

# SYNOPSIS

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## The Committee's Assignment

In December 1997, Secretary of Agriculture Dan Glickman convened an interdisciplinary Committee of Scientists to review and evaluate the Forest Service's planning process for land and resource management and to identify changes that might be needed to the planning regulations. Key phrases from that Charter include: "...make recommendations on how to best accomplish sound resource planning within the established framework of environmental laws and within the statutory mission of the Forest Service," "...provide technical advice on the land and resource management planning process, and provide material for the Forest Service to consider for incorporation into the revised planning regulations...", and "...recommend improvements in Forest Service coordination with other federal land management or resource protection agencies, state and local government agencies, and tribal governments while recognizing the unique roles and responsibilities of each agency in the planning process."

In his initial meeting with the Committee, Under Secretary James Lyons emphasized that he wanted the Committee to develop a conceptual framework for land and resource planning that could last at least a generation. Thus, the Under Secretary asked the Committee to dream a little, to develop a set of concepts and principles toward which land and resource planning could work.

We believe that the two guiding stars of stewardship in the national forests and grasslands are sustainability and the recognition that these are the people's lands.

## The Committee's Approach

The Committee met in cities around the country, where it heard from Forest Service employees, representatives of tribes, state and local governments, related federal natural-resource agencies, and members of the public. Everyone shared their concerns and offered their ideas about the current planning process as well as the current state of the management of national forests and grasslands.

As the Committee learned about the latest innovations in the planning process and emerging collaborative partnerships, it became clear that people and teams in the Forest Service were rapidly developing the elements of a new planning framework as they struggled to update and revise their plans. The Committee discovered that in the context of new information technologies, growing interest in sustainability, increased civic involvement, and

a new ethic of collaboration among governments and agencies, innovation in planning processes abounded on the national forests and grasslands across the country.

Many of the approaches and improvements to planning suggested in this report are based on innovative experiments across the country. The Committee gleaned ideas from the critiques of planning performed by the Forest Service and others, and from meetings and discussions across the country with Forest Service employees and the public. The Committee used this information in three ways. First, it helped us learn an enormous amount about planning. Second, it enabled us to test the validity and practicality of our own ideas that were based upon our experience and knowledge. Finally, it provided examples of the elements of successful planning, many of which are included in the report, often in sidebars.

## Sustainability: The Overarching Objective of National Forest Stewardship

The national forests and grasslands constitute an extraordinary national legacy created by people of vision and preserved for future generations by diligent and far-sighted public servants and citizens. They are “the people’s lands,” emblems of our democratic traditions. These lands provide many and diverse benefits to the American people. Such benefits include: clean air and water, productive soils, biological diversity, goods and services, employment opportunities, community benefits, recreation, and naturalness. They also provide intangible qualities such as beauty, inspiration, and wonder.

Yet, these benefits depend upon the long-term sustainability of the watersheds, forests, and rangelands if the public is to enjoy the ecological, economic, and social values that these lands can provide. Accordingly, based on the statutory framework for the national forests

and grasslands, the first priority for management is to retain and restore the ecological sustainability of these watersheds, forests, and rangelands for present and future generations.

The Committee believes that the policy of sustainability should be the guiding star for stewardship of the national forests and grasslands to assure the continuation of this array of benefits. Like other over-arching national objectives, sustainability is broadly aspirational and can be difficult to define in concrete terms. Yet, especially considering the increased human pressures on the national forests and grasslands, it becomes ever more essential that planning and management begin with this central tenet. Sustainability is broadly recognized to be composed of interdependent elements, ecological, economic, and social. It operates on several levels. As a collective vision, sustainability means meeting the needs of the present generation without compromising the ability of future generations to meet their needs. As an approach to decision making, it calls for integrating the management of biological and ecological systems with their social and economic context, while acknowledging that management should not compromise the basic functioning of these systems. As a measure of progress, sustainability has spawned a worldwide movement to develop a common set of criteria and indicators.

Looking back across the century, a suite of laws calls for federal agencies to pursue sustainability. The Organic Act of 1897 established the purposes of the forest reserves “to improve and protect the forests within the reservation, or for the purpose of securing favorable conditions of waterflows, and to furnish a continuous supply of timber for the use and necessities of citizens of the United States.” Concern with loss of species led to the Lacey Act in 1900 to “aid in the restoration of [game birds and other wild] birds in those parts of the United States where [they] have become scarce or extinct.” By 1960, the expanded conservation and management

purposes of the Forest Service were placed in statute by the Multiple-Use Sustained-Yield Act, which calls for the national forests to be administered for outdoor recreation, range, timber, watershed, and wildlife and fish purposes. The Act further calls for ensuring that various renewable surface resources be used in a combination that will best meet the needs of the American people (multiple use) and with the achievement and maintenance in perpetuity of a high-level annual or regular periodic output of these resources without impairment of the productivity of the land (sustained yield).

When the National Environmental Policy Act went into effect on January 1, 1970, federal responsibilities toward conservation of species and ecosystems as well as the protection of environmental quality were significantly strengthened. The Endangered Species Act requires all federal agencies to “provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of endangered species and threatened species.” The National Forest Management Act (NFMA) calls for maintaining the diversity of plant and animal communities to meet multiple-use objectives, which in the regulations implementing the Act have been stated as providing habitat to maintain viable populations of existing native and desired nonnative vertebrate species. NFMA requires the protection of soil, streams, and watersheds; and the regulations provide specific management guidelines for these resources. NFMA also reinforces the commitment to the principles of multiple use and sustained yield. In addition, it further explains the meaning of sustained yield, especially for the timber resource. As an example, with some exceptions, NFMA limits the rate of sale of timber on the national forests to quantities that can be removed in perpetuity. The Clean Water Act calls for protecting the physical, chemical, and biological integrity of the nation’s waters. The Clean Air Act calls for

protecting the nation’s air. Thus, individually and collectively, our environmental laws express a profound commitment to the protection of plant and animal species and of our air, water, and soil. While the laws allow considerable discretion in their interpretation, their thrust is clear.

Thus, for the past 100 years, we, as a nation, have been attempting to define what we mean by “sustainability,” in part through our grand experiment in public forest ownership. In the process, we have broadened our focus from that of sustaining commodity outputs to that of sustaining ecological processes and a wide variety of goods, services, conditions, and values. The concept of sustainability is old; its broadened interpretation and redefinition in this report should be viewed as a continuation of the attempt by Gifford Pinchot and others that followed him to articulate the meaning of “conservation” and “conservative use” of the precious lands and waters known as the national forests and grasslands.

Stewardship of the national forests and grasslands necessarily includes activities of the Forest Service along with other federal agencies, governments, businesses, organizations, communities, and citizens. The Committee feels that there is a national consensus on the importance of sustaining the lands and resources of the national forests and grasslands. For this reason, the foundation of sustainability underlies the shared commitment to stewardship. It is upon this shared commitment that our recommendations for building stewardship capacity through a process of collaborative planning rest.

## Ecological Sustainability: A Necessary Foundation for Stewardship

Ecological sustainability entails maintaining the composition, structure, and processes of a system. The National Forest Management

Act (NFMA) establishes the goals of maintaining species' diversity and ecological productivity; these goals are consistent with the concept of ecological sustainability.

The Committee recommends that ecological sustainability provide a foundation upon which the management for national forests and grasslands can contribute to economic and social sustainability. This finding does not mean that the Forest Service is expected to maximize the protection of plant and animal species and environmental protection to the exclusion of other human values and uses. Rather, it means that planning for the multiple use and sustained yield of the resources of national forests and grasslands should operate within a baseline level of ensuring the sustainability of ecological systems and native species. Without ecologically sustainable systems, other uses of the land and its resources could be impaired.

In addition to the suite of environmental laws calling for protection of ecological systems, scientific results and common sense point to the necessity of protecting forests and rangelands so they continue providing benefits to society. Lessons from across the National Forest System suggest that the conservation of ecological systems cannot be ignored. As an example, concerns over the effect that declining water clarity will have on tourism in Lake Tahoe have led to an intensive and expensive effort to reverse this trend. More generally, where National Forest System watersheds are used as a source of municipal water supplies, the cost of developing alternative sources of water for many communities is sufficiently expensive to have led to increased protection of these lands. Once ecological systems are pushed to the edge, the costs of recovery can be high, and the ability to apply adaptive management is significantly compromised.

Setting ecological sustainability as a key goal acknowledges that ecological systems provide many outputs that humans require to sustain themselves as living, biological organ-

isms. That is, human health and the integrity of ecological systems are inseparable objectives. Humans are "a part of" not "apart from" their environment. Choices in management still exist, and the level of risk to take is a policy choice. While the scientific community can help estimate the risk associated with different management strategies, decisions about an acceptable level of risk are value-based, not science-based, decisions. Further, the human values, needs, uses, and ecological condition of each locality will change with time. Policy and management must evolve according to natural dynamics and disturbances as well as social events, economic change, and political values. Nonetheless, it is clear that ecological sustainability lays a necessary foundation for national forests and grasslands to contribute to the economic and social components of sustainability, making contributions to strong, productive economies and creating opportunities for enduring human communities.

The Committee recognizes that its role is not to dictate specific management approaches for the Forest Service, but rather to provide advice that the Secretary and Chief may act on as they deem appropriate. Nonetheless, the Committee acknowledges that such concepts as focal species, ecological integrity, and the use of scientific information may involve technical issues and thus has an obligation to the Secretary and the Chief to provide some insight on how this framework for ecological sustainability might be converted from concept to application. Therefore, while our approach has not been field-tested, the Committee has drafted regulatory language in the report that, we believe, provides a useful approach to this issue.

