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National Forest Planning Under RPA/NFMA: What Needs Fixing?

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Introduction

The USDA Forest Service has nearly completed the first round of long-range land and resource management plans for the national forests, pursuant to the requirements of the Forest and Rangeland Resources Planning Act (RPA) of 1974, as amended by the National Forest Management Act (NFMA) of 1976. Of the 123 plans required, 91 are in final form as of July 1, 1989. The remaining plans are expected to be completed in 1990.

Forest planning under RPA/NFMA has been under way for 10 years. The process actually began in late 1979 after Department of Agriculture Secretary Robert Berglund issued final regulations to guide the planning process (36 CFR 219).

It is not a new activity for the Forest Service, long a leader in long-range, multiobjective forest planning. However, RPA and NFMA are the most demanding planning statutes that any Federal land management agency has been asked to implement. The acts significantly expanded the formal requirements for planning, resource use tradeoff analysis, documentation of the bases for decisions, reporting, and public participation. To respond, the Forest Service had to devise a whole new planning and decisionmaking system. At the same time, it had to recruit and train a new generation of forest planners, who then set about the task of producing 123 plans by 1985.

A retrospective evaluation at this time of the Forest Service's experience with the RPA/NFMA forest planning process seems appropriate for several reasons:

1. Changed conditions and new information require that some of the early forest plans be reconsidered in the near future, even if they have not yet been fully implemented. Before this second-round planning effort begins, the policies and procedures that guided the first round should be examined to determine whether there are ways to make the process more effective.

2. Problems and issues arose in the first round of planning that were not anticipated or thoroughly analyzed at the time NFMA was enacted and the planning regulations promulgated. These issues should be reviewed to determine whether changes in the NFMA planning regulations are needed to facilitate forest plan revisions. The regulations were scheduled for formal review by May 1990.

3. Normal turnover is rapidly depleting the original interdisciplinary planning teams and other professional personnel who contributed to the first-round forest plans. Forest planning is an inexact professional art—there is much to it that is not contained in manuals or regulations. Hence, there is need

to assess the collective experience of the first generation of forest planners before it is lost to the agency.

4. Congress may choose to hold oversight hearings on the first round of NFMA planning in the near future. To better anticipate the issues and questions that may be raised, the Forest Service needs a critical evaluation of the policies and procedures used to produce the first set of forest plans.

Objectives

In response to the above needs, and on direction from Chief Dale Robertson, the Washington Office of the Forest Service initiated a major review and critique of the forest planning process in early 1989. The work on which this report is based began in early 1988. The primary objectives of the study were to (1) review and evaluate the national forest planning process that has developed in response to the requirements of RPA/NFMA and (2) identify means for improving the planning process, including changes in the NFMA planning regulations or administrative policies.

The study focuses on regional- and forest-level planning, particularly the latter. The national RPA Assessment and Program planning process is not considered, except to the extent that forest plan development is linked to RPA program goals. Further, following discussions with Forest Service staff in the Office of Policy Analysis and the Office of Land Management Planning, it was agreed that the review would emphasize, but not necessarily be limited to, three closely related areas of concern:

1. Applications of economic analysis to the development and comparative evaluation of forest plans.

2. Effectiveness of alternatives formulation and analysis, as presented in the final forest plan documents.

3. Analytical techniques and procedures, including economic considerations, used to identify suitable timberlands.

With regard to the overall critique of the land and resource management planning process to be conducted by the Forest Service, the study contributes to the following areas of evaluation: Part IV(A), usefulness of the forest plan results; Part IV(B), adequacy of the NFMA regulations; Part IV(C), effectiveness of the planning and decisionmaking process; and Part IV(E), availability of information and effectiveness of the analytical tools and processes (USDA Forest Service 1989).

The study focuses on the RPA/NFMA forest planning process, rather than its primary product—the decisions documented in a forest plan. There is no comment here on whether the land allocations, output levels, or environmental protection goals presented in the forest plans represent good or bad policy, or if the decisions made are consistent with the expectations of Congress when the RPA/NFMA was enacted. A retrospective evaluation of that kind is appropriate for the Chief of the Forest Service or for Congress, but this report does

not enter that area, even though such issues are undoubtedly the main concern of many people in many different organizations.

From the start, Forest Service planning under RPA/NFMA has been controversial. Now, 10 years later, many participants in the process believe it is too complex, technical, and expensive. Some believe that the long period of time required to complete the plans has worked against effective public participation. Others argue that the intent of RPA/NFMA is not being met by either the process or the product. Still others believe that "forest planning is not going to work."

This report respects these concerns. However, it approaches the forest planning from a more positive perspective, much like that suggested by Alaric Sample (1989) in his review of the RPA Program process. Forest Service efforts to implement RPA/NFMA is viewed here as a "heuristic process." The immediate need is to revise those elements that failed to work out as hoped and to retain and possibly improve those that did.

This framework is consistent with the final report of the USDA National Committee of Scientists (44 FR 26599–26657), which in 1979 warned that the process would be costly and imperfect. The committee appealed "to all for a constructive period of dialogue, common effort, and cooperation so that the process may succeed" (at 26601). It also recognized that implementation of planning regulations would "produce a vast amount of new practical experience which may point to areas for improvement" and called for periodic reviews to evaluate and revise the regulations (at 26601). As a former member of the committee, this author endorsed those principles then and intended to follow them in this report.

Procedures

The information on which this report is based was derived from several interrelated stages of review of public documents and consultation with persons both within and outside the Forest Service. First, RPA/NFMA, NFMA legislative history, and NFMA planning regulations were reviewed to identify criteria for evaluating forest planning, with specific but not exclusive focus on the three areas of interest identified under "Objectives."

Second, the forest plans for six national forests in four different Forest Service regions were reviewed to assess how the planning requirements had been applied and the effectiveness of plan documentation. This review initially focused on the application of economic analysis, formulation of alternatives, and identification of suitable timberlands, but it expanded into other areas in response to concerns expressed in field interviews. Included were the Gallatin and Lolo National Forests in the Northern Region, the Ashley National Forest in the Intermountain Region, the Plumas and Sequoia National Forests in the Pacific Southwest Region, and the Siuslaw National Forest in the Pacific Northwest Region.

Third, seminars and field interviews were held with Forest Service personnel, industry organizations, and environmental groups. The purpose was to assess

the strengths and weaknesses of the forest planning process, as perceived by those participating in it, and to identify changes in procedures, the NFMA regulations, or statutory language that could improve the process. The seminars specifically addressed the role and application of economic analysis in forest planning and decisionmaking, the extent to which it was practically feasible to meet the requirements of the NFMA regulations, and any changes in policy or administrative direction that could improve the usefulness of economic analysis to planners and decisionmakers.

Nine seminars were held with Forest Service personnel, including Regions 1, 4, 5, and 6 and each of the six study forests. Three were held with industrial organizations, and two with environmental groups. In addition, the Washington Office was consulted at various times during the beginning and ending stages of the project. Altogether, in the field phase of the project, the author consulted with 25 organizations and 86 persons, including administrative officers, forest planners, operations analysts, attorneys, forest economists, and academicians. A complete list of participants is included in this report as Appendix A.

The field seminars and interviews were recorded in the form of notes and later expanded into an analysis of problems that the participants had identified as needing "fixing" in preparation for the second round of forest plans. This procedure was primarily subjective, drawing from the collective experience of the participants, including the author. Had a different person conducted the seminars, the results might have been different. However, many of the same problems or areas of concern were repeatedly raised by different groups. This replication suggests that while the method was subjective and relatively unstructured, there is some assurance that the problems are of general concern.

Fourth, previously published critiques of various aspects of the forest planning process were reviewed as a means for further refining the problems and issues identified in the field seminars. These are cited at appropriate points in the following chapters of this report.

The Report

The next chapter briefly discusses the statutory framework for forest planning and considers the problem of devising objective criteria for evaluating the planning process and forest plans. The third chapter is the core section; it analyzes 10 elements of the forest planning process that need further evaluation and "fixing" to improve the effectiveness of the second round of forest planning. This chapter is largely based on the field seminars and interviews but, for additional perspective, draws from other published critiques and the author's previous involvement as a former member of the Committee of Scientists in developing the NFMA planning regulations. The fourth chapter addresses the use of economic analysis in forest planning. The last chapter summarizes the major conclusions and recommendations.

Throughout the report, the term *second-round planning* refers to the process for revising the first generation of forest plans developed under the NFMA planning regulations, as required by 36 CFR 219.10(g). The regulations

provide that a forest plan can be revised at any time, if conditions have changed, but at least every 15 years. However, it is unlikely that all forests will find it necessary to start the revision process at the same time. Thus, in the future, forest planning will likely be a continuous process. The term *second round* as used here refers to the procedures and standards for plan revisions and should not be taken to imply a second cycle of forest planning with a discrete beginning and end involving all forests simultaneously.

Criteria for Evaluating Forest Planning

Ideally, an evaluation of forest planning should be based on a set of reasonably objective performance criteria. By comparing actual performance to explicit standards, problems and deficiencies can be identified. The evaluation process might at the same time identify means for improving future performance. The next chapter tries this approach, but, as explained below, the criteria used tend to be implied and inductive rather than explicit and deductive. Also, subjective judgment in large measure unavoidably enters the evaluation process. Of course, in the end, political or legal evaluations will be the ultimate referees.

RPA/NFMA is the key statutory source for identifying legal criteria for evaluating the perfonnance of both the planning process and the results of that process as expressed in a plan for a particular forest. The criteria may be drawn from the RPA/NFMA's numerous, often complex, and in some instances ambiguous requirements, which express congressional expectations about how the Forest Service was to conduct the planning process and the decisions to be made in a forest plan. The National Environmental Policy Act (NEPA) of 1969, the Administrative Procedures Act of 1946, and other laws also are sources, but in the discussion to follow, RPA/NFMA is of exclusive concern.

It is not necessary for the purposes of this report to provide a comprehensive review of RPA/NFMA or its legislative history. Several thorough reviews have alrcady been published (Wilkinson and Anderson 1985; The Wilderness Society et al. 1983). However, in a small-scale experiment, the author reviewed RPA/NFMA to identify language that established specific forest planning requirements and, by direct implication, performance criteria for *ex post* evaluations of the planning process. The objective was to explore the feasibility of establishing explicit, objective performance criteria. Most of the pertinent language is found in Section 6, National Forest System Resource Planning, but Sections 9, 10, and 13 also include specific requirements that must be addressed in forest planning.

The results of the analysis are reported and discussed in Appendix B. To summarize, 30 criteria are identified for evaluating forest planning. The criteria can be divided into three categories: (1) *procedures* for developing a forest plan (11 items); (2) *resource management standards* to be achieved by the plan (17); and (3) *documentation* to be included in the plan (3 items). Of the 30 criteria, 27 are expressed in *general, qualitative* form; they are not susceptible to objective application (that is, they involve issues of interpretation as to their exact legal or technical meaning, including congressional intent). Three criteria could be expressed as *quantitative* goals, and thus could be tested by reference to objective standards. An example is the requirement to limit the allowable sale quantity to "an amount equal to or less than a quantity

which can be removed from such forest annually in perpetuity on a sustained yield basis."

An example of an important performance criterion is Section 6(b) of RPA/NFMA, which stipulates that "the Secretary shall use a systematic interdisciplinary approach to achieve integrated consideration of physical, biological, economic, and other sciences." The corresponding NFMA planning regulations direct that "[a] team representing several disciplines shall be used for regional and forest planning . . ." and that the team "may consist of whatever combination of Forest Service staff and other federal government personnel is necessary to achieve an interdisciplinary approach" (36 CFR 219.5).

The interdisciplinarity criterion is in category 1, relating to procedures, and is expressed in qualitative terms. It does not specify the number of interdisciplinary team members or the number of disciplinary or professional specializations to be represented by the team, in keeping with the overall philosophy of RPA/NFMA, which generally established goals and policies rather than prescribing specific practices. The interdisciplinarity criterion is documented in forest plans—interdisciplinary team members are listed together with their disciplinary or professional specialization. In this sense, one might affirm or not affirm that an interdisciplinary approach was used. However, the degree to which the team was effective in integrating the various sciences and functional specialists is impossible to assess objectively based on its membership or the content of the forest plan. This is not to say that a subjective assessment is not possible or will not be attempted by someone.

Section 6(g)(3)(B), which requires that the plan(s) provides "where appropriate, to the degree practical, for steps to be taken to preserve the diversity of tree species similar to that existing in the region controlled by the plan . . ." (that is, the planning unit), is a performance criterion in the set of planning requirements relating to resource management standards (category 2). The corresponding NFMA planning regulation is more specific, stating that "[m]anagement prescriptions . . . shall preserve and enhance the diversity of plant and animal communities, including endemic and desirable naturalized plant and animal species, so that it is at least as great as that which would be expected in a natural forest and the diversity of tree species similar to that existing in the planning area" (36 CFR 219.27).

As in the case of many other performance criteria, the species diversity criterion is compound and not susceptible to expression as a technical or scientific measurement. It includes two basic standards: (1) the degree of diversity, either natural or common to the planning area, as known and measured and (2) management prescriptions that will accomplish diversity goals. The latter are discretionary decisions depending upon the multiple-use objectives of the forest plan. The first standard is subjective because there is a wide range of forest conditions that could be considered "natural." The second is subjective because the decisionmaker must make a nonobjective judgment about a desirable diversity goal. Any number of options may be available, none of which could be proven to be more correct than any of the others. It is to be expected

that different reviewers might arrive at different conclusions. Because subjective judgment so dominates the decisionmaking process, application of a performance criterion is similarly subjective. (For an excellent discussion of this point, see Wollondeck (1988).)

An example of a documentation criterion (category 3) comes from Section 6(f)(2), which requires that the forest plan shall include "in appropriate written material . . . the planned timber sale program and proportion of probable methods of timber harvest." This specific criterion is reasonably objective: "yes," the required information is displayed; or "no," it is not. Yet the general adequacy of "full disclosure" in forest plan documentation, particularly the environmental impact statement elements, is obviously judgmental and much at issue.

The performance criteria discussed above and listed in Appendix B all come under the heading of *legal sufficiency, compliance, or permissibility*. The whole planning process is designed to ensure that at minimum these standards are achieved. No reviewer can objectively determine that they were achieved: if in a particular instance there is an issue, it is for the courts to decide.

In the following chapter, the planning requirements are used in selected areas not to determine legal sufficiency of the decisions made in the forest plans but instead to help identify implementation problems and actions that could be taken to improve planning procedures for ensuring legal sufficiency or some other performance criterion. This, too, relies heavily on the subjective evaluations of those who participated in the study, including this author's.

Legal sufficiency is but one of a larger set of ad hoc criteria that will be used both within and outside the Forest Service to evaluate forest planning. Many were suggested by participants in this study. Still others can be drawn from the extensive critical literature on forest planning (Ellis and Force 1988; Baltic et al. in press; Gould 1987; O'Toole 1988; Rey 1987; Shands 1987; Schweitzer 1987; Wilkinson and Anderson 1985; USDA Forest Service 1989; Wollondeck 1988). Some relate primarily to the planning process, while others measure the adequacy of forest plans. The following generic list may not be inclusive, but illustrates the range of criteria that will enter the debate about the strengths and weaknesses of forest planning under RPA/NFMA:

The Planning Process

1. Legal sufficiency (with RPA/NFMA, NEPA, the Administrative Procedures Act, and other laws).

2. Successful resolution of conflicts and issues.

3. Cost-effectiveness relative to quality of the product.

4. Provision for effective public participation.

5. Production of "good" forest plans.

The Forest Plans

1. Criteria (1) to (4) above, plus the following below.
2. Based on "good" data.
3. Supported by sound analysis.
4. Technically feasible—can be implemented on the ground.
5. Economically efficient.
6. Utility—useful to managers and the public.
7. Flexibility—can accommodate new information or unexpected events.
8. Accommodating to the concerns of affected interest groups.

Toward Improving Forest Planning

This chapter offers general evaluations of forest planning as matters stood in 1988 and identifies 10 problem areas or issues that need "fixing" to improve the planning process, including recommendations for change. The focus is on the planning process rather than individual plans, but it is necessary to comment on the latter to identify problem issues of a procedural or policy nature and to document the basis for the recommendations.

