachusetts	2	Pennsylvania	19
California	11	Michigan	11	Rhode Island	3
Colorado	2	Minnesota	21	South Carolina	13
Connecticut	2	Mississippi	12	South Dakota	1
Delaware	3	Missouri	2	Tennessee	9
Florida	8	Montana	3	Texas	5
Georgia	9	Nebraska	7	Utah	4
Hawaii	9	Nevada	6	Vermont	4
Idaho	4	New Hampshire	17	Virginia	15
Illinois	1	New Jersey	1	Washington	20
Indiana	9	New Mexico	7	West Virginia	3
Iowa	3	New York	10	Wisconsin	11
Kansas	1	North Carolina	13	Wyoming	7
Kentucky	15	North Dakota	1		

Note: Total staff representing extension is 389. Number of extension staff is not comparable to "full-time extension staff-years."
Source: Biles (2001).

Table 5—Forestland component staff of Renewable Resources Extension Act (RREA) program, by State and national program objective (1999)

State	National program objective (RREA staff-years)					
	Production	Environmental quality	Utilization	Environmental education	Continuing education	Total
Alabama	2.5	2.0	1.0	3.0	1.3	9.8
Alaska	0.4	0.1	0.4	0.4	0.2	1.5
Arizona	0.2	1.0	0.2	0.3	0.0	1.7
Arkansas	1.5	0.5	0.8	0.5	0.8	4.1
California	16.0	3.8	13.1	6.9	0.0	39.8
Colorado	0.2	0.1	0.0	0.0	0.2	0.5
Connecticut	0.0	0.0	0.0	0.0	0.0	0.0
Delaware	0.0	0.0	0.0	0.0	0.1	0.1
Florida	1.0	1.0	0.4	1.0	0.0	3.4
Georgia	5.0	5.5	7.0	1.0	2.0	20.5
Hawaii	0.7	0.3	0.0	0.2	0.0	1.2
Idaho	1.5	1.0	0.6	0.8	0.8	4.7
Illinois	0.3	0.4	0.1	1.0	0.8	2.6
Indiana	1.6	0.4	0.8	0.0	2.3	4.7
Iowa	1.0	0.0	0.0	0.9	0.0	1.9
Kansas	0.5	1.0	1.0	1.0	0.1	3.6
Kentucky	2.7	0.2	2.8	1.0	1.5	8.2
Louisiana	5.0	0.0	2.0	0.0	2.3	9.3
Maine	1.0	0.5	1.0	1.0	1.0	4.5
Maryland	0.8	0.8	0.5	0.1	0.5	2.7
Massachusetts	0.1	0.3	0.1	0.1	0.3	0.9
Michigan	2.0	1.5	1.5	2.5	0.0	7.5
Minnesota	0.3	1.3	1.0	0.6	0.7	3.9
Mississippi	16.0	3.0	1.0	1.0	1.0	22.0
Missouri	5.0	3.2	3.2	3.0	0.9	15.3
Montana	0.9	0.9	0.9	0.2	0.4	3.3
Nebraska	0.0	0.8	1.8	0.8	0.0	3.4
Nevada	0.0	0.3	0.0	0.1	0.2	0.6
New Hampshire	3.4	2.3	0.8	2.0	1.0	9.5
New Jersey	1.7	0.1	0.0	0.0	0.2	2.0
New Mexico	0.0	0.2	0.0	0.0	0.0	0.2
New York	3.0	0.8	1.7	0.8	0.7	7.0
North Carolina	5.0	3.0	4.0	5.6	2.0	19.6
North Dakota	0.2	0.3	0.1	0.2	0.2	1.0
Ohio	3.3	0.5	2.7	0.0	0.0	6.5
Oklahoma	0.9	0.2	0.3	0.3	0.0	1.7
Oregon	4.6	1.0	3.9	1.0	2.0	12.5
Pennsylvania	1.8	1.8	1.1	1.0	0.7	6.4
Rhode Island	0.2	2.0	0.2	1.5	0.3	4.2
South Carolina	5.0	0.5	0.5	0.5	0.2	6.7
South Dakota	0.2	0.3	0.5	0.2	0.1	1.3
Tennessee	1.0	0.1	0.5	1.0	0.5	3.1
Texas	1.2	0.0	1.0	0.5	0.0	2.7
Utah	0.5	0.5	0.0	0.0	1.0	2.0
Vermont	1.0	0.0	0.8	1.0	0.2	3.0
Virginia	2.6	0.4	1.7	1.5	1.0	7.2
Washington	1.6	1.1	1.0	1.0	1.6	6.3
West Virginia	1.5	0.6	2.0	1.0	0.3	5.4
Wisconsin	1.5	0.6	2.0	1.0	0.3	5.4
Wyoming	3.5	1.5	3.0	0.0	0.0	8.0
Average per State	2.2	0.9	1.3	0.9	0.6	6.0

Note: RREA is the Forest and Rangeland Renewable Resources Extension Act.
Source: U.S. Department of Agriculture, Cooperative State Research, Education, and Extension Service (2000).

Table 6—State environmental education programs, by State and by type of program structure, program, and funding (1998)

State	Components of program structure			Major administrative components established (office, board, center, committee)	Program funding sources established (trust fund, general State revenue)
	K-12 Environmental instruction required	Environmental instruction master plan prepared	Environmental education curriculum guide prepared		
Alabama				X	X
Alaska				X	
Arizona				X	X
Arkansas	X	X	X	X	X
California	X		X	X	X
Colorado		X		X	X
Connecticut				X	X
Delaware				X	
Florida				X	X
Georgia	X			X	
Hawaii			X	X	X
Idaho				X	
Illinois	X			X	
Indiana				X	X
Iowa	X			X	X
Kansas			X	X	
Kentucky		X		X	X
Louisiana	X		X	X	
Maine				X	
Maryland	X			X	X
Massachusetts		X	X	X	X
Michigan				X	
Minnesota		X	X	X	X
Mississippi				X	
Missouri					X
Montana				X	X
Nebraska				X	
Nevada	X		X	X	
New Hampshire				X	
New Jersey		X		X	
New Mexico				X	
New York			X	X	
North Carolina		X		X	X
North Dakota					
Ohio	X		X	X	X
Oklahoma				X	
Oregon				X	X
Pennsylvania	X	X		X	X
Rhode Island				X	
South Carolina				X	X
South Dakota				X	
Tennessee				X	
Texas				X	X
Utah				X	
Vermont				X	
Virginia				X	
Washington	X	X	X	X	X
West Virginia		X	X	X	
Wisconsin	X		X	X	X
Wyoming			X		

Source: Ruskey and others (2001), U.S. Environmental Protection Agency (1996).

Summary of Conditions

Forestry and related public and private organizations in the United States have a long history of providing information about the use, management, and protection of forests. Efforts to provide such information is motivated by a desire to heighten public awareness of forest sustainability principles and to acquaint citizens with the potential of forests to enhance their economic and social well-being. In light of the background and current conditions discussed above, the following observations are made about the identification and measurement of activities involving the development and transfer of information concerning forest sustainability:

- Information about forest resources is enormous in quantity and breadth, as is the range of potential audiences seeking such information. As new information about forests is produced as a result of formal research activities or everyday experiences, the task of packaging and disseminating information about forests to an ever-growing assemblage of interests becomes increasingly challenging.
- Information about forests can be communicated in a variety of ways, depending on the audience of interest and the outcomes desired. Educational initiatives that relate to the sustainability of forest resources range from the highly structured curricula implemented in elementary and secondary schools to the more dispersed public-affairs approaches focused on changing or reinforcing opinions of the general public (which often has only a passing interest in forests).
- Organizations responsible for communicating information about forest sustainability are many in number and diverse in mission and program responsibilities, and the intensity with which they engage in educational activities varies greatly. At times, certain organizations (for example, private advocacy groups) are prone to bias and one-sidedness in the information they convey.
- Extensive partnering occurs among and between public and private organizations that are responsible for educational initiatives involving forest sustainability. Notable examples are the Cooperative Extension Service, which involves Federal, State, and local partnering in the financing and delivery of extension services, and the U.S. Environmental Protection Agency's extensive partnering with State organizations on educational matters related to environmental quality.
- Educational programs are extensively commingled with various other types of programs (programs such as technical assistance, fiscal incentives, tax relief, and regulatory actions) that promote the application of management principles commonly associated with forest sustainability. Implementation of education programs in ways that complement other types of programs often leads to more efficient accomplishment of overall forest sustainability goals and objectives.
- Private-sector capacity to undertake public education, extension, and technical assistance efforts is extensive. More than 80 private national organizations have educational initiatives focused on forest sustainability. Privately sponsored forest certification programs have an important role in education involving forest sustainability.
- Federal Government agencies implement a wide range of education programs focused on forest sustainability and have extensive legal and institutional capacity to do so. At least 19 Federal laws, including the Renewable Resources Extension Act of 1978 and the National Environmental Education Act of 1990, authorize such activity. This capacity is exercised via programs involving public education generally, extension service programs, and one-on-one technical assistance initiatives. In recent years, growth in extension service initiatives administered by the U.S. Department of Agriculture has been modest, whereas new authorities have significantly expanded the capacity of the U.S. Environmental Protection Agency to undertake environmental education (often involving forest sustainability).
- State government agencies have substantial legal and institutional capacity to carry out educational programs. In many cases these programs are conducted in close partnership with Federal programs; an example is the Cooperative Extension Service, which engages the educational abilities of approximately six full-time-equivalent staff years per State. In recent years, State governments have initiated a variety of K-12 environmental education programs, many of which are relevant to better understanding of forest sustainability principles.

Issues and Trends

The literature identifies a number of major issues and trends involving extension and public education as related to forest sustainability and conservation. Examples of this literature (from which the following issues and trends are drawn) are Bennett 1995; Ellefson and others 2001, 2002, 2003; Hamilton and Biles 1998; Hubbard and Dangerfield 1998; Leirman and Kulich 1987; Megalos and Payne 1995; National Research Council 1998; Reed and others 1997; Rivera 1996; Ruskey and others 2001; Sampson and DeCoster 1997, U.S. Environmental Protection Agency 1996; U.S. Department of Agriculture, Cooperative State Research, Education, and Extension Service 1994; and U.S. Department of Agriculture, Forest Service 2002.

- Organizations involved in the development and implementation of educational programs having implications for forest sustainability have increased considerably in

number and strength. Although this has provided opportunities to serve more and larger audiences, it has also posed challenges to program coordination (including concerns over interorganizational rivalries, especially in an era of program downsizing) and to presentation of integrated, consistent messages regarding forest sustainability (including concern over focus on a single forest or environmental value, which poses significant challenges to coordination within and between organizations and to confusion among client groups that hear mixed messages).

- New technologies (such as distance delivery technologies) continue to transform the way in which information about forest sustainability is communicated. Organizations responsible for educational initiatives are increasingly challenged to seek out and adopt new technologies and to use them to their fullest potential.
- Client groups seeking information about forest sustainability are becoming increasingly diverse and are seeking information that is more in tune with their cultural and ethnic experiences and background. Organizations responsible for educational initiatives are challenged to meet these increasingly diverse information needs. Such challenges are a reality in a world where the success of programs depends on the use of marketing skills and a sound understanding of the audiences to be served.
- Subject material considered relevant to forest sustainability is growing in breadth. Client groups are increasingly seeking a broader range of information about the use, management, and protection of forest environments. However, this development does not decrease the importance of communicating information about economically important forest uses, including timber production.
- Although the number of organizations providing information about forest sustainability is increasing, these organizations are quite mixed in terms of their ability to provide timely, high-quality, value-neutral information about forest sustainability. In the future, public and private providers of information will be challenged to broaden the sources from which they draw information and to carefully monitor the quality of information provided by such sources.
- Evaluating the efficiency and effectiveness of educational programs is becoming increasingly important to organizations that are responsible for such programs. Although evaluations are often hampered by the diffuse and long-term nature of the benefits delivered by investments in education and extension, the pressure to evaluate programs is likely to become even greater as competition for financial resources increases in both the public and private sectors. Especially troubling is the modest scale at which many education and technical assistance programs are implemented (willing participants often exceed supply).
- Educational programs at grades K-12 are increasingly being implemented to expose students to a better understanding of forest sustainability. However, implementation of these programs is often prevented by unresolved debate about the wisdom of integrating the programs into existing lessons (history, science, social studies) versus presenting environmental and related subject material in separate and distinct blocks or courses. The trend is toward the latter.
- Nongovernmental organizations are increasingly taking the lead in environmental education and are increasingly devoting attention to matters involving forest sustainability. Especially important are State environmental education associations and councils, which seek to strengthen State capacity for effective environmental education. Presently, 45 States have environmental education associations.

Information Adequacy

Specification

The diversity in form and function of extension, educational, and technical assistance programs raises many questions about the information required to adequately assess educational conditions considered necessary for forest sustainability and conservation. Educational programs are carried out in many different ways by a wide array of organizations. This makes it very difficult to present an understandable picture of the Nation's capacity to promote principles of forest sustainability via educational activities. A number of information concerns need to be addressed. For example (and from a strategic perspective), there is a pressing need for information about:

- *Status and condition of education initiatives*—magnitude and extent of current and planned investments in educational programs.
- *Need for investment in new or existing educational programs*—identification of objectives and assessment of educational program investments needed to accomplish them.
- *Processes by which information is communicated*—determinations of adequacy, assessment of needed investments, identification of financial resources, and designation of responsibility for implementation.
- *Effectiveness and efficiency of educational investments*—relationship between desired conditions of forest sustainability and type and level of educational program.
- *Knowledge and information networks*—communication and information flow between users and providers of information.

- *Regional and national influences on educational initiatives*—in contrast to local conditions, influence of broader geographic forest conditions, population structure, type and mix of client groups, research and development resources.
- *Regional and international comparisons*—determination of educational deficiencies, focusing of public and private investments, learning experiences for improving program efficiency.

Neither public nor private organizations have comprehensively assessed the availability of information about educational and extension programs that relate to forest sustainability. Notable providers of such information are certain Federal agencies (for example, the USDA Cooperative State Research, Education, and Extension Service), most of which focus only on programs for which they are directly responsible. In 1999, the National Association of State Foresters (1999) sought a better understanding of State forestry agency information concerning educational initiatives. The Association reported that 34 States had such information and that 16 did not. Of the 34 States with information, 7 indicated that the information was abundant, 18 indicated that it was sufficient, and the remainder indicated that they had some (but generally very little) information. Eleven States reported that the quality of their information was excellent, 19 that it was adequate, and the remainder that it was poor.

The following comments and questions may be helpful in guiding efforts to better understand the institutional capacity for and the role of extension and education that support forest sustainability and conservation:

- *Measurement Information*—Information about which variables should be measured and how they should be measured so as to accurately portray conditions involving extension, education, and technical assistance programs has not been assembled. What data should be obtained and compiled (for example, number of persons contacted, forest area under management, number and type of management actions taken)? How often are these data to be obtained? Are special data needs associated with different types of educational programs or with public and private programs? What kinds of data could be used to identify successful and indispensable educational efforts (for example, reforestation undertaken, species habitats protected, continuation of employment)?
- *Extent-of-activity information*—Information about education, extension, and technical assistance is often scattered among public and private collecting organizations and often lacks local, regional, and national consistency. What are the legal requirements for investing in educational programs at various geographic levels? How are these requirements changing over time? Are there different requirements at different levels of government? Is there consistency across these requirements? What is the status of local efforts to encourage investment in education and extension programs? What is the condition of private education, extension, and technical assistance programs and what is the extent of private investment in such programs? Are current compilations describing these programs useful for guiding policy and program direction?
- *Responsible-organization information*—The private and public organizations actively engaged in the development and implementation of education, extension, and technical assistance programs have not been listed comprehensively. What government agencies are responsible for and engaged in these programs, and what is the level of their involvement? What legal authority assigns them responsibility, and is this authority being interpreted accurately? What is the involvement of private organizations in relevant education and related programs? Do public and private organizations engaging in educational activities have similar or differing goals and objectives that foster or hinder needed investment in education programs important to forest sustainability? Should certain government levels be responsible for providing certain types of educational programs for certain forest landowners? Is there a standard for the educational efforts of various organizations, or are organizations working at cross-purposes, diminishing public confidence in the information being provided? Are there organizational patterns in the public and private sector that, if known and publicized, would enhance overall investment in education (alternatives to extension leadership by universities and technical assistance leadership by State forestry agencies)?
- *Coordination information*—Information about requirements to coordinate development and implementation of education, extension, and technical assistance programs among and between various levels of government and various private concerns has not been assembled. What conflicts exist among the various entities engaged in developing and carrying out educational programs? How might they be productively resolved? What are the requirements for coordination? Do they allow for cross-sectoral, coordinated planning and review (for example, with programs involving fiscal incentives, tax incentives, and regulatory requirements)? Do they ensure that the cumulative results of local, State, and regionally implemented educational, extension, and technical assistance programs will be consistent with national requirements and vice versa? Do they allow incorporation of ad hoc educational activities occurring at various times and undertaken by various levels of government?

- *Investment and incentive information*—Information about resources devoted to education, extension, and technical assistance has not been assembled comprehensively. What is the magnitude of investment in public and private education focused on forest sustainability? Is there an appropriate level of investment in these programs, and if there is, how is it determined (for example, by percentage of landowners to be contacted, or by number of K-12 students provided educational kits)? Are there legal and administrative processes for allocating resources to education focused on forest sustainability, and if so, are they effective? Are there legal or fiscal means for encouraging development of educational programs, especially those related to the sustainable management of multiple forest resources?
- *Effectiveness information*—Information about the effectiveness of various types and levels of educational, extension, and technical assistance programs in promoting sustainable forestry has not been compiled comprehensively. Are there legal or administrative requirements to determine the efficiency and effectiveness of educational and related programs? What are appropriate measures of success? What are the relative efficiencies of educational programs generally versus other policy tools for accomplishing forest sustainability? Are there more effective approaches to organizing and administering educational and extension programs (alternatives to land-grant university leadership, alternatives to State forestry agency leadership)? Are some organizations more effective than others in developing educational messages about forest sustainability, and if so why? How are different messages best communicated to different audiences?
- *Procedure and specification information*—Information about standards and procedures for the development and implementation of educational, extension, and technical assistance programs has not been assembled. Do current statutory requirements prescribe procedures for developing educational programs and the material presented in such programs? Are such requirements detailed, or do they establish a broad framework that gives discretion to administrators, educators, and land managers? Is the full intent of the existing laws that require education and related programs expressed in current rules and administrative procedures? Do national requirements for educational programs allow for regional and subregional development of programs consistent with regional interests? Do requirements specify the need for leadership in their development? Do they give guidance to such leadership? Is there any coordination among organizations in the development of educational materials?

Recommendations

Indicator 53 suggests that success in achieving forest sustainability requires consistent, long-term investments in education, extension, and technical assistance programs. In order to improve our understanding of the legal and institutional setting within which this will occur, we must address a variety of information voids. Many of these voids are described above. We recommend that the following actions be taken:

- *Comprehensive periodic reviews*. Conduct periodic and comprehensive reviews of current institutional capacity and associated authorities that give direction and resources to educational, extension, and technical assistance programs considered necessary for forest sustainability. These reviews should be guided by the information deficiencies we have just discussed and should emphasize the collection of information about the type and extent of educational programs, organizations responsible for ensuring appropriate levels of investment in educational programs, and the long-term appropriateness and effectiveness of these programs. This information should be gathered at Federal, State, and local levels of government. In addition, a systematic review of private sector capability to undertake educational programs relevant to forest sustainability should be initiated.
- *Responsibility for conducting reviews*. Assign responsibility for conducting continuous reviews of educational, extension, and technical assistance activities to a specific current or new administrative unit of a Federal agency (for example, the USDA Cooperative State Research, Education, and Extension Service's Natural Resources and Environmental Management Unit, the USDA Forest Service's State and Private Forestry Unit or Research and Development Unit, or the U.S. Environmental Protection Agency's Office of Environmental Education), a college or university, or other nonprofit organization (for example, the National Association of State Foresters or the National Association of Professional Forestry Schools and Colleges). This responsibility should be assigned to an organization that has a proven track record in addressing the complexities of educational, extension, and technical assistance programs relevant to forest sustainability.
- *Devote resources to reviews*. Invest sufficient resources in the reviews to provide the information necessary to dramatically improve our understanding of the capacity to plan, construct, and maintain educational, extension, and technical assistance initiatives considered important to sustainable forestry.

Indicator Appropriateness

Indicator Definition

The terminology in which Indicator 53 is stated is not adequately clear. The meanings of the phrases "public involvement," "public education," and "make available forest-related information" should be defined. Until they are defined, these phrases cannot serve as useful guides to information-gathering efforts. Furthermore, determining exactly what is to be included under the umbrella term "education" (Indicator 53 includes topics as diverse as public involvement, public education, and extension programs) also poses problems for information gathering. And failure to acknowledge capacities represented by technical assistance and related programs appears to be a major deficiency.

The indicator could be improved if it were better defined and more appropriately focused. As has also been suggested elsewhere (Roundtable on Sustainable Forestry 1999), this could be accomplished by changing the indicator's wording to "*provides for educational activities focused on various segments of the citizenry and the general public*." Reference to public involvement should be moved to other more appropriate indicators.

Relationship to Other Indicators

The breadth of subject material suggested by Indicator 53 poses a number of crosscutting problems, most of which could be avoided if the Indicator focused strictly on educational initiatives directed at the general public. Indicators 50 (opportunities for public participation), 55 (develop human resource skills), and 51 (encourage best-practice codes) seem to have a great amount of overlap with Indicator 53. Indicators 50 and 53 both indicate analysis of public involvement activities, while Indicator 55 suggests a number of educational issues that overlap with Indicator 53. Other indicators that may have additional overlap or close relationships with Indicator 53 include Indicator 39 (level of expenditure on research, development, and education), Indicator 44 (employment), Indicator 57 (enforcement), Indicator 58 (investment and taxation policies), and 60 and 62 (information availability and scope).

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Appendix A

Private Organizations Engaged in Public Education Activities Involving Forest Resources (2002)

American Fisheries Society
American Forest and Paper Association
American Forest Foundation
American Forests
American Rivers
American Society of Environmental History
American Society of Landscape Architects
American Water Resources Association
Arbor Day Foundation
Association of Consulting Foresters
Association of Ecosystem Research Centers
Association of Environmental and Resource Economics
Association of State Wetland Managers
Blue Mountains Natural Resources Institute
California Association of Resource Conservation Districts
Center for Conservation Biology Network
Chesapeake Bay Foundation
Colorado Riparian Association
Defenders of Wildlife
Earth Island Institute
Earth Pledge Foundation
Earthwatch
Ecological Society of America
Environmental Defense Fund
Environmental Design Research Association
Environmental Law Institute
Forest History Society
Forest Landowners Association
Forest Products Society
Forest Resources Systems Institute
Forest Stewardship Council
Friends of the Earth
Greenpeace
Hardwood Forestry Fund
Island Resources Foundation
International Association for Landscape Ecology
Izaak Walton League of America
League of Conservation Voters
Liberty Tree Alliance
National Audubon Society
National Association of Conservation Districts
Pesticide Action Network
Rainforest Action Network
Renewable Natural Resources Foundation
Resource Renewal Institute
Resources for the Future
Saving America's Forests
Sierra Club
National Association of Environmental Professionals
North American Association for Environmental Education
National Association of Conservation Districts
National Association of Professional Forestry Schools and Colleges
National Association of Resource Conservation and Development Councils
National Environmental Education Training Foundation
National Fish and Wildlife Foundation
National Forest Foundation
National Institutes for Water Resources
National Parks and Conservation Association
National Tree Trust
National Wildlife Federation
Nature Conservancy
Natural Areas Association
Natural Resources Defense Council
Natural Resources Law Center
Natural Resource Leadership Institute
New Forests Project
Society of American Foresters
Society for Ecological Restoration
Society of Environmental Journalists and Environmental Journalism
Society for Range Management
Society of Wetland Scientists
Soil and Water Conservation Society
Soil Science Society of America
Southern Forest-Based Economic Development Council
Student Conservation Association
Tall Timbers Research Station
Taxpayer Assets Project
Temperate Forest Foundation
Trees for the Future
Trout Unlimited
Trust for Public Land
Union of Concerned Scientists
Water Environmental Federation
Watershed Management Council
Western Forestry and Conservation Association
Wilderness Society
Wildlife Management Institute
Wildlife Society
Woods Hole Research Center
World Stewardship Institute

Source: Various directories, including Butler and Slack (1994), Gale Group (2002), Malonis (2000), National Wildlife Federation (2001), Trzyna and others (1996).

Appendix B

Periodicals Conveying Information About Use, Management, and Protection of Forest Resources (2002)

Agriculture and Human Values
Agriculture, Ecosystems, and Environment
Agroforestry Systems
American Christmas Tree Journal
American Journal of Agricultural Economics
American Review of Public Administration
Appita Journal
Applied Engineering in Agriculture
Applied Geography
Appraisal Journal
Arboricultural Journal
BioCycle
Biodiversity and Conservation
Biomass and Bioenergy
Boston College Environmental Law Review
Brookings Review
Cellulose Chemistry and Technology
Chemosphere
Christmas Trees
Climate Research
Climatic Change
Common Property Resource Digest
Consultant
Contemporary Economic Policy
Crossties
Culture and Agriculture
Ecological Applications
Ecological Modeling
Ecologist
Ecology Law Quarterly
Economic and Political Weekly
Economic Botany
Economic Development & Cultural Change
Economic Geography
Ecosystem Health
Energy
Energy Economics
Engineered Wood Journal
Environment and Behavior
Environment and History
Environment and Planning
Environmental and Resource Economics
Environmental Ethics
Environmental History
Environmental Management
Environmental Science and Policy
Environmental Values
Environmentalist
Evaluation Report
Experimental Agriculture
Farm Management
Forest and Landscape Research
Forest Ecology and Management
Forest Landowner
Forest Log
Forest Magazine
Forest Perspectives
Forest Policy and Economics
Forest Products Journal
Forest Science
Forest, Snow, and Landscape Research
Forestry
Forests, Trees and Livelihoods
Forests, Trees and People Newsletter
Geoforum
Geographical Journal
George Wright Forum
Global Ecology and Biogeography
Global Environmental Change
Grassroots Development
Growth and Change
Human Ecology
Human Organization
Issues in Science and Technology
Journal of ...
- Agricultural & Applied Economics
- Agricultural & Resource Economics
- Agricultural Economics
- Anthropological Research
- Applied Social Psychology
- Arboriculture
- Architectural Planning & Research
- Arid Environments
- Economic Behavior & Organization
- Economic Perspectives
- Environment and Development
- Environmental Economics & Management
- Environmental Education
- Environmental Management
- Environmental Planning & Management
- Environmental Psychology
- Environmental Systems
- Forest Economics
- Forest Science
- Forestry
- Industrial Ecology
- Interdisciplinary Economics
- Leisure Research
- Natural Resources & Life Sciences Education
- Non-Timber Forest Products
- Park and Recreation Administration
- Public Economics
- Range Management
- Regional Science
- Risk and Uncertainty
- Rural Development
- Rural Studies
- Sustainable Forestry
- Institute of Wood Science
- Travel Research
- Tree Sciences
- Tropical Forest Products
- Tropical Forest Science
- Tropical Forestry
- World Forest Resource Management

Land and Water Law Review
Land Degradation and Development
Land Economics
Land Use Policy
Landscape and Urban Planning
Landscape Research
Legacy
Leisure
Leisure Sciences
Management Science
Minnesota Forests
Monthly Labor Review
Mountain Research & Development
National Parks
National Woodlands
Natural Areas Journal
Natural Resource Modeling
Natural Resources Forum
Natural Resources Journal
New Forests
News of Forest History
Policy Sciences
Policy Studies Journal
Political Research Quarterly
Polity
Progress in Paper Recycling
Public Administration Review
Public Administration & Development
Pulp and Paper
Pulp and Paper International
Quarterly Journal of Forestry
Range Management & Agroforestry
Rangeland Journal
Rangelands
Regional Science & Urban Economics
Regional Studies
Renewable Energy
Renewable Resources Journal
Resource and Energy Economics
Review of Agricultural Economics
Review of Economics and Statistics
Rural Sociology
Science of the Total Environment
Society and Natural Resources
Socio-Economic Planning Sciences
Southern Journal of Applied Forestry
Southern Lumberman
Structural Change & Economic Dynamics
Temperate Agroforester
Tigerpaper
Timber Producer
Tourism Analysis
Tree Farmer
TRI News
Tropical Forest Update
Walnut Council Bulletin
Water Resources Research
Western Journal of Applied Forestry
Women in Natural Resources
Wood and Fiber Science
Wood and Wood Products
Wood Energy News
Wood Technology
Woodland Steward
World Resource Review
World Watch
Yellowstone Science

Source: University of Minnesota (2002).

Appendix C

Federal Agency Programs Containing Educational Elements Relevant to Forest Resources, by Agency (2001)

DEPARTMENT OF AGRICULTURE

Agricultural Research Service:
National Agricultural Library
Natural Resources and Sustainable Agricultural Systems
Office of Pest Management Policy
Pasture Systems and Watersheds
Water Management Research Laboratory

Animal and Plant Health Inspection Service:
Aquaculture
Wildlife Services

Cooperative State Research, Education, and Extension Service:
Cooperative Extension Service
Extension Indian Reservation Program
Forest Products Research, Education, and Extension
Hispanic-Serving Education Grants Program
Invasive Species Program
Multicultural Scholars Program
Renewable Resources Extension Program
Secondary Agricultural Education Challenge Grants
Small Farm Program
Sustainable Agriculture Research and Education Program
Tribal Colleges Endowment Fund
Tribal Colleges Education Equity Grants Program
Water Quality Program
Wildlife and Fisheries Program

Economic Research Service:
Agricultural and Rural Economic Research

Farm Service Agency:
Aerial Photography Field Office
Conservation Reserve Program
Conservation Reserve Enhancement Program

Foreign Agricultural Service:
Emerging Markets Program
Export Assistance Program
Market Access Program

Forest Service:
Agroforestry Program
Cooperative Forest Health Protection Program
Forest Products Conservation and Recycling Program
Forest Stewardship Program
Forest Taxation Program
National Forest-Dependent Rural Communities Program
Northwest Economic Adjustment Initiative
Research and Development Programs
Rural Development, Forestry, and Communities
State Fire Assistance

Forest Service (cont.):
Stewardship Incentives Program
Volunteer Fire Assistance Program
Wildlife Management & Education Programs

National Agricultural Statistics Service:
Agricultural Statistics Reports

Natural Resources Conservation Service:
Conservation of Private Grazing Land Initiative
Conservation Technical Assistance
Environmental Quality Incentives Program
Forestry Incentives Program
Great Plains Conservation
Resource Conservation and Development
Snow Survey and Water Supply Forecasting
Soil Survey
Soil and Water Conservation
Water Bank Program
Watershed Protection and Flood Prevention
Watershed Surveys and Planning
Wildlife Habitat Incentives Program

DEPARTMENT OF COMMERCE

International Trade Administration:
Forest Products and Building Materials Division

National Oceanic and Atmospheric Administration:
National Weather Service

Technology Administration:
National Technical Information Service

DEPARTMENT OF ENERGY

Office of Energy Research:
Office of Scientific & Technical Information

DEPARTMENT OF THE INTERIOR

Bureau of Indian Affairs:
Endangered Species on Indian Lands
Environmental Management: Indian Programs
Forestry on Indian Lands
Water Resources on Indian Lands

Fish and Wildlife Service:
Conservation Law Enforcement Training Assistance
Wildlife Restoration
Migratory Bird Banding & Data Analysis

Geologic Survey:
National Cooperative Geologic Mapping Program
Upper Mississippi River System Monitoring

National Park Service:
National Landmarks Program
Rivers, Trails, and Conservation Assistance

ENVIRONMENTAL PROTECTION AGENCY

Office of the Administrator:
Common Sense Initiative
Environmental Education Grants
Environmental Education and Training Program
Project XL
Small Business Ombudsmen
Small Business Regulatory Enforcement Programs

Office of Air and Radiation:
Agstar Program
Air Information Center
Air Toxics Program
Climate Change Research
Climate Protection Programs
Mobile Sources Program
Particulate Matter Programs

Office of Children's Health Protection:
Children's Health Protection

Office of Environmental Education:
National Environmental Education Act

Office of Environmental Information:
EMPACT (Community Tracking Program)
EMAP (Monitoring and Assessment Program)

Office of Prevention, Pesticides, and Toxic Substances:
Community Right To Know Program
Design for the Environment
Pesticide Applicator Certification and Training
Pesticide Registration
Pesticide Reregistration
Pesticide Residue Tolerance Reassessments

Office of Research and Development:
Environmental Technology Verification
Exploratory Grants Program
Human Health Research
Science to Achieve Results Fellowship Program

Office of Solid Waste and Emergency Response:
Hazardous Substance Research
Resource Conservation & Recovery Act Programs
Risk Management Program

Office of Water:
Clean Water Action Plan Related Research
Coastal Environmental Monitoring
Great Lakes Program
Gulf of Mexico Program
Lake Champlain Basin Program
Long Island Sound Study
NPDES (Pollutant Discharge Permitting Program)
Rural Water Technical Assistance
Safe Drinking Water Research

Forest Planning, Assessment, and Policy Review (Indicator 54)

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The full text of Indicator 54 is as follows: *Extent to which the institutional framework supports the conservation and sustainable management of forests, including the capacity to* ***undertake and implement periodic forest-related planning, assessment, and policy review, including cross-sectoral planning and coordination*** (Montreal Process Working Group 2003).

Rationale and Interpretation

Forests are affected by a wide variety of physical, economic, and social influences, many of which originate beyond the forest community in sectors such as energy, agriculture, transportation, communication, environment, and government. The sustainability of forests is dependent on the institutional ability of societies to comprehensively evaluate trends and conditions in these diverse sectors and take responsive actions that will ensure the sustained use, management, and protection of forest resources and the communities that are dependent upon them. These actions are typically predicated on institutional conditions that foster the production of well-focused and technically sound plans, assessments, and policy reviews that are sensitive to a range of forest values and are coordinated with a variety of forest-related sectors (Montreal Process Working Group 2003, Montreal Process Technical Advisory Committee 2000).

The focus of the indicator is on the institutional capacity available to conduct planning, assessments, and policy reviews. Useful measures of this capacity include enumerations of the public and private agencies and organizations involved; information about the frequency with which plans, analyses, and reviews are prepared; the financial and professional resources devoted to these activities; and information about the ability of public and private institutions to accomplish plan objectives involving conservation and sustainability. Of special interest is information about the ability of agencies, plans, assessments, and reviews to address issues involving coordination and cross-sectoral planning (Montreal Process Technical Advisory Committee 2000).

Indicator 54 refers to planning, assessments, policy review, and cross-sectoral planning and coordination. To guide this review, we define these terms as follows: *planning* refers to disciplined procedures undertaken to guide organizations having an interest in forest sustainability (for example, strategic resource planning, land use and management planning); *assessments* are comprehensive examinations of present and prospective conditions (ecological, economic, political) that are likely to affect forest sustainability; *policy review* is the development and examination of options for addressing important issues involving forest sustainability; *cross-sectoral planning* is planning that embraces diverse ecological, economic, and political structures and conditions important to forest sustainability; and *coordinating* is harmonizing and integrating plans, assessments, and policy reviews important to forest sustainability.

The indicator draws special attention to the institutional capacity to engage in cross-sectoral planning and coordination. A State or nation's forestry sector may be but one of many sectors capable of fostering sustainability and conservation of forests. There is potential for cross-sectoring at interfaces between project plans, forest sector plans, and macro or national plans; interfaces between plans for different forest resources (for example, timber, recreation, range, wildlife); interfaces between forestry and nonforestry plans (for example, agriculture, minerals); interfaces between public and private-sector plans (public timberland investments and private timber processing facilities); and interfaces between forestry plans and nonforestry plans for activities that affect forestry-related functions (such as general transportation plans). The number of potential interfaces relevant to forest sustainability is large and there is considerable opportunity for coordination (Ellefson 1985, Greeley 1966).

Conceptual Background

Planning Activities

Planning is often considered a central component of forestland management. Statutes and administrative directives governing the use, management, and protection of forests invariably set forth requirements for agency development of plans and directives that provide the framework within which managers can develop operational approaches for accomplishing organizational missions. Since private and public interests in the use, management, and protection of forests are part of dynamic political and economic systems, plans are subject to periodic review and revision.

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Coordination of various types and levels of plans prepared in response to various local, State, and Federal statutory requirements is an onerous task. An effective approach to coordinating, and in some cases reconciling, plan development and implementation has not yet been realized.

Forest resources plans are highly variable in their purpose, content, and focus. Strategic program plans, land use and management plans, and multisector plans have recognizable characteristics.

A *strategic program plan* sets the general direction of an agency's efforts to achieve its mission or vision and results from a formalized but modest set of exercises or from the combined responses of an agency to continuing streams of often-unexpected issues. Examples of the latter are State and Federal agency actions responding to unexpected judicial and legislative directives, actions which when combined form a de facto strategic plan. Statewide forest resource plans prepared by lead forestry agencies in State government, and the plans required of the USDA Forest Service by the Forest and Rangeland Renewable Resources Planning Act of 1974 and the Government Performance and Results Act of 1993, are examples of strategic plans resulting from more formalized exercises.

Plans can also be very focused in identifying expected outcomes, as in the case of *land use and management plans*. Of interest is agency capacity to develop plans that are specific enough to provide clear direction for management activities, and concrete enough so that success can be measured. Such plans can identify uses, outputs, and conditions that are desirable and feasible, and can explain how management will affect key sites, produce important outputs, and protect vital resources and ecosystems. Land use and management plans tend to be the product of rational planning approaches that require clearly specified objectives, alternatives, decision criteria, and implementation and monitoring procedures. Plans for each of the Nation's national forests, as prepared by the USDA Forest Service under authorities set forth by the National Forest Management Act of 1976, and plans for each refuge, as prepared by the USDI Fish and Wildlife Service under authorities set forth by the National Wildlife Refuge System Improvement Act of 1997, are examples of use and management plans for public lands. Plans prepared by nonindustrial private forestland owners in response to many fiscal incentive programs (such as the Forest Stewardship Act of 1990) and tax incentive programs (such as property tax relief) are examples of private planning initiatives.

Plans developed to guide the use, management, and protection of forests can be prepared in response to statutes that require direct and exclusive consideration of forests, or in response to statutes that authorize the development of broad multisector plans. The Forest and Rangeland Renewable Resources Planning Act of 1974, for example, requires the preparation of plans that address a variety of interests in forests (such as wildlife, fish, timber, and grazing) and requires interdisciplinary consideration of desired forest conditions. Some multisector plans focus on a specific physical resource (for example, air or water) that may be affected by the use and management of forests. Examples of more broadly construed multisector plans are those required of agencies that are responsible for administering the Endangered Species Act of 1973, Coastal Zone Management Act of 1972, Clean Water Act of 1987, and Clean Air Act of 1990. State governments also develop multiresource plans that affect forests, and these plans are often developed in direct response to the enactment of Federal laws.

Judgments about how well institutions execute their responsibility for developing plans (whether strategic program, land use and management, or multisector) and the implementation of planning processes presume the existence of standards or measures of goodness. An obvious source of such standards is the statutes that authorize an agency to engage in planning activities (for example, required public participation, preparation by interdisciplinary teams). Examples of other commonly advocated standards are legal sufficiency, ability to resolve conflict, cost-effectiveness, a foundation of accurate data and sound analysis, practicability, communication of a clear vision, timely completion, active leadership by administrators, and flexibility sufficient to accommodate unexpected events. This list of standards is not all-inclusive, but it illustrates the range of conditions to be considered in assessing the strengths and weaknesses of forest planning efforts (Bryson 1988, Gray and Ellefson 1987, Larsen and others 1990, Teeguarden 1990).

Assessment Activities

Assessments are comprehensive examinations of present and prospective conditions that are likely to affect the use, management, and protection of forests now and in the future. They are often viewed as supportive of plan development in that plans generally respond to assessment-identified gaps between current and desired conditions in the use, management, and protection of forests. Assessments developed by public agencies have traditionally been detailed, comprehensive, data-driven exercises, although movement is toward assessments that examine broad trends in resource, economic, and social conditions that a forestry agency might adapt to or attempt to influence (Sample and LeMaster 1995). Some assessments have been developed to evaluate or monitor agency progress toward key goals and objectives that have been identified in a plan. Examples of assessments are the

USDA Forest Service's renewable resources assessment, which is prepared every 10 years as is required by the Forest and Rangeland Renewable Resources Planning Act of 1974; the USDI Fish and Wildlife Service's critical habitat assessment for threatened and endangered species, which is required by the National Wildlife Refuge System Administration Act of 1966 (amended 1997); and various statewide resource assessments carried out by the forestry agencies of State governments (including the assessments of criteria and indicators that are being prepared by an increasing number of States).

Policy and Program Review Activities

Anticipating, evaluating, and developing options for addressing important forest resource issues is the focus of policy and program analysis. Organizations typically select issues requiring analysis on the basis of such factors as their urgency, strategic significance, programmatic importance, geographic scope, fiscal implications, and the expectation of useful results from analysis. The clients of public agency policy analyses are generally forestry agency executives, although leaders in other branches of government and in the private sector often seek the results of policy analysis. Examples of topics addressed by the policy analysis staff of the USDA Forest Service include payments to States from national forest receipts, water resource policy and the management of forests, and the role of public and private recreation enterprises. Policy analysis is also carried out by the renewable resources and planning staff of the USDI Bureau of Land Management, the planning and evaluation staff of the USDI Fish and Wildlife Service, and the Office of Policy, Economics, and Innovation of the U.S. Environmental Protection Agency. State government forest agencies have policy and program analysis capabilities (for example, the Resource Policy Division of the Oregon Department of Forestry), and private organizations often have significant capacity to undertake policy and program reviews.

Current Institutional Capacity

Private Sector Capacity

As stated before, private organizations often have significant capacity to undertake policy and program reviews. For example, industrial forestry concerns periodically prepare policy reviews of their strategic position in forest product markets and of their corporate landownership strategies. Similarly, private companies looking to timberland as a long-term investment opportunity often undertake careful review and analysis of such opportunities (for example, Hancock Timber Resource Group). Private organized interest groups also engage in policy review and analysis activities, often as a means of influencing the development of public policy on the use and management of forests. Examples of such groups and their publications include the Society of American Foresters ("Forest Wildlife-Habitat Relationships: Population and Community Responses to Forest Management" [2002]), the National Association of State Foresters ("Review of State and Private Forestry Deputy Areas of USDA Forest Service" [2002]), the Pinchot Institute for Conservation ("Allocating Cooperative Forestry Funds to States: Block Grants and Alternatives" [2001]), the Wilderness Society ("National Forests: Policies for the Future" [1988]), and the Sierra Club ("Forest Fires: Beyond the Heat and Hype" [2002]). Also representing policy review capacity are special-interest group reviews of National Forest land management plans and critiques of plans to offer timber sales from public forests.

Private-sector institutional capacity for land management planning is apparent in the development and implementation of management plans for private forests. In some cases, forest management certification programs require development of a management plan as a prerequisite for certification (for example, certification of forest management practices by the Sustainable Forestry Initiative of the American Forest and Paper Association). In 1994, approximately 5 percent of nearly 10 million private landowners had a plan for the management of their forest property (table 1). Nationally, these plans directed the use and management of forest on nearly 154 million acres of private land. Thirty-seven percent of the plans were prepared by a State government employee (service forester), while landowners (21.7 percent) and consultants (10.7 percent) were the next most frequent plan preparers. Consultants were responsible for plans applied to more than 25 million acres of private forestland. For 1998, the USDA Forest Service reported the preparation of nearly 28,000 forest management plans (including forest stewardship plans) that were applied to more than 1.8 million acres of private forest (U.S. Department of Agriculture, Forest Service 1999). A nationwide study found that 84 percent of landowners with forest stewardship plans had begun to implement them, applying at least one recommended activity (Esseks and Moulton 2000).

Private-sector capacity to prepare land management plans is also reflected by the legal requirements of State forest practice regulatory programs. As a prerequisite to timber harvesting on private forests (for example, in California, Oregon, and Washington), landowners are required to prepare a timber harvest plan that prescribes forestry practices considered critical to the sustainability of forest conditions. In the early 1990s, the California Board of Forestry processed between 1,200 and 1,500 such plans per year, while the Oregon Department of Forestry and Washington's

Table 1—Forest management plans prepared by private forest owners, by type of owner and type of plan preparer (1994)

Management plan preparation	Owners		Area	
	Number	Proportion	Acres	Proportion
	thousands	*percent*	*millions*	*percent*
Owners with written plan	531.2	5.4	153.6	39.0
Owners without written plan	8,594.1	86.7	226.2	57.5
Unknown status	784.9	7.9	13.6	3.5
Total	9,910.2	100.0	393.4	100.0
Plan prepared by:				
Owner	114.8	21.7	16.7	19.0
Consultant	56.5	10.7	25.5	28.9
Industrial forester	20.6	3.9	8.9	10.1
State government employee	196.2	37.1	16.8	19.1
Extension Service	8.9	1.7	0.9	1.0
USDA Natural Resources Conservation Service	47.3	9.0	4.6	5.2
Other	87.9	16.6	24.0	27.3
Total	532.2	100.7	97.4	110.6

Note: Table totals exceed 100 percent because plans were prepared by more than one type of preparer. Of owners with a written plan, 528,800 were nonindustrial private owners (88.1 million acres), and 2,400 were industrial owners (65.5 million acres).
Source: Birch (1996).

Division of Forest Practices processed 15,000 to 20,000 per year and 10,000 to 15,000 per year, respectively (Ellefson and others 1995).

Federal Government Capacity

Planning activities—Federal institutional capacity for planning the use, management, and protection of forests has existed for many years. Early planning activities were usually initiated by agency executives seeking to define broad strategic direction for the activities of their agencies. In recent years, however, Federal laws have required agencies to engage in planning that is more formal in process and more focused in substance. Prior to 1974, Congress did not specifically require any Federal land management agency to conduct formal systemwide planning (Coggins and others 1993). Today there are at least 26 Federal statutes that require major agencywide activities involving the preparation of strategic program or land use and management plans. One-third of these statutes establish planning requirements that are directly or exclusively applicable to forest programs or management (table 2). The planning required by these 26 statutes is carried out by at least 10 different Federal agencies and results in plans that vary in geographic scope (national, regional, local) and relevance to the use and management of forests (Coggins and others 1993, Dolgin and Guilbert 1974, Goble and Freyfogle 2002, Mansfield 1993, Plater and others 1998, Schoenbaum and Rosenburg 1996, U.S. Department of Agriculture, Forest Service 2002, West Publishing Company 1997).

Federal statutes requiring agency-developed plans focused on forests are nearly evenly split between those that require the preparation of strategic program plans and those that require land use and management plans (table 2). The planning requirements focused exclusively on forests address a wide range of forest values (water, wildlife, timber, recreation), while those not specific to forests tend to have primary concern for a single forest value. Although a number of statutes require agency-prepared plans to be coordinated with related sectors, in most cases the statutory requirement to do so is unclear. This lack of statutory clarity is also the case with regard to requirements for updating plans, although there are notable exceptions. For example, the National Forest Management Act of 1976 is very clear in this respect (plans must be revised at least every 15 years). In many cases (for example, the Clean Water Act of 1987), statutes require the preparation of an initial plan and are silent on subsequent revision or modification of that plan. Most, but not all, Federal statutory planning requirements apply to all major forest landownership categories. Examples of Federal agency responses to laws that require the preparation of strategic and land use and management plans are presented in the following pages:

Table 2—Federal statutes providing institutional authority for planning activities involving forests and forestry, by various planning characteristics (2001)

Federal statute requiring some form of planning activity	Primary type of plan required	Range of forest values addressed	Coordination with plans for related forest sectors	Periodic updating of plans required	Major forest ownership category addressed
Planning focus directly and exclusively on forests and forestry					
Cooperative Forestry Assistance Act of 1978	Strategic	Yes	Yes	*	All ownerships
Forest and Rangeland Renewable Resources Planning Act of 1974	Strategic	Yes	*	Yes	All ownerships
Forest and Rangeland Renewable Resources Research Act of 1978	Strategic	Yes	Yes	*	All ownerships
McIntire-Stennis Forest Research Act	*	Yes	*	*	All ownerships
Multiple-Use Sustained Yield Act of 1960	*	Yes	Yes	*	Federal
National Forest Management Act of 1978	Management	Yes	Yes	Yes	Federal
Renewable Resource Extension Act of 1978	Strategic	Yes	Yes	Yes	All ownerships
Planning focus on forests, forestry and related resources					
Administrative Procedures Act of 1946	Strategic	Yes	*	Yes	All ownerships
Anadromous Fish Conservation Act of 1965	Strategic	No	*	*	All ownerships
Clean Air Act of 1990	Strategic	Yes	*	*	All ownerships
Clean Water Act of 1987	Strategic	No	Yes	Yes	All ownerships
Coastal Zone Management Act of 1972	Management	Yes	Yes	Yes	All ownerships
Endangered Species Act of 1973	Management	No	No	*	All ownerships
Federal Insecticide, Fungicide, and Rodenticide Act (as amended 1996)	Management	Yes	*	*	All ownerhips
Federal Land Policy and Management Act of 1976	Strategic	Yes	Yes	Yes	Federal
Fish and Wildlife Conservation Act of 1980	Management	No	*	Yes	All ownerships
Government Performance and Results Act of 1993	Strategic	Yes	Yes	Yes	All ownerships
Land and Water Conservation Fund Act of 1965	Management	No	*	Yes	All ownerships
National Environmental Policy Act of 1969	Strategic	Yes	Yes	*	All ownerships
National Park Service Organic Act of 1916	Management	No	*	*	Federal
National Trails System Act of 1968	Management	No	Yes	*	All ownerships
National Wildlife Refuge System Administration Act of 1966 (1997)	Management	No	Yes	Yes	Federal
Soil and Water Conservation Act of 1977	Strategic	Yes	Yes	Yes	Private
Surface Mining Control and Reclamation Act of 1977	Management	Yes	*	*	All ownerships
Wilderness Act of 1964	Management	No	No	*	Federal
Wild and Scenic Rivers Act of 1968	Management	No	Yes	*	All ownerships

Note: Asterisk indicates statute is not clear on this point.
Source: Plater and others (1998); Shoenbaum and Rosenburg (1996).