Implementation of sustainability into plans for national forests and grasslands is not a precise process; there are many unknowns and potential pitfalls that are not under the control of resource managers. Therefore, planning must acknowledge the following features of ecological systems.

## Acknowledge the Dynamic Nature of Ecological Systems

The dominant paradigm for ecological systems is that they are not in equilibrium; inherent dynamics are natural features of these systems. For example, ecological systems are regularly subjected to episodic, natural disturbances that shape their states. A part of this paradigm is the concept that ecological systems are hierarchical structures, best evaluated at a variety of spatial scales. Sustaining ecological processes within the expected bounds of variation is the only way to sustain ecological diversity and productivity for future generations.

## Acknowledge the Significance of Natural Processes

National forests and grasslands contain a variety of natural resources that change over time and space. These changes include succession, disturbance, changes in climate, loss of site productivity related to land-use activities, the establishment and spread of nonnative species, and the loss of native species diversity. However, some of these processes are natural, occurring independently of human activity. Anthropogenic disturbances need to be considered against the background of natural dynamics. Thus, after particular land uses, a simple return to more natural conditions is often difficult or, in fact, may be impossible. Acknowledging natural processes means that these factors need to be considered in defining desired future conditions as well as in developing strategies for conservation and management actions to implement them. The observed range of environmental variation in natural processes needs to be compared to what would have been expected in the absence of human changes to the North American landscape during the past 500 years. If the degree of variation exceeds that expected, then it is likely

that human activity is changing the frequency or magnitude of disturbance processes.

## Acknowledge the Uncertainty and Inherent Variability of Ecological Systems

Uncertainty arises from an incomplete understanding of how ecological systems work and from insufficient information. However, even if these sources of uncertainty could be removed through more research and better theory, ecological systems are inherently variable. Thus, variability must be factored into expressions of desired future conditions as well as into expectations related to management actions and strategies. Thus, uncertainty and variability are primary ingredients of nearly all stewardship actions and are best acknowledged through monitoring and adaptive management so change is incorporated into the dynamics of stewardship.

## Acknowledge Cumulative Effects

Cumulative effects are "... the impact on the environment resulting from the incremental impact of the action when added to other past, present, and reasonably foreseeable actions regardless of what agency or person undertakes such actions" (Council on Environmental Quality 1978). This definition does not specify how to incorporate the role of future natural disturbances. In addition, because of the wide variation in site-specific practices and local environmental conditions, impacts of management practices may not always be well understood or predicted. While there are few analytical methods available to effectively address cumulative impacts, new technologies will soon allow proposed actions to be considered in terms of their cumulative effects on past, current, and proposed actions. This type of "real-time" cumulative-effects analysis will go a long way towards addressing the foreseeable consequences of specific decisions. Only active and ongoing monitoring can detect

unanticipated changes and allow the introduction of new elements to the system. Cumulative effects generally reach beyond administrative boundaries, and thus there is a need to coordinate with local, state, and federal agencies when undertaking cumulative-effects analysis and monitoring ongoing changes.

## Preserve Options

Preserving options presumes that a range of acceptable choices will be available to address the environmental problems confronting future human generations. It is also a way of explicitly acknowledging our incomplete knowledge of complex ecological systems. Therefore, this philosophy an important touchstone in planning for and managing the national forests and grasslands.

A core element of the concept of ecological sustainability is that it is future-oriented. The reason to ensure the long-term sustainability of ecological systems is to ensure that future generations live in a productive environment and have a broad range of choices. In assessing the ecological sustainability of complex and dynamic systems, the best single metric of sustainable use of the land is the persistence of the plant and animal species over time. The productivity of an ecosystem can be sustained over the long term only if species that provide the appropriate structure and function for the system are maintained.

Clearly, the concept of ecological sustainability means that national-forest planning and management must consider the larger landscape context and include lands and communities beyond the boundaries of the national forests and grasslands. National forests and grasslands are open systems that are affected by the land uses outside their boundaries. Thus, the characteristics of the land, the ways that people interact with it, and what they expect from it must be assessed in terms of ecological sustainability.

## Conserve Habitat for Native Species and Productivity of Ecological Systems

The Committee believes that conserving habitat for native species and the productivity of ecological systems remains the surest path to maintaining ecological sustainability. We suggest the use of two general approaches in tandem to conserve these key elements of sustainability. First, we suggest a scientific assessment of the characteristic composition, structure, and processes of the ecosystems. This assessment should provide an understanding of the “ecological integrity” of the planning area. Ecosystems with integrity maintain their characteristic species diversity and ecological processes, such as productivity, soil fertility, and rates of biogeochemical cycling. Because ecosystems are dynamic and variable, the concept of the “historic range of variability” is used to characterize the variation and distribution of ecological conditions occurring in the past. This concept allows one to compare the ecological conditions that will be created under proposed management scenarios to past conditions. The more the prospective conditions differ from the conditions during recent millennia, the greater the expected risk to native species, their habitats, and their long-term ecological productivity.

Second, we suggest focusing on the viability of native species themselves. However, monitoring the status of all species and assessing their viability is impossible from a practical standpoint. Thus it is necessary to focus on a subset of species called “focal species.” The key characteristic of a focal species is that its abundance, distribution, health, and activity over time and space are indicative of the functioning of the larger ecological system. In monitoring, the habitat needs of the focal species are analyzed, and projections are made of the habitat that will be needed for the species to be considered “viable,” having self-sustaining populations well-distributed throughout the species range. Self-

sustaining populations, in turn, can be defined as those that have sufficient abundance and diversity to display the array of life-history strategies and forms that will provide for their persistence and adaptability in the planning area over time. The habitat that will be created under any management scenario is compared to the habitat needed for the viability of each selected focal species. The less adequate the habitat for each species, the greater the risk to native species and ecological productivity. Therefore, the Committee suggests a three-pronged strategy: (1) focusing on a set of selected “focal” species and their habitat needs; (2) maintaining conditions necessary for ecological integrity; and (3) monitoring the effectiveness of this approach in conserving native species and ecological productivity.

In some situations, national forests and grasslands by themselves are unable to conserve native species and ecological productivity. As noted earlier, other landowners and agencies often control key elements of the habitats and ecological systems. Thus, in some cases, the national forests and grasslands can contribute to, but not ensure, the achievement of ecological sustainability.

It is important to note that the approach proposed by the Committee is similar to the existing regulations implementing the National Forest Management Act. These 1982 regulations have an extensive section on “Management Requirements” that calls for provision of adequate habitat to maintain viable populations of existing native and desired nonnative vertebrate species, protection of soils, streams and watersheds, and many other conservation measures. These requirements were intended to provide a policy framework for sustaining ecological systems within which decisions could be made.

In its details of implementation, however, the approach proposed by the Committee for assessing ecological sustainability differs from existing effects, reflecting more than 15 years of experience. Conserving habitat for native

species remains central to ecological sustainability while broadening the focus from vertebrates to all native species. At the same time, we recognize that ensuring the viability of all native species, through analysis of individual species, is an impossible task.

To ensure the development of scientifically credible conservation strategies, the Committee recommends a process that includes (1) scientific involvement in the selection of focal species, in the development of measures of species viability and ecological integrity, and in the definition of key elements of conservation strategies; (2) independent scientific review of proposed conservation strategies before plans are published; (3) scientific involvement in designing monitoring protocols and adaptive management; and (4) a national scientific committee to advise the Chief of the Forest Service on scientific issues in assessment and planning.

### *Reduce Uncertainty Through Adaptive Management and Continuous Learning*

Adaptive management views management actions as experiments and accumulates knowledge to achieve continual learning. There are three ways to do adaptive management: (1) trial-and-error learning, in which initial management choices are made based on current understanding, and successful prescriptions are made routine; (2) passive-adaptive management, in which existing data are reviewed and used to inform decisions within a given management approach; and (3) active-adaptive management, in which different management approaches are tested in similar circumstances and the results are evaluated and used to select approaches and decisions. Of these alternative ways to learn, passive and active adaptive management accelerate the rate of learning how to best manage ecological systems.

All these modes of adaptive management require monitoring the results of the management action. That is, the only way in which

learning is possible is to observe if the system responds as envisioned. A lack of concordance between observation and expectation would lead to a revised model of how the ecological system functions and how it responds to management. Thus, monitoring should be viewed as an on-going process and an essential component of responsible stewardship.

Given the stringent requirements for adaptive management, it may not be possible to cast all management actions as adaptive experiments. Therefore, we suggest that the adaptive-management paradigm and an explicit monitoring effort should be adopted when the environmental consequences of the action are highly uncertain or when the management action may result in significant or irreversible loss.

## Contributing to Economic and Social Sustainability

Conservation and management of the national forests and grasslands can promote sustainability by providing for a wide variety of uses, values, products, and services and by enhancing society's capability to make sustainable choices. There are four dimensions to the Forest Service's role in promoting economic and social sustainability, and each is inextricably linked to sustainable ecological systems. First, the forests and grasslands provide many and diverse resources and values through which economies and communities define and sustain themselves. Second, an effectively structured planning process can help build society's understanding of the interconnectedness of communities and economies with sustainably managed national forests and grasslands. Third, planning processes with continuous, open and public deliberation can enhance society's capabilities to make sustainable choices. Fourth, assessment and planning processes can identify and assist communities in need. In short, striving towards sustain-

ability for the National Forest System lands provides important material, aesthetic, and democratic contributions to society.