General Evaluation

RPA/NFMA and the NFMA planning regulations are widely acknowledged to be difficult to implement both technically and politically. (This caveat is discussed extensively elsewhere but merits repeating.) The analytical and documentation requirements are complex and require a massive data base. Some of the variables at issue are not readily quantifiable, and even the best available data are of questionable accuracy. Assumptions and projections, always an inherent part of any planning process, may become contentious issues in their own right. RPA/NFMA often gives vague and sometimes contradictory direction in precisely those areas most at issue. Furthermore, if the analyst tries to track congressional intent through the legislative history, clarification may prove to be illusive.

Much Was Learned

Looking back to 1979 when the NFMA planning regulations were first released, the Forest Service has made impressive progress in implementing the new planning process. The agency has developed a sophisticated state-of-the-art set of planning tools and processes. Planners have developed an extensive data base, imperfect though it is; equally important, they have identified missing and low-quality data that could be improved through research. The most recently available scientific and technical information has been brought to bear on planning issues. All forests visited during this study cited the generation of data and information not previously available or considered as a major benefit of the first round of forest planning. The standard statement was: "We learned a lot."

In 1979, there was no supporting analytical system. The Multiple Use–Sustained Yield Calculation Technique was waiting in the wings, but its descendent, FORPLAN, was yet to be developed and adopted for application to the forest planning problem. A massive research and development effort involving most of the very best systems analysts, programmers, and computing experts in the country was organized and subsequently produced the various releases of FORPLAN, including versions 1 and 2. (See Iverson and Alston (1986) for a critical evaluation and the historical development of FORPLAN.) Today, FORPLAN provides a powerful aid to forest planning and is regarded

by many specialists as the best available system for meeting many analytical requirements of the NFMA planning regulations. (Hoekstra et al. (1987) provide a comprehensive evaluation of FORPLAN, including its usefulness in meeting RPA/NFMA planning requirements.) IMPLAN and other simulation models also were developed and integrated with the analysis and decision-making process. As a result of these efforts, the state of the art in quantitative analysis of economic and environmental effects of resource management options was advanced considerably.

Forest Plans

The Lolo National Forest released the first draft forest plan for review in 1980, only a year after the NFMA planning regulations were promulgated. Others soon followed. In terms of their quality as public documents, all six of the more recent forest plans that were reviewed in this study are much improved compared to those early draft plans. The quality of the plans varies, but considering both the inherent expository limitations of an environmental impact statement and the complexity of forest planning, from a technical perspective they are generally well written and well organized. Some of the better plans provide guides for tracing issues through the environmental impact statement and indices for locating topics of specific interest to the reader. The plans generally meet legal requirements in terms of analysis and documentation.

As required by the NFMA planning regulations, all of the plans reviewed for this report present a relatively wide range of alternatives in terms of the mix and level of resource uses. Their estimated effects are displayed in maps, tables, and charts. Tables displaying environmental, financial, and economic effects of the alternatives, including the opportunity cost of constraints and minimum management requirements, have been greatly improved. The Pacific Southwest Region has been notably successful in standardizing terminology and technical explanations of analytical procedures.

The forest plans are legal documents designed to meet the requirements of RPA/NFMA, NEPA, and other statutes. Their legal sufficiency is understandably a major concern to planners and the responsible supervisor. As a result, the forest plans have become voluminous technical documents to the extent that they may not be readily understood by the general public.

For example, the Sequoia National Forest Land and Resource Management Plan released in 1988 (with the record of decision, forest plan, final environmental impact statement, and map packet) is 7 inches thick, 1,500 pages long, and weighs 11 3/4 pounds. (This plan was appealed by the attorney general of California and by the Sierra Club on the grounds that the environmental impact statement was inadequate, among other claims.) For a technically experienced reader, reviewing a document of this size and technical sophistication is an intimidating prospect, but not impossible. A lay reader, on the other hand, may be so daunted as to not undertake the task. But given the documentation requirements of the law and the prospect of legal actions, this situation must be accepted as one of the inherent, if unfortunate, features of forest planning today.

There is a related, even more serious, problem: Even though much information is presented, the forest plans are basically opaque. It is difficult, if not impossible, for a reader to trace the decisions reported to underlying analyses, assumptions, key relationships, marginal tradeoffs and values, and decision criteria. As a result, the preferred alternative, record of decision, mix of silvicultural practices, and many other details seem to emerge from a sort of black box.

For example, in the case of the six forest plans reviewed during this study, it was attempted to trace the procedures and rationale for identifying the suitable timberland base, as required by the NFMA planning regulations. All plans displayed in tables the number of acres designated as unsuitable because of availability, regeneration, or physical considerations. But analysis and decisionmaking procedures, including the use of economic criteria to select a cost-effective timberland base, were not explained. Theoretically, the most cost-effective timberland base is selected by FORPLAN to meet the policy-determined timber production goal for each alternative under consideration, including the preferred alternative. However, in the case of three forests, the actual identification of unsuitable timberlands was made through an ad hoc subjective decisionmaking procedure rather than the one prescribed by the NFMA planning regulations. The alternative approach was not documented or explained in the forest plan, so it is impossible for the reader to determine how the final decision was actually made. Other examples of this kind of reporting problem could be cited and are discussed further below.

Interdisciplinarity

Interdisciplinarity was a key concern of Congress when it enacted NFMA. Correspondingly, the Committee of Scientists gave extensive advice on means for ensuring that the NFMA planning regulations included an effective interdisciplinary approach to forest planning. The committee stated that three issues were central to establishing an effective interdisciplinary approach: (1) the composition of the team and the qualifications of its members; (2) the philosophy that guides the team while it operates; and (3) the actual planning process that the team uses (44 FR 26613). It also stated, "assuring an interdisciplinary approach through regulations is very difficult."

Forest Service implementation of interdisciplinarity in forest planning seems to be relatively free of public and professional criticism. (One exception are the procedures for minimum management requirements. See O'Riordan and Homgren (1987).) It was rarely raised as an issue in the seminars and field interviews. The forest plans examined for this report document that an extensive range of professional and disciplinary specialists were involved in the first-round plans. For example, the Sequoia National Forest plan lists 58 degreed persons in 17 different professional, technical, or scientific specialties. Numbers alone do not ensure effectiveness, but the plans demonstrate that a good faith effort was made to ensure that no particular resource-oriented group would dominate the information-gathering, analysis, and decisionmaking processes.

Planners on three forests (Siuslaw, Plumas, and Sequoia) reported that the interdisciplinary approach generally worked well, with specialists trading information and challenging each other's assumptions and viewpoints. The Plumas National Forest felt it had been about 50 to 60 percent successful in achieving an interdisciplinary effort. Two problems, however, were cited: (1) persuading the necessary people to serve on the interdisciplinary team and (2) the failure of key individuals to participate regularly in team meetings. Planners reported that understanding and communication among the resource specialists improved during the process. Only one of the six study forests reported serious difficulty in organizing an interdisciplinary effort; in this case, an internal conflict arose over whether timber or forest planners would have authority to resolve issues involving the identification of suitable timberland and the determination of the allowable sale quantity.

In addition to composition, competence, and cooperation, the effectiveness of interdisciplinary planning teams also depends on the continuity of membership. Unfortunately, because of the long period required to complete first-round planning—10 years on some west coast forests—interdisciplinary teams experienced high turnover. For example, the Siuslaw National Forest, which has not yet released a final plan, has had three interdisciplinary team leaders and three economists. Only 2 of the 10 original interdisciplinary team members are still assigned to the forest. On most study forests, only a small group of persons, as few as one or two, maintained continuous involvement in the project from beginning to end. Personnel turnover will make it difficult to preserve the collective memory, diminish continuity of intent and policy in plan implementation, and degrade the effectiveness of the postplanning monitoring process. Interdisciplinary team stability is definitely a problem to address before the second round of planning. It is addressed further under the heading "Fate of Planners" later in this chapter.

NFMA Planning Regulations

Many substantive questions have been raised about the effectiveness of the RPA/NFMA forest planning process. Yet, surprisingly, those consulted did not regard either RPA/NFMA or the NFMA planning regulations as in need of major revision. There were no suggestions for amending RPA/NFMA, now 13 years old. The NFMA planning regulations also are generally regarded as providing adequately principled guidance to the planning process. However, numerous suggestions for clarifying or improving the regulations emerged in the seminars and other meetings. These are discussed later in this chapter. For the most part, they can be characterized as "fine-tuning" rather than revision of fundamentals.

In contrast, people both within and outside the Forest Service frequently expressed dissatisfaction with the administrative implementation of the planning regulations. Some forests and regions expressed concern about administrative direction interpreting the NFMA planning regulations. One supervisor argued strongly: "We got a lot of garbage in administrative direction . . . we should eliminate the memos, letters, administrative policy statements, and go back to the regulations." One region raised consistency of direction versus flexibility

as an issue: "Interpretations [of the regulations] vary depending upon the issues of the day and who the main actors are." Other complaints focused on whether congressional intent was being followed in decisionmaking, on the scope of decisionmaking in the forest plan, on whether the forest plans were effectively resolving issues, and on whether decisions were "right" or "wrong."

These issues and many others are already well known to the Forest Service. They are mentioned here to emphasize that a full-scale problem analysis should involve three levels of review: statutory, regulatory, and administrative direction. In any case, a comprehensive review of administration implementation of NFMA regulations was beyond the time available for this study. To some extent, the problems and issues identified in this chapter cut across all levels, but they primarily fall at the regulatory level.

What Needs Fixing?: Problems and Recommendations

Based on the field seminars and published sources, numerous elements of the forest planning process were identified that merit review and evaluation based on the first-round forest planning experience. Several of these, including identification of suitable timberlands, use of economic efficiency analysis, formulation of alternatives, and FORPLAN, were cited by two-thirds or more of the Forest Service units and other organizations consulted during the study. Others, such as monitoring and cooperation with State or local governmental units, were cited, but seem to be of relatively little concern.

This section reviews the pathologies of 10 problem areas selected on the basis of the frequency with which they were identified by participating organizations. The problems involve the "nuts and bolts" of the present planning process, as prescribed by the NFMA planning regulations, rather than overarching political issues of the Forest Service's legal mandates and resource allocation policies.

Identification of Suitable Timberlands

In its 1979 final report, the Committee of Scientists described the identification of suitable timberlands as one of several particularly "complex and controversial" issues in forest planning (44 FR 26600). Ten years of experience amply substantiate its observation: Both the procedural and policy aspects of timberland suitability remain a subject of debate (Johnson and Sessions 1986; Wilkinson and Anderson 1987).

The NFMA planning regulations prescribe a three-stage procedure for identifying national forest land considered suitable (and, conversely, nonsuitable) for timber production as follows (36 CFR 219.14):

- In Stage I, land is evaluated to identify those areas that are potentially available for and physically and biologically suited to timber production. This is a decisionmaking procedure—some land may be declared as categorically unsuited at this stage.

- In Stage II, land that is physically and biologically suited is stratified into categories with similar management costs and returns. Further, alternative management prescriptions are formulated and evaluated to identify the financially most efficient management intensity for timber production for each category of land. Stage II is a data development procedure—there is no rule that requires negatively valued prescriptions or land to be declared unsuitable. On the other hand, the Forest Service has discretionary authority to establish a rule if it wishes. The intent of Stage II analysis is to stimulate a search for the most financially efficient set of prescriptions, particularly those that are positively rather than negatively valued.

- In Stage III, lands are further evaluated in the context of the multiple objectives, constraints, and management requirements of a specific strategic land management alternative. For each alternative plan under consideration, land is tentatively identified as suitable if: (1) the land is not needed to satisfy land-use objectives that preclude timber production (for example, wilderness); (2) nontimber management objectives do not limit timber production activities to the degree that management requirements cannot be met (36 CFR 219.27); and (3) the lands are cost-effective in meeting the alternative's objectives, including timber production.

In the final environmental impact statement, lands identified as physically suitable in the Stage I analysis and as tentatively suitable in the Stage III analysis are identified as suitable in the preferred alternative. Selection of the suitable timberland base is accomplished simultaneously with the design and selection of a preferred alternative. Timber and nontimber objectives and economic and environmental considerations affect the proportion of area identified as suitable. Stage III is informational in function because the result is a display of alternatives together with their associated cost-effective suitable timberland bases. It also is the point where subjective decisions are made about which alternative is best in the sense of maximizing overall public net benefits.

In principle, perhaps with one major exception, these procedures are still regarded as appropriate and with regard to "the requisite analysis . . . quite rigorous . . ." (Wilkinson and Anderson 1987). However, in application, several issues have arisen that deserve further consideration.

Stage I Problems

The NFMA planning regulations require that land be designated as unsuitable if, given existing "technology or knowledge," there is not "reasonable assurance" the lands can be restocked to standards specified in regional guides "within 5 years after final harvest" (36 CFR 219.14(a)(3) and 219.27(c)(3)). Experience with this requirement, particularly in Regions 1 and 4 where there is a large area of relatively unproductive or harsh site land, raises questions about the 5-year rule.

For example, on both the Ashley and Gallatin National Forests, it is technically feasible to regenerate harvested land within 5 years by a hand-planting prescription. However, hand-planting is less cost-effective than natural regeneration, which generally requires 7 to 8 years. Does the suitability test only require that a method exists that could ensure regeneration in 5 years? Or that the practice actually adopted is expected to do so? On the Ashley National Forest, the decision was made to assign a 7- to 8-year cost-effective natural regeneration prescription to land classed as suitable on the basis that such land technically could be regenerated in 5 years by hand-planting. Should there be some flexibility in establishing a minimum regeneration period in recognition of varying conditions within and between regions? Should there be some flexibility to adopt an extended regeneration period to capture nontimber benefits, such as increasing forage capacity for wildlife? These questions go to one of the root issues of RPA/NFMA and the NFMA planning regulations—specificity versus flexible discretionary authority in making silvicultural decisions.

The 5-year rule is drawn directly from NFMA; thus, in the absence of an amendment, there is no flexibility in this aspect of the Stage I screening process (16 U.S.C. 1604(g)(3)(E)). Technically, the Ashley National Forest and other forests that have followed the Ashley's interpretation of the NFMA planning regulations are in violation of both the regulations and the intent of NFMA. On the other hand, the regulations provide for administrative discretion in defining an acceptable level of risk of not achieving adequate stocking and the stocking standards by which success is to be judged. Apparently, judging by lack of comment, these elements of the Stage I process have not posed any particular problem for forest planners. However, Henry Carey et al. (1988), who reviewed practices on six national forests (Bitterroot, Shoshone, Apache-Sitgreaves, Bridger-Teton, Sequoia, and Siskiyou), concluded that the standards are exceptionally low. These authors argued (on page 13) that the minimum stocking requirements "are but a fraction of those suggested by research." They also recommended (on page 39) that the NFMA planning regulations be revised to follow the legislative language and to require implementation of several new requirements, including a strict economic test of timberland suitability. As noted, the NFMA planning regulations use the phrase "reasonable assurance" rather than "assurance," the statutory language. Also, the 1979 regulations were revised in 1982 to read, "the technology and knowledge exist to adequately restock the lands. . . ." Carey et al. claimed that the 1982 regulations are weaker than the standard prescribed by NFMA. However, the former members of the Committee of Scientists, who were consulted during the 1982 revision process, concurred with the changes and supported the "reasonable assurance" concept. In so doing, they recognized the impracticality of a "zero-risk" regeneration policy.

A detailed evaluation of this aspect of Stage I analysis was beyond the scope of this study. According to Region 1, the standard of "reasonable assurance" is a 75-percent chance of regeneration success. This seems low, but it is perhaps not unreasonable. Carey's argument that stocking standards are below those suggested by research studies deserves consideration. The test of Stage I

screening is whether reforestation backlog builds up under standards being applied. An effective monitoring and data analysis system is therefore essential to meeting the intent of Stage I and to second-round planning.

Stage I Recommendations

1. Clarify intent and procedures for Stage I analysis and decisionmaking with specific reference to the application of existing technology and knowledge for identifying physically suitable timberland subject to the 5-year rule.

