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B thru H

Final Environmentental Impact Statement

Land and Resource Management Plan

Ochoco National Forest and Crooked River National Grassland

Caring for the Land...

Appendices - Volume I A and I - Response to Public Comment

This volume of the appendices has not been included in this reprinting of the Ochoco National Forest Land and Resource Management Plan.

If you wish to view this document a copy is available at the Ochoco National Forest Supervisor's Office, 3000 East Third Street, Prineville, OR 97754.

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Description of the Analysis Process

Introduction (Section 1)

The Planning Problem

The National Forest Management Act and the implementing regulations (USDA-Forest Service 1982) require each National Forest to develop a comprehensive multiple resource land management plan. These regulations outline a complex, systematic process aimed towards the development and evaluation of alternative Forest plans designed to resolve public issues and management concerns, and to capture management opportunities in a cost efficient manner.

The complexity of this problem for the Ochoco National Forest and Crooked River National Grassland stems from several sources. First, potential management activities must be scheduled and evaluated over a long period of time, ranging from 50 to 150 years. Second, the entire National Forest and Grassland, approximately one million acres in size, need to be assessed simultaneously. A wide variety of conditions exists within this area. For resource plans to be effective management tools, the direction provided must be specific enough to enable project level planners to readily determine if contemplated activities contribute towards and are consistent with Forest-wide goals and objectives. In addition, potential activity schedules need to be assessed relative to multiple resource criteria. These resources include many types of fish and wildlife, recreation, range, timber, water, minerals, and cultural assets.

The need to ensure that the scheduled activities are cost efficient adds an additional complexity. Related to this problem is the fact that, in many cases, a proposed management regime that appears to be best for a specific site or timber stand will not be best from a Forest-wide perspective. Constraints placed upon timber harvest, which require harvest levels to remain at a given level, can cause this condition.

The scope, complexity, and cost efficiency orientation of this planning process led the Washington Office of the USDA-Forest Service to conclude that National Forests must use linear programming (LP) as the central analysis tool. The optimization characteristic of LP ensures cost efficient allocation of land, labor, and capital resources. Additionally, LP appears to effectively deal with the complexities described above.

The Planning Process

The planning process described in the NFMA regulations (USDA-Forest Service 1982) was conceived within the framework of systems analysis. That is, the planning process was seen as a rational, analytical means of solving the complex problems associated with multiple-use forest management. The ten step planning process described below is outlined in the NFMA regulations and is intended to meet the requirements of both NEPA and NFMA.

Step 1: Identification of issues, concerns, and opportunities - In any systematic approach to problem solving, the first step is to identify the problem In this step, the interdisciplinary team (ID Team) identifies and evaluates public issues, management concerns, and resource use and development opportunities. What does the public want? What does the Forest Service want? What needs to be done?

Step 2: Planning criteria - The issues, concerns, and opportunities (ICO's) collected and evaluated in Step 1 are be used to develop decision criteria for evaluating alternatives. Planning criteria are also used to guide the collection and use of inventory data and information, analysis of the management situation, and the design and formulation of alternatives. What tests, rules, and guidelines are needed to complete the plan and select the best solution?

Step 3: Inventory data and information collection - Based on the ICO's, data is collected which will allow analysis of the problems identified. What and where are the resources available? In what amounts?

Step 4: Analysis of the management situation - In this stage, the Forest estimates the range of various goods and services it can produce, the potential to resolve public issues and management concerns, and the technical and economic feasibility of providing various levels of goods and services. The primary purpose of this step is to provide a basis for formulating a broad range of alternatives.

Step 5: Formulation of alternatives - A broad and reasonable range of Forest Plan alternatives is formulated to provide a variety of ways of responding to the ICO's. Each major problem must be addressed in at least one alternative.

Step 6: Estimated effects of alternatives - This stage estimates and displays the physical, biological, economic, and social effects of implementing each alternative. What will happen if a certain set of management prescriptions is chosen?

Step 7: Evaluation of alternatives - The significant physical, biological, economic, and social effects of each management alternative are evaluated with respect to the decision criteria established in Step 2.

Step 8: Selection of alternative - Using the decision criteria, a preferred alternative is selected.

Step 9: Plan implementation - The preferred alternative will be used to develop multi-year program proposals. These proposals will be consistent with the standards and guidelines set forth in the Plan.

Step 10: Monitoring and evaluation - A monitoring plan is established to evaluate how well objectives have been met and how closely standards and guidelines have been applied. Periodic evaluation reports are required. Based on these reports the Plan may be revised or amended if necessary.

This process can be viewed more broadly as occurring in three phases:(1) judgmental phase, (2) analytical phase, and (3) execution phase. Planning Steps 1, 2, 7, and 8 make up the judgmental or selection phase of the process. In this phase, ICO's are identified, and decision criteria are established. Then, based on the analytical phase, alternatives are evaluated and a preferred alternative is chosen.

No one alternative will satisfy all goals and objectives better than all others. The decision maker compares the trade-offs between alternatives and decides which balance of outputs, conditions, and uses represented by an alternative maximizes net public benefits.

Planning steps 3, 4, 5, and 6 represent the analytical phase of the process. Appendix B is primarily concerned with this portion of the process. In this phase, data is collected which addresses the ICO's and objectives of the Forest. Estimates of the Forest's potential to address the ICO's are developed. Alternatives which focus on producing various combination of goods and services are developed and the effects estimated. This information is then provided to the decision maker to use in choosing a preferred alternative.

The final phase is implementation and monitoring (planning Steps 9 and 10). Planned actions will not

always produce the desired results. Through monitoring and evaluation, inconsistencies between desired conditions and actual results can be identified and corrected.

Changes Between the DEIS and FEIS

As a result of responding to comments received from public and organizations following the release of the Draft EIS, the following listing is a summary of changes made for this Final EIS. These changes are the result of a concerted Forest effort to respond to comments received during the Draft review process. The changes revolved around data and data sources, processes, additions of new issues, additional analysis, and the elimination or modification of DEIS alternatives or the development of new alternatives.

New and Expanded Issues

Between the DEIS and FEIS the timber issue was broadened to include uneven-aged management and large diameter ponderosa pine; four new issues were also identified: anadromous fish, historic trail preservation, off-road vehicle use (ORV), and Round Mountain. The following sections describe the changes made since the DEIS to deal with new or updated issues or new ways of addressing the old issues.

New Prescriptions and Yield Streams Applied in FORPLAN Model

Uneven-aged timber management applied to ponderosa pine on general forest (20" target size).

Uneven-aged timber management applied to ponderosa pine in special areas with 30-inch DBH target size:Lookout Mountain, Stein's Pillar, Deep Creek, North Fork Crooked River.

Uneven-aged timber management (group selection) applied to mixed conifer in some areas.

Extended rotation ages and new thinning cycles for ponderosa pine in general forest.

More reliance on mixed conifer to produce cover for big game.

Acres and Timber Yield Tables

Acres - Condition classes (i.e. the amount of pine sawlogs, saplings, etc.) have been updated from the 1983 information used in the DEIS. This was done to more accurately assess timber harvest scheduling and its associated outputs and effects.

Timber Yield Tables - Yield tables were updated to reflect the growth that has occurred in the last five years in order to more accurately determine outputs and effects.

Other

New elk coefficients.

New Habitat Effectiveness model for elk.

New mapping systems (Mount Hood Map, LIDES, Plot 7) installed for visual and analytical capabilities.

Standard view shed procedures eliminated in favor of set width (1200 ft)

New riparian analysis and scheduling based on updated stream condition inventory.

Potential water developments for livestock and wildlife re-evaluated.

Existing old growth inventory updated.

Anadromous fisheries identified. The analysis included resource production relationships and economic parameters.

Potential for mineral exploration and leasing, economic value of mineral leases incorporated.

Potential for capital investments concerning developed and dispersed recreation, including trails, re-evaluated.

Alternatives

Alternatives B-Dep, D, E, F, G, H, H-Dep have been dropped.

Alternatives B and C have been modified to incorporate new ICO's.

Alternatives A and E-Dep have been updated.

Alternative I has been developed based on ICO during the DEIS review process and is the preferred alternative.

Inventory Data and Information Collection

(Section 2)

Overview

Following the identification of ICO's and planning criteria, the Forest made some basic decisions concerning the types of inventory data to be used and the methods of organizing this information. Two different forms of information were recognized by the ID team as essential to complete the task. The first form consists of data tied to a map base. Timber stand mapping or potential big game management areas are examples of this form. The frequent and varied needs to relate these inventories to each other, and to aggregate or disaggregate massive amounts of data at several different levels, led the Forest to develop an automated geographic data base using the R2MAP software system at the Fort Collins Computer Center (FCCC). The second general type of data needed were items not tied to a map base. For example, forage yield data or cost data apply to certain categories without reference to a specific geographic location. Each of the individual ID team members and forest specialists organized this information in the most efficient manner for the intended use. The following page briefly describes data base development and some of the major uses of the Forest's inventory data.

At the time the Forest planning process was initiated, a new timber inventory was already underway on the Forest. This inventory was completed in 1982. The stand mapping completed for this inventory provided the most recent and accurate map of the Forest's timbered vegetation Consequently, this map was heavily relied upon throughout the planning process and was the basis for development of analysis areas (see Section 3, pages B-18 through B-20). For most other resources, the ID team felt that adequate data was already available or could be readily assembled. In some cases, better inventory data would have been very useful had time and dollars permitted major new inventories. In order to adequately address public comment to our DEIS, updates were made to our riparian, old growth, and range structural improvement data. Section 2, pages B-7 through B-9, gives a brief summary of the major data sources used and the general reliability of each.

Changes Between the DEIS and FEIS

The major changes discussed in this section are the new or updated data concerning old growth, riparian condition, water developments, and the installation of new computerized mapping systems.

Data Organization and Use

Data Base Development

The Forest considered use of several different geographic data bases before settling on R2MAP. R2MAP is a simple grid cell mapping system available to the forest through the FCCC. The system was thoroughly tested at the time this decision was made and had, in fact, been used previously on the Ochoco for a limited area in a unit planning effort. Selection of a grid cell size and map scale was neces-

sary to initiate data base construction. Three different scales were considered for use: 1" to the mile, 2" to the mile, or 2 64" to the mile. The latter scale, 2.64" to the mile, is the one used in the standard 7 5 minute USGS quad series which has been adopted by the Region for the primary base map series. Regional Office support and the suitability of this scale for most of the forest's mapping needs led the ID team to select this scale. The most convenient grid cell size for this scale is approximately three acres per cell. Given that several of our inventories were mapped to a 2-3 acre resolution, and the ID team wanted to retain as much accuracy as feasible, the use of a three acre grid cell size seemed appropriate and was adopted.

Many different layers of data were identified by the ID team as necessary for calculation of outputs, conditions, costs, and effects for the Forest Plan. In most cases it was apparent that use of the R2MAP data base would be an efficient method to provide the necessary data. Existing mapped data was gathered from several sources (TRI, specialist's maps, inventory records, etc.) Easily mapped information was prepared where none existed at the time. In most cases this information was placed on 2.64" to the mile quad maps or 4" to the mile quad maps.

Coding schemes were developed for each layer using two character codes for each attribute. An up-to-date code book containing all of these codes is maintained in the planning files. Each of the input layers was then coded, quad by quad, by placing an acetate grid over the source map and placing the appropriate attribute code on the grid. These maps were then entered onto floppy disks via a R2MAP data entry program (GRIDENT) available on TI-990 intelligent terminals, and transmitted to FCCC. The various programs of the R2MAP system were then available to format the data and perform the basic functions of a grid cell mapping system. Each of the layers input was overlaid against an ownership base layer to ensure that consistent boundaries were present on each layer. Updates, changes, or corrections to data already in the system were accomplished by either changing the codes, changing individual cells, or re-inputting affected quads.

The selection of layers to include in R2MAP followed from several criteria. The major need for forest planning was the ability to combine basic resource data and geographic locations into analysis areas and relate those acreages to potential land allocations. Therefore, basic resource data, geographic locators, and potential land allocations were selected for inclusion in the data base. Other layers were included to help provide data for the calculation of costs, yields, constraint values, or acreage adjustments. Additional criteria involved in the decision to include or exclude potential layers included: 1) time or costs to map, code and enter, 2) frequency of potential use, 3) stability of data, 4) importance of related ICO's, 5) complete current data available, and 6) potential for development of new applications. As needs and conditions changed new layers were added and/or revisions made to existing layers. Between the DEIS and FEIS, the Forest undertook an extensive effort in updating its mapping capabilities. Computer maps were produced with Mount Hood Map, LIDES, and Plot 7.

Major Uses of Inventory Data

Analysis Areas

In current planning processes the land and resource base is described in terms of a set of delineators that define analysis areas. Analysis areas represent aggregations of many individual mapping units that are identified with identical delineators. Without reference to these individual units, sometimes called capability areas, analysis areas lose site specificity. The fact that forest planning attempts to deal comprehensively with multiple resources across an entire Forest requires that analysis area delineators reflect fairly broad conditions. The selection of these identifiers is an important step, however, since the composition of an analysis area defines the range of management activities appropriate for a given objective and the resultant costs and yields. The analysis model FORPLAN does much of the assignment of prescriptions to analysis areas based upon these costs and yields.

Analysis areas were constructed by overlaying several resource inventories (District boundaries, unroaded areas, working groups, slope classes, timber size classes, and forage productivity classes) with the R2MAP data base and aggregating small units into larger ones. Verification of the spatial feasibility of the model results also requires that analysis areas be represented on a map. In addition to these functions, use of R2MAP has allowed the Forest to efficiently determine how each analysis area relates to broader land classifications.