The Committee wishes to emphasize that management of National Forest System lands plays an important and unique role in fostering social and economic sustainability. Forest Service stewardship of these lands, combined with the interactions through the NFMA planning process, involves Forest Service employees and the many people who care about these lands. This process serves a critical function in providing the information and understanding upon which communities and economies can assess and plan their own futures. In so doing, the Forest Service helps society to make sustainable choices. In addition, as the skilled, professional steward of the national forests and grasslands, the Forest Service is uniquely situated to provide the essential knowledge and assistance to communities as they transition toward sustainable social and economic systems.

The Forest Service, however, has specific obligations to adequately plan for the future conditions of the national forests and grasslands. Our report highlights some of these important obligations as summarized below.

### Assess the Contributions of National Forests and Grasslands to Society

The land- and resource-planning process for National Forest System lands provides an important opportunity to better understand and define the many connections between forests and grasslands and their associated economies and communities. Because forests and grasslands contribute in numerous tangible and intangible ways to the physical, spiritual, cultural, social, and economic well-being and identity of many communities and individuals, the planning process must actively consider and engage the different cultures, communities, and economies that value these attributes. It is not always possible to quantify

or rank diverse uses and values to determine such elusive concepts as highest and best use, just as it is impossible to identify, count, and value on a common ledger all plants and animals in an ecological system. It is, nonetheless, essential that important uses and values be recognized, assessed, and accommodated as practicable and appropriate.

### Recognize the Interdependence of Forests and Grasslands with Economies and Communities

Many communities depend on the national forests and grasslands for much of their economic, social, and cultural sustenance. Although the Forest Service cannot be expected to single-handedly sustain existing economies and communities, the national forests and grasslands nonetheless contribute many values, services, outputs, and uses that allow economies and communities to persist, prosper, and evolve. This charge of contributing to the well-being of people today and tomorrow is at the heart of the Forest Service's role in economic and social sustainability. Within a context of sustaining ecological systems, planning must take generous account of compelling local circumstances. This approach includes the needs of ranching, farming, timber, and mining communities as well as Indian communities relying upon treaty obligations and Hispanic communities depending on the resources in former Spanish and Mexican land grants. Within the context of sustainability, planning should consider the needs, resilience, and vulnerability of economies and communities in selecting long-term management strategies.

### Recognize the Rights of American Indian Tribes

Indian tribes possess unique and important rights recognized by federal treaties, statutes, and executive orders. The Forest

Service has a general trust responsibility to federally recognized tribes. It also has a duty to acknowledge them as sovereign governments and to work with them on a government-to-government basis. Depending on the circumstances of particular tribes and associated national forests and grasslands, National Forest System lands may provide for tribal hunting, fishing, and gathering rights; access to sacred sites; protection of graves and other archaeological sites; and watershed protection for downstream Indian reservations and fishing sites.

### Search for Strategies and Actions That Provide for Human Use in Ways That Contribute to Long-Term Sustainability

The national forests and grasslands should direct much of their planning and implementation energies toward developing, applying, and rewarding strategies and actions that enable multiple uses to occur in ways that promote long-term sustainability. Finding strategies and actions that contribute to long-term sustainability is the surest way to increase the predictability of these uses, products, outputs, and services desired from the National Forest System. As part of this effort, land and resource planning is designed to identify strategies that produce revenue from human use.

## Considering the Larger Landscape

Sustainability as a vision and goal applies to all lands and resources on this planet, not just the lands and resources in public ownership. Thus, the global implications of decisions made in the management of public lands in the United States must be considered in developing policies and management strategies for the future. Moreover, because public lands often rest within a mosaic of land ownerships and administrative entities, public-land management must be integrated into a broader

regional landscape. This context requires that the Forest Service have a strong commitment to ensuring the sustainability of ecological systems on public lands and to embracing an adaptive-management approach that recognizes the fundamental uncertainties in ecological as well as social systems but that also allows for policy choices to be informed by experience and changed over time.

Land and resource planning should consider the broader geographic, political, economic, and social landscape when assessing the potential contributions to ecological sustainability of the forests, rangelands, watersheds, and grasslands. Achieving sustainability depends, in part, upon the activities on other public, tribal, state, and private lands. In every sector of the country, the Forest Service via its national forests and grasslands is just one agency and one land-management system among many other important governmental and private entities.

Sustainability of watersheds and other areas in which national forests and grasslands are located may inevitably depend upon activities on nearby federal lands, tribal and state lands, and private lands as well as on the actions and attitudes of a wide variety of agencies, governments, and citizens. These neighboring landowners will vary in their abilities as well as their interest in providing the mix of uses, products, values, and services that people seek from forests and rangelands. Planning, therefore, must be outward-looking and done within the context of how individuals, communities, businesses, and governments conserve, regulate, and use the lands within and around the national forests and grasslands.

### Recognize the National and Global Implications of Managing National Forests and Grasslands

The growing national and global population is a pivotal concern with regard to ecological sustainability because it will place increas-

ing demands on our natural resources to provide goods and services, including wood products, for a multitude of uses. Without careful planning to enable continued production of wood and other outputs from the forests of the United States, societal demands may be transferred to other countries with uncertain environmental effects.

Planning should acknowledge how management of the national forests and grasslands can contribute to ecological, economic, and social sustainability on a national and international scale. As an example, with the concern over climate change, the national forests and grasslands are being urged to consider the effect that their management will have on carbon sequestration and to examine alternatives that might increase the amount of carbon stored.

### Recognize the Special Role That National Forests and Grasslands Play in Regional Landscapes

The national forests and grasslands often have special responsibilities in the context of these other ownerships. They will increasingly be called upon to provide the backbone of regional strategies to conserve species and ecosystems. They will also be counted upon to provide municipal water supplies and dispersed recreation for an increasingly developed and settled landscape. In addition, in some areas, they are the only substantial source of timber and forage supplies.

National forests and grasslands often provide the anchor of regional conservation strategies for protection of species and ecosystems, thus contributing to a stable landscape within which the extraction of timber and the use of other natural resources occurs across all ownerships. This regional approach is intended to conserve species and ecosystems without creating undue requirements on nonfederal lands, thus enabling the production of timber and other commodities from these lands. The argument for this approach has three sources.

First, through law and policy, the United States has developed a strategy by which the federal lands take the primary responsibility for protection of species and ecosystems. Second, federal lands often have the best remaining habitats and ecological conditions. Third, federal lands are inherently less efficient in the production of timber and other products because of the required planning processes to ensure protection of the environment.

## Building Stewardship Capacity for Sustainability

For these truly to be the “people’s lands,” the people must understand the lands’ condition, potential, limitations, and niche in resource conservation in this country and must be willing and able to help achieve sustainability. For its part, the Forest Service can learn from the unique knowledge, advice, and values of the American people and must be willing to try new approaches, organize in new ways, experiment, learn, and adapt. To succeed, the agency must provide a supportive organizational context that encourages and accommodates this experimentation and ongoing learning.

### Establish Collaborative Relationships That Provide Opportunities and Incentives for People to Work Together and Contribute to Forest Planning

The ability of the Forest Service and other individuals, organizations, agencies, and governments to work together toward sustainability is the foundation of stewardship capacity. To pursue sustainability, the process of stewarding National Forest System lands needs to engage those who have the information, knowledge, and expertise to contribute; those who have sole control or authority over lands and activities adjacent to national forests and grasslands; those who have the skills,

energy, time, and resources to carry out stewardship activities; and those who can independently validate the credibility of stewardship decisions and the reality of achievements. In short, many and diverse collaborative relationships between and among the Forest Service and other agencies, governments, organizations, communities and individuals are central to building stewardship capacity.

Land and resource planning must provide mechanisms for broad-based, vigorous, and ongoing opportunities for open dialogue. These dialogues should be open to any person, conducted in nontechnical terms readily understandable to the general public, and structured in a manner that recognizes and accommodates differing schedules, capabilities, and interests. The participation of citizens should be encouraged from the beginning and be maintained throughout the planning process, including roles in assessments, issue-identification, implementation, and monitoring.

Just as local communities depend on the national forests and grasslands, so too does the condition of many forests, rangelands, and watersheds depend on human communities. Many restoration actions are needed on these lands, including programs to improve riparian conditions, reduce fuel loads, and rebuild or decommission roads. These efforts will require entrepreneurs and a trained workforce. The surrounding communities can help provide these services.

The Forest Service should explore advisory boards as one component of collaborative planning. These boards can provide an immediate, legitimate, representative structure within which public dialogue can occur. The Committee recommends that the Forest Service test advisory boards on particular national forests and grasslands across the nation, learn from this experience, and then decide whether, and in what form, they would be most useful.

## Foster a Broad-Based Understanding of the Issues, Concerns, and Opportunities of National Forest Planning

Jointly conducted assessments and analyses can establish a credible and common base of information available to all participants in the planning process. Many factors bear on management of the national forests and grasslands. Many shared and divergent issues concern the Forest Service and its non-Forest Service partners. For stewardship capacity to be enhanced, the broad array of issues, interests, and concerns; the legal and administrative constraints and possibilities; and the realities of the Congressional budgetary process need to be understood across the spectrum of individuals, agencies, and groups who are a part of the planning process. With an informed and realistic understanding of the complexity of the stewardship task, people will be encouraged and enabled to make reasoned and reasonable contributions to the process.