2. Amend NFMA and revise the NFMA planning regulations to provide an exception to the 5-year rule in cases where achieving a 5-year standard requires a regeneration method that is less cost-effective than an alternative method.

3. Require that regional guides include standards for establishing reasonable assurance of regeneration success and minimum levels of stocking.

Stage II Problems

As noted above, the purpose of Stage II analysis is to generate information about the potential economic efficiency of alternative timber management prescriptions at the stand level before formulating forest-level alternatives and considering nontimber uses. The requirement for Stage II evaluations reflects congressional concern that timber harvesting and investment not be undertaken on economically submarginal timberland. The results of Stage II provide preliminary documentation that economic factors have been considered in selecting a suitable timberland base. Stage II analysis also can provide a basis for screening out prescriptions that are substantially negatively valued or less efficient than other alternatives.

Generally, the forest plans that were examined in this review did not document the results of Stage II, identify any issues that the evaluations might have raised, or explain its use for defining the set of prescriptions finally included in FORPLAN. The exception is the Plumas National Forest Land and Resource Management Plan of 1980, which in Appendix B states: "The Stage II analysis serves to flag proposed management activities which in isolation are inefficient. This information is useful in developing forest-wide alternatives and in validating the results of FORPLAN analysis."

The Plumas National Forest plan also reports the range of present net values for all timber management prescriptions, with and without current timber inventory value, and states that present net values are available in a special report included in the forest planning records. The information presented suggests that, generally, the prescriptions were positively valued, but the extent to which negatively valued prescriptions have entered FORPLAN is not evident from the documentation provided.

Although not documented in the forest plans, planners on two forests reported that Stage II results were used as the basis for identifying a range of cost-effective prescriptions. On others, there was no explicit Stage II evaluation process; indeed, in the case of several forests, economic efficiency was not directly considered in the decisionmaking process, as discussed further below. Apparently the usefulness of Stage II analysis is not widely perceived by forest planners, nor have the requirements been followed by all forests. Region 1 reported some uncertainty about the intent of Stage II analysis requirements. None of the plans identify the most efficient management intensity, as called for by the NFMA regulations, although this information may be available in the forest planning records.

Stage II Recommendations

The use of FORPLAN as the primary analysis tool for Stage III evaluations may have rendered Stage II redundant. Nonetheless, Stage II has potentially useful functions in the sequence of screens leading to the selection of a suitable timberland base, as already discussed. Therefore, it is recommended that the administrative implementation be strengthened by—

1. Clarifying the intent and use of Stage II analysis. This could be accomplished by amending the NFMA planning regulations or by administrative directive.

2. Requiring that the results of Stage II analysis be displayed and interpreted in the forest plan documents.

Stage III Problems

Stage III analysis is conducted in the context of forest-wide objectives and constraints. Given information on the area of physically suitable timberland (from Stage I), alternative management prescriptions (from Stage II), output goals, and constraints, FORPLAN is used to select the set of tentatively suitable timberlands that maximizes the present net value of each planning alternative under consideration. The acres allocated to timber production and other activities are mathematically cost-effective in meeting objectives of the plan in the sense that any other set would reduce the overall present net value. In the preferred alternative, acres not selected are per se relatively inefficient and are designated as unsuitable.

With this procedure, the marginally suitable unit is the least cost-effective acre selected by FORPLAN to meet a plan's goals and objectives. Subjectively determined policy decisions regarding timber production goals therefore directly influence the suitable timberland base. There is no absolute economic efficiency test at the stand or analysis unit level; indeed, as is now widely recognized, negatively valued land may be selected as suitable. However, the current procedure is consistent with the intent and requirements of the NFMA

planning regulations, which do not prescribe an absolute benefit-cost test for identifying suitable timberlands.

In practice, the FORPLAN-based Stage III procedures have proven difficult to implement and are much criticized. The problems have been extensively analyzed elsewhere and will not be repeated here (Iverson and Alston 1986; Hoekstra et al. 1987; Johnson and Sessions 1986; O'Toole 1988). Included are such technical matters as accuracy of data, price and cost trend assumptions, interest rate and modeling methods, and handling of spatial relationships. At the policy level, environmental groups continue to argue that NFMA requires a strict economic test of timberland suitability.

All forest plans examined in this study identified the area of suitable timberland by each planning alternative, including the preferred timber base, as required by the NFMA regulations. The Gallatin National Forest plan reports the amount of economically supramarginal timberland in the base, economically submarginal land included because of nontimber goals, and economically submarginal land included because of community stability considerations. This was an exceptionally forthright, informative display that explicitly states the decisionmaking criteria and highlights a policy issue. The format could well be adopted in other forest plans.

Used properly, FORPLAN is a useful tool for Stage III suitability analysis. However, three of the six study forests reported using ad hoc methods for identifying suitable timberlands that departed from the analytical approach described above. On the Ashley National Forest, all available timberland with a growth capacity of 20 cubic feet per acre or more was considered economically suitable under the most cost-effective management prescription. A FORPLAN Stage III analysis was done, but the suitable timberland base in the preferred alternative was established subjectively through a negotiation process with interested groups and district rangers. On the Lolo National Forest, timberland suitability was primarily examined as a roading/no roading issue. Early in the planning process, consultation with outside groups was initiated to identify areas considered best left roadless. This process simultaneously was the primary method for identifying suitable timberland for the first round of planning. These procedures could be called effective because suitability decisions on these forests were not administratively appealed. On the Sequoia National Forest, following Stage I analysis, suitable timberlands were identified by removing certain sensitive areas, reserves, and spotted owl habitat; the remaining area was considered suitable. Neither economic efficiency nor cost efficiency was a factor in the decisionmaking process.

These ad hoc approaches reflect reluctance of forest planners and supervisors to rely on FORPLAN simulations for Stage III decisionmaking. They properly recognize that certain unquantifiable values and distributional issues are at stake that require significant subjective judgment outside the confines of FORPLAN. This report takes no particular exception to the ad hoc methods reported, but it is problematical that the resulting timberland base is efficient as prescribed by the NFMA planning regulations. Nonetheless, their

experience in first-round planning should be studied carefully in the upcoming review of forest planning to identify ways of better linking subjective decision-making to the cost-effectiveness requirements of the NFMA planning regulations.

FORPLAN assigns management prescriptions and selects suitable timberland to maximize the present net value, subject to plan goals and policy constraints, including nondeclining yield. In 1986, McQuillan reported a troublesome phenomenon, which he called the "Declining Even-Flow Effect."

Areas exist on many forests (including four of the six forests reviewed in this study) that will have a negative present net value if scheduled for timber harvests. Considered on their own merits, at the stand or analysis unit level, such areas are economically inefficient for timber production. Without the nondeclining yield constraint, a FORPLAN-based Stage III analysis would exclude such stands from timber management. However, if an even-flow constraint is imposed, some or all of the negatively valued stands may be selected for harvest and in effect declared suitable for timber production. McQuillan explains the phenomenon as follows:

> The contribution of volume from the negatively valued stands tends to raise per decade harvest levels in later decades, and substitutes for volume from positively valued stands that can then be harvested in the nearer future. Because of the effects of discounting, the net contribution to total NPV or NPB is positive whenever the addition of the net discounted value from the increased harvests of positively valued stands in early decades exceeds the negative effects of harvesting deficient stands in later years.

The anomaly is that in subsequent rounds of replanning, the nondeclining yield will fall, unless there are offsetting changes in yield, price, and cost assumptions. This happens because at each plan revision the negatively valued stands move closer to a scheduled harvest. As a result, the effect of discounting diminishes, the cost of including the stands increases, and a smaller proportion of the negatively valued stands is declared suitable. As the economically suitable land base shrinks, the nondeclining yield level must fall—that is, the initial harvest level is not sustainable over time. In effect, a departure is presented in the guise of a nondeclining yield (Johnson and Sessions 1986, page 78).

The Declining Even-Flow Effect is a product of a decision to perform timberland suitability analysis at the forest rather than the subforest level and a policy to constrain future timber harvests to nondeclining yield levels. Forest-level planning is unquestionably the most appropriate point to evaluate the consequences of alternative goals and to identify the best set of management prescriptions. (See the succinct analysis by the Society of American Foresters Task Force (1980).) Some consequences, such as cumulative effects and multiple-use interactions, can only be evaluated at that level. The problem is the nondeclining yield constraint, which, as in the case of other types of constraints, can distort the effects of economic efficiency criteria in resource allocation. The solution is to search for an analysis procedure where the

effects of efficiency criteria work in the same direction at all levels of planning.

There are several possibilities, no one of which is without technical limitations. One approach is to identify, without the nondeclining yield constraint but with other forest-wide goals and constraints, the suitable land base that maximizes the overall present net value. This base would generally include only positively valued land (management prescriptions), plus any negatively valued prescriptions that may have been forced into the base by nontimber objectives expressed as constraints. The harvest schedule and management prescriptions can then be recomputed with the nondeclining yield constraint using only the suitable lands as a basis. One difficulty here is the impossibility of assigning values to all outcomes of a management prescription.

Michael Seig (Nez Perce National Forest) and David Cawrse (Flathead National Forest) describe a somewhat analogous procedure (Seig and Cawrse 1987). They suggest that a soil expectation value analysis be done for each national forest and the results mapped out to show areas that on their own merits are economically submarginal. The results of the normal FORPLAN-based Stage III analysis would then be overlaid with this mapping. Areas that are included in the suitable land base and scheduled for harvest that have a negative soil expectation value would be reviewed to determine the merits of including or not including them in the suitable land base. Conversely, areas with a positive SEV that are excluded from the base would be examined to determine whether they should be included. Seig and Cawrse emphasize the role of common sense and professional judgment in making timberland suitability decisions.

Klaus Barber, Operations Analyst for Region 5, suggested (through personal communication) the following procedure. First, identify economically unsuitable timberland at the subforest level, based on soil expectation value and soil expectation value plus current inventory value criteria. Second, analyze the effects on nondeclining yield and overall forest present net value of bringing successive increments of negatively valued land back into the base for specific reasons. This procedure clearly identifies the proportion of negatively valued land in the base, provides information on tradeoffs, and documents the policy reasons for the suitable land base. It is similar in most respects to Sieg and Cawrse's suggestion.

Johnson and Sessions (1986, page 81) suggested that models can be formulated in which "the present net value of the timber harvesting activities in each zone recognized on the forest must at least pay for the development that enabled harvests to take place. Unless the solution can find some pattern of timber harvest that pays off the original investment, development of the zone cannot occur." (Dennis and Teeguarden (1982) tested a version of this approach in a case study of the Shasta-Trinity National Forests.) This approach involves a combination of forest-level and area-level analysis in which the forest level present net value solution is further tested at the zone level to ensure that a reasonable relationship between benefits and costs exists. There is much to recommend it as an alternative to the present approach to Stage III analysis.

Apparently, there is some confusion over the meaning of classifying timberland as suitable or unsuitable and over the intent as to characteristics of land to be included in each category. The Gallatin National Forest reported a public perception that once classified as unsuitable an area that is permanently allocated to nontimber objectives. The Timber Association of California commented that similar confusion exists in Region 5. A question also has been raised about the objective of the Stage III process: Is it to identify a strategic pool of suitable timberland to support the long-term timber harvest schedule, or alternatively, as Randy O'Toole (1988, page 6) advocated, only those lands needed to support the first 15-year assumable sale quantity? Is it appropriate to include in the suitable timberland base a "hedge" of cost-inefficient land to provide for flexibility at the project level if such land is not needed to support other long-term objectives?

These issues can be resolved by reference to the NFMA planning regulations, which may not be widely understood by the public and even by some Forest Service personnel. RPA/NFMA and the planning regulations provide for periodic review and possible revision of the suitable/unsuitable classification. Clearly, the intent is that a decision to allocate land to either category is both reviewable and reversible at each round of planning.

The planning horizon for suitability determinations is prescribed by Section 13 of RPA/NFMA, which limits timber harvests to a level that can be maintained "in perpetuity on a sustained yield basis." Long-term projections of prospective timber harvest levels and the associated suitable timberland base are needed to meet the "in perpetuity" requirement. Thus the land base is tied to the multidecade-base timber harvest schedule required by the NFMA planning regulations, rather than solely the first decade, as the appropriate framework for Stage III analysis.

Finally, while the notion of a "hedge" was not anticipated when the NFMA planning regulations were promulgated, a good case can be made for administrative flexibility to make marginal adjustments in actual identity of suitable acres when implementing the plan at the project level. However, the need and justification for a hedging pool of land not needed to support the projected harvest levels should be documented in the forest plan as part of the planning process. Also, to the extent that project-level uncertainty is the basis for hedging, it should be applied to other resource management objectives as well.

Stage III Recommendations

1. Clarify the objectives and uses of the timberland suitability determination process, including the periodic review of land designated as suitable or unsuitable and the planning horizon to be used as a basis for analysis and decisionmaking.

2. Establish procedures, standards, and documentation requirements for identifying unneeded but potentially suitable land as a "hedge" against

implementation uncertainty at the project level for timber and other resource outputs or uses.

3. Review for a larger sample of forests than was possible in this study the actual procedures used by supervisors and planners to identify the first-round suitable timberland base, particularly the link between objective FORPLAN-based Stage III analysis and subjective, ad hoc approaches. Identify ways of better linking subjective decisionmaking processes to the cost-effectiveness requirements of the NFMA planning regulations.

4. Develop a negotiation process for reaching agreement on technical analysis issues, such as price levels and trends, management costs and investment, and a benefit-cost standard for determining economic suitability.

5. Consider alternatives to the present FORPLAN-based Stage III analysis procedures to overcome the Declining Even-Flow Effect and to achieve consistency between forest-level and subforest-level economic efficiency criteria. The suggestions reviewed in this section merit consideration.

6. Improve explanations of procedures used to identify suitable timberlands in the forest plans, including those that may be unique to each particular forest. Provide more informative documentation of analysis results, including the range of cost-effectiveness of land included in the base and the rationale for including economically inefficient timberland at the subforest level in the suitable base.

Formulation of Planning Alternatives

Section 219.12(f) of the NFMA planning regulations provides standards to guide formulation of planning alternatives. Besides complying with NEPA procedures, the primary objective of the process is to provide a basis for identifying the alternative that most nearly maximizes net public benefit. The alternatives are to be distributed across the range of minimum to maximum potential output levels revealed by "benchmark" analyses prescribed by Section 219.12(c). Two alternatives are required, one projecting the expected level and mix of goods and services "to be provided in the future if current management direction continues" (the NEPA "no action" alternative) (36 CFR 219.12(f)(7)) and the second incorporating the RPA Program resource objectives allocated to each forest in the regional guide (36 CFR 219.12(f)(6)). How many others are formulated is decided at the forest level. However, among other standards, the regulations direct that "[a]lternatives shall provide different ways to address and respond to the major public issues, management concerns, and resource opportunities identified during the planning process" (36 CFR 219.12(f)(4)). Put another way, the design of alternatives is to be issue driven.

In general, the process for formulating alternatives has proven feasible to implement and effective in terms of defining strategic choices, tradeoffs, and important issues. "Benchmark" analysis is reported to be a particularly useful beginning point for defining the decision space, identifying key resource interactions and tradeoffs, and estimating the effects of policy constraints. All the

forest plans studied for this report present a reasonably wide range of alternatives in terms of the level and mix of resource uses. In this perhaps narrow perspective, performance is in line with the expectations and standards of the regulations.

Several aspects of the alternatives formulation process were identified by study participants as posing issues that deserve evaluation and possible revision. Some involve technical matters and should be easy to fix. Still others, such as the link between the RPA Program and forest plans, are of a more fundamental policy nature not easily addressed by merely tinkering with principles currently driving the planning process.

Alternative Emphasis and Polarization

Forest planning documents generally present a detailed description and comparative evaluation of 7 to 10 alternatives. To facilitate discussion, each alternative is normally assigned an "emphasis" or "theme" that highlights differences in objectives and resource uses. Some thematic examples are market opportunities, amenity, livestock-timber, RPA, accelerated harvest, high production, wildlife and fish, and visual. Best intentions notwithstanding, this thematic approach and terminology tend to polarize public reaction, according to Kent Connaughton and Peter Emerson (through separate personal communications).