Costs and Yields

In order to estimate various costs and yields, data was assembled from many sources. In some cases, data representing several years experience were averaged together (e.g. precommercial thinning costs). In other situations, historical data were not representative of anticipated practices, and estimates were constructed (e.g. reforestation costs). Another example of data usage to construct production coefficients involved using Forest plantation data to drive a simulation model (e.g. timber yields from PROGNOSIS). The Forest's R2MAP data base aided in the construction of production coefficients by providing the acreages of specific categories within other more general categories. More specific data could then be averaged together, using acreages as weights for use within the broader classifications (e.g. forage yields by fairly broad working groups). The derivation of production coefficients is discussed in more detail in Section 3, pages B-44 through B-45 (yields) and Section 4, pages B-51 through B-52 (costs). Section 2 contains a summary of major data sources used by the Forest.

Timber Suitability

The Forest followed a process to determine which timbered lands were unsuitable for timber management according to Regional and National direction This process included a screen for regeneration difficulty. The Forest's soil resource inventory was used to locate areas with potential regeneration difficulty. Field checking focused on those sites and, when completed, resulted in a new map of verified unsuitable areas. This inventory was entered into the Forest's data base and overlaid with the timber map, resulting in an updated suitable timber map. The timber suitability process and results are presented in more detail in Chapter 3 of the FEIS (pages 3-62 through 3-65).

Alternative Development

A basic need in the development of alternatives was inventory data describing the land base (analysis areas). Section 3, pages B-18 through B-20, contains a description of the Forest's analysis areas. Analysis areas provided the basis for the scheduling of activities and estimation of outputs, costs, and effects for each alternative As described above, data were also essential for estimation of the production coefficients used to drive the Forest's FORPLAN Model. Additionally, it was essential to relate the activities scheduled on individual analysis areas to broader land classifications suitable for implementation of management direction for each alternative (management areas). Potential management areas were inventoried for many of the management area prescriptions (big game, visual corridors, recreation areas, etc.) The Forest's R2MAP data base greatly facilitated this task.

Implementation and Monitoring

Inventory data will continue to be essential when the plan moves into the implementation and monitoring phases Activities will be scheduled for implementation by referring the analysis areas on which they are scheduled to management areas. Changes in analysis areas, primarily due to timber harvest activities, will be reflected in an updated inventory to guide future activity scheduling. Data collected to monitor activities will be stored to facilitate midcourse corrections and future analyses. More detail can be found in the Proposed Forest Plan document, particularly in the monitoring plan.

Summary of Major Data Sources

Major data sources used in the planning process are summarized below.

Recreation Information Management (RIM) - This system consists of two major components. The first of these, a facility condition inventory, identifies maintenance and reconstruction needs for all developed facilities on the Forest. The second aspect of RIM contains recreation use estimates for each recreational activity, within each Recreation Opportunity Spectrum (ROS) class. This data provided the basis for recreational use projections by alternative (1982, updated 1988).

Recreation Opportunity Spectrum (ROS) - This inventory establishes the recreation potential on the Forest for various types of recreational opportunities (1983, revised 1985).

Trail System Inventory - This map shows existing and potential trail segments, existing trail conditions, and trail maintenance priorities. Trail systems for each alternative were developed from this information (1983, updated 1985, 1988).

RARE II and Roadless Area Inventories - These maps identify roadless area boundaries, according to Regional criteria, for use in the alternatives (1978, 1984).

Visual Quality Objectives (VQO) - The Forest was inventoried according to visual quality objectives as determined through a combination of variety class and sensitivity levels. This data guided application of management area prescriptions designed to retain or partially retain natural beauty (1983, revised 1985,1988).

Existing Visual Condition Map (EVC) - This map depicts the existing visual condition of the Forest, in terms of the degree to which an area appears to have been altered by man's activities. By establishing a reference point, this inventory allows a determination of how the alternatives alter existing visual conditions (1983).

Big Game Winter Range and Summer Range Areas - Based on big game habitat differences and actual big game usage, this map depicts the associated summer range and winter range areas used by various subpopulations across the Forest. This inventory was used to develop big game population projections, and to help develop management areas for the alternatives (updated 1-20-87).

Crown Closure/Thermal Cover - A data set describing the relationship between timber stand crown closure and big game thermal cover values was used to evaluate and control big game habitat (updated 6-26-84).

Old Growth - Maps of stands currently in an old growth condition were used to help identify how existing old growth would be affected by the alternatives. Maps of potential old growth management areas, based largely on distribution criteria, were used to help develop alternatives (3-15-88).

Nationwide Rivers Inventory - This inventory was conducted by the National Park Service, and served to identify which rivers on the Forest have the potential to be classified as Wild or Scenic Rivers (1982).

Watershed Condition - Watersheds were classified according to soil depth, riparian condition, road concentrations, and compaction hazards to help schedule timber harvests while meeting soil and water requirements (11-84).

Soil Resource Inventory (SRI) - This inventory identifies mapping units according to soil characteristics, vegetation, slope, aspect, landform, and bedrock characteristics. It was used to identify cost differences, suitability for some types of activities, and mitigation measures (12-77).

Riparian Improvement Schedule - This inventory identifies soil, water, and riparian problem areas, and was used to help determine costs and apply prescriptions (1-15-87).

Watershed Improvement Schedule - This inventory identifies soil, water, and riparian problem areas, and was used to help determine costs and apply prescriptions (1-12-89).

Physical and Biological Stream Surveys - Physical and biological data on most of the Forest's major streams were used to help develop and apply riparian prescriptions (1972-79).

Timber Inventory - The timber inventory and associated stand mapping was recently accomplished (1980-1982) and was the primary data used to describe the Forest's timbered vegetation. The stand mapping was a major part of the analysis area stratification. Timber volume and growth by species from the inventory were used as the basis for existing stands yield tables.

Managed Timber Yield Table Data - Several sources of data were used to develop and calibrate the timber yield tables for regenerated stands. Plot data from actual Forest plantations and naturally regenerated areas formed the main data input to the PROGNOSIS model used to generate these tables. Additionally, Forest stand exam data, previous inventory statistics, and published site index tables were used to calibrate the growth and yield model (1985, updated 1987).

Timber Suitability Map - Lands unsuitable for timber production due to physical and biological conditions that prevent successful regeneration were identified based on soil mapping, district experience, and field checking (1983).

Ecoclass Inventory - The Forest was mapped into plant communities using the classification established in the "Plant Communities of the Blue Mountains" guide. This map base provided a means of stratifying analysis areas for non-timber vegetation. Forage production data from the guide for each of these ecoclasses was used to develop livestock yields.

Cultural Resource Inventory - This inventory contains site specific data for the pre-historic sites known to exist on the Forest, and provided the context for the estimation of effects for the alternatives. (1976-present)

Transportation Sheds and Road Map - Areas of the Forest were mapped into transportation sheds, thereby delineating areas of similar traffic patterns and costs. This facilitated analysis of cost efficient transportation investments, and tied directly to a map of existing road segments and conditions (1989).

Road Management Plan - This plan contains data identifying road segment categories, mileages, travel times, haul and maintenance costs, construction/reconstruction needs and costs, and existing traffic levels. This provided the basic data for the Forest network analysis for each alternative (1989).

Slope Map - The Forest and Grassland was mapped into two slope classes to help determine appropriate activities and costs, and to schedule prescriptions efficiently (1983).

Timber Sale Appraisal Records (2400-17 Forms) - This data set was used to develop stumpage values and logging costs (76-84).

ADVENT/RPA Cost Data - Actual expenditures and planned costs were used to help develop cost data (76-86)

IMPLAN National and County Data Files, 1982 - These data describe the local counties' economies and the inter-industry transactions that occur as goods are produced and sold. They formed the base data used by IMPLAN to help predict local economic impacts of the alternatives.

Output Expenditure Data - These are used in the IMPLAN model. They compute the effect upon given sectors in the local economy of changing a unit of Forest outputs. This allows IMPLAN to trace the effect of the alternatives on local jobs and income. Some expenditure data was computed from the IMPLAN model for 1982, other data was originally computed for 1977 and then updated to 1982.

Socio-Economic Overview - A contractor prepared overview described the social constitution of the local area. This was used as the basis to describe the effects of the alternatives on social patterns and trends (2-82).

Fuels inventory - Project-level site-specific fuels inventories were used to select fuels models for the Fire Analysis System (late 1970's to early 80's).

Fire History/Weather History Records - These historic records provided the baseline data for the Fire Analysis System. This system was used to determine the most cost efficient fire suppression strategies given these historic probabilities of fire behavior and weather (1970-79).

Brush Disposal (BD) Appraisals - These appraisals provided data used to develop BD costs for efficient treatment scheduling (1980-84).

Mineral Potential Reports and Maps - Two separate documents were prepared - one for the Crooked River National Grassland (6/88) and one for the Ochoco National Forest (3/89). These documents discuss locatable and leasable minerals, addressing the geology of the area, historic mine production, and mineral potential. Both documents include mineral potential maps that are reproduced in the Plans. The documents are available for review in the Supervisor's Office.

The Forest Planning Model (FORPLAN)

(Section 3)

Overview

Forest planning is a very complex process. An enormous amount of information must be considered before an alternative management plan can be recommended as the one which best addresses the issues, concerns, and opportunities identified at the outset of the planning problem. Because of this complexity, several interrelated computer models and analytical tools have been utilized to help determine the decision space within which alternatives can be developed, and to evaluate their associated outputs and effects.

One of these models is called FORPLAN. The name is an acronym for FORest PLANning Model. FORPLAN is a computerized linear programming (LP) model which has its roots in RAM (Resource Allocation Model) and MUSYC (Multiple-Use Sustained Yield Calculations). It is composed of a matrix generator, a linear programming solution system (FMPS), and a report writer. Within the bounds of the matrix generator and the FMPS solution package, the user is allowed a great deal of latitude in formulating the mathematical representation of the forest planning problem to be analyzed. Our modeling analysis was performed with Version

I, Release 14. The system is maintained and operated on the Univac computer at Fort Collins, Colorado.

The Ochoco FORPLAN Model was specifically designed to help the Interdisciplinary Planning Team analyze the economic and production tradeoffs associated with the recreation, timber, visuals, range, water, and wildlife resources, and to help evaluate the extent to which various alternative management scenarios were able to address and resolve the identified planning issues. One key step in the development of the FORPLAN Model was to divide the Forest and Grassland into analysis areas Analysis areas are tracts of land with relatively homogeneous characteristics in terms of the outputs and effects that are being analyzed in the FORPLAN Model. Their delineations were intended to capture the significant social, biological, and economic differences in the way the land responds to alternative management strategies. The focus of the delineations was upon the planning issues.

In the FORPLAN Model, analysis areas were assigned to management emphases in order to achieve the resource management objectives of a particular benchmark analysis or alternative. "Management emphasis" is a FORPLAN term and is directly related to the "management areas" described in Chapter 2. Each management area has a set of standards and guidelines concerning how the resources in that area are to be managed to meet multiple use objectives. These are termed management prescriptions (see Appendix D). Six to ten different management emphases were available to each analysis area, depending upon its resource production opportunities.

In turn, "modeling prescriptions" were developed to achieve the multiple use objectives of each management area. In FORPLAN these are referred to as combinations of management emphases and intensities. Modeling prescriptions are combinations of scheduled activities and practices, and their associated outputs and effects The modeling prescriptions and their range of timing choices are represented as decision variables in FORPLAN. The outputs and effects associated with the prescription choices are represented as mathematical coefficients in the respective decision variables. FORPLAN had from one to twenty prescriptions to choose from for each management emphasis for each analysis area. In addition, dozens of different timing patterns and rotations were provided for most management emphases-management intensity combinations on timbered lands

The prescriptions FORPLAN selected depended upon the objective function and the set of constraints used to represent a particular benchmark or land management plan alternative. The objective function was usually to maximize present net value or the production of timber. These were subject to first satisfying all the specified constraints. Constraints were designed to guarantee the spatial and temporal feasibility of land allocation and harvest scheduling choices. Once the model had determined that a feasible solution existed by satisfying all of the constraints, it would then search for the set of prescriptions and timing choices which permitted it to optimize the solution according to the specified objective function.

Since operation and interpretation of the Ochoco's FORPLAN model must be consistent with the basic assumptions and limitations of LP, many analyses must be performed to fully analyze resource opportunities and trade-offs.

The next 3 segments of this section describe the concepts underlying the Forest's model and how the model was used to fully evaluate the ICO's. The last four segments of this section describe more completely the Ochoco's FORPLAN model.

Changes Between the DEIS and FEIS

The changes described in this section relate to a number of facets of the use of the FORPLAN model. The incorporation of new issues, and how these issues relate to modeling characteristics, is described. The section also discusses new analysis of such issues as uneven-aged management and elk habitat. The description of the use of other modeling tools has been expanded. Finally, the updating of analysis areas and management areas, and the development of new yield tables are explained.

Analysis Process

Ochoco Model Design and Relationship to ICO'S

Modeling Assumptions

Ideally, Forests would be able to take full advantage of the optimization characteristic of LP to allow the scheduling of activities from a full set of prescriptions that completely describe production potentials for all relevant resources. Prescription selection by LP could be based on economic efficiency criteria alone, since all the relevant resources, with competing economic values, would be represented in the model . Differences in the land's ability to provide these outputs would all be reflected in the land and resource stratification, allowing the model to differentiate between production functions to find the most efficient set of prescriptions. The land stratification would also contain specific geographic boundaries, enabling control of modeling inputs, outputs, effects, or conditions within these areas to ensure feasible activity schedules. The resulting solution would represent assignment of management direction to suitable, geographically coherent management areas.

Several assumptions underlie the ideal approach described above. Relationships expressed in the LP matrix must be congruent with the fundamental mathematical assumptions of LP. Activity variables are assumed to be linear and homogeneous. All significant aspects of the production functions to be analyzed must be known and quantifiable. Data required to categorize and measure these productive interrelationships must also be available. All resource values must be known and quantifiable. If the above assumptions can be met, current technology must be available to construct and solve the LP within reasonable time frames and without undue expense.