- *USDA Forest Service*—The USDA Forest Service is responsible for the National Forest System, forest resources research, and technical and financial assistance to State and private forestry agencies. A variety of statutes require the Forest Service to prepare strategic program plans and land use and management plans. In addition to the more multisectoral laws that guide the planning of resources use and management generally, the Forest Service must give consideration to such Federal statutes as the Alaska National Interest Lands Conservation Act of 1980, Fish and Wildlife Conservation Act of 1980, Archeological Resources Protection Act of 1979, Cooperative Forestry Assistance Act of 1978, Surface Mining Control and Reclamation Act of 1977, Wild and Scenic Rivers Act of 1968, Wilderness Act of 1964, National Forest Roads and Trails Act of 1964, and Multiple Use-Sustained Yield Act of 1960.

  An example of strategic program planning is the Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA), which requires preparation of a resources assessment every 10 years, a resource program every 5 years looking to conditions 45 years hence, a Presidential statement of policy to guide budget formulation, and annual reports on progress toward implementation of the planning documents (Office of Technology Assessment 1990, 1992a). The RPA process requires consideration of all forest values, coordination with other Federal agencies, and cooperation with other levels of government (especially State governments). Since 1993, the Government Performance and Results Act (GPRA) has preempted strategic planning legislative authorities for most Federal agencies. The program element of the RPA has in effect been subsumed by the GPRA; the RPA Assessment now provides the context for the GPRA strategic plan.

  The response of the USDA Forest Service to the Government Performance and Results Act of 1993 is another example of strategic program planning. Responding to the act, the 2000 plan (revised) sets strategic direction for the agency for a 5-year period, with each year's funding being dependent on progress toward accomplishing the goals specified in the plan (U.S. Department of Agriculture, Forest Service 2000a). Four broad goals are identified (ensure sustainable ecosystems, provide for multiple benefits, ensure development and delivery of information, and ensure organizational effectiveness). Each of these is given operational clarity by more focused objectives (for example, improve and protect water conditions, improve knowledge base through research and monitoring), time frames for accomplishment, and measures of performance. The strategic plan also sets forth provisions for program evaluations and coordination of overlapping functions.

  The USDA Forest Service is also responsible for land use and management planning under authorities specified in the National Forest Management Act of 1978. Specific to the national forests, this statute specifies planning processes and calls for guidelines that focus attention on the availability of land for resource management, potential levels of resource use and management, and ways in which a variety of resource management practices are to be carried out. The actual planning process involves 10 steps, including identification of potential uses and estimated outputs, response to issues of public concern, protection of especially valuable resources and ecosystems, and plan implementation and monitoring (Office of Technology Assessment 1992b, U.S. Department of Agriculture, Forest Service 2000b). Plans (identified as Land Resource Management Plans) are to be revised at least every 15 years, must comply with related and relevant Federal environmental and resource statutes, and are to be vertically integrated with planning at other levels in the agency (nationwide: strategic plan; region: regional guide; national forest: land resource management plan; and project-level: specific projects). More than 85 national forest plans are to be revised during the period beginning in 1999 and ending in 2004.

- *USDI Bureau of Land Management*—The USDI Bureau of Land Management administers 264 million acres of Federal public land and the mineral rights underlying 564 million acres of Federal public land. The Bureau has produced a strategic plan in response to requirements of the Government Performance and Results Act of 1993. This plan sets forth 5 major (or blueprint) goals (serve current and future client groups, restore and maintain health of land, promote collaborative management, improve business practices, and improve human resources management), 43 performance goals (for example, preserve natural and cultural heritage, establish and implement management standards and guidelines), and a variety of results to be accomplished over a 3- to 10-year period (for example, evaluate areas and resources that may warrant special recognition, incorporate comprehensive standards for public land health into existing land use plans). The Bureau coordinates plan implementation at the national and local level with 14 other Federal agencies.

  The USDI Bureau of Land Management also engages in land use and management planning (Williams 1987). The agency is guided by an especially wide range of Federal statutes and Executive orders that require planning activities, and many of these activities involve consideration of forests. In addition to multisector laws that guide institutional capacity for planning related to resource use and management generally, the Bureau of Land Management must give consideration to Federal

statutes such as the Colorado River Basin Salinity Control Act, Federal Coal Leasing Amendments Act of 1976, Taylor Grazing Act of 1934, Public Rangelands Improvement Act of 1978, and Wild and Free-Roaming Horse and Burro Act (U.S. Department of the Interior, Bureau of Land Management 2000a). However, the Bureau's major land management planning authority proceeds from the Federal Land Policy and Management Act of 1976, which requires the Bureau to prepare land-use plans that provide management direction for the Nation's public lands. These land-use plans are part of the Bureau's three-tier planning structure, which consists of a national strategic plan (responding to the Government Performance and Results Act of 1993), resource management plans, and plans for areas that are of critical concern (because they have unique wildlife and special ecosystems). The resource management plans, of which 108 have been developed since 1984, address specific resource conflicts, reflect public participation and comment, and are accompanied by environmental impact statements.

The USDI Bureau of Land Management planning process, developed in response to the Federal Land Policy and Management Act of Act of 1976, is as follows: identify issues and concerns, assess information, identify desired outcomes, and specify allowable uses and actions needed to achieve desired outcomes. Statutory limitations on the implementation of this process include requirements to inventory resource conditions on public lands; involve the public in plan development; comply with multiple-use principles; coordinate plan development and implementation with other Federal, State, local, and tribal governments; give priority designation and protection to areas of critical environmental concern; comply with applicable pollution control laws; and recognize development rights of mining claimants (U.S. Department of the Interior, Bureau of Land Management 2000a, 2000b). The Bureau's Land Use Planning Handbook requires that planning describe healthy forest conditions and the best management practices that can be applied in order to accomplish such conditions (U.S. Department of the Interior, Bureau of Land Management 2000b).

- *USDI National Park Service*—The National Park Service is responsible for the management of 83.6 million acres of public land. Under authority granted by the National Park Service Organic Act of 1916 and administrative rules and directives pursuant to the act, the National Park Service carries out four interrelated planning processes: general management planning (agencywide mission and goals), park strategic planning (park-level mission and goals), implementation planning (agencywide and park-level plans of action), and annual performance planning (agencywide and park-level measures of progress). The order in which these processes occur flows from broad-scale general management planning through progressively more specific strategic, implementation, and performance planning (U.S. Department of the Interior, National Park Service 1998). Major principles guiding the agency's planning activities include use of interdisciplinary planning approaches and principles, use of scientific and technical information in decisionmaking, use of peer review panels to address conflicts over validity and interpretation of information, use of alternative dispute resolution processes (internally and externally), and review and analysis of post-litigation decisions to identify ways to improve future decisions (U.S. Department of the Interior, National Park Service 2001).

  Although the agency's planning activities are heavily focused on specific park units (taking the form of land use and management plans), an agencywide strategic program plan has been developed in response to the Government Performance and Results Act of 1993 (U.S. Department of the Interior, National Park Service 2000). The plan focuses on four major goals, namely (1) to preserve park resources, (2) to provide for public enjoyment, (3) to strengthen cultural and recreational resources, and (4) to ensure organizational effectiveness. Eleven strategies for accomplishing these goals are specified (for example, develop additional partnerships, improve technology and databases), and various cross-agency issues and suggestions for their resolution are presented (for example, working with various Federal agencies on south Florida ecosystem restoration). The agency also suggests management and data issues to be dealt with and describes plans for evaluating programs.

- *USDA Natural Resources Conservation Service*—The USDA Natural Resources Conservation Service is responsible for a wide range of forest resource programs, all of which require some level of planning prior to their implementation. These planning activities are conducted in accordance with authorities granted by the Soil and Water Conservation Act of 1977 and the Government Performance and Results Act of 1993. The former requires the preparation (every 10 years) of an appraisal of the Nation's soil, water, and related resources and the development (every 10 years) of a soil and water conservation program. These documents are to be consistent with the findings of resource inventories and assessments, identification and analysis of alternatives, consultation and consensus-building processes, and sound principles of plan implementation and program evaluation. They are to be transmitted to the U.S. Congress, as are annual reports (to accompany proposed budgets) of progress in implementing the program. This planning and program development is to involve processes that integrate social, economic, and ecological resource concerns while also

ensuring the maintenance of natural systems and ecological processes. Only two plans and appraisals have been made by the Natural Resources Conservation Service under authorities established by the Soil and Water Conservation Act of 1977.

The agency's planning activities involving forests are responses to a number of forest and related programs that have been assigned to the agency for implementation. These planning activities give direction to programs that provide for natural resource information, community planning and development, conservation cost-share program assistance, conservation planning and implementation, erosion control and reduction, farmland protection, fish and wildlife habitat improvement, forest improvement and management, range management, stream restoration, water management, water quality improvement, wetland restoration and protection, watershed planning, conservation technical assistance, emergency watershed protection, and natural resources inventory. Most of these functions are carried out in cooperation with State governments and typically require State-developed plans prior to their implementation by the agency. Examples are the Forestry Incentives Program, Conservation Reserve Program, and Stewardship Incentive Program, all of which are administered in cooperation with the USDA Forest Service.

The agency also responds to the Government Performance and Results Act of 1993 by preparing an agencywide strategic program plan (U.S. Department of Agriculture, Natural Resources Conservation Service 2000). The plan identifies 4 major goals (enhance resource productivity, reduce unintended natural resource impacts, protect communities from flood and drought, deliver high-quality services to the public) and 14 specific objectives that give a focus to these goals (for example, enhance forestland productivity, enhance fish and wildlife habitats). Coordination of plan development and implementation with other public and private concerns (especially with State governments) is extensive and involves cooperation on matters including education, research, data collection, and program delivery. Provisions are made for program evaluations, including advance (by 1 year) insertion of evaluation schedules into the agency's annual operational plans.

- *U.S. Fish and Wildlife Service*—The Fish and Wildlife Service is responsible for conserving, protecting, and enhancing fish, wildlife, and plants and their habitats for the continuing benefit of the Nation. The agency is guided by more than 150 Federal statutes, many of which authorize planning activities that are directly relevant to the use, management, and protection of forests. An example is the agency's role in administering the Endangered Species Act of 1973, a planning role that has been especially important in defining the sustainability of wildlife habitats associated with public and private forests. Among other agency-developed plans that have implications for forest resources are comprehensive conservation plans for wildlife refuges, an information resources management strategic plan, endangered species habitat conservation plans, servicewide strategic and performance plans, and a wildland fire and air quality national strategic plan.

  The agency's long-range strategic program plan is prepared in response to the Government Performance and Results Act of 1993 (U.S. Fish and Wildlife Service 2001a). The plan states 4 mission goals (sustain fish and wildlife populations, conserve habitats through a network of lands and waters, provide for public use and enjoyment, establish partnerships for managing wildlife resources) and 14 long-term goals that implement these mission goals (for example, provide for greater recreational use of wildlife refuges, work with private landowners on eradication of invasive species). Key factors affecting the ability to accomplish these long-term goals are specified (for example, extent of collaboration with partners, extremes in weather and climate conditions), as is coordination of wildlife-related activities with other Federal agencies that have responsibilities involving wildlife and wildlife habitats (for example, management of the South Florida Everglades, implementation of the Northwest Forest Plan, recovery of endangered species). The plan has specific provisions for addressing major wildlife habitat concerns on land not directly administered by the U.S. Fish and Wildlife Service. For example, the plan calls for the restoration and establishment (by 2005) of 280,000 acres of wetlands habitat, 524,000 acres of upland habitats, and 4,150 riparian or stream miles of habitat not directly owned or controlled by the agency.

  The Fish and Wildlife Service also engages in land use and management planning as authorized by the National Wildlife Refuge System Administration Act of 1966 (as amended in 1997). This includes the development of comprehensive conservation plans for refuges that are part of the National Wildlife Refuge System (U.S. Fish and Wildlife Service 2001b). These plans are to provide a clear and comprehensive statement of desired conditions for each refuge and to provide for rational management decisions needed to accomplish such conditions, including the management of forests considered important as wildlife habitat. The process of developing comprehensive conservation plans provides opportunity for public involvement and for interaction with other Federal agencies that have responsibilities for the management of wildlife. Implementation of completed plans is also to be coordinated with State conservation agencies, tribal governments, and non-governmental organizations. The U.S. Fish and Wildlife Service expects to complete comprehensive conservation plans for 250 planning areas

of the National Wildlife Refuge System by 2006. The plans are to be reviewed and updated at least every 15 years.

- *U.S. Environmental Protection Agency*—The U.S. Environmental Protection Agency is responsible for a wide variety of programs that focus on protecting human health and safeguarding the natural environment (air, water, and land) upon which life depends. The agency influences the use, management, and protection of forests through statutory authorities that focus on water (wastewater, drinking water, ground water), air (acid rain, global warming, emissions), hazardous wastes, insecticides, endangered species, and wetlands and watersheds. Nearly all of these programs involve planning activities that have implications for forests. For example, States must develop implementation plans for meeting air and water quality standards promulgated by the agency under authorities of the Clean Air Act of 1990 and the Clean Water Act of 1987. The latter act authorizes plans developed to address nonpoint pollutant sources originating in forested areas, and these plans have been especially important in determining what forest practices are applied, and how they are applied on private and public forestland.

  The Environmental Protection Agency has developed a strategic program plan in response to the Government Performance and Results Act of 1993 (U.S. Environmental Protection Agency 2000). The strategic plan focuses on 10 goals (clean air, clean and safe water, safe food, pollution prevention, waste management, quality environmental information, sound environmental science, reduced global environmental risk, program compliance, and effective agency management). Multiple objectives and performance requirements are specified for each of these goals. The plan's development and implementation are coordinated with more than 100 Federal, State, and local agencies, tribal governments, business and industry organizations, and environmental and public interest groups.

  Other Federal agencies that engage in planning the use, management, and protection of forests include the Council on Environmental Quality (establishes rules that govern administration of the National Environmental Policy Act of 1969), Army Corps of Engineers (administers wetland provisions of the Clean Water Act of 1987), Department of Defense (prepares plans for the Department's forestlands), Tennessee Valley Authority (manages its forests and assists private forest landowners), and U.S. Bureau of Indian Affairs (manages Indian forestland).

Assessment activities—Federal agencies have significant institutional capacity to undertake comprehensive examinations of present and prospective conditions that are likely to affect the use, management, and protection of forests (table 3). Of the 22 assessments identified here as examples, two-thirds address a range of forest values, although often only for a specific region or land-ownership category (for example, the Interior Columbia Basin Ecosystem Assessment, the Northern Lands Assessment, and the Southern Forest Assessment). Most of these assessments are conducted in coordination with other agencies and with different ownerships and levels of government, but the details of this coordination are not always specified clearly by statutes or agency directives. Coordination can be difficult because assessments involving forests can have differing objectives (timber assessments versus endangered species assessments) and are often undertaken by a number of Federal agencies, many of which do not have forests as their primary responsibility (Johnson and others 1999). It is also significant that most Federal assessments are regional or ecosystems based; that is, the area of concern for planning is determined by scientifically defined, ecologically based geographic boundaries (for example, Greater Yellowstone Ecosystem, Interior Columbia River Basin, Northern Spotted Owl Forest Ecosystem) (Hardt 1997). This approach enables the development and implementation of policies and programs that comprehensively promote the sustainability of the large-scale, regional ecosystems in question.

Agency authority for carrying out assessments is set forth by statutes that call for continuous assessments (monitoring) (such as the acid rain deposition program of the U.S. Environmental Protection Agency), periodic assessments at specified intervals (such as the Renewable Resources Assessment of the USDA Forest Service), or intermittent assessments required to address important issues related to resource use and management (such as the Forest Ecosystem Management Assessment Report of the USDA Forest Service and cooperating agencies). Intermittent assessments frequently have a specific geographic focus, usually a multi-State region. About 80 percent of the assessments identified in table 3 address conditions on all forest ownerships. Notable exceptions are those focused on wildlife refuges, national forests, national parks, and Indian forestlands.

Assessments are frequently undertaken in concert with the development of strategic program plans or land use and management plans (as, for example, in the case of the Soil and Water Appraisal and the Conservation Program of the USDA Natural Resources Conservation Service). Resource information provided by assessments has proven to be especially useful in the development of such plans. Assessments are increasingly being used to evaluate progress toward key goals and objectives that are specified in agency plans, and have become especially important sources of information for agency employees who must evaluate

Table 3—Federal environmental and natural resource assessments, by type, administering agency, and source of authority (2001)

Assessment type and title	Principal administering agency	Authority for undertaking assessment
Continuous		
National acid precipitation assessments	U.S. Environmental Protection Agency	Clean Air Act of 1990
Periodic (specified intervals)		
Forest inventory and analysis	USDA Forest Service	Forest and Rangeland Renewable Resources Research Act of 1978
Land use and condition inventory	USDI Bureau of Land Management	Federal Land Policy and Management Act of 1976
Soil and water resource appraisal	USDA Natural Resources Conservation Service	Soil and Water Conservation Act of 1977
Air pollutant assessment	U.S. Environmental Protection Agency	Clean Air Act of 1990
Water quality assessment	U.S. Environmental Protection Agency	Clean Water Act of 1987
Renewable resources assessment	USDA Forest Service	Forest and Rangeland Renewable Resources Planning Act of 1978
Indian forestland assessment	USDI Bureau of Indian Affairs	Indian Forest Resources Management Act of 1990
Regional water and related resources assessment	Water Resources Council	Water Resource Planning Act of 1965
National forest resource assessment	USDA Forest Service	National Forest Management Act of 1976
Wildlife refuge resource assessment	U.S. Fish and Wildlife Service	National Wildlife Refuge System Administration Act of 1966
National park resource assessment	USDI National Park Service	National Park Service Organic Act of 1916
National biological survey	USDI National Biological Service	Various Federal statutes
Intermittent (determined by need)		
Environmental impact statements	Council on Environmental Quality and proposing agency	National Environmental Policy Act of 1969
Global climate change effects assessment	U.S. Department of Agriculture	Global Climate Change Prevention Act of 1990
Endangered species review	U.S. Fish and Wildlife Service and others	Endangered Species Act of 1973
Forest ecosystem management assessment report	USDA Forest Service and others	National Forest Management Act of 1978 and others
Northern forestlands assessment	Northern Forest Lands Council and USDA Forest Service	Federal and State statutes
Interior Columbia Basin ecosystem assessment	Multiple Federal agencies	Various Federal statutes
Sierra Nevada ecosystem assessment	USDA Forest Service	Various Federal statutes
Regional impact assessment of climate change	U.S. Environmental Protection Agency	Clean Air Act of 1990
Southern forest resource assessment	USDA Forest Service and others	Various Federal statutes

progress toward goals specified in their agency's strategic program plans, as required by the Government Performance and Results Act of 1993 (Sample and Le Master 1995).

Policy and program review activities—Federal agency institutional capacity for review and analysis of policy and program initiatives focused on forest resource matters is substantial. Unfortunately, no comprehensive documentation of staff levels, budgets, and responsibilities that reflect this capacity exists. An examination of agency staff directories and organizational charts reveals that policy and program reviews are undertaken at virtually all levels within agencies. For example, such reviews are conducted at the departmental level (USDA Office of Budget and Program Analysis), at the agency level (Policy Analysis Staff, USDA Forest Service), at middle levels within agencies (USDA Forest Service's regional office analysts and planners), and at field or operational levels (USDA Forest Service's National forest analysts and planners). Analysis and review capacity also exists within the research units of agencies (USDA Forest Service's Research and Development's Resource Valuation, and Use Research unit) and agency budget development and coordination units (U.S. Fish and Wildlife Service's Division of Budget and Office of Budget, Planning, and Human Resources). Further complicating judgment about policy and program review capacity is the large number of agencies that review broad-based resource or environmental programs that are not solely focused on forests (the USDA Natural Resource Conservation Service's Oversight and Evaluation Staff).

The number of policy and program analysts within Federal agencies that are responsible for programs affecting forests is probably in the range of 200 to 300. In the Washington, D.C. office of the USDA Forest Service, more than 25 persons have the title of policy analyst, program analyst, or program planner. A review of four policy and program review units in three agencies indicates that policy review activity is being applied to a wide range of issues and coordination responsibilities (table 4).

State Government Capacity

Planning activities—State governments have engaged in some form of forest planning activity since the early 1900s, although the character of these activities and the number and type of State government organizations involved in them have changed dramatically over the years. Early planning efforts were focused largely on protecting forests from fire, insects, and diseases and on promoting investments in timber as a forest use. By the mid 1980s, State-initiated forest planning activities ranged from the development of comprehensive statewide forest resource plans to the preparation of plans required by forest practice regulatory programs, and from broad water quality plans to plans for forest-based rural economic development. Moreover, forest resource planning activities, which through the late 1960s were largely the domain of a State's lead forestry agency (division of forestry, bureau of forestry, forestry commission), had by 2000 become the province of many units of State government. In 2000, each State reportedly had 8 to 10 executive branch units of State government (cabinet, sub-cabinet, governing commission) that engaged in some form of planning activity focused on forests (Ellefson and others 2001, 2002). Certain federal statutes require that State government agencies develop multisector plans to address possible impacts of forestry activities on water, air, wildlife, and the like (for example, Clean Water Act of 1987, Coastal Zone Management Act of 1972). The Cooperative Forestry Assistance Act of 1978 also has done much to encourage lead forestry agencies of State government to develop plans that focus on statewide forest resource conditions (U.S. Department of Agriculture, Forest Service 1980).

The capacity of State governments to engage in planning activities focused on forests varies greatly. States operate within different planning contexts (large state budgets versus small State budgets, large forest area versus small forest area), take different approaches to planning (issue driven, goal driven, or adaptive planning), and pursue different goals, objectives, and strategies (Gray and Ellefson 1987). Some States (Minnesota, for example) seek to develop broad strategic plans that formulate a vision, discuss obstacles to attaining the vision, and present a plan for dealing with such obstacles. Other States tend to focus on the specifics of land use and management, especially with respect to the forestland that is directly owned and managed by State governments (State forests). In yet other States, the aggregate of forest plans prepared by private forest owners as a requirement for participation in cost-share programs (Forestry Incentives Program), dedicated easement programs (Forest Legacy Program), or a State's forest practice regulatory programs (rules guiding plan preparation) become, in a sense, plans for a State's privately owned forests. Some States control land development generally by means of statutes that manage growth (for example, Vermont, Florida, Maine, Oregon); in these States, forests are subject to planning both in the sense that certain activities cannot occur within designated forest areas and in the sense that forests cannot be converted to nonforest uses (Wickersham 1994).

Statewide forest resource planning programs were actively underway in 47 States in 1982 (McCann and Ellefson 1982), while in 1985, the Council of State Governments determined that 29 States had completed first-generation plans and were in the process of implementing them (Cole 1985). In 2003, 45 of 50 States were determined to be

Table 4—Federal agency units with policy and program review and evaluation capacities, by unit name, mission, staff, and example analyses (2001)

Agency policy analysis and review unit	Mission or responsibilities	Staffing levels and assignments	Example reviews and analyses
Policy Analysis Staff, Programs and Legislation, USDA Forest Service	Bring existing or emerging policy questions to the attention of agency leadership; provide quality analysis on assigned policy questions and program evaluations in a timely and objective manner. Coordinate policy analyses with appropriate parties within and outside government, including analyses of agency-wide direction and standards for economic efficiency evaluation and economic impact assessment.	Nine policy analysts and two support staff	Evaluation of State payments from national forest receipts; role of public and private recreation enterprises; analysis of water resource policy and the management of forests; assessment of policy options for Forest Service participation in forest products certification; and evaluation of agency funding history, including spending trends and nonappropriated funding.
Office of Policy, Economics, and Innovation, U.S. Environmental Protection Agency	Support agency's mission through economic analysis and promotion of innovation needed to achieve better, more cost-effective environmental and public health protection.	Staff assigned to four major offices or centers	Development of guidelines for preparing economic analyses, assessment of U.S. experiences with economic incentives for protecting the environment, and review of options for public involvement in environmental permits.
Planning and Evaluation Staff, Division of Policy and Directives Management, and Division of Economics, U.S. Fish and Wildlife Service	Provide counsel, coordination, education, and liaison services to the agency and serve as coordinating point for internal and external customers, including the public and other governmental bodies requiring assistance.	Ten policy analysts plus support staff	Evaluation of agency policy options (for Director's Orders) for ozone-depleting substances phaseout plan, applicability of the Migratory Bird Treaty Act to Federal agencies, and development of options for the mission, goals, and purposes of the National Wildlife Refuge System.
Oversight and Evaluation Staff, Division of Operations Management and Oversight, Office of Strategic Planning and Accountability, USDA Natural Resources Conservation Service (also Division of Budget Planning and Analysis and Division of Strategic Performance Planning).	Conduct activities to assess quality, accountability, effectiveness, and consistency in the delivery of conservation assistance as defined by laws, Executive orders, rules, regulations, and policy so as to improve the use and management of natural resources.	About 30 policy and related program analysts plus support staff	Develop rational approaches to agency responsibilities regarding the National Environmental Policy Act, assess field staff-prepared designs, plans, and specifications for installation of site-specific practices, and evaluate these for consistency (1) with the agency's mission and strategic plan, (2) with the products and services developed by cooperating institutes and centers, and (3) with collaborating scientists.

involved in a variety of forest resource planning processes, such as State-administered forest planning (87 percent of States), comprehensive statewide forest resource planning (51 percent of States), agency operational planning (84 percent of States), issue- and problem-oriented planning (82 percent of States), and land-use allocation planning (22 percent of States). States spent, on average, $433,000 in 2003 to support forest resource planning activities, although the majority of States spent less than $250,000 (19 States invested less than $50,000, 11 States more than $1 million). Planning activities required the professional talent of an average of 4.4 full-time-equivalent staff per State. Half the States regularly seek the public's perspective during the development of comprehensive statewide plans. Planning activities were undertaken primarily to secure a clearer understanding of agency long-term directions and to improve the quality of management and administrative structures (Kilgore and Salk 2003).

Statewide forest plans have been prepared by nearly all States during the last 20 years (see Indicator 49, table 5, page 36). However, many States have not updated plans they prepared in the 1980s (for example, Connecticut, Massachusetts, New Jersey, and Ohio), while others have revised their plan or substituted a similar planning document or group of planning documents for it (for example, Colorado, Iowa, Vermont, and Wisconsin). Those States that have discarded the policy of preparing a traditional statewide forest plan have focused their planning efforts on specific forest areas or ownerships (for example, Indiana's Strategy for State Forest Land Properties, Alaska's Haines and Tanana Valley State forest plans, Washington's State land plan); more inclusive natural resource plans prepared by more broadly charged natural resource agencies (for example, Illinois Department of Conservation Strategic Plan); strategic focus involving all forest ownerships and management activities (for example, Minnesota's Forest Resources Council's Vision, Goals, and Actions for Minnesota's Forests; Kansas and Nebraska's sets of plans for various operations or programs which include fire, stewardship, and urban and community forestry); plans structured according to criteria and indicators of forest sustainability (for example, Oregon's First Approximation Report, Hawaii's Criteria and Indicators for Sustainable Forest Management in Hawaii); policy directive documents adopted by agencies or governing boards (California's Board of Forestry's Policy Document); and plans for specific forest management activities (California's Fire Plan, Hawaii's Watershed Protection Plan).

A nationwide review conducted in 1987 found that all States had governmental institutions with statutory authority to undertake forest planning, and that support of administering agencies and various client groups for planning (such as legislators, forest industries, environmental groups, State government budget directors) was considerable and increased in strength as planning activities progressed (Gray and Ellefson 1987). Most of these planning arrangements were promoted by the USDA Forest Service under authorities established by the Cooperative Forest Management Act of 1978 (USDA Forest Service 1980). Among the specifically identified benefits of planning were greater sense of long-term program direction, increased coordination among disparate programs, greater public awareness of forest conditions, more program accountability, and increased political support for the forestry programs of State government (Gray and Ellefson 1987).

Assessment activities—State governments have the institutional capacity and statutory authority to undertake comprehensive assessments of conditions affecting the use, management, and protection of forests. State government agencies conduct both one-time assessments of important issues and ongoing assessments of resource, economic, or social conditions affecting forests. Although there has been no systematic and comprehensive review of assessment programs implemented by States, the number of such programs is probably in the hundreds. Examples of recent assessments focused on important issues include those involving proposed expansions of chip or particleboard industries. At least three States—Minnesota, Missouri, and North Carolina—have produced comprehensive assessments of resource and economic conditions in relation to these industries (Missouri: Chip Mill Report to the Governor of Missouri, Governor's Advisory Committee on Chip Mills [2000]; North Carolina: Economic and Ecological Impacts of Wood Chip Production in North Carolina, Report of the Southern Center for Sustainable Forests [2000]; and Minnesota: Generic Environmental Impact Statement on Timber Harvesting and Forest Management, Minnesota Environmental Quality Board [1992]). Other examples of State assessment capacity are Washington's Natural Heritage Program Geographic Information System (rare plant species and endangered ecosystems), the Vermont Geographic Information System (rare, threatened, and endangered species), the Pennsylvania Biological Survey (formal system defining status of plants and animals), the Virginia Forest Resource Assessment (assessment of implications of population growth and land use changes for forest resources), the Illinois Critical Trends Assessment (statewide and regional environmental conditions), the Missouri Resource Assessment Partnership (develops and disseminates high-quality natural resource information), the Arizona Land Resource Information System (statewide multipurpose spatial database of resource extent and conditions), and the California Fire and Resource Assessment Program (assesses amount, extent, and condition of forests and rangelands). Many of

these State assessments focus on large ecosystem-bounded regions within a State.

State governments also have the institutional capacity to undertake assessments as part of efforts to understand the environmental consequences of certain proposed actions. State authority to prepare environmental impact statements is typically set forth in statutes, Executive orders, or administrative regulations. By the early 1980s, 60 percent of States had established these authorities, although how and to whom they are applied varies considerably from State to State (Fisher and Phillips 1983) (see Indicator 49, table 6, page 38). For example, California's authority applies to government and some private actions, Kentucky's authority is limited to certain types of development (power plant siting), and Minnesota's authority can apply to broad geographic areas (generic environmental impact statements). Many of the environmental impact assessments conducted via environmental impact statement processes have a focus on forest conditions (for example, Minnesota's Generic Environmental Impact Statement on Timber Harvesting and Management). It is not known exactly how often and in what manner such laws have been applied in relation to forest resources in the United States.

Policy and program review activities—State agencies often have institutional capacity to undertake policy and program reviews of important forest resource issues or programs. However, there is little information on the extent and focus of such capacity at the State level. Usually the forest resource policy and programs review function is not assigned to a specific stand-alone unit within State government. Typically, it is spread among many subunits of an agency (for example, fire management, resource management), or combined with administrative functions involving personnel, budgeting, legal reviews, and legislative liaison activities, or is performed by a policy and program unit at a higher organizational level. At the cabinet or subcabinet level of State government, about 15 States have planning or policy and program review units, and these very likely have some responsibility to review forest resource programs administered by lower-level forest resource units or divisions (Ellefson and others 2001). Examples are the Division of Environmental Planning and Management of the California State Lands Commission; the Office of Planning and Assessment, Indiana Department of Environmental Management; the Office of Planning and Development, Connecticut Department of Environmental Protection; and the Office of Strategic Planning and Policy, Rhode Island Department of Environmental Management. Policy review units specifically identified as part of a State's lead forestry agency are very few. They include the Fire and Resource Assessment Unit (23 employees) of the California Department of Forestry and Fire Protection, which, in addition to assessing forests and rangelands, also identifies and analyzes alternative management and policy guidelines, and the Division of Resource Policy, Oregon Department of Forestry, which is responsible for program evaluation, resources planning, public affairs, and legislative coordination.

Local and Regional Government Capacity

Local and regional governmental jurisdictions are known to engage in planning, assessment, and policy and program review activities. Unfortunately, no comprehensive national assessment of this capacity has been made. Local governments undertake forest planning and related activities if the forests in their jurisdictions are large and locally important. States that are known to have local governments with planning capabilities are California, Massachusetts, Minnesota, Oregon, and Wisconsin. In some States, regional authorities conduct planning relevant to forests (for example, the Tahoe Regional Planning Agency and the Coastal Commission in California). In 2000, more than 400 small-scale local government watershed initiatives (districts) were identified in the western United States (3 times the 1995 total) (Natural Resources Law Center 1998, 2000). These initiatives often involve forested watersheds.

Summary of Conditions

Forestry and related public and private organizations in the United States have a long history of institutional capacity for engaging in forest planning and assessment activities, and for undertaking periodic reviews of forest resource policies and programs. The capacity of such organizations for planning, assessment, and policy review may be summarized as follows:

- Private individuals and organizations represent important institutional capacity for carrying out planning, assessment, and policy review activities focused on forests and related natural resources. These individuals and organizations are diverse, as are the planning, assessment, and policy review activities they carry out. The extent to which this capacity is actually being used to produce meaningful plans that are implemented effectively is largely unknown.
- Public forest resource agencies at all levels engage in some form of planning, assessment, and policy review activities. In general, there appears to be ample authority for planning, assessment, and policy review, although the institutional capacity for exercising these authorities varies widely within and between different levels of government.
- Institutional planning capacity responds to both statutes or administrative directives that require direct and exclusive consideration of forests, and to statutes that require development of multi-sector plans for resources such as

air, water, or wildlife. Multisector authority tends to fragment institutional capacity and the administration of forest activities rather than to integrate consideration of forest values.

- Agencies of many types and with many different responsibilities for forests engage in planning, assessment, and policy review activities. In only a limited number of cases is there evidence of concerted and effective effort to coordinate these capacities and activities within and between governments.
- Agencies can produce strategic program plans as well as land use and management plans. In some cases, these plans are essentially aggregations of individual plans and assessments prepared for specific individual forest ownerships or specific geographic areas. Plans that are assembled in this way are commonly produced by agencies of State governments.
- Some agencies, especially State government agencies, appear to be reducing their participation in the development of statewide strategic program plans. The statewide forest resource plans of State governments are frequently very much out of date, and are often being replaced by regional or issue-oriented plans and by plans that are driven by criteria and indicators.
- Although some agencies separate planning, assessment, and policy review functions organizationally, these functions most often are combined as a single activity assigned to a single administrative unit. Few States assign exclusive responsibility for policy analysis and review to a specific administrative unit.
- Investments in institutions that have responsibility for planning, assessment, and policy review activities involving forests are highly variable in amount and regularity. They are determined by the importance of the forests being managed and by the willingness of agency leadership to promote the importance and usefulness of planning, assessment, and policy review activities.
- Many agencies devote substantial levels of resources (substantial finances, advanced analytical methods, and highly educated professionals) to their planning, assessment, and policy review activities. In general, Federal agencies invest more heavily in these activities than do State, regional, or local government agencies.
- Assessment activities are very often one-time efforts that respond to major issues involving controversy over proposed resource development or management. However, some assessment activities have become monitoring initiatives that are conducted on a continuous basis (such as air-quality monitoring) or at periodic intervals (such as forest inventory and analysis).

Issues and Trends

The literature identifies a number of issues and trends in forest planning, assessment, and policy review activities that are worth noting in the context of institutional capacity. Examples of this literature (from which the following issues are drawn) are: Bryson 1988, Hardt 1997, Sample and LeMaster 1995, U.S. Department of Agriculture, Forest Service 1990 and 2002.

- Agencies are increasingly seeking the flexibility necessary to anticipate and take advantage of important opportunities represented by forests, and are more and more inclined to focus forest planning processes on these opportunities. This change in emphasis is making planning less technical in its emphasis and more focused on the preferences that flow from public debate and discussion.
- Clients of forest resource programs are increasingly involved (through various collaborative processes) in the development of forest plans and in the conduct of assessments and policy reviews. This is part of a general public expectation for greater interaction in decision-making with government agencies.
- Institutional capacity for conducting planning, assessment, and policy activities is increasingly fragmented, as are the agencies responsible for conducting such activities. This diversity in institutional capacity and legal authorities often results from the need to meet the demands of many different and sometimes competing client groups. There is increased recognition of the importance of coordinating the planning, assessment, and policy review activities of multiple agencies.
- Planning, assessment, and policy analysis have become more complex, costly, and time-consuming. The desire to address all management uncertainties with intensive information gathering and analysis is of growing concern.
- Institutional capacity to prepare forest plans and assessments increasingly recognizes planning boundaries as defined by scientifically defined, ecologically based geographic boundaries or the political (State) boundaries of large multi-State regions. This trend is driven in large measure by an interest in ensuring the physical sustainability of large forested areas.
- Approaches based on criteria and indicators are becoming increasingly common. Such approaches to planning, assessment, and policy analysis provide a structure to guide program direction and accountability, and provide direction for the gathering of information and its subsequent management.

- The technical, budgetary, and fiscal practicability of forest plans is increasingly being emphasized, as is monitoring of progress in achieving plan goals and objectives. These trends are largely a response to the public's skepticism about the effectiveness of government programs and the public's interest in greater accountability of government.

Gathering and analyzing information that can be directly useful in dealing with issues and problems is receiving greater emphasis. This trend is a response to cost concerns and to the need for information that will serve a wider variety of purposes (such as planning, monitoring, public relations, and policy development). Approaches that treat information gathering as an isolated technical exercise are being de-emphasized.

Information Adequacy

Specification

The variables or combination of variables that can be used to describe institutional capacity to undertake planning, assessment, and policy review activities, and the agencies and organizations involved in these functions, are numerous. It is often difficult to determine exactly what information to gather, analyze, and present to make a useful picture of institutional capacity.

The National Association of State Foresters has surveyed State forestry agency information about the institutional setting for planning, assessment, and policy reviews involving forests (National Association of State Foresters 1999). The Association reported that 5 States had abundant information about institutional capacity for planning and related activities, that 12 States had sufficient information of that kind, and that the rest had very little or none. Seven States reported that the quality of their information was excellent, 11 that it was adequate, and 6 that it was poor.

The kinds of information that could be used to clarify the capacity of institutions to conduct planning, resource assessment, and policy review activities are as follows:

- *Extent-of-activity information*—Comprehensive information about the institutional capacity for planning, assessment, and policy analysis activities at various levels of government has not been assembled systematically. What are the requirements for conducting such activities? Who is responsible for conducting such activities? Are there different requirements at different levels of government? Is there consistency across these requirements? Are there legal and constitutional issues at stake between governments? What is the status of local planning and zoning initiatives? To what extent do planning, assessment, and policy analysis activities occur in the private sector?
- *Coordination information*—Information about requirements for coordination of planning, assessment, and policy analysis activities among and between institutions at various levels of government has not been assembled. What coordination is required? Do the requirements address the need for cross-sectoral coordinated planning and policy review? Do they ensure that the cumulative results of local and regional planning will be consistent with national plans and vice versa? Do they allow incorporation of ad hoc planning activities occurring at various times and undertaken by various levels of government?
- *Procedure and specification information*—Information about the procedures to be employed in planning, assessment, and policy review activities undertaken by various institutions has not been assembled. Do current statutory requirements prescribe procedures for planning, assessment, and policy review? Are these procedures specified in detail, or in a broad framework that allows for administrative discretion and flexibility in rulemaking procedures? Is the full intent of the existing laws that address planning, assessment, and policy review activities expressed in current regulations and practices? Do national planning requirements allow for regional and subregional planning? Do requirements specify the need for planning leadership? Do they give guidance to such leadership?
- *Cumulative effect information*—Information about requirements for effective institutional linkages between national, regional, and subregional planning, assessment, and policy analysis activities has not been gathered. Are the accumulated results of planning, assessments, and analysis at various levels consistent with principles of sustainable forest management?
- *Investment and incentive information*—Information about resources devoted to planning, assessments, and policy analysis activities has not been assembled. What is the magnitude of investments in planning, assessment, and policy review activities? Are there legal and administrative processes for allocating resources to these activities, and are the resources so allocated sufficient? Are there legal or fiscal provisions for encouraging these activities, and especially for encouraging cross-sectoral planning?
- *Effectiveness information*—Comprehensive information about the effectiveness of planning, assessment, and policy analysis activities has not been compiled, except in some very limited cases. Are there legal or administrative requirements to determine the efficiency and effectiveness of these activities? What are appropriate measures of success? Are there alternative, more effective ways to carry out planning, assessment, and policy review activities?

- *Monitoring information*—Information about monitoring capacity associated with planning, assessment, and policy analysis activities has not been compiled systematically. Are there requirements to monitor the results of these activities and to adapt them to changing circumstances?

Recommendations

The information adequacy issues we have just discussed must be resolved if we are to effectively assess institutional capacity to conduct planning, assessment, and policy analysis and review activities as described in Indicator 54. The following actions seem appropriate:

- *Comprehensive review of capacity*—Conduct a comprehensive review of current organizations that have authority, direction, and resources to undertake forest resource planning, assessment, and policy analysis and review activities. The review should address each of these activities as they occur at Federal, State, and local levels of government, and should be designed to correct the information deficiencies we have described. In addition, a systematic review of private-sector capability to carry out these activities should be initiated.
- *Responsibility for conducting review*—Assign responsibility for conducting continuous reviews of planning, assessment, and policy analysis and review capacities to a specific current or new administrative unit located within a Federal agency (such as the USDA Forest Service's State and Private Forestry unit, or the USDA Forest Service's National Forest System); a college or university; or a nonprofit organization engaged in policy review activities (e.g., Resources for the Future, Inc. or the Pinchot Institute for Conservation). This responsibility should be assigned to an organization that has a proven track record in conducting analyses and reviews of programs at various levels of government and the private sector.
- *Devote resources to review*—Invest sufficient resources in the review to provide the type and quantity of information necessary to dramatically improve our understanding of current abilities to plan, assess, and analyze conditions important to sustainable forestry.

Indicator Appropriateness

Indicator Definition

Indicator 54 does not provide clear definitions of the major activities to be examined. The terms and phrases "forest-related planning," "assessment," "policy review," and "cross-sectoral planning and coordination" are poorly defined. The specification problem is complicated further by the introduction of new words and phrases (for example, "policy planning"). Each of these words or phrases supposedly embodies an agreed-to set of concepts and principles, but this is not always the case. Also, it is unclear what units are to be included under the umbrella phrase "institutional capacity." We recommend that the indicator be reworded to read: ". . . *provides for periodic planning, assessment, and policy reviews that embrace various forest values and fosters the coordination of forest plans and assessments with other sectors*."

Relationship to Other Indicators

Indicators 54 and 49 are very similar in their coverage. Indicator 54 focuses on institutional capacity and Indicator 49 focuses on legal capacity, but institutional and legal capacities are very closely related. Assessment of information resources might be facilitated if Indicators 49 and 54 were merged.

Indicator 54 overlaps with other indicators that relate to concepts involving laws and values, public participation, funding, and planning. More specifically, it overlaps with Indicators 38 (investment in forests), 39 (investment in research), 50 (public participation), 52 (special values), 53 (public involvement and education), 60 (information and data), 61 (forest inventories), 62 (foreign country monitoring), 64 (value integrative methods), 65 (new technologies), and 66 (human intervention impacts).

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Human Resource Skills (Indicator 55)

Paul V. Ellefson and Calder M. Hibbard[1]

The full text of Indicator 55 is as follows: *Extent to which the institutional framework supports the conservation and sustainable management of forests, including the capacity to* ***develop and maintain human resource skills across relevant disciplines*** (Montreal Process Working Group 2003).

Rationale and Interpretation

Forest sustainability and conservation are possible only if persons engaged in the development and implementation of forest resource policies and programs possess the necessary knowledge and skills. Of special importance to sustainability is access to a broad range of disciplines (for example, economics, statistics, ecology) and resource orientations (for example, timber, water, recreation, wildlife). These skills are developed by means of formal educational programs, professional work experiences, and access to continuing education opportunities. Relevant educational programs are made available by a number of organizations and are provided in various forms, including training by professional societies, continuing education programs, extension outreach programs, and professional technical assistance programs (Montreal Process Working Group 2003, Montreal Process Technical Advisory Committee 2000).

Useful data for measuring institutional capacity to accomplish Indicator 55 include compilations and descriptions of laws and programs that promote conditions considered essential to maintaining human resource skills across relevant disciplines. Examples of potentially useful information are number of professionals by discipline (for example, economics, statistics, ecology) and resource orientation (for example, timber, water, recreation, wildlife); number of degrees confirmed by formal educational institutions (universities, colleges, technical schools); and continuing education offerings by subject, enrollment, and manner of presentation. Various other kinds of information can also be of importance, such as the number of professionals engaged directly in land management activities by discipline (or resource orientation) per unit of forested area (Montreal Process Technical Advisory Committee 2000).

Indicator 55 suggests various concepts and principles that need to be addressed. For the purposes of this review, *human resource skills* can be defined as interdisciplinary professional knowledge and insight required to develop and apply principles of sustainable forestry, and *across relevant disciplines* can be defined as encompassing various disciplines (for example, economics, statistics, ecology) and various resources (timber, water, recreation, wildlife) important to forest sustainability. The indicator implicitly acknowledges the importance of information describing integration across disciplines and across resources, as well as information demonstrating the integration of biophysical and social subject matter.

Conceptual Background

Human resources and the talent, ingenuity, and creativity they represent are critical to the sustainability of forests and the communities that depend on them. Ecological, economic, and social skills are required, and these skills must be integrated effectively. Both the quality and the quantity of human resources are significant, since both can have a direct bearing on the amount and quality of benefits provided by forest and related natural resources.

Development of human resources begins with early experiences and education and continues through a lifetime of exposure to various experiences and learning opportunities. Much of the development of skills relevant to the management of forest resources occurs as part of formal educational processes at universities, colleges, or technical schools. The skills and knowledge developed in these settings are maintained and increased by lifelong continuing education and direct professional work experience. Most of these opportunities for learning are provided or supported by employers and educational institutions.

The rapid pace of scientific discovery in the natural sciences and the continuing improvement in understanding of human systems and processes have combined to produce a substantial and dynamic body of knowledge that is relevant to the sustainability of forests. This knowledge serves as a foundation for the decisions made by forest resource professionals. For this reason, it is important that professionals be exposed to this knowledge base on a continuing basis, absorbing knowledge about a variety of disciplines important to informed assessments and judgments regarding forest sustainability. Moreover, the occurrence of new and unforseen developments affecting forest sustainability

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makes it imperative that this foundation of knowledge is added to and updated continually. This enlargement and updating of knowledge is essential if management decisions are to be relevant and forest resources are to be sustained.

Current Institutional Capacity

Professional Workforce Capacity

Comprehensive and meaningful information about the professional workforce relevant to forest sustainability has not been compiled. The available information often relates only to certain categories of employers (for example, a State agency) or to certain types of forestry professionals (for example, professionals engaged in research). Conflicting definitions of "expert," "authority," or "professional" are invariably at the core of the information problem. Who has knowledge and skill that is relevant to forest sustainability, and what portion of the Nation's workforce should be classified as having the professional skills required to ensure the sustainability of forests? Some suggest that the relevance of professions to sustainability should be determined by the extent to which professionals focus on certain resources associated with forests (for example, professional timber manager, professional watershed manager), while others suggest that the professional sphere should include all those who hold professional degrees and are engaged in matters involving forests (for example, meteorologists engaged in fire weather forecasting). Also adding to information problems concerning professional capacity is the reality that employees of some Federal and State agencies with relatively new responsibilities involving forest sustainability have yet to be properly acknowledged, identified, and made party to existing information-gathering processes (for example, the U.S. Environmental Protection Agency, the U.S. Army Corps of Engineers, State and local pollution control agencies, and watershed management districts). Because nationwide comprehensive reviews of the forestry professional workforce have not been made, what follows are examples of the public and private professional workforces focused on matters involving forest sustainability.

Federal agencies—The USDA Forest Service reported the employment of 34,511 full-time-equivalent (FTE) employees in fiscal year 2001. This workforce was distributed among agency programs as follows: National Forest System: 15,893 FTEs (46 percent); wildland fire management: 7,178 FTEs (21 percent); infrastructure improvement and maintenance: 3,841 FTEs (11 percent); forest and rangeland research: 2,644 FTEs (8 percent); State, private, and international programs: 774 FTEs (2 percent); land acquisition: 112 FTEs (less than 1 percent); and other employees involved with trust funds and permanent and discretionary appropriations: 4,069 FTEs (11 percent). The USDA Forest Service also employs nearly 14,600 persons as part of the Youth Conservation Corps, Job Corps, and Senior Community Service Employment Program. Forty-nine percent of the agency's workforce is composed of minorities, women, and persons with disabilities, and approximately one-third of these persons are in leadership positions (U.S. Department of Agriculture Forest Service 2001).

Federal Government forestry research capacity is widely dispersed across many Federal agencies. In 1995, the USDA Forest Service reported the employment of 607 research scientists distributed as follows: foresters: 138; ecologists, biologists, botanists: 72; plant pathologists: 69; wildlife and fishery biologists: 59; engineers: 44; economists, social scientists: 28; forest products technologists: 25; statisticians, mathematicians: 19; geneticists: 19; soil scientists: 19; hydrologists: 13; and other disciplines such as geologists, physicists, and range scientists: 102 (U.S. Department of Agriculture Forest Service 2002a). A 2001 review of research capacity indicates that the agency engaged the talents of 658 full-time-equivalent researchers, or 49 percent of the total number employed by the agency, forest industry, and academic institutions (table 1). The number of research scientists employed by the agency declined by more than 45 percent during the period 1985 through 1999. The largest proportional declines were in the research forester and forest products technologist classifications, whereas the largest increase occurred in ecologists engaged in research (from 9 in 1985 to 50 in 1999) (National Research Council 2002).

The USDI Bureau of Land Management reported that in fiscal year 2001 it employed 2,846 FTE persons in 5 activity areas with a direct bearing on resource sustainability. These persons were assigned as follows: land resources 1,647 FTEs (of which 64 were assigned to the forest management subactivity); threatened and endangered species management 193 FTEs; recreation management 622 FTEs; and resource protection 384 FTEs (U.S. Department of the Interior, Bureau of Land Management 2002). In fiscal year 2001, the USDI National Park Service employed 2,730 FTE employees in park resource stewardship and 4,628 FTE employees in visitor services (U.S. Department of the Interior, National Park Service 2002). The USDI Fish and Wildlife Service employed 5,540 FTE employees in the following resource management areas in fiscal year 2002: ecological services 1,887 FTE employees; law enforcement 375 FTE employees; migratory bird management 553 FTE employees; and refuge operations and management 2,725 FTE employees (U.S. Fish and Wildlife Service 2002). Information about the professional workforce engaged in forest sustainability activities in other Federal agencies (for example, U.S. Environmental Protection Agency, U.S. Department of Commerce) has not been compiled.