Furthermore, it promotes hardening of each special interest group's support for the alternative that comes nearest to accommodating its concerns. A more neutral terminology, such as alphabetic or numerical designators, might have a less preconditioning effect on public response. However, polarization is undoubtedly an intrinsic feature of a process that emphasizes the development of a comprehensive and wide-ranging set of alternatives. Tinkering with terminology will only marginally reduce polarization, if at all, in the absence of more fundamental changes in the approach to planning and decisionmaking. The problem is addressed further under the section "Planning Approach: Comprehensive or Incremental?".

RPA Alternative

In principle, a forest plan is an element of the RPA Program. The 1979 NFMA planning regulations recognize this relationship by creating a specific link between the RPA Program and forest planning by requiring that at least one alternative be specifically responsive to the Program. In practice, it has proven difficult to integrate the national RPA Assessment and Program planning process with forest-level planning, owing in part to scheduling differences. Another problem is that RPA targets do not enjoy much credibility as policy objectives.

One region and several forests participating in this study reported that the RPA alternative had not been of any value in the first round of planning and, further, that RPA targets had not been a "driving force" in the planning process. The Wilderness Society and industry spokespersons made similar statements, but from different perspectives. Environmental organizations are generally opposed to the "top-down" approach of RPA targets, while industrial groups tend to favor achieving RPA Program goals as a major objective of forest planning. Region 6 officials reported that the forests could respond to general RPA goals but not to all RPA targets handed down through the region. They recommended that the NFMA planning regulations be revised to eliminate the RPA alternative.

Current Direction ("No Action") Alternative

The issue here concerns the somewhat ambiguous language of the NFMA planning regulations regarding the content of the "no action" alternative, which serves as a baseline for comparing the relative differences in the effects of other alternatives under consideration. Apparently, there is some confusion about what should be included in the "no action" alternative. Should it be based on outputs to be achieved under current management direction or on the level and mix of outputs actually being achieved? (There can be a considerable difference.) Should the "no action" alternative retain current direction management standards or incorporate NFMA-mandated minimum standards as in the case of all other alternatives? If they are included, the "no action" alternative is certainly not the same as "current management direction"; indeed, with new constraints, the output levels associated with it may not be feasible.

Region 6 suggested that a new baseline ("no action") alternative is needed for the second round of forest planning and that it should include the land allocation pattern, associated projected outputs, and management standards. However, the region did not suggest a specific resolution to the issues above. The first-round preferred alternative, adjusted to reflect subsequent revisions and amendments, would be a logical point for defining a new baseline. Perhaps more than one baseline alternative is needed—one reflecting current direction and management standards and the second reflecting new management standards that, owing to changes in law, must be incorporated into the forest plan.

Number of Alternatives

Under present administrative direction, the forests are required to consider a minimum set of alternatives. Planners in two regions reported that some of these alternatives are irrelevant to the issues that must be addressed on a particular forest. The requirement adds work load and increases planning costs without contributing significantly to issue resolution. In addition, although up to 10 or more alternatives may be presented, some may be virtually identical to others. For example, the Sequoia National Forest plan's environmental impact statement of 1988 (pages 2--18) considered 10 benchmarks and

13 alternatives. Of the 13 alternatives, 6 were dropped from further study because "they were similar to other alternatives, displayed nothing unique, or provided limited resolution of public issues and concerns."

Seven alternatives are presented in detail in the final environmental impact statement, but because some tended to become clustered toward the end of the planning process, only four involved significantly different choices. Perhaps this reflects compelling and realistic forces favoring incremental changes to current management direction and correspondingly the unrealistic nature of more extreme options. In any case, several forests recommend that, in second-round planning the number of formal alternatives should be reduced. This could occur naturally anyway if, in the second round, comprehensive planning gives way to incremental planning focusing on adjustments made at the margin in response to new information and conditions.

Relation to Budget

In first-round planning, benchmarks were formulated pursuant to the NFMA planning regulations' requirement that "[b]udgets shall not be a constraint" (36 CFR 219.12(e)(1)). Planning alternatives also were developed without reference to either current or expected budgets, although planners may have attempted to be realistic. This approach is consistent with the concept that forest planning should identify optimal long-term levels of investment and expenditure to maximize net public benefits. Also, a wider and perhaps more creative set of options presumably would be considered if the alternative formulation process is unfettered by budget constraints.

As a consequence, the preferred alternative for a particular forest may have an associated budget considerably greater than either the current or likely level of expenditure authorization. For example, the Sequoia National Forest plan calls for nearly $20 million, compared to a current budget of about $12 million. Forest Service officials and outside groups recognize that a budget increase of this magnitude is unlikely. Thus an issue arises concerning policies and priorities for adjusting or down-scaling the forest plan during the implementation phase. Also, in such a situation, the credibility of the forest plan as a statement of Forest Service intent is weakened.

One approach to addressing this problem is a sensitivity analysis to show how the preferred alternative's schedule of outputs and land management activities could be changed in response to budgets ranging from levels slightly below the current situation up to the target level. For this purpose, the basic land allocations could remained fixed, with the analysis focusing only on changes in prescriptions, output levels, investment and program priorities, and environmental effects. Additional analysis of this kind also might help identify ways of improving the overall effectiveness of the preferred alternative by identifying ways of reducing tradeoffs and increasing economic efficiency.

More generally, for second-round planning, consideration should be given to basing the formulation of alternatives on a range of likely budget possibilities centered on decreases and increases around the current budget. For each budgetary base, a series of alternatives could be evaluated to identify the level and mix of outputs and activities that are considered to maximize net public benefit. Perhaps as many as a dozen combinations might be necessary to define a reasonable decision space; however, it might not be necessary to present all of them in detail in the forest plan.

Recommendations

1. Use alphabetic designators to identify planning alternatives.

2. Drop the RPA alternative. Instead, require that RPA Program goals and policy be considered at the forest level in the formulation of all planning alternatives. Specify that the alternatives are to contribute to the RPA Program goals in a manner consistent with each forest's productive capacity, local needs, and environmental protection. (This requires that the NFMA planning regulations, 219.12(f)(7), be revised.)

3. Clarify and standardize the content of the NEPA "no action" alternative. Consider replacing the term "no action," which implies no management, with a more accurate description, such as present direction, baseline alternative, or current goals.

4. Tie the formulation of planning alternatives directly to a range of reasonably realistic budgetary expectations, and require that for each budget level considered, alternative output mixes are specified and evaluated.

Planning Approach: Comprehensive or Incremental?

Theoretically, first-round forest planning was a zero-based, rational, comprehensive procedure. The old functional or area plans were moot. Planners were to start with a clean blackboard. A wide range of planning alternatives were to be formulated and evaluated in response to the new mandates of RPA/NFMA. A single, fully integrated, long-term, comprehensive land-use and management plan that resolved all issues was to emerge from a process that emphasized interdisciplinarity and extensive public involvement.

This global approach is not without merits, but the experience of 10 years of effort to implement it suggests that in preparing for second-round planning, consideration should be given to shifting to an incremental approach, or at least providing that option depending on the issues on a particular forest. Many persons consulted in this study described zero-based, comprehensive planning as too complex, too time-consuming, and a hindrance to effective public involvement. Regional personnel and supervisors participating in the seminars strongly favor incremental planning conducted through successive revisions that focus on newly emerging issues or implications of new information. Under this procedure, the overarching land-use zoning scheme

developed from the first round would be used as the framework for marginal adjustments in response to new needs, issues, or information. The approach would simplify analysis, shorten planning time, promote more effective public involvement by focusing on specific issues or areas, perhaps reduce polarization, and significantly reduce the cost of planning.

Ernest Gould (1987) reviewed the planning process of the White Mountain National Forest in New Hampshire from 1970 to 1987, identifying a number of problems with the NFMA planning process that need serious rethinking. Among other recommendations, all expressed in a folksy style, he concluded:

> Never make another global plan. Once a global plan is in place, find rules which all agree will indicate when a problem worth fixing has arisen. Then search for and make the necessary adjustments. Thus, if the present plan "ain't broke, don't fix it," when it is, limit the adjustments to those needed to get rid of the misfit situation, leaving the rest of the plan intact. Done properly, incremental adjustments in the present plan will make it good forever, just as great-grandfather's axe, with only an occasional new head or handle, is still as good as new. (page 18)

It may not be desirable or feasible to adopt incrementalism as the planning model for every forest at all points in time when revisions or adjustments in the current plan need to be studied and evaluated. This particularly may be the case for forests where first-round planning did not resolve issues concerning roadless areas, catastrophic natural events have substantially altered resources, or the cumulative effect of changes in law require comprehensive replanning. However, flexibility could be provided to permit individual forests to adopt the planning approach, comprehensive or incremental, that best fits the nature of the planning issues at the time. Which approach might become the exception rather than the rule will in part depend on the scope of public support for the first-round preferred alternative.

The NFMA planning regulations currently state, "Revisions are not effective until considered and approved in accordance with the requirements for the development and approval of a forest plan." In other words, the same comprehensive process and standards for formulating alternatives used in first-round planning seem to be prescribed for second-round planning as well. Providing flexibility to consider only marginal changes without the necessity of redoing the original analysis, including reconsidering alternatives previously rejected, will therefore require that the regulations be revised. This issue is rather urgent because some forests are already preparing for second-round planning.

Recommendations

1. Provide flexibility to adopt comprehensive or incremental planning approaches in second-round planning.

2. Revise the NFMA planning regulations to give regional foresters the authority to authorize prenoticed departures from procedures prescribed in 36 CFR 219.12 when forest plans are revised.

Usefulness of Forest Plans

An enormously time-consuming and costly effort has gone into developing the first-round forest plans. Have, or will, the resulting documents prove useful by providing effective, reasonably comprehensive programmatic and policy direction to implementation and project planning? The question was extensively discussed by study participants. The response ranged from strongly negative to strongly positive. As one might expect, the first-round plans are perceived to have some strong features and some significant shortcomings. Also, there is more optimism about the value of forest plans within the Forest Service than among its constituency.

The NFMA planning regulations (Section 219.11) direct that the forest plan include: (1) a summary of the analysis of the management situation, as prescribed by Section 219.12(e); (2) goals and objectives, including goods and services expected to be produced during the RPA planning periods; (3) management prescriptions and associated standards and guidelines for each management area; and (4) a monitoring plan. Implicit in (2) is a land-allocation or zoning scheme. This direction is remarkably brief, running to only 115 words, but it is not inclusive because other requirements expand the scope of decisionmaking to include such issues as suitable timberlands and the assumable sale quantity.

Some failures and shortcomings notwithstanding, planners and supervisors consider the forest plan to be a useful management tool. Identified as particularly useful were the "handbook" elements, including management standards and guidelines, management prescriptions, land-use allocations (zoning scheme), and having all functional and special area plans integrated in a single, comprehensive document. Production goals and schedules apparently are regarded as being less useful than these other elements. The reason, of course, is that the actual output and activity levels are more directly controlled by the annual budgeting process than by the forest plan. Some forests expressed concern about implementation flexibility in the face of public perception that the production goals and objectives represent a hard-and-fast, legally binding commitment.

When the planning regulations were first promulgated, relatively little systematic thought was given to the scope of decisionmaking in the forest plan or its strategic relationship to what is now called "implementation planning." The regulations allow for considerable administrative discretion, generally identifying only a minimum set of decisions to satisfy the specific requirements of RPA/NFMA. However, perhaps naively, the expectation was that the forest plan would simultaneously address NFMA requirements and resolve other issues identified in the planning process that might be unique to each particular forest.

Persons and organizations consulted during the study, including Forest Service personnel, expressed concern that the scope of decisions in first-round planning was more limited than it could or should have been. It was alleged that, because of a lack of information, court decisions, political controversy, and other factors, issues that could and should have been resolved were moved forward to the implementation phase. Outside organizations, industrial and environmental, believe that a progressive narrowing of decisions made in the forest plans will limit plan usefulness, add to uncertainty, and simply carry conflicts over to the program and project level where "[t]he basic issues will be fought over again during implementation," according to William Dennison of the Timber Association of California (through personal communication). One critic (Julie McDonald of the Sierra Club Legal Defense Fund) put matters this way: "The Forest Service is shooting itself in the foot by not making decisions about roadless areas in the forest plan. What's the purpose of a plan if those decisions are not made?"

There is sentiment in environmental and industrial circles that the NFMA planning regulations should specifically define the whole range of decisions to be made in the forest planning process and the followup monitoring requirements. A step in this direction has already been taken by the Washington Office in the form of administrative direction that identifies the minimal decision content of a forest plan and clarifies its relationship to future decisions to be made at the project level (USDA Forest Service 1988; USDA Forest Service Region 1 1988). It should be possible, upon further review, to expand the scope of this direction to include all issues that experience has shown are common to most forest plans, including but not necessarily limited to the RPA/NFMA requirements. Further, in response to public concern, it may be desirable to incorporate this direction in Section 219.11 through appropriate revisions.

The usefulness of forest plans is perceived by some observers to be limited by poor data, which undermine plan credibility, and by the long period between initiation and completion of the first-round plan, by which time new data, a different public, or new issues had emerged. Through successive rounds of planning, it should be possible to improve both of these areas, the first by research and the second by shifting from global to incremental planning that focuses on narrower, site-specific issues. However, one lesson is clear—fix a specific time period of completion for second-round planning and keep it short (say, 18 months).

Also limiting plan usefulness is the lack of a direct connection between the forest plan and the annual budgeting and appropriations process. The two are uncoordinated processes. This is widely understood within the Forest Service and other agencies, so the situation does not need to be examined in detail here. John Krutilla (1988), of Resources for the Future, summarized it succinctly: "The individual forest's production targets, personnel complement and funding ceilings, derived from the budget and appropriation process, are usually, if not always inconsistent with the forest level plans and proposals, and sometimes even with feasible production possibilities at the forest level." The

impact on utility of the forest plan at the forest level is rather dramatic. Planners on one study forest put it this way: "The budget establishes annual goals, and personnel are trained to respond to it, not the objectives of the plan. As a result, the policy and operational significance of the forest plan is of relatively little concern to program managers."

Without basic budgetary reform, which is not likely, this problem is one of the confounding, confusing, and frustrating limitations of the forest planning process with which people will have to live.

One final comment: All the forest plans reviewed for this report address the minimum set of decisions required by the NFMA planning regulations, provide a massive amount of information regarding alternatives and their consequences (projected future output levels and activity schedules), and report legal requirements for forest planning. In the introduction, strategic goals are listed and the future forest condition tersely discussed. This information contributes to public understanding of what the plan hopes to accomplish, but does not go far enough. The plans are much alike—the forest will be managed for multiple use, the output of goods or services will be marginally changed, and the overall forest conditions will change little in the first decade.

Several persons, including Forest Service personnel, suggest that the forest plan should include a concise statement of the unique mission of the forest compared to other forests and adjoining private land in the same region, identify policy decisions that will drive its production and environmental protection priorities, and present a more detailed visualization of the expected future condition and appearance of the forest if the proposed management actions are implemented. To some degree, such perspectives can be extracted by a careful reading of the forest plan, but a more detailed, explicit statement along these lines could improve its usefulness as a public document and as a management guide.

Recommendations

1. Revise NFMA planning regulations to specifically prescribe the scope of decisions to be made in the forest plans and to define their relationship to decisions made in the implementation phase at the project level.

2. Fix a specific time period for plan completion, no more than 18 months, and to the extent possible synchronize second-round plans with the RPA cycle.

3. Require that a forest plan include a mission statement.

FORPLAN

The strengths and weaknesses of using FORPLAN as an analysis system to support forest planning are extensively reported in the proceedings of two national conferences sponsored by the Forest Service in 1986 (Baily 1986;

Hoekstra et al. 1987). Both proceedings contain recommendations for improving FORPLAN and its application to the planning process. These need not be repeated here, nor was this aspect of first-round planning explored in any detail with forest planners consulted in this study. However, the subject did arise, so a few comments are in order.