## Recognize That Planning and Management of Public Lands Proceeds under Legitimate, but Often Divergent, Interests

Planning and management of National Forest System lands will always involve conflict; too many resources and issues at stake. The Committee acknowledges that, even when building more productive collaborative relationships among the many and diverse people who care about the national forests, some conflicts will still remain. Difficult decisions will still have to be made by the Forest Service.

While it may be unreasonable to expect consensus on all management decisions for national forests and grasslands, there are ways to narrow the scope of the conflict and, at the same time, to better inform the difficult decisions that remain. There is a clear national consensus on the importance of sustaining the resources of National Forest System lands and their contribution to the social and economic

welfare of the nation. The Committee report rests on this national interest in sustainability, and identifies a planning process that can work towards regional and local management strategies capable of reflecting areas of agreement and as well as issues of continuing conflict. While there is often a tendency in planning to try to eliminate or minimize the controversy inherent in the issues, it is important for the Forest Service to maintain the terms of the public controversy. By placing a strong reliance on external review and thereby acknowledging the many divergent yet legitimate interests at stake in the management of National Forest System lands, the Forest Service can better understand and illuminate for others the nature of the choices that must be made. Our strong reliance on external review stems from recognition that some conflicts will remain and can only be addressed through continuing opportunities for public and agency dialogue and learning and, at times, through decisions that the agency must make and must do so in a manner that is scientifically sound and credible.

## Make Plans Understandable to the American People

People find it difficult to support what they do not understand. Further, few people have time for in-depth analysis. However, few regional offices or forest supervisors could supply a simple, straightforward explanation of the plans for the lands they administered. Apparently, few such explanations exist, and none that give an image of the future landscape that will be achieved under the plan. To regain public support for its policies and management and to thereby engage the public in the stewardship of their national forests and grasslands, the Forest Service must make a far greater effort to explain these policies in an understandable manner to the people who own these lands.

# Collaborative Planning for Sustainability

The legislative mandate for the management of the national forests and grasslands requires that these public lands be conservatively used and managed to ensure their sustainability and to guarantee that future generations will continue to benefit from their many values. The Forest Service has broad discretion in charting management direction and regulating human use in meeting this mandate. Broad public participation in making these choices is required in statute, regulation, and policy. The purpose of planning is to develop management strategies and policy guides for human use that respond to new scientific understanding of natural and social systems as well as to changing societal conditions and values. Thus, planning is the process in which scientists, citizens, and other public and private stakeholders come together to debate and discuss how to use and manage the national forest system to the benefit of current and future generations and to ensure the ecological sustainability of these lands and resources. Planning is dynamic and ongoing because the social values and scientific knowledge that guide decision making will change with time, thus changing the management emphases and policies as well as on-the-ground results.

Collaborative planning is a shared process within which agencies cooperate with one another, work with other public and private organizations, and engage communities and citizens in envisioning and working toward a sustainable future on the national forests and grasslands. Because sustainability of ecological, economic, and social systems is not the responsibility of any single agency or landowner, collaborative planning is necessary to establish the relationships, commitments, and responsibilities necessary for effective stewardship. Collaborative planning creates opportunities for

people and organizations to work together, builds stewardship capacity by cultivating understanding around problems and issues as well as strategies and actions, and designs new institutions that encourage individuals and organizations to pursue sustainability.

However, plans do not implement themselves. The Forest Service must ensure that incentives exist for managers and staff to dedicate themselves to the purposes, goals, and strategies developed in the course of the planning process. Performance evaluation should rest on the effectiveness of management strategies in achieving results on the land. Performance evaluation should also rest on the willingness of managers to experiment with new approaches, consider new information, and embrace new constituencies interested in contributing to the stewardship of these lands. A continuing challenge is for the agency to obtain sufficient funds to survive, yet not to create incentives that run cross-ways with goals of the plan. Finding stable funding sources to support the stewardship of the national forests and grasslands remains among the greatest challenges that the agency faces and among the greatest threats to successful implementation of the results from collaborative planning.

A collaborative planning process develops guidance for the management and use of the national forests and grasslands. Thus, collaborative planning generally involves assembling and evaluating information in the context of goals, creating a vision of desired future conditions. It also requires crafting strategies to achieve those conditions, and requires the evaluation of outcomes, including making changes as necessary. The purpose of this effort is to build effective stewardship for sustainability.

Stewardship requires scientifically credible strategies for sustainability, options for multiple-use management that respond to public interests and issues, and processes for monitoring and adaptive management as

conditions and performance change over time. Because many agencies share responsibility for effective stewardship on the national forests and grasslands, it is common sense that a collaborative approach is necessary to achieve sustainability. It is also common sense that some issues, like developing conservation strategies for wide-ranging species, need to be addressed at a bioregional scale. Although multiple-use strategies may be best addressed at a large-landscape scale where the boundaries of the planning area are determined by both ecological and administrative considerations, actual work occurs on the ground. Thus, implementation planning needs to occur on smaller landscapes, but still based on ecological boundaries. Such a multilevel planning and decision process follows the scale of the issues to be addressed, and engages the full range of participants to set overall policy, provide strategic direction, and then work together in developing pathways of actions to achieve desired results. (See Table S-1.)

From the perspective of the Forest Service (or any other single agency), developing a clear logic of decision making within a collaborative planning process requires that the strategic vision and goals of the agency be integrated into bioregional policies and strategic plans and then realized through operational decisions. To meet the requirements of NFMA, an integrated land- and resource-management plan that represents all of the policies, strategies, and implementation activities for the individual national forest or grassland is necessary. Thus, the “plan” as a document is an administrative tool for management and evaluation as well as a means to communicate to the public the vision for the area along with the strategies and actions anticipated to achieve that vision. From this integrated land- and resource-management plan, every national forest and grassland will be expected to develop a simple and compelling expression of expected future actions, the differences they will make, and the significance of those results.

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**Table S-1. A spatial approach to collaborative planning.**

<b>Information</b>	<b>Decision Making</b>
Bioregional assessments	Bioregional policy
Small-scale (e.g., watershed) assessments	Strategic planning of large landscapes
	Operational planning of small landscapes

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## Assessments Provide a Credible Foundation of Information

Within a collaborative planning process, credible information emerges from collaborative scientific assessment processes at both large and small scales. A critical component of the framework proposed by the Committee is that assessments are not decision documents and should not be made to function under the NEPA processes associated with decision making. Rather, assessments provide the foundation of independent information upon which to build conservation strategies and management decisions and against which alternative approaches can be evaluated and modified

### Undertake Assessments That Build a Knowledge Base for Planning and Relationships for Stewardship

The way information is developed and synthesized and by whom is as important as the content. Ideally, assessments are organized as joint inquiries undertaken by scientists and other knowledgeable people and involving the federal agencies, other governments, and the public. Analysis of current assessment processes indicates that assessments can have a number of functions: identifying issues of

special importance; creating forums for joint learning by scientists, managers, and the public; improving inventories; encouraging a broad spatial perspective that transcends national-forest and agency boundaries; building cohesion among different levels of the Forest Service and between the Forest Service and other agencies; and providing a context for planning. For participants, assessments also help develop leadership abilities and provide a crash course in adaptive management. For example, assessments lay the groundwork for developing regional, scientifically credible conservation strategies.

### Conduct Assessments at the Bioregional Scale and at a Smaller Scale, like a Watershed

The Committee envisions two primary scales of assessments. Assessments over large areas (“bioregions”), such as the Sierra Nevada or the spotted-owl region, will generally be needed to provide the context for landscape-level strategic planning. Assessments at the more local level, such as watersheds, will be needed to help translate strategic plans for large landscapes into site-specific management actions. In some cases where the bioregional assessment is at a very large scale, for example the Columbia River Basin assessment, an intermediate scale of analysis may be needed. Nearly half of the National Forest System lands have had a recent bioregional assessment of some form.

### Decisions Are Made at the Spatial Scale of the Issue or Problem

In the past, the administrative boundaries of national forests and grasslands have often bounded the scope of decisions in land- and resource-management planning. In the collaborative planning process for sustainability,

administrative boundaries of a particular agency may often not be logical decision boundaries. Rather, decisions should occur at the scale of the issue or problem. This means that developing policies regarding conservation strategies for wide-ranging species, for example, need to occur at the bioregional level to encompass the entire range of the species. Similarly, strategic planning will generally occur at a “large-landscape” level following ecological and political or social boundaries. Naturally, implementation planning occurs at a “small-landscape” level where actions, cumulative effects, and performance can be monitored.

### Develop Overall Guidance on Sustainability for Bioregions

Regional guidance is needed on sustainability. In particular, a special focus needs to be placed on regional guidance that will help ensure scientifically credible strategies for conservation of wide-ranging species and large-scale ecosystem processes because of past difficulties in planning when those strategies were not available. Recent examples of successful efforts to construct these strategies include late-successional species and ecosystems as well as salmon stocks in the Northwest (FEMAT), the red-cockaded woodpecker (southeast), the northern goshawk (southwest), and community resilience and vulnerability in the Columbia River Basin (ICBEMP). The congressional language in the 1998 budget bill calling for the development of regional strategies for fish, wildlife, and forest health in the Columbia Basin is also an example of this approach.

