Abstract: Long-range resource plans are being developed for National Forests under legislated environmental planning regulations. Vegetation is the common denominator of the resource activities for which the Forest Service is responsible. Through the management of vegetation, water yield, sediment yield, erosion rates, wildlife populations, species diversity, wildfire potential, biomass production, plant vigor, and overall changes in ecosystem dynamics are all affected. An interdisciplinary approach and public involvement are both vital to the process.

Planning Background

Natural resource planning is not new to the Forest Service. It has been practiced in varying degrees since the early 1900's. However, much of the past planning has been directed toward specific activities such as timber harvesting, wildlife management, and recreation. Management planning was accomplished in later years through such vehicles as Ranger District Multiple Use Plans. These plans usually provided for broad zoning of National Forest lands as the basis for future decisions and management activities. They also included coordinating requirements considered necessary to ensure compatibility of resource uses. These plans were limited in scope, in that only general resource management goals were identified, and then only from a single Ranger District, rather than from a Forest perspective.

In 1969, the National Environmental Policy Act (NEPA) was passed. It set the framework for the formal planning processes the Forest Service follows today. The major changes from the multiple use and individual resource planning of the past, as dictated by NEPA, were that plans were to be done in more detail, and were to apply to geographic areas containing similar social and physical characteristics. Plans were to be developed incorporating strong interdisciplinary interaction, and the public was to play a more active role in providing input and review for the documents.

Within a few years of the passage of NEPA, two other pieces of legislation were enacted which have had a tremendous influence on the scope and intensity of resource planning within the Forest Service. These are the Forest and Rangeland Renewable Resources Act of 1974 (RPA), and the National Forest Management Act of 1976 (NFMA).

RPA requires an assessment of renewable resources on a nationwide basis, and makes projections of present and future demands for these resources. This assessment is updated every ten years. RPA projections provide the output targets that are used by the Forest Service as National goals for production of goods and services.

NFMA takes the process one step further by establishing statutory direction for the Forest Service to respond to National demands by developing very comprehensive land and resource management plans. These plans will integrate resource management direction for all activities for the next fifty years into a single document. They will also specify the capability and suitability of the land to produce goods and services, the amount of land allocated to uses such as recreation, wildlife habitat, and biomass production, and the schedule of outputs from these activities over time. Driven by local public issues and management concerns to be resolved, the Forest land management plans will specify management practices to be used, such as labor-intensive brush control or prescribed fire; predict the environmental consequences of specific management practices; and specify monitoring and evaluation steps to be implemented.

Identification of Resource Management Goals and Objectives

One of the most significant changes Forest planning presents is that for the first time, National Forests will be developing long-range resource plans that not only deal with the integration and interaction of all the resources simultaneously, but specify a schedule of activities and resulting outputs over time. Developing definitive resource management goals, which are applicable to the individual National Forest, is one of the earliest tasks associated with any forest planning process. Without this initial step, there would be no basis for establishing individual resource objectives, determining what data should be collected, or knowing what end result to anticipate.

To help develop resource management goals, legislated environmental planning regulations (NEPA and NFMA) require the identification of...
internal management concerns and public issues. During the initial phase of the Forest planning effort, through public involvement, the San Bernardino National Forest identified fourteen major issues and concerns which represent a wide range of activities. The type and intensity of management in chaparral and related vegetation was identified as one of the overriding concerns on the Forest by both management and the public. The challenge of managing chaparral lands to achieve an integrated resource program will be a key issue in the Forest Plan. The following are a few of the types of issues that will be addressed:

- The San Bernardino is one of the four primary southern California Forests that provide recreation opportunities to the more than 13 million people of the area. The demand is increasing to open more public land to recreation uses. Many of the proposed uses are compatible with other land uses, but others are not. What kinds and amounts of recreation opportunities should be emphasized, taking into consideration all other resource uses and impacts? What kind of vegetation manipulation will most enhance these experiences?