Ochoco Planning Problems And Modeling Characteristics

Design and development of modeling and analysis processes on the Ochoco required a determination of the public issues, management concerns, and resource opportunities to be addressed in the planning effort. These ICO's defined the objectives to be represented. Delineation of analysis areas, development of prescriptions, and model design were all influenced by the content of the ICO's. Consequently, the first step to understanding the Ochoco's LP model and its capabilities and limitations is to identify the planning problems being addressed. Data gathered from public involvement processes and

TABLE B-3-1
ISSUES, CONCERNS, AND OPPORTUNITIES FOR THE OCHOCO NATIONAL FOREST AND CROOKED RIVER NATIONAL GRASSLAND
As Presented in the DEIS

1 What should be the level of timber production?
2 How can activities on the Forest and Grassland benefit social and economic wants and needs of local communities?
3 What is the appropriate level of livestock grazing and intensity of range management?
4 How should riparian areas be managed to meet various resource needs?
5 What road system should be provided to meet public, commercial, and administrative access needs?
6 What habitat levels should be provided for big game?
7 How much roadless recreation opportunity should be provided?
8 What level of emphasis should be placed on management of scenic resources?
9 How much old growth habitat should be provided?
10 To what extent should firewood be provided to meet demand?
11 How much habitat should be provided for wildlife species dependent upon dead trees?
12 To what extent should the Forest provide for winter sports activities?

from Forest personnel were analyzed to develop a list of ICO's (Table B-3-1). Appendix A describes the evaluation of these ICO's and Chapter 1 summarizes them. The following paragraphs summarize the factors affecting production of key outputs and effects related to these ICO's, and the adaptability of these factors to LP modeling.

A few of the more important issues facing the Ochoco are the level of timber harvest, species mix, and size of material. The scheduling of intermediate and regeneration harvests, and the timing and stocking level of reforestation methods and precommercial thinnings, are the major activities affecting timber growth. The size class and species mix of the standing timber inventory is the other major component of harvest level projections. Fortunately, use of LP is well suited to analysis of timber harvest schedules (Ware and Clutter 1971, Navon 1971, Johnson and Scheurman 1977, and Johnson and Jones 1980). Different timber types can be reflected in the analysis area stratification, and inputs related to the activities described above are reasonably linear in the production of timber. In fact, FORPLAN (Johnson et al. 1980) contains many features of the harvest scheduling model called MUSYC (Johnson and Jones 1980). Adequate analysis of the combinations of stand treatment options that best meet Forest objectives and constraints consumes a great deal of model space, however. Each of the treatment sequences for an analysis area needs to have many scheduling choices available to provide the LP with sufficient flexibility.

The issue of social and economic impacts is to some degree a composite of all the ICO's, since the resolution of any ICO has a social and/or economic impact. Several related aspects of social and economic concerns comprise this ICO. One major focus of this issue is the provision of job opportunities and income to the local area. Forest Service planning processes employ an input-output model (IMPLAN) to trace the effects of changes in National Forest outputs through the local economy to estimate the impact on local jobs and income. Within this context, factors relating to commodity and non-commodity production, and the economics thereof, that affect local jobs and income deal directly with this issue. A second aspect of this ICO arises primarily from a national management concern for determination of the most cost efficient set of prescriptions appropriate for a given set of objectives. This concern focuses on attaining the most efficient use of capital in the national economy, thereby maximizing national wealth. A major factor affecting and limiting analysis of this concern is lack of good, specific cost data. This concern is a composite of all ICO's but places greater emphasis on those ICO's with larger economic implications. A third component of this ICO stems from a national concern to maintain or attain a high level of returns to the Federal treasury. All three of these components are most affected by the level and scheduling of timber harvest and timber management practices.

A third major ICO for the Ochoco concerns the number of animal unit months (AUM's) permitted for livestock. Factors affecting the level of forage available for livestock include the particular analysis area, timber stand density, application of nonstructural improvements, and the percentage of total forage production allocated to livestock. These activities can be reasonably represented as coefficients in a LP. The presence or absence of water sources also affects livestock yields, as this controls the area over which livestock graze This spatial distribution factor is more difficult to deal with, however, since it is related to factors which are hard to measure and do not completely fit the linearity and homogeneity assumption of LP. The water improvements associated with a prescription should be modeled as a step function, not a linear function. In the context of forest planning, the steps may be small enough that this is not a significant problem. Another problem associated with water improvements is that the area served by one development usually encompasses several analysis areas with different yields, thus distorting LP coefficients developed for specific analysis areas. Additionally, an economic analysis of water development opportunities would need to account for differences in the land base which cause water improvement costs to vary widely. Measurement and categorization of those differences would involve accounting for topographical, climatic, and historical variations, and would be a difficult task at best.

The spatial distribution of livestock is a major aspect of another important ICO; i.e., riparian area conditions. Livestock concentration in riparian zones often reduces vegetative shading, which increases stream temperature and reduces channel stability. In order to attain riparian objectives, activities need to be coordinated along and adjacent to lengthy stream segments. This aspect of the issue and the highly constrained management prescribed for these areas greatly reduces the value of modeling activity optimization within riparian zones on a per acre basis. For example, timber management practices influence the shading present over streams, thereby affecting stream temperature. Achievement of specific temperature objectives requires consistent treatment over long stream reaches. Additional difficulties with modeling riparian area choices include an inability to quantify the aesthetic, vegetative diversity, and non-game wildlife values obtained, and lack of accurate in-place data within riparian influence zones.

Similar modeling problems hinder efforts to effectively analyze transportation-related questions and problems within the LP. Development of reasonable network road construction and reconstruction costs requires site-specific knowledge within the model of the activities scheduled and the associated management area objectives. Roads are built by segments that must follow a certain sequence and are not linearly related to prescriptions applied to spatially disjunct analysis areas on a per acre basis. Transportation planning models are available for use (Kirby, et al., 1980), but making an effective linkage between models requires large amounts of model space in the LP to provide a usable degree of spatial resolution. Even with fairly specific geographic boundaries, the loading of harvest volumes from analysis areas to road network nodes still requires somewhat arbitrary assumptions This is one of the most difficult problems to deal with since road related costs are a significant portion of the total costs on the Ochoco.

Analysis of big game habitat levels is one of the more complex and interesting modeling problems. The major component of big game habitat is the amount and spatial arrangement of cover and forage over broad areas. Sufficiently large contiguous blocks of land must be represented in the model for valid assessment of habitat-population relationships. The approximate home range of elk was used as a minimum size. If these contiguous areas are modeled, then cover and forage habitat components can be manipulated with harvest scheduling constraints to control big game habitat and provide compatible harvest schedules. Provision of cover and forage varies according to the timber management practices used, which generally can be reasonably portrayed on a per acre basis Modeling big game habitat as a function of relatively large areas, however, renders valuation of big game-related recreation in the acre-based LP ineffectual.

The roadless recreation issue also presents modeling difficulties. Management of large contiguous areas in an unroaded state is necessary to provide the desired condition. Historical patterns of use, intermingled ownerships, and expressions of public interest are all factors which are difficult to measure and affect the relative desirability of one area over another. Primitive recreation area attribute rating systems are highly subjective and not widely accepted.

The scenery issue is primarily concerned with the type of timber harvest constraints imposed to meet scenic objectives. Factors related to modeling scenic quality trade-offs include the inability to specify a dollar value for the benefits obtained, difficulty with categorizing the relative desirability of one area over another, and the fact that scenery prescriptions are logically applied to specific broad areas of land Similar to the modeling of big game, attainment of scenic objectives can be insured by manipulating harvest scheduling constraints if appropriate areas are represented.

The winter sports issue is primarily concerned with the allocation of competing recreation uses on specific areas. Prescription assignment must be specific to the areas involved to resolve the issue. Another aspect of the issue relates to the type of timber harvest activities occurring in these areas. In some cases management objectives for these areas would require modification of timber harvest practices for scenic purposes. Harvest scheduling constraints can

ensure attainment of these objectives in the model if the appropriate areas are represented

The two remaining wildlife issues, old growth and snags, have similar modeling characteristics. First, neither of these resources produces outputs with monetary values. Second, effects of providing different levels of old growth or snags are straightforward in that both result in direct timber harvest level reductions. Analysis of other resource interactions in the LP is not particularly useful for these issues. Additionally, in order to ensure attainment of objectives old growth needs to be provided in units of certain sizes at particular spacings, further limiting modeling flexibility.

The remaining ICO, firewood, is relatively minor from a modeling standpoint by virtue of the values involved and the magnitude of the trade-offs required. Provision of firewood would be relatively amenable to modeling in a LP if it were competitive with normal timber harvesting on the Ochoco.

Four new ICO's were identified since the DEIS, and are incorporated in the FEIS. They are:

13. Anadromous fish
14. Historic trail preservation
15. Off-road vehicle (ORV) use
16. Round Mountain

All four new ICO's present modeling characteristics similar to the problems described above. Anadromous fish presents modeling problems similar to riparian; historic trail and Round Mountain are similar to the scenery issue, and ORV use is similar to winter sports.

As evidenced by the foregoing discussion, much of the effort associated with constructing an LP model for the Ochoco centers around the spatial relationships inherent in the analysis of Ochoco planning problems. These relationships present modeling problems because they are not congruent with the nature of the LP activity variables. Activity variables represent the assignment of prescriptions to analysis areas and are assumed to be linear and homogeneous on a per acre basis. Stratification of the land and resource base so that costs and yields portrayed in the LP meet these assumptions results in analysis areas composed of many individual units scattered across broad sections of the Forest. The analysis necessary to explore the resolution of the ICO's was supported by other tools (see pp. B-17 through B-18).

Figure B-3-1 illustrates this pattern on a typical section of the Forest. Many of the Ochoco's planning problems, however, require the application of management direction to specific land areas. Riparian, roadless, scenery, winter sports, and old growth ICO's all fall into this category. Other planning problems, such as big game habitat, necessitate analysis of broad contiguous areas for valid representation of management objectives. As a result, land areas allocated to a particular set of management directions to resolve an ICO are comprised of portions of many analysis areas. Figure B-3-2 depicts this relationship with a realistic land allocation pattern. These circumstances led to the conclusion that some sort of spatial control over the assignment of management direction to analysis areas is necessary to realistically analyze the management opportunities on the Ochoco.

Basic Model Design

The design of a valid and meaningful model for the Ochoco required the careful consideration of the factors discussed in the previous section. The assumption of linear, homogeneous activity variables and the relationships inherent in analyzing planning problems with particular spatial characteristics had to be reconciled to meet the planning mandate. Several additional criteria were used to guide model design. An evenly spaced sample of production functions adequately covering the full range of production possibilities was necessary to ensure thorough analysis of management opportunities, and to provide as much flexibility as possible to the LP. A need consistent with this objective was to include all of the relevant cost and price data in the LP, if feasible. A further model design goal was to capture as much of the significant land and resource variability in the analysis area stratification as the data would support. The inclusion of specific geographic