Given the integrated focus on sustainability, regional guidance may be needed to encourage and promote economic and social sustainability. This guidance can highlight special roles of the national forests and grasslands in contributing to economic and social sustainability in the region. It can direct planning to consider the differing resiliency and

vulnerability of communities across the region. And, in an increasingly global economy, regional guidance can contribute to shaping policies that enhance the competitiveness of local and regional markets and products.

### Undertake Strategic Planning of Large Landscapes Within Regions for Attaining Long-Term Goals

Strategic planning occurs at a second level, smaller in geographic scope although still perhaps covering millions of acres. It develops long-term strategic policies and decisions. Strategic planning needs to consider the full range of goals, multiple uses, and public issues of concern in the area. The central reference point for strategic planning is developing the “desired future conditions,” which must recognize the larger landscape surrounding national forests and grasslands and use information from assessments. Strategic planning then focuses on developing pathways and actions to achieve the suite of desired future conditions.

This approach contrasts sharply with those used in the past when land and resource planning generally focused on the relatively short-term issues of land allocations and timber-harvest levels. Although these issues are important and consistent with the emphasis on sustainability, strategic planning must emphasize the development of desired long-term landscape conditions and outcomes that will provide a pathway towards sustainability. Current attempts at “large-landscape” planning include the coordinated plan revisions for five forests in the southern Appalachians, three national forests in southern Idaho, and the national forests of the Sierra Nevada.

### Conduct Operational Planning for Small Landscapes

A small-landscape-level decision process (sometimes called a site-specific landscape plan) identifies the types and locations of

actions to carry out the long-term strategic goals and policies for sites covering 10,000 to 100,000 acres. The need to consider connected actions, cumulative effects and enable the public to understand the geographic context within which the actions occur argues for an approach to project planning that considers a larger geographic area than is usually covered by a single project. Examples are the Little Applegate River on the Rogue River National Forest, the Seven Buttes area of the Deschutes National Forest, and the Chattooga Watershed Conservation Plan in the Southeast.

There often is a need to evaluate individual, controversial projects separately, but the cumulative effects of the project must be analyzed in the context of the small landscape management plan. Based upon an adaptive-management approach, this level has a continuous cycle of activity, evaluation and review, adaptation, and change.

## The Integrated Land and Resource Plan

The NFMA calls for development of an integrated land- and resource-management plan for each national forest and grassland. In our approach, the integrated plan is the assemblage of all policies and decisions affecting an administrative unit. It can include regional guidance for conservation strategies relevant to the area; the strategic vision, policies, and multiple-use goals developed through large landscape planning, including the description of the desired future conditions; proposed management pathways for achieving the desired future condition and multiple-use goals; implementing decisions and proposed project-level management activities developed at the small-landscape level; and sufficient records and documentation from monitoring to support ongoing adaptive management. As the foundation of administrative policy and guidance, this

planning documentation also should include the budget and staffing needs for implementation as well as the procedures and timing of monitoring and review processes. As a management tool, the plan not only includes monitoring processes, but also records ongoing results and subsequent changes in both strategic and implementation decisions.

In the past, the use of administrative units as the planning units often caused large-scale ecological, economic, and social processes to be neglected or resulted in inconsistent decisions by adjacent administrative units. Therefore, the Committee suggests a planning and decision-making hierarchy whose geographic extent will often not be limited to the boundaries of a particular national forest or grassland but whose physical repository will rest at within multiple administrative units.

Thus, the land- and resource-management plan should be in the form of a loose-leaf notebook that contains all of the policy directions, strategies, and implementation proposals from decisions that have been made at all levels of the planning process. It is the official repository of decisions big and small that have been made and reviewed in the strategic and landscape-level planning processes. It must also contain the monitoring methodologies that will be implemented as well as the evaluation results from monitoring. Because this model of the land- and resource-management plan is different than that employed during the first round of NFMA planning, the process of plan amendment is also different. Rather than a formal process involving review and comment, these loose-leaf plans are dynamic and evolving, readily reflecting and accommodating the outcomes of adaptive management. Thus, as decisions are revisited and revised in response to changing scientific and social understanding, natural events, and policy priorities, the loose-leaf notebook immediately reflects those changes. Consequently, any “amendments” made to these plans reflect decisions that have been made and reviewed elsewhere.

While adaptive management focuses on the learning generated by testing management approaches against actual results, this is not sufficient to ensure the kind of organizational learning necessary for planning to be effective. An adaptive planning method is also necessary to ensure that innovative approaches to assessments are tested and shared; new ways of working within a collaborative context are tried and evaluated; and new roles, responsibilities, and ways of organizing agency staff are also tested and effective ones passed on. Adaptive planning often begins with “trial and error” as innovative approaches emerge across the agency. For example, the Green Mountain National Forest was reorganized as a completely team-based organization to facilitate both collaborative planning and collaborative management. That management team will compare its experiences with those from the Rogue River National Forest and others that are trying team-based organizations. A “passive-adaptive” planning approach builds from these innovative efforts in that those that seem to work are continued and shared with others, prompting new experiments. But, to develop a strong and effective collaborative planning process, an “active-planning” approach is needed in which the innovations around the country are systematically studied and compared. The diversity of places and people across the national forest system will naturally lead to a range of approaches to generating information, establishing relationships with scientists, bringing together the stakeholders and constituents of the area, and developing useful land- and resource-management plans. The Forest Service must embrace a diversity of approaches, based upon careful study and analysis. An example is the systematic research of different approaches to public participation in the northeastern national forests. An adaptive-planning approach can produce the kind of organizational learning that will promote effective stewardship and thereby sustainability.

## Key Elements in the Collaborative Planning Process

Collaborative planning begins by finding agreement in a common vision for the future conditions of the national forests and grasslands and their unique contributions to different regions of the country. Drawing from commitment to a common vision, and a shared goal of sustainability, collaborative-planning efforts bring people together at different geographic scales, across political and administrative boundaries, and from different parts of society to craft strategies and actions that will make a difference and have worthwhile results. Several key elements of collaborative planning are elaborated below to provide a richer understanding of this concept and its importance in achieving sustainability.

### Make “Desired Future Conditions” and the Outcomes Associated with Them the Central Reference Points for Planning

Establishing long-term goals is the most constructive place to start in collaborative planning, and provides an essential guide for adaptive management. Visualization of the future landscape through pictures, maps and computer simulations will be a crucial element in this work. Using information on current conditions from the bioregional assessments and elsewhere, the large landscape strategies should build proposed pathways from the current state to the desired future state and should include an estimate of actions and budgets that will be needed. However, just as the difficulty of producing an even-flow harvest level through time arises from several sources including the inherently dynamic nature of ecological systems, this inherently dynamic situation that will make management for a “desired future condition” also difficult to predict or achieve with precision.

### Establish Pathways to the Desired Future Conditions and Orient Performance Measures, Monitoring, and Budgeting to Those Pathways

Collaborative planning should estimate a schedule of management actions needed to reach desired future conditions and outcomes along with the intermediate conditions, outcomes, and learning expected along the way. The correspondence between management actions and expected results should become the performance measures for achievement of strategic goals. Measurement of performance would be accomplished through (1) annually comparing the expected outcomes to actual results, and (2) every five to ten years comparing the rate and degree of movement towards the desired future conditions and outcomes that are expected. Either of those measures might have three possible outcomes: (1) concluding that management actions are moving the landscape toward the desired future conditions and outcomes; (2) concluding that treatments must be adjusted to more efficiently achieve those conditions (i.e., passive adaptive management); or (3) reevaluating the possibility of achieving the desired future conditions in light of the actual conditions (i.e., active adaptive management), which would require reexamination of the targeted future conditions and the proposed pathways to reach those conditions.

### Support Local-Management Flexibility with Independent Field Review

The key to successful implementation lies in harnessing the creative talents of national forest managers and interested members of businesses, communities, tribes, state and local governments and the public. With this collaborative approach, public trust will be improved, and local managers are more likely to develop successful approaches to implementation of strategic goals. In this way, managerial discretion can be a means to improving the

reliability and effectiveness of broad policies applied at the local level.

Part and parcel with this discretion is the need for independent evaluation of how well site-specific implementation plans achieve strategic goals. In addition to ensuring consistency of actions with goals, field reviews also can highlight creative solutions and innovative approaches to common issues. Without an independent evaluation of specific projects and their implementation, it is difficult to justify such flexibility at the local level.

### Keep Decisions Close to the Planning Area

Currently, the chief is responsible for regional plans and the regional forester is responsible for national forest and grassland plans. Experience shows that this approach inhibits change and adaptation both at both planning levels. The Committee suggests that the regional foresters be responsible for bioregional policy guidance and that the forest supervisors be responsible for strategic, large-landscape planning. Forest supervisors should work closely with District rangers in the small-landscape, implementation planning. Forest supervisors are responsible for ensuring that an integrated land- and resource-management plan is up-to-date and reflects what has happened in the area as well as what actions are anticipated over the planning horizon.

### Emphasize Ecological Boundaries for Assessment and Planning but Consider Their Social Meaning

In the past, planning boundaries were generally based on political, economic, or social boundaries, such as states, national forests or grasslands, or timber-sale boundaries. Over the past 20 years, it has been increasingly recognized that assessing and planning for sustainability must consider the ecological, economic, and social implications of the analysis and planning units chosen, be

they administrative units, river basins, or mountain tops. Using boundaries meaningful for ecological, economic, and social processes will enable (1) the development of comprehensive plans for the conservation of species and ecosystems and (2) the ability to measure the cumulative effects of current and future management actions. Examples are the bioregions defined by the range of the northern spotted owl, the watershed formed by the Columbia River, and the vegetative/watershed boundary for the Southern Appalachian Assessment. Rarely, however, will a single boundary be sufficient for the assessment of sustainability. Rather, different boundaries will be needed for different species and ecosystems in the assessment and for assessing economic and social processes.