Elsewhere, 24 generic categories of analysis needs based on the requirements of the NFMA planning regulations have been identified (Teeguarden 1986; Hoekstra et al. 1987). Nineteen items relate to analysis and planning at the forest level, while the other 5 necessarily involve larger geographic units, including possibly a region or whole State. FORPLAN is very strong in meeting analytical needs at the forest level, particularly those relating to the analysis of production capabilities, benchmarks, the formulation of alternatives, timber harvest and activity scheduling, the selection of vegetation management prescriptions (particularly those relating to timber), and economic efficiency analysis. FORPLAN's capacity for multiresource coordinated planning and for tradeoff analysis also supports an interdisciplinary approach to forest planning.

For other analysis needs, such as economic impact analysis, FORPLAN can contribute but must be coupled with other models or exogenous analytical procedures or processes. In only 3 of the 19 areas is FORPLAN incapable of meeting or contributing to an analysis requirement, all reflecting its forest-level orientation; these include determination of viable vertebrate population levels, analysis of regional cumulative impacts, and coordinated planning among Federal, State, and private sectors. Notwithstanding widely acknowledged shortcomings, it is the best available system for meeting the analytical requirements of the NFMA planning regulations.

Several comments about FORPLAN were volunteered by study participants. Among forest planners and supervisors, the primary area of concern is FORPLAN's lack of spatial or geographical specificity. "FORPLAN gives a mathematical solution that has no relation to what is on [the] ground," complained one supervisor. Additional research and development work to link FORPLAN to a GIS system was recommended as one means of overcoming this structural limitation.

Major problems of application also arose in first-round planning, particularly the adequacy of model definition, prescription specification, and large model size. Two suggestions were to standardize FORPLAN modeling techniques and to bring in an outside technical team to review and verify the appropriateness of model structure, adequacy of data, and application to decision issues before the alternative formulation stage.

Individuals outside the Forest Service commonly complain that FORPLAN solutions are sometimes "hard-wired" by imposing constraints rather than being arrived at through objective analysis. The allegation is not new and is reported with the above suggestions without further elaboration or comment for whatever value they might have.

Quality of Data

Several people within and outside the Forest Service expressed concern about the "poor" quality of the data base used in first-round forest planning and the absence of efforts to improve it. Some feel that forest plan credibility and usefulness are undermined by inadequate data. Because the required data base is extensive and often involves variables and relationships that are not well understood, its adequacy is an intrinsic and probably a continuing problem of the forest planning process. The issue did not go beyond brief, cursory discussions with study participants. The problem is already well recognized within the Forest Service, so only this brief notice is appropriate.

However, this is an obvious area for systematic improvement in preparing for second-round planning. First-round planning experience should be reviewed in depth to identify the most significant areas of weakness in the data base. Some participants suggested that each forest should specify the data base to be developed before forest planning begins and that disputes about the more controversial elements be resolved by negotiation before the modeling and analysis work is conducted.

Indicator Species

The NFMA planning regulations require that "management indicator species" be selected and used as a basis for "estimating the effects of each alternative on fish and wildlife populations" and for monitoring (36 CFR 219.19). The regulations further state that "[t]hese species shall be selected because their population changes are believed to indicate the effects of management activities," that "[e]ach alternative shall establish objectives for the maintenance and improvement of habitat for management indicator species . . . to the degree consistent with overall multiple-use objectives . . . ," and that "[f]ish and wildlife habitat shall be managed to maintain viable populations of existing and native and desired non-native vertebrate species in the planning area."

The management indicator species concept was introduced as a new element of forest planning in 1979, when the NFMA planning regulations were first promulgated. At the time, it was an untested concept in terms of operational application to multiobjective forest planning and monitoring. The premise was that a relatively small subset of species could be used as indicators of management effects, including vegetation changes, on population levels of other associated species in selected biological communities. Except for threatened and endangered species, the regulations do not require that the forest plan establish a specific population level for a management indicator species; rather, the management indicator species is a proxy measure of the effects of management on the overall welfare (population viability) of the associated species.

The objectives and intent of the planning regulations relating to fish and wildlife habitat are considered to be a "positive" element of the forest planning process. But experience with the management indicator species concept is somewhat mixed, raising questions about implementation feasibility.

In Region 5, industrial and environmental groups indicated that implementation of the management indicator species requirement had not been an issue in

forest planning; both groups support the concept or regard it as the best available method for monitoring wildlife populations. However, in Regions 1 and 4, Forest Service personnel were less positive, citing the technical inability to accurately monitor certain species (for example, the wolverine and pine marten), inadequate funding to support monitoring, and difficulty with interpreting population trends if habitat requirements are not known or are in dispute.

The notion that population data on relatively few selected species can be interpreted as a measure of the welfare of scores of others in a habitat is widely questioned. Recent scientific literature raises substantial doubt about the validity and usefulness of the management indicator species concept contained in the NFMA planning regulations. Morrison (1986, page 444) reviewed the use of birds as indicators, concluding that "[t]he current and widespread practice of using individual species or groups of species . . . as indicators of environmental change is clearly inappropriate in most situations . . . the entire concept of using indicator species to monitor environmental change, or the 'health' of a community must be questioned." Patton (1987, page 33) argued that the regulations broaden management indicator species beyond that generally used in the biological sciences and that the concept may not be scientifically sound for wildlife. He stated that "the lack of scientific definition in the regulations, a lack of data, and a lack of field experience detracts, at least for now, from its credibility as a planning tool." Block et al. (1987, page 268) reported on a study of mountain quail as an indicator species and concluded that "[t]here is little assurance that habitat suitability or population status of a guild indicator will parallel those of other species in the guild." They recommended that the use of management indicator species be reevaluated "until rigorously designed experiments prove indicators to be a valid resource management tool." Szaro (1986, page 687) made the same recommendation.

Some planners believe that the value of such data is probably not worth its cost. Another problem involves using each forest as a basis for ensuring population viability when, in the case of many species, this issue needs to be resolved for a larger area. There also is concern on some forests that the original use of management indicator species has been corrupted by focusing the planning process on quantitative management targets for the selected species rather than on the associated biological community and desired habitat conditions.

In view of its limitations, some planners suggest that for second-round planning habitat conditions rather than management indicator species population levels be used as the basis for evaluating the effects of management and monitoring wildlife. Their proposal may have merit in terms of focusing attention of the potential of habitat to support wildlife populations, simplifying analysis requirements and reducing monitoring costs. However, the two approaches are not mutually exclusive; notwithstanding limitations, some quantitative data for selected key species are necessary to document to the extent feasible that viable populations are being maintained.

Both Patton (1987, page 34) and Verner (1983, page 355) have recommended alternatives to the management indicator species approach that emphasize habitats but retain periodic inventories of wildlife. Verner (page 362) described a system developed for the Sierra National Forest that merits evaluation as a possible basis for revising the requirements of the NFMA planning regulations. The system includes three levels of monitoring: (1) species, but only a minimum number focusing on endangered and threatened or other species of special management interest; (2) management guilds (of birds) in sensitive habitats; and (3) habitat trends. Of these, Verner (page 364) suggested that monitoring of habitat should eventually be used as a basis for monitoring wildlife resources "because it is the least costly."

Recommendations

1. Critically review the implementation of the management indicator species concept to assess the technical feasibility of complying with the NFMA planning regulations and the usefulness of population level data for evaluation and monitoring.

2. Consider using a combination of habitat assessment and periodic wildlife inventories within selected biological communities, rather than management indicator species, as the primary basis for evaluating and monitoring management effects on wildlife.

Public Participation

The NFMA planning regulations require that public participation "shall be used early and often throughout the development of plans . . ." (36 CFR 219.6(c)). The intent is to acquire information, provide an opportunity for the Forest Service to understand public concerns and values, and to inform the public of Forest Service planning activities, programs, and proposed actions (36 CFR 219.6(a)).

The Forest Service made an enormous effort to implement these and NEPA requirements at every stage of first-round planning. Consultation with the public was both prolonged and extensive, involving more individuals and groups outside the Federal Government than any previous planning exercise. Methods varied, depending on the issue and the particular forest, but ranged from soliciting comment on proposed actions to public meetings to direct negotiations with affected parties. The environmental impact statement documents examined for this report include extensive analysis and response to issues raised by public participation and lists of outside persons and groups consulted.

The effectiveness of public participation did not receive extensive comment in field seminars, but it was raised as an issue on five of the six study forests and by both environmental and industrial organizations. Several problem areas emerged from the discussions. One is the long period required on most forests to complete the planning and public participation processes. This, it was

asserted, caused some public participants to withdraw, or shut out the public, and reduced public confidence. A representative of the Oregon Natural Resources Council stated, "There were so many steps in the process that the public 'burns out'. . . . If you don't go to every meeting, say the same thing, your views are not considered. . . . The planning process involved too much public involvement."

A second problem is the complexity of plan documentation. As a result, according to one industry spokesman, "People don't really have access to the plan and its rationale."

A third fundamental issue concerns the structure of the public participation and decisionmaking processes. Planners on several study forests and representatives from both industrial and environmental organizations believe that current procedures promote polarization, distrust, confusion, and delay. This undoubtedly is a widely held perception both within and outside the Forest Service. It is not a new problem, having arisen early in first-round planning.

Julie Wondolleck (1988) offered a constructive analysis of the issue in a recent seminal study of national forest disputes. She identified three inherent pathologies that undermine the effectiveness of forest planning, including the public participation element:

> 1. The process is *not sufficiently informative or convincing*. Forest Service analyses, no matter how thorough and seemingly objective, do not indicate what decision should be made. . . . Moreover, because no decision can be proven to be the correct one, the process is not convincing to those groups who perceive a different outcome to be more appropriate than that reached by the Forest Service.
>
> 2. The process is *divisive*. It separates different interest groups into adversarial camps and encourages strategic behavior among them. It provides no means for bridging the obvious chasm between them and hence only exacerbates the political conflict over the decision that must be made.
>
> 3. The process is *not decisive*. Even when the Forest Service ultimately makes a "decision," the "decision" rarely ends the controversy. On the contrary, the decision merely begins the next phase of the real decisionmaking process wherein groups resort to appeals, lawsuits, and pleas to Congress in hopes of influencing a "final" decision more supportive of their interests. (page 70)

Wondolleck (page 119) argued that these unintended consequences are the product of land management decisions that cannot be resolved solely on the basis of scientific or technical analysis by professional managers. National forest planning calls for subjective value judgments across a wide range of allocation issues that affect different groups in different ways. At present, the public is invited to provide information and comment, even to express preferences, but Wondolleck concludes that the procedure promotes mistrust and invites opposition:

> Although the current administrative decision-making process provides participation by these many publics in order that the concerns of each are aired, it is not

> designed to accommodate their concerns in a way that satisfies them that they have indeed been accommodated as well as possible. Interest airing is not interest accommodation.
>
> Despite extensive public involvement efforts, despite extensive public input to and review of decisions, and despite Congressional mandates that all values be represented, frequently one user group or another is not satisfied that their concerns have been accommodated. These groups distrust a process that yield decisions contrary to their best interests, and therefore they oppose those decisions and appeal to other avenues for obtaining representation . . . the process is a "negative" one with energies devoted to checking administrative behavior in the judicial arena rather than an "affirmative" one ensuring representation in the administrative arena. (page 173)

To improve matters, Wondolleck (page 210) recommended an alternative approach to public participation that would supplement "more traditional review and analysis procedure with more direct, collaborative efforts involving concerned forest users." She cited the experience of seven national forests (Monongahela, Jefferson, Cibola, Chugach, Rio Grande, Chattahoochee-Oconee, and Nebraska) with collaborative processes that resolved planning issues and led to mutually acceptable plans. Expanding opportunities for joint fact-finding and providing incentives for cooperation and collaboration among affected groups are central to the proposed approach.

Wondolleck proposed that the Forest Service experiment with a new procedure that would supplement existing decisionmaking processes, recognize Forest Service authorities and responsibilities, and allow *outside groups to more directly represent their own interests*. The procedures are modeled after EPA's negotiated rulemaking process and involve three stages of public participation: prenegotiation, negotiation, and postnegotiation. Elements of the first stage include deciding whether a particular decision might benefit from the process and convening the representative groups. Elements of the second include joint fact-finding, identifying key issues of concern, developing alternatives, and reaching agreement. Elements of the third include notice to those not participating directly in the negotiations, including opportunity for review and, finally, implementation. (This is a brief summary of Wondolleck's proposal. For details, see Wondolleck (1988), page 225.)

Recommendation

Wondolleck's proposal is not a panacea for resolving all conflicts over forest planning issues. Value differences and distributional conflicts may run so deep that no form of public participation in the decision process will produce an outcome mutually acceptable to the adversaries. But her ideas for providing an alternative to the present approach are highly responsive to the concerns expressed by participants in this study; thus the Forest Service should evaluate them as a basis for improving the public participation element of second-round planning.

Fate of Planners

It is generally recognized that interdisciplinary planning teams experienced a relatively high level of stress, "burnout," and turnover during first-round planning. The problem was raised by personnel on four of the six study forests, sometimes expressed in rather bitter terms. According to Forest Service personnel, the causes lie in the difficulty of defining a regular flow of output and accomplishment, the long period required to complete the first plan, constantly changing policy directives that required doing some work over again, difficulty of achieving "closure" on a final plan, and whether the plan would be taken seriously even within the Forest Service.

Also, some planners expressed frustration over their professional status, alleging that the planning function is not well respected by peers nor rewarded. Some expressed concern about career paths, including prospects for advancement to line positions in the Forest Service. In contrast, there were others who expressed more positive attitudes; they saw planning as a good opportunity to be where the "action" was, to "influence events," and to acquire the experience necessary for a line position. The recently appointed supervisor of one study forest began her career with the Forest Service as a forest planner. For reasons not immediately apparent, planners at the regional level seemed to have a more positive attitude than those at the forest level; they are enthusiastic and have technical expertise, perspective, and dedication.

To some extent, these organizational problems reflect the experimental nature of forest planning under RPA/NFMA and the fact that the Forest Service had to create nearly from whole cloth a new corps of professional planners. It should be possible to conduct second-round planning on a shorter timeline and perhaps in a less contentious political environment, particularly in the case of forests where implementation of first-round plans is publicly supported and the issues involve only marginal adjustments. However, there is need to provide for continuity among planners at the forest and regional levels to ensure consistency between successive plans and implementation efforts and for training personnel who are newly assigned to the planning function.

Recommendations

Two positive suggestions emerged from discussions with Forest Service personnel:

1. Address the experiences and concerns of interdisciplinary team members and forest planners during the first-round planning, including sources of job stress and frustration, in the broader critique now being conducted by the Washington Office.

2. Institutionalize forest planning as a professional specialization within the Forest Service, and provide opportunity for advancement through the ranks, including line appointments at the field and higher levels.

Minimum Management Requirements

The NFMA planning regulations require that certain "minimum specific management requirements" be incorporated into the forest plan as a means for protecting resources (such as streams and wildlife) and for other purposes (36 CFR 219.27). The requirements establish goals that are expressed in generalized terms with the expectation that methods, prescriptions, and quantitative standards to accomplish them would be developed as part of the forest planning process. How this is to be done is not specifically prescribed by the planning regulations, but clearly the Forest Service has considerable discretionary authority in this area, provided the legal requirements are met.

Clark Row and Perry Hagenstein are studying this issue under a contractual arrangement with the Forest Service, so little attention is devoted to it in this study. However, the issue was raised in the field seminars by some Forest Service personnel and outside groups, particularly industry.

The primary issue concerns procedures for establishing minimum management requirements in the forest plan, including the role of the interdisciplinary team vis-à-vis functional specialists, tradeoff analysis, and public participation in the decisionmaking process, according to R. Weinmann and W. Dennison (in separate personal communications). Planners (and one supervisor) from two of the six study forests expressed a strong opinion that minimum management requirements were "absolute" and outside the normal public involvement process. O'Riordan and Horngren (1987), whose analysis of the issue reflects industry's position, expressed strong dissent:

> This process, therefore, directly violates the procedural requirements of the NFMA and the Multiple-Use Sustained Yield Act. The MMR process is nothing more than single-use planning development in nonpublic meetings and in disregard of interdisciplinary analysis. (page 666).

O'Riordan and Horngren (page 643) argued that to comply with NFMA, "[r]ules controlling resource protection standards must be adopted through rule making, public participation and integrated resource planning." They recommended (page 668) several changes to resolve the issue, including the establishment of rules to control the development of minimum management requirements at the forest level.