Figure B-3-1

ILLUSTRATION OF THE NON-CONTIGUOUS NATURE OF OCHOCO ANALYSIS AREAS

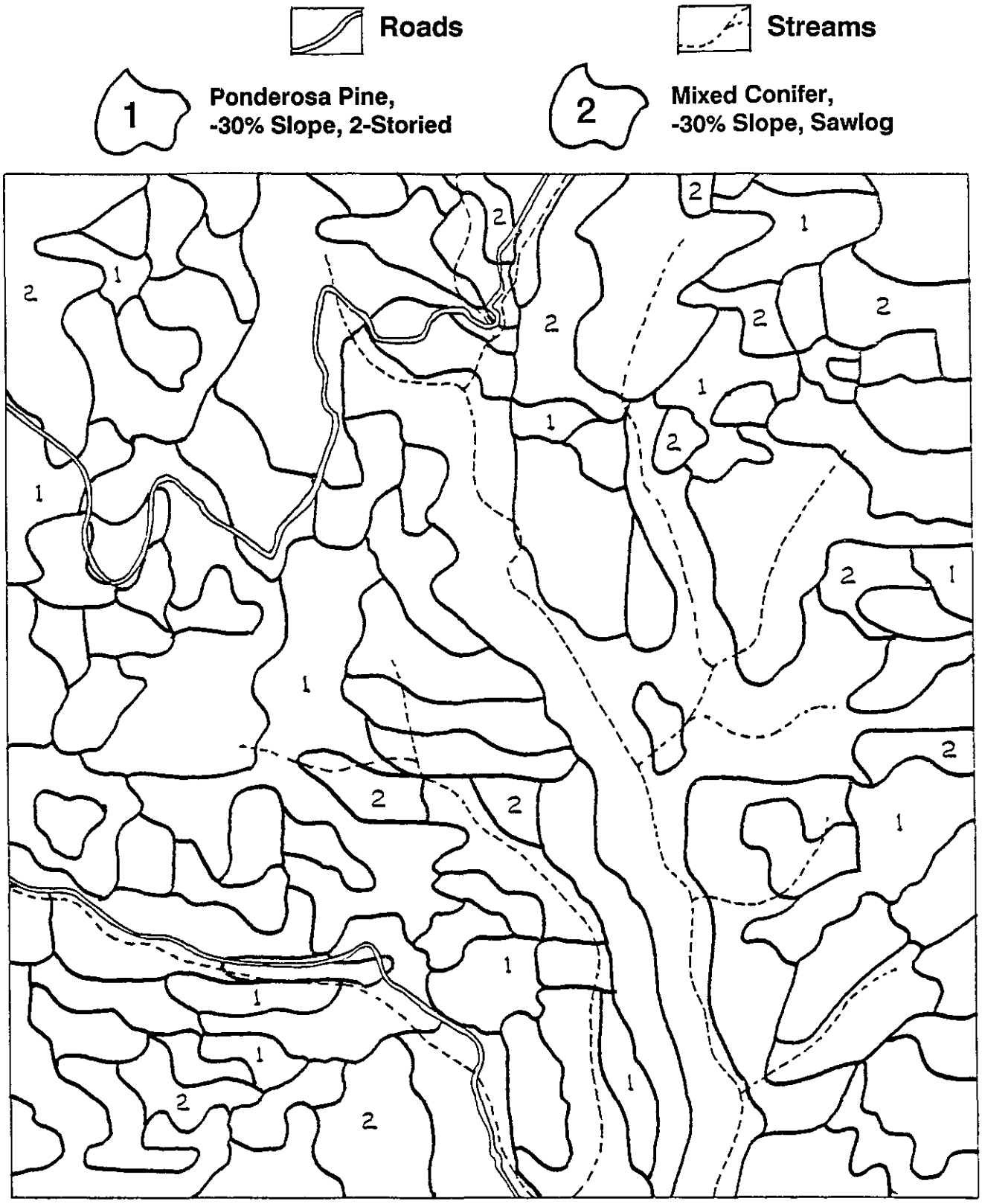
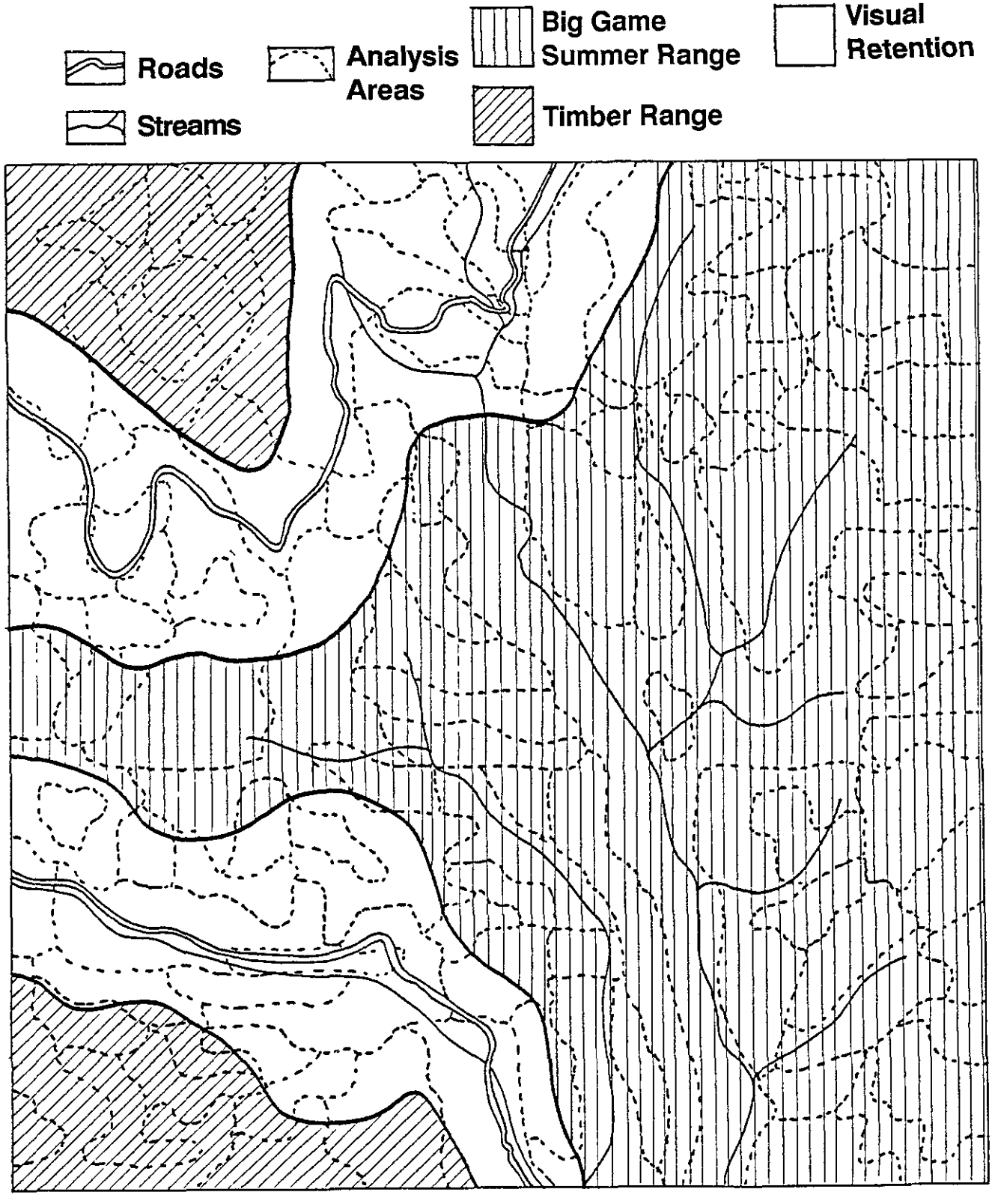


Figure B-3-2

RELATIONSHIP OF A LAND ALLOCATION TO ANALYSIS AREAS ON THE OCHOCO



boundaries enabling control of the LP to ensure both accurate representation of objectives and technical feasibility was also desired. In an environment of limited budgets, a final criterion placed a high premium on the design of a relatively inexpensive model

The planning problems described earlier fall into several categories relative to model design criteria and modeling characteristics. Analysis of timber and range ICO's requires portrayal of a wide range of potential activity schedules. These activities generally meet the assumptions of LP variables, comprise a large proportion of the total economic picture, and can be stratified in the land and resource base to reflect cost and yield variabilities. The scenery, historic trail, Round Mountain, winter sports, and big game habitat ICO's can be categorized as requiring some sort of spatial control over the assignment of management direction to analysis areas. However, provided that the objectives of areas assigned to this type of management can be ensured, a range of potential timber and range activities may be scheduled. The riparian, anadramous, old growth, and roadless area planning problems are similar in that spatial control is again needed. In this case, management objectives are obtained through imposition of strict timber harvest and/or grazing constraints. These latter two categories are similar in that both require spatial constraints over prescription assignment to ensure attainment of objectives. A wide range of land areas that could be assigned to these types of emphases needs to be examined to ensure consideration of a full spectrum of production opportunities and selection of cost efficient activities. Similarities also exist between the snag ICO and a major aspect of the road system planning problem. Both snags and local road construction and reconstruction needs are directly associated with costs and yields modeled as a per acre function of timber and range activities. Due to the difficulties described earlier, a second component of the road system, major arterial and collector roads, is not analyzed within the LP. The firewood ICO is also addressed utilizing other processes.

The model structure selected as best meeting the design criteria stated earlier can be described in terms of three types of model components. The first of these, management prescriptions, provides the objectives and types of direction necessary to coordinate and schedule activities to ensure attainment of the desired condition within relatively large land areas. This type of direction is portrayed on maps of alternative forest plans and responds to the particular spatial characteristics of individual planning problems. The second and third model components are closely linked together in that one, analysis areas, represents the land and resource stratification, and the other, modeling prescriptions, contains sequences of management activities applied to specific analysis areas. The level of resolution attainable in a Forest-wide planning effort prohibits sensible mapping of activity schedules for individual analysis areas. Accordingly, activity sequences for specific analysis areas are regarded as modeling prescriptions used to calculate broader activity schedules applicable to the larger management area. These analysis area-modeling prescription combinations constitute the columns in the LP matrix. A simple example is presented (Table B-3-2) to illustrate the relationships between these components in the LP matrix.

Management prescriptions are represented in the LP matrix by selecting a particular column or subset of columns and fixing the analysis area acreage to which it is assigned for any one model run. This spatial control is necessary to ensure that appropriate areas are assigned to special area prescriptions and contiguous blocks of land are assessed when resource considerations require it. Right hand side constraints can then be applied to these subsets of columns controlling the activity scheduling to represent management prescription objectives. A simplified matrix depicts this structure in Table B-3-2. Two analysis areas and four management prescriptions are represented. Three modeling prescriptions showing the timber yield and resulting effects on big game cover are contained in the matrix for the timber/range and big game management prescriptions. The timber management activities portrayed in these columns are described in Table B-3-3. The first set of rows, the acreage control rows, constrains the acreage assigned for each management prescription to

TABLE B-3-2
A SIMPLIFIED EXAMPLE MATRIX DEPICTING THE OCHOCO MODEL STRUCTURE

		ANALYSIS AREA #1								ANALYSIS AREA #2								
		Timber/Range			Big Game			RP	OG	Timber/Range			Big Game			RP	OG	
		1	2	3	1	2	3	1	1	1	2	3	1	2	3	1	1	RHS VALUES
Acreage Control	AA #1 T/R	1	1	1														=600
	AA #1 BG				1	1	1											=250
	AA #1 RP							1										=50
	AA #1 OG								1									=100
	AA #2 T/R									1	1	1						=400
	AA #2 BG												1	1	1			=400
	AA #2 RP															1		=50
	AA #2 OG																1	=150
Timber Volume	Period 1	6	6		6	6				29			29			3		>700
	2			7				1			32			32		3		>700
	3	8	8		8	8		1				35				3		>700
	4			19			19	1		6			7			4		>700
	5	17		9			9	2			6					4		>700
	6	8	20		20			2		7						4		>700
	7		9		9			2			7		8			4		>700
	8							2		7		7		17		4		>700
	9			5		29		2			23		24			4		>700
	10	7				14		2		29		24			17	4		>700
Thermal Cover	Period 1				6	6	10						0	14	14			>300
	2				6	6	10						2	0	14			>300
	3				6	6	10						2	2	14			>300
	4				6	6	10						2	6	0			>300
	5				8	8	4						4	10	2			>300
	6				4	8	2						4	12	6			>300
	7				2	10	2						4	14	10			>300
	8				4	10	4						6	0	12			>300
	9				4	10	6						0	2	14			>300
	10				6	4	8						2	6	0			>300

ANALYSIS AREA #1 = PONDEROSA PINE
ANALYSIS AREA #2 = MIXED CONIFER-SAWLOG

Management Area Prescriptions

T/R = Timber Range BG = Big Game RP = Riparian OG = Old Growth

TABLE B-3-3
ACTIVITIES REPRESENTED IN THE EXAMPLE MATRIX

Analysis Area Number 1 = Ponderosa Pine - Sapling

	Prescriptions							
Planning Period	T/R-1	T/R-2	T/R-3	BG-1	BG-2	BG-3	RP	OG
1	CT	CT		CT	CT			
2			CT				AH	
3	CT	CT		CT	CT		AH	
4			SH-RG			SH-RG	AH	
5	SH-RG		SH-OV			SH-OV	AH	
6	SH-OV	SH-RG		SH-RG			AH	
7	PCT	SH-OV		SH-OV			AH	
8		PCT		PCT			AH	
9			CT		SH-RG		AH	
10	CT				SH-OV		AH	

Analysis Area Number 2 = Mixed Conifer - Sawlog

	Prescriptions							
Planning Period	T/R-1	T/R-2	T/R-3	BG-1	BG-2	BG-3	RP	OG
1	CC			CC			AH	
2		CC			CC		AH	
3	PCT		CC	PCT			AH	
4	CT	PCT				CC	AH	
5		CT		CT			AH	
6	CT						AH	
7		CT		CT			AH	
8	CT		CT		CC		AH	
9		CC		CC			AH	
10	CC		CC			CC	AH	

MANAGEMENT AREA PRESCRIPTIONS
T/R = Timber/Range
BG = Big Game
RP = Riparian
OG = Old Growth

ACTIVITIES
PCT = Pre-Commercial Thin
CT = Commercial Thin
SH-RG = Shelterwood-Regeneration Cut
SH-OV = Shelterwood-Overwood Removal
CC = Clearcut
AH = Average Periodic Harvest

the constituent analysis area proportions. In the case of the timber/range and big game management prescriptions, several columns are available within the overall acreage control. In the full Ochoco model, several dozen columns containing different sets of activities and many scheduling options are generated for these management prescriptions when applied to timbered analysis areas. Only one column is displayed for the riparian and old growth prescriptions. The timber volume rows illustrate that the average periodic harvest from the riparian prescription contributes to constraints in the LP. The third set of rows, thermal cover constraints, displays the application of right hand side constraints representing big game habitat objectives to a subset of columns. The combination of the acreage control rows and the thermal cover rows ensures that habitat objectives are assessed for contiguous potential management areas.

In order to ensure that model results could be validly interpreted, some compromises in model design were required as compared to the ideal optimization model These compromises took two major forms. The first category includes monetarily valued outputs not present in the FORPLAN LP model. Fish, wildlife, and roadless-oriented recreation are the major outputs in this category. The second form of compromise refers to the assignment of management objectives to specific management areas prior to the execution of any particular model run. Ensuring that the most efficient assignment of prescriptions occurs, given these compromises, requires thorough analysis utilizing sequences of model runs or other supplemental analyses. For example, to compensate for assigning a roadless management emphasis to a specific area prior to running the model, a series of runs were made with candidate areas successively assigned an unroaded emphasis. Opportunity costs and trade-offs were examined and decisions made in light of this information. Another example concerns the development of structures, primarily water developments, to increase livestock utilization of existing forage. Since this could not be adequately dealt with this in the LP model, supplemental analysis was conducted to determine the economic prudence of these proposed investments. More detail on these types of analyses and the role of the Ochoco's LP model in the overall analysis process can be found in the following segment.

Other Analysis

The overall analysis process followed on the Forest and Grassland was designed to ensure a wide range of reasonably distributed, cost efficient alternatives that responded to the identified issues and concerns. From an analysis standpoint the guiding direction is found in the NFMA regulations (36 CFR 219.12 (f)(8)) as stated below:

> "Each alternative shall represent to the extent practicable the most cost efficient combination of management prescriptions examined that can meet the objectives established in the alternative."