Table 1—Forestry research scientist capacity, by sustainable forest management focus and research institution (2001)

Sustainable forest management focus	Major forestry research institutions (full-time-equivalents in research)			
	USDA Forest Service	Academic	Forest industry	Total
Biological diversity	112	136	10	258
Productive capacity	158	96	67	321
Ecosystem health	156	53	5	214
Soil and water	86	84	20	190
Carbon cycles	41	47	3	91
Socio-economics	80	114	9	203
Institutional framework	25	45	0	70
Total	658	575	114	1,347

Source: National Research Council (2002), U.S. Department of Agriculture, Forest Service (2002a).

State agencies—Various State government agencies employ professional personnel to address matters of forest sustainability (Ellefson and others 2001, 2002). However, no systematic and comprehensive compilation of the type and number of these employees in State government has been made. More than 22,000 persons were employed in State forestry programs in 1998 (table 2) (National Association of State Foresters 1998). Of this total, 26 percent were considered to be managerial or professional employees. Some States had relatively few such employees (Delaware and New Hampshire had only 13); other States had many more (California had 670 and Washington had 640). The average number of such employees per State was approximately 120. Information of a similar nature is available for 1994 and 1996 and for some prior years.

Information about State government agency staff who administer forest practice regulatory programs has been gathered periodically since the early 1980s. In 2003, an estimated 1,039 full-time-equivalent employees in 276 State agencies were involved with programs regulating forestry practices (Ellefson and others 2003). Of these full-time-equivalents, more than 470 were assigned to lead State forestry agencies in the 10 States with comprehensive forest practice laws, with California, Oregon, and Washington accounting for 84 percent of the total (table 3). Staffing in the 10 States with comprehensive programs increased by nearly 124 percent from 1985 through 2003, but staffing in some States remained the same or decreased slightly during that period. In 1991, State lead forestry agencies employed the following numbers (full-time-equivalents) of regulatory staff per 100,000 acres of private timberland: Alaska 0.05, California 1.26, Idaho 0.42, Maine 0.04, Massachusetts 0.59, Nevada 4.46, New Mexico 0.36, Oregon 0.75, and Washington 1.26 (Ellefson and others 1995).

Private organizations—Information about the professional workforce of private organizations focused on forest sustainability is particularly limited in quantity and quality. Professionals who specialize in forest sustainability are known to be employed in many private organizations, including advocacy interest groups, business investment firms, professional societies, timber harvesting companies, forestry consulting firms, and corporations engaged in industrial forestry operations. Forestry consultants typically are affiliated with corporations, partnerships, and sole proprietorships, and most are general foresters, although many have professional specialties within forestry. Their clients include landowners, forest industries, investment and financial industries, attorneys, government agencies, bankers, trusts, and Native American corporations. Consulting foresters are often represented by the Association of Consulting Foresters of America, which had 610 members in 38 States and 2 Canadian Provinces in 2002 (Association of Consulting Foresters in America 2002).

The most recent known national assessment of forest resource professionals affiliated with industrial forestry concerns was conducted in 1986 (Ellefson and Irving 1989). The assessment focused on 70 timberland-owning companies that accounted for 72 percent (49.4 million acres) of the Nation's 1986 industrial timberland ownership (68.6 million acres). The 70 companies employed 3,569 professional foresters, 445 of whom held administrative

Table 2—State government forestry program personnel, by State and type of personnel (1998)

State	Type of forestry program personnel					
	Managerial	Professional	Technical	Administrative and clerical	Seasonal and temporary	Total
Alabama	82	119	199	39	0	439
Alaska	*	*	*	*	*	*
Arizona	8	19	6	5	4	42
Arkansas	5	65	216	17	37	340
California	592	78	3,057	628	1,500	5,855
Colorado	12	63	12	20	57	164
Connecticut	1	24	3	3	13	44
Delaware	4	9	9	2	2	26
Florida	27	348	715	27	150	1,267
Georgia	21	120	461	122	193	917
Hawaii	12	46	20	11	61	150
Idaho	24	132	5	50	210	421
Illinois	10	27	21	8	86	152
Indiana	20	63	*	64	228	375
Iowa	8	17	15	1	150	191
Kansas	4	8	3	4	25	44
Kentucky	43	61	113	24	80	321
Louisiana	18	73	200	19	220	530
Maine	4	120	20	12	15	171
Maryland	8	56	46	11	2	123
Massachusetts	5	27	13	7	*	52
Michigan	54	66	155	25	57	357
Minnesota	11	223	92	74	270	670
Mississippi	15	155	400	90	74	734
Missouri	23	58	134	11	37	263
Montana	26	104	28	16	76	250
Nebraska	5	20	3	9	5	42
Nevada	75	7	97	6	20	205
New Hampshire	7	6	23	5	25	66
New Jersey	33	33	31	10	30	137
New Mexico	12	36	2	9	2	61
New York	25	163	140	12	170	510
North Carolina	29	76	532	64	250	951
North Dakota	2	11	10	1	50	74
Ohio	25	55	15	25	120	240
Oklahoma	8	40	98	14	23	183
Oregon	160	222	17	110	527	1,036
Pennsylvania	74	130	85	60	200	549
Rhode Island	8	7	15	1	24	55
South Carolina	105	64	94	72	30	365
South Dakota	6	19	6	4	5	40
Tennessee	12	65	264	20	279	640
Texas	16	78	137	67	18	316
Utah	13	21	1	14	64	113
Vermont	10	34	11	9	2	66
Virginia	18	35	112	29	144	338
Washington	110	530	100	80	380	1,200
West Virginia	5	62	25	14	61	167
Wisconsin	7	223	148	18	398	794
Wyoming	4	16	12	5	3	40
Total	1,806	4,034	7,921	1,948	6,377	22,086

Note: Asterisk indicates information not available.
Source: National Association of State Foresters (1998).

Table 3—Lead State forestry agency staffing for the administration of comprehensive forest practice regulatory programs, by State (1985-2003)

	Staffing (full-time equivalents)							
State	1985	1986	1987	1988	1989	1990	1991	2003
Alaska	6.5	6.5	4.5	2.5	2.5	3.0	3.0	7.9
California	68.0	68.0	68.0	68.0	74.0	83.0	94.0	124.5
Connecticut	*	*	*	*	*	*	*	3.0
Idaho	4.5	5.5	5.5	8.0	10.0	8.0	13.7	20.0
Maine	*	*	*	*	*	6.0	6.0	12.7
Massachusetts	16.0	16.0	17.0	16.0	15.0	15.0	15.0	16.0
Nevada	5.0	5.0	5.0	5.0	5.0	5.0	5.0	7.0
New Mexico	7.0	7.0	7.0	7.0	7.0	7.0	7.0	9.0
Oregon	44.1	48.2	48.2	53.6	62.6	64.3	64.3	94.0
Washington	58.1	58.1	73.0	73.0	77.5	77.5	112.8	176.0
Total	209.2	214.3	228.2	233.1	253.6	273.1	320.8	470.1

Note: Asterisk indicates information not available or program not established. Connecticut Forest Practices Act established June 28, 1991.
Source: Ellefson and others (1995, 2003).

positions at the central headquarters of their companies (table 4). The remainder (3,124) were either directly engaged in the management of company lands, procured timber from noncompany land, or provided services to owners of nonindustrial private forests. The 1,709 foresters who were responsible primarily for forestry activities on company land were responsible for more than 49.4 million acres of timberland, an average of 28,814 acres of timberland per forester. The average acreage of of timberland per forester varied depending on a company's total timberland ownership: 28,300 acres per forester for companies with less than 300,000 acres of timberland, 24,917 acres per forester for companies with 300,000 to 1 million acres, and 32,246 acres per forester for companies with more than 1 million acres of timberland. Such information is available on a regional basis.

Formal Professional Education

Formal professional education, meaning professional education received prior to employment in a field of forestry or related resource employment, is usually provided by universities, colleges, and technical schools (Appendix A). Because these institutions generally have responsibility for education and research involving many subjects and disciplines, they are well suited to the task of providing educational experiences involving the broad array of subject matter that is required to apply principles of forest sustainability. Unfortunately, information about this professional educational landscape is not uniform across information-gathering organizations and not consistent in form over time. However, meaningful information about capacity to offer formal professional education involving forest

Table 4—Industrial foresters employed by 70 leading U.S. wood-based companies, by primary responsibility and region (1986)

	Region			
Responsibility	North	South	West	Total
Manage company-owned or leased land	226	1,082	401	1,709
Procure timber from noncompany land	121	983	122	1,226
Provide services to private woodland owners	28	153	8	189
Total	375	2,218	531	3,124

Note: Excludes 445 foresters engaged in administrative supporting activities at company headquarters.
Source: Ellefson and Irving (1989).

resources is collected by the Society of American Foresters (SAF), the Society of Wood Science and Technology (SWST), the Food and Agricultural Educational Information System, and the National Association of Professional Forestry Schools and Colleges. Another source of relevant information is the Southeastern Section of The Wildlife Society, which offers accreditation to programs that meet the Section's criteria for professional education.

The Society of American Foresters is the organization officially charged with accreditation of professional forestry educational programs in the United States. It judges such programs in light of various criteria, including program goals and objectives, curriculum, faculty and students, physical facilities, and organizational and administrative support (Society of American Foresters 2000). The broad scope of these criteria reflects the forest resource professional's need for a wide range of knowledge and skills. In 2001, colleges, universities, institutes, and other educational organizations offered 136 educational programs involving forestry or natural resources (Appendix A). Of these, the SAF accredited 47 as professional degree programs and recognized 23 as technical education programs involving forest resources.

The Society of Wood Science Technology is the accrediting organization for professional programs leading to the bachelor's degree in wood science and wood technology. Initiated in 1984, the SWST has accreditation standards very similar to those applied by the Society of American Foresters. As of 2001, 25 university-level programs were known to offer professional education in wood science and technology. The SWST accredited 9 of these 25 programs (Society of Wood Science and Technology 2002).

The Food and Agricultural Education Information System provides a broad range of higher education statistics related to agricultural and natural resources. The System is a cooperative endeavor involving the USDA Cooperative State Research, Extension, and Education Service and the Department of Agricultural Economics of Texas A&M University. Its purpose is to provide empirical information for use in planning and coordinating efforts directed toward supporting higher education in the food, agricultural, and natural resource sciences. Focusing on topics such as enrollment, faculty, degrees awarded, and placement, the System annually surveys institutions that are members of the National Association of Professional Forestry Schools and Colleges (62 colleges or departments), the American Association of State Colleges of Agriculture and Renewable Resources (56 colleges or departments), the Society of American Foresters (48 colleges, schools, or departments), and the National Association of State Universities and Land Grant Colleges/Academic Committee on Organization and Policy/Academic Programs Section (85 departments or colleges of agriculture, forestry, and renewable resources). Some institutions are members of more than one of these organizations. Not all institutions respond to the System's annual survey (the average response rate is about 70 percent); therefore, the following estimates of faculties, enrollment, and degrees granted may be considered conservative.

An estimated 1,596 resident full-time faculty were engaged in forestry or natural resources instruction in 2001, of whom 44 percent (705 faculty, or 360 full-time-equivalents) had specializations directly related to forest resources (table 5). The most common teaching specialities were general forestry (18 percent of faculty), forest biology (15 percent), forest management (14 percent), and forest sciences (12 percent). A significant number of faculty were engaged in instruction involving broader environmental or natural resource topics (891 faculty, or 449 full-time equivalents), nearly all of which are important to the development of professional skills that might be applied to the use, management, and protection of forests. The most common of these specialities were wildlife and wildlands management, and renewable natural resources and conservation generally (table 5).

Students enrolled in forest resources and natural resources instructional programs at colleges and universities totaled 31,650 in 2001. Of these students, only 29 percent (9,080) had academic specializations directly related to forest resources (table 6). Of this 29 percent, 5,360 students (59 percent of forest resource-focused students) had general forestry or forest management as areas of specialization. The largest number of forest resources-oriented students were pursuing the baccalaureate degree (6,955 students). A large number of students (22,570) were engaged in professional skills instruction involving wildlife and wildlands management, environmental science and studies, and general renewable natural resources and conservation. These areas of specialization all have relevance to the use, management, and protection of forests. In 2001, 7,921 degrees were awarded in the fields of forest resources (27 percent) and natural resources (73 percent). Of these, 78 percent were baccalaureate degrees (table 7).

Indicator 55 emphasizes that the integration of various subjects and disciplines into professional education is critical to the sustainable management of forest resources. Through program accreditation procedures and standards, organizations such as the Society of American Foresters provide direction as to the appropriate mixture of skills, disciplines, and technical competencies within a forestry curriculum. In 1998, employers rated the importance of skills needed for long-term professional success as follows, in descending order: ability to work in teams, ability to address public concerns, understanding of requirements for healthy ecosystems, adoption of innovative approaches

Table 5—Faculty (resident full-time) engaged in forest resources and natural resources instruction at colleges and universities, by academic specialization and academic rank (2001)

Academic specialization	Academic faculty rank					
	Professor	Associate professor	Assistant professor	Instructor	Other	Total
Forest resources						
Forestry, general	64 (46)	31 (21)	29 (18)	3 (1)	2 (1)	129 (87)
Forest harvesting and production	6 (3)	3 (1)	0 (0)	0 (0)	0 (0)	9 (4)
Forest products technology	27 (9)	20 (5)	9 (4)	0 (0)	4 (2)	60 (20)
Timber harvesting	4 (1)	6 (2)	0 (0)	0 (0)	0 (0)	10 (3)
Forest sciences	46 (17)	24 (10)	15 (8)	2 (0)	0 (0)	87 (35)
Forest biology	53 (32)	35 (17)	15 (11)	0 (0)	0 (0)	103 (60)
Forest engineering	10 (6)	6 (2)	7 (3)	3 (2)	1 (1)	27 (14)
Forest hydrology	9 (4)	5 (1)	4 (1)	1 (1)	0 (0)	19 (7)
Forest management	40 (17)	32 (18)	22 (12)	3 (2)	0 (0)	97 (49)
Forest mensuration	23 (13)	15 (8)	10 (6)	1 (1)	0 (0)	49 (28)
Urban forestry	4 (2)	4 (2)	3 (1)	0 (0)	1 (1)	12 (6)
Wood science	29 (11)	11 (5)	5 (3)	0 (0)	1 (0)	46 (19)
Pulp and paper technology	12 (7)	5 (3)	8 (5)	0 (0)	0 (0)	25 (15)
Forest soils	10 (4)	5 (2)	2 (1)	0 (0)	0 (0)	17 (7)
Forest sciences, other	9 (4)	3 (1)	3 (1)	0 (0)	0 (0)	15 (6)
Subtotal	346 (176)	205 (98)	132 (74)	13 (7)	9 (5)	705 (360)
Natural resources						
Renewable natural resources and conservation, general	72 (32)	44 (23)	29 (16)	0 (0)	3 (1)	148 (72)
Environmental science studies	33 (16)	21 (9)	30 (13)	2 (1)	3 (3)	89 (42)
Natural resources management & policy	52 (19)	27 (15)	20 (7)	2 (1)	5 (1)	106 (43)
Natural resources law enforcement & protection service	3 (1)	0 (0)	0 (0)	0 (0)	0 (0)	3 (1)
Fishing & fisheries sciences management	53 (22)	22 (12)	23 (11)	0 (0)	2 (1)	100 (46)
Wildlife & wildlands management	79 (42)	44 (26)	37 (24)	2 (1)	0 (0)	162 (93)
Rangeland science management	57 (26)	23 (13)	14 (8)	0 (0)	1 (0)	95 (47)
Parks, recreation, & leisure studies	21 (10)	18 (12)	14 (8)	1 (1)	1 (1)	55 (32)
Parks, recreation, & leisure facilities management	10 (6)	7 (5)	10 (6)	0 (0)	0 (0)	27 (17)
Water resources	16 (6)	14 (6)	6 (3)	0 (0)	0 (0)	36 (15)
Natural resources, other	33 (19)	17 (7)	18 (13)	1 (1)	1 (1)	70 (41)
Subtotal	429 (199)	237 (128)	201 (109)	8 (5)	16 (8)	891 (449)
Total	775 (375)	442 (226)	333 (183)	21 (12)	25 (13)	1,596 (809)

Note: Numbers in parentheses are full-time-equivalent faculty.
Source: Texas A&M University (2002).

Table 6—Student enrollment in forest resources and natural resources instruction at colleges and universities, by academic specialization and type of degree (2001)

Academic specialization	Academic program – enrollment				Total
	Two-year program	Baccalaureate program	Master's program	Doctoral program	
Forest resources					
Forestry, general	45	2,672	354	170	3,241
Forest harvesting and production	31	50	3	4	88
Forest products technology	0	147	17	4	168
Timber harvesting	0	0	0	0	0
Forest sciences	0	436	206	145	787
Forest biology	0	464	180	139	783
Forest engineering	0	250	15	10	275
Forest hydrology	0	18	29	7	54
Forest management	25	1,756	187	151	2,119
Forest mensuration	0	0	32	20	52
Urban forestry	39	222	30	4	295
Wood science	0	281	64	53	398
Pulp and paper technology	0	543	11	9	563
Forest soils	0	5	15	4	24
Forest sciences, other	49	111	29	44	233
Subtotal	189	6,955	1,172	764	9,080
Natural resources					
Renewable natural resources and conservation, general	0	2,089	290	154	2,533
Environmental science studies	27	4,016	576	348	4,967
Natural resources management and policy	0	1,389	135	108	1,632
Natural resources law enforcement and protection service	0	33	0	0	33
Fishing and fisheries sciences management	0	1,492	301	111	1,904
Wildlife and wildlands management	58	5,029	747	296	6,130
Rangeland science management	0	454	158	80	692
Parks, recreation, and leisure studies	0	1,338	86	56	1,480
Parks, recreation, and leisure facilities management	0	1,387	133	38	1,558
Water resources	0	287	132	75	494
Natural resources, other	0	203	118	226	1,147
Subtotal	85	18,317	2,676	1,492	22,570
Total	274	25,272	3,848	2,256	31,650

Source: Texas A&M University (2002).

Table 7—Degrees granted in forest resources and natural resources at colleges and universities, by academic specialization and type of degree (2001)

Academic specialization	Academic program – degrees awarded				Total
	Two-year program	Baccalaureate program	Master's program	Doctoral program	
Forest resources					
Forestry, general	43	529	198	16	786
Forest harvesting and production	12	30	2	0	44
Forest products technology	0	22	4	0	26
Timber harvesting	*	*	*	*	*
Forest sciences	0	121	44	8	173
Forest biology	0	116	54	20	190
Forest engineering	0	79	2	0	81
Forest hydrology	0	6	9	1	16
Forest management	4	389	80	17	490
Forest mensuration	0	0	2	6	8
Urban forestry	15	60	2	0	77
Wood science	0	85	20	12	117
Pulp and paper technology	0	104	6	4	114
Forest soils	0	1	1	2	4
Forest sciences, other	26	2	7	2	37
Subtotal	100	1,544	431	88	2,163
Natural resources					
Renewable natural resources and conservation, general	0	446	94	28	568
Environmental science studies	7	1,197	184	46	1,434
Natural resources management and policy	0	391	41	15	447
Fishing and fisheries sciences management	0	306	96	19	421
Wildlife and wildlands management	29	1,153	230	38	1,450
Rangeland science management	0	93	43	22	158
Parks, recreation, and leisure studies	0	382	28	14	424
Parks, recreation, and leisure facilities management	0	360	58	8	426
Water resources	0	79	50	4	133
Natural resources, other	0	242	19	36	297
Subtotal	36	4,649	843	230	5,758
Total	136	6,193	1,274	318	7,921

Note: Asterisk indicates information not available.
Source: Texas A&M University (2002).

to forest management, use of creative approaches for working with the public, ability to evaluate and synthesize information, and understanding of landscape-level planning and management (Sample and others 1999). Employers reported that the largest gaps between importance level and performance level were in the areas of working in teams and addressing public concerns.

Employers also have an interest in securing persons with appropriate technical competencies (Sample and others 1999). In descending order of importance, the following areas of competence were identified: ethics, written communication, oral communication, silvicultural systems, managerial leadership, collaborative problem-solving, resource management, forest ecology, forest inventory and

biometry, landscape analysis (Geographic Information Systems), tree and plant species identification, human resource management, watershed management, resource economics, financial management, alternative dispute resolution, fire dynamics, organizational development, forest soils, resource policy and law, wildlife biology, government relations, forest pathology, conservation biology, forest engineering, transportation systems, rural community development, wildland and protected areas management, range management, and foreign languages. Except for plant identification, the gaps between performance and importance of a technical skill were largest for various aspects of communicating with and managing people.

Continuing and Life-Long Education

Continuing education is generally viewed as those learning experiences (or informational updates) occurring after completion of formal professional education. The intent of continuing education is to "constantly refine the sensitivities of professionals, enlarge their concepts, add to their knowledge, and perfect their skills so they can discharge their responsibilities within the context of their own personalities and the needs of society of which they are a part." (Houle 1980). Continuing education has always been recognized as important to maintaining skills across forestry disciplines (a need suggested by Indicator 55) (Miller and Lewis 1999). However, only since the 1970s have concepts of lifelong learning experiences for forest resource professionals begun to gel and become formal programs assumed by accountable institutions. This development has not occurred without acrimony, most notably in struggles with issues involving (1) the purposes of continuing education, (2) the emphasis that continuing education should place on scientific and technical updates that increase productivity of the workforce, and (3) the development of the professional as a contributor to the broader interests of society (Swanson and Arnold 1996).

Public and private organizations employing forest resource professionals typically offer or require programs focused on professional development and in-service education. The extent and nature of these programs have not been documented comprehensively. Although they are not common, legal requirements for provision of or encouragement of continuing education opportunities for natural resource professionals do exist at both the State and Federal Government levels. It appears that most of the relevant laws simply require agencies to collaborate with universities and related institutions on continuing education matters. Examples of Federal legal requirements are as follows:

- TITLE 7—AGRICULTURE; Chapter 64—Agricultural Research, Extension, and Teaching; Subchapter III—Agricultural Research and Education Grants and Fellowships; Sec. 3152. Grants and fellowships for food and agricultural sciences education; "(g) Continuing education. The Secretary shall conduct special programs with colleges and universities, and with organizations in the private sector, to support educational initiatives to enable food and agricultural scientists and professionals to maintain their knowledge of changing technology, the expanding knowledge base, societal issues, and other factors that impact the skills and competencies needed to maintain the expertise base available to the agricultural system of the United States. The special programs shall include grants and technical assistance."
- TITLE 16—CONSERVATION; Chapter 36—Forest and Rangeland and Renewable Resources Planning; Subchapter III—Extension Programs; Sec. 1672. General program authorization: "(a) Types of programs; preconditions and cooperation with State program directors, etc. The Secretary of Agriculture (hereinafter in this subchapter referred to as the "Secretary"), under conditions the Secretary may prescribe and in cooperation with the State directors of cooperative extension programs and eligible colleges and universities shall . . . (6) assist in providing continuing education programs for professionally trained individuals in fish and wildlife, forest, range, and watershed management and related fields…"
- TITLE 25—INDIANS; Chapter 33—National Indian Forest Resources Management; Sec. 3114. Postgraduation recruitment, education and training programs: "The Secretary shall maintain a program within the Division of Forestry of the Bureau of Indian Affairs for the ongoing education and training of Bureau of Indian Affairs, Alaska Native, and Indian forestry personnel. Such program shall provide for (1) orientation training for Bureau of Indian Affairs forestry personnel in tribal-Federal relations and responsibilities; (2) continuing technical forestry education for Bureau of Indian Affairs, Alaska Native, and tribal forestry personnel; and (3) developmental training of Indian and Alaska Native personnel in forestland based enterprises and marketing."

State governments also have legal authorities requiring continuing education of natural resource professionals. In some States, the requirements are part of general forest resource law. This is the case in Minnesota, where the State's MN Sustainable Forest Resources Act encourages ". . . timber harvesters and forest resource professionals to establish continuing education programs within their respective professions that promote sustainable forest management . . . the Forest Resources Council shall, where appropriate, facilitate the development of these programs" (Minnesota Forest Resources Council 2002). In other States, requirements for continuing education are integral parts of licensing and regulatory programs. This is the case in California, where the State's Forest Practice Rules

authorize the Director of the California Division of Forestry and Fire Protection to ". . . conduct timber operator education programs in addition to or in lieu of approving programs conducted by others . . . courses shall use educational materials approved by the Director . . . and shall address the content of rules established by the Board" (California Department of Forestry and Fire Protection 1997).

Continuing education opportunities are provided by a great number of institutions with diverse expertise and equally diverse capabilities. However, most continuing education is provided by employers, and of that so offered, 90 percent is accomplished in collaboration with other organizations (Cervero 2000). Colleges and universities are major sources of continuing education in forestry and related natural resource fields. Most, if not all, of the colleges, universities, and technical schools previously identified (Appendix A) provide such opportunities. Examples are:

- Executive Management Program for Natural Resource Managers, Pennsylvania State University
- Institute for Sustainable Natural Resource Continuing Education Programs, University of Minnesota
- Continuing Education Coordinating Committee Programs for Forestry and Range, Continuing Education, Universities of Oregon and Washington
- Center for Environmental Continuing Education, Duke University
- Consortium for Continuing Education for Ecosystem Management, Northern and Southern Rocky Mountain Universities
- Georgia Center for Continuing Education, School of Forest Resources, University of Georgia
- Center for Ecological Management of Military Lands, Department of Forest Sciences, Colorado State University
- Center for Continuing Education, University of Montana.

Federal natural resource agencies provide professional resource managers with numerous opportunities for continuing education. For example, the USDA Forest Service provides a two-track program involving a technical leadership component (workshops on fish habitat management, wildlife habitat and plant management, vegetation monitoring, and managing forested ecosystems) and a program leadership component (workshops on leadership and communication, natural resource policy, values and economics, and program management) (U.S. Department of Agriculture Forest Service 2002b). A number of other Federal agencies have similar programs that are relevant to needs of natural resource professionals, for example:

- National Training Center, U.S. Geological Survey
- National Education and Training Center, USDI Fish and Wildlife Service
- The Learning Place, USDI National Park Service
- National Training Center, USDI Bureau of Land Management
- National Employee Development Center, USDA Natural Resources Conservation Service
- National Environmental Training Center, U.S. Environmental Protection Agency.

These Federal programs and centers provide a wide variety of continuing education opportunities, meeting the needs of professional employees at various career stages (entry-level employees, new employees, mid-career professionals). Most often, the programs consist of short courses and workshops with some opportunities for longer periods of formal study (university graduate education). In addition to these single-agency-oriented programs, multiagency collaborative efforts exist to offer continuing education opportunities for forest and natural resource professionals. An example is the Carhart Natural Wilderness Training Center, which is sponsored by the USDI Bureau of Land Management, USDI National Park Service, USDI Fish and Wildlife Service, and USDA Forest Service. The center provides educational opportunities for land managers assigned wilderness management responsibilities.

State forestry and related natural resource agencies also offer continuing education programs. Unfortunately, these programs have not been identified systematically and have not been assessed as to their focus and intensity. As with Federal agency programs, State agency programs probably take a variety of forms ranging from technical and scientific training to computer technology training, management training, and workplace safety training. Most of these opportunities are probably offered in conjunction with other State, Federal, and local agencies or universities.

Continuing education opportunities for forest resource professionals are also provided by various private organizations, including professional societies, industry associations, conservation groups, and environmental advocacy organizations (Appendix B). As might be expected, these opportunities address a diverse array of subjects and disciplines. Some organizations, such as the Society of American Foresters, offer member certification programs that require some type of continuing education for certification maintenance. Other groups, such as the American Forest and Paper Association (AF&PA), encourage member

continuing education that emphasizes knowledge and application of sustainable forestry principles (AF&PA Sustainable Forestry Initiative). Some private organizations, such as The Nature Conservancy, sponsor periodic workshops and conferences focused on critical natural resource issues. Many private corporations and interest groups involved in forest management offer professional development or in-service training programs, and often require that their employees participate in these programs.

Certification and Licensing Program Education

Institutional capacity to maintain human resource skill is also present in occupational registration, certification, and licensing programs focused on forest resource professionals and timber harvesters. Most such programs have a required educational component. The terminology of these programs is confusing, but *registration* implies that individuals voluntarily list their names on an official roster managed by some public or private organization; *certification* implies that certain minimum qualifications (education, experience) are met; and *licensing* is exclusionary in that government authorization is required to engage in professional practices (MacKay and others 1996). Such programs are usually established to assure the public that only competent persons are providing a service or practicing a trade. Proponents of these programs argue that they are necessary to protect public health and safety. Unfortunately, the programs are beset by various problem areas, including voluntary versus mandatory application, the relationship between the professional and the general public, the procedure and substance of eligibility standards, the question of educational requirements, the imposition of penalties for noncompliance, and the responsibility for program financial support (Garland 1996, MacKay and others 1996, Young 1987).

State registration, certification, and licensing programs for forestry professionals were in effect in 16 States in 1996 (Block 2000, Society of American Foresters 2001) (table 8). All of these programs had minimum educational requirements; many had continuing education requirements. The States with such programs are: *voluntary registration*—Michigan, New Jersey, Oklahoma, West Virginia; *mandatory registration*—Arkansas, Georgia, Mississippi, North Carolina, South Carolina; *mandatory licensing*—Alabama, California, Maine, Maryland, Massachusetts, New Hampshire; and *mandatory certification*—Connecticut. Florida's forester registration program was allowed to expire because there were too few public complaints to justify the program.

Table 8—State-initiated professional forester registration and licensing programs, by State and program characteristics (2001)

State	Type of program	Voluntary or mandatory program	Foresters registered or licensed	Term of license or registration	Credentialing requirements	Continuing education requirements
Alabama	Licensing	Mandatory	1,000	1 year	E, ED	10 credits per year
Arkansas	Registration	Mandatory	450	1 year	E, ED&EX	6 credits per year
California	Licensing	Mandatory	1,550	2 years	E, ED&EX	None
Connecticut	Certification	Mandatory	120	5 years	E	6 credits per 2 years
Georgia	Registration	Mandatory	1,220	2 years	E, ED&EX	12 credits per 2 years
Maine	Licensing	Mandatory	1,000	1 year	E, ED&EX	12 credits per 2 years
Maryland	Licensing	Mandatory	206	2 years	E, ED&EX	8 credits per 2 years
Massachusetts	Licensing	Mandatory	45	1 year	E, ED&EX	20 credits per year
Michigan	Registration	Voluntary	500-600	Indefinite	ED&EX	None
Mississippi	Registration	Mandatory	2,000	2 years	E, ED	16 credits per 2 years
New Hampshire	Licensing	Mandatory	350	2 years	E, ED&EX	20 credits per 2 years
New Jersey	Registration	Voluntary	64	Indefinite	ED&EX	6-9 credits per year
North Carolina	Registration	Mandatory	1,050	1 year	E, ED&EX	10 credits per year
Oklahoma	Registration	Voluntary	116	1 year	ED&EX	None
South Carolina	Registration	Mandatory	1,600	1 year	E, ED&EX	10 credits per year
West Virginia	Registration	Voluntary	350	1 year	ED&EX	10 credits per year

E = written or oral exam; ED = education requirements only; EX = experience requirements only; ED&EX = education and experience requirements.
Connecticut's certification program is the same as a licensing program.
Source: Society of American Foresters (2001).

State governments have established occupational registration, certification, and licensing programs focused on timber harvesters or timber buyers (MacKay and others 1996). Twenty-five such programs existed in 1995, namely: *registration*—Iowa, Rhode Island; certification—Alabama, Connecticut, Florida, Kentucky, Maine, Maryland, Michigan, Minnesota, Montana, New Hampshire, North Carolina, Ohio, Oregon, Pennsylvania, South Carolina, Tennessee, Vermont, Washington, West Virginia; *licensing*—California, Illinois, Massachusetts, West Virginia. Maryland has both registration and certification programs, and West Virginia has a certification and a licensing program.

Private organizations also engage in the design and implementation of occupational registration and certification programs, nearly all of which have some continuing education component. The American Forest and Paper Association has a long history of working with States to develop effective registration and certification programs for timber harvesters. Similarly, the Society of American Forests sponsors a Certified Forester Program. Professional foresters granted certification status must complete 60 contact hours in continuing forestry education prior to recertification every 3 years (Society of American Foresters 2002).

Summary of Conditions

Professional education programs focused on maintaining human resource skills are an important component of forest sustainability and conservation. This review of professional education programs suggests the following:

- Professional educational opportunities occur in some form in virtually all public and private natural resource and related organizations. Activities range from formal professional education in a university setting to professional continuing education via electronic media, and from forest practice workshops for timber harvesters to national and international conferences on forest sustainability and conservation.
- Formal education of resource professionals is generally provided by universities, colleges, and some technical schools. These institutions offer students an opportunity to select courses in a wide array of subjects and disciplines. Much information about these formal educational programs is available, but this information is often questionable in quality and consistency.
- Resource professionals can get their formal education by participating in university and college programs that focus strictly on forest resources, or in broad natural resource and environmental studies programs offered by such institutions. The breadth of subjects and disciplines applicable to the sustainability of forests makes this possible. In 2001, less than half the faculty engaged in the education of forest and natural resource professionals claimed forest resources as a primary area of expertise.
- In recent years, formal professional education programs appear to have increased student exposure to a wider range of disciplines (for example, mathematics, economics, sociology, communication, administration, conflict management) and a broader set of resources (timber, water, wildlife, range, recreation). However, the magnitude of this increase is unclear, as is the extent to which integration of knowledge actually occurs across disciplines and across resources.
- Formal programs educating forest resource professionals are often required to conform to standards specified by accreditation programs. The Society of American Foresters (47 professional degree programs, 23 technical education programs) and the Society of Wood Science and Technology (9 baccalaureate degree programs) are the most widely known organizations accrediting educational programs in professional forestry and wood science. Except for professional wildlife education programs in the Southeast, other natural resource programs (such as fisheries, range management, wildlife, water resources, environmental conservation) are not known to be subject to accreditation procedures.
- Continuing education programs for forest resource professionals are offered by a wide array of organizations, and are often implemented in a partnership fashion. The approaches to continuing education range from correspondence courses to formal doctoral programs, and from short-term workshops to extensive international forest-study tours. Universities and colleges are major sources of continuing education, although employers and some private organizations (including professional associations and special-interest groups) provide such opportunities. At least three Federal statutes provide for the continuing education of forest resource and related professionals.
- Occupational registration and certification programs focused on forest resource professionals and timber harvesters commonly require the maintenance of professional skills applied to forest and related natural resources. State governments have been most active in developing and implementing such programs. At least 16 States registered, certified, or licensed forestry professionals in 1996, and 25 States applied similar occupational programs to timber harvesters in 1995.

Issues and Trends

The literature identifies a number of major issues and trends involving institutional capacity to promote human resource skills. Examples of this literature (from which the

following issues and trends are drawn) are: Alford 1980, Cervero 2000, DeSteiguer and Merrifield 1979, Ellefson 1989, Garland 1995, Houle 1980, Levine 1997, MacKay and others 1996, National Research Council 2002, Sample and others1999, Society of American Foresters 1994, Swanson and Arnold 1996, Tombaugh 1998, Young 1987.

- Formal educational programs for professionals at the university and college level are increasingly beleaguered by shrinking financial support for university programs generally, and by requirements to make educational program decisions on the basis of rigorous cost-containment procedures. These conditions suggest that university administrators need to be persuaded of the importance of forestry education programs and that partnerships between educational programs and the client groups they serve need to be strengthened. Competition for bright students and competent faculties will increase in the years ahead.
- Accreditation mechanisms to promote higher standards for formal professional education will increase. However, the use of accreditation mechanisms will raise questions about assignment of responsibility for accreditation, accreditation across broader natural resource interests (timber, wildlife, water, recreation, environmental studies), expansion of the competency standards (technical versus managerial skills) used to judge program conditions, and accreditation of graduate education programs (programs beyond the first professional degree).
- Continuing professional education is becoming increasingly important to forest sustainability. Notable in this respect are employers' increasing assumptions of responsibility for continuing education activities (in some areas, surpassing that assumed by all other providers combined); growth in collaborative institutional and program arrangements (especially between universities and employers) for providing continuing education; and increased designation of continuing education as a prerequisite for professional and related registration, certification, and licensing.
- Continuing professional education as a system is increasingly beset by concerns about the fundamental intent of continuing education programs (for example, updating professional knowledge generally versus improving professional technical competency), and about institutional governance and responsibility for continuing education programs over long periods of time (for example, assignment of responsibility and leadership, mission and strategic planning, acquiring and allocating resources, program monitoring and evaluation, avoidance of destructive organizational competition).
- Formal educational institutions that graduate resource professionals who will be engaged in the sustainable management of forests will increase in number and diversity. The range of disciplines and resource specialities required for the sustainable management of forests will draw talent from an increasing variety of formal educational programs (for example, conservation biology, environmental studies, landscape architecture, and archeology), in addition to those traditionally accredited as formal forestry education programs.
- The development of knowledge bases required to address forest sustainability and conservation is increasingly being hindered by severe declines in research capacity. Federal research organizations in particular suffered declines in numbers of full-time-equivalent researchers, especially in the fields of entomology, plant pathology, chemistry, soil science, and forest product technologies.

Information Adequacy

Specification

Information about maintaining human resource skills across relevant disciplines has been assessed by various public and private organizations. In 1999, the National Association of State Foresters reported that only two States had abundant information about professional and related education, that nine had sufficient information about such activities, and that three had little information. Thirty-four States reported that they had no information concerning educational activities required to maintain the human resource skills needed for forest sustainability. Three States reported that the quality of their information was excellent, 10 that it was adequate, and 1 that it was poor (National Association of State Foresters 1999).

The Society of American Foresters, Society of Wood Science Technology, and Food and Agriculture Educational Information System are major sources of information about professional education programs important to forest sustainability. However, no known sources of comprehensive information exist for continuing education programs focused on resource professionals, technicians, and timber harvesters. Information about formal and continuing education programs in related fields (for example, conservation biology, environmental conservation, wildlife management, recreation, law, and political science) has not been gathered and synthesized comprehensively.

Measurement information—It is not known what variables should be measured, or how they should be measured, to accurately portray conditions required to establish and maintain necessary human resource skills. What conditions should be measured and subsequently assessed (for

example, characteristics of students, needs of employers, quality of faculties, relevance of subjects, levels of investment)? What variables and measurement techniques are appropriate given the large number and variety of institutions engaged in skill maintenance? What measurable characteristics would best indicate that the human skills needed to achieve sustainable forest management have been accomplished? How often are these variables to be measured? Are there special measurement needs associated with different types of educational activity (such as formal professional education and continuing education)? What information would most clearly identify trends?

Extent of activity information—Information about relevant formal and related educational activities has often been assembled in an uncoordinated way. The result of this is often information that depicts only current conditions and lacks local, regional, and national consistency. The diversity of institutions offering education makes information gathering difficult, although the Food and Agriculture Educational Information System is certainly a step in the right direction. What kinds of educational programs exist at various geographic levels, and what organizations support and present them? How large are these programs? How are programs and program availability changing? Does the content of relevant skill-building programs vary significantly from school to school, and if so, why? What is the status of educational programs that are sponsored by local government, and of conservation education programs at community colleges and small liberal-arts colleges? Are compilations of skill-building information as currently conducted useful for guiding policy and program direction? Is there a need to expand and improve the focus of centralized reporting systems for educational programs such as the Food and Agriculture Educational Information System?

Responsible organization information—Organizations actively engaged in relevant educational activities (and especially in continuing education) have not been listed comprehensively. What public and private organizations are engaged in activities that maintain human skills across resource disciplines? What authority assigns them responsibility, and is this authority being interpreted accurately? Do some organizations have an advantage in providing educational opportunities? What are these institutional advantages? Do different public organizations engaging in educational initiatives have similar or differing goals and objectives, and are these goals and objectives consistent with the maintenance of resource-oriented skills? What roles do private organizations play in skill maintenance? Are there organizational patterns in the public and private sectors that, if known and publicized, would enhance overall maintenance of human skills across relevant disciplines?

Coordination information—Information about coordination of activities important to maintenance of human skills has not been assembled. What are current patterns of coordination, including requirements and incentives for coordination? Do program conflicts exist between the various entities engaged in education focused on the maintenance of relevant skills? How might they be resolved productively? Do existing coordination efforts encourage coordination across relevant forest resource disciplines? Do they ensure that the cumulative results of local, State, and regionally undertaken education will lead to outcomes consistent with national requirements for maintaining human skills? Do they allow for incorporation of ad hoc educational activities (such as special continuing education) occurring at various times and undertaken by various levels and types of educational institutions? Are different educational offerings comparable (for example, conservation biology and environmental conservation)? How is the comparability of different educational programs determined, and by whom?

Procedure and specification information—Information about standards for the development and implementation of relevant educational programs has not been assembled. Is there a broad agreed-to framework within which public and private administrators of educational programs seek to develop and implement programs relevant to maintaining human skills important to forest sustainability? How are such frameworks, including specific standards (such as the SAF Accreditation Standards, and the timber harvester continuing education standards) developed and implemented? Do national educational standards allow for regional and subregional development of specialty education programs focused on maintaining certain resource skills?

Scope of skill-maintaining information—Information about educational programs for maintaining skills often focuses only on a limited range of skills associated with selected forest benefits. What capacity exists for maintaining skills across the wide range of values associated with forests (timber, water, wildlife, recreation)? What can be done to encourage the development of the wide range of skills required for forest sustainability? Are different resource-oriented institutions such as university departments and private continuing education programs complementary or competitive in this respect?

Investment and incentive information—Comprehensive information about resources devoted to the maintenance of skills across relevant disciplines has not been assembled except in some very limited cases. What is the magnitude of investment in various relevant educational activities, and especially in continuing education? Are political and administrative processes for allocating resources to these

activities effective and sufficient? Are there fiscal incentives for encouraging the development of skills across relevant disciplines?

Effectiveness information—Comprehensive information about the effectiveness of various approaches to maintaining relevant skills has not been compiled. Do existing laws or administrative directives require that the efficiency and effectiveness of skill-enhancing programs be assessed? What are appropriate measures of success? What opinions do stakeholders and interest groups have about these programs? What are the skill requirements for employment in forest resource programs? Are educational programs meeting these requirements?

Monitoring information—Information about the monitoring of programs designed to maintain skills relevant to forest sustainability has not been assembled. Are there legal or administrative requirements to monitor the results of educational activities of various types? Who is or should be responsible for gathering and analyzing such information? Is the information from monitoring activities being used to adapt educational programs to changing circumstances? Is the information being collected and analyzed in useful ways?

Recommendations

Indicator 55 suggests that it is necessary to develop and maintain the institutional capacity to ensure availability of the wide range of skills required to meet expectations for the sustainable management of forest resources. Many information needs must be addressed if we are to understand how to accomplish this. We recommend the following actions:

- *Comprehensive periodic reviews.* Conduct periodic and comprehensive reviews of current authorities and public and private institutions that direct and commit resources to educational programs that teach resource skills important to forest sustainability. These reviews should gather and synthesize information about the providers of educational efforts, the content of educational offerings, coordination of activities by providers, and program effectiveness and appropriateness.
- *Responsibility for conducting reviews.* Assign responsibility for conducting reviews of educational efforts to a specific unit of a Federal agency, a college or university, or other nonprofit organization. This responsibility should be assigned to an organization that has a proven track record in addressing the complexities of education and human resource development within the forest resource arena. Such organizations include the Society of American Foresters, the National Association of Professional Schools and Colleges, and the administrators of the Food and Agriculture Educational Information System.
- *Devote resources to the reviews.* Invest sufficient resources in the reviews to obtain the information necessary to dramatically improve understanding of our capacity to provide the skills essential to sustainable forestry.

Indicator Appropriateness

Indicator Definition

There are a number of definition, scope, and interpretation problems in connection with Indicator 55. The breadth and indefiniteness of the phrases "human resource skills" and "relevant disciplines" make information gathering difficult. Human resource skills may be classified by occupational category (for example, professionals, timber harvesters, technicians), function (for example, administration, research, education), discipline (for example, economics, ecology, statistics), and resource orientation (for example, timber, water, recreation). Furthermore, the phrase "across relevant disciplines" seems to refer to integration and interdisciplinary activities, yet it is problematic whether the focus of interpretation should be on "across disciplines," "across resource orientations," or "across social and biological dimensions." And continuing education seems to be implied by the indicator. It should be borne in mind that employers, as well as schools, are major providers of continuing education.

The indicator might be better specified as institutional capacity to ". . . *develop and maintain professional and related human skills across relevant disciplines and resource orientations*."

Relationship to Other Indicators

Indicators 55 and 53 overlap with respect to extension programs and making forest-related information available. Indicator 55 also overlaps with Indicators 39 (level of expenditure on research, development, and education), 44 (direct and indirect employment in the forest sector), 45 (average wage rates and injury rates), 46 (viability and adaptability to changing economic conditions), 56 (infrastructure), 57 (enforcement), 59 (trade policies), 63 (development of scientific understanding), 64 (costs and benefits), and 65 (new technologies).

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Appendix A

Selected Colleges, Universities, and Technical Schools with Professional, Technical, or Pre-Professional Education in Forestry or Related Natural Resources, 2001

Abraham Baldwin Agricultural College, GA (3)
Alabama A & M University, AL(1)
Alcorn State University, MS (1)
Allegheny College, MD (3)
Arizona State University, AZ
Auburn University, AL (1,2)
Augustana College, IL
Ball State University, IN
Brown University, RI
California Polytechnic State University, CA (2)
Central Lakes College, MN
Central Oregon Community College, OR (3)
Chemeketa Community College, OR
Clark University, MA
Clemson University, SC (1,2)
College of the Redwoods, CA
College of William and Mary, VA
Colorado State University, CO (1,2)
Columbia University, NY
Cornell University, NY (1)
Dabney S. Lancaster Community College, VA (3)
Delaware State University, DE (1)
Duke University, NC (2)
Eastern Oklahoma State College, OK (3)
Florida A & M University, FL (1)
Florida Atlantic University, FL
Hocking College, OH (3)
Horry-Georgetown Technical College, SC (3)
Humboldt State University, CA (2)
Indiana University, IN
Iowa State University, IA (1,2)
Kansas State University, KA (1)
Kentucky State University, KY (1)
Lake City Community College, FL (3)
Langston University, OK (1)
Lincoln University, MO (1)
Louisiana State University, LA (1,2)
Louisiana Tech University, LA (2)
Lurleen B. Wallace State Junior College, AL (3)
Michigan State University, MI (1,2)
Michigan Technological University, MI (2,3)
Mississippi State University, MS (1,2)
Montana State University-Bozeman, MT (1)
Mt. Hood Community College, OR
New Mexico State University, NM (1)
New York State Ranger School, NY
North Carolina A&T University, NC (1)
North Carolina State University, NC (1,2)
North Dakota State University, ND (1)
Northern Arizona University, AZ (2)
Northeastern Illinois College, IL
Ohio State University, OH (1,2)
Oklahoma State University, OK (1,2)
Oregon State University, OR (1,2)
Oregon Graduate Institute of Science & Technology, OR
Paper Industry Management Association, IL
Paul Smith's College of Arts and Sciences, NY (3)
Pennsylvania College of Technology, PA (3)
Pennsylvania State University, PA (1,2)
Pennsylvania State University-Mont Alto, PA (3)
Pittsburgh State University, KS
Princeton University, NJ
Purdue University, IN (1,2)
Reedy College, CA (3)
Rutgers University, NJ
San Diego State University, CA
Santa Rosa Junior College, CA
Sierra College, CA
South Carolina State University, SC (1)
South Dakota State University, SD (1)
Southern University, LA (1)
Southern Illinois University, IL (2)
Southeastern Illinois College, IL (3)
Southwest Texas State University, TX
Southwestern Oregon Community College, OR
Spokane Community College, WA (3)
State University of New York, NY (2,3)
Stephen F. Austin University, TX (2)
Technical Association of the Pulp and Paper Industry, GA
Tennessee State University, TN (1)
Texas A & M University, TX (1,2)
Texas Tech University, TX
Tuskegee University, AL (1)
University of Alaska, AK (1,2)
University of Arizona, AZ (1)
University of Arkansas, AR (1,2)
University of California-Berkeley, CA (1,2)
University of California-Davis, CA
University of Colorado, CO
University of Connecticut, CT (1)
University of Delaware, DL (1)
University of Denver, CO
University of Florida, FL (1,2)
University of Georgia, GA (1,2)
University of Hawaii, HI (1)
University of Idaho, ID (1,2)
University of Illinois, IL (1,2)
University of Kansas, KS
University of Kentucky, KY (1,2)

(continued)

Appendix A

Selected Colleges, Universities, and Technical Schools with Professional, Technical, or Pre-Professional Education in Forestry or Related Natural Resources, 2001 (continued)

University of Maine, ME (1,2)
University of Maine-Fort Kent, ME (3)
University of Maryland, MD (1)
University of Massachusetts, MA (1,2)
University of Michigan, MI (2)
University of Minnesota-Duluth, MN
University of Minnesota-Twin Cities, MN (1,2)
University of Missouri, MO (1)
University of Montana, MT (2)
University of Nebraska-Lincoln, NE (1)
University of Nevada, NV (1)
University of New Hampshire, NH (1,2,3)
University of Oregon, OR
University of Pennsylvania, PA
University of Rhode Island, RI (1)
University of the South, TN
University of Tennessee, TN (1,2)
University of Vermont, VT (1,2)
University of Virginia, VA
University of Washington, WA (2)
University of Wisconsin-Madison, WI (1,2)
University of Wisconsin-Stevens Point, WI (2)
University of Wyoming, WY
Utah State University, UT (1,2)
Vermillion Community College, MN (3)
Virginia Polytechnic Institute & State University, VA (1,2)
Virginia State University, VA
Washington State University, WA (1,2)
West Virginia University, WA (1,2)
Western Michigan University, MI
Yale University, CT (2)

1 = Land grant university; 2 = Society of American Foresters accredited professional degree program; and 3 = Society of American Foresters recognized technical educational program.