In 1987, the Washington Office (Towle 1987) issued a draft statement, "Minimum Management Requirements in National Forest Planning—Their Basis and Application," that provides significantly improved administrative direction for establishing minimum management requirements. Basically, it establishes two fundamental principles:

1. When establishment of a specific minimum management requirement significantly affects other resource uses, planners should formulate and evaluate other approaches to determine whether other practices might be more cost-effective.

2. The minimum management requirement decisionmaking process is to include public participation.

This new direction is consistent with the overall intent and philosophy of the NFMA planning regulations and goes a long way toward addressing the concerns expressed above. Moreover, the policy addresses a deficiency in the regulations by clarifying procedures for establishing specific minimum management requirements. It is of sufficient importance that the administrative direction should be incorporated into the NFMA planning regulations through the normal rulemaking process.

Recommendation

Revise the NFMA planning regulations to incorporate recently developed administrative policies governing the process for developing minimum management requirements in regional- and forest-level plans.

Economic Efficiency Analysis

RPA/NFMA directs the Forest Service to consider economic efficiency in managing the national forests. Pursuant to statutory direction, the NFMA planning regulations require that economic analysis be performed at several points in the planning process and that the resulting information be weighed in decisionmaking. Neither law nor regulations prescribe a mathematically rigid benefit-cost standard for testing or ranking alternative plans.

The regulations provide a process for developing internally efficient alternatives, constrained by specific resource protection standards (the minimum management requirements) and unpriced objectives, and for subjecting these alternatives to comparative evaluations pursuant to NEPA requirements. The process consists mainly of four linked steps: (1) analysis of the management situation, including the evaluation of "benchmark" programs; (2) the formulation of a range of alternatives that differ in the level and mix of resource uses and their associated costs; (3) the estimation of effects of alternatives, including present net values, economic impacts on affected areas, and monetary opportunity costs associated with management standards and unpriced resource outputs set at prescribed levels by constraints; and (4) a comparative evaluation of the aggregate effects of each alternative based on information developed in step (3). (For a more detailed review of the statutory and regulatory requirements, see Teeguarden (1987).)

The intent of these requirements is to ensure that the decisionmaking process is based on a comprehensive understanding of the tradeoffs, environmental and economic, within each alternative and between alternatives. Of particular concern are the tradeoffs between the priced and unpriced outputs and effects of the constraints reflecting legal management standards or prescribed levels of unpriced outputs (Teeguarden 1987, page 409).

To implement economic analysis as part of the overall planning process, the Forest Service issued conceptual and methodological direction to planners through the Forest Service Manual (such as FSM 1970, *Economic and Social Analysis*; FSM 1971, *Evaluating Economic Efficiency*; and FSM 1920, *Land and Resource Management Planning*), administrative policy statements (USDA 1983; Crowell 1983; Peterson 1983), regional handbooks (such as the 1983 directions from Regions 5 and 6), and other publications (such as Jameson et al. 1982). *The principles of economic efficiency analysis are effectively established and integrated in these documents. Taken together, they represent substantive progress in creating a policy environment that encourages extensive deliberation of the financial and economic consequences of national forest programs.* The agency is to be commended for its efforts in this area, for it represents a sharp break from past traditions and meets head-on difficult

pricing and evaluation problems that resource economists have long advocated but not yet fully perfected for operational applications.

FORPLAN is the principal tool for ensuring that economic efficiency analysis enters the alternative formulation and evaluation process. It is used to simulate the effects of each alternative and to compute the most economically efficient way of accomplishing the objectives that have been specified. Given the data, including priced inputs and outputs, FORPLAN identifies management activities that contribute most to maximizing the present net value, a measure of overall efficiency; in this sense, subject to constraints established by forest planners, the model designs alternatives that are internally economically efficient. At the same time, a present net value estimate is generated that can be used along with other information for comprehensive comparative evaluation of the alternatives under consideration. Thus, to the extent that FORPLAN incorporates "good" data and represents an appropriate definition of the planning problem, it theoretically provides a powerful way of bringing economic efficiency considerations into the planning process. In this narrow sense, Forest Service implementation of economic analysis requirements has been responsive to the regulations.

FORPLAN-based planning alternatives are, of course, subject to a number of limitations, most of them stemming from problems of data and policy constraints that can confound consistent application of economic criteria for decisionmaking. These have been amply reported in the literature and will not be repeated in detail here. (For a discussion of several limitations of FORPLAN simulations, see Teeguarden (1987), page 422.) Few, perhaps none of them, are readily "fixed," given the limitations of current knowledge and the law.

Did the economic information generated during first-round planning actually influence the formulation of alternatives and decisionmaking? Anecdotal evidence from the field seminars suggests that the answer is generally yes but that the scope of influence was probably more marginal than dominant and limited to lower level decisions as opposed to strategic goals. Also, the attention given to economic variables and efficiency objectives varied from one forest to another.

Lolo National Forest planners stated that economic efficiency analysis had been used "throughout the whole planning process." Analysts estimated first-decade marginal cost (supply) curves for all outputs; this information was considered in making decisions about output levels for each of the planning alternatives. Two forests (Sequoia and Siuslaw) used FORPLAN simulations to identify the most cost-effective method of providing spotted owl habitat. The Siuslaw conducted an extensive economic analysis of silvicultural prescriptions and forest-type conversion alternatives. "Benchmark" present net value analysis was generally regarded as useful for defining an appropriate range of alternatives, identifying tradeoffs, and estimating opportunity costs. Planners on two forests reported that the results of economic analysis did not dominate decisionmaking or rationalization of the forest plan but that it did often "force rethinking" about some issues. Useful areas of application were

sensitivity analysis, tradeoffs, selection of a range of management intensities, and comparative evaluation of alternatives.

At the strategic level, the testimony of planners and others was much less sanguine about the influence of analysis and economic information on alternatives formulation or design. Decisions about suitable timberlands, allowable sale quantity, wilderness, unpriced outputs, silvicultural systems, land allocations, and long-term output mixes are strategic elements of a forest plan that were generally decided outside a FORPLAN analysis on the basis of subjective evaluations reflecting considerations other than an efficiency goal. Several planners stated that economics was not a dominant or driving force in the strategic decisionmaking process. This is confirmed by final environmental impact statements—in no case is the preferred alternative the plan with the highest present net value. Because it is not possible, given the current state of knowledge, to incorporate all relevant benefits and costs in a present net value estimate, or to simultaneously weigh distributional issues, this outcome is to be expected.

In accordance with direction from the NFMA planning regulations, the Forest Service uses market prices for such resources as timber and range forage and "assigned prices" for such nonmarket resources as wilderness recreation and wildlife. These theoretical assigned prices are based on travel-cost and contingent evaluation models developed by resource economists in recent years. In a FORPLAN model, prices could perform the same function they do in the private market economy; combined with cost information, they could help guide the allocation of resources to the highest combination of uses.

FORPLAN price sets are used to simulate the potential short- and long-term economic outcomes of the planning alternatives under consideration and for other lower level investment or allocation decisions as noted above. However, planners and supervisors are reluctant to allow prices to control strategic decisions. In addition to the fact that not all values can be quantified, there is another reason. Many forest planners do not believe that the assigned values for unpriced resources are credible or defensible. As a result, assigned prices play an accounting role in converting physical units of output to commensurable dollar units but have only a marginal influence on allocation decisions. One planner stated succinctly, "Decisions about wildlife are not affected by assigned prices."

Much the same view prevails with respect to the priced resources, but for a different reason—long-term price uncertainty. Timber is the major case in point. Historically, the real price of timber in the United States has increased at the rate of about 1.5 percent per year. Forest Service economists have estimated even higher rates of increase, particularly over the next two decades. Forest-level planners are reluctant to base current resource allocation decisions on long-term price estimates substantially above those currently being experienced. Moreover, if an upward price trend is used in FORPLAN timber harvest simulations, the effect can be to reduce timber harvests in the near term in favor of higher harvests later when prices are higher. This is consistent with

what economic theory would suggest as the optimal response to future market conditions, but it runs counter to a longstanding Forest Service policy of promoting stability in rural communities that depend on the wood products industry. Forest planners therefore impose constraints on first-decade harvest levels to ensure that this historical level of harvest is maintained, thus overriding the role of price in temporal allocations. However, the forest plans examined for this report retain an upward price trend for timber, which affects the overall plan present net value, the suitable timberland base, and management intensity decisions.

Generally, forest planners regard the mixing of current market prices for some resources, such as timber with hypothetical willingness-to-pay prices, with other resources, such as wildlife recreation, as inappropriate. The problem, as already noted, is that the latter are difficult to justify and thus lack credibility. As one planner put it, the assigned prices cause the "most pain." Another stated that mixing market and assigned prices in the analysis renders present net value "analysis meaningless." On the other hand, there was recognition that assigned prices played a useful role by focusing attention on unpriced resources and by assuring public constituencies that "their resource" was not being overlooked in the planning process. Indeed, the NFMA planning regulations were designed to accommodate such concerns. Also, if reasonable estimates can be derived, which can be the case for some forms of outdoor recreation and increased water flows, assigned prices facilitate the relative comparison of planning alternatives.

The concerns above notwithstanding, the assigned price problem is not one in need of "fixing" during second-round planning. The rules are broadly permissive and do not require that every nonmarket output or resource be assigned a monetary value. Perhaps all that is needed is to limit the scope of outputs receiving assigned prices to those where a value can be anchored on market transactions at some level in the distribution system and to those where replicated travel-cost or contingent evaluation studies produce reasonably consistent estimates. To ensure that uniform standards are followed in establishing prices, whether market or assigned, and to reflect policy goals of the RPA Program, they should be included in regional direction as was the case in first-round planning.

An alternative, supplementary procedure is to estimate the marginal opportunity cost of successively higher levels of unpriced outputs in the context of each planning alternative under consideration. This procedure could serve as a check on the reasonableness of an assigned value, as a basis for a subjective decision regarding an appropriate level of output, and to document the implicit value associated with the preferred alternative. One of the study forests reported that it had followed such a procedure in cooperation with the State fish and game agency and found it to be more useful as a decision aid than arbitrarily assigned prices. The planning regulations anticipate this situation by directing that "[a]lternatives shall be formulated to facilitate an evaluation of the effects on present net value . . . of achieving various outputs and values that are not assigned monetary values, but that are provided at specified levels"

(36 CFR 219.12(f)(3)). The procedure has merit in terms of generating useful information. The extensive use of it should be encouraged for second-round planning.

The forest plans examined for this report include an extensive documentation of the financial and economic effects of the planning alternatives aggregated to the *forest level*. The economic tables have been greatly improved compared to some of the earlier forest plans. The most recent (Plumas and Sequoia) include five basic tables that project benefit and cost data, capital investment, income and employment, present net value, and benefit-cost ratio for each alternative; average annual cash-flow and noncash benefits; marginal cost of constraints, which include minimum management requirements; a present net value comparison of alternatives, including a general display of its major components; and a display of major tradeoffs. Accompanying notes and narrative, including technical appendices, provide an explanation of the economic information displayed and how it was derived, including pricing assumptions. There also is an explanation of differences among the alternatives and a discussion of major tradeoffs. Generally, the economic tables respond concisely and fully to the NFMA planning regulations (36 CFR 219.12(g)). They are informative, give a relatively comprehensive overview of economic effects at the forest level, and should be readily understood by lay readers.

As noted, the economic tables include an estimate of the marginal opportunity cost of minimum management requirements. The estimate is derived by individually removing each of the minimum management requirements from a monetary benchmark that includes the minimum management requirements common to all alternatives. The change (increase) in the present net value represents the marginal cost of the minimum management requirement constraint. This procedure is in accordance with standard principles of "with-and-without" analysis and conforms to the planning regulation that requires that such opportunity costs be estimated.

Presumably, the analysis procedure also is used to help identify ways of achieving the minimum management requirements at least cost, thus serving as a valuable planning aid. However, the forest plans examined for this report do not document how opportunity cost information was used in decisionmaking. This information may be available in the forest planning records. There is always a question of how much detail to include in an environmental impact statement, but given the resource allocation impacts of minimum management requirements, it is appropriate to provide additional justification of methods to accomplish them and an explanation of how information about their opportunity costs was considered.

Currently, opportunity cost information is displayed for the minimum management requirement benchmark only. However, the minimum management requirements are common to all of the subsequently formulated planning alternatives, including the preferred alternative. Because their present net values vary, depending on the nature of each particular plan, the opportunity costs of the minimum management requirements also can be different from those

associated with the minimum management requirement benchmark. Affected groups are primarily concerned with the preferred alternative. Thus, it is appropriate to present minimum management requirement opportunity cost information for the preferred alternative as well as for the minimum management requirement benchmark. This would help clarify tradeoffs and could be used to document cost-effectiveness of methods and standards selected to implement the minimum management requirements. The forests have generated this type of information; it should be displayed in the environmental impact statement documents, possibly as a separate technical appendix.

In first-round planning, it was assumed that price, whether market-determined or assigned, is invariant with respect to the range of outputs represented by planning alternatives. Thus, horizontal demand functions at the specified price were used as the basis for efficiency analysis. At the forest level, this may be an appropriate assumption for timber, but not for recreation, water, or game wildlife. Also in the case of some regions (notably western), market price for timber is related to quantity; as a result, the outputs of forest plans in a region added together could produce different price levels than initially assumed for analysis purposes. This is not an inherent limitation of the planning process per se, but rather reflects a lack of information regarding price-quantity relationships and the inability to estimate demand functions for all the many different kinds and qualities of outputs at issue in forest planning. Efforts should be made to improve this aspect of the data base, but this is an area where a state short of perfection must be accepted. Improvements could be made, particularly at the regional level, but the procedures followed in first-round planning were not unreasonable, given the limitations of the data.

Concluding Remarks

Is the forest planning process working? The question was raised by many of the participants in this study. At the forest level, the principal concern is to get "closure" of the forest plan so that implementation could proceed with public support. Outside the Forest Service, the primary concerns are issue resolution, scope of decisionmaking, adequacy of analysis, and the public participation process. Some observers believe that the forest plans have not resolved key issues, which will have to be addressed again during implementation or second-round planning. Concern has been expressed about the high cost of forest planning, including appeals and litigation.

On the other hand, there is a more optimistic view. Much was learned during first-round planning that can serve as the basis for improving data, procedures, and public participation in the decisionmaking process. (This report is intended as a step in that direction, as is the current Forest Service review.) A large number of forest plans were successfully completed and are in the process of being implemented, providing evidence that the process can be made to work. Appeals and litigation might be taken as contrary evidence, but also can be viewed as an inherent aspect of conflict resolution in which there are strong value differences, subjective decisionmaking, and perhaps legitimate legal issues arising over the interpretation of what the law requires.

Finally, from the testimony received, RPA/NFMA and the NFMA planning regulations are generally regarded as having provided adequately principled requirements for forest planning. This is rather surprising considering the controversial nature of the process. NFMA apparently is an enduring instrument for improving Forest Service long-range planning, even though there is dissatisfaction in some circles with its implementation and whether legislative intent is fully satisfied.

The first-round planning process had both strong and weak points. In the first category are an extensive data base (imperfect though it might have been), use of interdisciplinary planning teams, emphasis on quantitative analysis of options, systems analysis, forest-level decisionmaking, and integrated rather than functional planning. In the second are the extraordinarily long time required to complete many of the plans, complexity of the process, opaqueness of plans, a narrowing of the scope of decisionmaking and issue resolution as the process developed, and effectiveness of public participation. All are areas where further review and evaluation offer promise of making improvements for second-round planning.

This report identifies 10 aspects of the planning process that could be improved in preparing for second-round planning. It also contains specific

recommendations, many of which were suggested by persons participating in the study or by others in the published literature. All involve significant issues, but some involve more difficult and complex matters than others. Particularly important are procedures and standards for identifying suitable timberlands; the usefulness of forest plans, including the scope of decision-making; formulation of alternatives; incorporation of an optional incremental planning process into second-round planning; and provision of a more effective public participation process.