The Forest met this requirement through careful design of the FORPLAN model, use of the model to select and schedule prescriptions for each alternative, use of the model in sequential analyses to help design alternatives, and by conducting supplemental analyses. The following paragraphs summarize the types of analyses performed.

The Forest performed several types of analysis in the process of designing and building the Ochoco FORPLAN model. The purpose of these analyses was to allow FORPLAN a wide range of choice to evaluate the significant aspects of cost efficient prescription assignment. The Forest developed analysis areas several times, testing different combinations of land classifications each time, finally leading to use of analysis area data that most efficiently reflected economic factors (see Planning Records, 1920, 7/7/83). Specific modeling prescriptions were developed, tested, and selected based to a large degree upon cost efficiency analysis (see Planning Records, 1920, 9/10/84). Once the model was built, scheduling options for management of two-storied stands were evaluated and refined based upon a cost efficiency analysis. This is the largest timbered stand component on the Forest. Specific modeling procedures were also analyzed for cost efficiency. The

Forest elected to manage and model old growth habitat with a dedicated stand system based in part upon economic efficiency considerations (see Planning Records, 1920, 6/21/84). Final procedures for modeling dispersion of harvest units were adopted to minimize the impacts on present net value (PNV) while meeting dispersion objectives (see Planning Records, 1920, 6/13/85). The resulting Ochoco FORPLAN model is flexible, trackable, and capable of determining cost efficient prescription assignment and scheduling for each alternative or benchmark.

The Ochoco FORPLAN model was used to select and schedule prescriptions for all alternatives. The goals and objectives of each alternative were represented by constraints and the objective function in the LP matrix. These are described in detail in Section 7 of this appendix. Other components of the LP model (analysis areas, prescriptions, and economic data) are described in Sections 3 and 4 of this appendix. Design and use of the LP model consistent with the underlying assumptions of LP, as described on pp. B11 through B-16, helps assure cost efficient prescription selection due to the optimization characteristic of LP.

Many different types of analysis were performed with FORPLAN, both to evaluate different mixes of goals and objectives and to fully evaluate choices not explicitly analyzed within FORPLAN. An analysis in the latter category examined the relative cost efficiencies of different management prescriptions and the timing of initial entry, as applied to individual roadless areas. The Ochoco FORPLAN model was not able to validly analyze these choices with a single model "run", so sequential analyses were performed to provide economic efficiency trade-off data (see Planning Records, 1920, 10/3/85). A similar type of analysis examined relative cost efficiencies of different management area locations on the Forest and Grassland (see Planning Records, 1920, 10/2/85). The Analysis of the Management Situation (AMS) (see Planning Records, 11/24/84) documented a series of analyses performed to provide a framework for alternative development. Economic relationships were examined relative to the maximum PNV obtainable, to competition between market and assigned values, and to current management direction. The opportunity costs of economic assumptions, minimum management requirements, and timber harvest policies were also displayed in the AMS.

For various reasons the Ochoco FORPLAN model was not able to effectively deal with some types of choices. Significant choices of this nature were analyzed "outside the model" with supplemental analyses. Early in the planning process the Forest ID team recognized an opportunity to increase domestic livestock utilization of forage by constructing additional water developments. An economic analysis of these proposed investments was conducted and the results used in the various benchmarks and alternatives (see Planning Records, Range Structural Improvement Analysis, 2/85). Similarly, the trade-offs between livestock usage and recreation users in riparian areas were examined in an economic analysis and used accordingly in benchmarks and alternatives (see Planning Records, 1920, 3/27/85).

Between the DEIS and FEIS many types of analysis were performed to update the design of the Ochoco FORPLAN model, to both evaluate different mixes of goals and objectives, and to fully evaluate choices not explicitly analyzed within FORPLAN. Model design was experimented with and changed to handle various uneven-aged management scenarios, changes in timber yield stratification, desired rotation lengths, new thinning options for low-site pine and maximizing species volume.

The model was used extensively in evaluating different mixes of goals and objectives for the three new or updated alternatives, and to evaluate choices not explicitly analyzed within FORPLAN. For example, the level of management intensity applied to certain roadless areas was varied. The effect of cover component manipulation on elk habitat was analyzed. The Forest also updated analyses that the Ochoco FORPLAN model was not able to analyze effectively. These include the opportunity to increase domestic livestock utilization of forage by constructing additional water developments, riparian and

watershed improvement analysis, and stream condition (Planning Records, 1920, 1/87). Others analyses considered acres of remaining old growth existing and over time, biological diversity, and road management. Considerable effort was also put into the updating of the elk habitat effectiveness model. Elk production potential and the effect of open roads were modified.

The question of whether forage should be in the elk habitat model was also revisited. As in a similar analysis done in 1983, it was felt that forage is generally not limiting, and at this level of planning would not have any effect in the model.

Other Tools

Due to the complexity of planning, numerous computerized and noncomputerized models and analytical tools have been used in addition to FORPLAN.

FORSUM (FORplan SUMmary)

Due to FORPLAN Version One's limitations, both in model formulation and report writing capabilities, the Ochoco National Forest developed a post FORPLAN processor. This processor aggregates timber harvest information in a more useful manner for the Ochoco National Forest. Some of the major summary reports listed acres by Management Intensity, rotation age, and diameter; and various treatment types by working group and management emphasis. It also uses FORPLAN outputs and additional formulas to generate information on snag levels, successional stages, big game habitat, road construction, soils, and number of AUM's.

IMPLAN (IMpact PLANning Analysis)

IMPLAN is a computer-based input-output (I-O) model designed to assess the potential economic impacts of alternative courses of action. Economic input-output analysis is a procedure for describing the structure of inter-industry dependencies in a regional economy. The three regions in this case are Crook, Harney, and Wheeler counties. I-O analysis is based upon the interdependence of the production and consumption sectors of the economy of the area being studied. Its foundation rests on the concept that industries must purchase inputs from other industries, as well as from primary sources (i.e, natural resources), for use in the production of outputs which are then sold either to other industries or to final consumers. Thus, a set of I-O accounts can be thought of as a "picture" of an impact area's economic structure at one point in time. See Chapter 3 of the FEIS and Section 5 of this appendix for a more complete description.

The IMPLAN system consists of:

A data base of economic information from which input-output tables for the three counties were constructed,

Several computer programs designed to access the data base and construct an input-output model for any county or group of counties that the user designates; and

An analysis program that records data about land management planning alternatives and computes their economic impacts.

The IMPLAN data base has two major components:

The national level technological matrix, derived from the Department of Commerce 1977 national input-output model (updated to 1982, and in some cases to 1987); and

Estimates of sectoral activity for final demand, final payments, industrial output, primary inputs, and employment by county. These county estimates provide a detailed description of the structure of the regional economy, identifying which industries are present and their relationship to other industries.

IMPLAN estimates the changes (direct, indirect, and induced) in gross outputs, employment, income, and value added. In addition, IMPLAN provides some features that, thus far, have not been used by the Ochoco.

The availability of a complete transactions table permits the estimation of gross regional product. Detailed employment analysis is possible by tracking employment requirements among various occupations and by accounting for the effects of either

in-migration of workers or re-employment of unemployed local labor. This type of information could provide a comprehensive, detailed account of potential regional impacts.

Spreadsheets

Numerous spreadsheets were developed to process economic efficiency information (PNV, discounted benefits and costs), budget item information, and other resource related information.

Other

Most resource outputs, scheduled activities, and environmental effects were generated with the assistance of noncomputerized processes. They range from the very simplistic to more complicated, such as the elk habitat effectiveness model.

Development of Analysis Areas

Overview

In our current forest planning process, the land and resource base is described in terms of analysis areas. Analysis areas represent aggregations of many individual non-contiguous mapping units that are characterized by having identical delineators and are considered homogeneous in terms of costs and yields. Without reference to these individual units, sometimes called capability areas, analysis areas lose site specificity. The fact that forest planning attempts to deal comprehensively with multiple resources across an entire Forest requires analysis area delineators that reflect fairly broad conditions. The selection of these identifiers was an important step, however, since the composition of an analysis area defined the range of management activities appropriate for a given objective and the resulting costs and yields. Selection of analysis area delineators followed from criteria and general principles set forth in Forest Service planning handbooks and manuals, and in the relevant literature. One of the criteria used was that delineators had to be able to provide information useful for resolving issues, concerns, and opportunities (ICO's). Analysis area identifiers responding to several ICO's or higher priority ICO's were favored over those that did not. A second major criterion used was that delineators must reflect the key factors affecting the variability of cost and yield responses to potential management practices. The relevant costs and yields were those that were significant to the problem and met the linearity and homogeneity assumptions of LP. The availability, resolution, and accuracy of the data being considered was a third major criterion used to select analysis area identifiers. Another factor important to the interdisciplinary (ID) team was recognition of the need to accommodate a wide range of prescriptions and the limits of FORPLAN. In general more analysis area meant fewer prescriptions per analysis area.

Since the Forest used a large number of prescriptions for each analysis area, a goal of having a fairly low number of analysis areas effectively limited the types of information portrayed with analysis areas. Three types of data were not included in analysis areas due to this practical and technical limit. The first type desired was more specific geographical boundaries, such as watersheds or aggregations of watersheds. Not including these reduced the accuracy of some objectives modeled with FORPLAN and increased the difficulty of determining some outputs and effects. Elk winter range boundaries were also excluded from the model with similar consequences. The third type of data desired was aggregations of soil types. Soil types affect the types of practices allowed and the related costs. Not using these delineators required some averaging of costs (e.g., brush disposal costs), resulting in a less discriminating analysis and less accurate cost calculations.

Composition

The set of delineators currently in use on the Ochoco evolved through a lengthy process fully documented in the Ochoco planning records (file designation

TABLE B-3-4
ANALYSIS AREA DELINEATORS FOR THE OCHOCO NATIONAL FOREST AND CROOKED RIVER NATIONAL GRASSLAND

Level 1	Level 2	Working Group	Land Class	Condition Class
Big Summit Paulina Prineville Snow Mountain Crooked River National Grassland	Roaded Unroaded Green Mountain Lookout Mountain Rock Creek Cottonwood Silver Creek Deschutes Canyon Unavailable Unproductive	Ponderosa Pine Mixed Conifer Ponderosa Pine-Low Site Timbered-Unsuitable Grassland Unavailable Unproductive	<30% Slope >30% Slope Unavailable Unproductive	Seedling/sapling Poles Sawlog Two-storied Low Productivity Moderate Productivity High Productivity Meadows Unavailable Unproductive

1920, dated 7/7/83). Table B-3-4 displays these analysis area identifiers using FORPLAN terminology to identify each level of information, i.e., Level 1, Level 2, Working Group, Land Class, and Condition Class. The following paragraphs describe each level in terms of their composition, relative specificity and accuracy, use for cost and yield differentiations, and use for reporting and control purposes.

Level 1 identifiers represent our five District boundaries and provide some geographic definition to the LP. These boundaries are accurate but fairly general in that each district contains 110,000 to 240,000 acres. The only cost or yield differences tied to this level are higher timber haul and road maintenance costs on one District (Paulina), and different livestock distribution percentages on another District (Crooked River National Grassland). One of the primary functions of these boundaries is to make the multiple resource harvest scheduling constraints more specific, and therefore more accurate, than for the full Forest. The ability to report, control,and interpret outputs at the district level for implementation purposes, as well as to address administrative and community stability concerns is also a major reason for their inclusion.

Three different roading categories are recognized in the Level 2 identifiers. Small unroaded areas not requiring network road construction for access are lumped together and differentiated from the general roaded areas of the Forest. Larger unroaded areas that require collector construction for access are each uniquely identified in this level. Boundaries for these areas are accurate. The small unroaded areas category is fairly general in that most Districts contain several of these areas. The large unroaded areas are very specific since each area is uniquely identified. Local road construction cost differences for currently unroaded areas are reflected with these identifiers The major purpose of individually identifying the larger unroaded areas is to interpret and control the scheduling of activities within each area so that road building costs can be more accurately analyzed using the Forest's transportation network model. These boundaries also enable the reporting of outputs and effects for these areas by alternative.

Major cover type differences for both timbered and non-timbered lands are represented with the Working Group level. These cover types are fairly general, reflecting major structural and productivity differences. Each of the Working Groups contain several different plant communities. Given the general nature of these Working Groups, the data are fairly accurate. The stand mapping used was the basis for the recent timber inventory (1981). Major cost differences are tracked by Working Group, including logging, brush disposal, haul costs, road mainte-

nance, reforestation, and range treatments Stumpage values vary by Working Group, as do livestock forage yields. Working Group identifiers also enable the Forest to control and report timber outputs and practices, range practices, and big game cover provision. This latter capability is essential to meet multiple resource objectives.

The Land Class identifier distinguishes the major slope break commonly used by the Forest to determine the appropriate logging system. These two categories are fairly general since they do not reflect all of the site-specific factors that govern the actual logging system used and costs incurred. These identifiers are believed to be very accurate, however, since they were mapped to a 2 acre level of resolution from USGS topographic maps. Major cost differences are tracked by Land Class, including logging, brush disposal, road haul and maintenance, and range treatments. Range forage utilization and distribution factors also vary by Land Class. This level is not generally used for reporting and control purposes except for dispersion of timber harvest units.

Timber size classes and forage productivity classes are represented with the Condition Class level. Both of these stratifications are general in nature. The timber size classes represent an average of many different conditions found on the ground. This is particularly true of the Forest's many two-story stands, most of which have been entered several times in the past with some type of partial cut. The same stand mapping base used for the Working Group level was used for these size classes. The forage productivity classes also represent averages of many different ground conditions. They are considered to be reasonably accurate for purposes of estimating forage yields. Timber size classes affect treatment opportunities and the scheduling thereof All associated costs and yields related to timber scheduling are therefore affected. Livestock forage yields, and to a degree utilization and treatment opportunities, are affected by the productivity classes. This level is not generally used for reporting and control purposes, except for timber harvest dispersion.