Appendix B

Private Organizations Providing Continuing Education Opportunities Involving Timber and Wood-Based Commodities

Alaska Forest Association

American Chestnut Foundation

American Conifer Society

American Forest and Paper Association

American Institute of Biological Sciences

American Institute of Chemical Engineers-Forest Products Division

American Institute of Timber Construction

American Plywood Association

American Wood Council

American Wood Preservers Institute

Appalachian Hardwood Manufacturers

Architectural Woodwork Institute

Arkansas Wood Manufacturers Association

Association for Temperate Agroforestry

California Forest Products Commission

California Forestry Association

California Redwood Association

Composite Panel Association

Empire State Forest Products Association

Empire State Paper Research Institute

Evergreen Partnership

Florida Wood Council

Forest Industries Telecommunications

Forest Industry Training and Education Council

Forest Landowners of California

Forest Products Society

Georgia Forestry Association

Hardwood Manufacturers Association

Hardwood Plywood and Veneer Association

Hardwood Utilization Consortium

Hawaii Forest Industry Association

Idaho Forest Products Commission

Independent Forest Products Association

Indiana Lumber and Builders' Supply Association

Intermountain Forest Industry Association

Intermountain Woodnet

International Association of Pallet Recyclers

International Society of Wood Anatomists

Kentucky Wood Products Competitiveness Corporation

Lignin Institute

Lumberman's Association of Texas

Lumbermen's Credit Association

Maine Council on Sustainable Forest Management

Maine Wood Products Association

Michigan Forest Association

Michigan Lumber and Building Materials Association

Minnesota Forest Industries

Mississippi Forestry Association

National Arbor Day Foundation

National Forest Foundation

National Hardwood Lumber Association

Material Dealers Association

National Lumber and Building Material Dealers Association

National Paper Trade Association

National Particleboard Association

North American Horse and Mule Loggers Association

North American Wholesale Lumber Association

Northeastern Retail Lumber Association

Northwest Forestry Association

Northwest Timber Workers Resource Council

Northwest Wood Products Association

Ohio Forestry Association

Oregon Forest Industries Council

Particleboard and Medium Density Fiberboard Institute

Pulp and Paperworkers Resource Council

Secondary Wood Products Consortium

Society of Wood Science and Technology

Southern Forest Products Association

Southern Lumber Exporters Association

Southern Pine Council

Technical Association of the Pulp and Paper Industry

Temperate Forest Foundation

Tennessee Forestry Association

Timber Trade Federation

Washington Contract Loggers Association

Washington Forest Protection Association

Western Forestry and Conservation Association

Western Red Cedar Lumber Association

Western Wood Products Association

World Timber Network

Physical Infrastructure (Indicator 56)

Paul V. Ellefson and Calder M. Hibbard[1]

The full text of Indicator 56 is as follows: *Extent to which the institutional framework supports the conservation and sustainable management of forests, including the capacity to* ***develop and maintain efficient physical infrastructure to facilitate the supply of forest products and services and support forest management*** (Montreal Process Working Group 2003).

Rationale and Interpretation

Capital resources that take the form of physical infrastructure are essential to the management of forests and ultimately to economic development and the quality of life in rural forested areas. Government investments in public infrastructure such as roads, bridges, sewerage and sanitation systems, schools, parks, and other physical facilities are important complements to the capital investments made by private firms (such as plants and equipment). Together they constitute the capital basis for protecting forests and related resources and for producing the goods and services that help to sustain the economies of forested areas (Montreal Process Working Group 2003, Montreal Process Technical Advisory Committee 2000).

Data useful for measuring this indicator are compilations and descriptions of laws and programs at national and subnational levels that promote investments in forest infrastructure. From a forest resource perspective, useful information includes types, locations, and magnitudes of forest infrastructure (for example, campgrounds, roads, trails, signs, fire lookouts, interpretative and educational facilities), forest area judged to be adequately serviced by existing infrastructure and plans for future infrastructure investments, portion of existing infrastructure being managed to designated standards and needs, and extent to which public- and private-sector budgets devote financial resources to new construction of infrastructure, as opposed to maintenance of existing infrastructure. Also relevant is the extent to which local, regional, and national inventories of infrastructure are undertaken and the degree to which the information provided by these inventories is relevant to decisions regarding the use, management, and protection of forests. In assessing this indicator, one should be aware that measurements can be interpreted in various ways. For example, while roads are important to most interests in the sustainability of forests, some segments of society may consider roads to have a negative impact on the importance of certain forest values (Montreal Process Technical Advisory Committee 2000).

Concepts and principles that are to be identified and addressed are suggested by the indicator. To guide this review, brief definitions of three important concepts are: *physical infrastructure*—the underlying, large-scale, capital assets (physical and tangible) required in order to use, manage, and protect forest resources; *facilitate the supply of*—the ability of infrastructure to efficiently expedite the availability of services and products from forests; and *support forest management*—the ability of infrastructure to provide for activities considered essential to tending or administering forests and related resources.

The definition of physical infrastructure as used here does not preclude consideration of other types of infrastructure. For example, physical infrastructure can include at least four basic elements, i.e., forest ecosystems as infrastructure ("green infrastructure"), forestland base infrastructure (trails, roads, recreation facilities), processing and manufacturing infrastructure (manufacturing and fabricating facilities), and broad forest community infrastructure (such as schools, hospitals, highways, libraries, museums, and sanitation systems) that promotes health and safety interests and contributes to the quality of life in towns, cities, and rural areas. Although these categories are not mutually exclusive, they do provide a useful structure for review and assessment of information concerning forest infrastructure. We do not think that it would be useful to interpret Indicator 56 as applying to green infrastructure, as such information is presented in great depth in discussions of indicators associated with Criteria One through Six.

Conceptual Background

The notion of infrastructure conveys the sense of basic, underlying framework or features. Frequently it is used to refer to technical or structural features such as military installations, communication systems, and the transportation networks of an organization, city, or nation. The infrastructure of a particular locality or region provides the physical basis for economic and social life for those who live and work in that area. Whether running a business, raising a family, or merely visiting from another region, people depend on—and to varying degrees, come to

[1] Ellefson, Professor, and Hibbard, Research Specialist, Department of Forest Resources, University of Minnesota, St. Paul, MN.

expect—a core framework of services to be available, from roads and communication systems to schools and medical facilities. With such a framework in place, people can pursue the myriad activities that are the basis of their everyday lives. Unless this basic underpinning is available, many activities necessary to a well-functioning society, including the sustaining of forest resources, may not be possible (Fox 1987, Lewis and others 1993, Munnel 1990, Sears and others 1990, U.S. Department of Agriculture 1990, Vaughn 1983).

People who live and work in rural forested areas utilize a variety of resources in pursuing their interests. Some resources are used to provide goods and services that are directly consumed, while others are used as a resource in the production of other products (for example, timber as an input in the production of wood products). Within such a context, resources can take different forms, including *biophysical resources* (trees, water, wildlife), *human resources* (labor, management skills), and *capital resources* (plants and equipment). The latter are frequently viewed as capital assets directly supportive of manufacturing processes, but important capital resources also include roads, bridges, electricity, communication systems, health and educational facilities, and law enforcement and fire protection services, all of which are essential to the variety of productive and consumptive activities of a community, region, or State. Although the term *infrastructure* can be applied to all three types of resources, it is usually employed as a descriptor for capital resources.

The capital resources important to the infrastructure of an area or community may originate from private as well as public sources. Private capital can originate from various internal sources (such as reinvested business revenue) and from a myriad of external sources (including public and private lending institutions). Private investments in infrastructure are most commonly viewed as *physical capital* (investments in plants, facilities, and equipment) required in order to carry out primary production processes. However, some firms consider capital to include the *human capital* (investments in work-related training, employee health and educational benefits) required to enhance labor and managerial skills, and the *community capital* (investments in the establishment and maintenance of community service organizations via donations and sponsorship of events) needed to provide a wholesome and secure community for employees and supportive citizens. In some cases, the financial resources of lending institutions are considered to be capital. These financial resources are made available to private enterprises for a variety of purposes, including the establishment of certain kinds of infrastructure that have broader social purposes (for example, pollution control facilities).

The public sector is also a major contributor to infrastructure. Federal, State, and local governments invest accrued or borrowed revenue directly (as in the construction of roads and dams) or indirectly (as in cost-share projects with private enterprises) in infrastructure as a means of enhancing private-sector production and improving the quality of life of individuals and communities in general (table 1). Government investment in infrastructure is a recognition that even with available private capital, firms and businesses may need additional investment in infrastructure if they are to be productive and operate efficiently.

Table 1—Functional categorization scheme for public infrastructure, by type of facility

Service facilities	Production facilities
Education: Elementary, middle, and secondary schools; public libraries	*Energy:* Direct power suppliers
Health: Hospitals, nursing homes, ambulatory care facilities (outpatient, dental, health), residential facilities (dependent children, emotionally disturbed persons, handicapped persons, persons with drug abuse problems), emergency vehicle services	*Fire safety:* Fire stations, communication systems, water supply and storage facilities
Justice: Jails and prisons, law enforcement facilities	*Solid waste:* Disposal sites, collection facilities and equipment
Recreation: Community recreation facilities	*Telecommunications:* Cable and satellite television, over-air television, disaster preparation facilities
Transportation: Railroads, airports, streets and highways, inter- and intra-community transit	*Wastewater:* Sewer mains and collection systems, treatment and disposal systems
	Water supply: Community systems (storage facilities, treatment facilities, delivery systems), on-site wells and cisterns

Source: Vaughan (1983).

There must be roads and bridges in place to permit businesses to obtain raw materials and to transport products and services to markets, just as business must have access to facilities that provide electricity, water, wastewater treatment, and communications. The magnitude of such investments and the distribution of their benefits over many firms and communities positions government in a leading and responsible role for their provision.

Public infrastructure investments are often popularly viewed as supportive only of businesses or economic enterprises. In reality, however, such investments help support a wide variety of social functions considered necessary to healthy and wholesome communities. Public school buildings, for example, are an obvious necessity. Likewise, police and fire protection services require adequate physical facilities and equipment if they are to provide citizens the opportunity to live and work in an atmosphere of security. Parks and recreation facilities give citizens the opportunity to experience the aesthetic dimension of natural surroundings in a relaxed and unconstrained fashion.

Effective and well-functioning infrastructure depends on well-planned investments that are efficient and of an appropriate scale. For this reason, guiding principles have been provided for Federal investments in infrastructure (for transportation, water resources, energy, and environmental protection) (Presidential Executive Order 1994). Infrastructure investment and management should be based on systematic analysis of benefits and costs. Persons who are responsible for infrastructure investment and management should consider the full range of options available for accomplishing desired objectives, quantify benefits and costs to the extent possible, discount costs over the full life-cycle of projects, and directly and explicitly address project uncertainty. Infrastructure investments and management require efficient management of infrastructure facilities (sound operational practices, appropriate pricing of services provided), active participation of the private sector (appropriate private-sector ownership, financing, construction, operation), and sharing of project development with State and local governments.

Current Institutional Capacity

Private-Sector Capacity

Private sources of information describing infrastructure investments of relevance to sustaining forests are few, and the amount of information they provide is not very extensive. The information often originates from many uncoordinated sources, is seldom capable of being compared in any meaningful way, and, because of definition problems and inconsistent time periods assessed, poses real problems for sound analysis over long periods of time. In addition, nearly all of the published information focuses on wood product manufacturing and processing. With the notable exception of information about private investments in the infrastructure necessary for the prevention of water pollution, very little information is devoted to descriptions of infrastructure devoted to other forest benefits (such as water, recreation, range, and wilderness). Notable in this respect is the lack of information about infrastructure that supports outdoor recreation on private forestland (for example, roads, bridges, campsites, shelters) (Teasley and others 1999).

Some private publishers periodically present information about the extent of capital assets in certain segments of the wood-based industry, most notably the number of processing facilities (usually referred to as mills) and the number of new or closed manufacturing facilities. Examples of such publishers or publications are Miller Freeman Publications,[2] *Business Week* (R&D expenditures), *Maharashtra Industry Directory*, Wood Science & Marketing (University of Washington), *Forbes* (annual report on American industry), and WoodCenter.net. Information on infrastructure can also be gleaned from the annual reports of individual companies and from a variety of privately sponsored Web sites.

Trade associations representing the wood-based industry also periodically publish information regarding plant capacity and capital investments in various types of infrastructure. An example is the American Forest and Paper Association, which annually reports capital expenditures for paper and wood product manufacturing, primary mills and converting plants, and environmental protection expenditures (tables 2 and 3) (American Forest and Paper Association 2000). Much of the information reported by the association has been published previously by the U.S. Census Bureau.

Federal Government agencies are active in gathering and reporting information about relevant manufacturing establishments and capital investments. Most notable are the U.S. Census Bureau and the U.S. Bureau of Economic Analysis. To the extent that establishments and capital expenditures are reflective of infrastructure conditions, the U.S. Census Bureau's Economic Census of Manufacturing and Report on Annual Capital Expenditures present a wealth of statistical information by State and industry (table 4) (U.S. Census Bureau 2001a, 2001b). In some

[2] Miller Freeman directories include Lockwood-Post's *Directory of Pulp, Paper and Allied Trades*; *Pulp and Paper North American Fact Book*; *Lumber and Panel North American Fact Book*; *Directory of Wood Products Industry*; *Secondary Wood Products Manufacturers Directory*; and *Pulp and Paper Company Profiles* (Vol. I: United States, Volume II: Canada).

Table 2—Capital expenditures in paper manufacturing and wood product manufacturing in the United States, by region—1997, 1998, and 1999

Region	Paper manufacturing			Wood product manufacturing		
	1997	1998	1999	1997	1998	1999
	thousands of dollars					
Northeast	1,366,253	1,584,799	1,236,995	238,100	302,123	245,704
North Central	1,973,850	2,113,766	2,059,378	537,222	552,908	645,781
South	4,397,278	3,952,498	3,030,662	1,330,272	1,330,272	1,399,972
West	818,342	818,342	670,345	610,997	610,997	727,105
Pacific	695,790	695,790	594,264	453,730	453,730	602,197
Total	9,251,723	8,492,703	6,997,380	2,812,452	2,796,300	3,018,562

Source: American Forest and Paper Association (2000).

Table 3—Capital expenditures for environmental protection by the pulp and paper industry in the United States, by type of resource protected (1990-2000)

Year	Total investments	Investment by resource protected		
		Water	Air	Land
	millions of dollars			
1990	1,292	579	478	235
1991	1,343	676	479	189
1992	1,048	486	379	183
1993	737	337	275	125
1994	721	286	249	186
1995	625	309	219	97
1996	740	352	251	137
1997	588	325	151	112
1998	627	312	129	186
1999	718	360	290	68
2000	1,117	382	657	78

Note: Land category includes investments to curb pollutants such as sold waste.
Source: American Forest and Paper Association (2000).

Table 4—Establishments and capital expenditure of wood-based industry in the United States, by type of industry (1997)

Industry	Establishments	Capital expenditures 1997
		thousands of dollars
Logging	13,533	780,601
Sawmills and wood preservation	4,841	1,161,016
Veneer, plywood, engineered wood products	1,841	762,558
Millwork, containers, other wood products	10,685	945,660
Pulp, paper, paperboard mills	546	5,727,647
Converted paper products	5,322	2,867,486
Wood furniture	8,061	255,044

Source: U.S. Census Bureau (2001a).

cases, information reporting is hampered by U.S. Census Bureau rules limiting disclosure of information when doing so would reveal the identity of individual firms. Nevertheless, the information reported is very useful.

Federal Government Capacity

Information regarding Federal authority and institutional capacity to develop and maintain infrastructure is scattered among various sources and seldom has as a central focus the importance of infrastructure in sustaining certain forest conditions. Legal authority to expend appropriated funds on infrastructure is seldom stated specifically in statutes addressing forests and related resources. Usually, such authority is specified as part of broader authority to spend monies generally. For example, the National Trails System Act of 1968 authorizes the appropriation of specific amounts of money for development of certain trails (for example, Pacific Crest National Scenic Trail, Appalachian National Scenic Trail), while the Federal Land Policy and Management Act of 1976 establishes a working capital fund to be used for investments in the management of public lands, including infrastructure investments. Likewise, the Forest and Rangeland Renewable Resources Planning Act of 1974 authorizes the installation of a transportation system to service the National Forest System, and the Public Rangelands Improvements Act of 1978 authorizes investments in infrastructure that will improve Federal rangelands (dams, roads, trails). Unfortunately, there has been no comprehensive review of Federal legal authority specifically for infrastructure investments in the area of natural resources.

Data about Federal investments in public works are gathered by the U.S. Census Bureau as part of the agency's annual survey of State and local government finances (U.S. Census Bureau 2000a). The definition of public works infrastructure is very broad, and includes investment in highways, airports, sewerage, water supply, solid waste facilities, mass transit, and water transport terminals, all of which have implications for forest sustainability. In 1995, Federal expenditures in these activities totaled $12.8 billion of the $193.0 billion invested by government (7 percent Federal, 29 percent State, 64 percent local), of which an estimated 39 percent was in the form of capital expenditures. A dataset that focuses more directly on Federal Government capital outlays in natural resources shows that such expenditures totaled $3.3 billion in 1995, $3.0 billion in 1994, $6.1 billion in 1993, $5.5 billion in 1992, $4.7 billion in 1990, $4.1 billion in 1985, and $4.0 billion in 1980) (U.S. Census Bureau 2000b).

Information about USDA Forest Service investments in infrastructure is similarly diffuse, although some is publicly available in reports of independent agencies (for example, General Accounting Office 1991) and in the agency's annual reports. For example, in the National Forest System in 1998, the agency was involved in the construction of more than 200 miles of road and reconstruction of more than 2,700 miles of road, construction or maintenance of more than 130,000 miles of trails, and construction or reconstruction of six bridges (U.S. Department of Agriculture Forest Service 1999). A recent but significant change in road infrastructure within the National Forest System has been the decommissioning of roads, which has increased from about 1,500 miles per year in 1996 to about 2,800 miles per year in 1999 (U.S. Department of Agriculture Forest Service 2000). For the years 1994 through 1998, the agency's investments in the construction and maintenance of facilities, roads, and trails were, in millions of dollars, as follows (U.S. Department of Agriculture, Forest Service 1999):

	Facility		Road and Trail	
Year	Construction	Maintenance	Construction	Maintenance
1994	94,437	26,476	130,896	79,180
1995	61,588	26,304	129,655	83,784
1996	46,029	23,008	115,359	81,019
1997	59,974	26,008	115,000	81,019
1998	47,919	24,244	114,951	84,974

Information about infrastructure investments in the National Park System is periodically issued by independent government agencies (for example, General Accounting Office 1995). In addition, the USDI National Park Service provides information on investments in improvements, maintenance, and construction, although these may or may not be related to forests and associated resources. For selected years, these investments, in millions of dollars, were as follows (U.S. Department of the Interior, National Park Service 2000):

Year	Improvements and maintenance	Construction
1990	160.0	108.5
1991	179.6	134.1
1992	212.1	193.3
1993	224.8	226.8
1994	222.9	205.6
1995	234.0	192.0
1996	234.0	168.0
1997	246.0	188.0

The National Outdoor Recreation Supply Information System (NORSIS) provides extensive information about recreation infrastructure (Betz 1998, Betz and others 1999, Cordell 1999). Compiled for the 1998 Renewable Resources Planning Act Assessment of Outdoor Recreation and Wilderness, the system organizes information (primarily at the county level) from an extensive variety of references and databases (both public and private). The system presents

summary measures of outdoor recreation infrastructure in terms of area (acres), miles (roads and trails), and number of units (campgrounds), with the information organized by major resource ownership categories (Federal, State, local, and private) (table 5).

State Government Capacity

The capacity of State governments to gather, analyze, and distribute information regarding infrastructure relevant to the use, management, and protection of forests has not been surveyed systematically or comprehensively. Little is known about the legal and institutional capacity of State governments to promote investments in infrastructure. Some private organizations representing State governments at the national level have gathered State expenditure information that has relevance to infrastructure generally, but not to forest infrastructure specifically (for example, information about State general expenditures, and Federal direct payments to States) (Council of State Governments 2000).

State capacity to affect various elements of forest infrastructure is also described by a 2000 analysis of State government executive agencies influencing the use, management, and protection of forests. The analysis determined that nationwide in 2000 there were 47 Cabinet-level entities (departments, agencies, commissions) engaged in economic development and business promotion activities involving investment in infrastructure important to forest

Table 5—Recreational infrastructure database sets for the National Outdoor Recreation Supply Information System, by recreation provider (1998)

Federal agencies

Estate agencies
- Multiple-use agencies
- USDA Forest Service
- Bureau of Land Management

Resource protection and public use
- National Park Service
- U.S. Fish and Wildlife Service

Other Federal land resources
- Indian land
- Department of Defense land

Water resource agencies
- Bureau of Reclamation
- U.S. Army Corps of Engineers
- Tennessee Valley Authority
- National Oceanic and Atmospheric Administration

Specially designated Federal systems
- National Wilderness Preservation System
- National Recreation Areas
- National Trails System
- National Wild and Scenic Rivers

State agencies

State park systems in the United States
- State park areas
- State park facilities

Other State resource systems
- State forests
- State wilderness
- State fish and wildlife land
- State trust lands
- State scenic rivers

Local agencies

Municipal recreation and parks
County recreation and parks
Special park districts
Local recreation facilities and sites

Urban agencies

Greenways
Rails-to-trails
Land trusts
Tourism development

Private sector

Recreation land
- Nature Conservancy
- Industrial timber lands

Private recreation businesses
- Campgrounds
- Downhill and cross-country skiing
- Outfitters and guides
- Farm-ranch vacations
- Amusements and attractions
- Golf and tennis facilities
- Vacation homes and resorts

Public-private partnerships

Scenic byways
Watchable wildlife

Source: Adapted from Betz (1998).

conditions. Forty-six sub-Cabinet (first-tier) entities were engaged in similar matters. Nineteen governing or advisory bodies to Executive agencies also had influence over infrastructure matters related to economic development. Also at the department level were six State entities involved in the development of transportation and communication infrastructure (Ellefson and others 2001 and 2002).

Information about State and local investments in public works is gathered by the U.S. Census Bureau as part of the agency's annual survey of State and local government finances (U.S. Census Bureau 2000a). In 1995, State expenditures for public works totaled $56.4 billion of the $193.0 billion invested by governments (7 percent Federal, 29 percent State, 64 percent local). State and local government capital outlays in the area of natural resources were $2.9 billion in 1996, $3.0 billion in 1994, $6.1 billion in 1993, $5.5 billion in 1992, $4.7 billion in 1990, $4.1 billion in 1985, and $4.0 billion in 1980. Capital outlays in the area of parks and recreation were $4.9 billion in 1996, $4.1 billion in 1995, $3.9 billion in 1994, $3.8 billion in 1993, $3.9 billion in 1992, $3.9 billion in 1990, $2.2 billion in 1985, and $2.0 billion in 1980 (U.S. Census Bureau 2000b).

Local Government Capacity

Information about local government expenditures for construction and maintenance of infrastructure directly relevant to forests and forest uses has not been gathered or assessed. However, data about local investments in public works are gathered by the U.S. Census Bureau (U.S. Census Bureau 2000a). In 1995, local expenditures on these activities totaled $123.7 billion of the $193.0 billion invested by government (7 percent Federal, 29 percent State, 64 percent local).

Infrastructure in forested counties in Michigan, Minnesota, and Wisconsin was assessed in 1993 using U.S. Census Bureau county government finance and related reports (Lewis and others 1993). The focus was on 1986 capital outlays by all levels of government (local, State, Federal) in counties that did not have large urban centers (populations exceeding 25,000) and whose land area was at least 25 percent forested. Forty-five percent of the counties in the three States had these characteristics. Of the total capital outlay for infrastructure in 1986, the largest portion was directed to education services (57 percent in Michigan, 39 percent in Minnesota, 44 percent in Wisconsin), with core infrastructure a distant second in level of capital outlay (table 6). Capital investment in environmental infrastructure did not exceed 3 percent of total capital outlays in any of the States analyzed.

Summary of Conditions

An effective level of infrastructure is important to accomplishing a diversity of societal interests in the sustainability

Table 6—State and local government capital outlays for infrastructure in forested counties of Michigan, Minnesota, and Wisconsin, by infrastructure category (1986)

Major infrastructure category	Michigan	Minnesota	Wisconsin
	percent of capital outlays		
Core infrastructure (transportation, utilities, sewerage, and sanitation)	15	22	26
Education services (schools and libraries)	57	39	44
Environment (parks, recreation, natural resources)	1	2	3
Social services (hospitals and health care)	9	4	5
Public safety (police and fire protection)	3	3	5
Housing and community development	*	10	1
Other capital outlays	15	29	16
Total percent	100	100	100
Total dollars (in thousands)	$2,384,381	$895,978	$1,940,672

Note: Capital expenditures represent all capital expenditures by all levels of government in a county. Less than one percent indicated by asterisk.
Source: Lewis and others (1993).

of forests and the communities that depend on them. This review of infrastructure capacity at Federal, State, and local levels of government suggests the following:

- Infrastructure is often presumed to exist as a set of conditions facilitating the management of forests, use of benefits provided by forests, and quality of life of communities that see forests as a community attribute. Infrastructure is often taken for granted. In fact, it is a foundation that must be invested in, built, managed, and maintained.
- Infrastructure occurs as a result of investment in various desirable facilities. This includes investments associated with forest resource conditions (forest roads and trails, recreational facilities), processing and manufacturing facilities (particle board mills, pulp and paper mills), and community-supporting facilities (schools, highways, sewage treatment facilities). Determining acceptable levels of investment in public infrastructure is difficult because of the often differing preferences of forest users. For example, different forest users have different views about the desirability of forest road systems.
- Legal authority and institutional capacity to build infrastructure important to forest and community sustainability is distributed among and within many levels of government. In reality, nearly all forest resource agencies exercise some capacity to influence infrastructure, although very few government agencies have explicit responsibility for infrastructure conditions. The greatest responsibility for promoting infrastructure investments lies with economic development agencies, pollution control agencies, and some resource management agencies.
- Concern about forest-related infrastructure tends to focus on physical facilities associated with the extraction, processing, and distribution of wood and wood products (for example, forest roads, manufacturing mills, highway systems). In terms of visibility, investment levels, and available information, less concern appears to be focused on the infrastructure necessary to provide other forest benefits (for example, recreation, water, range).
- Infrastructure investments by the private sector are primarily the result of access to privately raised capital, which is often complemented by government-provided finances and technical advice. Private-sector investments tend to focus on processing infrastructure while the government focuses on infrastructure requirements of the community as a whole (highways, schools, communication systems).

Issues and Trends

The literature identifies a number of major issues and trends that relate to infrastructure capacity as it affects forest sustainability and conservation. Examples of this literature (from which the following issues and trends are drawn) are: Aschauer 1991a, 1991b; Fox 1987; General Accounting Office 1992; Lewis and others 1993; Munnel 1990; Sears and others 1990; U.S. Department of Agriculture Forest Service 1997, 2000, 2003; Vaughn 1983.

- The relevance of traditional definitions and concepts of infrastructure to forest sustainability is increasingly being challenged. The concept of infrastructure as physical structures such as roads, buildings, processing facilities, and communication systems is being enlarged to include green infrastructure (ecosystems filtering pollutants and providing aesthetic, recreational, and spiritual qualities); facilities that disperse, transform, or store by-products of economic activities (facilities for storage of toxic materials); and facilities that focus on objectives not previously considered (such as campgrounds, ski lifts, recreational trails).
- There is increasing recognition that the benefits provided by infrastructure are very diffuse, and that it is therefore extremely difficult to determine market values for many current or proposed public investments in infrastructure. Furthermore, the benefits from public investments in infrastructure are often only loosely connected to the prices users pay for them. In some cases, users pay no clearly identifiable fee for the use of certain infrastructure. For example, hunters and recreationists usually pay no explicit fee for use of public forest roads and trails. The results of these conditions are frequently significant distortions in important economic relationships and subsequent investment decisions.
- There is increasing skepticism that public investments in forest and related infrastructure are promoting economic development and private-sector productivity. This skepticism gives rise to serious questions about the roles of government and the private sector in fostering infrastructure investments necessary for certain forest uses and management activities.
- Specifying appropriate levels of public investment in infrastructure is increasingly being viewed as a major challenge. This is largely because such determinations are often made without benefit of a market system that establishes appropriate levels of pricing in a forest sustainability context. A private firm can compare revenues with costs and adjust output capacity to the point at which marginal cost equals marginal revenue, but the production of forest infrastructure by government is seldom subject to these market mechanisms.
- The task of determining appropriate types and levels of investment in infrastructure is being made more difficult by intense political debates over the use, management, and protection of forests. For example, there is strong disagreement about the extent to which roads should be built and maintained in public forests, and about the

extent to which economic development (often in the form of wood processing facilities) should be allowed to occur in forested areas. This problem is of special concern for public lands, for which there are often multiple, shifting, and contradictory objectives for forest sustainability.

- Expected demographic changes are likely to have a significant impact on the type and intensity of forest infrastructure required in the future. Preferences for some forest uses (for example, preferences for certain recreational activities) may change dramatically as population structure changes or as population density declines in some forested regions and increases in others.
- Maintenance of existing infrastructure continues to be a concern for both public and private sectors. For the public sector, backlogs in the maintenance of roads, trails, bridges, and dams are well documented. Compounding the problem is the need to decommission roads on some public forests. In the private sector, aging processing facilities and the advent of new technologies are placing greater stress on private sources of capital for needed improvements in infrastructure.
- Permanent infrastructure installations are increasingly viewed as deterrents to the production of certain forest benefits. Sentiment for minimal, if any, permanent physical infrastructure is increasing in some segments of society that find forest benefits diminished by the presence of permanent structures (such as roads, buildings, communication structures). This problem reflects broader contradictions in infrastructure requirements associated with multiple needs.

Information Adequacy

Specification

The diversity in form and function of infrastructure raises many questions about the information required to adequately assess the infrastructure conditions considered necessary to forest sustainability and conservation. A number of information concerns must be addressed. For example, there is a pressing need for information about the *status and condition of infrastructure* (magnitude and extent of current and planned capital outlays in infrastructure), *need for investment in new or existing infrastructure* (identification of desired objectives and assessment of infrastructure investments needed to accomplish them), *processes by which infrastructure is provided* (determinations of adequacy, assessment of investment needs, identification of financial sources, designation of responsibility for implementation), *effectiveness and efficiency of infrastructure investments* (relationship between desired conditions of forest sustainability and required type and level of infrastructure), *knowledge and information networks* (communication and information flow between users and providers of infrastructure), *regional and national influences on infrastructure* (in contrast to local conditions, influence of broader geographic forest conditions, population structure, type and mix of industries, financial capital, research and education resources), and *regional and international comparisons* (determination of infrastructure deficiencies, focusing of public and private investments, use of learning experiences to increase program efficiency) (Lewis and others 1993).

Information about infrastructure considered important to forest sustainability and conservation has received very limited attention from public and private organizations. Notable providers are Federal agencies (for example, U.S. Census Bureau), most of which focus on the infrastructure required for industrial production (including wood-based production). The National Association of State Foresters has surveyed State forestry agency information concerning infrastructure. The association reported that only 14 States had access to such information. Of the 14 States with information, 3 indicated that they had abundant information, 7 that they had sufficient information, and 4 that they had some, but generally very little, information. Two States reported that the quality of their information was excellent, 11 that it was adequate, and 2 that it was poor (National Association of State Foresters 1999).

The following kinds of information might be useful in clarifying the capacity of institutions to provide the infrastructure required for forest sustainability and conservation:

- *Measurement information*—Information about which variables are important and how they should be measured to accurately portray conditions involving forest infrastructure has not been assembled. What indicators should be measured and compiled (for example, road density per unit area, roads per capita)? What infrastructure indicators are most appropriate for various standards of sustainable forest management (for example, campgrounds, trails, educational facilities, timber management)? How often should these indicators be measured? Are special indicators and measurement needs associated with different types of infrastructure, or with public versus private infrastructure? What is an appropriate indicator of necessary infrastructure (for example, what are appropriate standards for roads and processing facilities)?
- *Extent of activity information*—Information about infrastructure is often scattered unevenly among public and private collecting organizations, and lacks local, regional, and national consistency. What are the legal requirements for investing in infrastructure at various

geographic levels and by various organizations? How are these requirements changing over time? Are there different requirements at different levels of government? Is there consistency among these requirements? What is the status of local efforts to encourage infrastructure development? What is the condition of private infrastructure and the extent of private investment in such infrastructure? How does current infrastructure relate to public and private forest plans? What portion of infrastructure is being managed to some agreed-upon standard? Are compilations of data, as currently carried out, useful for guiding policy and program direction?

- *Responsible organization information*—Comprehensive information about what private and public organizations are actively engaged in the development and maintenance of forest and related infrastructure has not been assembled. What government agencies, and at what levels, are engaged in infrastructure development and maintenance (for example, USDA Forest Service, U.S. Department of Transportation, U.S. Geological Survey, State and local governments)? What legal authority assigns them responsibility, and is such authority being interpreted accurately? Should certain levels of government be responsible for providing infrastructure for certain categories of forest landowners? Do public and private organizations that engage in infrastructure development have similar or differing goals and objectives, and do these objectives foster or hinder needed investment in infrastructure? Are there organizational patterns in the public and private sector that, if known and publicized, would enhance overall investment in infrastructure?
- *Coordination information*—Information about requirements for coordinating the development and maintenance of infrastructure among and between various levels of government and various private concerns has not been assembled. What conflicts exist among the various entities engaged in developing and maintaining forest infrastructure? How might they be resolved productively? What are requirements for coordination? Do they allow for cross-sectoral, coordinated planning and review (for example, in the construction of road systems involving multiple forest ownerships)? Do they ensure that the cumulative results of local, State, and regionally developed infrastructure will lead to outcomes consistent with national requirements and vice versa? Do they allow incorporation of ad hoc code development activities occurring at various times and undertaken by various levels of government?
- *Scope of infrastructure information*—Comprehensive information about forest infrastructure in addition to that required for wood production and processing has not been assembled. What infrastructure has been developed for the range of values associated with forests? What approaches have been used to encourage the development of such infrastructure? What laws require the development of infrastructure for the broad range of values associated with forests? Do these legal requirements differ among agencies at the same level of government and among different levels of government? Are these differences complementary or competitive? Are there barriers to the development of infrastructure that is not focused on wood production and processing? If so, how might they be overcome?
- *Investment and incentive information*—Comprehensive information about resources devoted to infrastructure development and maintenance has not been assembled. What is the magnitude of investment in public and private infrastructure? Is there an appropriate level of investment in new infrastructure, possibly as a percentage of existing infrastructure? Are there legal and administrative processes for allocating resources to infrastructure development and maintenance, and are they sufficient? Are there legal or fiscal provisions for encouraging infrastructure development, and especially for encouraging cross-sectoral development and maintenance activities?
- *Effectiveness information*—Comprehensive information about the effectiveness of various types and levels of infrastructure in supporting sustainable forestry interests has not been compiled. Are there legal or administrative requirements to determine the efficiency and effectiveness of infrastructure development? What are appropriate measures of success? Are there more effective approaches to infrastructure development and maintenance than those currently in use?
- *Monitoring information*—Limited monitoring of the condition of forest infrastructure and levels of investment therein has been conducted, often by Federal agencies. However, more intensive monitoring could be useful. Are there legal requirements to monitor the condition of forest infrastructure? Is the information obtained by means of monitoring being used to adapt infrastructure investments to changing circumstances? Is the information being collected and analyzed in ways that enable agencies to fulfill their legal responsibilities? Are the results of monitoring efforts capable of being accumulated to portray conditions at the landscape, regional, and national levels?

Recommendations

The ability to achieve forest sustainability will depend very largely on consistent, long-term investments in appropriate types of infrastructure. In order to improve understanding of the legal and institutional setting within which such investment will occur, a variety of information voids must be addressed. We recommend that the following actions be taken:

- *Comprehensive periodic reviews*—Conduct periodic and comprehensive reviews of current authorities and institutions that give direction and resources to the physical infrastructure considered necessary for forest sustainability. These reviews should be guided by the information deficiencies suggested above. Special attention should be given to the collection of information about the type and extent of infrastructure, the organizations responsible for ensuring appropriate levels of infrastructure, and the long-term appropriateness and effectiveness of forest infrastructure. This information should reflect conditions at Federal, State, and local levels of government. In addition, a systematic review of private-sector capability to create and maintain appropriate infrastructure should be initiated.
- *Responsibility for conducting reviews*—Assign responsibility for continuous reviews of forest infrastructure to a specific existing or new administrative unit of a Federal agency (for example, the USDA Forest Service's State and Private Forestry unit or Research and Development unit), a college or university, or other nonprofit organization (for example, the National Association of State Foresters or the National Council of the Paper Industry for Air and Stream Improvement). This responsibility should be assigned to an organization that has a record of success in addressing the complexities of forest infrastructure.
- *Devote resources to reviews*—Invest in the review sufficient resources to provide the type and quantity of information necessary to dramatically improve understanding of current abilities to plan, construct, and maintain forest infrastructure that is important to sustainable forestry.

Indicator Appropriateness

Indicator Definition

The activities specified by Indicator 56 are not defined clearly. The phrases "physical infrastructure," "facilitate supply of forest products and services," and "support for forest management" must be explained if information gathering is to proceed in an orderly way. The problem of definition is further complicated by the use of old terms (such as "public works") and new terms (such as "green infrastructure") that reflect different perceptions of infrastructure.

The scope of the subject matter addressed by Indicator 56 is also of concern. Physical infrastructure can consist of least four basic elements, namely forest ecosystems as infrastructure, forestland base infrastructure (such as roads, recreation facilities), forest product processing infrastructure (such as manufacturing facilities), and broad forest community infrastructure (such as schools and hospitals). Although these distinctions are not mutually exclusive, they will regulate information gathering for this indicator. The Roundtable on Sustainable Forestry has suggested that Indicator 56 be interpreted as applying only to implementation of forest plans and capital investments in the management and protection of the forestland base (for example, forest roads and recreational facilities). While germane, larger-scale infrastructure systems (for example, mills, production facilities, public and freight transportation systems, energy infrastructure, water infrastructure, financial systems, banking systems) are beyond the scope of this indicator. Such an approach would make the information-gathering task much easier. However, to limit interpretation of the indicator in such a way would severely constrain efforts to appreciate and understand the importance of infrastructure (in its broadest sense) to forest sustainability and conservation.

Infrastructure scope and definition problems will continue to be troublesome. However, we recommend that the indicator be reworded to refer to institutional capacity to "*Develop and maintain physical infrastructure necessary to manage and protect forests and to make available the range of goods and services that forests are capable of providing*."

Relationship to Other Indicators

Indicator 56 overlaps with several others, particularly as they relate to concepts involving development and implementation of forest management plans. There is potential for difficulty in this respect in Indicator 56's relationship to Indicators 10 (area of forestland), 35 (area of recreational forestland), 36 (facilities available for recreation and tourism), 38 (investment in forests and product processing), 42 (forestland spiritual values), 46 (changing economic conditions), 49 (planning and assessment), and 54 (planning and coordination).

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Enforcement of Laws, Regulations, and Guidelines (Indicator 57)

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The full text of Indicator 57 is as follows: *Extent to which the institutional framework supports the conservation and sustainable management of forests, including the capacity to* ***enforce laws, regulations, and guidelines*** (Montreal Process Working Group 2003).

Rationale and Interpretation

The achievement of conditions conducive to forest conservation and sustainability implies that various biophysical standards (for example, forestry best management practices) and assorted political processes (for example, collaborative processes, legislative processes) have been appropriately engaged and applied. In many cases, this will occur in response to market systems or to various participatory processes involving different segments of the public. However, there may be circumstances in which sustainability standards are applied only in response to the fear of penalty or punishment. Some unwilling persons or entities respond only to the imposition of a sanction in the form of an order, fine, or incarceration. Without adequately and appropriately applied enforcement efforts, the effectiveness of laws, regulations, and guidelines focused on forest resources may be substantially diminished in some circumstances (Montreal Process Technical Advisory Committee 2000, Montreal Process Working Group 2003).

Useful data for measuring institutional capacity to accomplish this indicator are compilations and descriptions of laws and programs at national and subnational levels that enforce conditions considered essential to forest sustainability (for example, legally authorized penalties and jail sentences, number of personnel employed in enforcement roles, administrative and judicial review capabilities, and number and type of programs, databases, and clearinghouses established to monitor violations). The laws that require enforcement actions relevant to sustaining forest conditions are far-ranging. They address, for example, conditions of the environment (air, water, pesticides, hazardous waste), fisheries and wildlife (harvest limits, species preservation, subsistence hunting), timber harvesting (road construction, harvest limits, health and safety), and special features protection (sensitive or fragile areas containing unique environmental attributes or resources). In addition, many laws promote sustainability by means less harsh than those commonly thought of as enforcement actions, namely education, technical assistance, fiscal incentives, and tax incentives. In a broader sense, the latter programs may also be considered enforcement mechanisms even though their appeal is directed to the self-interest of landowners and timber harvesters (Montreal Process Technical Advisory Committee 2000).

Indicator 57 refers to concepts and principles that should be defined. *Enforcement* refers to actions taken to compel conformity with desired conditions or implementation of favored programs. Examples of enforcement actions include inspections, investigations, and imposition of fines. *Laws* are legislatively binding and authoritatively prescribed standards that must be adhered to. Examples include air and water quality laws. *Regulations* are operational procedures that govern the actions of persons or organizations. They are interpreted and enforced by public agencies, and include, for example, rules promulgated in response to State forest practice laws. *Guidelines* are criteria, touchstones, or benchmarks such as recommended best management practices. Guidelines may be incorrectly specified by the indicator, in that guidelines in the United States are generally viewed as standards to be voluntarily complied with by landowners and timber harvesters, often in response to offers of fiscal and technical assistance. Moreover, "enforcement" is widely associated with laws and regulations that make certain actions mandatory, whereas "incentives" is typically associated with guidelines.

Conceptual Background

Enforcement of favored conditions that will accomplish societal interests in the sustainability of forests requires a delicate balancing of public and private interests in forests. In the context of the enforcement of laws and rules, this balance is achieved when nearly everyone expects certain standards of sustainability to be applied whether they agree with the standards or not, and this expectation deters the contrary actions of those who do not wish to comply. In guideline enforcement, a balance occurs when landowners and timber harvesters respond to various forms of incentives by voluntarily following procedures and applying practices that also lead to conditions of sustainability. The balance between public and private interests in forests is fragile. So too is the political balance between laws and rules obeyed out of fear, and guidelines followed in response to persuasive tactics that appeal to the ethics of forest stewardship and ultimately to sustainable forestry. There have been many rancorous political battles between those

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who have attempted to define the appropriate balance between the two (Callicott 2000, Ellefson 2000).

Enforcement of laws, rules, and guidelines can take many forms. If the emphasis is on persuasive actions focused on guidelines, the forest resources community has access to an enormous array of programs that represent Federal and State capacity to promote sustainability. Such programs range from educational and technical assistance programs to fiscal and tax incentives, and from payment for use and development rights to legally binding arrangements for transferring property between owners. As for enforcement of actions by threat of punishment, the range of tools is equally wide. Penalties (for example, fines and incarceration) exist for violation of endangered-species laws and failure to comply with regulatory rules being implemented by State air and water quality agencies. For example, in Arkansas it is unlawful to remove any trees growing below the normal high-water mark on any river or stream, and violation of this law is punishable by a fine to be not more than $1,000 (Environmental Law Institute 1998). Yet, in other States (for example, Indiana, Maine, Missouri, and Wisconsin), forestry laws require the withholding of a tax benefit (or recapture of taxes avoided) if agreed-to forest management plans are violated, or laws may condition receipt of cost-share monies on a landowner's willingness to apply certain forestry practices. On Federal public lands, enforcement by means of threats of penalties is authorized by a variety of laws, regulations, and administrative directives. Penalties may be imposed for violations involving timber harvest trespass, endangered species habitat destruction, and failure to maintain safe and healthy working conditions. In some situations, Federal agency administrative withdrawal of access to unique resources located on public lands is also viewed as an enforcement action.

The complex jurisdictional conditions that surround the enforcement of laws and regulations and the promotion of guidelines can be especially challenging to those who attempt to map patterns of enforcement. Some resource conditions are a Federal responsibility (for example, wildlife habitat management on Federal lands) and some are a State responsibility (for example, State determination of harvest levels on Federal lands), while in other cases (for example, endangered species) responsibility rests primarily with the Federal Government. In yet other situations, Federal and State enforcement jurisdictions operate cooperatively on enforcement matters (educational and fiscal incentives, health and safety standards), while in others (for example, air quality standards, pesticide use standards) the Federal Government may again be the preeminent authority. Local units of government also have significant enforcement authority, especially in matters of land use (for example, zoning and subdivision of property).

The task of describing enforcement activities and programs is also made difficult by issues involving definitions. What constitutes a violation and what is an appropriate attendant penalty? Enforcing agencies seek clarity in both, as do violators of the law, yet both prefer some latitude in the definition of an offense and the nature of the sanctions to be imposed. Room for bargaining and negotiation may benefit both sides. In reality, however, statutory language may at times be so broad that confusion ensues and agencies have to seek direction from rule-making processes or the opinions of courts. Statutory phrases like "prohibit waste disposal," "forbid discharge of a pollutant," or "enjoin pollutants from nonpoint sources" can perplex enforcement. At the other extreme, the standards or thresholds of conduct stipulated in law may be so explicit that enforcing agencies have difficulty applying the standards to geographically diverse forest conditions or to the diversity of honorable intentions of landowners and timber harvesters. Forest practice regulatory rules are sometimes particularly explicit in specifying standards (for example, harvest operations cannot commence without an on-site inspection, trees over 24 inches in diameter cannot be harvested, riparian buffer strips must be 150 feet in width and pesticides will not be applied therein).

Current Insitutional Capacity

Federal Government Capacity

Authorities and programs—Federal agencies have substantial authority and institutional capacity to enforce laws, regulations, and guidelines that contain standards important to the sustainability of forests and related resources. For example, in administering the National Forest System "all persons employed in the Forest Service of the United States shall have authority to make arrests for the violation of the laws and regulations relating to the national forests" (Public Law 58-138; Agricultural Appropriations Act of March 3, 1905). In furtherance of this authority, the agency is also authorized to cooperate with any State or political subdivision thereof in the enforcement of laws involving national forests (Cooperative Law Enforcement Act of 1971). Similarly, the USDI Bureau of Land Management is authorized to "institute a civil action for an injunction to prevent any person from utilizing public lands in violation of regulations" (Federal Land Policy and Management Act of 1976). The agency has the authority to develop regulations for public land use, management, and protection; to initiate civil actions for violation of regulations, including nature of relief expected; to enter into contracts with law enforcement officials as necessary to enforce regulations; and to cooperate with regulatory and law enforcement officials of any State or political subdivision thereof. Similar authorities are granted to other Federal agencies (for example, the USDI National

Park Service and the U.S. Fish and Wildlife Service enforce the laws and regulations for which they are responsible) (West Publishing Company 1997). Although extensive enforcement authority does exist, there is only a limited understanding of how such authorities are interrelated and of the extent to which cooperation in enforcement matters actually occurs (American Forest and Paper Association 1994).

Enforcement authorities of Federal agencies can be exercised in a wide variety of ways. However, the most commonly referred-to approach to the enforcement of forest sustainability standards is by exercising authority to inspect, investigate, and impose fines and prison sentences. The mere existence of authority to impose fines or seek court-imposed prison terms can significantly influence behavior regarding the adoption of forest sustainability standards. Information about such authorities and their application is modest. Two of 7 Federal statutes focused directly and exclusively on forests grant authorities to impose fines, while 11 of 20 Federal laws that are more broadly focused on the environment and natural resources authorize fines and court-imposed prison sentences for noncompliance with statutory provisions (table 1). Most

Table 1—Enforcement actions authorized by selected Federal statutes relevant to forest resources, by statute and type of action (2001)

	Type of action authorized to compel action or enforcement				
Federal statute	Specifies fines and prison sentences to be imposed	Authorizes development of rules to be followed	Specifies standards, action, or process to be followed	Authorizes funds required to compel action	Authorizes education & incentives to compel action
Focus directly and exclusively on forests and forestry					
Cooperative Forestry Assistance Act of 1978				X	X
Forest Conservation and Shortage Relief Act of 1990 (timber exports)	X	X	X	X	
Forest and Rangeland Renewable Resources Planning Act of 1974		X	X		
Multiple-Use Sustained Yield Act of 1960					
National Forest Management Act of 1978			X		
National Forest System Drug Control Act of 1986	X				
Renewable Resources Extension Act of 1978		X	X		X
Focus broad, but including forests and forestry					
Administrative Procedures Act of 1946		X	X		
Archeological Resources Protection Act of 1979	X		X		X
Clean Air Act of 1990	X	X	X	X	X
Clean Water Act of 1987	X	X	X	X	X
Coastal Zone Management Act of 1972		X	X	X	X
Endangered Species Act of 1973	X	X	X	X	X
Federal Insecticide, Fungicide, and Rodenticide Act (as amended 1996)	X	X	X	X	
Federal Land Policy and Management Act of 1976	X	X	X	X	
Federal Noxious Weed Act of 1974	X	X	X	X	
Fish and Wildlife Conservation Act of 1980			X		
National Environmental Policy Act of 1969		X	X	X	
National Trails System Act of 1968			X	X	
National Wildlife Refuge System Administration Act of 1966 (1997)	X	X	X	X	
Occupational Safety and Health Act of 1970	X	X	X	X	X
Public Lands U.S. Criminal Code of 1948	X		X		
Soil and Water Conservation Act of 1977			X	X	
Solid Waste Disposal Act of 1986	X	X	X	X	X
Surface Mining Control and Reclamation Act of 1977		X	X		
Wild and Scenic Rivers Act of 1968			X	X	
Wilderness Act of 1964			X		

Sources: Coggins and others (2001); U.S. Department of Agriculture, Forest Service (1993); West Publishing Company (1997).

statutorily authorized fines and imprisonment relate to fish and wildlife statutes, although archeological resources, human health and safety, and pesticide use and management are often the focus of enforcement (table 2).