References

Baily, R.G., ed. 1986. *Proceedings of the Workshop on Lessons from Using FORPLAN.* Ft. Collins, CO: USDA Forest Service, Land Management Planning Systems.

Baltic, T., H. Hof, and B. Kent. In press. "Review of Critiques of the USDA Forest Service Land Management Planning Process." USDA Forest Service Tech. Rep.

Block, W., L. Brennan, and R. Gutierrez. 1987. "Evaluation of Guild-Indicator Species for Use in Resource Management." *Environmental Management* 11(2):265.

Carey, H.H., V.A. Sample, S.P. Greenway, and N.S. Van Pelt. 1988. *National Forests, Policies for the Future: Reforestation Programs and Timberland Suitability,* Vol. 3. Washington, DC: The Wilderness Society.

Cortner, H.J., and D.L. Schweitzer. 1983. "Institutional Limits and Legal Implications of Quantitative Models in Forest Planning." *Environmental Law* 13:493.

Crowell, J.B. 1983. Memorandum from Assistant Secretary to Chief R. Max Peterson on the subject of National Forest Land Management Planning, January 19.

Dennis, N., and D.E. Teeguarden. 1982. "Identifying Suitable National Forest Timberlands: A Case Study." *Journal of Forestry* 80(11):712–716.

Ellis, D.J., and J.E. Force. 1988. National Forest Planning and the National Forest Management Act of 1976: An Annotated Bibliography, 1976–1986. Bethesda, MD: Society of American Foresters.

Gould, E., Jr. 1987. "RPA: The Curious Case of the White Mountain National Forest Plan." Harvard Faculty of Forestry Misc. Pub. 14.

Hoekstra, T.W., A.A. Dyer, and D.C. LeMaster, eds. 1987. *FORPLAN: An Evaluation of a Forest Planning Tool.* USDA Forest Service Gen. Tech. Rep. RM-140.

Iverson, D.C., and R.M. Alston. 1986. "The Genesis of FORPLAN: A Historical and Analytical Review of Forest Service Planning Models." USDA Forest Service Gen. Tech. Rep. INT-214.

Jameson, D.A., M.A.D. Moore, and P.J. Case. 1982. *Principles of Land and Resource Management Planning*. Washington, DC: USDA Forest Service, Land Management Planning.

Johnson, N.K., and J. Sessions. 1986. "Forest Planning: Can It Deal With Below-Cost Timber Sales?" In: LeMaster, D., B.R. Flamn, and J.C. Hendee, eds. *Below-Cost Timber Sales: A Conference on the Economics of National Forest Timber*. Washington, DC: The Wilderness Society.

Krutilla, J.V. 1988. "Economics & Public Forestland Management." William P. Thompson Memorial Lecture, School of Forestry, Northern Arizona University, p. 18.

Krutilla, J.V., and J.A. Haigh. 1978. "An Integrated Approach to National Forest Management." *Environmental Law* 8:373.

McQuillan, A.G. 1986. "The Declining Even Flow Effect—Non Sequitur of National Forest Planning." *Forest Science* 32:960–963.

Morrison, M. 1986. "Bird Populations as Indicators of Environmental Change." *Current Ornithology* V(3).

Patton, D.R. 1987. "Is the use of 'Management Indicator Species' Feasible?" *Western Journal of Applied Forestry* 2(1):33.

Peterson, R.M. 1983. Memorandum from Chief to Assistant Secretary Crowell on the subject of National Forest Land Management Planning, May 13, responding to January 19, 1983, memorandum.

O'Riordan, W.H., and S.W. Horngren. 1987. "The Minimum Management Requirements of Forest Planning." *Environmental Law* 17(3):643–669.

O'Toole, R. 1988a. *Reforming the Forest Service*. Washington, DC: Island Press. 247 pp.

O'Toole, R. 1988b. "The Suitable Timber Base, Well-Behaved FORPLAN Models, and Win-Win Situations in National Forest Planning." CHEC Res. Paper 19.

Rey, M. 1987. Remarks before the USDA Forest Service National RPA/LMP/PD&B Workshop. Washington, DC: National Forest Products Association.

Sample, V.A. 1989. "National Forest Policy Making and Program Planning: The Role of the President's Office of Management and Budget." *Journal of Forestry* 87(1):17–24.

Shands, W. 1987. "Beyond Multiple-Use: Managing National Forests for Distinctive Values." *American Forests* (March/April).

Schweitzer, D. 1987. "Forest Service Planning for the National Forests." *Trends* 24(2).

Seig, M., and D. Cawrse. 1987. "Soil Expectation Value as a Criterion for Timberland Suitability." In: Dress, P.E., and R.C. Field, eds. *The 1985 Symposium on Systems Analysis in Forest Resources*. Georgia Center for Continuing Education, University of Georgia, p. 77.

Society of American Foresters Task Force. 1980. *Fiscal and Social Responsibility in National Forest Management*. Washington, DC: Society of American Foresters.

Szaro, R. 1986. "Guild Management: An Evaluation of Avian Guilds as a Predictive Tool." *Environmental Management* 10(5):681.

Teeguarden, D.E. 1986. "The Committee of Scientists Perspective on the Analytical Requirements for Forest Planning." In: Hoekstra, T.W., A.A. Dyer, and D.C. LeMaster, eds. *FORPLAN: An Evaluation of a Forest Planning Tool*. USDA Forest Service Gen. Tech. Rep. RM-140.

Teeguarden, D.E. 1987. "Benefit-Cost Analysis in National Forest System Planning: Policy, Uses, and Limitations." *Environmental Law* 17(3):393–427.

Towle, E. 1987. Memorandum from Land Management Planning Director to Regional Foresters transmitting "Draft Policy for Evaluating NFMA Management Requirements," USDA Forest Service, August 6.

The Wilderness Society, Sierra Club, National Audubon Society, Natural Resources Defense Council, and National Wildlife Federation. 1983. "National Forest Planning: A Conservationist's Guide."

U.S. Department of Agriculture. 1983. "Role of Economic Analysis in National Forest Planning and Decision Making." Unpublished policy statement, October 10.

USDA Forest Service. 1988. "Decisions in Forest Plans." May 1.

USDA Forest Service. 1989. "A Critique of the Land Management Planning Process: Study Plan." Unpublished.

USDA Forest Service Region 1. 1988. "Summary of Decisions Made in Forest Plans and Forest Plan Implementation." October 25.

Verner, J. 1983. "An Integrated System for Monitoring Wildlife on the Sierra National Forest." *Proceedings of the Forty-Eighth North American Wildlife Conference*. Transactions of the North American Wildlife and Natural Resource Conference. 48:355–366.

Wilkinson, C.F., and H.M. Anderson. 1985. "Land and Resource Planning in the National Forests." *Oregon Law Review* 64(1&2).

Wilkinson, C.F., and H.M. Anderson. 1987. "Below-Cost Sales: Are They Legal?" *Journal of Forestry* 85(8):20.

Wondolleck, J.M. 1988. *Public Lands Conflict and Resolution: Managing National Forest Disputes*. New York, NY: Plenum Press.

Appendix A
List of Organizations and Persons Consulted

Forest Service Units

Washington Office

F. Dale Robertson, Chief
George M. Leonard, Associate Chief
Jeff M. Sirmon, Deputy Chief
Allan J. West, Deputy Chief
Charles R. Hartgraves, Associate Deputy Chief
Tom Mills, Director, Policy Analysis Staff
Everett L. Towle, Director, Land Management Planning Staff
Denny Schweitzer, Assistant Director, Land Management Planning Staff
Fred Norbury, Land Management Planning Staff, Appeals and Analysis
Robert Randall, Economist, Wildlife and Fisheries Staff

Also, in the Secretary's Office, Douglas MacCleery, Assistant Deputy Secretary of Agriculture

Northern Region, Missoula, Montana

James L. Hagemeier, Director, Planning, Programming, and Budgeting
Douglas Glevanik, Operations Analyst, Region 1
Tom Rhode, Forest Planner, Clearwater National Forest
Brad Gilbert, Forest Planner, Idaho Panhandle National Forests

Intermountain Region, Ogden, Utah

John P. Butt, Director, Planning and Budget
Don Murphy, Group Leader, Land and Resource Planning
Ron Gross, Forest Planner
David C. Iverson, Regional Economist
Paul Barrett, Operations Analyst
Joe Stringer, Attorney, Office of General Counsel

Pacific Southwest Region, San Francisco, California

Paul F. Barker, Regional Forester
Raymond G. Weinmann, Assistant Regional Forester, Timber Management
Jon D. Kennedy, Timber Salvage Program
Joyce Muraoka, Director, Office of Planning and Budget
Klaus Barber, Systems Analyst
Michael J. Skinner, Economist

Pacific Northwest Region, Portland, Oregon

James F. Torrence, Regional Forester
Harold T. Nygren, Director of Planning
Richard Reeves, Forest Planner

	Jerry Allen, Director of Environmental Affairs Lyle Jack, Planning Staff Officer, Mount Baker-Snoqualmie National Forests Neil Hunsaker, Forest Planner, Deschutes National Forest Robert Williams, Forest Supervisor, Gifford Pinchot National Forest Jeff Blackwood, Group Leader, Forest Planning, Region 6
Lolo National Forest, Fort Missoula, Montana	Orville Daniels, Supervisor Fred Stewart, Forest Economist Richard Seitz, Budget Analyst Robert P. Meuchel, Long Range Planning
Gallatin National Forest, Bozeman, Montana	Ronald Desjardin, Director of Budget and Planning James DeVittee, Coordinator, Forest Planning, and Head, Interdisciplinary Team Mike Shau, formerly the Systems Analyst Randy Gay, Interdisciplinary Team Member
Ashley National Forest, Vernal, Utah	Duane Tucker, Forest Supervisor Mick Kissell, Acting Forest Planner Darwin Richards, Silviculturalist Clark Tucker, District Ranger Jill Leonard, Lands and Minerals Darleen Foster, Forest Planner Darrel Johnson, Silviculturalist
Plumas National Forest, Quincy, California	Mary J. Coulombe, Supervisor Carl Summerfield, Director of Planning and Budget Courtland Bennett, Economist Charles F. Stury, Watersheds Terry Bennack, Forest Planning
Sequoia National Forest, Porterville, California	James Crates, Forest Supervisor Jerry Gelock, Recreation Officer and Head, Forest Planning Julie Allen, Assistant Planning Officer Norman Carpenter, Landscape Architect Lew Jump, Systems Analyst
Siuslaw National Forest, Corvallis, Oregon	Tom Thompson, Forest Supervisor Toni Vander Heide, Lands and Forest Planning John Rolland, Economist

Pacific Southwest Forest and Range Experiment Station

Ernst Valfer, Director, Management Sciences
Malcolm Kirby, Operations Analyst, Management Sciences
Daniel I. Navon, Operations Analyst/Economist, Management Sciences
Robert J. Hrubes, Economist, Management Sciences
Steve Laner, Management Sciences

Pacific Northwest Forest and Range Experiment Station

Roger D. Fight, Forest Economist
Kent P. Connaughton, Forest Economist

Industrial, Environmental, and University

Industrial Organizations

Chris West, District Forester, Northwest Forestry Association, Eugene, Oregon
Gregory Miller, Manager, Forestry Issues, Northwest Timber Association, Eugene, Oregon
Ralph Saperstein, Vice-President, Forest Policy, Western Forest Industries Association, Portland, Oregon
William Dennison, President, Timber Association of California, Sacramento
James R. Craine, Vice-President—Public Timber, Timber Association of California
Steven E. Self, Director of Timber Supply, Timber Association of California
Anne E. Heissenbuttel, Manager, Federal Forest Planning, National Forest Products Association, Washington, D.C.
Ken Robinson, Policy and Programs Analyst, National Forest Products Association

Environmental Organizations

Andy Kerr, Conservation Director, Oregon Natural Resources Defense Council, Portland, Oregon
Julie McDonald, Sierra Club Legal Defense Fund, Inc., San Francisco
Peter M. Emerson, Vice-President, Resource Planning and Economics, The Wilderness Society, Washington, D.C.
Jay Watson, Director, National Forest Action Center, The Wilderness Society
H. Michael Anderson, Forest Planning Specialist, The Wilderness Society
Barry R. Flamm, Chief Forester, The Wilderness Society
Carin Sheldon, Public Communications, The Wilderness Society
E. Kaid Benfield, Senior Attorney, Natural Resources Defense Council, Washington, D.C.

University Persons	Professor Norman K. Johnson, School of Forestry, Oregon State University, Corvallis Professor David Jackson, School of Forestry, University of Montana, Missoula
Other	Dave Cox, Economist, Mason, Bruce, and Girhard, Portland

Appendix B
Criteria for Evaluating the Forest Planning Process: An Analysis of RPA/NFMA

RPA/NFMA is the key statutory source for identifying criteria for evaluating the performance of both the planning process and the results of that process as expressed in the national forest plans. The criteria may be drawn from the various requirements of RPA/NFMA. These requirements state congressional expectations of how the Forest Service was to conduct the planning process.

The author reviewed RPA/NFMA and identified language that established specific forest planning requirements. Most of the pertinent language is found in Section 6 (National Forest System Resource Planning). However, Section 9 (National Forest System Program Elements), Section 10 (Transportation System), and Section 13 (Limitations on Timber Removal) also include specific requirements that must be addressed in developing a forest plan.

The author identified 30 criteria for evaluating forest planning—that is, whether or not or the degree to which the process or plan meets legal requirements. The criteria relate to: (1) *procedures* for developing a forest plan; (2) *resource management standards* to be achieved by the plan; and (3) *documentation* to be included in the plan. Of the 30 criteria, 27 are expressed in qualitative terms, while 3 establish quantitative goals.

An example of a performance criterion is Section 6(b), which stipulates that "the Secretary shall use a systematic interdisciplinary approach to achieve integrated consideration of physical, biological, economic, and other sciences." This criterion is in category 1, relating to procedures, and is expressed in qualitative terms. For example, it does not state that the interdisciplinary team should consist of at least 10 specialists in at least five different disciplines.

The interdisciplinarity criterion is documented in the forest plans and is measurable to a degree. The interdisciplinary team members are listed with their disciplinary specialization. The degree of interdisciplinarity is expressed by the number of different specializations represented by the interdisciplinary team members. But a simple yes or no test would seem to meet the legal requirement: yes, an interdisciplinarity approach was used, or no, it was not used. Most of the 30 criteria seem to involve a yes or no test. However, to document performance, it may be appropriate to go beyond a yes or no test. To the extent feasible, quantitative measures are desirable to document the level of commitment or effort to satisfy a particular performance criterion.

Fourteen of the criteria (identified as items 10 to 24 in the following section) established specific requirements for promulgating secretarial regulations to guide the planning process. The planning regulations amplify these requirements by providing additional specificity. Examples are the requirements to

provide for "diversity of plant and animal communities" and to establish "maximum size limits for areas to be cut in one harvest operation." However, the planning regulations also provide implementing guidelines and standards for requirements other than those given in Section 6(g), which specifically pertains to the regulations. The forest planning regulations are therefore linked to the requirements of various sections of NFMA, not just to those specifically required by Section 6(g).

RPA/NFMA requires some actions to be taken *after the forest plans are completed.* An example is the requirement that the plans be reviewed and revised at least every 15 years. Administrative actions of this type are not included in the list of performance criteria—neither are the various reports required of the Secretary of Agriculture.

Performance Criteria

The 30 performance criteria are listed below. Many are paraphrased versions of statutory language, but in each case, the pertinent section of the act is identified. An attempt is made to assess whether or not the criteria are testable and, if testable, by what sort of measure.

Criterion 1—Section 6(b)

A systematic, interdisciplinary approach was used to develop the plan, and the result was an integrated consideration of physical, biological, and other sciences.

This is a compound statement. Both parts testable by a subjectively based yes or no response. The list of interdisciplinary team members and their disciplinary affiliation provides documentation for the first part. The data base used in FORPLAN and the alternatives analysis in the forest plan documents the second part. The first part could be measured quantitatively by the number of disciplines represented by the interdisciplinary team.

Criterion 2—Section 6(d)

Opportunity was provided for public participation in the development and review of the forest plans.