Between the DEIS and FEIS, the Forest evaluated their Analysis Area delineators and acres assigned to each. This intensive analysis was undertaken for two main reasons. The first reason was the large amount of volume that was returned to the Forest (buy back) that the model assumed had been treated. Secondly, during the five years since acres were assigned to analysis areas, the Forest had cut and sold a historically high level of timber. Based on this analysis, the acre assignment to analysis areas was updated because of significant shift in acres between the condition class levels.

Development of Prescriptions

Overview

The analysis of factors required to produce outputs and conditions related to the resolution of ICO's described earlier (pp. B-11 through B-20) demonstrated that two levels of prescriptions were necessary. The first level applies to relatively large manageable areas and contains the types of management direction needed to coordinate activities within a management area to ensure attainment of objectives. These are called management prescriptions. As described previously, many of the factors related to broad areas do not meet the assumptions necessary to be modeled in LP columns and, consequently, are controlled with Right Hand Side constraints. The second tier of prescriptions is called FORPLAN prescriptions, or modeling prescriptions, and represents sets of activities applied to specific analysis areas to meet management prescription objectives. This level of prescriptions constitutes the columns in the LP matrix and represents the resulting costs, yields, and conditions. Potentially, there is a set of these columns in the LP for each analysis area-management prescription combination. For any one model run, potential management areas are selected, each of which contains portions of analysis areas. Geographic control is maintained in the model by constraining the acres

assigned to each management area to those analysis area proportions. Right Hand Side constraints can then be applied to specific management areas to meet management objectives. One of the keys to the successful use of LP within this modeling framework is providing adequate choice among production possibilities for each analysis area-management prescription combination. A discussion of how these choices are structured follows the ensuing description of the Ochoco management prescriptions.

Management Prescriptions

The National Forest Management Act (NFMA) regulations define management prescriptions as "management practices selected and scheduled for application on a specific area to attain multiple use and other goals and objectives" (36 CFR 219.3). Management prescriptions consist of a goal statement which establishes the purpose of the prescription and a compatible set of management practices designed to develop and/or protect some combination of resources and to create or perpetuate a desired condition Prescriptions were constructed within the requirements specified in 36 CFR 219.27 (see Planning Records, 1920 1/84). These requirements guide the development, analysis, approval, implementation, monitoring and evaluation of Forest Plans with regard to

(a) Resource protection

(b) Vegetative manipulation

(c) Silvicultural practices

(d) Even-aged management

(e) Riparian areas

(f) Soil and water

(g) Diversity

The process of identifying and subsequently developing management prescriptions began with an Interdisciplinary Team review of the issues, concerns, and opportunities (ICO's). Prescriptions were then identified which would help address those ICO's related to decisions regarding standards and guidelines, scheduling, or land allocations. There were other ICO's which were to be addressed through policy statements for which it was not appropriate to develop prescriptions.

To start the development of management prescriptions, the ID team identified a list of potential resource emphasis strategies. As these strategies were fleshed out, similarities and differences became apparent, allowing consolidation and further definition. The final list of management strategies responded to the ICO's and ensured a full range of choice among realistic management possibilities. These strategies provided the direction for construction of detailed management prescriptions (see Planning Records, 1920 8/10/83).

Once the need and purpose for certain types of prescriptions were identified, goal and objective statements for each management prescription were designed to respond to the ICO's. The ID team then identified the practices which would be used to meet the objectives To accomplish this, the ID team used professional judgment, evaluation of existing policy, legislative directions and research literature. As appropriate practices were identified for each prescription, standards and guidelines for accomplishing them were developed Essentially the standards and guidelines are intended to meet legal requirements and objectives of the prescription and to provide the guidelines for how the prescription is to be implemented on the ground. In addition, general policies, standards, and guidelines were written by the Interdisciplinary Team to cover practices common to all prescriptions and resource management situations that are Forest-wide in scope.

In addition to addressing ICO's, the process of designing management prescriptions was also guided by the following criteria:(1) prescriptions should be achievable and contain realistic practices, (2) they are to be general enough to accommodate the variable site specific conditions on the ground, (3) they should be specific enough for the Interdisciplinary Team to develop accurate resource and economic output and effects coefficients, and (4) to the extent practicable they should be the most cost effective means of achieving the intent of the prescription

To a large degree, the particular structure used represented a consensus judgment about the type and detail of direction appropriate for management areas. Sufficient detail is necessary to resolve problem areas and provide clear direction. Enough flexibility must be preserved to allow for efficient accomplishment of objectives. Improvement of the accuracy and specificity of data and of analysis techniques may allow more specific direction in the future.

In the DEIS, prescriptions were developed for each of the fourteen management areas to which different parts of the Forest could be allocated For each management area, a resource management goal and the general objectives to achieve a desired future condition are described. Management practices are implemented within each prescription according to the resource management goals and the standards and guidelines A map of the land allocation to each management area is available for each alternative. This map, in conjunction with the associated prescriptions and the standards and guidelines, identifies what and where activities will take place. Table B-3-5 compares the major elements for each management area prescription Between the DEIS and FEIS, the Forest decided to create many new management areas to address the ICO's. The Draft management areas are identified as MA-D1 through MA-D14, and have been updated and carried forward from the DEIS The Forest management areas are identified as MA-F1 through MA-F28, while the Grassland management areas include MA-G1 through MA-G16, all of which were developed for the FEIS. There may or may not be any difference between the 14 DEIS management areas and those developed for the FEIS. Table B-3-6 lists management area groupings by resource emphasis. The fifty-eight management areas are summarized below. Appendix D describes them more completely.

Draft Management Areas

MA-D1. General Forest

Emphasis

The primary management objective is to produce timber and livestock.

Desired Condition

Timber management activities will include planting genetically improved stock, natural regeneration, precommercial thinning, commercial thinnings, and regeneration harvests generally at or near culmination of mean annual increment. Timber stands will generally be even-aged, 20 to 40 acres in size, with relatively uniform spacing. The largest trees in managed stands will be 16 to 18 inches DBH. Forage production for livestock will be enhanced by most timber harvesting activities and by range improvement activities, including the use of prescribed fire and the construction of additional water sources.

MA-D2. Big Game Winter Range

Emphasis

The primary management objective is to produce winter range habitat of sufficient quality to ensure high big game survival potentials.

Desired Condition

A quality big game winter range habitat will be brought about, over time, through vegetative treatment, including timber harvests and prescribed fire. These activities will be designed to create an optimal relationship between the size and spacing of thermal cover units for maximum deer and elk use. Open road densities will be kept low to limit the amount of disturbance to big game from vehicle traffic. Livestock grazing will be monitored and controlled to ensure sufficient forage for big game.

Uneven-aged management has been added to Alternative C-Modified, and it will have an effect on a portion of this management area. It is not known at this time how close those acres managed under this silvicultural system will be to the desired future condition specified for this management area.

MA-D3. Big Game Summer Range

Emphasis

Management is directed towards ensuring big game habitat of sufficient quality for high production levels of deer and elk.

Desired Condition

A quality big game habitat will be brought about, over time, through timber harvest and other vegetative treatments. These activities will create an optimum relationship between the size and spacing of cover units and forage areas for maximum deer and elk use. Open road density will be kept low to limit the amount of disturbance to big game from vehicle traffic

Uneven-aged management has been added to Alternative C-Modified, and it will have an effect on a portion of this management area. It is not known at this time how close those acres managed under this silvicultural system will be to the desired future condition specified for this management area.

MA-D4. Old Growth

Emphasis

The management emphasis on these lands is to provide habitat for wildlife species dependent on old growth habitat.

Desired Condition

Timbered stands of 300 acres or greater in size will contain mature and overmature trees in a multilayered canopy. Standing dead and down material will also be a significant component of the stand Stands managed for old growth will generally be distributed throughout the Forest. To create this pattern, existing old growth stands will be utilized where possible. If no suitable old growth exists, areas capable of becoming old growth will be managed to bring the stand to an old growth habitat condition as rapidly as possible.

MA-D5. Retention Foreground

Emphasis

The primary management emphasis of these areas is to provide scenic views that retain or enhance natural beauty.

Desired Condition

Lands in this management area are comprised of the seen area immediately adjacent to areas of very high recreational use. Management activities will only repeat form, line, color, or textures frequently found in a natural landscape. Changes to the scenery will not be visually apparent to the casual Forest user. Where possible, forested areas will contain a major component of large ponderosa pine in open, parklike stands.

MA-D6. Partial Retention Foreground

Emphasis

Management in these areas is directed towards providing scenic views that partially retain natural beauty.

Desired Condition

Lands in this management area are comprised of the seen area immediately adjacent to areas of high recreational use Management activities may change form, line, color, or texture but should remain subordinate to natural patterns and not dominate the landscape. Where possible, forested areas will contain a major component of large ponderosa pine in open, parklike stands.

MA-D7. Partial Retention Middleground

Emphasis

These areas provide scenic views that partially retain natural beauty, with man's activities remaining visually subordinate to the natural landscape.

Desired Condition

Lands in this management area are located in the visual middleground adjacent to areas managed under a retention prescription (Management Area #D5). Management activities may change form, line, color, or texture but should remain subordinate to natural patterns and not dominate the landscape. When viewed from a highway, widely dispersed, small timber harvesting units will be visible, but will be shaped to the terrain.

MA-D8. Wilderness

Emphasis

Protect the Wilderness ecosystems. Manage to maintain a natural setting and preserve solitude. (This management area has changed from the Draft and presently applies to the Deshutes Canyon-Steelhead Falls area for Alternatives C-Modified and E-Departure only.)

Desired Condition

These areas are to be managed in a manner "...where the earth and its community of life are untrammeled by man..." and where ". .natural processes operate without interference by man..." Opportunities for solitude and challenge are offered away from the sights and sounds of motorized mechanical vehicles or equipment. Scientific information may be sought without the intrusion of permanent improvements or motorized equipment. Special exceptions provided in the Oregon Wilderness Act will be allowed.

MA-D9. Semiprimitive Nonmotorized

Emphasis

The management goal for these areas is to administratively provide near-natural, unroaded, and undeveloped recreational opportunities.

Desired Condition

Motorized vehicles are excluded except for over-snow vehicles, allowing for a semiprimitive nonmotorized recreational experience Generally, interaction between users is low, but there is often evidence of other users. Natural processes will generally be operating without human interference, but management may occur to protect or enhance roadless qualities.

Motorized equipment such as chainsaws may be used in the management and maintenance of these areas Nonmotorized mechanized equipment, such as "mountain bikes" and wheel-barrows, is acceptable. River corridors that are eligible for designation as Scenic Rivers under the Wild and Scenic Rivers Act are included in this management area.

MA-D10. Semiprimitive Motorized

Emphasis

The management emphasis on these lands is to provide challenging motorized recreational opportunities in a natural appearing environment free from developed roads, highway vehicles, and concentrations of people.

Desired Condition

This Management Area contains selected roadless areas that meet these goals. Management is directed towards maintaining a natural appearing setting for off-road vehicle use while maintaining other resource values.

MA-D11. Developed Recreation

Emphasis

The management goal at these sites is to provide and maintain safe, healthful, and aesthetically pleasing recreational facilities.

Desired Condition

This applies to sites currently developed or planned for parking, camping, picnicking, boating and other recreational activities.

MA-D12. Research Natural Areas

Emphasis

The management goal of these areas is to preserve Research Natural Areas (RNA's) as scientific benchmarks.

Desired Condition

This management area contains natural or nearly undisturbed areas which are representative of important forest and range land ecosystems. These areas fulfill identified needs for completion of the Regional RNA system. The RNA's will preserve natural ecosystems for research, education, and comparison with those affected by human activities.

MA-D13. Riparian in Acceptable Condition

Emphasis

The primary management emphasis of these areas is to improve poor riparian areas to a fair condition,

and to maintain existing conditions in other riparian areas.

Desired Condition

Streambank vegetation will be managed to maintain or improve streambank stability and fish habitat as needed to meet this objective. Water temperatures will generally not be increased in major streams. Temperatures in other streams will not deteriorate downstream fish habitat. Natural, large, woody material will be provided. Range allotment plans will reflect forage utilization levels necessary to meet brush and hardwood protection needs.

MA-D14. Riparian in Excellent Condition

Emphasis

Management in these areas will ensure that riparian areas are maintained or improved to provide excellent streambank stability and fish habitat in 15 years.

Desired Condition

Streambank vegetation will be managed to provide the amount of cover and shade needed to meet this objective. Water temperatures will not be increased in major streams, and may need to be decreased in some areas Temperatures in other streams will contribute to improved downstream fish habitat. Natural, large, woody material will be provided to help achieve high quality fish habitat. Range allotment plans will reflect forage utilization levels necessary to meet brush and hardwood protection needs.

Forest Management Areas

The land and resource management emphasis and goals for the management areas for Alternative I are summarized on the following pages. The 28 management areas for the Forest and the 14 management areas for the Grassland are presented in narrative form to provide a picture of the physical description, management emphasis, and desired future condition of each area. The standards and guidelines that apply to each of the Management Areas and the Forest-wide Standards and Guidelines are presented in Chapters 4 of the Forest and Grassland Plans.

MA-F1. Black Canyon Wilderness

Emphasis

Protect the wilderness ecosystems. Manage use to maintain a natural setting and preserve solitude.