### Address All Federal Lands Within the Area and Work with Affected Federal Agencies

Effective assessment and planning for our federal lands requires a coordinated approach across affected federal agencies. Harmonizing and coordinating the different statutory priorities, geographic areas of consideration, and implementation time frames of the various federal agencies is no small task, but the potential benefits are enormous. Integrating and coordinating these separate planning processes is essential to developing integrated strategies for ecological and social sustainability and for adapting these strategies to changed conditions over time. Moreover, the Committee has repeatedly heard that state and local governments, tribes, non-governmental and private organizations, and the public is overwhelmed by the multitude and complexity of federal land and resource planning processes. Coordinating the federal planning processes, especially where there are adjacent federal managers within an area, would help solve this problem. It must be said, though, that the Forest Service cannot make coordinated federal planning happen by

itself. Other federal agencies must also want to participate.

### **Move Toward Integrated Administration of Jurisdictionally Fragmented Areas**

Although the land and resource plans of individual national forests and grasslands provide a framework for integrative administration, the Committee suggests a move toward an organizational structure keyed to the boundaries of the large-landscape planning processes in some places. Without such a change, the potential for inconsistent, wasteful actions within the large-landscape areas is high. In addition, designating a large-landscape area, drawn on ecological boundaries, as the administrative unit should make it easier to communicate the goals of management to the public. A current example of such a unit is the Lake Tahoe Basin, which is the watershed of Lake Tahoe that was previously administered by four national forests in two political regions.

### **Use the NEPA Review Process to Coordinate Across Agencies and Jurisdictions**

Agency processes for planning, decision making, and appeals tend to assume a single-agency approach. NEPA is intended to disclose the evidence and reasoning used in making commitments of federal resources or budgets and to enhance working relationships across agencies. Because it is a process that applies to all federal agencies, it is an opportunity for integrating and coordinating single-agency processes. Ideally, a more coordinated federal approach to planning and assessment will evolve and will give greater attention to sustainability.

### **Use Principles of Efficiency Analysis in Planning, Plans, and Management**

The national forests and grasslands should be efficient in their management, within

the context of meeting their other goals. This mandate does not require the Forest Service to manage the public lands to maximize monetary return. Rather it simply requires the Forest Service to pursue its objectives in the least-cost manner and to ensure that social benefits from its actions exceed social costs.

Some people may recoil from pursuit of “efficiency” in resource analysis, in part, because they feel that it serves only to justify commodity production from forests. We argue that efficiency analysis, broadly interpreted to address nonmarket as well as market outputs, serves an important function in planning the management of national forests and grasslands. Whenever multiple goals are sought, efficiency analysis can reduce the conflicts that may arise or exist. Also, with the greater scrutiny that budgets will receive in the future, it will become increasingly important that managers be able to demonstrate through efficiency analysis that they are not “wasting” resources.

### **Identify the Suitability of Land for Resource Management as an Outcome of Planning**

In the National Forest Management Act, Sect. 6 (g) states that guidelines are to be developed that “... require identification of the suitability of lands for resource management.” The broad classification of lands as to their suitability for different kinds of resource management should be made during planning for large landscapes. Such classifications are often needed to support decisions at various levels and can be incorporated into the land- and resource-management plan. However, small-scale assessments and planning efforts, because they are based upon more-local and site-specific information, may locally alter these broad classifications. Furthermore, the identification of lands not suited for timber production should be a subset of the identification of the suitability of lands for different types of resource management.

The planning process should classify (zone) lands by suitable types of resource management: habitat preservation, water-quality management, timber production, range management, and recreation. Some lands might be classified as suitable for all types of management; others might only be suitable for one type. Site-specific analysis might be necessary to refine the estimates of where activities could actually occur and the form they could take.

The most complicated portion of this analysis addresses resource management involving timber harvest and timber production, where timber production is defined as a long-term commitment to produce commercial-timber volume. NFMA states “Sec. 6 (k) In developing land management plans pursuant to this Act, the Secretary shall identify lands within the management area which are not suited for timber production, considering physical, economic, and other pertinent factors to the extent feasible, as determined by the Secretary, and shall assure that, except for salvage sales or sales necessitated to protect other multiple-use values, no timber harvesting shall occur on these lands for a period of 10 years.”

Under this clause, timber harvest can occur for the “protection of other multiple-use values,” even where the forest is not suitable for timber production. Thus, lands suitable for resource management involving timber harvest need two subcategories: (1) where timber harvest is prohibited and (2) where timber harvest is permitted. When timber harvest is permitted, however, it might be either (1) for protection of other multiple-use values, even though timber production is not a goal, or (2) for timber production as one of several goals.

Given this complexity, it is not surprising that identifying the lands “not suited for timber production considering physical, economic, and other pertinent factors to the extent feasible...” has perplexed analysts since the passage of the NFMA. However, the crite-

tion of economic efficiency broadly defined should eliminate many of these conflicts. For example, lands should be viewed as unsuited for timber production if the costs of regeneration, with a reasonable discount rate, cannot be covered by the benefits (returns) from the future timber sales. In this case, these lands should not be allocated to timber production; such an allocation would be inconsistent with efficient attainment of long-term sustainability. Timber harvest should occur on these lands only to “protect other multiple-use values.” Lands may also be unsuitable because of environmental damages associated with the harvest (e.g., serious erosion or water-quality deterioration) that exceed any surplus of harvest revenues over harvest costs. Similarly, economic criteria suggest that below-cost timber sales do not pass the efficiency test and therefore should not be undertaken unless justified by the achievement of some other end of sufficient value to justify the revenue losses. For example, if the below-cost activity generated substantial values in turkey browse to compensate for the economic losses, the activity would be meet the efficiency criteria. The careful use of economic criteria should eliminate many of the questionable practices of the past. We do believe these problems are solvable by appropriate analysis of revenues and costs. Furthermore, such problems can be avoided by using the scientifically credible, participatory planning process that is recommended in the report and by striving to attain the overarching goal of sustainability.

## Make Effective Use of Scientific and Technical Analysis and Review

In the first round of land and resource plans under NFMA, scientists, by and large, sat on the sidelines as managers and interdisciplinary teams developed plans using scientific information as best they could. A series of

lawsuits and a growing realization of the important role of science in planning led the Forest Service and other federal agencies to call for “scientifically credible conservation strategies” for species and ecosystems. In addition, it has become increasingly clear that a scientific framework is needed to understand how the national forests and grasslands can contribute to ecological, economic, and social sustainability. Thus, the Committee of Scientists has suggested new institutions along with new roles for scientists in assessments, planning, implementation, monitoring, and review.

### Involve the Scientific Community in Developing Strategies for Maintaining Ecologic, Economic, and Social Sustainability

Assessments have a crucial role in providing the information base for planning. As part of that effort, scientists should help develop strategies for determining and measuring all aspects of sustainability: ecologic, economic, and social. In addition, they need to suggest measures of ecological integrity, procedures for obtaining these measurements, and ways to assess whether ecological systems are being sustained. In some cases, they can suggest important elements of conservation strategies to conserve species and ecosystems for use in planning. Recent work in the Pacific Northwest (FEMAT and ICBEMP) illustrates this approach. Social and economic assessments are also critical elements in the assessment processes at both large and small scales. New concepts and new frameworks for analysis of social and economic systems in the context of sustainability are emerging from current efforts, like FEMAT and the Columbia Basin assessments. Assessments can also provide an opportunity for addressing issues of public concern and for social learning that promotes sustainability, as illustrated by the Southern Appalachia Assessment process.

### Endorse Forest Service Research in Support of Collaborative Planning and Adaptive Management

The Forest Service is blessed with its own research organization, perhaps one of the finest natural resource research organizations in the world. Forest Service Research has fought for and achieved a mission that emphasizes scholarly work publishable in peer-reviewed journals and allows considerable independence from the immediate needs of the National Forest System.

Decisions based in part on scientific information will require the involvement of scientists and knowledgeable people both inside and outside the federal government. However, a key to the success of science involvement in planning is a strong, deep, and sustained commitment from Forest Service Research. Forest Service Research will necessarily need to shoulder major responsibilities for the contribution of science and scientists to land and resource planning, from assessments to monitoring. While collaborative planning will no doubt be assisted by scientists in other federal agencies as well as from outside the federal government, Forest Service Research will need to form a reliable core of scientists experienced in such efforts. These added responsibilities will require a refocused role for this branch of the Forest Service along with new institutions and new funding to make it work. Otherwise, the shift of resources to assist planning will undercut the major research mission of the organization.

### Link Scientific Results and Principles to Management Actions and Monitoring

While Forest Service Research has an important and central role to fulfill in enhancing planning, it cannot and should not shoulder this responsibility alone. Care must be taken to ensure the ongoing credibility of Forest Service Research and maintain its solid

foundation of basic research. The National Forest System technical staff must adopt the role of an interface between policymakers and the research community as well as between policymakers and managers on scientific issues bearing on decision making. Forest Service Research can, for example, help create and evaluate science-based protocols for monitoring or assessments; develop the scientific basis for creating, evaluating, and modifying management standards and guides; and coordinate independent review of the scientific foundation of plans. National Forest System technical specialists, on the other hand, need to assist, enable, and ensure managers' ability to apply this guidance to their day-to-day management decisions.