Agency-promulgated rules and regulations are also enforcement tools, in that they establish standards of conduct that command respect and influence behavior (Kerwin 1999). Influencing both the substance of sustainable forestry and the processes by which sustainable forestry is accomplished, rules and regulations are extremely common enforcement mechanisms among Federal natural resource agencies. Especially notable in this respect have been rules and rulemaking efforts related to the implementation of the National Forest Management Act of 1976, Endangered Species Act of 1973, and Federal Land Policy and Management Act of 1976. During the 5-year period beginning in 1997, 4 Federal agencies issued nearly 400 final rules for guiding the actions of other Federal agencies and the public (table 3). Rules issued by the USDI Fish and Wildlife Service accounted for the vast majority of these final rules (most of which were required to implement the Endangered Species Act of 1973). Similar in many respects to rules, Presidential Executive orders also serve as enforcement mechanisms in that they command respect and ultimately coerce compliance with desired policy and program directions (Appendix A).

Enforcement can also be exercised in a number of other ways. Unfortunately, information describing this Federal institutional capacity is usually scattered, inconsistent, and in many cases nonexistent. For example, few if any compilations or analyses have been made of enforcement actions involving injunctive relief imposed by Federal courts in response to civil violations identified by Federal agencies. At best, there have been modest efforts to determine the frequency and disposition of Federal cases generally involving environmental and natural resource statutes (Alden and Ellefson 1997, Jones and Taylor 1995, Wasby 1983) (table 4). Similarly, there has been but modest attention paid to: (1) agency administrative withdrawal of certain Federal public lands as a means of protecting them from deleterious uses and management practices (U.S. General Accounting Office 1995); (2) agency review of permits granted by authority of environmental and natural resource statutes (for example, permits for timber harvesting, mineral extraction, and access to private property); (3) actual or threatened suspension of financial payments if compliance with plans, management directives, or sustainability standards are not met (for example, failure of State governments to adhere to certain provisions of the Coastal Zone Management Act of 1972) (West Publishing Company 1997); (4) agency acquisition (primarily from nonprofit organizations) of certain private lands or resources considered to be in jeopardy (U.S. General Accounting Office 1994); and (5) enforcement of public interest in forest sustainability by moral persuasion that is promoted through an assortment of fiscal and tax incentives and the extending of information and technical assistance. Federal statutory capacity for this persuasive approach is extensive (table 5).

Enforcement magnitude—Comprehensive information describing the extent of Federal agency capacity for enforcement has not been assembled. The following examples describing Federal agency enforcement efforts must suffice, although much of the information does not relate exclusively to forestry and forest-resource matters.

The USDI Bureau of Land Management (responsible for 264 million acres of Federal public land) implements a law enforcement program involving approximately 200 law enforcement officers who patrol areas as large as 1.8 million acres. Enforcement activities focus on a wide array of illegal activities involving timber, oil, and gas trespass; mineral theft and fraud; cultural resource vandalism and theft; unlawful land occupancy; recreational site violations; illegal hazardous waste dumping; wrongful use of off-road vehicles; and drug-related offenses. Enforcement is especially critical for formally designated special places on Federal public lands, and more than 3,000 of these have been identified. The agency's 1998 budget request for resource protection and law enforcement was nearly $16 million. In 1996, enforcement actions involved an estimated 7,200 felonies and misdemeanors and 4,700 natural-resource violations (USDI Bureau of Land Management 2001).

The USDI National Park Service is responsible for 84 million acres of Federal public land. More than 288 million persons visited these lands in 2001. In fiscal year (FY) 2001, the Park Service spent more that $196 million on law enforcement, of which $140 million was invested in enforcement related to resource protection (vandalism, archeological safeguards) and ranger law enforcement (search and rescue, vehicle violations). Since 1996, the agency has spent about twice as much on enforcement that is related to resource protection as it has spent on ranger law enforcement. In FY 2001, the actual law enforcement and protection workload was as follows: law enforcement incidents, 85,300; natural resource incidents (violations), 18,800; search and rescue incidents, 4,200; emergency medical incidents, 13,700; archeological protection incidents, 320; vandalism incidents, 3,300; and resource incidents, 19,800. The agency's enforcement activities are facilitated by the use of a computer-based clearinghouse of information on archeological looting and vandalism (called LOOT or Listing of Outlaw Treachery). Between 1985 and 1987, 1,620 incidents involving archeological resources were reported by Federal agencies, leading to

Table 2—Penalties and punishment authorized by Federal statutes relevant to forest resources (2001)

Federal statute	Penalties for violations and provision for related enforcement
Preservation of American Antiquities Act of 1906	Persons appropriating any object of antiquity on Federal Government lands subject to penalties of up to $500 or up to 90 days (or both).
Migratory Bird Treaty Act of 1918	Persons failing to comply with regulations regarding taking, killing, or possessing migratory birds subject to penalties up to $500 or imprisonment up to 6 months (or both) ($2,000 or 2 years [or both] for sale of birds).
Bald and Golden Eagle Protection Act of 1940	Persons possessing or selling eagles subject to penalties of up to $5,000 or imprisonment up to 1 year (or both) (second violation: $10,000 and 2 years).
Federal Insecticide, Fungicide, and Rodenticide Act (as amended)	Persons failing to properly register or use pesticides subject to various penalties ranging from maximums of $1,000 to $25,000 and from maximums of 30 days to 3 years imprisonment.
Public Lands U.S. Criminal Code of 1948	Persons engaged (on Federal public lands) in timber trespass, tree injury, setting of wildfires, destruction of livestock fences, destruction of survey markers, or deception at land and timber sales subject to various penalties ranging from maximums of $500 to $3,000 and from maximums of 6 months to 3 years imprisonment.
Occupational Safety and Health Act of 1970	Persons violating safety and health rules subject to civil and criminal penalties ranging from maximum of $7,000 to $70,000 and 6 months imprisonment.
Endangered Species Act of 1973	Persons knowingly (civil crime) or willfully (criminal crime) engaged in violations of endangered species law subject to various penalties ranging from maximums of $500 to $50,000 and from maximums of 6 months to 1 year imprisonment. Criminal violations also result in loss of any permits or leases authorizing use of Federal land.
Federal Noxious Weed Act of 1974	Persons violating quarantine of noxious weeds or promoting their dissemination subject to penalties of up to $5,000 or up to 1 year imprisonment (or both).
Federal Land Policy and Management Act of 1976	Persons violating provision of act regarding use and protection of public lands subject to penalties up to $1,000 or up to 12 months imprisonment (or both).
Archeological Resources Protection Act of 1979	Persons damaging, removing, or defacing archeological resource on Federal public lands subject to criminal penalties ranging from maximum of $10,000 to $100,000 and from maximum of 1 year to 5 years imprisonment. Civil penalties assigned by land manager.
Lacey Act Amendments of 1981 (wildlife)	Persons importing, exporting, selling, or purchasing wildlife in violation of Federal laws subject to civil and criminal penalties ranging from maximum of $250 to $20,000 and up to 5 years imprisonment.
Solid Waste Disposal Act of 1986	Persons or organizations violating compliance orders for management of hazardous wastes subject to civil and criminal penalties ranging from maximums of $25,000 to $1,000,000 and from 2 to 15 years imprisonment.
National Forest System Drug Control Act of 1986	Persons acting to harm Federal officials or Federal property subject to penalties ranging from maximums of $10,000 to $20,000 and from maximum of 10 to 20 years imprisonment. Special enforcement powers assigned to Forest Service employees (carry firearms, make arrests).
Forest Resource Conservation and Shortage Relief Act of 1990 (timber exports)	Persons illegally exporting unprocessed Federal timber subject to penalties ranging from maximum of $75,000 to $500,000. Violators may be barred from purchasing Federal timber for up to 5 years.
National Wildlife Refuge Administration Act of 1966	Persons violating act's provisions subject to fines prescribed by Title 18 U.S.C. or up to 1 year imprisonment (or both).

Sources: Coggins and others (2001); U.S. Department of Agriculture, Forest Service (1993); West Publishing Company (1997).

Table 3—Final rules issued by Federal natural resource agencies, by agency (1997-2001)

Agency	Year				
	1997	1998	1999	2000	2001
USDA Forest Service	6	10	9	5	13
USDA Natural Resources Conservation Service	3	1	1	2	0
USDI Bureau of Land Management	13	14	5	6	10
USDI Fish and Wildlife Service	54	57	56	63	52
USDI National Park Service	5	2	5	4	3

Note: Information for 2001 is for January through October 2001.
Source: National Archives and Records Administration (2001a).

Table 4—Environmental and natural resource statutes subject to litigation in Federal district and appellate courts, by major Federal statutory category and number of cases (1980-1990)

Federal statute category and law	No. of cases
Fish and wildlife laws	
Endangered Species Act of 1973	57
Fish and Wildlife Coordination Act of 1934	2
Migratory Bird Treaty Act of 1918	1
National Wildlife Refuge System Administration Act of 1966	1
Wild Horses and Burros Protection Act of 1971	2
Total fish and wildlife cases	63
Waste and pollution prevention laws	
Federal Insecticide, Fungicide, and Rodenticide Act (amended 1996)	1
Noise Control Act of 1972	4
Rivers and Harbors Act of 1889 (as amended)	27
Solid Waste Disposal Act of 1965	5
Surface Mining and Reclamation Act of 1977	6
Toxic Substances Control Act of 1989	5
Total waste and pollution cases	48
Planning, land use, and management laws	
Coastal Zone Management Act of 1972	10
Forest and Rangeland Renewable Resources Planning Act of 1974	1
Historic Preservation Act of 1966	8
Federal Land Policy and Management Act of 1976	11
Minerals Leasing Act of 1920	2
Multiple-Use Sustained Yield Act of 1960	4
National Environmental Policy Act of 1969	37
Taylor Grazing Act of 1934	2
Total land use and management cases	75
Total all cases	186

Source: Alden and Ellefson (1997).

Table 5—Federal fiscal and educational programs promoting or evoking actions important to the sustainability of forests, by program focus and administering agency (2001)

Federal statute or program	Principal administering agency	Program focus
National Environmental Education Act of 1990	U.S. Environmental Protection Agency	Environmental education, grants, internships, and awards
Conservation Reserve Program (Farm Bill 1995)	U.S. Department of Agriculture (Farm Service Agency)	Educational and financial assistance to reduce soil erosion
Cooperative Forestry Assistance Act of 1978 (Forestry Incentives, Forest Stewardship, Stewardship Incentives, Forest Legacy)	U.S. Department of Agriculture (Forest Service)	Technical and financial assistance and land protection via easements
Fish and Wildlife Conservation Act of 1980	U.S. Department of the Interior (Fish and Wildlife Service)	Technical and financial assistance for planning
Reforestation Tax Incentives (Recreational Boating Safety and Facilities Improvement Act of 1980)	Internal Revenue Service and U.S. Department of Agriculture (Forest Service)	Reforestation tax incentive, investment tax credit, reforestation trust fund
Renewable Resources Extension Act of 1978	U.S. Department of Agriculture (Cooperative State Research, Education, and Extension Service)	Education and technical assistance
Clarke-McNary Act of 1924	U.S. Department of Agriculture	Education and technical assistance
Wildlife Habitat Incentives Program (Federal Agricultural Improvement and Reform Act of 1996)	U.S. Department of Agriculture (Natural Resources Conservation Service)	Financial incentives for wildlife habitat improvement
Environmental Quality Incentives Program (Farm Bill 1996)	U.S. Department of Agriculture (Natural Resources Conservation Service)	Educational, financial, and technical assistance for conservation activities

Source: U.S. Department of Agriculture, Forest Service (1993), West Publishing Company (1997), and various agency documents describing programs and statutory authority.

134 citations, 49 arrests, 57 criminal convictions, 16 felony convictions, and 17 civil penalties (Carnett 1991; U.S. Department of the Interior, National Park Service 2001).

The USDI Fish and Wildlife Service law enforcement program addresses a wide variety of illegal activities both domestically and internationally. Authority for this stems from 14 laws and several treaties specific to wildlife and plants. Information identifying enforcement actions that directly and exclusively involve forests is limited, although certain actions clearly have relevance to forests and forestry. Examples are pursuit of habitat destruction cases, promotion and enforcement of habitat conservation plans under the Endangered Species Act of 1973, investigation of domestic crimes involving federally protected species, monitoring and regulation of unlawful trade in domestic wildlife, and investigation of environmental hazards and contaminants that pose a special threat to wildlife. The agency's 2000 caseload involving forestry or closely related matters was as follows: archeological destruction, 6 cases; eagle protection infractions, 120 cases; endangered species violations, 4,101 cases; National Wildlife Refuge trespass, 228 cases; and wild bird conservation violations, 64 cases. With a budget of nearly $50 million, the agency in 2001 employed 253 agents, 94 wildlife inspectors, and a staff of wildlife forensics scientists. Information identifying the portion of the agency's law enforcement budget and personnel that are devoted specifically to matters involving forests is not available (U.S. Department of the Interior, Fish and Wildlife Service 2001).

The USDA Forest Service enforcement program focuses on curbing a variety of illegal activities (for example, arson, theft, vandalism, and use of controlled substances) that occur primarily in the National Forest System. To

facilitate this work, the agency has established the Law Enforcement Management Reporting System (LEMARS), a data retrieval system that provides management with a means of identifying and following law enforcement activities. The system is designed to consistently and accurately document information on violations occurring within the National Forest System by type, location, resources damaged, and estimated property loss. Numbers of law enforcement incidents and violations on the national forests have risen substantially in recent years, going from about 144,000 in 1996 to more than 285,000 in 2000 (U.S. Department of Agriculture, Forest Service 2000). Timber trespass incidents on the national forests in 1994 totaled 143,232 (1992: 114,328; 1993: 111,512), with closely related incidents numbering 8,209 in the same year (1992: 5,414; 1993: 6,168). The agency's law enforcement budget in 1998 was $64.0 million, as compared to $8.3 million in 1992. The agency conducts law enforcement investigations with a staff of about 450 professionals, who are assigned to the agency's regional administrative centers and to the national headquarters in Washington, D.C. (U.S. Department of Agriculture, Forest Service 2001).

State Government Capacity

Authorities and agencies—States have substantial institutional capacity to enforce laws, regulations, and guidelines that will further the application of standards essential for forest sustainability. An assessment conducted in 1992 found that many States had programs promoting State-adopted best forest practices, and that these programs focused on a wide variety of forest benefits (for example, water quality, reforestation, timber harvesting, forest protection, wildlife protection, recreation, and aesthetic qualities). Eleven percent of these best practices were enforced by regulatory means, with such an approach being most commonly applied to activities involving water quality, wildlife, endangered species, wildfire, insects, and diseases (table 6). Other State programs included technical assistance (28 percent), education and extension (27 percent), fiscal incentives (15 percent), voluntary guidelines (13 percent), and tax incentives (6 percent) (Ellefson and others 1995).

Lists of State laws authorizing enforcement action focused on nonpoint forest sources of water pollution have been compiled periodically. These authorities exist both as comprehensive State water pollution control laws and as State forest practices laws focused specifically on nonpoint sources of pollutants. Nearly all States have laws of the first kind, while slightly more than 30 States have forest laws that grant legal authority to enforce application of water-pollution prevention activities (Appendix table B.1). Further evidence of institutional enforcement capacity with regard to nonpoint pollutants has been gathered by the National Association of State Foresters (2001). In 2000, 21 percent of States used only voluntary programs to promote forestry best management practices on private forests; 35 percent used voluntary programs plus a backup enforcement penalty (a "bad actor" or "contingency" law) for failure to willingly apply best management practices; 27 percent used only regulatory programs for enforcement; and 17 States used some combination of all three approaches. The numbers of States that have established legal enforcement authority with respect to forest practices are as follows: forest practice standards generally, 11 States; lake and stream protection standards, 27 States; wetland protection standards, 23 States; stream crossing standards, 23 States; sediment and erosion control standards, 29 States; chemical application standards, 15 States; storm water discharge standards, 10 States; and laws authorizing actions against especially troublesome landowners and timber harvesters (bad-actor laws), 12 States.

The diversity of State agency capacity and involvement in the enforcement of forest resource standards is great (Ellefson and others 2001 and 2002). In the year 2000, more than 100 State cabinet-level executive branch units were so engaged, while more than 200 entities at the first-tier subcabinet level had direct or indirect responsibility for enforcement activities (table 7). More than 50 governing bodies and advisory bodies to executive branch units also had enforcement responsibilities in various States. Over half of the first-tier subcabinet entities so involved had moderate or substantial influence over the use, management, and protection of forests. Governing or advisory bodies had somewhat less enforcement influence: only 4 of 10 had moderate or substantial influence.

In some States, the enforcement of forest-practice standards is constrained by State laws that limit or condition the ability to adopt enforceable regulations that are more stringent than any Federal environmental regulations. Known as "no more-stringent" laws, such statutes occur in about one-third of the States and are usually but not always focused on nonpoint sources (including forest sources) of water pollutants. For example, Montana State law prohibits rules "more stringent than the comparable Federal regulations or guidelines that address the same circumstances"; Kentucky forbids imposition under any permit of "any limitation, monitoring requirement, or other condition which is more stringent than . . . would be applicable under Federal regulation"; Oregon bars the Environmental Quality Commission and the Department of Environmental Quality from "promulgating or enforcing any effluent limitation upon nonpoint source discharges from forest operations on forestlands unless mandated under the Clean Water Act"; and Idaho requires environmental agencies in the water pollution control area to "not impose requirements beyond those of the Federal Clean Water Act."

Table 6—State government programs promoting best-forest-practice standards on private forests, by forestry activity, region, and type of program (1992)

Major forestry activity and type of program	Number of States in region having program type									
	North-east	Lake States	Mid-Atlantic	Mid-Continent	South-east	South Central	Great Plains	Rocky Mtn.	West	Total
Protect water quality										
Educational programs	6	3	6	5	5	5	5	5	6	46
Technical assistance	6	3	7	5	5	5	5	6	5	47
Voluntary guidelines	5	3	6	4	5	5	1	4	1	34
Tax incentives	1	1	4	3	0	1	3	1	0	14
Fiscal incentives	2	3	5	3	1	4	5	4	2	29
Regulatory programs	6	1	5	1	4	1	0	2	6	26
Promote reforestation										
Educational programs	6	3	6	5	6	5	4	5	6	46
Technical assistance	6	3	6	5	6	5	5	6	4	46
Voluntary guidelines	1	1	3	2	1	1	1	4	1	15
Tax incentives	2	3	3	3	1	1	0	1	2	16
Fiscal incentives	5	2	5	3	4	5	5	5	3	37
Regulatory programs	3	0	4	0	0	0	0	1	6	14
Improve timber harvesting methods										
Educational programs	6	3	6	5	5	4	5	5	6	45
Technical assistance	6	3	7	5	6	5	5	6	4	47
Voluntary guidelines	4	2	6	1	3	3	2	4	2	27
Tax incentives	2	2	3	1	0	1	0	0	0	9
Fiscal incentives	3	0	4	0	0	1	2	2	1	13
Regulatory programs	4	0	4	0	1	1	0	1	6	17
Protect from wildfire, insects, and diseases										
Educational programs	6	3	6	5	5	5	5	6	6	47
Technical assistance	6	3	7	4	6	5	4	6	6	47
Voluntary guidelines	3	0	3	1	2	3	2	4	2	20
Tax incentives	0	1	3	2	0	0	0	0	0	6
Fiscal incentives	1	1	4	2	1	0	2	4	2	17
Regulatory programs	5	2	3	1	3	2	1	4	6	27
Protect wildlife and endangered species										
Educational programs	6	3	7	5	6	5	4	5	5	46
Technical assistance	5	3	6	5	6	5	5	5	4	44
Voluntary guidelines	4	1	3	1	1	2	2	2	2	18
Tax incentives	0	0	1	2	0	0	0	0	0	3
Fiscal incentives	3	2	5	3	2	4	5	2	2	28
Regulatory programs	4	2	2	0	3	1	1	2	5	20
Enhance recreation and aesthetic qualities										
Educational programs	6	3	6	4	5	5	4	5	3	43
Technical assistance	6	3	7	5	5	5	5	6	3	45
Voluntary guidelines	3	1	2	1	1	2	2	2	2	16
Tax incentives	1	1	1	2	0	1	0	1	1	8
Fiscal incentives	4	1	6	2	2	4	2	3	1	25
Regulatory programs	2	0	1	0	0	0	0	0	5	8

Note: Regional groupings of States are Northeast: CT, ME, MA, NH, RI, VT; Lake States: MI, MN, WI; Mid-Atlantic: DE, MD, NJ, NY, PA, VA, WV; Mid-Continent: IL, IN, KT, MO, OH; Southeast: AL, FL GA, MS, NC, SC; South Central: AR, LA, OK, TN, TX; Great Plains: IA, KS, NB, ND, SD; Rocky Mountain: AZ, CO, MT, NM, UT, WY; West: AK, CA, HI, ID, NV, OR, WA.
Source: Ellefson and others (1995).

Table 7—State government executive branch units exercising enforcement functions involving the use, management, and protection of forests, by organizational level and type of activity (2000)

Primary enforcement function	Cabinet or sub-cabinet level executive branch units			Governing or advisory bodies to executive branch units
	Cabinet level	Subcabinet level first tier	Subcabinet level second tier	
Functional enforcement activities				
Administration, personnel, operations	4	10	2	0
Information, information management	5	29	12	3
Law, legal counsel	51	27	3	0
Occupational licensing	2	6	1	9
Planning, budgeting, review, analysis	8	18	9	3
Regulation, permits, enforcement	1	22	11	3
Other	13	17	3	3
Total	84	129	41	21
Resource-oriented enforcement activities				
Air quality, pollutant management	1	29	9	8
Energy conservation	14	9	5	1
Environmental quality, protection, management	22	16	0	21
Waste management, recycling	0	19	7	4
Chemical and pesticide abatement	0	4	4	2
Water quality, pollutant management	0	33	15	6
Other	1	12	4	2
Total	38	122	44	44
Total	122	251	85	65

Note: Some units recorded more than once because of multiple enforcement functions.
Source: Ellefson and others (2001, 2002).

Other States with similar statutory provisions are Florida, Maine, Maryland, Mississippi, Ohio, Pennsylvania, South Dakota, Utah, and Wisconsin. Not all prohibit outright the adoption of enforcement standards more stringent than Federal law; many require a detailed and complex set of justifications and procedural reviews if proposed State standards are more stringent than Federal requirements. Among problems with "no more-stringent" laws is the loss of State flexibility to address unique and especially severe resource problems that may require more severe enforceable measures than those authorized by Federal law (Environmental Law Institute 1997).

Enforcement mechanisms—State agencies that are responsible for administering forest-practice regulatory programs focused on private forests have substantial institutional capacity to enforce laws and rules. They do so in a variety of ways, including the use of informal conferences, notices to comply, stop-work orders, corrective actions, injunctions, and civil and criminal penalties. Information describing the nature of these enforcement actions is readily available from State agencies responsible for such programs (Ellefson and others 1995). For example, from 1984 through 1991, regulatory enforcement actions in California numbered as follows: misdemeanor actions, 461; injunctions, none; license denials, 4; and corrective actions, 110. In Oregon during 1989, 109 citations were issued as follows: failure to notify of intent to harvest, 32 percent of citations; improper harvest activities, 24 percent; improper written plans, 16 percent; road construction and maintenance, 15 percent; incomplete reforestation, 9 percent; and inappropriate chemical application, 2 percent. Similar information exists for other States with regulatory programs focused on forests.

State forest-practice laws often authorize State agencies to repair damage caused by violations of forest-practice rules. For example, the Washington Department of Natural

Resources "may expend funds available to undertake and complete [corrective forest practices], and operator, timber owner, and forest landowner shall be jointly liable for the actual, direct cost thereof." Similarly, in Oregon, "the State Forester or by contract [shall] repair the damage or correct the unsatisfactory condition . . . and shall prepare an itemized [cost] statement thereof and shall deliver a copy to the operator, timber owner and landowner." Under Maryland's Critical Areas Act, illegal timber cutting resulting in failure to reforest can result in a circuit court's assessing violators the cost of replanting the trees. And in Vermont, the Secretary of the Agency of Natural Resources may "fix and order compensation for any public property destroyed, damaged or injured [as a result of unacceptable discharge in waters]" and may order persons responsible for water pollution to reimburse governments that have taken corrective action. Other States that have authority to take corrective action include Idaho and Nevada, where operators and landowners who fail to take corrective action and subsequently do not reimburse the State for the cost of doing so may be refused future permits to harvest timber or may have liens imposed on their forest property. In Idaho, for example, the State will not accept an operator's notification of intent to harvest timber until corrective action is taken on a previously harvested site. In California and Oregon, the State has authority to place a lien on property. Oregon's authority in this respect is clear: failure to reimburse the State for corrective actions "shall constitute a general lien upon the real and personal property of the operator, timber owner, and landowner . . . and may be foreclosed in the manner provided by law."

Laws known as "bad-actor laws" or "contingency regulations" have been adopted by at least 12 States in recent years. These laws impose obligations only on those landowners or timber harvesters who have already committed or are in the process of committing violations of standards considered necessary to forest sustainability. Under these types of statutes, the owner or harvester has no prior obligation (to, for example, obtain a permit before harvesting), and the enforcement response tools are more limited, more narrowly focused, and less complex than might occur under comprehensive regulatory laws. States with bad-actor laws or contingency regulations include Delaware, Idaho, New Hampshire, Virginia, and West Virginia. In Delaware the State Forester can issue special orders requiring cessation of silvicultural activities that are likely to pollute a waterway and can require implementation of corrective measures. In Virginia a cease-and-desist order may be issued and corrective actions may be ordered. In Idaho, if a landowner or timber harvester fails to apply appropriate best management practices or is known to have willfully caused degradation of water resources, an operating bond may be required as a condition for continuing timber-harvesting activities. In West Virginia, if failure to use a particular best management practice is causing or contributing to soil erosion and water pollution, an order for immediate suspension of work may be issued if there is a present danger to life or if there is risk of uncorrectable soil erosion. In New Hampshire, the State is authorized to issue cease-and-desist orders to suspend logging or forestry operations in areas where such operations are likely to result in pollution of surface water or ground water.

Information about civil and criminal penalties for violation of legally established forest-practice standards is readily available from various compilations of State forestry and related law. For example, penalties of the following nature existed in 1992: Alaska—civil penalty up to $10,000 per violation; California—criminal penalty up to $1,000, or 6 months in prison, or both; Connecticut—civil penalty up to $5,000 for each offense; Idaho—criminal penalty misdemeanor violation with fines recoverable by administering agency; Maine—civil penalty for failure to notify (harvest of less than 50 cords: up to $50, more than 50 cords: up to $1,000 each occurrence), continued operation after cessation order up to $1,000 per day; Massachusetts—civil penalty up to $100 per acre for each acre in violation, harvest without license $500 per violation; Montana—civil penalty up to $1,000 per violation of Streamside Management Act; Nevada—criminal penalty misdemeanor fines and prison sentence; New Mexico—criminal penalty misdemeanor fines and prison sentence; Oregon—civil penalty up to $10,000 per violation and criminal penalty misdemeanor fine of $2,500 or 1 year in prison for individuals and $5,000 or twice the gain for corporations; Virginia—civil penalty up to $5,000 per violation; Vermont—civil penalty up to $10,000 per day of violation and criminal penalty up to $25,000 or up to 6 months in prison, or both; Washington—civil penalty up to $5,000 per violation and criminal penalty $100 to $1,000 or 1 year in prison, or both; and West Virginia—civil penalty up to $2,500 first offense and up to $5,000 subsequent offenses (Ellefson and others 1995). Some States rely on a matrix of factors when imposing penalties, one factor being prior violations committed by a landowner or timber harvester (for example, Montana's implementation of streamside management zone regulations).

Investments and personnel—States employ professionals in enforcement activities important to sustainable forestry. Unfortunately, nearly all of the readily accessible information concerns enforcement personnel involved with forest-practice laws administered by State agencies. Information about enforcement and investigation personnel involved in arson, theft, and fraud may exist but has not been compiled and analyzed. Similarly, information on the enforcement personnel of agencies with broader environmental responsibilities that are relevant to forest resource conditions (for

example, pollution control agencies, departments of agriculture, environmental quality boards) is just becoming available (Ellefson and others 2003). In 2003, the 10 States with comprehensive forest-practice regulatory programs administered by lead forestry agencies employed more than 470 full-time-equivalents (FTEs) to carry out enforcement activities (table 8). In 1991, the 320 FTEs engaged in such activities represented only 5 percent of the total FTEs of lead forestry agencies in the 10 States considered. If enforcement personnel affiliated with agencies that are not traditionally considered lead forestry agencies is included, the number exceeds 400 (table 9).

Information about the intensity of enforcement efforts (investment per acre, personnel per acre, and number of field inspections) is especially relevant to an understanding of institutional enforcement capacity. Such information has been gathered and analyzed for only the 10 States with lead forestry agencies that are responsible for comprehensive forest-practice regulatory programs. Institutional capacity measurements for 1992 for these States were as follows: Alaska: 0.05 FTEs per 100,000 acres of private forests, $7 investment per 1,000 acres, 40 percent of FTE time on field inspections; California: 1.26 FTEs per 100,000 acres of private forests, $543 investment per 1,000 acres, 40 percent of FTE time on field inspections; Idaho: 0.42 FTEs per 100,000 acres of private forests, $164 investment per 1,000 acres, 60 percent of FTE time on field inspections; Maine: 0.04 FTEs per 100,000 acres of private forests, $20 investment per 1,000 acres, 10 percent of FTE time on field inspections; Massachusetts: 0.59 FTEs per 100,000 acres of private forests, $20 investment per 1,000 acres, 35 percent of FTE time on field inspections; Nevada: 4.46 FTEs per 100,000 acres of private forests, $16,234 investment per 1,000 acres, 45 percent of FTE time on field inspections; New Mexico: 0.36 FTEs per 100,000 acres of private forests, $27 investment per 1,000 acres, percentage of FTE time on field inspections not available; Oregon: 0.75 FTEs per 100,000 acres of private forests, $318 investment per 1,000 acres, 45 percent of FTE time on field inspections; and Washington: 1.26 FTEs per 100,000 acres, $836 investment per 1,000 acres, 15 percent of FTE time on field inspections (Ellefson and others 1995).

State capacity to enforce the use of forest-practice codes often depends on informed landowners and professionally astute timber harvesters, as well as professional resource managers such as foresters and wildlife managers. In 1995, 25 States had active registration, certification, or licensing programs for timber harvesters (MacKay and others 1996). Of this total, six States had licensing programs under which a person was not allowed to conduct timber-harvesting activities without demonstrating through written or field exams an informed ability to do so. In nearly all cases, an understanding of a State's code of best forest practices was the basis for granting a license. In 2001, 26 States reported certification programs for timber harvesters, and 13 States reported some form of licensing of professional foresters (National Association of State Foresters 2001).

Monitoring and analysis—Enforcement activities of State forestry agencies rely on their ability to monitor the rate at which the forest-practice standards are being applied.

Table 8—Lead State forestry agency staffing for the administration of comprehensive forest practice regulatory programs, by State (1985-2003)

	Staffing							
State	1985	1986	1987	1988	1989	1990	1991	2003
	full-time equivalents							
Alaska	6.5	6.5	4.5	2.5	2.5	3.0	3.0	7.9
California	68.0	68.0	68.0	68.0	74.0	83.0	94.0	124.5
Connecticut	*	*	*	*	*	*	*	3.0
Idaho	4.5	5.5	5.5	8.0	10.0	8.0	13.7	20.0
Maine	*	*	*	*	*	6.0	6.0	12.7
Massachusetts	16.0	16.0	17.0	16.0	15.0	15.0	15.0	16.0
Nevada	5.0	5.0	5.0	5.0	5.0	5.0	5.0	7.0
New Mexico	7.0	7.0	7.0	7.0	7.0	7.0	7.0	9.0
Oregon	44.1	48.2	48.2	53.6	62.6	64.3	64.3	94.0
Washington	58.1	58.1	73.0	73.0	77.5	77.5	112.8	176.0
Total	209.2	214.3	228.2	233.1	253.6	273.1	320.8	470.1

Note: Asterisk indicates information not available or program not established. Connecticut Forest Practices Act established June 28, 1991.
Source: Ellefson and others (1995, 2003).

Table 9—Staffing of State forest practice regulatory programs, by selected States and administering agency (1991)

State and agency	Staffing
	full-time equivalents
Alaska	
Division of Forestry	3.0
Division of Fish and Game	5.0
Department of Environmental Conservation	2.0
California	
Department of Forestry and Fire Protection	94.0
Regional water quality agencies	12.0
Department of Fish and Game	10.0
State Water Resources Board	1.0
Connecticut	
Division of Forestry	4.0 (est)
Florida	
Regional water management districts	2.8
Idaho	
Department of Lands	13.7
Division of Environmental Quality	4.0
Maine	
Maine Forest Service	6.0
Department of Inland Fisheries and Wildlife	0.5
Land-use Regulation Commission	1.0
Department of Environmental Protection	0.1
Maryland	
Chesapeake Bay Critical Areas Program	8.0
Waterways Access Program	4.0 (est)
Nontidal Wetlands Program	1.0
Massachusetts	
Division of Forests and Parks	15.0
Montana	2.0
Division of Forestry	
Nevada	
Division of Forestry	5.0
New Mexico	
Division of Forestry and Resources Conservation	7.0
Oregon	
Department of Forestry	64.3
Department of Environmental Quality	2.0
Department of Fish and Wildlife	2.0
Washington	
Division of Forest Practices	112.8
Department of Fisheries	7.0
Department of Ecology	9.2
Department of Wildlife	5.0
Total	403.4

Source: Ellefson and others (1995).

Only then can the agencies redirect or intensify their enforcement efforts toward critical problems or opportunities. In 1997, 34 States conducted compliance-monitoring programs to determine whether relevant codes were being applied (table 10) (Ellefson and others 2001a). Although nearly one-third of the States had not initiated a formal compliance-monitoring program, this does not mean that forest practices are not monitored in those States. In some, monitoring activities (inspections) are carried out when landowners participate in cost-share programs (for example, Federal Forestry Incentives Program and Stewardship Incentives Program) or when formally designated Tree Farms are reinspected. In States where forestry operations are by law incomplete until approved by an inspector, the required preharvest and postharvest inspections are considered compliance monitoring. Legislative directives often compel compliance monitoring. Montana requires determination of "how current forest practices are affecting watersheds," Minnesota requires "a program for monitoring silviculture practices and the application of timber harvest and forest management guidelines," and Washington requires "annual assessment of how regulations and voluntary processes are working" (Ellefson and others 2001a).

The forest practices most commonly monitored by States are those that most strongly affect water quality, riparian areas, and forested wetlands (table 11). In 2000, the results of monitoring were found to be used in a variety of ways, including modification of education and training programs (in 23 States), targeting of technical assistance programs (in 20 States), modification of existing guidelines (in 11 States), and development of additional guidelines (in 12 States) (National Association of State Foresters 2001). In 1997, the lead State forestry agency was the only agency engaged in monitoring compliance with recommended best forest practices in only 20 States (Ellefson and others 2001b).

Local Government Capacity

Many local units of government have laws, rules, and guidelines that are significant contributors to forest sustainability (ordinances protecting special resources, limiting timber harvesting, preserving individual trees). Whether they have the capacity to actually enforce these laws, rules, and guidelines is largely unknown. Hickman and Martus (1991) identified nearly 400 local ordinances regulating forestry practices in 1991, with more than 70 percent established since 1980 and half established since 1985. In 1993, Martus and others (1995) identified 522 local ordinances regulating forestry activities in 24 States, with 68 percent of them in northeastern States and 27 percent in southern States. In 1996, there were more than 100 local ordinances directing the application of forest practices in New York alone. As of 2000, county and municipal governments in 10 of the 13 southern States had enacted a total of 346 forest-related ordinances (an increase from 7 States and 141 ordinances in 1992), most of which were enacted in States experiencing rapid urban expansion (Wear and Greis 2002).

Local enforcement potential is suggested by the total number of local political jurisdictions within a State that could possibly adopt laws, rules, and guidelines affecting forest sustainability. In 1991, an estimated 8 percent of all

Table 10—State programs monitoring compliance with best-forest-practice standards, by region and number of States (1997)

	Monitoring program exists		Compliance monitoring conducted					
Region	Yes	No	On all harvested sites	On sample of harvested sites	On selected sites more intensely	Monitor training required	Incentive provided to private landowner	Individual landowner compliance made public
North	11	9	2	9	4	10	2	5
South	13	0	2	12	2	11	0	7
West	10	7	4	5	7	7	1	9
Total	34	16	8	26	13	28	3	21

Note: Compliance monitoring may be focused on forest-practice guideline programs that are voluntary, mandated for landowners and harvesters, or both. Nationally, 13 States have compliance monitoring programs that are part of a voluntary practice program (North: 4, South: 8, West: 1); 9 that are part of a mandatory program (North: 3, South: 1, West: 5); and 12 that involve both voluntary and mandatory programs (North: 4, South: 4, West: 4). (North Region: CT, DL, IA, IL, IN, MA, MD, ME, MI, MN, MO, NH, NJ, NY, OH, PA, RI, VT, WI, WV; South Region: AL, AR, FL, GA, KY, LA, MS, NC, OK, SC, TN, TX, VA; West Region: AK, AZ, CA, CO, HI, ID, KS, MT, NB, ND, NM, NV, OR, SD, UT, WA, WY.)
Source: Ellefson and others (2001a).

Table 11—State programs monitoring compliance with best-forest-practice standards, by region, resource, or condition monitored and number of States (1997)

Subject area	Region (number of States)			
	North	South	West	Total
Water quality	11	13	9	33
Riparian	10	11	9	30
Wetland	9	8	7	24
Soil productivity	1	5	7	13
Wildfire, insects, and diseases	3	1	9	13
Aesthetics	4	3	5	12
Wildlife habitat	2	1	8	11
Reforestation	3	1	6	10
Cultural-historic resources	2	0	3	5
Recreation	2	0	2	4
Other	1	3	5	9

Source: Ellefson and others (2001b).

local jurisdictions nationwide had forest-practice enforcement potential. This estimate is based on the known frequency of forest-practice regulatory programs at the local level in the following States: Colorado, 3 of 63 counties; Delaware, 1 of 3 counties; Florida, various of 57 counties; Georgia, 11 of 159 counties; Illinois, 100 of 1,200 municipalities and 1 of 102 counties; Louisiana, 1 of 64 parishes; Maryland, 20 of 23 counties; Michigan, 10 to 15 of 1,200 townships; Minnesota, 1 of 87 counties; New Jersey, 300 of 567 municipalities and 15 of 21 counties; New York, 70 of 900 municipalities; North Dakota, 7 of 53 counties; Pennsylvania, 13 of 420 municipalities; Vermont, 2 of 251 municipalities; and Wisconsin, 3 to 4 of 1,500 municipalities and 2 of 72 counties (Ellefson and others 1995).

In some cases, State forest-practice laws prohibit or severely restrict local governments from regulating forest practices. The argument is that the existence of many and potentially conflicting regulatory jurisdictions can be an administrative burden to those owning land or operating businesses in many different parts of a State. Oregon's Forest Practices Act is quite specific in this respect: ". . . no unit of local government shall adopt any rules, regulations or ordinances or take any other actions that prohibit, limit, regulate, subject to approval or in any other way affect forest practices on forestland." Idaho and Washington also restrict local governments from developing forest-practice codes and implementing them.

Summary of Conditions

Enforcement of accepted forestry standards is often an important and necessary step in furthering societal interests in the sustainability of forests and the communities that depend on them. This review of institutional enforcement actions at Federal, State, and local levels of government suggests the following:

- Enforcement authority and institutional capacity needed to achieve standards of forest sustainability exist for nearly all State and Federal agencies that have responsibility for forests and related resources. However, the extent to which this capacity is exercised varies considerably within different levels of government and among different agencies. Enforcement authority is noticeably scattered among many different agencies of State government.
- Institutional capacity for enforcement is exercised in a variety of ways, ranging from preharvest reviews and postharvest inspections to fines and imprisonment, and from court-ordered injunctions to recovering the cost of repairing damaged resources through liens on private property. Because the resource, social, and political conditions associated with forests are diverse, the range of enforcement mechanisms must be very broad. In some respects, use of incentives to shape behavior can be viewed as enforcement.
- Penalties associated with enforcement capacity include broad civil and criminal actions, provisions for fines and jail sentences, termination of actions by injunctions, rescinding of previously granted incentives, revoking of licenses and permits, and placement of liens on property for violations committed. The effectiveness of these penalties in shaping the behavior of landowners and timber harvesters is largely unknown.

- Enforcement authority and institutional capacity emanate from both environmental law (relating, for example, to solid waste disposal) and public health law (relating, for example, to toxic substances), as well as law that is specifically focused on forests and forestry practices. There is substantial variation in the scope, focus, and intensity of State and Federal agency enforcement capacity stemming from these different legal authorities and relating to forests.
- Enforcement authority is very often designed and organized to be implemented in a targeted fashion. For example, enforcement actions are focused on specific sectors (private forests), geographic areas (riparian areas), forestry practices (clearcutting), pollutants (pesticides), and products or benefits (timber, wildlife). Enforcement authority and the intensity with which institutions apply it are not uniform across these target areas.
- Enforcement of laws, rules, and guidelines is often accomplished through the involvement of third parties. Examples of such third parties include those that license, certify, or register timber harvesters on the basis of their understanding of acceptable forestry activities.
- Environmental pollution control law often exempts forestry or silvicultural activities from the standards and penalties specified therein, instead deferring to incentives, cost-sharing, or voluntary programs as means of accomplishing sustainable forestry objectives.
- Enforcement actions may defer to voluntary compliance with forest-practice standards, rules, and guidelines, but very often link voluntary actions to some enforcement mechanism. For example, compliance with best management practices may void the need for a permit, excuse compliance with a related law, or make operations immune from being defined as a nuisance.
- State governments in some cases have been extremely reluctant to adopt programs that rigorously and directly enforce the application of sustainable forestry practices. Instead, they rely on voluntary compliance with such practices, buttressed by educational and incentive programs. However, many States have adopted "bad-actor" laws or "contingent regulations" that focus enforcement on the exceptionally uncooperative landowner or timber harvester.
- State governments have often limited their enforcement ability to sustainability standards specified by Federal law or regulation (for example, through "no more-stringent" laws). By State law or regulation, State-adopted standards that are more stringent than Federal standards are not allowed. Such limitations on enforcement relate primarily to control of water pollutants from nonpoint sources.
- Local units of government are often engaged in enforcement actions involving forest sustainability, although many States limit or prohibit local regulation. The extent and effectiveness of local regulatory enforcement of sustainable forestry practices are not known.

Issues and Trends

The literature identifies a number of major issues and trends involving the enforcement of laws, regulations, and guidelines relevant to forest sustainability and conservation. Examples of this literature (from which the following issues and trends are drawn) are: Anderson 2000, Cubbage and Moffat 1997, Ellefson and others 1995, Ellefson and others 2001b and 2002, Environmental Law Institute 1997 and 1998, Ice and others 1997, National Association of State Foresters 2001, National Research Council 1998, U.S. Department of Agriculture, Forest Service 2002, and Wear and Greis 2002.

- The number of Federal, State, and local government agencies involved in the enforcement of standards of forest sustainability has increased dramatically over the past 3 decades. In most cases, each agency's enforcement authority is grounded in that agency's responsibility for a single forest value (for example, air, water, or wildlife). This requires much coordination within and between governments, and forces landowners and timber harvesters to try to keep abreast of many different enforcement provisions.
- Legal frameworks supporting the enforcement of standards of forest sustainability have been strengthened in recent decades by many new Federal laws and regulations that directly or indirectly influence the forest practices of public and private landowners. These Federal laws have in many cases nurtured political and administrative environments within which State and local governments have sought and applied more rigorous enforcement authority.
- Management approaches of regulatory agencies and land management agencies have become increasingly divergent. Land management agencies attempt to focus on long-term ecosystem and social needs (for example, implementation of long-term strategic plans), while regulatory agencies tend to focus in the short term on individual proposed actions (for example, review permits, inspect projects).
- Institutional frameworks supporting the enforcement of standards of forest sustainability have been strengthened in recent decades with the establishment of a large number of Federal laws and regulations that directly or indirectly influence the forest practices of public and private landowners. These Federal laws have in many

cases nurtured political and administrative environments within which State and local governments have sought and applied more vigorous enforcement authority.

- Enforcement authorities of governments at different levels have increased in number and complexity, and this suggests a need for more coordination and greater clarification of roles and responsibilities. This is true especially for the enforcement authorities of local governments.
- State governments have made increasing use of "bad-actor" laws or "contingent regulatory" laws. Under such laws, landowners and harvesters do not have prior obligations to government (for example, to obtain a permit before harvesting). Enforcement is focused on only those landowners or timber harvesters who have already committed or are in the process of committing a violation of law or rules.
- Enforceable authority is increasingly being established for targeted areas such as specially protected watersheds, estuaries, and coastal waters; wild and scenic rivers; fish and wildlife habitat; and specially designated waters that are considered impaired. This focusing of authority provides for more explicit operating requirements for landowners and timber harvesters.
- States are increasingly limiting the expansion of regulatory enforcement via State laws that prohibit adoption of standards that are more stringent than Federal standards for forestry, natural resources, or environmental protection generally. This decreases legal and administrative flexibility to address issues of sustainability that are unique to a State.
- Enforcement authorities emanating from forest law and from broad environmental law have increasingly come into conflict as environmental agencies have more aggressively enforced environmental statutes. This is especially common for enforcement authorities involving nonpoint-source water pollution.

Information Adequacy

Specification

Information about the institutional capacity for enforcing laws, rules, and guidelines that are considered important to forest sustainability has been surveyed by various public and private organizations. In 1999, the National Association of State Foresters surveyed State forestry agency information about institutional enforcement capacity. It was found that 6 States had abundant information about the enforcement of laws, rules, and guidelines and that 19 had sufficient information of this kind. Twenty-one States had no information about enforcement. Eight States reported that the quality of their information was excellent, 19 that it was adequate, and 5 that it was poor (National Association of State Foresters 2001).

The following questions relate to the gathering of information that might help us better assess institutional capacity to enforce standards of forest sustainability and conservation:

- *Measurement information*—Information about which variables are significant and how they should be measured to accurately portray conditions involving enforcement capacity has not been assembled. What conditions should be measured and compiled (for example, personnel per unit area, area of forest covered, number of landowners and harvesters involved, rate of compliance with standards, rates of fines, durations of prison sentences, number of open cases pending administrative or judicial review)? What measurable conditions are the best indicators that standards of sustainable forest management are being met? How often are these variables to be measured? Are there special measurement needs associated with different types of enforcement activity?
- *Extent of enforcement activity information*—Information about the extent of institutional enforcement capacity has often been assembled in an uncoordinated way, so that the results depict only current conditions and lack local, regional, and national consistency. What are the legal mandates for enforcement at various geographic levels and by various organizations? How are these requirements changing over time? Are there differences between requirements at different levels of government? Are these requirements consistent? Are there legal and constitutional issues at stake between governments? Exactly how much enforcement is occurring (number of violations, judicial injunctive relief, prosecutions, Federal contract violations) and what is its focus (by forest benefit, landowner category)? How much is being invested in enforcement (in money, personnel, equipment]? What are the educational requirements for employment in enforcement programs (basic, specialized, continuing education)? What is the status of local government enforcement programs (extent, reason for proliferation)? Are compilations of information about enforcement as it is currently carried out useful for guiding future policy and program direction? Is there a need to expand centralized reporting systems for enforcement (LOOT system, LEMARS system, reporting of county and municipal enforcement activities)?
- *Responsible organization information*—Comprehensive information about what organizations are actively engaged in enforcement activities has not been assembled. What government agencies are engaged in enforcement, and at what levels? What legal authority assigns them responsibility, and is this authority being

interpreted accurately? Do different public organizations engaging in code development have similar or differing goals and objectives, and do any differences hinder code development and implementation? Do private organizations have a role in enforcement, and if they do, what is the nature of that role and what prompted such involvement (for example, privately sponsored forest certification programs)? Are there organizational patterns in the public and private sector that, if known and publicized, would enhance overall enforcement of standards of forest sustainability?

- *Coordination information*—Information about requirements for coordination of enforcement activities among and between various levels of government has not been assembled. What conflicts exist between the various entities engaged in enforcement? How might they be productively resolved? What coordination is required? Do requirements for coordination allow for cross-sectoral, coordinated planning and review? Do they ensure that the cumulative results of local, State, and regionally undertaken enforcement will be consistent with national requirements and vice versa? Do they allow incorporation of ad hoc enforcement activities occurring at various times and undertaken by various levels of government?
- *Procedure and specification information*—Information about how enforcement standards and procedures are best developed and implemented has not been assembled. Do current statutory requirements prescribe procedures for developing and implementing enforcement actions? Are these procedures detailed and restrictive, or do they constitute a broad framework that permits administrative discretion and flexibility? Is the full intent of the existing laws that require enforcement expressed in current rules and administrative procedures? Do national requirements for enforcement allow for regional and subregional development of enforcement actions? Do requirements specify the need for leadership in their development? Do they give guidance to such leadership?
- *Scope of enforcement information*—Information about enforcement activities frequently focuses on enforcement that is related to wildlife and water quality, failing to comprehensively assess enforcement focused on other forest benefits. What enforcement capacity exists for the range of values associated with forests? What approaches have been used to encourage development and application of enforcement actions focused on this broader range of benefits? What legal requirements are there for enforcement of sustainability standards for the broad range of values associated with forests? Do these legal requirements differ among agencies at the same level or at different levels of government? Are any differences complementary or competitive? Are there barriers to developing and implementing enforcement actions other than those focused on water and wildlife? If so, how might they be overcome?
- *Investment and incentive information*—Comprehensive information about resources devoted by various institutions to enforcement activities has not been assembled. What is the magnitude of investment in enforcement activities? Are there legal and administrative processes for allocating resources to these activities, and are they sufficient? Are there legal or fiscal provisions for encouraging these activities, and especially for encouraging cross-sectoral development and implementation of enforcement activities?
- *Alternative types of enforcement information*—Comprehensive information about the appropriateness of various types of enforcement actions has not been compiled. What is the array of enforcement actions (for example, fines, imprisonment, revocation of permits, issuance of cease-and-desist orders) that might be undertaken to ensure that sustainability standards are applied? What is the relative efficiency and effectiveness of each of these approaches in fostering compliance by landowners and timber harvesters? Are certain categories of landowners and timber harvesters more apt to respond to certain types of enforcement actions? What is the appropriate scale and administrative design for successful implementation of an enforcement program?
- *Effectiveness information*—Information about the effectiveness of various approaches to enforcement in achieving sustainable forestry interests has not been compiled. Are there legal or administrative requirements to determine the efficiency and effectiveness of different ways of conducting enforcement activities? What are appropriate measures of success? Are enforcement programs funded and staffed at the appropriate level? Are there more effective ways to accomplish the objectives of enforcement (for example, fiscal incentives, technical assistance)? What opinions do stakeholders and interest groups have of enforcement actions?
- *Monitoring information*—Information about the monitoring of enforcement programs and activities has not been assembled. Are there legal requirements to monitor the results of enforcement activities? Is the information from monitoring activities being used to adapt enforcement actions to changing circumstances? Is the information being collected and analyzed in such a way that it is useful to enforcement agencies? Are monitoring programs statistically well designed? What is being done to monitor the administrative processes used to manage enforcement programs?