Desired Condition

The Black Canyon Wilderness will be as natural as is possible, with little evidence of human activity. The area will be a place of natural settings with opportunities for solitude. Present road access and hunter caches and camps will be rehabilitated so their presence is no longer a dominant land feature. Recreational improvements, such as trailheads and access trails, will be evident where they are necessary to control use in order to preserve wilderness qualities. Livestock use will be evident, but the successful application of allotment management requirements will also be evident

Old growth stands will be evident within the Management Area, along with those wildlife species in the Ochoco National Forest which are dependent on old growth habitat. Wildlife and fish species indigenous to the area will continue to exist at levels consistent with the available habitat. Tree mortality, resulting from past spruce budworm and other endemic insects and pathogens, will be evident, along with associated changes in fuel loadings and plant succession. Fire occurrence will be evident where lightning starts occur.

MA-F2. Bridge Creek Wilderness

Empasis:

Protect the wilderness ecosystems. Manage use to maintain a natural setting and preserve solitude. The area will be managed as a trailless wilderness where people can use their orientation skills.

Desired Condition

The Bridge Creek Wilderness will be as natural as possible, with little evidence of human activity. The area will be a place of natural settings where solitude may be sought. Present road access will be rehabilitated so that its presence is no longer a dominant land feature. Recreational improvements, such as trailheads and access trails, will not be evident, but entry points will be signed where necessary to control use and to preserve wilderness qualities.

Livestock use will be evident, but the successful application of allotment management requirements will also be evident. Riparian areas in less than desirable condition will show evidence of recovery from the application of mitigation and rehabilitation measures.

Old growth stands will be evident within the Management Area, along with those wildlife species in the Ochoco National Forest dependent on old growth habitat. Wildlife and fish species indigenous to the area will continue to exist at levels consistent with the available habitat.

Tree mortality, resulting from past Mountain Pine Beetle infestations and other endemic insects and pathogens will be evident, along with associated changes in fuel loadings and plant succession. Fire occurrence will be evident where lightning starts occur.

MA-F3. Mill Creek Wilderness

Emphasis

Protect the wilderness ecosystems. Manage use to maintain a natural setting and preserve solitude.

Desired Condition

The Mill Creek Wilderness area will be as natural as possible, with little evidence of human activity. The area will be a place of natural settings where solitude may be sought. Present road access will be rehabilitated so that its presence is no longer a dominant land feature. Recreational improvements, such as trail heads and access trails, will be evident where necessary to control use to preserve wilderness qualities. Livestock use will be evident, but the successful application of allotment management requirements will also be evident. The stock driveway in the northeast portion of the Wilderness will be evident due to its routine use in association with the Mill Creek Allotment.

Old growth stands will be evident within the Management Area, along with those wildlife species dependent in old growth habitat on the Ochoco National Forest. Wildlife and fish species indigenous to the area will continue to exist at levels consistent with the available habitat.

Tree mortality, resulting from past Mountain Pine Beetle and other endemic insects and pathogens, will be evident along with associated changes in fuel loadings and plant succession. Fuel loadings will become very significant along the south side of Forest Road 27 and will pose a serious fire risk. Fire occurrence will be evident where lightning and human-caused starts occur. There may be planned ignitions to achieve wilderness objectives.

Minerals activities on valid mining claims will be evident along with authorized access under approved plans of operation

MA-F4. North Fork Crooked River Wilderness Study Area

Emphasis

Management will maintain the existing conditions of the area pending a decision by Congress on wilderness designation.

Desired Condition

The wilderness study area will be as natural as possible with reduced evidence of human activity. The area will be a place of natural settings where solitude may be sought. Present road access, and hunter caches and camps, will be rehabilitated. Recreation improvements, such as trail heads and access trails, will be evident where necessary to control use in order to preserve wilderness qualities. Livestock use will be evident, but the successful application of allotment management requirements will also be evident. Riparian areas in less than desirable condition will show evidence of recovery from the application of mitigation and rehabilitation measures.

Old growth stands will be evident within the management area, along with those wildlife species in the Ochoco National Forest dependent on old growth habitat. Wildlife and fish species indigenous to the area will continue to exist at levels consistent with the available habitat.

The Final Environmental Impact Statement for Wilderness by the BLM has not been published, but a decision on the status of this area along with the adjoining BLM lands is pending. If these areas are not designated wilderness, they will be managed

under old growth, riparian, and general forest standards and guidelines.

MA-F5. Research Natural Areas

Emphasis

These tracts of land are areas where natural processes are maintained for research and education purposes. They will provide baselines against which other activities may be measured, sites for study of natural processes in undisturbed ecosystems, and gene pool preserves for both plant and animal species.

Desired Condition

Natural conditions will be maintained. Any management activities within the RNA's will be directed at maintaining the natural conditions of the area, and these human-caused changes to the ecosystem will not be readily evident. Continuing, nondestructive baseline studies may be occasionally visible in terms of equipment, instruments, and related activities.

Fire occurrence will be evident where natural lightning and human-caused fire starts occur.

MA-F6. Old Growth

Emphasis

Provide habitat for wildlife species dependent on old growth stands.

Desired Condition

Stands of old growth are not expected to change significantly over the next ten to fifty years, barring natural catastrophe. They will continue to provide habitat for a number of wildlife species, such as the pileated woodpecker and Rocky Mountain elk, and may become more extensively used by these species as the majority of the Forest moves towards a "managed condition." High levels of snag habitat will continue as individual trees within the stands die of old age, as well as from periodic infestations by insect and disease populations. Management activities and roads will generally not be evident. Fire occurrence will be evident where lightning and human-caused starts occur. Prescribed fire may be evident if natural fuels accumulate to dangerous levels, threatening the existence of the old growth stand, or where vegetation manipulation is needed to maintain stand structure and species composition. Grazing by livestock, as well as by big game wildlife species may be evident.

MA-F7. Summit Historic Trail

Emphasis

Protect the existing integrity of the Summit Trail. Enhance and interpret significant segments for public enjoyment and education. Pristine segments will be managed to protect, interpret, and preserve their historic qualities.

Desired Condition

The Summit Trail will be a place where Forest visitors can enjoy the cultural and recreational resources offered in a visually pleasing environment. The majority of the trail route is along developed roads and will provide travel by highway vehicle, as well as by mountain bike and horseback. Vegetation may appear manipulated in widely dispersed areas in order to enhance cultural and recreational resources, but will generally not dominate the landscape. Interpretive facilities such as signs and landmarks may be visible in special, culturally significant areas.

The outer boundary of the management area will generally not exceed 600 feet on either side of the trail.

MA-F8. Rock Creek/Cottonwood Creek Roadless Area

Emphasis

Provide for protection of soil, water, and fisheries, and for opportunities for nonmotorized recreational use and enjoyment. Maintain vegetation on steep slopes to prevent erosion and to protect water quality and the anadromous fishery.

Desired Condition

Recreationists will see natural appearing areas free from motorized vehicle use. Recreational use, livestock grazing, prescribed fire and wildfire will occur, but the area will appear natural. These activities, along with any desired recreational improvements, will be the only visible impacts of direct human activities.

Riparian areas in less than desirable condition will show evidence of recovery from the application of mitigation and rehabilitation measures. Old growth stands will be evident within the Management Area, along with those wildlife species in the Ochoco National Forest which are dependent on old growth habitat. Wildlife and fish species indigenous to the area will continue to exist at levels consistent with the available habitat. Structures may be constructed, or other work may be done to maintain or improve habitat for the anadromous fishery. The area will remain one where there are above average numbers of trophy-sized elk and deer. Tree mortality, resulting from past spruce budworm infestations and other endemic insects and pathogens, will be evident along with associated changes in fuel loadings and plant succession. Fire occurrence will be evident where natural lightning and human-caused starts occur.

MA-F9. Rock Creek/Cottonwood Creek Unroaded-Helicopter Area

Emphasis

Allow timber harvest while protecting the anadromous fishery, sensitive soils on steep slopes, and big game habitat.

Desired Condition

The area will be unroaded. Timber harvest and associated activities will use helicopter systems. The area will remain unroaded with landings located outside the management area. Prescribed fire use will also be evident in some areas where its use is desirable to attain management objectives. Visible harvest impacts will generally be limited to vegetation modification with little soil or other surface disturbance.

Recreation improvements, such as trailheads and access trails, will be evident where necessary to enhance access. Livestock use may be evident, but the successful application of allotment management requirements will show acceptable grazing practices Riparian areas in less than desirable condition will show evidence of recovery from the application of mitigation and rehabilitation measures. Old growth stands will be evident within the Management Area, along with those wildlife species dependent on old growth habitat in the Ochoco National Forest. Wildlife and fish species indigenous to the area will continue to exist at levels consistent with the available habitat. Tree mortality, resulting from spruce budworm and other endemic insects and pathogens will be evident along with associated changes in fuel loadings and plant succession. Fire occurrence will be evident where natural lightning and human-caused starts occur.

MA-F10. Silver Creek Roadless Area

Emphasis

Protect and enhance the roadless qualities and provide nonmotorized recreational use.

Desired Condition

Recreationists will see natural appearing areas free from motorized vehicle use. Recreational use, livestock grazing, prescribed fire and wildfire will be evident over time. These activities, along with any desired recreational improvements, will be the only visible impacts of human activities within the Management Area.

Riparian areas in less than desirable condition will show evidence of recovery from the application of mitigation and rehabilitation measures. Old growth stands will be evident within the Management Area, along with those wildlife species dependent on old growth habitat on the Ochoco National Forest Wildlife and fish species indigenous to the area will continue to exist at levels consistent with the available habitat. Tree mortality, resulting from past spruce budworm and other endemic insects and pathogens, will be evident, along with associated changes in fuel loadings and plant succession. Fire occurrence will be evident where lightning and human-caused starts occur.

MA-F11. Lookout Mountain Recreation Area

Emphasis

Maintain a natural setting, providing continued opportunities for high quality, semiprimitive recreational activities and wildlife habitat, while maintaining healthy forests.

Desired Condition

General

The Lookout Mountain Management Area will become a well-known area for year-round recreational activities and will provide excellent habitat for big game.

Prescription Area A:

This area will comprise approximately 7,550 acres of Forest land in a semiprimitive state with no vegetation manipulation planned. The recreational user will experience a highly diverse, natural landscape with interspersed stands of trees, openings, rock outcrops, and talus. A tree species mix including early successional species such as ponderosa pine, western larch and lodgepole pine will be seen across the lower elevations of the landscape. Lodgepole pine, sub-alpine fir, white fir and Douglas-fir will dominate at the higher elevations. Pockets of mixed conifer old growth will be an integral part of the vegetation mosaic. Natural tree mortality will be evident.

Big game habitat will be excellent due to the secluded nature of the area, high elevation moist meadows, and good year-round springs with heavy dense cover. Elk wallows will be numerous and big game use will be evident.

The area will be roadless, with currently existing roadbeds exhibiting evidence of rehabilitation activities and revegetation. Man-made improvements will be subordinate to the natural landscape and will be present to enhance recreational use of the area Typical improvements apparent to the recreational user may include trails, trailheads, signing, trail shelters, livestock fencing, and possible wildlife habitat enhancement projects.

Prescription Area B:

This area will comprise about 8,110 acres in a relatively natural appearing condition.

A variety of trails, roads, trail shelters, signs and other improvements for the benefit of recreational users may exist, but will be designed and managed to be subordinate to the natural landscape. Several existing roads into the Management Area will remain open for motorized travel to dispersed campsites and mining activities.

Vegetation may appear manipulated in widely dispersed places in order to enhance recreational opportunities and wildlife habitat resources; vegetation manipulation will not dominate the landscape or generally be evident to the casual Forest visitor. Various vegetation manipulation techniques will be used to promote healthy forests which are more resistant to catastrophic events that may detract from big game habitat or a recreational experience. As a result of these limited entries, ponderosa pine and western larch, which are tree species valued for their appearance, will become more abundant over time. These species will be interspersed in a mosaic of other mixed conifer species of various size and age classes, including stands of old growth mixed conifer and ponderosa pine.

Minimum standard roads designed for specific projects will exist in low densities on the more gentle ground. Road use will be restricted to project activities and roads will be closed upon completion of each project Roadbeds and banks will be seeded with mixtures of legumes and grasses to improve wildlife habitat. The amount of activity occurring at any one time will be limited.

MA-F12. Eagle Roosting Areas

Emphasis

Provide winter roosting habitat for migrating bald eagles from December through April.

Desired Condition

An uneven-aged stand will contain large trees which are at least 22 inches DBH, and a few trees which are 36-40 inches at DBH. Roost trees generally are at least 22 inches DBH and have an open structure which allows eagles to land easily. Those trees actively being used will be preserved along with replacement trees in the same vicinity.

The area will be free of potentially disturbing human activity during the period from December 1 to May 1. When actual or potential roosting areas overlap with areas which have more restrictive prescriptions, the area will be managed under the most restrictive prescription as long as roost trees are maintained.

MA-F13. Developed Recreation

Emphasis

Provide safe, healthful, and aesthetic facilities for people to utilize, within a relatively natural outdoor setting, while pursuing a variety of recreational experiences.

Desired Condition

This Management Area will consist of natural-appearing areas with obvious man-made controls and structures to direct users, provide for comfort and sanitation, and protect the natural resources. Developed sites will be provided for a broad range of recreational opportunities.

New and upgraded sites will incorporate a barrier-free design.

Management activities will not be visually evident. Scenic views may be enhanced through harvest or thinning but will appear natural.

Facilities, roads, and trails will have a well maintained appearance and provide a safe recreational environment. When vandalism is a problem, public use may be prohibited on a seasonal basis.

MA-F14. Dispersed Recreation

Emphasis

Provide a near-natural setting for people to utilize while pursuing outdoor recreation experiences.

Desired Condition

Within the immediate dispersed site, management activities will not be evident to the casual observer. Activities may be evident in areas adjacent to the site, depending on the management prescription applied to them. Primitive, user-constructed structures or facilities, consistent with a site's use, will be seen. Sites will be managed so that users tend to feel relatively isolated. A strategy will be developed that encourages individuals or groups to "find their own place."