- The San Bernardino National Forest provides municipal water to 12 individual water agencies and numerous irrigation districts, both within and outside the Forest boundary. Under existing management conditions, the Forest produces over 250,000 acre feet of water annually. Water quality and quantity are directly affected by the manipulation of vegetation, and one of the questions to be answered is to what extent management practices should maintain or enhance water production from National Forest lands.

- How can the integration of resource management objectives with fire protection objectives be more effectively implemented? Added to this concern is the fact that the San Bernardino National Forest is one of the most fire-prone forests in the entire National Forest system. Protection of the land from wildfire is a complex task because of the rugged topography and vast expanses of highly flammable chaparral fuels, the Mediterranean-type climate, Santa Ana winds, and increasing urban intrusion. The rapidly developing interface between existing urban development and the National Forest chaparral slopes presents the dual problem of protecting Forest lands from man-caused fires, and homes from wildland fires. The feasibility and effectiveness of establishing greenbelts or their equivalents as buffer zones between developments and chaparral areas is being studied as a part of the land management plan.

- Land use coordination has become a vital issue because of the pressures of development in the private sector and the growing demand for the use of public lands. The San Bernardino is the only National Forest in the nation with a year-round permanent population of over 40,000 people within its boundaries. On weekends and during other high-use periods, this figure can rise to over 100,000 residents.

- Some additional concerns to be dealt with are increasing range opportunities, enhancement of wildlife habitat, protecting or enhancing visual quality, and what kind of transportation network is needed to support Forest activities. Issues will be addressed in the Forest Plan under one of three categories: management of vegetation; allocation of support facilities and structures; or specially administered lands such as wilderness areas, cultural or historical areas, and biological areas. Of the major issues identified, more than half will be addressed by translating policies, standards, guidelines and management direction into acres of vegetation on the ground to be manipulated over time. Vegetation is the common denominator of the majority of the resource activities for which the Forest Service is responsible. Through management or manipulation of vegetation, water yield is increased or decreased, sediment yield and erosion rates are affected, wildlife populations and species diversity may be enhanced, wildfire potential is changed, biomass production and plant vigor are influenced, and overall ecosystem dynamics are changed. Not only are these activities controlled to a great extent by the periodicity of removal, but they are also affected by the spatial patterns resulting from vegetation treatment and the methods by which the treatment is carried out—prescribed burning, mechanical removal, herbicides, and so forth. Since each resource activity benefits to a greater or lesser degree from various and sometimes conflicting approaches to vegetation management, the challenge to the resource manager is to determine the goals and definitive objectives for which the land will be managed over time, to recognize the complex interrelationships among those objectives, and to develop a sound rationale for management that is ecologically, economically, socially, and politically acceptable.

Although this description depicts the San Bernardino National Forest, the basic scenario, in varying degrees, represents similar conditions all over the world, wherever there are vast areas of chaparral-type vegetation, a Mediterranean climate, high resource values to be managed and protected, and the increasing pressure of urban development. Management of the vegetation is one of our major working tools. The diverse vegetation systems of southern California offer some of the greatest challenges to management in the Nation, if both the intent and the letter of the law as set forth in the National Forest Management Act are to be met. The remainder of this paper will outline one possible approach to the application of the land management planning
Vegetation Management Planning

Vegetation management, as we are defining it on the San Bernardino National Forest, includes actively applying some practice to the ground, such as doing something to the vegetation, and also deliberately excluding activity, thus allowing some growth-related or development-related processes to occur. Implicit in this definition is the requirement that the persons responsible for land management understand the dynamics of the systems they manage. It requires an understanding of the relationships between the physical and biological components of the systems being managed. It requires that managers be able to predict with confidence the effects of doing or not doing some specified activity or sets of activities.

There are basic questions a Forest Plan must address regarding vegetation management. Assuming that products include commodities such as wood products and water, and also non-commodities such as wildlife habitat, recreation, and visual experiences, what can be produced from the land? Where can it be produced, and on what schedule? What is the cost of producing these things, and what is the value of the things being produced? What are the measurable short-term, long-term, on-site, and off-site effects of producing goods and services on National Forest lands?