This is testable by a subjectively based yes or no response. This criterion is documented in the forest plan by the list of public comments and the written response to the public and by the record of public hearings and the NFMA planning regulations, which specified requirements for public involvement. It is quantitatively measurable by the number of "public" persons and organizations who participated, the number of letters received, and direct contact with the public. How or in what specific manner public input materially affected the development or selection of the preferred alternative cannot be documented.

Criterion 3—Section 6(e)(1)

The forest plans provide for multiple use and sustained yield in accordance with the Multiple Use–Sustained Yield Act of 1960.

This is a compound, complex, and very general criterion and is testable by a subjective yes or no response. It is documented in the forest plan by the alternatives analysis, output tables, land allocations, and harvest schedules. By simply following standard procedures, all forests should automatically satisfy this criterion.

Criterion 4—Section 6(e)(2)

The forest plans determine forest management systems, harvesting levels, and procedures in the light of all multiple uses.

This also is a compound, complex, and qualitative criterion and is testable by a yes or no response—yes, the forest plan does determine management and harvesting systems for various outputs, or no, it does not. It should be noted that the criterion does not state that the management systems and harvest levels must be shown to be "optimal" (the test for using clearcutting as a harvesting method), but there is a requirement that the determinations be made in accordance with the definitions of *multiple use* and *sustained yield.*

Criterion 5—Section 6(f)(1)

An integrated plan was developed for each unit of the National Forest System.

There are two parts to this criterion—a plan was developed for each unit of the National Forest System, and there is one, integrated plan for each unit. The test is a straightforward yes or no response.

Criterion 6—Section 6(f)(2)

The forest plans are embodied in appropriate written material, including maps and other descriptive documents, reflecting proposed and possible actions.

This criterion and the following two establish documentation requirements for the forest plans. This one is the most general. In effect, it calls for full disclosure of "proposed and possible actions." In a simplistic, qualitative sense, the criterion can be tested by reference to the forest plan, the environmental impact statement, and related documents—yes, the documentation is presented, or no, it is not. The quality of the documentation is another matter. Does the plan identify all the decisions made in the plan, and does it provide the supporting analysis? Are the consequences of the alternatives fully analyzed and displayed?

Criterion 7—Section 6(f)(2)

The forest plans include the planned timber sale program.

This is another seemingly straightforward documentation requirement and is testable with a yes or no. A question does arise with regard to interpretation of this section of the act. Does the programmatic timber harvest schedule,

with its associated assumable sale quantity, satisfy the requirement, or is an actual site-specific timber sale program required?

Criterion 8—Section 6(f)(2)

The forest plans include the proportion of probable methods of timber harvest within the unit necessary to fulfill the plan.

This also is a documentation requirement. This criterion is tied to criteria 21 and 22, which relate to the selection of clearcutting as a harvesting method. It requires that the plan display the proportion of harvested acres by method of harvest (for example, clearcutting, shelterwood, seed-tree, sanitation-salvage, partial cutting, and so on). It is testable with a yes or no.

Criterion 9—Section 6(f)(3)

The forest plans are prepared by an interdisciplinary team.

This is easily testable by referring to the list of interdisciplinary team members. It duplicates criterion 1.

The following criteria, items 10 to 24, are drawn from Section 6(g), which calls for the promulgation of planning regulations by the Secretary of Agriculture and directs that the regulations address but not be limited to the requirements specified. The language is paraphrased to apply to the forest plan. For the most part, these criteria establish management standards and decision guidelines.

Criterion 10—Section 6(g)(1)

The plans are prepared in accordance with procedures required by the National Environmental Requirement Act.

This criterion is administratively testable by analyzing the forest plan environmental impact statement. A yes or no response is the measure. However, the criterion is fundamentally legal—absent a legal challenge, or an unsuccessful challenge, the plan with an environmental impact statement meets the standard. It does not if the environmental impact statement is successfully challenged in court.

Criterion 11—Section 6(g)(2)(A)

The plans identify the suitability of lands for resource management.

This is a general criterion, followed later by another relating specifically to the identification of lands not suited for timber management (criterion 25). The criterion calls not only for a classification of the land base but the standard and guidelines used to arrive at the classification. The plan must document that decisions have been made with regard to suitability for management. It is probably testable with a yes or no response.

Criterion 12—Section 6(g)(2)(B)

The plans provide inventory data on the various renewable resources, soil, and water.

This is a documentation criterion. It is testable with a yes or no response, based on information in the forest plan.

Criterion 13—Section 6(g)(2)(C)

The plans identify special conditions or situations involving hazards to the various resources.

This is an inventory and documentation criterion. Examples are insect and disease problems, soil erosion, and fire hazard. It does not require any specific actions other than an inventory. It is testable based on information in the forest plan.

Criterion 14—Section 6(g)(3)(A)

The plans consider the economic and environmental aspects of renewable resource management to provide for outdoor recreation (including wilderness), range, timber, watershed, and wildlife and fish.

This is redundant; it largely repeats criteria 3 and 4. It is testable by referring to documentation provided in the forest plan, including the data, alternative analyses, and output tables.

Criterion 15—Section 6(g)(3)(B)

The plans provide for the diversity of plant and animal communities.

This criterion is quantitatively testable by referring to information in the forest plan. Quite possibly an index of diversity could be construeted and used to compare the preferred alternative with the current situation. However, the criterion does not suggest any absolute standard of diversity to be achieved, only that diversity be provided for. The Secretary's regulations require an evaluation of "diversity in terms of its prior and present condition" (36 CFR 219.26) and "habitat to maintain viable populations of existing native vertebrate species" (36 CFR 219.27(a)(5)). Diversity is a key area of concern going back to the origins of NFMA. The criterion may not be readily measured or applied, owing to lack of agreement on the response of some plants and animals to vegetation manipulation or change, as in the case of the spotted owl.

Criterion 16—Section 6(g)(3)(B)

The plans provide for steps to be taken to preserve the diversity of tree species similar to that existing in the region controlled by the plan (for example, the planning unit).

There are three parts to this criterion: (1) steps are to be taken; (2) diversity is known and measured; and (3) the proposed steps will preserve diversity. This criterion is testable by referring to the forest plan, but issues commented on under criterion 15 also apply here. A simple yes or no response, with supporting explanation, is possible but not as powerful as quantitative comparisons.

Criterion 17—Section 6(g)(3)(C)

The forest plans ensure research on and evaluation of the effects of each management system to ensure that it will not produce substantial and permanent impairment of the productivity of the land.

This criterion calls for research and monitoring. A national forest unit cannot ensure research, because it does not have a research function, so the requirement is interpreted here as applying generally to the Secretary rather than to the individual forest. On the other hand, monitoring is a forest-level function. This criterion is testable by determining whether or not the forest plan includes a monitoring program and the extent to which that program addresses the major areas of concern.

Criterion 18—Section 6(g)(3)(D)

The plans permit increases in harvest levels based on intensified management practices only when such practices justify increasing the harvest in accordance with the Multiple Use–Sustained Yield Calculation.

This criterion relates to the "allowable cut effect"—harvest levels can be increased based on growth stimulating practices, but must be decreased at the end of each planning period if such practices cannot be successfully implemented or are not funded. The first condition applies to the development of a forest plan, while the second applies to implementation and revision. This criterion is testable by referring to the harvest scheduling features of FORPLAN. It is a yes or no criterion.

Criteria 19 to 24 involve constraints on timber harvesting and the application of silvicultural systems.

Criterion 19—Section 6(g)(3)(E)

The plans provide that timber will be harvested only where (1) soils, slope, and watershed conditions will not be irreversibly damaged; (2) the lands can be adequately restocked within 5 years after harvest; and (3) protection is provided for streams, streambanks, shorelines, lakes, wetlands, and other bodies of water from detrimental changes.

This overlaps criterion 24, which relates to unsuitable timberlands. This criterion is addressed in forest planning through the resources inventory and land classification process. It is subjectively testable in terms of managerial intent by referring to documentation provided in the forest plan. The consequences of proposed actions may be arguable—the subject of appeals and lawsuits. As a qualitative criterion, it is answerable as yes, the plan has these attributes, or no, it does not.

Criterion 20—Section 6(g)(3)(E)(iv)

The harvesting system proposed in the plan is not selected primarily because it will give the greatest dollor return or the greatest unit output of timber.

This is testable by observing the difference between the present net value and timber output of the proposed harvesting system vis-à-vis the harvesting

system that will give the greatest dollar return or output of timber. The qualitative element enters through the question of what weight should be given to "dollar return" or "greatest unit output." However, any nonzero difference would seem to satisfy the criterion. It is testable in terms of a yes or no response by referring to documentation in the forest plan.

Criterion 21—Section 6(g)(3)(F)(i)

If "clearcutting" will be used to regenerate an even-aged stand of trees, it has been determined to be the "optimum method."

The word *optimum* is not defined in RPA/NFMA. However, given the history and language of the act, it may be presumed that the word *optimum* is not exclusively limited to the effectiveness of clearcutting from a timber production standpoint. Clearcutting must be shown to be optimum in terms of vegetation management for the whole planning unit, taking into account both timber and nontimber values. Two types of tests are apparent. One is to merely confirm that if clearcutting is proposed, the forest plan provides supporting justification. The more difficult test is to determine whether or not the documentation adequately shows that clearcutting is optimal. The criterion quickly becomes subjective and would probably involve second guessing if applied by an external reviewer. The type of test is yes, the plan shows clearcutting to be optimal, or no, the plan fails to do so.

Note that Region 5 is taking the position that partial cutting/even-aged systems have been unsatisfactory silviculturally and are not feasible administratively. The region's position is that it cannot prove that clearcutting is optimal, only that the alternative will not work (not feasible). Would this decision stand up to a legal challenge?

Criterion 22—Section 6(g)(3)(F)(ii)

If clearcutting is to be used, an interdisciplinary review of potential effects has been completed on each advertised sale area as well as the consistency of the sale with the multiple use of the general area.

See earlier remarks regarding the relationship between criteria 21 and 22. The question raised: Does this criterion require that a site-specific analysis be part of the forest plan or conducted in the implementation phase? In either case, this is testable by referring to the forest plan or implementation plans. This is a yes or no test.

Criterion 23—Section 6(g)(3)(F)(iii)

The plans provide that cut blocks, patches, or strips are shaped and blended to the extent practicable with the natural terrain.

This is a postplanning implementation requirement. Similar language appears in the planning regulations. The criterion would be satisfied if the forest plan indicates that where clearcutting is to be used, the cut areas "are shaped and blended . . . with the natural terrain." It is testable by referring to the forest plan.

Criterion 24—Section 6(g)(3)(F)(iv)

The forest plans establish maximum size limits for areas to be cut in one operation.

The maximum size of an opening created by even-aged silviculture is established by the regional guide but may not exceed the limit prescribed by the NFMA planning regulations. At the forest level, the maximum size of opening may be equal to or less than the regional limit. It is testable by referring to documentation in the forest plan and is a yes or no test. It also is testable by monitoring the actual implementation of the forest plan.

Criterion 25—Section 6(k)

The forest plans identify lands within the management areas that are not suited for timber production.

This is the "marginal timberland" requirement. The NFMA regulations contain detailed direction regarding procedures for conducting the suitability analysis. The criterion involves both documentation and procedures. Does the forest plan identify suitable and unsuitable timberlands? Did the analysis procedures comply with the NFMA planning regulations? Because no absolute standard is specified in either RPA/NFMA or in the regulations, it is not possible to test whether or not the actual classification is appropriate. This is testable by referring to documentation in the forest plan—yes or no, unsuitable lands are identified, or yes or no, prescribed procedures were followed.

Criterion 26—Section 6(k)(1)

The Secretary shall formulate a process for estimating the long-term costs and benefits to support the program evaluation requirements of this act.

The NFMA regulations (36 CFR 219) and Forest Service Manual (*Economic and Social Analysis*) implement this requirement. It also applies at the forest level. Does the plan estimate the long-term costs and benefits of the proposed alternatives? Were the economic and social analysis procedures established in the regulations and Manual followed in developing the forest plan? Were economic and social consequences of proposed actions considered in selecting the preferred alternative? As with other criteria, it is superficially testable by referring to documentation in the forest plan, including the FORPLAN matrix generator and the record of decision. The quality of analysis and the extent to which analysis results actually influenced decisions would be difficult if not impossible to assess on the basis of plan documentation.

Criterion 27—Section 6(m)(1)

The plans ensure that, prior to harvest, stands of trees shall generally have reached the culmination of mean annual increment of growth.

This is one of the few straightforward criteria, except for the qualifier *generally*. It is testable by comparing the average age of stand scheduled for harvest during the planning horizon to the age of maximum mean annual growth. Documentation is available in the timber harvest schedules computed by FORPLAN. This is a yes or no test.

Criterion 28—Section 9

The plans provide that by the year 2000, all backlogs of needed treatment for the restoration of renewable resources shall be reduced to a current basis.

In Section 9, Congress set the year 2000 as a target year for reducing the "backlog" of areas needing treatment and directed that the Secretary's budget include requests for funds to eliminate the backlog. The requirement is directly applicable to the development of forest plans, which should show: (1) an inventory of backlog areas and needed treatments; (2) the costs and benefits of such treatments; and (3) the schedule of treatments needed to eliminate the backlog by the target year for those areas where the economic and environmental benefits exceed the costs. This is testable by referring to documentation in the forest plan.

Criterion 29—Section 10(b)

The plans provide that nonpermanent roads constructed in connection with a timber contract or other permit or lease be designed with the goal of re-establishing vegetative cover within 10 years after the termination of the contract, permit, or lease.

Section 10 relates to "the forest development road system plan." Presumably, such a plan is included in the general forest plan. In the case of the Sequoia National Forest final environmental impact statement, there is reference to the road system plan and some general discussion of the road system. There is a brief discussion of "road closures," in the context of the alternatives, but no specific reference to reestablishment of vegetative cover. In any event, this provision should be testable by referring to either or both the forest plan and the forest development road system plan.

Criterion 30—Section 13(a)

The plans limit the sale of timber to a quantity equal to or less than a quantity that can be removed from such a forest annually in perpetuity on a sustained-yield basis, with the exception that a planned departure may be made for any decade if consistent with the multiple-use objectives of the plan.

This is superficially testable by referring to the LTSYC and harvest schedule displayed in the forest plan and by documentation on the FORPLAN model for the forest in question. However, at issue will be the assumptions and projections which underlie the nondeclining yield harvest schedule, notably yields, inventory, the suitable timberland base, and the minimum management requirements. FORPLAN simulations and intent aside, is the allowable sale quantity in fact sustainable at the level projected?

Concluding Notes

1. RPA/NFMA establishes standards for judging the planning process and the forest plans. The test criteria generally take the form of yes or no evaluations.

2. Of the 30 criteria, 11 establish procedural standards (1, 2, 5, 9, 10, 14, 17, 20, 22, 24, and 26), 15 establish resource management standards to be

achieved by the forest plan (4, 11, 12, 13, 15, 16, 18, 19, 21, 23, 25, 27, 28, 29, and 30), and 3 establish forest plan documentation requirements (6, 7, and 8).

3. Of the 30 criteria, perhaps 9 could be expressed in quantitative form (1, 9, 15, 20, 24, 27, 28, 29, and 30). The majority are not measurable in quantitative terms. Testing for performance with RPA/NFMA will be a subjective exercise in any case.

4. There is some duplication and overlap; criteria 1 and 9 are substantially the same and so are criteria 4 and 14. Criterion 15 is a more narrowly defined version of criterion 4.

5. Thirty or so evaluation criteria may seem a bit overwhelming, but if anything, the list above (and the accompanying discussion) oversimplifies the situation. For another perspective, see "National Forest Planning: A Conservationist's Guide," published in 1983 by The Wilderness Society, Sierra Club, Natural Resources Defense Council, National Audubon Society, and National Wildlife Federation. The guide cites key provisions of NFMA and the NFMA regulations. Each section is prefaced with a "Conservationist's Concern," including advice on what to scrutinize in the forest plan. An analysis of the guide would produce far more than the 30 criteria identified above, for two reasons. First, the guide includes criteria from the NFMA regulations that were not considered here. Second, the environmental organizations included in their guide expectations about the results of the planning process that might not be shared with other interest groups.

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