Recommendations

As Indicator 57 suggests, our ability to influence forest sustainability will depend a great deal on consistent, long-term enforcement of standards associated with forest sustainability and conservation. In order to improve our understanding of the institutional setting for such enforcement, we must address a variety of information voids. We recommend that the following actions be taken:

- *Comprehensive periodic reviews*. Conduct periodic and comprehensive reviews of institutional capacities to enforce laws, rules, and guidelines relevant to sustainable forestry. The reviews should give special attention to the collection of information concerning the different types of enforcement activities, the organizations that implement them, and the effectiveness of enforcement actions in promoting and conserving desired forest values. Information about enforcement at Federal, State, and local levels of government should be gathered. Special attention should be directed to information about local, county, and municipal enforcement activities, which appear to be expanding rapidly.
- *Responsibility for conducting reviews*. Since there is no single source of comprehensive information about forest-related enforcement activities, assign responsibility for conducting continuous reviews of these activities to a specific new or current administrative unit of a Federal agency (such as the USDA Forest Service's Law Enforcement and Investigations Unit, State and Private Forestry Unit, or Research and Development Unit), a college or university, or other nonprofit organization (for example, the National Association of State Foresters). This responsibility should be assigned to an organization that has achieved a good track record in addressing the complexities of developing and implementing enforcement programs that involve forests and their sustainability.
- *Devote resources to reviews*. Invest sufficient money and personnel in the review to obtain the type and quantity of information necessary to significantly improve our understanding of current abilities to develop and implement the enforcement actions that are important to sustainable forestry.

Indicator Appropriateness

Indicator Definition

Some of the words and phrases used in stating Indicator 57 have not been defined clearly. The word "enforce" is commonly taken to mean "compel conformity with some standard," but the concept of compulsion is not at all appropriate in the context of a discussion of "guidelines" as they are understood in the United States. In this country, guidelines are generally viewed as standards (criteria, touchstones, or benchmarks) to be voluntarily complied with by landowners and timber harvesters. Only if guidelines are viewed as being coercive (rather than adopted in response to fiscal incentives or technical information) should they be thought of as part of enforcement activities. It further confuses the issue that the term "enforcement" is widely associated with laws and regulations that make certain actions mandatory, whereas the term "incentives" is typically associated with guidelines in a voluntary sense. We recommend that the wording of Indicator 57 be changed to "*enforce laws and regulations and assure implementation of guidelines*," as has been suggested elsewhere (Roundtable on Sustainable Forestry 1999).

Relationship to Other Indicators

Indicator 57 overlaps with several others, particularly as they relate to laws, values, public participation, funding, and planning. There is potential for difficulty in this respect in Indicator 57's relationship to Indicators 40 (extension and use of new technology), 51 (best-practice codes), 54 (planning and coordination), 58 (investment in forests), 60 (information and data), and 66 (human intervention impacts). Even though the focus of information gathering is different for the two indicators (legal versus institutional capacity), consideration should be given to merging Indicator 57 and Indicator 51, which relates to best-practice codes. They have much in common conceptually, and the information that describes them frequently has relevance both to best-practice codes and to their enforcement.

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Appendix A

Presidential Executive Orders Representing Enforcement Actions Relevant to Forest and Related Resources, 1961-2000

Greening Government through Environmental Management Leadership (EO 13148; 2000)
Invasive Species Federal Action Directive (authorities addressing invasive species) (EO 13112; 1999)
Federal Interagency Partnership on Lake Tahoe Ecosystem (establishment of . . .) (EO 13057; 1997)
Federal Agency Standards for Content of Recycled Paper (EO 12995; 1996)
Management and Use of National Wildlife Refuge System (EO 12996; 1996)
International Union for Conservation of Nature & Natural Resources (legal immunity) (EO 12986; 1996)
Commission on Environmental Cooperation (establishment of . . .) (EO 12904; 1994)
Advisory Committee on Trade and the Environment (establishment of . . .) (EO-12905; 1994)
Environmental Cooperation Agreement (enforce NAFTA) (EO 12915; 1994)
President's Council on Sustainable Development (establishment of . . .) (EO-12852; 1993)
Grazing Fee on Federal Lands (establish rates for . . .) (EO 12548; 1986)
Presidents's Commission on Americans Outdoors (establishment of . . .) (EO 12503; 1985)
Commission on Indian Reservation Economies (establishment of . . .) (EO 12401; 1983)
Animal Damage Control on Federal Lands (environmental safeguards for . . . (EQ 12342; 1982)
Environmental Effects Abroad of Major Federal Actions (specify conditions of . . .) (EO 12114; 1979)
Environmental Evaluation Functions (transfer of certain federal responsibilities) (EO 12040; 1978)
Off-Road Vehicle Use on Federal Public Lands (establish conditions for . . .) (EO 11989; 1977)
Protection of Wetlands (establish responsibility and standards for . . .) (EO 11990; 1977)
Protection and Enhancement of Environmental Quality (EO 11991; 1977)
Preservation of Endangered Species (establish responsibility and standards for . . .) (EO 15683; 1976)
Animal Damage Control on Federal Lands (environmental safeguards for . . .) (EO 11643; 1972)
National Forests in Illinois, Michigan, Missouri, and Wisconsin (boundary of . . .) (EO 10932; 1961)

Source: National Archives and Records Administration (2001b).

Appendix B

Appendix table B.1—Provisions of major enforceable State laws to control nonpoint source water pollution, by State, water pollution law, and requirements for forestry (2001)

State	Nonpoint-source water pollution control law	Forestry nonpoint-source water pollution law
Alabama	Water pollution control law requires a permit for discharge of water pollutants, although certain nonpoint-source discharges from agriculture and silviculture are excluded from the permit requirement. State may directly enforce against nonpoint sources, if they cause violation of water quality standards or deal with any type of water pollution resulting from negligence or that produces a health hazard. Attorney General may commence a civil enforcement action for damages for pollution of the waters of the State. Enforcement includes orders, injunctions, civil actions of damages for pollution (recover reasonable costs to prevent, minimize, or clean up any damage), costs of restocking of fish killed, civil penalties of $100 to $25,000 per day, and criminal penalties for willful violation or grossly negligent violations.	Forestry Commission has power to adopt and promulgate rules and regulations pertaining to all phases of forestry. However, for enforcement the Commission relies on voluntary BMPs, licensing requirements for foresters, and the State's water pollu- pollution control act. State law authorizes soil and water conservation districts to "formulate regulations governing the use of lands within the district in the interest of conserving soil and soil resources and preventing and controlling soil erosion." "Any management guidelines developed by watershed management authorities [a special form of authority within some soil and water conservation districts] to protect forested watersheds shall follow the best management practices established by the Forestry Commission." Enforcement of district land use regulations is by injunction ordered by circuit courts or by districts performing needed corrections and subsequent recovery of expenses.
Alaska	Water pollution control law prohibits persons from "pollut[ing] or add[ing] to the pollution of the air, land, subsurface land, or water of the State." The Alaska Department of Environmental Conservation (DEC) has broad authority to adopt pollution standards and "to determine what qualities and properties of water indicate a polluted condition . . ." If an activity presents "an imminent or present danger" to the people of the State or would result in or be likely to result in "irreversible or irreparable damage" to the environment, the DEC may issue an emergency abatement order without a hearing. Superior court may also enjoin violations of statutes, regulations, orders, or permits and impose sanctions including civil penalties of between $500 and $10,000 for the initial violation and not more than $5,000 for each subsequent day of the violation. If a violation occurs with criminal negligence, it is considered a misdemeanor.	Commissioner of Natural Resources may issue nonpoint source pollution regulations subject to Department of Environmental Conservation approval. On State, municipal, and private forestland, State law provides that "environmentally sensitive areas" shall be recognized "in the development of regulations and best management practices that are designed to implement nonpoint source pollution control measures." Before beginning forestry operations on private or State public forest land, the operator must submit to the Director of the State Division of Forestry a "detailed plan of operations." Unless a stop-work order is issued or the agency extends the review period, the operator may commence work, at the latest, 30 days after submission of the plan. The plan must be renewed annually. Director may issue orders to cease violations of plan or to repair any resulting damage. Violation of statute, regulation, directive, or stop-work order can result in a maximum civil fine of $10,000, or, if criminal negligence is found, charges of a misdemeanor. Repairs may proceed with the violator liable for their cost.
Arizona	Water pollution law authorizes development of programs for nonpoint source discharges, including development of enforceable mechanisms. However, the Department of Environmental Quality is required to adopt a "program to control nonpoint source discharges of any pollutant or combination of pollutants into navigable waters." Thus, enforceable mechanisms could be created by regulation.	State law does not appear to contain enforcement requirements specifically focused on nonpoint source water pollution from forestry activities.

continued

Appendix table B.1—Provisions of major enforceable State laws to control nonpoint source water pollution, by State, water pollution law, and requirements for forestry (2001) (continued)

State	Nonpoint-source water pollution control law	Forestry nonpoint-source water pollution law
Arkansas	Water pollution control law establishes a general discharge prohibition that may be used to take enforcement action against nonpoint source discharges, namely unlawful to "cause pollution . . . of any of the waters of this State," or to "place or cause to be placed any sewage, industrial waste, or other wastes in a location where it is likely to cause pollution of any waters of this State." Pollution and Ecology Commission is the responsible enforcement agency and is authorized to conduct investigations and administrative proceedings, and institute civil enforcement actions in the proper court. Administrative penalties may be no greater than $10,000 per day of violation; civil actions may result in penalties not over $10,000 per day of violation, an order to enjoin violations and/or compel compliance, an order for remedial measures, and recovery of all costs, expenses, and damages. Violations may also be criminal misdemeanors punishable by imprisonment for not more than 1 year, or a fine of not more than $25,000, or both. A purposeful, knowing, or reckless violation adversely affecting human health or the environment is a felony, punishable by imprisonment.	State law does not appear to contain enforcement requirements specifically focused on nonpoint source water pollution from forestry activities. However, there is a restriction on tree-cutting near river beds, namely "it is unlawful to remove any trees growing below the normal high watermark on any river or stream which has been designated as a navigable river or stream." Violators are subject to a fine of not less than $10.00 and not more than $1,000.
California	Water pollution control law (Porter-Cologne Act) establishes enforceable permitting provisions and empowers regional water quality control boards to order the abatement of nonpoint-source discharges. Timber harvesting operations conducted under the State's forest practices act are exempt from the waste discharge requirements if the law's requirements are certified as best management practices by the U.S. Environmental Protection Agency. Enforcement of pollution control law is by order, injunction, or remedial action with cost recovery. Other sections of the law provide for civil penalties, injunctions, misdemeanor prosecutions, and administrative orders.	State's forest practices law addresses nonpoint-source pollution in the context of forestry practices and timber harvesting activities. Law divides the State into three districts (coast forest, northern forest, southern forest) with distinct rules established by the State Board of Forestry. Rules must "protect the soil, air, fish, and wildlife, and water resources, including, but not limited to, streams, lakes, and estuaries," and must include measures for "soil erosion control, for site preparation that involves disturbance of soil or burning of vegetation following timber harvesting activities . . . , for water quality and watershed control, for flood control . . . [etc.]." Rules are implemented through requirements for licensing of foresters and for filing and approval of timber harvest plans; ". . . no person shall conduct timber operations unless a timber harvesting plan prepared by a registered professional forester has been submitted for such operations to the Department of Forestry." Law provides for public comments and review of proposed plans by other agencies. Reports of completion of work must be filed within 1 month after completion of the activity described in the plan, and operations must be inspected within 6 months. Enforcement measures include license actions, misdemeanor prosecutions (with fines of not more than $1,000 per day or imprisonment for more than 6 months), civil injunction actions, and departmental corrective actions with cost recoveries. Although local government regulation of forestry is largely preempted, the California Tahoe Regional Planning Agency may adopt rules that are stricter than those promulgated by the Board of Forestry.

continued

Appendix table B.1—Provisions of major enforceable State laws to control nonpoint source water pollution, by State, water pollution law, and requirements for forestry (2001) (continued)

State	Nonpoint-source water pollution control law	Forestry nonpoint-source water pollution law
Colorado	Water pollution control law establishes a general policy declaration favoring the prevention of discharge of untreated pollutants. However, the law does not have a general enforceable prohibition that directly applies to nonpoint sources. Instead, the law confers authority on the Water Quality Control Commission to adopt regulations which may include nonpoint-source regulations. The law specifically requires the use of nonregulatory mechanisms before regulatory approaches may be used.	Board of Agriculture has the power and duty "to foster and promote the control of soil erosion on . . . forestlands." State law does not appear to specify enforcement requirements related to nonpoint-source water pollution from forestry activities.
Connecticut	Water pollution control law makes it a violation to discharge any substance to the waters of the State without a permit, namely ". . . no person or municipality shall initiate, create, originate, or maintain any discharge of water, substance or material into the waters of the State without a permit for such discharge issued by the Commissioner of Environmental Protection." "Discharge" means "the emission of any water, substance or material into the waters of the State, whether or not such substance causes pollution." In such a context, discharge is not limited to point sources. In setting standards for permits, the Commissioner must consider "best management practices," namely practices that reduce the discharge of waste into the waters of the State and that have been determined to be acceptable based on technical, economic, and institutional feasibility. Enforcement authorities include orders prohibiting or abating pollution and orders to correct potential sources of pollution. Civil penalties are available up to $25,000 per day. Criminal actions may be brought for willful violations with a sanction of up to $25,000 per day and/or 1 year of imprisonment.	State forestry law requires any person engaged in commercial forest practices to obtain and maintain a State certificate in one of three categories, namely forester, supervising forest products harvester, and forest products harvester. Certified foresters, supervisors, and harvesters are required to file annual reports of their activities and continuing education. The certification process provides a basis for assuring that forest practices are conducted in accordance with forest practice rules addressing nonpoint-source water pollution. State law authorizes the Commissioner of Environmental Protection to adopt regulations "governing the conduct of forest practices including, but not limited to, the harvest of commercial forest products . . . such regulations shall provide for a comprehensive statewide system of forest practices regulations which will . . . afford protection to and improvement of air and water quality . . ." The law also authorizes municipalities to regulate forest practices in a manner consistent with the State law. Municipal regulations must be approved by the Commissioner. Enforcement tools include civil penalties of up to $5,000 per day per offense, compliance orders, injunctions, and denial, suspension, or revocation of a certificate.
Delaware	Water pollution control law requires that ". . . no person shall, without first having obtained a permit from the Department of Natural Resources and Environmental Control, undertake any activity that may cause or contribute to discharge of a pollutant into any surface or groundwater . . ." The adopted permitting regulations are aimed at point sources, but the State also can use this statutory authority to deal with nonpoint-source pollution events. Numerous nonpoint activities do not require a permit (for example, activities involving drainage ditches; uncontaminated stormwater discharges; application of fertilizer; plowing or cultivating for agricultural or horticultural purposes; irrigation; movement of earth for building excavations). Enforcement mechanisms include civil penalties, orders, and injunctions.	State's forestry administrator "shall provide for the protection of the waters of the State from pollution by sediment deposits resulting from silvicultural activities." A special order may be issued by the administrator if it is determined that an owner or operator is conducting any silvicultural activity in a manner that is causing or is likely to cause alteration of physical, chemical, or biological properties of any State water, resulting from sediment deposition and presenting an imminent and substantial danger to public health, safety, or welfare, or recreational, commercial, industrial, agricultural or other reasonable uses. The order may direct the owner or operator "to cease immediately all or part of the silvicultural activities on the site and to implement specified corrective measures within a stated period of time." Special orders are issued after notice and hearing and are effective not less than 5 days after service, except for emergency special orders which may be issued immediately. Failure to comply can lead to civil penalties of $200 to $2,000 per violation per day, although intentional and knowing violations of orders are subject to fines of $500 to $10,000 per violation per day.

continued

Appendix table B.1—Provisions of major enforceable State laws to control nonpoint source water pollution, by State, water pollution law, and requirements for forestry (2001) (continued)

State	Nonpoint-source water pollution control law	Forestry nonpoint-source water pollution law
Florida	Water pollution control law administered by the Department of Environmental Protection (DEP) prohibits any person ". . . to cause water pollution so as to harm or injure human health or welfare, animal, plant, or aquatic life or property." Also a violation of State law is failure to obtain a permit required by law, rule, or regulation adopted to prevent such pollution. Additional and separate State law provides water pollution prevention enforcement authority for Florida's five water management districts. DEP enforcement powers include civil actions for damages; actions for civil penalties up to $10,000 per day; administrative actions for damages; and administrative orders for abatement or other corrective action, subject to administrative hearings. The law also provides for injunctions and for criminal prosecution for violations committed with intent.	State relies on voluntary best management practices; enforcement, if necessary, is under the State's water pollution discharge laws. Where applicable, persons engaging in forest harvest operations must file a "notice of a general permit" with a water management district.
Georgia	Water pollution control law authorizes a permit program to control nonpoint sources that may impair water quality. Specifically, law requires a permit for anyone seeking to "erect or modify facilities or commence or alter an operation of any type which will result in the discharge of pollutants from a nonpoint source into the waters of the State, which will render or is likely to render such waters harmful to the public . . ." Permits are required only if the State's Environmental Protection Division "has issued one to the same person for a point source discharge." Injunctive relief and civil penalties of up to $50,000 per day are provided for, as are criminal penalties of $2,500 to $25,000 and/or imprisonment.	State forestry laws do not appear to contain enforceable provisions relating directly to nonpoint-source pollution. However, State does require registration of professional foresters, with continuing education and relicensing. Forest practices for hire must be conducted by a professional forester. Enforcement of licensing requirements includes injunction, license revocation, and misdemeanor prosecution.
Hawaii	Water pollution control law includes some provisions that may be used to take enforcement action against nonpoint source discharges that are not permitted or that result in water quality violations. Administrative and civil (up to $10,000 for each offense) penalties are authorized. Criminal sanctions are more stringent if the violation was "knowing" rather than "negligent."	State law does not appear to contain enforcement requirements specifically focused on nonpoint source water pollution from forestry activities.

continued

Appendix table B.1—Provisions of major enforceable State laws to control nonpoint source water pollution, by State, water pollution law, and requirements for forestry (2001) (continued)

State	Nonpoint-source water pollution control law	Forestry nonpoint-source water pollution law
Idaho	Water pollution control law provides that "no person shall conduct a new or substantially modify an existing nonpoint-source activity that can reasonably be expected to lower the water quality of an outstanding resource, except where the nonpoint source activities are temporary or short-term and do not alter the essential character of a stream segment." Prior agency approval is required to conduct any new nonpoint-source activities affecting such waters. Where total maximum daily loads are required, the State must develop "pollution control strategies for both point sources and nonpoint sources for reducing those sources of pollution." If a person fails to obtain new nonpoint-source approval in those few instances where it is required (outstanding resource waters), or fails to implement best management practices and violations of water quality standards result, the State may institute a civil action. Nonpoint-source activities not conducted according to BMPs may be subject to compliance schedules, administrative and civil relief including injunctive relief.	State forestry law requires the Forest Board to "develop methods for controlling watershed impacts resulting from cumulative effects" of forest practices. Under the Idaho Forestry Act, best management practices are defined as practices that the Forest Board determines to be the "most effective and practicable means of preventing or reducing the amount of nonpoint pollution generated by forest practices," and the rules under the act establish site-specific BMPs for stream segments of concern. If implementation of BMPs is insufficient to protect beneficial uses, the forest activity may be deemed "an imminent or substantial threat." Operators are required to post a notice of intent to engage in forestry practices; a bond is required where an operator has failed to apply BMPs or willfully caused degradation of water resources. Rules are enforced through issuance of notices of violation and cease and repair orders. Relevant sanctions include suits for reparations, attachment of liens, bond forfeiture, and injunctive relief. The Right to Conduct Forest Practices Act limits the circumstances under which forest practices may be deemed a nuisance.
Illinois	Water pollution control law provides that "No person shall cause or threaten or allow the discharge of any contaminants that would cause or tend to cause water pollution, or that would violate regulations or standards . . ." Enforcement occurs by injunction, mandamus, or other appropriate remedy and/or civil penalties. Civil penalties of a maximum of $50,000 for the violation and $10,000 for each continuing day may be assessed.	State law does not appear to contain enforcement provisions specifically focused on nonpoint-source water pollution from forestry activities.
Indiana	Water pollution control law provides that "A person may not: (1) throw, run, drain, or otherwise dispose into any of the streams or waters of Indiana; or (2) cause, permit, or suffer to be thrown, run, drained, allowed to seep, or otherwise disposed into any waters; any organic or inorganic matter that causes or contributes to a polluted condition of any waters, as determined by rule . . ." Water Pollution Control Board can establish requirements for permits "to control or limit the discharge of contaminants into State waters." While this is not limited to point sources, the current regulations cover permitting for point sources and do not require permits for "any introduction of pollutants from nonpoint-source agricultural and silvicultural activities." Laws are enforced by administrative order, civil penalties of up to $25,000 per day, and injunctions. Failure to comply with an order is a misdemeanor.	State law does not appear to contain enforcement provisions specifically focused on nonpoint-source water pollution from forestry activities.

continued

Appendix table B.1—Provisions of major enforceable State laws to control nonpoint source water pollution, by State, water pollution law, and requirements for forestry (2001) (continued)

State	Nonpoint-source water pollution control law	Forestry nonpoint-source water pollution law
Iowa	Water pollution control law contains a general prohibition against unpermitted discharges of pollutants (defined as "wastes") into waters, which may be used to reach some types of nonpoint-source discharges. Enforcement is through cease and desist orders, civil penalties up to $5,000 per day, injunctions, and criminal (serious or aggravated misdemeanor) prosecution. Cities and counties are authorized to assess a civil penalty equal in amount to the penalty assessed by the State.	State law does not appear to contain enforcement provisions specifically focused on nonpoint-source water pollution from forestry activities.
Kansas	Water pollution control law provides that "No person shall place or permit to be placed or discharge or permit to flow into any of the waters of the State any pollutants, except pursuant to a permit." Enforcement of these provisions is by corrective action orders, civil penalties of up to $10,000, and criminal prosecutions.	State law does not appear to contain enforcement provisions specifically focused on nonpoint-source water pollution from forestry activities.
Kentucky	Water pollution control law may be enforced against nonpoint-source discharges that pollute State waters in violation of applicable standards or regulations: "No person shall, directly or indirectly, throw, drain, run or otherwise discharge into any of the waters of the Commonwealth . . . any pollutant in contravention of the standards adopted by . . . rule, regulation, permit or order or any provision of the statute." The Natural Resources and Environmental Protection Office or the Attorney General may institute an action to recover penalties or bring an action seeking an injunction. Violators are subject to a civil penalty not to exceed $25,000 per day for each violation. Knowing violations are a felony punishable by a fine not to exceed $25,000, or imprisonment of 1 to 5 years, or both.	State Forest Conservation Act (1998) establishes enforceable mechanisms applicable to commercial timber harvesting. No person shall conduct commercial timber harvesting operations unless a certified "master logger" is on site who has completed certain educational requirements (including continuing education every 3 years). Timber harvesting operations must use appropriate best management practices (BMPs) which are defined by the State's Division of Forestry, approved by the Agriculture Water Quality Authority, and reviewed by the Forestry Best Management Practices Board. If a logger or operator fails to use appropriate BMPs or is causing water pollution, a written warning is issued and/or the logger or operator must attend a conference with district foresters. Continued failure to comply can result in issuances of a special order mandating immediate implementation of the corrective measures or cessation of all or a portion of the timber harvesting operation. Subsequent failure to discontinue noncompliance may result in logger or operator being deemed a "bad actor" and subjected to civil penalties of up to $1,000. Agriculture Water Quality Act also establishes enforceable BMPs that apply to farm operations of 10 or more acres, including silviculture conducted on such operations.
Louisiana	Water pollution control law prohibits any person from conducting an activity "which results in the discharge of any substance into the waters of the State without the appropriate permit, variance, or license." The law is not applicable to "unintentional nonpoint-source discharge resulting from agricultural, horticultural, or aquacultural products." Regulations also exclude from the permitting requirements "introduction of pollutants from nonpoint sources resulting from normal agricultural and silvicultural activities."	State forestry law provides that any person who cuts standing cypress trees on water bottoms owned by the State of Louisiana is subject to a fine (up to $5,000) and/or imprisonment (up to 6 months). Furthermore, the State's Natural and Scenic Rivers Act prohibits commercial harvesting of timber within 100 feet of low-water marks, with exceptions including selective harvesting of trees, cutting to control disease or insects, and harvesting timber for personal use by the person owning the property. Civil penalties of up to $1,000 per day for each violation can be imposed.

continued

Appendix table B.1—Provisions of major enforceable State laws to control nonpoint source water pollution, by State, water pollution law, and requirements for forestry (2001) (continued)

State	Nonpoint-source water pollution control law	Forestry nonpoint-source water pollution law
Maine	Water pollution control law provides that "No person may directly or indirectly discharge or cause to be discharged any pollutant without first obtaining a license" from the appropriate State agency, a prohibition that includes nonpoint-source discharges. If discharge, emission, or deposit of any materials into any waters, air, or land constitutes a substantial and immediate danger to the health, safety, or general welfare, the governing State agency shall request the Attorney General to initiate immediate injunction proceedings to prevent such discharge. Additional enforcement mechanisms include administrative consent orders, civil injunctive remedies, and civil penalties of up to $10,000 per day. Criminal violations can result in a fine of not less than $100 and not more than $25,000 per day of violation.	State forestry law authorizes rules to protect water quality. Management plans are required for clearcuts in excess of 50 acres. Landowners are required to notify the State's forestry agency prior to harvesting timber and to file reports on timber sales. Enforcement includes civil forfeitures of $1,000 per violation of performance standards. Violation of notice requirements results in a civil forfeiture of $50 for harvests of 50 cords or less and $1,000 for larger harvests or for failure to submit other reports. For unorganized portions of the State, the Land Use Regulation Commission establishes forest practice regulations, including timber harvesting standards for slash disposal, clearcut size and location, retention of buffer strips, and a general requirement to "reasonably avoid sedimentation of surface waters." The State's shoreland zone law protects areas within 250 feet of the normal high-water line of any great pond, river, or saltwater body, within 250 feet of a coastal wetland or the upland edge of a freshwater wetland, and within 75 feet of the highwater line of a stream. Statute limits timber harvesting in the protected areas to selective cutting of no more than 40 percent of trees 4 inches or more in diameter in any 10-year period, prohibits timber harvests within 75-foot areas abutting great pond shorelands zoned for resource protection, and requires reforestation within 2 growing seasons of any harvest beyond the 75-foot buffer.
Maryland	Water pollution control law provides that "a person may not discharge any pollutant into the waters of this State." To enforce this requirement the Department of the Environment may require nonpoint-source dischargers to obtain permits under certain circumstances. Enforcement of permits is by corrective action orders, injunctions, civil penalties not exceeding $10,000 per day (judicially) or $1,000 per day (administratively), or criminal prosecution. Furthermore, on land managed under an agricultural soil conservation and water quality plan approved by the local soil conservation district, "it is unlawful for any person to add, introduce, leak, spill, or otherwise emit soil or sediment into waters of the State or to place soil or sediment in a condition or location where it is likely to be washed into waters of the State by runoff of precipitation." Enforcement is by injunctive relief or corrective action orders. Civil penalties up to $25,000 per day or criminal penalties up to $50,000 and/or 1 year imprisonment may be imposed.	State forestry law requires the Department of Natural Resources "to administer forest conservation practices on privately owned forestland and manage publicly owned forestlands," and authorizes the promulgation and enforcement of rules and regulations specifying forest practice standards, which are to be enforced by district forestry boards. State law also provides for licensing of professional foresters. Under the State's Nontidal Wetlands program, forestry activities are required to have an erosion and sediment control plan, except that various forestry practices are exempted from the planning requirement. Under the Chesapeake Bay Critical Area Protection Program, "all harvesting of timber in the Chesapeake Bay Critical Area shall be in accordance with plans approved by the district forestry board."

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Appendix table B.1—Provisions of major enforceable State laws to control nonpoint source water pollution, by State, water pollution law, and requirements for forestry (2001) (continued)

State	Nonpoint-source water pollution control law	Forestry nonpoint-source water pollution law
Massachusetts	Water pollution control law prohibits any person from ". . . discharging any pollutant into waters of the commonwealth, except in conformity with a permit . . . or shall be punished by a fine . . . or by imprisonment . . . or shall be subject to a civil penalty not to exceed $25,000 per day of such violation." However, regulations issued pursuant to the law exempt from permit requirements "any introduction of pollutants from non-point source agricultural and silvicultural activities, including runoff from orchards, cultivated crops, pastures, range lands, and forestlands." Enforcement mechanisms, in addition to civil penalties, include orders and injunctive relief.	State forestry law (Forest Cutting Practices Act) requires preparation of minimum forest cutting practices and guidelines (best management practices). Landowners must give prior notice to the appropriate agency and to neighboring property owners of intent to harvest. The notice must include a proposed cutting plan. Not covered by the law is cutting for the owner's own use, cutting of less than 25,000 board feet or 50 cords, or land-clearing activities. Enforcement is by stop-work order and fine of up to $100 per acre. Harvesting timber for hire or profit requires a license and requires licensees to demonstrate familiarity with the State's laws on forestry and timber harvesting; enforcement is by fine and injunction. State law also prohibits the placement of slash within 25 feet of any continuously flowing stream, or any pond, river, or water supply. Forestry operations in wetlands are subject to additional regulations and to best management practice requirements.
Michigan	Water pollution control laws prohibit the direct or indirect discharge into the waters of the State any substance that is or may become injurious to public health, safety, or welfare; to domestic, commercial, industrial, agricultural, recreational uses; to the value or utility of riparian lands; or to livestock, wild animals, birds, fish, aquatic life, or plants. The Department of Environmental Quality may promulgate rules and issue orders restricting the polluting content of any waste material or polluting substance discharged or sought to be discharged into any waters of the State. The State may bring civil actions or criminal prosecutions in court, revoke a permit, issue an order of abatement, or refer cases to the Attorney General. Sanctions include civil fines of not less than $2,500 and not more than $25,000 per day, and terms of imprisonment and other penalties for knowing violations.	State forestry law authorizes forest improvement districts wherein minimum forest practice standards are to be applied. Persons who intend to conduct forestry operations must submit a forest management plan notifying the district board of intent to comply with the forest practice standards. The board can issue a notice of violation if a forest practice rule is violated and may order the operator to make "reasonable efforts to repair the damage or correct the unsatisfactory condition." If the operator fails to comply, the board may take action and then file a lien to recover the costs of the action. State's Inland Lakes and Streams law requires permits for projects that affect lakes and streams (for example, stream crossings). Enforcement is by civil action with fines up to $10,000 per day.
Minnesota	Water pollution control law obligates every person to notify the State of the discharge of any substance or material that may cause pollution of the waters and the discharger to take all reasonable actions to minimize or abate the pollution caused. Rules state that no sewage, industrial waste, or other wastes shall be discharged from either a point or nonpoint source into the waters of the State in such quantity or in such a manner as to cause water pollution. Enforcement accomplished by criminal prosecution, civil penalties, injunction, and other actions to compel performance.	State forestry laws have few provisions regulating private forestry operations with respect to nonpoint-source water pollution, although the Sustainable Forest Resources Act of 1995 provides for voluntary forest practice guidelines. Department of Natural Resources is prohibited from selling State forestland that borders on or is adjacent to meandered lakes or public waters and water courses, and if the Department harvests these State lands, it must "reserve the timber and impose other conditions deemed necessary to protect watersheds, wildlife habitat, shorelines, and scenic features." Clear cutting is prohibited where "soil, slope or other watershed conditions are fragile" and within certain distances of wild, scenic, and recreational rivers.
Mississippi	Water pollution control law prohibits any person ". . . to cause pollution of any waters of the State or to place or cause to be placed any wastes in a location where they are likely to cause pollution; and to discharge any wastes into any waters of the State which reduce the quality of such waters below established water quality standards." Enforcement is by administrative orders, civil penalties of up to $25,000 per day, injunction, or misdemeanor prosecution. Regulations provide that no permit may be required for nonpoint agriculture and silviculture pollution.	Forest Harvesting Law requires that certain numbers of trees be left on each acre for growing stock and/or seed trees after harvest. Law does not apply to land clearing for crop production, pasture, building sites, or roads, or to noncommercial cutting by owners for their own use. Enforceable by injunction or by misdemeanor or prosecution with a fine of $25-$50 per working unit of 40 acres or less.

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Appendix table B.1—Provisions of major enforceable State laws to control nonpoint source water pollution, by State, water pollution law, and requirements for forestry (2001) (continued)

State	Nonpoint-source water pollution control law	Forestry nonpoint-source water pollution law
Missouri	Water pollution law provides that it is "unlawful for any person to cause pollution of any waters of the State or to discharge any water contaminants into any waters of the State which reduce the quality of such waters below established water quality standards." Enforcement is through administrative penalties up to $10,000 per day, civil penalties up to $10,000 per day, and criminal prosecution.	State law does not appear to contain enforcement provisions specifically focused on nonpoint-source water pollution from forestry activities.
Montana	Water pollution control law makes it unlawful to cause pollution of any State waters or to place or cause to be placed any wastes where they will cause pollution of any State waters. However, exempt from the prohibition is "any placement of materials that is authorized by a permit issued by any State or Federal agency . . . if the agency's permitting authority includes provisions for review of the placement of materials to ensure that it will not cause pollution of state waters." Statute also makes it unlawful to "cause degradation of State waters without authorization" and establishes a detailed nondegradation policy for State waters. Department of Environmental Quality has general inspection and penalty authority for violations of the water quality code, including issuance of specific compliance orders, cleanup orders, and administrative penalties of up to $10,000 per violation per day. Civil actions include temporary and permanent injunctions, while judicial remedies include civil penalties of up to $25,000 per day and, for willful or negligent violations of the discharge prohibition, criminal fines of up to $25,000 per day, or imprisonment of up to 1 year, or both. Criminal penalties may be doubled for repeat violations.	State forestry law requires creation of streamside management zones for forest streams (strip at least 50 feet wide) within which certain activities are prohibited, including: broadcast burning; off-road vehicle operation; clearcutting; road construction (unless necessary for stream crossing); handling, storage, application, or disposal of hazardous substances; and deposit of slash in water bodies. Department of Natural Resources and Conservation has inspection authority on Federal, State, and private land to ensure compliance with the rules for streamside management zones and may issue civil penalties of up to $1,000 per day, as well as rehabilitation orders. State's forest practice law requires use of best management practices and requires that notice be given prior to commencement of any forestry practices. Consultation with landowner or operator may result, the intent of which is to provide information and advice.
Nebraska	Water pollution law makes it unlawful to "cause pollution of any waters of the State or to place or cause to be placed any wastes in a location where they are likely to cause pollution" of State waters. Enforcement is through corrective action orders, injunctions, civil penalties up to $10,000 per day, and criminal (felony and misdemeanor) prosecution. State may recover damages for restocking the waters with fish or replenishing wildlife.	State law does not appear to contain enforcement provisions specifically focused on nonpoint-source water pollution from forestry activities. However, the State's Erosion and Sediment Control Act may be applicable to forestry activities.
Nevada	Water pollution control law authorizes prescriptions for "diffuse sources" (equivalent to nonpoint sources) of water pollutants that are "significantly causing or adding to water pollution in violation of a water quality standard." Special regulations exist to protect the Lake Tahoe watershed. It is illegal to discharge waste within 100 feet of Lake Tahoe or a stream or other water supply in the watershed.	State forestry law requires a permit for logging operations and for conversion of timberland to any use other than the growing of timber. All logging permits require the use of best management practices to prevent, eliminate, or reduce water pollution from diffuse sources. Violation of permit conditions can result in administrative revocation of permit and/or charge of a misdemeanor violation punishable with a fine (up to $1,000) and/or imprisonment (6 months or less). Statute prohibits "felling of trees, skidding, rigging or construction of roads within 200 feet of a waterbody" or tractor logging on slopes of 30 percent or more. Variances may be granted for both prohibitions. Tractor skid trails, landings, logging truck roads and firebreaks to be located, constructed, used, and left so as to not "appreciably diminish water quality."

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Appendix table B.1—Provisions of major enforceable State laws to control nonpoint source water pollution, by State, water pollution law, and requirements for forestry (2001) (continued)

State	Nonpoint-source water pollution control law	Forestry nonpoint-source water pollution law
New Hampshire	Water pollution control law does not expressly focus on nonpoint sources yet requires that ". . . after adoption of a given classification for a stream, lake, pond, tidal water, or section of such water, it shall be unlawful for any person or persons to dispose of any sewage, industrial, or other wastes, in such a manner as will lower the quality of these waters . . ." The Department may issue cease-and-desist orders, seek injunctive relief in courts, request civil penalties of up to $10,000 per day, or impose administrative penalties of not more than $2,000 per offense. Willful or negligent violations, or knowing failure to obey a lawful order subjects the violator to a fine of up to $25,000 per day and/or imprisonment for up to 6 months.	State forestry law authorizes the Department of Resources and Economic Development to develop and implement enforceable provisions regarding timber harvesting on private and public lands. Law requires filing of a notice of intent to cut, cross-compliance with the State's wetlands permitting program, and compliance with the State's Alteration of Terrain Program. Harvesting is prohibited within specified distances of great ponds, and standing bodies of water, and within 50 feet of any perennial stream. Law also prohibits disposal of slash and mill residue in any perennial stream or standing body of water. Cease-and-desist orders can be issued against any timber operation in violation of the law; violations may be enjoined by superior court. Administrative fines may also be assessed for any offense, not to exceed $2,000 per violation. The Alteration of Terrain Program requires loggers to notify of intent to cut and obligates them to abide by appropriate best management practices to include all State laws pertaining to logging operations. State's Comprehensive Shoreland Protection law is also partly applicable to forestry activities as it requires natural woodland buffers near shorelands.
New Jersey	Water pollution control law prohibits the discharge of any pollutant except as authorized by statute or under a permit. Enforcement provisions include compliance orders, injunctive relief, civil penalties of not more than $50,000 for each violation, and criminal sanctions if there is a knowing or reckless violation that causes a significant adverse environmental effect.	State law does not appear to contain enforcement provisions specifically focused on nonpoint-source water pollution from forestry activities.
New Mexico	Water pollution control law does not contain enforceable provisions directly applicable to nonpoint-source discharges. However, law does authorize the Water Quality Control Commission to promulgate and publish regulations to prevent or abate water pollution in the State and to require permits. Law provides for administrative orders and penalties up to $25,000 per day.	State law does not appear to contain enforcement provisions specifically focused on nonpoint-source water pollution from forestry activities. However, the State's forest practices law requires permits and inspections for timber harvesting beyond specified specified minimum timber volumes and harvest areas. New Mexico counties may also enact enforceable ordinances addressing harvest practices (Rio Arriba County has a timber harvest permit process that incorporates as mandatory conditions the State's voluntary forest practice guidelines).
New York	Water pollution law declares State policy to maintain reasonable standards of water purity "and to that end require the use of all known available and reasonable methods to prevent and control the pollution of the waters of the State." Enforcement is by administrative order, injunction, a civil penalty of up to $25,000 per day, or criminal prosecution (for willful violations).	State law does not appear to contain enforcement provisions specifically focused on nonpoint-source water pollution from forestry activities.

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Appendix table B.1—Provisions of major enforceable State laws to control nonpoint source water pollution, by State, water pollution law, and requirements for forestry (2001) (continued)

State	Nonpoint-source water pollution control law	Forestry nonpoint-source water pollution law
North Carolina	Water pollution law specifies (absent a permit or special order) that no person shall cause or permit any waste, directly or indirectly, to be discharged to or in any manner intermixed with the waters of the State in violation of the water quality standards applicable to assigned classifications. Violators of the law may be assessed civil penalties of up to $10,000 per violation per day, misdemeanor criminal fines of up to $15,000 per violation per day, or felony criminal fines of up to $250,000 per violation per day; they also are subject to injunctive relief.	Sedimentation Pollution Control Act regulates certain kinds of land-disturbing activity that causes erosion and sedimentation and requires the Department of Environment, Health and Natural Resources to adopt "Forest Practice Guidelines Related to Water Quality" (best management practices for forest activity). The guidelines are presented in the North Carolina Administrative Code as well as in a Forestry Practices Manual issued by the Division of Forest Resources. Forest activities conducted in accordance with these guidelines are exempt from the other provisions of the act.
North Dakota	Water pollution law makes it unlawful "to cause pollution of any waters of the State or to place or cause to be placed any wastes in a location where they are likely to cause pollution of the waters of the State." This provision is not restricted to point sources. State law also requires a permit for a range of activities that would cause a "discharge" or "would otherwise alter the physical, chemical, or biological properties of any waters of the State in any manner not already lawfully authorized." Enforcement actions include emergency orders, judicial injunctions, fines of up to $50,000, and, for willful violations, jail terms of 1 or 2 years. Civil penalties of up to $10,000 per day are also available for violations without willful intent.	State law does not appear to contain enforcement provisions specifically focused on nonpoint-source water pollution from forestry activities.
Ohio	Water pollution law applies to all waters of the State. However, pollution resulting from farming, silvicultural, or earthmoving activities is exempted. Local units of government (such as Soil and Water Conservation Districts) have inherent powers to abate pollution from such sources if it is determined to constitute a nuisance.	Law specifically provides for control of sediment and related runoff from agricultural and silvicultural activities by directing the Division of Soil and Water Conservation, Department of Natural Resources, (with the approval of the Soil and Water Conservation Commission) to adopt rules establishing "technically feasible and economically reasonable standards to achieve a level of management and conservation practices in farming or silvicultural operations that will abate wind or water erosion of the soil or abate the degradation of the waters of the State by animal waste or by soil sediment including substances attached thereto." The law further empowers the Division to "establish procedures for . . . enforcement of rules for agricultural and silviculture pollution abatement." The law is implemented at the farm and forest level by local soil and water conservation districts.
Oklahoma	Water pollution law makes it "unlawful for any person to cause pollution of any waters of the State or to place or cause to be placed any wastes in a location where they are likely to cause pollution of any air, land or waters" and declares any such action to be a public nuisance. Regulations expressly construe the law to include nonpoint sources. For violations, the Department of Environmental Quality may seek an injunction, a civil penalty of up to $10,000 per violation, and/or misdemeanor criminal penalties of $200 to $10,000, and/or imprisonment for up to 6 months. However, the law divests the Department of jurisdiction over agricultural and silvicultural nonpoint sources, instead assigning jurisdiction to the Department of Agriculture for agricultural discharges and to the Conservation Commission for erosion control. Neither of these entities appears to have enforcement authorities applicable to nonpoint-source discharges.	State Board of Agriculture "shall administer silviculture best management practices in cooperation with forestry land users under the provisions of State and Federal water pollution laws, which include the process to identify silviculturally-related nonpoint sources of pollution as defined by the Oklahoma Environmental Quality Code and setting forth procedures and methods to control to the extent feasible such sources." The statute does not expressly set out enforcement authority for best-management practices.

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Appendix table B.1—Provisions of major enforceable State laws to control nonpoint source water pollution, by State, water pollution law, and requirements for forestry (2001) (continued)

State	Nonpoint-source water pollution control law	Forestry nonpoint-source water pollution law
Oregon	Water pollution control law prohibits persons from polluting "any waters of the State," from placing waste where it is "likely to escape or be carried into the waters of the State by any means," and from discharging wastes into water if the discharge reduces water quality "below the standards established by rule for such waters." The general prohibition is not expressly limited to point sources; it is interpreted to address nonpoint-source discharges. Violations of the general prohibition provision are deemed a public nuisance.	State's Forest Practices Act requires that forest operations be conducted in accordance with rules and standards "relating to air and water pollution control." State Forestry Board establishes best management practices (BMPs) "to insure that nonpoint source discharges of pollutants resulting from forest operations do not impair the achievement and maintenance of water quality standards." Operators are required to comply with BMPs, unless they can demonstrate that alternative practices yield better results. Forestry Board is authorized to require a written plan for forestry operations if operations are within 100 feet of a stream used by fish or for domestic use. Also, operators must give written notice of chemical applications to the Forestry Board which in turn must notify persons that are within 10 miles of the application and hold downstream surface water rights. Where forest operators are in compliance with the Board's BMPs, then the operations are not considered in violation of any water quality standards. Also, forestry operations are immune from private nuisance actions if they are in compliance with the act and with BMPs. Enforcement is through inspection, notice of violation, issuance of administrative orders (cease-and-desist or reparation orders), and general criminal and civil penalties, including potential civil sanctions of up to $5,000 per violation.
Pennsylvania	Water pollution law authorizes State to "enforce reasonable orders and regulations for the protection of any source of water for present or future supply to the public, and prohibiting the pollution of any such source of water rendering the same inimical or injurious to the public health or objectionable for public water supply purposes." Violation of law is a summary offense punishable by a fine of not less than $100 nor more than $10,000 for each offense. Willful or negligent violations are misdemeanors punishable by a fine of not less than $2,500 nor more than $25,000 for each separate offense and/or imprisonment in the county jail for a period of not more than 1 year. Civil penalties may be assessed not to exceed $10,000 per day per violation. State may also issue orders or seek injunctive relief.	State law does not appear to contain enforcement provisions specifically focused on nonpoint-source water pollution from forestry activities. However, with respect to erosion and sediment related pollutants, forest harvesting activities involving earth-moving must comply with the regulatory program authorized by the Clean Streams Law.
Rhode Island	Water pollution law makes it unlawful for any person to place any pollutant in a location where it is likely to enter the waters of the State. Enforcement is by notices of violation, compliance orders, injunctive relief, criminal liability, and civil penalties of up to $25,000 per day.	State forestry law requires, for the cutting of trees for commercial forest products, registration with the Department of Environmental Management as a woods operator. Cutting without such registration is a misdemeanor punishable by a fine of $100 to $500.
South Carolina	Water pollution law makes it unlawful for any person, directly or indirectly, to discharge pollutants into the waters of the State, except as in compliance with a permit issued by the Department of Health and Environmental Control (DHEC). Enforcement is by administrative orders, injunctive relief, civil penalties of up to $10,000 per day, and criminal penalties for willful or negligent violation of $500 to $25,000 per day and/or imprisonment for up to 2 years.	State forestry law does not specifically regulate nonpoint sources of water pollutants on private lands. However, the Erosion and Sediment Reduction Act requires the DHEC to promulgate regulations for erosion and sediment reduction and stormwater management on land owned by the State, a State agency, a quasi-State agency, or land under the management or control of such an entity. For forestland controlled by the State Forestry Commission, the commission must develop and implement a sediment reduction plan, doing so in consultation with the DHEC.

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Appendix table B.1—Provisions of major enforceable State laws to control nonpoint source water pollution, by State, water pollution law, and requirements for forestry (2001) (continued)

State	Nonpoint-source water pollution control law	Forestry nonpoint-source water pollution law
South Dakota	Water pollution law prohibits discharges of waste that result in water quality violations, and the placement of wastes in locations where they are likely to cause water pollution. The State's Water Management Board is required to promulgate water quality standards and to classify water according to its beneficial uses. The standards must protect public health, use of waters for public water supplies, propagation of fish and aquatic life and wildlife, recreational purposes, and agricultural, industrial, and other legitimate uses. Persons violating rules are liable for a civil penalty not to exceed $10,000 or for damages to the environment, or both. Criminal violations are misdemeanors subject to a fine not to exceed $10,000 and/or a sentence of up to 1 year imprisonment.	State law does not appear to contain enforcement provisions specifically focused on nonpoint-source water pollution from forestry activities.
Tennessee	Water pollution law (Water Quality Control Act of 1977) prohibits the discharge of sewage, industrial wastes, or other wastes into waters, or a location from which it is likely that the discharged substance will move into waters. However, the law does not apply to "any agricultural or forestry activity or the activities necessary to the conduct and operations thereof or to any lands devoted to the production of any agricultural or forestry products, unless there is a point-source discharge from a discernible, confined, and discrete water conveyance." Enforcement of the law is through corrective action orders, civil penalties up to $10,000 per day, criminal misdemeanor prosecution, and injunctions. Violators are also subject to action for damages.	State law does not appear to contain enforcement provisions specifically focused on nonpoint-source water pollution from forestry activities.
Texas	Water pollution law provides that no person may discharge sewage, municipal waste, recreational waste, agricultural waste, or industrial waste into or adjacent to any water in the State. Exempted from this prohibition are discharges authorized by permit, discharged in compliance with a certified water quality management plan as provided under the State agriculture code, and activities under the jurisdiction of the Department of Parks and Wildlife, General Land Office (coastal management), or the Railroad Commission of Texas. Enforcement is through administrative penalties of up to $10,000 per day, civil penalties of between $50 and $10,000, and injunctions.	State Soil and Water Conservation Board and soil and water conservation districts are empowered to plan, implement, and manage programs for abating agricultural and silvicultural nonpoint-source pollution. Where silvicultural nonpoint sources are identified as important water quality problems, the Board can certify a program for addressing the problem, using local soil and water conservation districts as the key implementers of the plan. The Board adopts rules for the plans in compliance with State water quality standards.
Utah	Water pollution law makes it unlawful for any person to discharge a pollutant into waters of the State or to cause pollution which constitutes a menace to public health and welfare, is harmful to wildlife, fish, or aquatic life, or impairs domestic, agricultural, industrial, recreational, or other beneficial uses of water. Violations of these prohibitions are treated as a public nuisance. If violations occur, the State's Water Quality Board may give written notice, may seek injunctive relief in a civil action, pursue civil penalties not to exceed $10,000, or, in the case of willful or gross negligence, seek fines not to exceed $25,000.	State law does not appear to contain enforcement provisions specifically focused on nonpoint-source water pollution from forestry activities.