The focus of this paper is on techniques for predicting the capability of the land to produce goods and services. The question of whether specified areas within the land base are suitable for a specific use will not be addressed here. Suitability is a function of many social and political issues or constraints and must be determined outside of the physical-biological realm.

The scientific community has produced some significant results in several areas of vegetation and ecosystems research. However, we are all aware of the many gaps in existing information, especially for southern California. Taking a positive approach, there are a number of tools available to facilitate planning. The vegetation of southern California is now described in a systematic and hierarchical manner (Paysen, et al., 1981) which is compatible with the National Land Classification System and is patterned after the UNESCO system of vegetation classification (UNESCO, 1973). Some literature is available which allows interpretation of the reproductive strategies and developmental processes of various plant communities (Keeley and Zedler, 1978, and others). Some information is available which will allow planners to predict relationships between the physical and biological elements of the systems (Bailey and Rice, 1969; Rice and Foggin, 1971). The Forest Service has also developed some in-house tools to facilitate predictions about the relationships between various characteristics of the vegetation systems being managed and the outputs being produced.4

With that basic framework, Forest planners and other team members can begin to examine management activities in a manner which will allow them to predict outputs, analyze effects, and display the relevant cause-and-effect relationships between outputs and effects. Perhaps most important, predictions can be tested and examined through follow-up monitoring.

Although the Forest Service conducts many different activities on the ground to meet a variety of vegetation management objectives, all of those activities can be grouped into one of four basic vegetation management categories. The first category is removing vegetation. Activities in this category include removing entire plants or parts of plants, resulting in a temporary change in vegetation structure or species composition. Generally, this treatment induces a different successional phase in the stand of vegetation being treated.

The second category is changing the vegetation type in order to produce a relatively permanent change in physiognomy, such as converting trees to grass, or shrubs to trees. Vegetation manipulation activities which would be implemented imply some level of management over time to maintain the vegetation in the desired state. Greenbelts comprised of orchards, irrigated pastures, recreation areas, or managed woodlots are examples that might be included in this category.

Third is protection from insect or disease epidemic. This category includes all activities associated with treating and protecting vegetation on a large scale, where there may be a potential for significant effects on system dynamics.

The fourth category is revegetation; the enhancement of existing vegetation through replanting on a large scale, or reintroducing species into historic range. It could include the introduction of non-native species, for example, introducing annual grass seed on a burn.

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Early in the process, a decision must be made about how the vegetation Series, or stands of dominant vegetation which are present on the Forest will be grouped for predicting land capability and for analysis. This is a separate exercise from mapping. Ideally, the decision is reached through a carefully considered interdisciplinary process. Each resource specialist must determine the logical grouping of vegetation that allows some amount of confidence in predicting the effects of a set of activities, and also allows the prediction of the outputs produced in goods or services. A leveling session must follow permitting the various resource specialists to bargain and to agree upon the common aggregation of plant communities that they can finally and unanimously live with. The task is much easier for the conifer zones on the Forest, where established management practices and observable results are documented. Vegetation types which have been managed for a number of years provide an opportunity to experience the effects of management. When working in the frontier of vegetation management such as with chaparral and oaks or other hardwoods of the Mediterranean ecosystems, we do not have the luxury of past experience. We must use all the professionalism available, in other agencies as well as our own, in developing a common basis for writing management prescriptions.

Management prescriptions will be applied to aggregates of vegetation Series in order to predict outputs and set priorities for land allocation. Ideally, the criteria used to aggregate the vegetation should be based upon biological principles. Criteria might include the structural characteristics of the vegetation--both characteristics of individual plants as well as community structure. They might also include the physiological characteristics of dominant overstory plants, and life cycle characteristics, including reproductive strategies of dominant plants.