## Make Review and Evaluation Processes Ongoing Elements of Stewardship

To ensure public trust and support innovation, scientific and technical review processes need to become essential elements of management and stewardship. Scientific and technical credibility will continue to be key sources of public trust. To build this trust, review processes need to ensure that the best available information was used in making decisions and used appropriately. Given the tentative nature of scientific knowledge, the scientific community must also be asked to provide assessments of current knowledge when changes in theory occur, when there are competing explanations, or when uncertainty is high because decisions are being made on the basis of limited research.

### Establish a National Science and Technology Advisory Board

The Committee recommends that the Forest Service create a national science and technology advisory board to provide highly

qualified and independent scientific advice. The more that conservation strategies and management actions are based on scientific findings and analysis, the greater the need for an ongoing process to ensure that the most current and complete scientific and technical knowledge is used. Such a board could also provide advice on the current "state of the knowledge" when policy decisions and management actions must reconcile variation in scientific findings or uncertainty in scientific results.

### Involve the Scientific Community in Designing Procedures for Monitoring and Adaptive Management

Monitoring is a key component of planning. Yet, monitoring was not typically considered part of the planning process. Monitoring procedures need to be incorporated into planning procedures and should be designed to be part of the information used to inform decisions. Adaptive management and learning are not possible without effective monitoring of actual consequences from management activities.

Monitoring is crucial if performance evaluations are to provide accurate and useful information and as an "early-warning system" against the risks involved in management activities. Monitoring needs to be given very strong emphasis in the new approach to planning. Adequate budgets and sufficient staff are needed to ensure that the results of management actions are continuously monitored and that the data gathered are transformed into usable and used information for evaluating and, if necessary, changing management actions.

### Establish Independent Scientific Reviews on the Use of Technical and Scientific Information in Planning

The credibility of the planning process rests in part on the routine application of an outside check on the use of technical and scientific information. Independent reviews can

provide verification that plans and their implementation are consistent with current scientific concepts. There should be an evaluation of consistency of strategic goals and objectives with scientific and technical understanding at critical spatial and temporal scales. Independent reviews can also promote adaptive management and learning. For example, reviews can highlight and reward creative approaches to challenging management issues. It can, by its very presence, encourage collaboration among managers, specialists, and scientists at all stages of the planning process.

## Integrate Budget Realities into Planning

Past land- and resource-management plans developed both the goals for management and a set of actions (such as timber harvest, road construction, trail building, wildlife-habitat improvement, and campground maintenance) to achieve those goals. Typically, these actions are spread across a decade. Seldom did this planning process limit budget expectations to current or recent past experience. Rather, the plans were developed with the expectation that they would define the budget levels, based on conclusions reached by the planning process and with public support. This approach often led to disappointment during plan implementation when Congress appropriated less money than envisioned by the ten-year plan and targeted the funds it did allocate to a different mix of actions and outputs than called for in the plans. In anticipation of budget shortfalls, plan-implementation priorities should be established as part of the collaborative learning process.

## Set Long-Term Goals with Credible Budgets and Let Actual Budgets Affect the Rate of Progress to the Goals

For planning to be meaningful, it needs to bear a relationship to the current and likely future budget situation. Strategic planning concentrates on setting the long-term goals and the associated desired future conditions and makes a first estimate of the pathway (set of actions needed/conditions expected along the way) over time to achieve these desired future conditions. In a strategic plan, the estimated rate of attainment of desired conditions should be keyed to expected budget. The details of actions to achieve progress toward these goals, however, should be left to implementation planning. As part of strategic planning, the budget required to achieve and to maintain desired future conditions should be examined; if the costs appear unrealistic, less expensive desired future conditions may need to be considered.

The actions outlined in the small-landscape management decisions, updated on a yearly basis, should be the basis for the budget requests. Budget shortfalls will affect the actions taken and the rate of progress toward goals; they do not automatically trigger a revision in the strategic plan. If it becomes clear over time that Congress is unlikely to fund accomplishment of the management goals, then the large-landscape strategies and policies may need to be revisited.

## Extend Public Participation in Planning to the Annual Budgeting Process

Land and resource planning and the budgeting to fund the plans operate under two different processes. Planning is largely an administrative process, and budgeting is largely a congressional process. It is important that people understand that (1) plan implementation depends on funding that, in turn, depends on another political process and

(2) budgeting is part of plan implementation. Without such an appreciation, people may have unrealistic expectations about what can be accomplished through land and resource planning unless they extend their efforts to the annual budgeting process.

### Consider Putting More National-Forest Goods and Services, such as Recreation, on a Paying Basis

One way to reduce the uncertainty of budgeting is to fund activities out of a percentage share of the net returns from user fees. Such an approach should reduce the dependence of the Forest Service on the vagaries of the budget process, encourage managers to be efficient in their expenditures, and provide signals indicating the value that members of the public place on different goods and services. Some forms of recreation, as an example, would seem perfect for this approach. Recent Resources Planning Act assessments suggest the American people would be willing to pay hundreds of millions of dollars per year for the right to undertake recreation on national forests and grasslands. As another example, developing stand-treatment projects that contribute to sustainability while paying for themselves will be a major challenge for the next decade. While it is difficult or impossible to charge individually for collective goods, such as the protection of endangered species, self-financing activities will be one key to a stable future for programs on the national forests.

## Watersheds and Timber Supply: A Traditional Focus of the Forest Service in Achieving Sustainability

Watershed and timber issues are, by statute, central management purposes of the Forest Service. From the first congressional

management guidance to the forest reserves in 1897 to the more recent National Forest Management Act, watersheds and timber supplies have been singled out for special legislative attention. The 1897 Organic Act expressly stated that “No public forest reservation shall be established, except to improve and protect the forest within the reservation, or for the purpose of securing favorable conditions of water flows, and to furnish a continuous supply of timber for the use and necessities of citizens of the United States.” The NFMA responded to concerns about timber harvest on national forests and expressly limited harvest in situations where “(E)(i) soil, slope, or other watershed conditions will not be irreversibly damaged; (iii) protection is provided for streams, streambanks, shorelines, lakes, wetlands, and other bodies of water from detrimental changes in water temperatures, blockages of water courses, and deposits of sediment, where harvests are likely to seriously and adversely affect water conditions or fish habitat.” While NFMA strongly reinforced the principles of multiple use, it also gave specificity to protection of watersheds consistent with the purposes of the national forest system.

Given the continuing importance and attention to these two important resources, the Committee has developed general recommendations in response to specific language in the NFMA. This in no way indicates a lack of interest for other important resources and values on the national forests and grasslands. Rather, the Committee feels that a strong commitment and balanced approach to sustainability, as implemented through a collaborative planning process, responds directly to the often repeated assertions of the principles of multiple use in the NFMA.

### Develop a Strategy for Conserving and Restoring Watersheds

In the past two decades, concern for conserving and restoring watersheds has grown

around the country. Not only have timber-harvest methods changed in response to requirements for protecting watersheds and aquatic habitat, but also priorities for human uses have changed as the populations have expanded adjacent to national forests and economies have subsequently changed. Once, diversion of water for irrigation took primacy over in-stream water uses; now, concerns with protection of watershed integrity and aquatic habitat are changing how managers balance multiple-use priorities. The goal of sustainability necessitates that the capacity of watersheds to provide water flows be actively maintained and restored when necessary. A guiding reason for many of the assessments initiated in the past decade has been to scientifically assess watershed conditions and then propose strategies or the elements of management strategies to maintain and restore watershed integrity.

Based upon the knowledge and management approaches developed in the past decade, the Committee suggests that the following six strategic goals be integrated within collaborative planning processes at all levels. (1) Provide conditions for the viability of native riparian and aquatic species. (2) Maintain and restore watershed integrity; that is, maintain and restore the natural composition, structure, and processes of the watershed, including their flow regimes. (3) Recognize watersheds in assessment and planning. (4) Develop an overall strategy for setting priorities for restoration and use. (5) Energize the people of the watershed to help provide stewardship. (6) Monitor watershed conditions over time as part of adaptive management.

It is the view of the Committee that sustainability on the national forests and grasslands cannot be achieved unless these goals are part of the foundation for collaborative planning. Stewardship of watersheds has a long history in the United States. Today, community-based approaches to watershed conservation are flourishing, enhancing the capacity of the Forest Service to achieve its goals.

## Recognize the Role of Timber Harvest in Achieving Sustainability

From the beginning, a major purpose of the national forests has been to ensure a sustainable supply of timber for the American people. The 1897 Organic Act called for the national forests to “furnish a continuous supply of timber for the use and necessities of the citizens of the United States.” Indeed, the primary reason for enacting National Forest Management Act was to provide authorization for timber harvest consistent with current silvicultural knowledge and harvesting techniques.

Silvicultural practices, such as timber harvest and prescribed burning, can help meet stand-specific objectives for species composition and forest structure along with landscape-level objectives for abundance, size, shape, and pattern of patches of different stand conditions, in addition to aiding in the attainment of a variety of goods and services.