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Appendix table B.1—Provisions of major enforceable State laws to control nonpoint source water pollution, by State, water pollution law, and requirements for forestry (2001) (continued)

State	Nonpoint-source water pollution control law	Forestry nonpoint-source water pollution law
Vermont	Water pollution control law prohibits discharge of any waste, substance, or material into the waters of the State without a permit. For certain classes of waters, the State "shall not regulate accepted agricultural or silvicultural practices, as are defined by the commissioners of agriculture, food and markets and forests, parks and recreation . . ." Law is enforceable by administrative orders, emergency orders, administrative penalties of up to $25,000 for a single violation or $10,000 per day (but not more than $100,000 total) for a continuing violation, civil enforcement, and criminal enforcement.	State forestry law requires notice of intent to harvest when harvest involves more than 40 acres. State forestry agency must review the proposed harvest to determine compliance with silvicultural guidelines and forestry standards and requirements with respect to water quality, wetlands, and riparian zones. Exemptions from notice are properties under a State-approved forest management plan. Violation of law or rules may result in a penalty of up to $50,000 and up to $25,000 per day for a continuing violation. Municipal bylaws may not restrict "accepted silvicultural practices."
Virginia	Water pollution law provides that except as otherwise permitted by law, it shall be unlawful for any person to place pollutants into State waters which can substantially impair the lawful use or enjoyment of such waters and their environs by others. Violations are misdemeanors and punishable by a fine of not less than $100 nor more than $500 or by confinement in jail for not more than 12 months or both such fine and imprisonment. Any person whose property is damaged or whose property is threatened with damage may seek from the court an injunction enjoining any violation of this law.	State forestry law declares that if silvicultural activities are being conducted in a manner that causes or is likely to cause pollution, the State forester ". . . may advise the owner or operator of corrective measures needed to prevent or cease the pollution." The State forester is also granted authority ". . . to issue special orders to any owner or operator . . . to cease immediately all or part of silvicultural activities on a site and to implement specified corrective measures within a stated period of time." Also authorized is the issuance of emergency orders (without advance notice or hearing) if an ". . . owner or operator is conducting any silvicultural activity in a manner which is causing or is likely to cause an alteration of the physical, chemical or biological properties of any State waters resulting from sediment deposition . . ." A civil penalty of up to $5,000 per violation per day may be assessed after the owner or operator has been given an opportunity for a hearing. Orders may be enforced by injunction.
Washington	Water pollution law prohibits the discharge of any organic or inorganic matter that shall cause or tend to cause water pollution and requires a permit for the disposal of solid or liquid waste material into waters of the State. The State Department of Ecology enforces the law by bringing an action, issuing orders or directives, or imposing penalties. Willful violations are crimes punishable by a fine of up to $10,000 and/or imprisonment for not more than 1 year. Civil violations incur penalties of up to $10,000 per day per violation.	State forestry law (Forest Practices Act) requires the State Forest Practices Board to promulgate regulations that establish minimum forest practices standards. Regulations determine which forest practices fall within which of four classes of practices, ranging from Class I, requiring no notification, through Class II-IV, requiring notification and submission of an application for approval. Class IV forest practices are considered to have "a potential for substantial impact on the environment and therefore require an evaluation." The State Departments of Ecology and Natural Resources enforce the law. The attorney general also may engage in enforcement actions, and a county may bring actions in superior court against the State departments, landowners, timber owners, and operators. Sanctions include civil penalties, collection of costs, or disapproval, for up to 1 year, of a forest practices application.

continued

Appendix table B.1—Provisions of major enforceable State laws to control nonpoint source water pollution, by State, water pollution law, and requirements for forestry (2001) (continued)

State	Nonpoint-source water pollution control law	Forestry nonpoint-source water pollution law
West Virginia	Water pollution law generally does not appear to provide for the regulation or prohibition of nonpoint-source discharges.	State forestry law requires a license for commercial timber harvest and purchase of timber or logs for resale, and certification of supervisors of logging services. If the Division of Forestry notifies the Office of Water Resources (Division of Environmental Protection) that failure to use a particular best management practice is causing or contributing, or has the potential to contribute, to soil erosion or water pollution, the Division of Environmental Protection may issue a written compliance order, issue immediate suspension of work orders, suspend licenses or certificates for 30 to 90 days for the second violation within 2 years, or revoke licenses or certificates for third violations within 2 years. The Division may seek civil penalties of up to $2,500 for the first offense and $5,000 for subsequent offenses.
Wisconsin	Water pollution law authorizes the Department of Natural Resources (DNR) to issue general orders and adopt rules for preventing and abating pollution of the waters of the State. The DNR may issue orders for the abatement of nonpoint-source pollution which it has determined to be significant on a case-by-case basis. Violators of agency orders are subject to administrative penalties of up to $5,000 per day.	State forestry law provides for a tax incentive program that requires submission of a forest management plan. Failure to file notice of intent to harvest can result in fines of up to $1,000. Persons intentionally harvesting merchantable timber in violation of the law are subject to forfeiture equal to 20 percent of the current value of the timber harvested. Furthermore, all slash which falls into or is deposited in any lake or stream or on the land of an adjoining owner, must be removed immediately. Violators are subject to fines of not more than $50; however, repeat offenders are subject to higher fines and imprisonment.
Wyoming	Water pollution law (Wyoming Environmental Quality Act) prohibits "causing, threatening or allowing the discharge of any pollution or waste into the waters of the State" or "altering the physical, chemical, radiological, biological or bacteriological properties of any waters of the State" unless authorized by permit. Enforcement measures include cease-and-desist orders, temporary and permanent injunctive relief, reparations for damages, civil penalties of up to $10,000 per violation per day, and criminal penalties of up to $25,000 per violation per day and/or imprisonment of up to 1 year.	State law does not appear to contain enforcement provisions specifically focused on nonpoint-source water pollution from forestry activities.

Sources: Adapted from Ellefson and others (1995); Environmental Law Institute (1997, 1998); National Conference of State Legislatures (2001); Wear and Greis (2002).

Information Review and Evaluation:

Economic Framework

Investment, Taxation, and Regulatory Environment (Indicator 58)

Michael A. Kilgore and Paul V. Ellefson[1]

The full text of Indicator 58 is as follows: *Extent to which the economic framework (economic policies and measures) supports the conservation and sustainable management of forests through* ***investment and taxation policies and a regulatory environment which recognize the long-term nature of investments and permit the flow of capital in and out of the forest sector in response to market signals, nonmarket economic valuations, and public policy decisions in order to meet long-term demands for forest products and services*** (Montreal Process Working Group 2003).

Rationale and Interpretation

The sustainability of forests and the many benefits they are capable of providing requires high levels of sustained investment in forest management and protection. It is only through such investment that the full range of products, values, and services provided by forests can be ensured. If investment capital is lacking in the forest sector, sustainable management and the associated economic, ecological, and social benefits may not be obtained. Similarly, if investment capital is prevented from leaving the forest sector, inefficiencies can occur and over-exploitation of forests is a possibility. Investment is affected by a number of economy-wide factors, most notably product or service prices, forestland productivity, and discount rate as affected by risk (Montreal Process Technical Advisory Committee 2000, Montreal Process Working Group 2003).

Forest investment is often discouraged by certain inherent characteristics of forests. For example, they typically grow very slowly, and this results in substantial holding costs and revenue uncertainty; they are at risk from insect and disease infestations and natural disturbances (fire and wind) that can seriously erode or wipe out the capital investment in trees; and they have a very low degree of liquidity (National Research Council 1998). Other investment opportunities often provide greater return with less risk. Understanding the economic framework within which capital can readily flow in and out of the forest sector will suggest the degree to which policies and programs support adequate long-term investment that promotes sustainable forestry (Montreal Process Technical Advisory Committee 2000).

Information indicating economic capacity for investment that promotes sustainability can be found in compilations and descriptions of laws, policies, and programs that encourage or discourage investment in, and management of, private forests. Information about the use, efficiency, and effectiveness of tax incentives or disincentives (such as income tax and property tax) and fiscal incentives (such as grants, cost-share assistance, and conservation easements) is relevant.

This review focuses on the nation's *policy and program capacity* to promote adequate private investment in forest resources within existing economic frameworks (taxation and fiscal incentives). Information about actual levels of investment in the management, use, and protection of forest resources is given only limited attention here. Regulatory programs that force private investments in forests are not reviewed here; they are given extensive coverage in the review of Indicator 57 (enforcement of laws, regulations, and guidelines). We acknowledge the importance of legal and institutional capacity to encourage investment in public forests, but an examination of information about such capacity is beyond the scope of this review.

Concepts and principles that are to be identified and addressed are suggested by the indicator. To guide this review, brief definitions of three important concepts are: *forest investment*—expenditure of funds to increase the production of goods and services from forestland; *tax incentives*—programs designed to alter the timing, type, or amount of tax expected from private forestland or the income produced from the property; and *fiscal incentives*—financial payments to owners of private forestland for the purpose of encouraging certain land uses or management practices or both (Ellefson 1992, Klemperer 1996).

Conceptual Background

Forests provide a wide range of ecological, social, and economic values. Nationally, they provide more than 16.3 billion cubic feet of wood fiber to support a forest products industry that employs more than 1.3 million people, contributes in excess of $40 billion in wages per year, and annually produces products valued at more than $200 billion (Congressional Information Service 2000). Forests also provide important nonmarket outputs such as wildlife habitat, clean water, recreational opportunities, and aesthetic enjoyment.

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Accounting for more than 474 million acres, or nearly two-thirds of all forest area in the United States, private forests are owned by some 10 million ownership units (Birch 1996, USDA Forest Service 1996). Eighty-five percent of the area of private forests is in nonindustrial private ownership, with the remaining 15 percent owned by the forest products industry (Smith and others 2001). Nearly one-half of the Nation's private forestland consists of tracts at least 500 acres in size, with 80 percent accounted for by tracts at least 50 acres in size. Fifty-nine percent of the ownerships are smaller than 10 acres in size (National Research Council 1998).

The economic and ecological contributions of the Nation's private forests are significant. More than 80 percent of the Nation's timber harvest (13.4 million cubic feet) originates from private forests; 61 percent of its growing stock inventory occurs on private lands; an estimated 148 million acres of private forestland is available for recreational use by the general public; 70 percent of carbon sequestered in the Nation's forests is located on private lands (Heath and Birdsey 1996); habitat for 86 percent of all species listed as threatened or endangered (609 species) is located on private property (U.S. General Accounting Office 1994); and hunting and fishing are among the most popular recreational activities on private forests (U.S. Department of Agriculture, Forest Service 2001a). The ability of private forests to sustainably provide these products and services is directly dependent on the level of investment devoted to them.

Landowners may invest in private forests for a number of reasons: to maintain the land in a forested condition; to improve the growth and value of trees; to reduce the risk of loss due to insects, diseases, fire, or vandalism; to develop or improve access through road and trail construction; to support management planning such as timber harvest or estate planning; or to support specific land management objectives such as tree planting, timber stand improvement, or wildlife habitat improvement (National Research Council 1998). Many forest landowners (primarily nonindustrial landowners) invest in forests in order to capture a very broad range of market and nonmarket benefits (for example, recreation, esthetic enjoyment, part of residence) (Birch 1996, Kuuluvainen and others 1996). Yet for other landowners (for example, timberland investment management organizations), investments are made with the intent of maximizing return on investment. This is often true of industrial timberland owners and other owners of large private forest holdings. Nearly 30 percent of privately owned forestland area (industrial and nonindustrial) is managed with timber production as a principal goal, yet only 3 percent of owners consider timber production to be the primary reason for ownership (U.S. Department of Agriculture, Forest Service 2001a).

Adequate investment in the Nation's private forests requires an economic climate that fosters the flow of capital in and out of the forest sector. Some have questioned whether the amount of capital required to capture many forest investment opportunities in the United States is available from most landowners (Kaiser and Royer 1997). Reasons suggested for this deficiency include high establishment costs, long investment horizons, uncertain markets, low liquidity of and access to capital, and various biological risks associated with forests (National Research Council 1998). The implication is that many individuals and organizations perceive forestland investments as characterized by high risk and low yield, and thus reject them in favor of alternative opportunities considered safer and capable of providing greater return.

Analyses have suggested that investments in forests should not be regarded as having high risk and low return. One such analysis suggests that as an asset class, timberland investment portfolios are characterized by higher-than-average returns for a given level of risk (Binkley and others 1996). The analysis reports that the average cumulative total return (nominal return including land appreciation) during the 10-year period ending in 1996 was 21.4 percent annually for timberland investments and 18.0 percent annually for the S&P 500 Index. Indeed, institutional investment in timberland grew from less than $100 million in 1986 to more than $6 billion in 1997, suggesting that long-term returns to timberland investment are competitive with those from other investments (Yin and Izlar 2001).

Taxation as Investment Influence

Tax policy can be an important means of encouraging or discouraging behavior that leads to production of goods and services associated with forests. Tax policy can significantly affect the profitability of forest investments (Bailey and others 1999), and has been applied in forestry for at least three basic public purposes: to encourage private forestland owners to invest in activities that result in increased timber supply and encourage the flow of capital from outside sources into the forestry sector; to compensate private forestland owners for the many nontimber values provided by forests from which society as a whole benefits; and to provide an equitable basis for long-term investment in forests (U.S. Department of Agriculture, Forest Service 1990). The taxes that most commonly affect forest investment and management decisions are those on income, property, and estates.

Tax policy must be well designed, properly focused, and well administered if it is to guide investment toward worthwhile opportunities represented by forests and forestry. Hibbard, Kilgore, and Ellefson (2001) suggest that good tax policies will have the following characteristics:

- Equity—Tax policies should provide for fair treatment of various sectors and of individuals within a sector. Under an equitable tax policy, taxpayers would be liable for the same amount of tax given the same set of circumstances and across a range of abilities to pay. Taxes can be designed to be proportional or to be discriminatory in the sense of being progressive or regressive. Tax equity is not achieved easily, however (Klemperer 1996).
- Efficiency—Tax policies should be efficient in gathering revenue for government operations and influencing private investment decisions. They should not distort or adversely affect market behavior, nor should they adversely affect the timing of activities such as harvest activities and timber stand improvement. Taxation should neither favor nor discourage decisions to convert forestland to a nonforest use. Tax policies and programs should also be administered efficiently (for example, efficient collection and enforcement).
- Simplicity—Tax policies should be easy to understand and administer. Taxpayers should clearly know who is taxing them, how the tax is determined, and how to make use of various tax provisions. Tax policies that are designed with simplicity in mind tend to breed a sense of fairness, reduce compliance costs, and increase accountability. Principles of simplicity and equity can be in conflict. For example, full provision for variability in forest management conditions (for example, site characteristics, growth rates, markets, species, and landowner objectives) would make the most theoretically equitable forest tax prohibitively costly to administer and too complex to apply correctly. Appropriate tax policy balances equity and simplicity (Minnesota Department of Revenue 2000).
- Adequacy, stability, and visibility—Tax policies should provide an adequate, stable, and visible source of revenue to pay for government services. The revenue generated by tax polices should be adequate and should be stable from one tax period to the next. Tax policies and their administration should be clear and widely known, so that there is political accountability for the accomplishment of desired policy outcomes.

To determine whether tax polices promote sustainable forestry, we should ask the following questions (Hibbard and others 2001): How do the tax policies affect investments in long-term forest productivity? How do they affect the propensity of private forestland owners to apply ecologically sound forest management practices? How do they encourage retention or expansion of the forestland base? How do they protect and increase the production of wildlife habitat and other important nontimber benefits? Unfortunately, however, the extent to which tax policies encourage these outcomes is often unclear. (Brockett and Gebhard 1999, Klemperer 1989, National Research Council 1998).

Fiscal Incentives as Investment Influence

Fiscal incentives can also be used as a policy tool to address certain characteristics of forests and forestry that tend to discourage forest investments. Tree planting, for example, requires significant capital expenditure without financial return for very long periods of time, often 60 years or more. Fiscal incentives can be used by government to encourage landowners to make these long-term investments, investments they might not otherwise consider (Sampson and DeCoster 1997). By providing financial payments to offset or reduce these large initial capital outlays, government can increase landowner return on investment and at the same time encourage the production of important goods and services desired by the public in general. Fiscal incentive programs initially were developed to focus on the production of timber, and typically provided cost-share payments to landowners for tree planting, site preparation, and other cultural practices that tend to increase productivity. More recently, fiscal incentive programs have been developed and implemented to address a wide range of forest resource benefits (for example, wildlife habitat improvement, scenic landscape improvement) (U.S. Department of Agriculture, Forest Service 2001b, U.S. Department of Agriculture, Natural Resources Conservation Service 2001).

Current Economic Capacity

Federal Government Capacity

Income tax provisions—The Federal tax code contains a number of provisions that affect private landowners interested in the management of their forests. For example, the tax code contains provisions that govern the allocation of costs of purchasing forestland (percentage of value attributed to land, timber, and other property improvements), the treatment of expenses commonly associated with forest management activities, and the depreciation of equipment and land improvements (Bailey and others 1999). Many of these tax provisions are complex, and vary depending on taxpayer classification (for example, corporate versus individual), use and purpose of owning the property (investment versus a business or hobby), and level of taxpayer involvement in managing the forest (material versus no material participation) (Haney and others 2001). Relatively few provisions, however, have the unique and specific objective of encouraging landowners to make long-term investments in the management of forest resources. Rather, tax provisions often apply to a broad range of income-producing activities of which forest management

is but one. Three provisions that are available to encourage investment in forest resources management are as follows:

- *Reforestation amortization and investment credit.* The reforestation amortization and investment credit is specific to forestland owners. Qualified reforestation expenditures (or afforestation expenditures in the case of planting or seeding non-forested land) paid or incurred in a tax year are eligible for a 10 percent investment tax credit. Unlike a deduction, which is an offset against income, a credit is a direct offset against taxes. In addition, qualified reforestation costs (direct expenses incurred in establishing a stand of timber, whether by planting, seeding, or natural regeneration) can be amortized as a deduction over 8 tax years to an annual maximum of $9,500 if the credit is taken. Individuals, estates, partnerships, and corporations are eligible for either or both the amortization and the tax credit. Trusts are not eligible for either (Haney and others 2001). Additionally, Federal and State cost-share payments used for reforestation can generally be excluded from gross income.
- *Capital gains treatment of timber*—The Federal tax code also provides for lower tax rates (capital gains tax treatment) on the sale or cutting by the owner of standing timber that meets certain standards (how long timber has been owned, how it is disposed of, and whether or not it is held as an investment or as part of a business). Capital gains treatment for timber can substantially lower tax bills. In 1999, noncorporate taxpayers were taxed at five levels for ordinary income, with a maximum rate of 39.6 percent. Noncorporate long-term capital gains, however, were generally taxed at rates no higher than 20 percent (10 percent for gain that otherwise would be taxed in the lowest, 15 percent rate bracket). Certain noncorporate capital gains realized after December 31, 2000 are taxed at a top rate of 18 percent and at a bottom rate of 8 percent if the timber has been held for 5 years (table 1). For corporations, ordinary income and long-term capital gains are taxed at the same rates (table 2) (Haney and others 2001).
- *Management expense*—Corporate and noncorporate timber owners may generally deduct management costs relating to timber held as an investment against income from any source in the year they were incurred (as opposed to capitalizing them). Management costs include normal expenses associated with managing the forest property (for example, consultant fees, labor, silvicultural and related management activities) and carrying charges (for example, insurance, property taxes). The specific tax treatment of management costs and carrying charges depends on a landowner's specific tax classification and ownership objectives (Haney and others 2001).

Estate tax provisions—Federal estate taxes can impose significant burdens on the inheritors of highly valued forestlands (table 3). Because a high tax rate may be imposed (50 percent maximum in 2002), estate taxes can affect forest management and timber harvesting activities and may, in extreme circumstances, force premature timber liquidation or outright forestland disposal in order to satisfy estate taxes. Major reforms in Federal estate tax provisions were made in 1997 and 2001. Through 2001, the Federal estate and gift tax were combined into a unified tax on the transfer of wealth. A "unified credit" shielded large, lifetime gifts and estates from tax, up to a certain value. Gifts and estates over the unified credit were taxed at rates ranging from 37 to 50 percent. Beginning in 2002, gift and estate taxes are treated separately, each with their own exemptions ($1 million each for gift and estate exemptions in 2002, with the latter increasing to $3.5 million in 2009). The maximum gift and estate taxes (55 percent in 2002) will decrease to 45 percent by 2009. In 2010, the estate tax is eliminated completely, and the maximum gift tax rate will equal the top individual income tax rate. At the end of 2010, however, these provisions are scheduled to "sunset," returning the estate and gift taxes to their status prior to 2002.

Table 1—Federal noncorporate income tax rates (2001)

Type of taxpayer (taxable income)			Type of income	
Married taxpayers filing joint return	Single taxpayers	Estates and trusts	Ordinary income	Net capital gains
		thousands	*percent*	
$ 0 – 45,200	$ 0 – 27,050	$ 0 – 1,800	15	8
$ 45,201 –109,250	$ 27,051 – 65,550	$ 1,801 – 4,250	27.5	18
$ 109,251 – 166,500	$ 65,551 – 136,750	$ 4,251 – 6,500	30.5	18
$ 166,501 – 297,350	$ 136,750 – 297,350	$ 6,501 – 8,900	35.5	18
$ 297,351 +	$ 297,351 +	$8,901 +	39.1	18

Source: Haney and others (2001).

Table 2—Corporate Federal income tax rates (2001)

Taxable income	Type of income (maximum marginal tax rate)	
	Ordinary income	Net capital gains
	percent	
$ 0 – 50,000	15	15
$ 50,000 – 75,000	25	25
$ 75,000 – 100,000	34	34
$ 100,000 – 335,000	39	39
$ 335,000 – 10,000,000	34	34
$ 10,000,000 – 15,000,000	35	35
$ 15,000,000 – 18,333,333	38	38
$ 18,333,333+	35	35

Source: Haney and others (2001).

Table 3—Federal estate and gift tax rates (2002-2009)

Estate tax applicable		Maximum estate and gift tax rate	
Tax year	Exclusion amount	Tax year	Tax rate
			percent
2002	$1,000,000	2002	50
2003	$1,000,000	2003	49
2004	$1,500,000	2004	48
2005	$1,500,000	2005	47
2006	$2,000,000	2006	46
2007	$2,000,000	2007	45
2008	$2,000,000	2008	45
2009	$3,500,000	2009	45

Source: U.S. Department of the Treasury (2002).

Current estate tax law provides for (a) an increasing credit that has the effect of exempting a portion of the value of the estate from taxation, (b) valuation of the forestland estate (both land and timber up to certain limits) on the basis of current use (as opposed to fair market value), and (c) exclusion of up to 40 percent of the land and timber's value (up to certain limits) if the land is enrolled in a qualified conservation easement. With careful planning, the death tax liability on a forestland estate can be reduced by more than 50 percent by taking advantage of specific estate tax provisions (Peters and others 1998).

Fiscal incentive programs—The Federal Government has a number of agencies and programs involved in reducing or offsetting large initial investments in management and related activities considered necessary to protect, improve, restore, and sustain forest resources (National Research Council 1998) (table 4). Although not all of these programs and agencies focus directly on forests, Federal funds available for cost-share and related fiscal support of private actions affecting forest conditions probably exceeds $1 billion annually. These funds are administered by at least seven major Federal agencies. The following are five examples of Federal fiscal incentive programs that encourage long-term investment in the management of forests. Some of these programs were terminated by the 2002 Farm Bill and replaced by similar, but not identical, programs that have yet to be fully developed.

- *Forest Legacy Program (FLP)*—The Forest Legacy Program is designed to protect private forestlands from being converted to nonforest uses. Focusing on protecting environmentally sensitive forestlands, the FLP provides for the acquisition of partial interests in privately owned forestlands using conservation easements. As legally binding agreements that transfer certain property rights from one party to another, conservation easements restrict development while requiring practices that sustain forest values. Voluntary participation in the program is limited to private forestland owners. To qualify, landowners must prepare a multiple-resource management plan that accompanies the conservation easement. The Federal Government may fund up to 75 percent of program costs, with at least 25 percent coming from private, State, or local sources. In addition to gains associated with the sale or donation of property rights, many landowners also benefit from reduced taxes associated with limits placed on land use. The USDA Forest Service administers the Forest Legacy Program in cooperation with State foresters. The State grant option allows States a greater role in implementing the program. The FLP also encourages partnerships with local governments and land trusts, recognizing the important contributions that landowners, communities, and private organizations make to conservation efforts (U.S. Department of Agriculture, Forest Service 2001b). In 2001, $60 million was appropriated to the Forest Legacy Program (table 5).
- *Forest Stewardship Program (FSP)*—The Forest Stewardship Program provides resources to assist private forestland owners in developing plans for the sustainable management of their forests. Program funds are used to pay for professional advice and assistance in preparing detailed natural resource management plans that reflect both landowner objectives and broader society-wide interests in private forests. These forest management plans provide guidance for the production of timber, wildlife habitat, watershed protection, recreational

Table 4—Federal programs providing financial assistance to public and private interests in forests and related resources, by program, resource focus, available funding, and administering agency (2002)

Program	Resource focus	Available funds	Lead administering agency
Chesapeake Bay Grants Program	Water	$15 million	U.S. Environmental Protection Agency
Coastal Zone Program	Wildlife	$9 million	USDI Fish and Wildlife Service
Conservation Operations Program	Soil	NA	USDA Natural Resources Conservation Service
Conservation Reserve Program	Soil	$250 million (est)	USDA Natural Resources Conservation Service
Conservation Reserve Enhancement Program	Soil	$200 million (est)	USDA Natural Resources Conservation Service
Economic Action/Rural Community Programs	Forests	$15 million	USDA Forest Service
Emergency Watershed Protection Program	Water	*	USDA Natural Resources Conservation Service
Environmental Quality Incentives Program	Soil & Water	$174 million	USDA Natural Resources Conservation Service
Farmland Protection Program	Land	$10 million (est)	USDA Natural Resources Conservation Service
Forest Health Protection Program	Forests	NA	USDA Forest Service
Forestry Incentives Program	Forests	$7 million	USDA Natural Resources Conservation Service
Forestry on Indian Lands Program	Forests	$38 million	USDI Bureau of Indian Affairs
Forest Legacy Program	Forests	$60 million	USDA Forest Service
Forest Stewardship Program	Forests	$33 million	USDA Forest Service
Land and Water Conservation Fund Grants Program	Land	$40 million	USDI National Park Service
Nonpoint Source Implementing Grants Program	Water	$200 million	U.S. Environmental Protection Agency
North American Wetlands Conservation Program (Act)	Wetlands & Wildlife	$44 million	USDI Fish and Wildlife Service
National Coastal Wetlands Conservation Program	Wetlands	$12 million	USDI Fish and Wildlife Service
National Estuary Program	Water	$15 million	U.S. Environmental Protection Agency
Payments in lieu of taxes	Various	$150 million	USDI Bureau of Land Management
Stewardship Incentives Program	Forests	(None)	USDA Forest Service
Sustainable Development Challenge Grants	Land	$5 million	U.S. Environmental Protection Agency
Rural Community Fire Protection Program	Forests	$2 million	USDA Forest Service
Urban and Community Forestry Program	Forests	$30 million	USDA Forest Service
Water Quality Cooperative Agreement Grants Program	Water	$19 million	U.S. Environmental Protection Agency
Watershed Protection and Flood Prevention Program	Water	$100 million	USDA Natural Resources Conservation Service
Wetlands Program Development Grants Program	Wetlands	$15 million	U.S. Environmental Protection Agency
Wetlands Reserve Program	Wetlands	$76 million	USDA Natural Resources Conservation Service
Wildlife Conservation and Appreciation Program	Wildlife	$1 million	USDI Fish and Wildlife Service
Wildlife Habitat Incentives Program	Wildlife	$8 million (est)	USDA Natural Resources Conservation Service

Note: Annual funding level presented. Asterisk indicates information is not readily available.

opportunities, and other benefits. While there are no ownership restrictions, recipients of FSP-funded plans typically own less than 1,000 acres of forestland. Participation is available to individuals and noncommercial landowners who agree to manage their forestland as specified in a plan for at least 10 years. FSP is not a cost-share program; rather it provides technical and planning guidance, encouraging multiresource management. Completion of a forest stewardship plan is required of landowners seeking eligibility for cost-share assistance

Table 5—Funding levels of selected Federal fiscal incentive programs focused on private forests (1993-2001)

Fiscal year	Forest Stewardship Program	Stewardship Incentives Program	Forest Legacy Program	Forestry Incentives Program
	dollars			
1993	23,280,000	17,847,000	9,915,000	12,446,000
1994	25,791,000	17,932,000	6,948,000	12,820,000
1995	25,908,000	18,283,000	0	6,625,000
1996	23,378,000	4,500,000	3,000,000	6,325,000
1997	23,378,000	4,500,000	2,000,000	6,325,000
1998	23,880,000	6,500,000	4,000,000	6,325,000
1999	28,830,000	0	7,012,000	16,325,000
2000	29,833,000	0	29,933,000	5,376,000
2001	32,782,000	0	59,868,000	6,811,000

Source: U.S. Department of Agriculture, Forest Service (2001b); U.S. Department of Agriculture, Natural Resources Conservation Service (2001).

through the Stewardship Incentives Program. Approximately $33 million was appropriated for this program in FY 2001 (U.S. Department of Agriculture, Forest Service 2001b) (table 5).

- *Stewardship Incentives Program (SIP)*—Established in 1990, the Stewardship Incentives Program provides financial assistance to private landowners to carry out forest stewardship plans and also supports implementation of forestry practices by other Federal and State agencies through their land conservation programs. The planning and evaluation requirements of the FSP, and the broadness of the range of management activities the SIP program supports, encourage landowners to undertake a variety of forest enhancement and protection activities that might not otherwise be accomplished. The SIP supports a wide range of forest management activities that, when implemented as part of a comprehensive forest stewardship plan, contribute to a healthy forest ecosystem. These activities include development of stewardship plans; reforestation and afforestation; forest and agroforest improvement; windbreak and hedgerow establishment, maintenance, and renovation; soil and water protection and improvement; riparian and wetland protection and improvement; fisheries habitat enhancement; wildlife habitat enhancement; and forest recreation enhancement. SIP participants generally own less than 1,000 acres, with waivers up to 5,000 acres on lands with potential for significant public benefit. The Federal Government may reimburse the landowner for up to 75 percent of approved expenses, to a maximum of $10,000 per year per landowner, in exchange for landowner agreement to maintain and protect SIP-funded practices for a minimum of 10 years. No Federal appropriations were made for this program in 2001 (U.S. Department of Agriculture, Forest Service 2001b) (table 5).
- *Forestry Incentives Program (FIP)*—Since its inception in 1973, the Forestry Incentives Program has supported tree planting, forest stand improvement, and site preparation for natural regeneration. In all three instances, the principal goal is to build or restore the capacity of nonindustrial private forestlands to produce timber. However, the program recognizes that healthy productive forests also provide many other public goods, such as watershed protection, wildlife habitat, aesthetics, and recreational activities. Participation in the FIP is limited to nonindustrial private forestland owners, whose properties must meet selection criteria designed to ensure that the most productive forestland receives funding. Participants generally own less than 1000 acres of forest. The Federal Government may pay up to 75 percent of approved expenses, to a maximum of $10,000 per year per landowner, in exchange for landowner agreement to maintain and protect funded practices for a minimum of 10 years. In 2001, $6.8 million was appropriated to the FIP (U.S. Department of Agriculture, Natural Resources Conservation Service 2001) (table 5).
- *Conservation Reserve Program (CRP)*—The Conservation Reserve Program encourages farmers to convert highly erodible cropland or other environmentally sensitive agricultural land to vegetative cover (for example, tame or native grasses, wildlife habitat plantings, trees, filter strips, or riparian buffers). Farmers receive an annual rental payment for the term of a multiyear contract which can be of 10 to 15 years duration. Cost-sharing is provided to establish the vegetative cover practices. The Federal Government may pay up to 50 percent of cover

crop or tree establishment costs, and rental payments of up to $50,000 per year per landowner during the 10-year rental period. CRP tree-planting contracts applied to more than 2.6 million acres as of the end of 2001 (U.S. Department of Agriculture, Farm Services Agency 2002; U.S. Department of Agriculture, Natural Resources Conservation Service 2001).

State Government Capacity

State governments have also established tax and fiscal incentives programs important to forest sustainability. The following describes selected State tax and fiscal incentive programs focused on forest sustainability.

Taxation provisions—State income, estate, and property taxes often include provisions designed to protect the sustainability of privately owned forests. Property taxes are unique to State and local governments and are implemented in many different ways when applied to forestland. In 1992 all States had tax provisions designed to promote sustainable forestry. Tax programs for promoting reforestation (16 States) and protecting water quality (14 States) were most common (table 6). In 1985, 11 States had tax incentive programs designed specifically to encourage private landowners to create, improve, or preserve forest wildlife habitat (Wigley and Melchiors 1987) (table 7).

- *Income tax—*All but seven States impose income taxes on individuals, with marginal tax rates ranging from 0.5 to 12 percent. Only four States do not have an income tax on corporations (Deloitte & Touche 2002). Of States with income tax codes for individuals and corporations, the majority use the Federal tax code as the basis for

Table 6—State government fiscal and tax programs promoting best-forest-practice standards on private forests, by forestry activity, region, and type of program (1992)

Major forestry activity and type of program	Number of States in region having program type									
	North-east	Lake States	Mid-Atlantic	Mid-continent	South-east	South-central	Great Plains	Rocky Mtn.	West	Total
Protect water quality										
Tax incentives	1	1	4	3	0	1	3	1	0	14
Fiscal incentives	2	3	5	3	1	4	5	4	2	29
Promote reforestation										
Tax incentives	2	3	3	3	1	1	0	1	2	16
Fiscal incentives	5	2	5	3	4	5	5	5	3	37
Improve timber-harvesting methods										
Tax incentives	2	2	3	1	0	1	0	0	0	9
Fiscal incentives	3	0	4	0	0	1	2	2	1	13
Protect from wildfire, insects, and diseases										
Tax incentives	0	1	3	2	0	0	0	0	0	6
Fiscal incentives	1	1	4	2	1	0	2	4	2	17
Protect wildlife and endangered species										
Tax incentives	0	0	1	2	0	0	0	0	0	3
Fiscal incentives	3	2	5	3	2	4	5	2	2	28
Enhance recreation and aesthetic qualities										
Tax incentives	1	1	1	2	0	1	0	1	1	8
Fiscal incentives	4	1	6	2	2	4	2	3	1	25

Note: Regional groupings of States are Northeast: CT, ME, MA, NH, RI, VT; Lake States: MI, MN, WI; Mid-Atlantic: DE, MD, NJ, NY, PA, VA, WV; Mid-Continent: IL, IN, KT, MO, OH; Southeast: AL, FL GA, MS, NC, SC; South Central: AR, LA, OK, TN, TX; Great Plains: IA, KS, NB, ND, SD; Rocky Mountain: AZ, CO, MT, NM, UT, WY; West: AK, CA, HI, ID, NV, OR, WA.
Source: Ellefson and others (1995).

Table 7. State wildlife agencies offering fiscal, tax, and technical services to enhance private investment in forest and related wildlife habitat (1985)

Region	Program type offered		
	Fiscal incentives	Tax incentives	Technical-educational
	number of States		
East	3	3	19
South	0	0	6
North	5	5	18
West	4	3	7
Total	12	11	50

Source: Wigley and Melchiors (1987).

treating income and expenses for State income tax purposes. (Purdue University 2002). For example, most States use Federal adjusted gross income as the starting point for determining State income tax liabilities. Nearly all State income tax codes contain provisions that differ from the Federal tax code, some of which affect forestland owners. For example, analysis of income tax laws in 14 southern States revealed that the treatment of specific income tax provisions (for example, standard deductions, deductibility of Federal income taxes, exemptions, and long-term capital gains exclusions) varied, and could affect tax liabilities associated with forestland investment and management (Bailey and others 1999, Federation of Tax Administrators 2001).

- *Estate tax provisions*—Twenty-nine States impose estate or inheritance taxes. The latter are often "piggyback" taxes, whereby a State takes a portion of the Federal estate tax as a State tax credit. The tax paid generally equals the difference between the estate tax credit allowed on the Federal estate tax return, on the one hand, and the estate or inheritance tax imposed by the State government, on the other. The net result is no net increase in the taxpayer's liability. Sixteen States impose an inheritance tax on heirs receiving the property, and five States tax the right of the decedent's estate to transfer property (Peters and others 1998).
- *Property tax provisions*—Property tax is most often collected by counties and distributed to the local units of government who impose the tax (for example, counties, cities, townships, school districts, or other special taxing districts). Although the property tax is generally a local source of revenue, nearly every aspect of property taxes is controlled by State statutes and State agencies. In 1994-1995, property taxes generated $193 billion, a sum that was 28.6 percent of the total revenue needed by local units of government (Sokolow 1998).

Depending on the specific design of the program, the property tax generally has one to three functions: to raise money for the taxing authority, to redistribute income and wealth, and to encourage certain types of behavior (Grayson 1993). Tax program design determines the entity subject to the tax, the methods of taxation, and the use of the revenue collected (Hibbard and others 2001, Purdue University 2002).

A wide variety of property tax classifications and programs exist in the United States. Five of these have special relevance to forests and forestry: current use, ad valorem, flat, yield, and exemption. An examination of 63 programs or classifications determined program frequency as: current use, 36; ad valorem, 15; flat tax, 9; and combined current use-ad valorem programs, 3 (Hibbard and others 2001, Purdue University 2002) (tables 8 and 9). At least one type of program exists in each State. Yield tax is not considered separately; it is always imposed in addition to another tax type and could be added to all of the categories.

- *Current-use programs*. In the United States, more than half of all property tax programs for forestland are current-use programs (tables 8 and 9). Such programs employ income capitalization formulas for valuation, administratively or legislatively determined land-use values, or annual measures of timberland growth value. More than three-fifths of current use programs employ income capitalization formulas, which value land according to the income it can produce. Most programs based on income capitalization make use of soil and land productivity classes. These soil or land productivity classes are translated into yield information, which is multiplied by a determined average price, often a multiyear moving average, and then management costs are deducted. Not all States deduct management costs when capitalizing land income. A number of different methods are used to calculate these costs. The capitalization rate used in current-use valuation is often indexed to a Federal or State bank rate, with the current rate averaging 9.9 percent (varying from 4.5 percent to 13 percent). The rate selected is important and it is often selected in a highly charged political environment (Hibbard and others 2001, Purdue University 2002).

  Typically, determined-use values are established by State agencies or boards. Counties determine the values in a few instances and State legislatures determine them even more rarely. Since the seemingly more scientific method of income capitalization is really politically determined, determined values may not be of any greater or lesser value or objectivity than income capitalization values. Determined-use-value programs make up one-third of the current use programs, and the balance are programs using values

Table 8—State forest property tax programs, by State, program type, eligibility, and ad valorem characteristics (2000)

State	Program name	Program type	Eligibility requirements						Modified ad valorem						
			Minimum acreage	Maximum acreage	History	Minimum income	Management plan	Percent stocked	Minimum growth	Modified rate	Original rate	Productivity classes	Price	Capitalization rate	Costs
										percent				percent	
Alabama	Class III	Income capitalization								10	20	4	Agency set	4.50	.15 (of Y*P)
Alaska		Exemption													
Arizona	Class I	Modified ad valorem								25					
Arkansas		Income capitalization								20	20		10-year average		
California	Timberland production zones	Income capitalization							15 cubic ft/acre						
Colorado	Agricultural land	Income capitalization	40				Yes	10		29	29			13	
Connecticut	Forestland	Income capitalization	25											12.4	
Delaware	a. Forest-use land	Determined-use value	10		2 yrs	$1,000/yr									
	b. Commercial forest plantation	Exemption	10				Yes								
Florida	Agricultural purposes	Income capitalization										7	$30 to $70/cord	12.6	$12.85/ acre
Georgia	a. Agricultural preferential assessment	Modified ad valorem		2,000						75	100	9			
	b. Conservation use	Income capitalization and ad valorem		2,000											
Hawaii	Timber farm property	Determined-use value	10				Yes								
Idaho	a. Forestland less than 5 acres	Ad valorem	5												
	b. Forestlands tax	Income capitalization	5	5,000								12	5-year average		
	c. Forest products yield tax	Bare ad valorem													
Illinois	a. Other farmland	Income	.				Yes					4			
	b. Vegetative filter strip	Capitalization	66 ft.							16	33.3				

continued

Table 8—State forest property tax programs, by State, program type, eligibility, and ad valorem characteristics (2000) (continued)

State	Program name	Program type	Eligibility requirements						Modified ad valorem						
			Minimum acreage	Maximum acreage	History	Minimum income	Management plan	Percent stocked	Minimum growth	Modified rate	Original rate	Productivity classes	Price	Capitalization rate	Costs
										percent				*percent*	
Indiana	a. Classified forestland	Flat ($1 per acre)	10												
	b. Woodland	Modified ad valorem						50		33.3	100				
	c. Windbreaks		50 ft.												
	d. Wildlife habitat	Flat ($1 per acre)	<10 ac.												
	e. Filter strips	Flat ($1 per acre)	20 ft.	70 ft.											
Iowa	a. Forest reservation	Exemption	2					200 trees/ac.							
	b. Agricultural use	Income capitalization												7	
Kansas	Agricultural use	Income capitalization								30.0					
Kentucky	Agricultural land	Income capitalization & ad valorem	10												
Louisiana	Timberland	Income capitalization	3			$2,000/yr						4		10	$6.53 /ac
Maine	Forestland	Productivity	10				Yes								
Maryland	Agricultural use	Determined use value					Yes								
Massachusetts	a. Forestland	Modified ad valorem	10				Yes	16.7		5% fmv					
	b. Recreation land	Modified ad valorem	5							25% fmv					
Michigan	a. Private forest reservation	Flat ($1 per acre)		160				1,200 trees							
	b. Commercial forest reserve	Flat ($1 per acre)					Yes		20 cu. ft/ac/yr						
Minnesota	a. Timberland (2b)	Modified ad valorem								1.2					
	b. Tree growth tax	Productivity	5												
Mississippi	Agricultural use	Income capitalization								15		5		>10	
Missouri	Forest croplands	Flat ($3 per acre)	20												

continued

Table 8—State forest property tax programs, by State, program type, eligibility, and ad valorem characteristics (2000) (continued)

State	Program name	Program type	Eligibility requirements						Modified ad valorem						
			Minimum acreage	Maximum acreage	History	Minimum income	Management plan	Percent stocked	Minimum growth	Modified rate	Original rate	Productivity classes	Price	Capitalization rate	Costs
										percent				*percent*	
Montana	Forestland	Income capitalization	15									5			
Nebraska	Agricultural land	Modified ad valorem								80					
Nevada	Agricultural use	Modified ad valorem	7									5			
New Hampshire	Forestland	Determined use value	10												
New Jersey	Agricultural use	Determined use value	5		2 yrs		Yes					5			
New Mexico	Agricultural use	Income capitalization	1												
New York	Forestland (480-a)	Modified ad valorem	50				Yes			80	100				
North Carolina	Forestland	Income capitalization	20											9	
North Dakota	Forest stewardship tax	Flat ($0.50 per acre)	10												
Ohio	a. Current agricultural use value	Income capitalization	10		3 yrs	$2,500/yr									
	b. Forest tax law	Modified ad valorem	10				Yes			50	100				
Oklahoma	Timberland	Modified ad valorem													
Oregon	(New program)	Ad valorem													
Pennsylvania	Forest reserves	Income capitalization	10											9.5	$4.71/ac
Rhode Island	Forestland	Determined use value					Yes								
South Carolina	Agricultural use	Income capitalization	5												
South Dakota	Agricultural land	Determined use value													
Tennessee	Forestland	Income capitalization and ad valorem					Yes								

continued

Table 8—State forest property tax programs, by State, program type, eligibility, and ad valorem characteristics (2000) (continued)

State	Program name	Program type	Eligibility requirements						Modified ad valorem						
			Minimum acreage	Maximum acreage	History	Minimum income	Management plan	Percent stocked	Minimum growth	Modified rate	Original rate	Productivity classes	Price	Capitalization rate	Costs
										percent				*percent*	
Texas	Timberland	Income capitalization			5 of 7 years							4			
Utah	Agriculture use	Determined use value	5		2 yrs							6			
Vermont	Managed forestland	Determined use value	25				Yes								
Virginia	Forest use	Income capitalization	20					40						8.58	
Washington	a. Classified forestland	Determined use value	20												
	b. Designated forestland	Determined use value	20	20											
	c. Open space timber	Determined use value	5												
West Virginia	Managed timberland	Income capitalization	10				Yes	40				3			
Wisconsin	Managed forest	Flat ($0.83 per acre)	10				Yes		20 cu. ft. per acre						
Wyoming	Agricultural land	Income capitalization												7.67	

Note: Fair market value is indicated by “fmv.” For Minnesota and New York, “2b” and “”480-a” refer to sections in State law, respectively.

Table 9—State forest property tax programs, by State, administration, penalties, and severance-yield characteristics (2000)

State and program name	Administration			Penalties					Severance or yield tax			Other characteristics	
	Application	Fee	Agency	Contract period	Rollback	Interest	Percent of inventory	Percent of stumpage	Type	Percent or set	Number of categories	Privilege tax	Percent of severance
Alabama													
Class III	One-time		County assessor		3 years				Severance	Set	14	Exemption	Standing timber
Alaska									Severance	Local			Auxiliary State forests
Arizona													
Class I									Severance	Set	2		
Arkansas									Severance	Set	2	Special timberland tax	$0.15/acre for fire protection
California													
Timberland production zones			County board		Up to 10 years				Yield	2.9		Exemption	Standing timber
Colorado													
Agricultural land			State agency						None				
Connecticut													
Forestland	Yes		State forester						Yield	2 to 10		Conveyance tax	1% to 10 % of sale price
Delaware													
a. Forest use land	Yes		County assessor		1 year				None			Exemption	Commercial
b. Commercial forest plantation	Yes		State agency		1 year				None				
Florida													
Agricultural purposes	One-time		County appraiser						None				
Georgia													
a. Agric. preferential assessment									Yield	None			
b. Conservation use									Yield	Percent of fair market value			
Hawaii													
Timber farm property	Yes		State agency	20 years	Yes					None			

continued

Table 9—State forest property tax programs, by State, administration, penalties, and severance-yield characteristics (2000) (continued)

State and program name	Administration			Penalties					Severance or yield tax			Other characteristics	
	Application	Fee	Agency	Contract period	Rollback	Interest	Percent of inventory	Percent of stumpage	Type	Percent or set	Number of categories	Privilege tax	Percent of severance
Idaho													
a. Forestland less than 5 acres									None	3%			
b. Forestlands tax				10 years					None				
c. Forest products yield tax				10 years					Yield				
Illinois													
a. Other farmland									Yield	4%			
b. Vegetative filter strip									Yield	4%			
Indiana													
a. Classified forestland			Dept. of Natural Resources						None				
b. Woodland									None				
c. Windbreaks									None				
d. Wildlife habitats									None				
e. Filter strips									None				
Iowa													
a. Forest reservation			County assessor						None				
b. Agricultural use									None				
Kansas													
Agricultural use									None				
Kentucky													
Agricultural land									None				
Louisiana													
Timberland	Yes		Parish assessor	4 years					Severance	2.25% to 5%	6	Forest protection tax	$0.08/ac
Maine													
Forestland					5 years				None				
Maryland													
Agricultural Use	Yes		Dept. of Natural Resources	15 years					None				
Massachusetts													
a. Forestland	Every 10 years		State forester		Yes	Yes			Yield	8%			
b. Recreation land									Yield	8%			

continued

Table 9—State forest property tax programs, by State, administration, penalties, and severance-yield characteristics (2000) (continued)

State and program name	Administration			Penalties					Severance or yield tax			Other characteristics	
	Application	Fee	Agency	Contract period	Rollback	Interest	Percent of inventory	Percent of stumpage	Type	Percent or set	Number of categories	Privilege tax	Percent of severance
Michigan													
a. Private forest reservation			County assessor					5	Yield	5%			
b. Commercial forest reserve	Yes	$1/ac			7-15 years plus $1/acre				Yield	5%			
Minnesota													
a. Timberland (2b)									None				
b. Tree growth tax					10 years	Yes			None				
Mississippi													
Agricultural use			County assessor						Severance		12	Forest acreage tax	$0.09/ac
Missouri													
Forest croplands	Yes				Yes	Yes			Yield	6%			
Montana													
Forestland									Severance	$0.15/mbf			
Nebraska													
Agricultural land									None				
Nevada													
Agricultural use			County assessor						None				
New Jersey													
Agricultural use	Annual		State agency		3 years				None				
New Mexico													
Agricultural use	Yes		County assessor						Severance	0.13%		Resource excise tax	0.0375% for timber processing
New York													
Forestland (480-a)	Annual		County assessor	10 year rolling					Yield	6%			
North Carolina													
Forestland	Yes		County assessor		3 years	Yes			Severance		4		
North Dakota													
Forest stewardship tax	Yes		County commissioner	5 years					None				
Ohio													
a. Current agricultural use value	Annual	$25	County auditor		3 years				None				
b. Forest tax law	Yes	$50	County auditor						None				
Oklahoma													
Timberland									None				

continued

Table 9—State forest property tax programs, by State, administration, penalties, and severance-yield characteristics (2000) (continued)

State and program name	Administration			Penalties					Severance or yield tax			Other characteristics	
	Application	Fee	Agency	Contract period	Rollback	Interest	Percent of inventory	Percent of stumpage	Type	Percent or set	Number of categories	Privilege tax	Percent of severance
Oregon													
(New program)									Yield	$3.19/mbf			
Pennsylvania													
Forest reserves	Yes		County board		7 years	6%			None				
Rhode Island													
Forestland	Yes		State agency						None				
South Carolina													
Agricultural use	Yes				6 years				Severance		4		
South Dakota													
Agricultural land									None				
Tennessee													
Forestland	Yes		County assessor						None				
Texas													
Timberland	Yes		County appraiser		5 years	7%			None				
Utah													
Agriculture use	Yes		County assessor		5 years				None				
Vermont													
Managed forest land	Yes				10 years		20		None				
Virginia													
Forest use	Yes		County assessor		6 years				Severance		11		
Washington													
a. Classified forestland	None				10 years				Yield	5%			
b. Designated forestland	Yes		County assessor		10 years				Yield	5%		Forest fire protection tax	
c. Open space timber	Yes				7 years				Yield	5%			
West Virginia													
Managed timberland					5 year	9%			Yield	3.22%		Woodland tax	$2 per parcel
Wisconsin													
Managed forest				25 or 50 years	Unlimited			5	Yield	5%			
Wyoming													
Agricultural land									None				

Note: For program name and type in application column refer to table 8.

of annual growth for taxation. Only two States, Maine and Minnesota, use annual growth programs, in which annual growth is multiplied by an average price that is then reduced by a legislatively determined percentage. (Hibbard and others 2001, Purdue University 2002).