Physical characteristics such as percent slope, landform, and climate zone will be applied in order to ultimately sort the various groups of vegetation into manageable units for analysis purposes. The physical land characteristics will have an effect on the productivity potential of a vegetation group and will also affect the method which can be used to treat the vegetation. However, in most cases, it is not possible to predict a direct relationship between the physical characteristics of the land and the dominant overstory species that exist on the ground.

After vegetation has been grouped by Series into categories of similar biological response and the significant physical features of the landscape have been applied as a further sorting process, the most difficult task awaits. Ultimately, all disciplines must arrive at a common understanding of, and agree upon, the various successional stages or changes in overall plant community structure which produce significant changes in outputs, effects, or costs. This agreement among disciplines on the relationships between changes in resource production and changes in vegetation structure or successional phase is essential. This step is key to developing management prescriptions, which are the basis for the plan analysis. At the same time, standards that will guide or constrain the activities are developed. The constraints will be carried through and applied to actual on-the-ground management.

**EXAMPLE**

A hypothetical example of a management treatment or prescription which might be applied to Chamise Chaparral on the south side of the San Bernardino Mountains follows:

**Management Direction**

Within all chamise chaparral land units of 500 acres (202.5 ha) or more, the vegetation will be managed in a mosaic of age classes on a 20-year rotation cycle and will be treated at 5-year intervals.

Standards and guidelines applied with this practice might include

1. No more than 2000 total acres (810 ha) of land shall be treated during any one year within the Santa Ana River drainage.

2. No more than 10% increase in sediment will be tolerated within the watershed through-out the treatment cycle.

3. Prescribed fire will be the preferred treatment method on slopes >50%.

4. Every initial treatment shall include cultural and historical inventories and sensitive plant inventories.

5. At least 10% of the chamise chaparral vegetation shall be retained in a mature phase (>50 years old) at all times.

6. The pattern of treated acres should be spatially arranged in 35-50 acre (14-20 ha) patches with at least 200' (61 meters) of untreated ground between the patches whenever possible.

7. Treated acres abutting the urban interface will be accomplished in a manner compatible with any proposed greenbelt projects.

For every 10 acres (4 ha) treated within the chamise chaparral, the treated land might produce 50 acres (20 ha) of wildlife habitat improved for early successional indicator species, 0.5 acre feet (616 cubic m) of
water yield, 20 visitor days per year for recreationists, 10 acres of cultural resource inventory completed, and one animal unit month of range. Again, these are hypothetical numbers for the purpose of illustration. The point is that because all disciplines have participated in developing the rationale for writing the prescription, each can predict some outputs which are tied to a treatment schedule on a specific land type, and develop the standards and guidelines which will maintain the activity within acceptable impact levels. The intense interaction that takes place among disciplines to achieve this stage in planning produces a confidence level which will carry through for the rest of the process. Time and energy spent in developing feasible management prescriptions is rewarded through a commitment to the reliability of the resulting plan and an eagerness to implement it. Production models can be tested incorporating ground truth into the future plan revisions.

Summary

Probably every person involved in this stage of land management planning is somewhat idealistic. They are hoping to achieve greater perfection than is possible, given the present level of experience in managing these lands and the time frame in which to produce a plan.

Each participant also recognizes that as social or political emphases change, the plan may need to change; that it must be flexible enough to accommodate unplanned events such as fire, flood or earthquake. Given these unknowns, what is the value of investing so much time and energy in a Forest Plan? The real value will be realized when assumptions and predicted relationships relative to vegetation system dynamics have been documented and tested. The set of planning criteria being developed will suggest links between actual management practices being applied to the ground and measurable elements or characteristics of the systems being managed. The set of criteria and relationships can be tested through research and monitoring over time. The plan will be an attempt to define the now missing links between management practices, measurable characteristics of the systems being managed, and the goods and services which can be produced. Even though management priorities may change or the demand for various kinds of outputs may change, the basic principles upon which land capability is based will not change.

The Forest Plan itself will be validated only if and when we can show that the sum of individual projects applied to the ground and implemented on a specified schedule, within established constraints, will produce the predicted outputs and effects.

Literature Cited