Regional assessments need to define the historical characteristics of disturbances and stocking conditions so the appropriate silvicultural methods can be selected. The assessment should consider the types of silvicultural systems potentially useful in the maintenance or recreation of these disturbance characteristics. Out of this analysis should come minimum and maximum sizes of disturbances in different forest types and landscapes and also information on the historical frequency, intensity, and pattern of disturbances. This information would then be used to guide silvicultural approaches for achieving stand and landscape objectives, including the selection of silvicultural systems and restocking standards.

## Develop Flexible Regeneration Requirements That Allow for Natural Seeding

Natural regeneration and associated ecosystem characteristics (such as the resultant genetic diversity) should be considered specifi-

cally in the regulatory process. NFMA states that the Forest Service should “ensure that timber will be harvested from National Forest System lands only where . . . there is assurance that such lands can be adequately restocked within five years after harvest.” Interpreting the clause to mean that sites “will be” restocked within five years of harvest, rather than “could be” restocked, will likely have a chilling effect on the willingness of managers to give natural regeneration an opportunity.

### Select the Silvicultural System to Promote Sustainability

Under NFMA, clearcutting should be used only where it can be demonstrated to be the optimal method for meeting the objectives for the stand and landscape, but not as a default method. There are species, ecosystems, and disturbance conditions for which a convincing argument can be made for the “optimality” of clearcutting. Even here, suitable conditions for regeneration can almost always be created with a range of alternative reproduction methods (e.g., clearcutting-with-reserve-trees, shelterwoods, and even large-group selection). At times there have been attempts to list the situations under which clearcutting will be considered. Such an approach is fraught with difficulties because of the impossibility of predicting all the different situations that might occur.

Generalized limits on the size of harvest units can be a prescription for fragmentation of the forest into patterns that have not been experienced historically though natural disturbance. To emulate natural disturbances, the overall size of the harvest units should be designed in accordance with patterns of disturbance on the broader landscape. Any limits regarding the minimum or maximum opening sizes of harvest blocks need to be based on the ecology of the species and disturbances typical of the region.

### Recognize the Need for Predictable Timber Supplies and How Sustainability Increases Predictability

Just as the timber industry in many parts of the country requires outputs from the national forests, the national forests need a functional timber industry to help achieve long-term ecological, economic, and social goals for these lands. Communities planning for their future would like to have some confidence in the amount of timber that will be coming off of nearby national forests. Without some notion of the magnitude of likely offerings, it is improbable that investment will occur in wood-processing facilities.

In recent years, achieving predictable timber supplies has been increasingly difficult for the Forest Service for a number of reasons. The inherently dynamic nature of our ecological and economic systems makes predictability difficult. In addition, timber harvest has more and more been seen as at odds with long-term sustainability, with resulting political and legal protests.

While the dynamic nature of ecosystems and economies will always make predictable timber supplies somewhat difficult to achieve, the more that timber harvest contributes to long-term sustainability, the more predictable supplies will tend to be. Conversely, to the degree that timber harvest works against sustainability (ecological, economic, or social), it will be unpredictable and difficult to achieve.

### Focus Timber-Harvest Planning, Budgeting, and Monitoring on Desired Conditions

Under the Committee’s recommendations, forest-management actions in the future would be guided by a comparison of the existing condition with the desired future condition. Where timber harvest is scheduled, management actions should be stated as a prescription that focuses first on the actions needed to achieve or maintain the desired ecological

processes, structure, and composition. The volume taken is the result of applying the prescription. While aggregating the expected volume will also be useful (and may be one of the goals of the prescription) planning, budgeting, and monitoring should focus first on the kinds and amounts of expected actions and the conditions they produce.

Past planning, which often emphasized timber harvest and the allowable cut, tended to polarize people and groups. Planning that focuses on desired future conditions and outcomes and the activities to achieve them, on the other hand, gives the Forest Service its best chance to unify people on the management of the national forests.

Budgeting by amount and type of actions, rather than by volume harvested, will ensure that the needed treatments occur. Currently, there is the understandable tendency to tackle the easy treatments to get the target volume; accountability by type of treatment will help reduce that.

The expected outcomes following a specific management action should guide the design of the monitoring program. The degree to which outcomes correspond to expectation will provide a key piece of information about progress toward the desired future condition.

## External Influences on Collaborative Planning and Stewardship: Issues and Recommendations

The Forest Service must deal with many external influences on planning and stewardship, such as budgets, the appeal process, the different agency legal responsibilities and missions, and the occasional direct interjection of the Executive Branch and Congress into planning. While these influences go beyond the Committee's mission, they are important to the stewardship of national forests and grasslands,

so we acknowledge and discuss them. We covered budgets in a previous section; we will cover the other three influences here.

### Develop a Consistent Approach Across Federal Agencies for Addressing Protests and Appeals

Different rules regarding how protests and appeals are treated by each agency can pose a significant problem within a multiagency collaborative planning process. The Committee recommends that the different agencies form a multiagency task group to carefully examine this problem and consider the development of an appeals process that is consistent across agencies and encourages participation in collaborative planning. The agencies' differences in experience and perspective on appeals and protests will provide useful comparisons for this effort.

The Committee hopes that the benefits to every agency of more smoothly working in a collaborative process will prompt immediate attention to this issue and lead to a willingness by the agencies to adopt consistent procedures. The Committee recognizes that legislation currently requires the Forest Service to allow project-level appeals after a final decision is made. While changing legislation requires a level of effort beyond that needed to change agency regulations, the appeal requirements need to be analyzed in the context of the new approaches to planning and recommendations for changes made to ensure that a collaborative planning process can succeed.

### Recognize That Differences Exist in Legal Responsibilities and Missions Across Federal Agencies

The Committee heard many comments from people concerned about the substantive and procedural differences across the numerous federal statutes affecting federal land and resource management. While ideally these

differences might be reconciled by new legislation, such a solution is for the long term. For both the short and long terms, the Committee recommends a collaborative planning process in which representatives from other agencies responsible for implementing these laws and the public are involved in the planning process. In addition, representatives of agencies with jurisdiction or interest would logically be members of the teams undertaking the project reviews of implementation plans. Certainly, getting the requirements of all environmental laws out on the table from the beginning of the planning process should help reduce problems at the end of it. Nonetheless, the differences in timing and procedures for planning processes across agencies poses a significant impediment for a coordinated approach to collaborative planning. To the extent that planning processes are a matter of regulation, agency efforts to revise the schedules and processes to provide greater consistency would enable each to better meet their responsibilities for stewardship and sustainability.

Still, it must be acknowledged that agencies differ in legal responsibilities and missions. Some agencies are charged with protecting a specific set of resources; others have a more expansive mission that calls for both protection of resources and their use. It is not surprising that these agencies differ, at times, in the appropriate actions to take to deal with an issue or problem. While this arrangement can be viewed, by some, as part of our system of checks and balances, it can be very frustrating to the agency participants and the public. We believe that the collaborative-planning approach suggested here can help the agencies and the public to develop new approaches for working with each other and methods for reconciling differences in responsibilities. Nonetheless, at times there may be conflicts between the requirements of different statutes and their implementation that require new policies, regulations, or legislation.

## Recognize That Actions by Congress and the Administration Can Undercut Plans and Render Collaborative Planning Ineffective

Nothing is more disheartening to a collaborative planning group than to work for months and years on a plan for some national forest or grassland and then to see it pushed aside by actions from Congress or the administration. The people whose participation is needed must have some belief and assurance that their work will make a difference and that a carefully crafted long-term plan will not be overturned on the sudden impulse of someone in Washington, D.C.

The Committee's report discusses the potential effect of budgets on plans and their implementation. Here, a slightly different issue is being addressed: the temptation of congresses and administrations to give planning direction outside of the planning process. Everyone understands that emergencies can occur that require such action. But doing so on a regular basis will undercut and render ineffective the planning process set up to create long-term plans.

It is not the Committee's role to instruct current and future congresses and administrations on the limits of their actions. But people will put their time, energies, and emotions into crafting long-term plans only if they have assurance that these plans will actually guide actions on the national forests and grasslands.

## Conclusions

Since the deliberations of the previous Committee of Scientists, society has undergone several changes. During the past 20 years, the pressures on the national forests and grasslands have significantly increased. At the same time, society has redefined sustainable use. The policy of sustainability has been sharpened by identifying its ecological, economic, and social components. Complementing the new understanding of sustainability has been

new understanding of stewardship and collaborative planning. Planning and management can no longer be organized around the administrative boundaries of national forests when those boundaries do not recognize the larger landscapes within which the forests and grasslands exist. Assessments of resource conditions must be made at appropriate scales. Decisions and assessments at these scales must be made with effective, ongoing public participation. Complementing the need for increased and more-effective public participation are changes in the roles of scientists and scientific information in the collaborative-planning process.

The report explains how these new understandings can be implemented within a framework of planning for the national forests and grasslands. As the Undersecretary requested, we have developed a conceptual framework

that has integrated diverse perspectives from the natural and social sciences into what we believe are realistic ideas. Implementation of these suggestions in many cases will not be easy. However, the Committee expects that the learning and innovation that is already occurring will continue. The Committee's emphasis on adaptive management and adaptive planning seeks to ensure that a commitment to "continuous learning" about how to do planning, how to develop stewardship capacity, and how to ensure desired on-the-ground results will come to define the culture of the Forest Service. By approaching planning not as a "cookbook" for making decisions, but as an opportunity to learn, to test new ideas, and to continuously evolve based on new understandings, the Forest Service will meet the expectations for "conservation leadership" set forth in the National Forest Management Act.