- *Ad valorem tax program*—Ad valorem tax systems are the second most-common type of property tax program for forestland (tables 8 and 9). Most ad valorem forestland property tax programs are modified in nature, with very few utilizing a full fair-market value as the basis for property valuation. Most programs also reduce the fair-market value by some percentage, and the reduction is often greater for forested land than for land that is not in a forested condition. Ad valorem programs in many States (especially those with very limited forestland area) simply combine forestland into an agricultural classification. In yet other States, a special forest classification is established, and forestland is taxed using a reduced fair market valuation. The differences in rate reductions are great, with some States instituting a slight reduction in valuation and other States providing more than a 50-percent reduction in taxable value.
- *Flat tax program*—Flat tax programs tax all lands at the same rate, although some are accompanied by a yield tax (tables 8 and 9). Nine such programs exist at the time of this writing (four of these in one State). Flat tax rates vary from $0.50 per acre to $3.00 per acre, with an average charge of $1.16 per acre.
- *Tax exemption program*—Property tax exemption programs, in which certain forestlands are exempted from property taxation for a limited or indefinite period of time, are relatively rare in the United States, occurring only in Alaska, Delaware, and Iowa (tables 8 and 9).

  Three States (Georgia, Kentucky, and Tennessee) combine an income capitalization valuation mechanism and an ad valorem or modified ad valorem valuation mechanism. These programs value land by assigning a percentage of an income capitalization valuation plus a percentage of an ad valorem valuation to equal a full valuation. Georgia bases its full "current use" value on 65 percent of an income capitalization value and 35 percent of comparable market sales.

  State governments can also levy an additional property tax on forestland. Generally, these taxes are for such management activities as fire protection or for discouraging changes in forestland use, although they may also include severance taxes that are sometimes levied against processors as well as producers. Examples of such tax programs are the Privilege Tax (Alabama), Special Timberland Tax (Arkansas), Conveyance Tax (Connecticut), Forest Protection Tax (Louisiana), Forest Acreage Tax (Mississippi), Resource Excise Tax (New Mexico), Land-Use Change Tax (Rhode Island), Forest Fire Protection Tax (Washington), and Woodland Tax (West Virginia) (Hibbard and others 2001, Purdue University 2002).

Fiscal incentive programs—Many States have developed cost-share and other fiscal incentive programs to help private landowners manage forest resources sustainably (Bullard and Straka 1988, Ellefson and others 1995) (table 6). In 1992, State fiscal incentive programs targeting reforestation existed in 8 of 10 States and fostered forest practices important to water quality in 6 of 10 States. Fiscal incentives were common even for purposes of promoting practices that enhanced forest recreation and aesthetic qualities (25 States), and protecting wildlife and endangered species (28 States).

A variety of State agencies offer financial assistance to private landowners. For example, in 1985, the wildlife agencies of 12 States provided fiscal incentives to private landowners to manage forested habitats as required by various species of wildlife (Wigley and Melchiors 1987) (table 7). Seven cabinet-level units of State government and 29 first-tier subcabinet units implemented programs that provided fiscal assistance to private landowners in 2000. Three governing or advisory bodies of State government did this also. In addition, many agencies of State government also offered tax and fiscal incentives for purposes of economic development and business promotion in a forest resource context (in 2000: 47 cabinet-level units, 46 subcabinet-level units) (Ellefson and others 2001, 2002).

Many State fiscal incentive programs are developed to complement Federal cost-share programs either by providing funding or by addressing specific resource needs not addressed by Federal cost-share programs (Appendix A). Most State programs concentrate on reforestation and related activities that promote investment in healthy and sustainable forests. For example, the Wisconsin Forest Landowner Grant Program provides up to 65 percent cost-share assistance (up to $10,000 per year) to private landowners within the State to develop land management plans and implement certain land management practices. The latter include tree planting and timber stand improvement measures such as crop-tree release, crop-tree pruning, and thinning. Such practices can be directed toward timber production as well as toward enhancement of fish and wildlife habitat (Wisconsin Department of Natural Resources 2001). Virginia's cost-share program provides 40 percent of the cost of restoration or management of pine, and is funded by Virginia's forest industry with matching funds from the Virginia general fund (Virginia Department of Forestry 2001).

Summary of Conditions

Forestland owners in the United States have a long history of making long-term investments in reforestation and various silvicultural practices. Tax policies and fiscal incentive programs can influence the extent to which the Nation's private landowners invest in the management of their forests and maintain the land in a forested condition. In light of the background and current conditions discussed, the following observations are made about the identification and measurement of the legal and institutional capacity to foster investment that is important to sustainable forestry.

- Federal and State governments use taxation and fiscal assistance programs to influence long-term investment in the use and management of private forests. These types of programs enable private forestland owners to obtain assistance in underwriting capital investments deemed necessary to provide for a variety of important benefits associated with forests.
- Taxation programs applicable to all citizens, or exclusively to owners of private forests, are of various types and are implemented by local, State, and Federal governments. They include taxes on income, estates, and property, and each of these programs can affect the efficiency and profitability of private investments in forest management.
- Federal income tax provisions, such as those that apply to reforestation and other silvicultural practices, help reduce the overall income tax liability of forest owners. However, with the exception of reforestation amortization provisions, investment credit provisions, and provision for exclusion of reforestation cost-share payments from income, few of these measures are designed exclusively to encourage investment in private forests. Reforestation investment credit provides taxpayers a direct offset against tax liability for reforestation activities. With a credit limit of 10 percent of qualified reforestation expenses up to $10,000, the credit's annual benefit is greatest for those taxpayers with modest annual reforestation investments.
- Federal and State estate tax laws can place significant burdens on the heirs of highly valuable forest properties. In order to satisfy death tax liabilities often associated with estate transfer, forestland may be sold or timber may be prematurely liquidated. Current estate tax laws do have provisions (current-use valuation, use of conservation easements) that can significantly reduce forestland estate tax burdens.
- State income taxes provide very limited incentive for long-term investment in forest resources, although some State codes provide special benefits to owners of private forests. State income tax programs often use the Federal income tax program as a basis for establishing liability for State taxes generally.
- Forestland is taxed in a variety of ways by State and local units of government. Most property tax programs have provisions that reduce net tax liability. The four types of property tax programs most frequently applied to private forests are current use, modified ad valorem, flax tax, and tax exemption.
- The Federal Government has a number of financial incentive programs that affect investment in forests. These are implemented by various Federal agencies. They are designed to complement private investments in a range of forestry practices (for example, reforestation, timber-stand improvement). In recent years, the scope of forest benefits and related management activities addressed by these programs has broadened considerably (for example, wildlife, recreation). Unfortunately, the level of funding for Federal forestry cost-share programs has varied significantly over time (for example, the Forestry Incentives Program is currently funded at one-half its 1993 level).
- Financial incentive programs have also been established by State governments and are often complementary to Federal fiscal incentive programs. The focus of State programs and the level of funding they offer to private landowners vary extensively among States.

Issues and Trends

The literature identifies a number of major issues and trends associated with investing in forest resources, and with the policy tools directed at such investments. Examples of this literature (from which the following issues and trends are drawn) are: Binkley and others 1996, Ellefson 1989, Gaddis and others 1995, Haney and others 2001, Hibbard and others 2001, Klemperer 1989, National Research Council 1998, Peters and others 1998, U.S. Department of Agriculture, Forest Service 2001a, Wear and Greis 2002, and Yin and Izlar 2001.

- Forests are increasingly looked to as viable long-term financial investments, especially by institutional investors. In the mid-1980s, only six timberland investment management organizations existed in the U.S., and their total assets were less than $100 million. By 1997, due in part to changes in tax laws, 11 investment companies held timberland assets in the U.S. estimated at $6 billion. This rapid growth in institutional timberland investment suggests that forestland is increasingly viewed as a competitive investment asset. Indeed, the average annual return for institutional timberland investments exceeded that of the S&P 500 index over a 10-year period ending in 1996.

- Economic and demographic factors have increased the influence that Federal and State estate and inheritance taxes have on forest conditions and management actions. The high marginal tax burdens associated with such taxes can alter long-term forest management goals and investment decisions. In extreme situations, these taxes can result in premature timber liquidation to satisfy tax liabilities. Certain Federal estate tax provisions for forestland (current-use valuation and exclusion for conservation easements) can have a substantial effect on Federal and estate tax liability.
- The owners of forestland must have a good understanding of the many and often complex provisions of Federal and State tax laws that pertain to forest ownership. The lack of such an understanding can dramatically affect the profitability of forestland investments. Recent analyses suggest that landowners who fail to use advantageous income tax provisions can lose more than one-third of their timberland revenues to income taxes.
- Land management practices eligible for cost-share assistance through Federal and State fiscal incentive programs have increased considerably in number and are likely to increase further. Whereas the initial focus of such programs was largely on improving timberland productivity, cost-share programs today provide financial assistance for a wide range of forest and related management activities having wildlife, water quality, and environmental benefits.
- Conservation easements and property tax programs are increasingly looked to as tools to help protect forestlands from being converted to nonforest uses, especially where development pressure is great. When appropriately combined with other tax and fiscal incentives, conservation easements apparently can be useful tools to accomplish interests in forest sustainability.
- Useful analyses of the efficiency and effectiveness of forest tax and fiscal incentive programs have been very few in number. Significant uncertainty exists about the efficiency of such programs, the appropriate scale for their implementation, and the proper combination in which they should be applied. The lack of such analysis of State and Federal forest tax programs is of special concern.

Information Adequacy

Specification

The variables or combinations of variables that can be used to describe the economic climate that fosters the conservation and sustainable management of forests through long-term investment are numerous. Such a climate is the collective influence of market conditions, taxation and investment laws and policies, trade policies, financial and related assistance to forestland owners, and regulatory conditions on the management and use of the Nation's private forest resources. In 1999, the National Association of State Foresters surveyed State forestry agency information about investment and tax policies. The association reported that only eight States had such information. Of these States, two had abundant information, four had sufficient information, and two had some information. Two States reported that the quality of their information was excellent, four that it was adequate, and two that it was poor (National Association of State Foresters 1999).

Conditions contributing to the investment climate for forest management (for example, tax policy, cost-share programs) have been the subject of analyses and research. Unfortunately, comprehensive ongoing assessments of these factors, and of their collective influence on the investment climate for forest resources management, are not being conducted. There is no centralized and systematic collection and no ongoing analysis of information about Federal and State programs that are designed to encourage long-term investment in forest resources management. Currently, such information (about program type, scope, and investment levels) is scattered among a variety of public and private organizations. Gaps in information about the use and effectiveness of various public policies and programs directed at forestland owners are especially noticeable. For example, little information is available about forestland owner use of income tax provisions or about returns on public sector investments.

The following information gaps exist:

- *Measurement information*—It has not been determined what variables should be measured to describe and evaluate the overall investment climate for forest management. What variables contribute to forestland owner interest in making long-term investments? How can they best be described and evaluated? What variables are the best predictors of changes in the investment climate for forest management?
- *Cumulative effect information*—Information has not been compiled on the extent to which laws, policies, and programs collectively foster a climate conducive to investing in forest resources. How do the various taxation, incentive, and regulatory tools collectively influence the extent and overall performance of forest investment? What is the interdependence of combinations of laws, policies, and programs? Do certain combinations of policy tools work to effectively encourage or discourage forest investment?

- *Effectiveness information*—Information is incomplete on how various laws, policies, and programs have influenced forest investment decisions and performance. Do certain policies really make a difference in the level of investment in forest resources, or would such investment occur without their existence? Can efficiencies be gained by modifying the scale of programs designed to encourage landowner investment in forests? Do we understand the relative effectiveness of various policy tools in promoting investment in forests? Do we sufficiently understand the attitudes and perceptions of forestland owners toward which tax and fiscal incentives are directed?
- *Participation information*—Information has not been assembled on the rate of forestland owner participation in various programs designed to encourage forest investment. To what extent do forestland owners participate in various programs designed to encourage long-term forest investment? How many forestland owners take full advantage of the various tax provisions available to them? Do levels of participation reflect only the effectiveness of policy tools, or do they reflect lack of landowner awareness and understanding?
- *Investment information*—Information on the magnitude of forest investment has not been compiled. What is the overall level of investment in forestland? How does forest investment vary among groupings of private forestland owners? How do levels of private forest investment compare with levels of investment in public forests? Are there regional variations in forestland investment? How does U.S. investment in forestland compare to that in other parts of the world? How have investment levels changed over time?
- *Public investment information*—Information about levels of Federal investments in private forests has been compiled, but information on State-level investments in private forests is incomplete. What is the current level of public investment in the management of private forest resources? How has this level of investment changed over time? How much do State governments invest in the management of private forests?
- *Encouragement and promotion information*—Information has not been assembled about the methods used to encourage private investment in forestland. What approaches are used to encourage such private investment? What information is made available to potential investors and how is it presented? How effective and efficient are programs for fostering landowner investment? Are certain types of forestland owners more apt to respond to certain information delivery methods? How do private forestland owners become aware of investment opportunities and assistance?

Recommendations

Our ability to determine the extent to which the economic framework encourages and rewards investment in forest resources, as suggested by Indicator 58, is limited by a lack of information in various areas. The information voids that need to be addressed are considerable. The following actions seem appropriate:

- *Comprehensive periodic reviews.* Comprehensive reviews of the economic climate that supports long-term investment in private forest resources should be conducted periodically. These reviews should be guided by the above-suggested information deficiencies and should give special attention to describing the factors that contribute to or detract from landowner investments in forest resources. Compiling information on the numerous programs available to private forestland owners to assist them in making long-term investments should be a central part of such an initiative.
- *Responsibility for conducting reviews.* At present, no single source of information describes and assesses the myriad tax laws, cost-share programs, and regulatory provisions affecting private forest investment. Responsibility for collecting and analyzing this information should be assigned to a specific unit within a Federal agency (for example, the USDA Forest Service State and Private Forestry unit), college, university, or nonprofit organization (for example, the National Association of State Foresters). The organization assigned this responsibility should have substantial experience and expertise in conducting analyses and reviews of the investment climate for forest management.
- *Resources needed for reviews.* Invest sufficient resources to conduct reviews that will lead to increased understanding of the economic climate for investing in forest resources, the factors contributing to this climate, private-sector investment response, and needed policy and programmatic changes to more effectively promote sustainable forest management.

Indicator Appropriateness

Indicator Definition

Indicator 58 is an extremely broad statement that encompasses a variety of economic dimensions associated with forests. The term "investment policies," as it relates to promoting sustainable forestry practices, is not defined adequately. Investment policies can include several components, such as access to capital, investment performance, market access, and resource supply, and the lack of specificity hampers analysis of information pertinent to the indicator. Also, many policies that are enacted for

purposes other than the encouragement of forest investment have a direct and often substantial impact on the investment climate. Specificity regarding the treatment of information about these policies and programs is needed. The indicator also refers to "nonmarket valuations" and "public policy decisions," and these concepts need clarification. Inclusion of the term "regulatory environment" is especially troubling, as Indicator 51 explicitly addresses regulatory laws and programs directed at forcing the application of sustainable forest management practices. And finally, Indicator 58 does not distinguish between public and private investment. It appears that the indicator ignores investments in lands that make up over one-third of the Nation's forestland base.

The ability to gather information about economic capacity suggested by Indicator 58 would be greatly enhanced if the indicator were better focused and its wording reduced or modified. One possible approach to a rewording of the indicator is as follows: ". . . *provides for policies and programs that promote the long-term flow of capital into and out of public and private forest sectors in response to changes in market and nonmarket forces*."

Relationship to Other Indicators

Indicator 58 appears to overlap with Indicators 1 and 2 (extent of forestland), 5 (fragmentation), 12 (plantations), 14 (timber removals), 29, 30, 31, 32, 33, and 34 (production and consumption), 38 (value of investment), 41 (rates of return on investment), 42 (area under management), 43 (non-consumptive-use forest values), 44 and 46 (employment and community needs), 48 (property rights), 51 (best-practice codes), 59 (trade policies), 60 (information and data), 64 (value integrative methods), 65 (new technologies), and 66 (human intervention impacts).

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Appendix

Forestry Cost-Share Programs Implemented by State Governments

Program title and description
Alabama Agricultural and Conservation Development Program (1985): 60 percent for tree planting, site preparation, and timber stand improvement; funding level: $750,000 per year; funding source: general State revenue.
California Forest Improvement Program (1980): 75 percent for site preparation, reforestation, stand improvement, planning, and fish and wildlife habitat improvement; funding level: (*); funding source: revenue from sale of State forest timber.
Illinois Forest Development Programs (1983): 83 percent for tree planting, site preparation, and timber stand improvement; funding level: (*); funding source: 4 percent timber harvest fee.
Iowa Woodland Fencing Program (1985): 50 percent for fencing of forestland subject to soil loss from grazing; funding level: (*); funding source: general State revenue.
Louisiana Forest Productivity Program (1998): 50 percent for reforestation and timber stand improvement; funding level: $4.1 million/year; funding source: timber severance tax.
Maryland Woodland Incentives Program (1986): 50 percent for reforestation and timber stand improvement; funding level: (*); funding source: 4 to 5 percent tax on wooded lands transferred to nonagricultural use valuations for property taxes.
Minnesota Forestry Improvement Program (1985): 65 percent for fencing and firebreaks and 50 percent for road construction; funding level: (*); funding source: general State revenue.
Mississippi Forest Resources Development Program (1974): 50 to 75 percent for reforestation and timber stand improvement; funding level: $3 million; funding source: timber harvest tax.
Missouri Soil and Water Conservation Program (1985): 75 percent for tree planting and fencing; funding level: (*), funding source: .001 percent sales tax fee.
New Jersey Farmland Preservation Program (1986): 50 percent for plantation establishment, site preparation, and stand improvement; funding level: (*); funding source: State bond fund.
North Carolina Forest Development Program (1978): 40 to 60 percent for tree planting, site preparation, and stand improvement; funding level: $2.2 million per year; funding source: timber harvest tax and general State revenue.
South Carolina Forest Renewal Program (1981): 40 percent for reforestation, stand improvement, and prescribed burning; funding level: $660,000 per year; funding source: timber harvest tax and general State revenue.
Tennessee Reforestation Incentives Program (1997): 50 percent for reforestation and timber stand improvement; funding level: $160,000 per year; funding source: real estate transfer receipts.
Texas Reforestation Foundation Program (1981): 50 percent for reforestation practices; funding level: $350,000 per year; funding source: voluntary forest industry assessment on primary forest products.
Virginia Reforestation Timberland Program (1970): 40 percent for site preparation, tree planting, and stand improvement; funding level: $2.2 million per year; funding source: harvest tax and general State revenue.
Wisconsin Forest Landowner Grant Program (1980s): 65 percent for land management plans, tree planting, and stand improvement; funding level: (*); funding source: (*).

Note: Asterisk indicates information is not readily available.
Source: Bullard and Straka (1988); Meeks (1982); U.S. Department of Agriculture, Forest Service (2001b).

Forest Products Trade (Indicator 59)

C. Denise Ingram and Michael Hicks[1]

The full text of Indicator 59 is as follows: *Extent to which economic frameworks (economic policies and measures) support the conservation and sustainable management of forests through* ***non-discriminatory trade policies for forest products*** (Montreal Process Working Group 2003).

Rationale and Interpretation

The interpretation of Indicator 59 reflects the assumption that free trade and nondiscriminatory trade advance sustainable management of forests. This review of information and information-gathering capacity will not question this premise. Measures of the indicator over time should capture domestic trade policy impacts and trends of imports and exports in order to promote transparency in implementing trade policy. Indicator measures should capture also the use of tariff barriers (import and export duties), nontariff barriers (subsidies, export controls, below-market wages, transportation costs) and other factors that distort domestic and international markets. These types of distortions can lead to deforestation and forest degradation by providing strong disincentives to sustainable forest management. In addition, policies that distort the marketplace can obscure an understanding of factors, such as economic costs and benefits, affecting resource allocation and environmental impacts (Montreal Process Technical Advisory Committee 2000, Montreal Process Working Group 2003, U.S. Department of Agriculture, Forest Service 1997).

There are positive effects that can be associated with increased trade liberalization that would likely result from nondiscriminatory trade policies. One positive effect of trade liberalization is to increase investments in sustainable forest management. Reduced trade barriers and costs allow investors to shift resources from the payment of penalties and duties to enhancement of product quality, including environmental quality, in order to successfully compete in current global markets.

Indicator Appropriateness

Nondiscriminatory trade can be significantly influenced by the will of governments to encourage a competitive and fair market for domestic industries. Sustainable forest management is enhanced by the prospect of fair and competitive markets for forest products. Countries that develop a significant international trade for their forest products industries rely on national policies to promote competitive participation in global markets through support for international agreements on the rules of trade.

The World Trade Organization (WTO) serves as the lead international institution that facilitates trade by setting guidelines and policies for dispute resolution and trade development among member countries (World Trade Organization 2001). The WTO and its member countries have defined nondiscriminatory trade practices as those practices that do not apply unequal treatment to imports from different trading partners "as through preferential tariff rates for imports from particular countries or trade restrictions that apply to the exports of certain countries but not to similar goods from other countries." Nondiscriminatory trade as referred to by Indicator 59 implies tariff and nontariff effects on trade in wood products. Nonwood forest resources that are traded and whose management contributes to sustainable forest management are not included in this review because of the difficulty in tracking, by trade data codes, wood material in other product categories such as horticulture, food, and chemical products. The WTO Ministerial Declaration of 2001 establishes three priorities under the trade and environment section as: (1) a foundation of multilateral environmental agreements with respect to scope and application of regulations; (2) encouragement of information exchange and observer inputs; and (3) reduction or elimination of nontariff and tariff barriers (World Trade Organization 2001).

Conceptual Background

Nondiscriminatory trade practices form a crucial element of a country's overall trade policy with regard to sustainable economic development and sustainable resource management. The promotion of free and fair trade requires mutual cooperation and exchange among countries. It also thrives under the reciprocal openness of borders under agreed-upon international frameworks and institutions (Barbier and others 1994).

Trade practices can have indirect and direct effects on economic, social, and environmental elements of a country. Direct discriminatory practices are usually specific applications of tariffs that limit the flow of goods between countries. Provisions under the WTO and other trade

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agreements result in a level of monitoring and in assessments of the legitimacy of trade systems. Other practices, however, are not as clear-cut. The most-favored-nation (MFN) status, for example, is bestowed upon a country that the U.S. finds to have the capacity and political will to participate in trade resulting in the reduction or elimination of tariffs (U.S. Department of State 2002a, 2002b). However, some countries interpret the selection of specific countries for MFN status as a form of indirect discrimination toward the non-MFN countries.

Several types of nontariff barriers may have indirect effects on trade. Subsidies by a government (i.e., tax incentives, research and development investments) can also be interpreted as barriers to free trade and a challenge to economic development. Categories of indirect measures that are indicative of trade imbalances include quantitative restrictions, measures influencing prices, health and technical standards, customs and administrative entry procedures, trade agreements, and ocean freight charges and regulations (Bourke 1988). Assessment of these barriers and indirect measures requires a complex of data that reflect domestic actions under, and reactions to U.S. trade policy.

U.S. Agency Trade Responsibility

The United States participates globally to develop policies that support nondiscriminatory practices in forest products trade. A variety of domestic institutions have responsibilities and mandates for trade activities and strategies. U.S. leadership in the coordination of these agencies and programs increasingly reflects environmental linkages to trade, and especially to trade in products from natural resources.

The U.S. agency primarily responsible for trade negotiations and Federal trade policy is the Office of the U.S. Trade Representative (USTR). The USTR administers trade policy as mandated by the executive branch of government. Department-level government agencies are represented through committee appointments to draft trade policy statements and trade agreements, and to carry out trade mandates according to guiding legislation and Executive order. Bilateral and multilateral trade agreements fall within the purview of the USTR. A brief history of major trade policy developments provides a context for U.S. interpretations of trade priorities and strategies.

The U.S. Tariff Commission was established in 1916, and within the next decade, the concept of the most-favored-nation principle was formally instituted as part of the basic foundation of U.S. trade policy (U.S. Department of State 2002a, 2000b). The Reciprocal Trade Agreements Act of 1934 and the Trade Expansion Act of 1962 gave the President the authority to further trade policy through bilateral and multilateral negotiations. The Reciprocal Trade Agreements Act of 1934 provided authority for U.S. participation in the initial rounds of the General Agreement on Tariffs and Trade (GATT) held in Geneva, Switzerland in 1947. A GATT report in 1971 recommended a push for major trade negotiations, which took place at the Tokyo round of GATT in 1973. In 1975 the International Trade Commission (ITC) evolved from the former U.S. Tariff Commission in conjunction with the signing of the U.S. Trade Act of 1974 (U.S. Department of State 2002a, 2000b). The first United Nations (UN) session on trade and employment established the International Trade Organization (established in 1946), as an initiative submitted by the United States (U.S. Department of State 2002a, 2000b). The UN further facilitates the global dialogue on trade through the sessions of the UN Commission on Trade and Development.

Policy Trends Affecting Trade

Trade policy developments that affect the forestry and forest products sector favorably include those that result in increased transparency, effective governance (trade capacity), and environmental monitoring. Reliable and timely data must exist in order for countries to analyse the linkages between trade policies and the sustainability of forest resources production and consumption. In 1996, the Harmonized Commodity Description and Coding System was applied to the Standard International Trade Classification (SITC) system. This reflected the expanding number and types of traded products, including forest products (U.S. International Trade Commission 2002). This development makes it easier to track trade in forest products and to understand the effects of technological change on this trade.

Illegal logging, illegal wood trade, and associated corruption can be interpreted as nontariff barriers to trade. The tracking of illegal trade in forest products can draw lessons from the experiences of the Convention on International Trade in Endangered Species of 1973. Through scientific study and open debate among its members, the Convention "regulates the international trade in wild animals and plants and their products when it is determined that this trade does, or potentially could, threaten their survival in the wild." The difficulties inherent in tracking and monitoring trade flows of forest products may invite increased investments in circumvention and corruption, and the costs of gross distortions in market dynamics that result from illegal activities are borne unsustainably by the resource base.

There are concerns that the adoption of certification systems by governments may result in nontariff barriers to trade. Systems of certification require that forest resource

management meet certain standards so that the products made from those resources are considered environmentally friendly. Most certification programs are private-sector initiatives. Companies use them as marketing tools in order to enhance their environmental image. The U.S. Government does not have a policy on certification. In the United States, various national and subnational laws and regulations provide a reasonable and effective system of promoting sustainable forest management on public lands, while certification remains a voluntary private-market initiative.

Open Access to Markets

Owners of forest resources will not invest in sustainable management of those resources unless they have reasonable assurance that their investments will have a fair and competitive chance of paying off. Those who depend on international trade in forest products for financial success must have government leadership in forming international policies that encourage free and fair trade. Trade must be based upon nondiscriminatory policies that can be reciprocated by other countries that serve as export markets.

Compliance with Tariff Reductions

A general goal of international trade agreements is to strive toward continually reduced tariffs on forest products. The reduction of tariffs is usually negotiated and phased in over a period of time. When tariffs are reduced, markets become more competitive (assuming no other barriers or nontariff discriminatory practices are put in place), trade increases, and economic development opportunities expand for participating countries. The United States currently has little to no tariff on forest products imported from most countries.

Effects of Domestic Subsidies on Trade

Countries that provide subsidies to an industry increase the lack of will and decrease the opportunity for industry members to participate in markets under normal decision-making. Subsidies mask market dynamics, and participants need information about market dynamics in order to make good business decisions. A lack of data on market dynamics thus reduces the likelihood of success and therefore reduces the production and income potential for the country.

Labor Costs and Investment

Higher labor costs in any given sector influence various business decisions, including the location of production units, and thus influence the flow of goods. Lower labor costs in conjunction with the raw material costs of production influence the movement of investment from one country to another. Industries will take advantage of lower labor costs to produce similar goods at lower cost, thereby increasing profit margins. The impact of production location choices directly influences which resources will be selected as raw material for wood processing. The ability of a country to sustainably meet raw material resource demands is directly affected by decisions for investments by the industry. Increased investments in a country due to lower labor costs can result in a greater strain on local resources. Likewise, countries that maintain higher labor costs in a developed and technologically advanced industry will influence the shift of investments to areas where costs are lower. Meanwhile, the higher income populations may now have the luxury of "purchasing" other forest products and services in the form of leisure activities, environmental concerns and support, asset management, and other cultural, religious, and social activities that reflect and promote sustainable forest management.

Current Conditions

The consumption and trade of forest products has increased approximately fourfold in real terms over the last 30 years, and is projected to increase further in the years ahead. Forest products are broadly defined to include unprocessed wood products (for example, chips, logs, lumber) as well as highly processed wood products (for example, fiberboard, plywood) and paper products (for example, printing and writing paper). According to the UN Food and Agriculture Organization, world trade (imports and exports) of forest products totaled more than $300 billion in 2000. Canada, the United States, Finland, Germany, and Sweden account for 50 percent of forest-product exports. The United States, along with four other countries (Germany, Japan, China, and the United Kingdom), account for almost 45 percent of forest-product imports.

In 2001, the value of new construction in the United States increased by 5.6 percent over the 2000 level, to $861 billion, in large part due to the strength of the residential construction market. Residential construction traditionally accounts for a significant portion of the softwood lumber and structural panel products consumed annually in the United States. Residential housing starts totaled 1.60 million units in 2001, compared to 1.57 million units in 2000. Not surprisingly, consumption of many construction-related wood products increased in 2001. However, a near-record level of imports ($15.1 billion) kept prices of wood products generally lower in 2001 in spite of the strong construction market. Imports of softwood lumber, primarily from Canada, and structural panel products from Canada, Brazil, and Chile accounted for almost one-half of total imports on a value basis (Howard 2001a).

Canada remains the dominant provider of softwood lumber imports into the United States at a share of approximately 94 percent, but other countries in Europe and elsewhere have slowly increased their participation in this market. Hardwood lumber imports declined slightly in 2001 on a value basis compared to the previous year's sharp increases. Other solid wood products exhibited similar fluctuations, notably imports of softwood plywood, oriented strand board, hardwood plywood, and fiberboard products. Paper and paperboard imports continue to show increases at the beginning of this decade (Howard 2001a, 2001b).

Given the high level of consumption of wood products in this country, imports play a significant role in forest products trade. Imports of industrial roundwood (much of it from Canada) surged during the past decade, increasing from 246,000 cubic meters in 1991 to 6.992 million cubic meters in 1999 as the United States experienced an extended period of unprecedented economic growth, near-record housing starts, and reduced availability of Federal timber in the U.S. Pacific Northwest. (Industrial roundwood is defined as sawlogs, veneer logs, pulpwood, chips and particles, and wood residues.)

Imports have also been the center of several trade disputes, most notably with Canada. The softwood lumber dispute with Canada is one of our most complex and longest running bilateral trade disputes, dating back to October 27, 1982. There have been repeated countervailing duty investigations into alleged Canadian subsidies in the softwood lumber sector. Consultations in late 1994 and early 1995 led to the U.S.-Canada Softwood Lumber Agreement. The agreement, which was signed on May 29, 1996, was retroactive to April 1, 1996. On April 2, 2001, immediately following the expiration of the agreement, the Coalition for Fair Lumber Imports (and others) filed countervailing duty and antidumping petitions with the Department of Commerce (DOC) and the U.S. International Trade Commission. On March 22, 2002, the DOC announced its final subsidy determination, finding a subsidy rate of 18.79 percent. The DOC also found that Canadian companies were selling products into the U.S. market at below fair-market value, and imposed antidumping duties ranging from 2.18 to 12.44 percent. Products manufactured in the Maritime Provinces are exempt from the countervailing duty, as are products of certain manufacturers who rely entirely on logs from the Maritimes or Maine. On May 2, the ITC announced its final injury determination, finding a threat of material injury in both the countervailing duty and antidumping investigations of Canadian softwood lumber.

Overall, however, the United States has some of the lowest tariff rates in the world (U.S. International Trade Commission 2002). From 1989 to 1999, average U.S. tariffs on all primary goods remained stable at about 2.0 percent and declined from 6.1 percent to 4.2 percent for manufactured goods. Only countries such as Singapore, Australia, Hong Kong, and Switzerland had lower (or zero) tariffs or similar declines during that same period. Examples of general U.S. wood-products tariffs range from mostly zero to 8 percent on some plywood products (U.S. International Trade Commission 2002).

After a modest increase in 2000, U.S. wood-products exports declined sharply in 2001, from $6.2 billion in 2000 to $5.2 billion in 2001, because of continued weak economic conditions in Japan and several other Asian markets. U.S. wood-products exporters were also hurt by the strong dollar. Significant declines were registered in most markets and most product sectors in 2001. China was the only major market to show any degree of strength in 2001.

U.S. producers are increasingly facing increased competition at home and abroad, not only from longtime competitors like Canada and Northern Europe but also from producers in Estonia, Latvia, Chile, Malaysia, and Brazil. With the breakup of the former Soviet Union, Estonia and Latvia have emerged as two of the leading suppliers of logs, chips, and, lumber. Russia has reemerged as a leading producer and exporter of logs. Russian exports of logs and chips totaled 27.4 million cubic meters in 1999, primarily to Finland, China, and Japan. U.S. exports of softwood logs to Japan have dropped by more than 60 percent during the past decade. Nevertheless, were it not for the United States' plant health regulations requiring heat treatment of unprocessed wood products prior to import, it is quite possible that the United States would also be a significant importer of Russian logs. The economics are such that heat treatment is not a commercially viable option.

A similar situation can be seen in other commodities. The United States is the world's largest producer of lumber and plywood, but, even here, U.S. producers are facing increasing competition. Finland has doubled its plywood production over the past decade. China, Malaysia, and Brazil now account for almost one-quarter of the world's plywood production. Brazilian softwood plywood producers are even beginning to make some inroads into the U.S. domestic market. And as noted earlier, we are seeing more and more softwood lumber in the U.S. market from European suppliers (Austria, Finland, Germany, and Sweden), as well as from Chile and New Zealand.

Relationship to Other Indicators

Other Montreal Process indicators that overlap Indicator 59 include Indicator 38 (value of investments), Indicator 44 (employment), Indicator 45 (average wage rates), Indicator 46 (community viability), and Indicator 48

(appropriate land tenure). Each of these will reflect responses to trade flows that are dependent on forest resource supply and management decision making in the United States.

Information Adequacy

The United States has a long history of trade and economic development research, both in academia and in Federal agencies. However, the lack of a clear guiding national strategy for trade analysis is shown by the existence of autonomous trade research in forestry and forest products.

Measuring this indicator involves social and political difficulties. For example, domestic antitrust laws govern the sharing or discussion of individual company data. Responses to trade actions are often divided along philosophical and pragmatic lines, such as those between producers and consumers, developers and environmentalists, and various other stakeholders.

There is not yet a clear and coordinated priority in the United States to commit resources to the measurement of economic and institutional trade issues. A shift in priorities will be required to provide the level of consistent, comprehensive, and national-level trade analysis necessary to contribute to the knowledge of overall trade policies and their impacts.

One problem is that studies and analyses are available, but no one public entity has responsibility for tracking or compiling information and measurements. Some of the hurdles we face are finding, identifying, and assessing the conclusions of the various reports and studies in order to establish a minimal level of consistent tracking of trade developments and impacts. Neither the USDA Forest Service nor any other Federal agency has a mandate to undertake these reviews; however, we anticipate a push to build these analyses into future work as international trade issues demand increased attention and debate.

Recommendations

Early analysis of the status of Indicator 59 suggests that there is increased interest in understanding the linkages between trade and impacts on the environment in the United States. The United States has the world's most complete compilations of national trade data, and a variety of public and private institutions compile and analyze components of trade activities and trends. The efforts vary and are in many ways disjointed, thus projecting a less-than-national emphasis on comprehensive trade strategies. Moreover, the United States has only a recent history of adopting institutional strategies or guidance to ensure consistent implementation of trade analyses reflecting environmental and resource management impacts.

The most current effort of this kind is the 1999 Executive Order 13141 that requires the Council on Environmental Quality and the U.S. Trade Representative to conduct an environmental review of all natural resource trade agreements, both bilateral and multilateral (U.S. Trade Representative 1999a). Implementation of the new trade policy will contribute data and methodologies to assist in the measurement of Indicator 59 in the future.

Data Analysis and Approaches

The analysis of trade data goes beyond direct measurement of trade flow changes and market implications. It is difficult to assess whether a country's economic framework will fully support sustainable forest management if measures such as the internalizing of costs and benefits are not provided. Many of the current analytical approaches are designed to reflect, albeit on aggregate levels, the implications of trade policy changes through the linkages of social and environmental variables that reflect sustainable forest management characteristics.

The most common approaches to analysis of trade data are spatial equilibrium econometric models that reflect historical and projected trends under alternative policy and technology scenarios (Boyd 1983). Expertise in trade research is available at institutions such as the Center for International Trade in Forest Products, the University of Wisconsin-Madison, the University of Washington, and Purdue University. The United States is also a member of the International Institute for Applied Systems Analysis research collaboration on global forest-sector analysis, including trade. One of the more recent applications of forest products trade analysis is the Accelerated Tariff Liberalization study, conducted by the U.S. Government and collaborating universities (U.S. Trade Representative 1999b). This is a one-time study of the potential impacts of reductions in tariff rates on forest products in the Asia-Pacific region, including environmental implications reflected in the projections of changing harvest levels.

Analytical approaches require the establishment of a baseline of data and information that, in itself, is a valuable measure of trade potential and the underlying resource requirements to reach that potential. How do those requirements affect sustainable forest management goals and possibilities? Trade models allow the analysis of policy impacts, such as the effects of removal of tariffs (trade liberalization), on trade flows and related resource supply and management opportunities.

The political sensitivity of trade is analyzed by approaches that use content analyses of news articles, public response to trade issues, and other social drivers that influence decisions which, in turn, are linked to sustainable forest management potential. More recently, some qualitative studies tracked developments in the United States and other countries with regard to certification schemes and their potential to serve as nontariff barriers. Case studies are also used to gain an understanding of various countries' trade capacity developments in order to preview potential effects of U.S. trade policy changes on sustainable forest management.

- Data analysis and requirements—What variable or combination of variables can be used for measuring the effectiveness or existence of nondiscriminatory trade policies for forest products? Like many other institutional indicators, the information required goes beyond strictly quantifiable data. Although much of this information exists, it has not been analyzed in such a way as to measure this indicator adequately. For this reason, the discussion of applicable data suggests not only the type of data but also the need for strategic analytical approaches to processing that data.
- Annual import and export data—Time series analysis of basic annual import and export data for the United States would provide a foundation for following trends in trade flows and would reflect changes in trade policies or specific trade actions. Trade data coupled with production data also provides a basis for determining consumption patterns as a link to supply trends and to the potential for sustainable forest management.
- Technical barriers to trade—The Agreement on Technical Barriers to Trade, established under the WTO, requires members of the WTO to ensure that their legal and regulatory guidelines do not constitute barriers to free trade. An analysis of compliance of forest products standards with the Code of Good Practice of the agreement would provide a view of U.S. commitment to nondiscriminatory trade policies in forest products (International Organization for Standardization 2002).
- Domestic legislation affecting trade—A survey of domestic legislation affecting trade would identify the legislative and regulatory provisions that encourage or discourage nondiscriminatory trade policies for forest products. Four pieces of legislation provide examples: (1) the Jones Act of 1920, which provides regulation of intercoastal shipping of goods such as lumber, thus affecting resource demand and supply balances both domestically and with neighboring producers (Boyd 1983); (2) the Forest Resource Conservation and Shortage Relief Act of 1990 prohibits exports of raw logs from Federal land harvests in the western region (west of the 100th meridian) (U.S. Code 1993); (3) the Export Trading Company Act of 1982, which promotes the development of export trading associations and the expansion of export trade in general (U.S. Code 1982); and (4) the Foreign Sales Corporation Act, which provides tax reduction incentives to U.S. companies operating in other countries in order to promote exports by relieving the tax on some of the profits from those exports (Export FSC International 2002).
- Countervailing, antidumping, and safeguard actions—The World Trade Organization and regional trade agreements generally allow for individual parties to maintain discretion in the development and application of domestic trade laws and regulations. A tally of actions by the United States under appropriate laws would not in itself identify less than nondiscriminatory practices regarding trade imports. Successful challenges to the application of domestic trade regulations could occur through bilateral, regional, or WTO provisions. There is a need for analysis of the trends in the number of countervailing duty, antidumping, and safeguard actions by the United States for forest products. This information would show the extent to which the United States issues bilateral actions under domestic laws that might be challenged as discriminatory or prohibitive to free trade.
- Invasive and alien species—Invasive and alien species increasingly threaten the full range of biological, social, and economic values that are derived from forest resources. A 1999 study at Cornell University (Environmental News Network 1999) estimated that the United States suffers approximately $123 billion in damage annually from alien species of insects, diseases, and other nonindigenous species. Under international trade laws and agreements, countries have the right to set standards for safety and health. The challenge within the context of sustainable forest management is to maintain sustainability with adequate protection, while not reducing sustainability by adopting discriminatory trade that leads to conversion of forest resources to nonforest uses. Sanitary and phytosanitary regulations could constitute barriers to trade or be applied in a discriminatory fashion. An analysis of the number of actions by the USDA Animal and Plant Health Inspection Service that affect trade in the United States would provide a measure of potential discriminatory policies.
- Cross-sectoral influences on trade policies—External influences on trade in forest products include policies and trends in other sectors such as agriculture, transportation, commerce, and environment. Such linkages are difficult to define and quantify, but increased analysis of cross-sector impacts on the forestry and forest products sectors are needed because these influences often result in land-use changes and often increase the opportunity costs of holding land in forest cover.

- Environmental measures to affect forest management—Within the last decade, producers and owners of forest resources have made increasing use of environmental certification as a marketing device. Quantitative research in the area of certification is, however, lacking for the forest products sector (International Tropical Timber Organization 1990).
- Tariff liberalization—The trade policy of the United States has consistently promoted free trade throughout various administrations. There is, however, a growing debate on the net impacts of trade on natural resources and environmental goals. Does tariff liberalization in the forest-products sector encourage unsustainable forestry practices in individual countries? Does tariff liberalization promote efficient use of resources so that increased investment leads to high levels of conservation and the ability to afford the costs of environmental protection? Few studies have provided conclusive insight into this debate. Several leading econometric studies of national, regional, and global forest-products trade have included analyses of the environmental impacts of shifts in trade flows, and especially of shifts in production levels (i.e., harvesting) that may occur as a result of the projected trade flows. These and other issues could be addressed by future empirical work in this area, and the results of this work would provide data on the extent to which U.S. trade policies promote sustainable forest management.
- Internalized costs and benefits—Internalized costs and benefits may affect the final results of environmental impact analyses. Trade data and related information are often provided at relatively high levels of aggregation. Thus, analyses of trade policies and their impacts are difficult to complete for specific issues or concerns. Often, the total benefits and costs associated with trade policy changes do not include environmental values such as biodiversity benefits or net positive carbon-storage shifts.
- NAFTA environmental agreement—The North American Free Trade Agreement contains guidelines and rules for actions under an environmental "side" agreement (NAFTA Secretariat 2002). This trilateral trade agreement between the United States, Canada, and Mexico was implemented in 1994 to remove barriers to trade and investment among the three countries. Under NAFTA, the challenge is to strike a balance between free trade and investment and the promotion of domestic economic development. The environmental agreement provides for challenges to a party's level of enforcement and administration of its domestic environmental laws. The number of actions taken against the United States under the side agreement would indicate not only the strength of U.S. environmental and trade laws, but also the effectiveness of these laws through enforcement. Sustainable forest management goals could be directly affected by the degree to which the United States applies its own environmental legislation and regulations.
- Consistency and priority of nontariff measures—A variety of nontariff measures such as quotas, investment incentives, and tax credits may reflect less than nondiscriminatory commitments to free and fair trade by a country. An analysis of U.S. nontariff measures in the forest products sector, and trends in their use over time, would provide additional understanding of the extent to which our commitments to nondiscriminatory trade are consistent and are given priority. For example, data and analysis of U.S. subsidies in the forestry and forest products sector (for example, for trucking and road construction) could identify areas in need of further enhancement of competitiveness to support fair trade.
- National and subnational procurement requirements—The procurement requirements of national and local governments underscore the linkage between consumption choices for products made from forest resources and the sustainability limits of exporting countries. The percentage of recycled content used in paper products and in certified wood content are two examples of how procurement policies may reflect goals. At the same time, these policies can be considered nontariff barriers that constitute discriminatory trade policies if they are targeting specific countries or regions.
- Domestic processing requirements—One commonly perceived trade barrier is the implementation of a country's regulations regarding processing requirements. These requirements ensure that there is employment and income for labor, while adding value to industries through the promotion of downstream processing. Increased internal processing of wood can reduce demand for logs per unit of output with increased wood recovery and multiple product outputs. On the other hand, increased capacities in wood processing and attractive foreign exchange from exports of downstream products may encourage unsustainable harvest levels, thus contributing to unsustainable forest-management practices. An understanding of domestic processing requirements will indicate potential policy applications linked to unsustainable or unfair trade.
- Bilateral trade agreements—Bilateral trade agreements are an increasingly common means of fostering free and fair trade, cooperation, and partnerships for addressing mutual goals in a region or with neighboring countries. These agreements also enable countries to anticipate and make adjustments for the impacts of trade flows and changes. Thus, countries can make specific provisions for monitoring and assessing progress toward economic, social, and environment objectives. The implementation of U.S. Executive Order 13141 adds a new dimension to and enhances the development of trade agreements.

Institutional Links to Data Inadequacy

The inadequacies of data to support measurement of nondiscriminatory trade policy linkages to sustainable forest management range from a simple lack of data or data collection to more complicated institutional developments that require strategic planning of data and information management. Some data are not being collected, even though their collection would be consistent with the mission of existing public agencies or other institutions. In other cases, the data are collected but coverage is inadequate or the protocol for data collection must be changed to provide more relevant and informative data. Institutional decisions must be made with regard to the existing data gaps in areas such as:

- *Tracking forested areas under certification schemes*: No single entity is compiling this information.
- *External costs and benefits that are not being internalized*: Data are not collected or are not under any institution's control; methodologies and linkages are not well understood.
- *External influences on trade policy*: Uncertainty of the extent to which policy is implemented.
- *Number of nontariff barriers*: A one-time study, not conducted regularly enough or with adequate coverage.
- *Impacts of tariff liberalization*: A one-time study, not conducted on a regular basis.
- *Number of Animal & Plant Health inspection service actions*: Need systems in place to track regularly. These actions are published in the Federal Register, but no one entity has a mandate to summarize them.
- *Survey of domestic trade legislation*: Protocol changes are required to meet the needs of users. It is possible that these changes come under multiple agency missions, but it is not clear which ones.

Applicable Data and Data Sources

Sources of data that indicate the level and impacts of nondiscriminatory trade policies in the United States are described in table 1. The listing is not all-inclusive, but

Table 1—Organizational sources of information for assessing nondiscriminatory trade policies in the United States

Organization	Description of data	On-line access
United States Customs	Tariff schedules	www.customs.ustreas.gov
International Trade Commission	Countervailing, antidumping, and safeguard actions database, competitive studies	www.usitc.gov
Asia-Pacific Economic Cooperation	Country studies of nontariff barriers, tariff rates	www.apec.org
USDA Foreign Agricultural Service	Import-export data	www.fasonline.gov
International Tropical Timber Organization	Studies on certification and labeling of wood products	www..or.jp/inside/download/Certification_Schemes.doc
World Trade Organization	Trade policy reviews by country	www.wto.org
North American Forestry Commission	Data not described	www.fs.fed.us/global/nafc/welcome.html
North American Free Trade Act, Commission on Environmental Cooperation	Country reports	www.nafta-sec-alena.org
Department of Commerce, Bureau of Census	Industry database on value of shipments, employment, wages	www.census.gov/epcd/www/97EC31.HTM
USDA Forest Service, Forest Products Laboratory	Periodic publications on trade, consumption, production, and prices	www.fpl.fs.fed.us/econ/Publications.htm#Stat
World Bank	Trade databases, country reports, tariff statistics	www.worldbank.com

does represent the majority of the national sources of critical data and information for the analyses suggested above.

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Ellefson, Paul V.; Hibbard, Calder M.; Kilgore, Michael A.; Granskog, James E., eds. 2005. Legal, institutional, and economic indicators of forest conservation and sustainable management: review of information available for the United States. Gen. Tech. Rep. SRS-82. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 221 p.

This review looks at the Nation's legal, institutional, and economic capacity to promote forest conservation and sustainable resource management. It focuses on 20 indicators of Criterion Seven of the so-called Montreal Process and involves an extensive search and synthesis of information from a variety of sources. It identifies ways to fill information gaps and improve the usefulness of several indicators. It concludes that there is substantial information about the application of such capacities, although that application is widely dispersed among agencies and private interests; which in turn has led to differing interpretations of the indicators. Individual chapters identify a need to further develop the conceptual foundation on which many of the indicators are predicated. While many uncertainties in the type and accuracy of information are brought to light, the review clearly indicates that legal, institutional, and economic capacities to promote sustainability are large and widely available in both the public and private sectors.

Keywords: Criterion and indicators, economic capacity, institutional capacity, legal capacity, Montreal Process, sustainable management.

The Forest Service, United States Department of Agriculture (USDA), is dedicated to the principle of multiple use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research, cooperation with the States and private forest owners, and management of the National Forests and National Grasslands, it strives—as directed by Congress—to provide increasingly greater service to a growing Nation.

United States Department of Agriculture

Forest Service

Southern Research Station

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Legal, Institutional, and Economic Indicators of Forest Conservation and Sustainable Management: Review of Information Available for the United States

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