Livestock grazing may be evident, but the successful application of allotment management requirements will also be evident.

MA-F15. Riparian

Emphasis

Manage streamside vegetation and habitat in order to maintain or improve water quality and meet temperature and turbidity levels as required by state standards under the Clean Water Act (See Forest-wide Standards and Guidelines, Water; and Best Management Practices (BMP'S), Appendix G).

Desired Condition

Riparian areas will exhibit a low but apparent level of management. Vegetation may or may not appear manipulated, depending on the condition of the stream. An abundance of wildlife species should be evident. Due to management restrictions and the low risk associated with these areas, the signs of natural or man-caused fire will be infrequent.

For management purposes, a special protection area (100 feet from the edges of perennial bodies of water) will be apparent. In addition, the streams listed below will receive extra protection to 200 feet from the stream edge, in order to provide "connective habitat" for a variety of wildlife species on the Forest:

> Trout Creek, Bear Creek, Drake Creek, Pine Creek, Allen Creek, Indian Creek, West Fork Bridge Creek, Porter Creek, Howard Creek, Fox Creek, Cottonwood Creek, Baldy Creek, Little Windy and Windy Creek, and Nicoll Creek.

Roads not planned for future use will be obliterated and revegetated to a natural or near natural condition.

Within the limits of ecological potential, a shady, brushy condition with a canopy of alder, willow, aspen, or other deciduous vegetation will exist.

Where coniferous evergreens are a natural component of the ecosystem, a variety of size classes will exist to perpetuate the supply of shade and woody debris over time. Sites unable to support a canopy of deciduous or evergreen species will be characterized by vigorous stands of forbs, grasses, and grass-like riparian species.

Bank slopes containing high plant densities, thick root masses, embedded angular boulders, and old

logs will also characterize these areas Extensive scouring of streambanks will be an uncommon occurrence, as will soil deposition outside the norm for the individual stream system. Streambeds will be commonly covered by native aquatic growth on assorted sizes of rocks and boulders.

Where cobble and gravel bars are prominent, they will become covered by sandy loam soils as riparian vegetation filters and traps stream sediments. As stream banks are re-built and cutbanks stabilized, a narrower, deeper channel will gradually develop.

Springs and wet meadows are not specifically included in this management area prescription, but should receive appropriate protection as stated in Forest-wide Standards and Guidelines for Water, Chapters 4, Forest and Grassland Plans.

MA-F16. Bandit Springs Recreation Area

Emphasis

Provide dispersed, nonmotorized recreational opportunities, within a setting where management activities are generally not evident to the casual observer. Expand the recreational activities and opportunities beyond winter recreation to year-round activities.

Desired Condition

The Bandit Springs Recreation Area is expected to become an important winter sports use area on the Forest, as well as a setting for other year-round recreational activities, including environmental education, mountain bike riding, day hiking, hunting, and horseback riding. Developments to accommodate a broad spectrum of nonmotorized recreationists' needs will be built. Emphasis will be on enjoying the natural scenery, with interpretation aiding the casual visitor. Developments may include trail shelters, maintained trails, horse unloading ramps, toilets, information areas, parking, picnic areas, and signs.

Periodic manipulation of vegetation to meet recreation and visual objectives for the area will be apparent to the user. Timber stands will be managed to develop and maintain resistance to catastrophic events that would detract from the recreational experience. Both uneven- and even-aged silvicultural practices will be used. A road system will be visible, but secondary to the natural setting Livestock use will also be evident.

MA-F17. Stein's Pillar Recreation Area

Emphasis

Maintain a scenic, natural or natural-appearing setting associated with unique geologic formations, particularly Stein's Pillar. Provide roadless nonmotorized recreation with opportunities to enjoy nature.

Desired Condition

The area will be a natural or natural-appearing place with a variety of volcanic plugs, topography, plant communities, and wildlife, where recreationists can enjoy nonmotorized recreation.

Ponderosa pine stands will have large, yellow-bark trees, particularly along the Stein's Pillar Trail. There will be a mosaic of these large-tree, open pine stands interspersed with juniper scab flats and fir stands Created openings will blend with the natural appearance of the area. Scenic views will be created but management activities will not be evident to the casual observer.

The area will offer scenic views of Stein's Pillar and other volcanic plugs, as well as the Ochoco and Cascade Mountains. Recreationists will enjoy nonmotorized activities, including hiking, picnicking, rockclimbing, sightseeing, horseback riding, and group activities. These activities will mostly be day use.

Nonmotorized recreational opportunities and facilities will be provided. A rustic trail, designed and maintained for family day walks, will access Stein's Pillar. There will be an associated trailhead and access route. The trail system may be extended to the north to tie to the Benefield road Also, a safe way to the base of the pillars will be constructed to allow easier access for climbers and others. Interpretive facilities will highlight geological, recreational, historical, old-growth, and wildlife features, and the nearby wilderness

Streamsides will be extremely shady and brushy with an abundance of tall overstory conifer trees and/or shorter hardwoods of alder, willow, and aspen. Streamsides will meet the Riparian Management Area objectives.

Deer and elk may use the area for winter cover, feed, and security. Deer and elk may summer throughout the area. A 300-acre Old Growth Management Area will be available for wildlife, such as the goshawk and pileated woodpecker. Snags will occur naturally, providing habitat for woodpeckers, nuthatches, owls, and other cavity nesters.

Livestock use will be evident, but the successful application of allotment management requirements will also be evident.

MA-F18. Hammer Creek Wildlife/ Recreation Area

Emphasis

Provide and maintain habitat diversity for a variety of wildlife species where open road density is minimal. Provide a scenic, semi-natural or natural-appearing setting for nonmotorized recreational opportunities.

Desired Condition

Forested areas of ponderosa pine will be seen as a wide variety of size/age classes with a major component of large, yellow-barked pine. Mixed conifer areas will be a mosaic of open and closed canopy stands of various size classes to provide an optimum forage and cover mix for big game. Nonforested areas will generally appear natural in character, but with periodic evidence of livestock grazing. Riparian areas will be shady and consist of a mixture of trees and shrubs. Management activities will remain visually subordinate to the characteristic landscape.

Developed facilities such as trailheads, picnic/camp areas, and associated access routes will be evident on the periphery of the unit. Interpretive facilities will be available to highlight historical, recreational, and wildlife features.

Access roads to trailheads will be open All other roads will be closed to motorized use and rehabilitated after management projects are completed.

MA-F19. Deep Creek Recreation Area

Emphasis

Provide a near natural setting for recreational pursuits within the area

Desired Condition

Forested areas will contain large larch and ponderosa pine. Nonforested areas will generally appear natural in character with little immediate evidence of management activities. The riparian area will contain abundant alder and other riparian hardwood species.

Dispersed recreational areas will be protected. Opportunities for camping in developed sites will be provided at Deep Creek Campground.

Trails may be developed that provide day hiking or interpretive recreational opportunities.

Management activities, including timber harvest and prescribed burning, will not be evident to the casual observer. Livestock use will be evident, but the successful application of allotment management requirements will also be evident.

MA-F20. Winter Range

Emphasis

Manage for big game winter range habitat.

Desired Condition

Big game use on winter range will be the primary activity, with other management activities and human intervention restricted from December 1 to May 1. Habitat effectiveness for big game will improve over time, due to increases in both quality and quantity of thermal cover, and to reductions in open road density. Road and trail use will be limited to one mile of open access per section, from December 1 to May 1, but up to three miles per section will be available during the remainder of the year.

Vegetation cover types, key species condition, big game use, and domestic livestock grazing will be inventoried and mapped. Treatment units will be identified and treatments prescribed on a scheduled basis to maintain key forage and browse species. Treatments will be monitored to assure appropriate forage and browse allocations for big game.

Management, including vegetation manipulation, structures, and prescribed fire to maintain or improve winter range, may be apparent. Livestock use of forage will be conducted in harmony with big game winter range habitat needs.

Tree mortality, resulting from past spruce budworm and other endemic insects and pathogens, may be evident along with associated changes in fuel loadings and plant succession, in areas reserved for big game cover.

MA-F21. General Forest Winter Range

Emphasis

Manage for timber production, with measures taken to maintain habitat effectiveness for big game. Design and implement management activities to recognize big game habitat needs.

Desired Condition

Big game use on winter range will be the primary activity, with other management activities and human intervention restricted from December 1 to May 1. Habitat effectiveness will slowly decrease in this area, mainly due to future reductions in quality and quantity of thermal cover. This decrease will not be as rapid as in MA-22 General Forest, due to specified road closures and other incidental wildlife improvements. Road and trail use will be limited to one mile of open access per section during December 1 to May 1, but up to three miles per section will be available during the remainder of the year.

Fire occurrence will be visible where lightning and human-caused starts occur and where prescribed fire is applied.

Management activities will take into account vegetation types and successional responses in order to apply prescriptions which have beneficial results for habitat. Areas of particular importance as big game habitat will be identified and management activities modified to complement, protect, or improve habitat. Livestock use of forage will be conducted in harmony with big game winter range habitat needs.

Tree mortality, resulting from past spruce budworm and other endemic insects and pathogens, may be evident along with associated changes in fuel loadings and plant succession, in areas reserved for big game cover.

MA-F22. General Forest

Emphasis

Produce timber and forage while meeting the Forest-wide standards and guidelines for all resources. In ponderosa pine stands, management will emphasize production of high-value (quality) timber.

Desired Condition

Most ponderosa pine stands and some mixed conifer stands on slopes less than 30 percent will exhibit the application of uneven-aged management. Trees up to 20 inches DBH will be seen in these stands, and the evidence of trees managed for high quality lumber (where the first log is relatively free of limbs) will be noted.

Most mixed conifer timber stands, most stands on slopes greater than 30 percent, and some pine stands not suitable for uneven-aged management will be seen as even-aged, with trees uniformly spaced and fully occupying the site, except in seedling and sapling stages. Regenerated stands will generally be 20 to 40 acres in size. A mix of species, with emphasis on the seral species such as pine and larch, will be evident where conditions permit. The largest trees will generally be 18 to 22 inches DBH, but larger ones may be found where left for snag replacements or other resource reasons Trees will have full crowns and be relatively free of defect. Snags will be apparent over the area with potential snag habitat managed at the 20 percent level for Alternative B-Modified and at the 40 percent level for Alternative I.

A variety of native grasses, sedges and forbs will be available for grazing animals. Competition from nonforage species such as sagebrush and juniper will not be a major problem. Most of the forested range lands will be in fair and good forage condition class Forage use will be apparent, and improvements installed to facilitate stock distribution and effective

use of available forage will be evident.

Following use for timber haul, local access routes with planned future use will generally be open to high clearance access (maintenance level 2) for Forest visitor and administrative use, unless there are significant reasons to do otherwise. Access routes/ trails will be developed to offer a variety of terrain and experience levels for ATV's, and users will be restricted to these areas. Recreational off-road motorized use will be allowed, but users will be encouraged to use designated routes in order to protect Forest resources such as soils and water quality.

Dispersed sites will be scattered throughout the area. These sites will be maintained in as natural a condition as possible.

Fire occurrence will be visible where natural lightning or human-caused starts occur, and where prescribed fire was applied.

MA-F23. North Fork Crooked River Recreation Corridor

Emphasis

Maintain the appearance of a natural landscape in the foreground view from Road 42. Protect and enhance public use and enjoyment of the river segment.

Desired Condition

This segment of the North Fork of the Crooked River will be a free-flowing river whose shorelines may be accessible by roads The immediate river environment (up to one-quarter mile from the river) will appear natural, though there may be evidence of past and ongoing timber harvest and grazing. Developed and dispersed campsites and interpretive signing will be seen throughout the area. The use of prescribed fire may be evident where used to enhance the retention of featured tree species such as old growth ponderosa pine or western larch.

MA-F24. North Fork Crooked River Scenic Corridor

Emphasis

Maintain and enhance a natural appearing landscape to protect the "scenic river" designation.

Desired Condition

This segment of the North Fork of the Crooked River will be seen as a free-flowing river whose shoreline is accessed by a road. The immediate river environment (up to one-quarter mile from the river) will have an overall natural appearance, though there may be evidence of past timber harvest. Other management activities will be evident, including dispersed campsites and interpretive signing. A low standard trail will be developed that will require wading or rock-to-rock natural crossings. Prescribed burning will be apparent where used to enhance the retention of featured tree species such as large old growth ponderosa pine and western larch.

Several stands have been designated for old growth within the scenic river corridor. Where old growth restrictions are more restrictive than scenic river restrictions, the old growth prescriptions will apply.

MA-F25. U.S. Highway 26 Visual Corridor

Emphasis

Maintain and enhance the scenery along U.S. Highway 26.

Desired Condition

The U.S. Highway 26 Corridor will be managed to maintain the big tree appearance; activities will not be evident to the casual Forest visitor. Vegetation will be manipulated in order to provide a variety of size and age classes of timbered stands, including open parklike stands of old growth ponderosa pine, dense shaded stands of mixed conifer, and small openings with planted and natural tree seedlings. Both uneven- and even-aged stand conditions will exist.

An established road system will be in place but will have been designed to minimize the visual effect on the landscape. Prescribed livestock grazing is planned. Pastoral scenes will add to visual variety. Prescriptive grazing will be designed to be in concert with the visual quality objectives of the area.

Wildlife may be viewed in the corridor. This might include big game and a variety of bird species. The effects of fire will be periodically evident, as a result of natural and prescribed burning.

Dispersed recreation sites will be abundant throughout the corridor. Camping will be encouraged, except where restricted for other resource reasons, such as streamside management areas along Mark's Creek. Snowparks for winter recreation will be constructed to blend into the surroundings.

MA-F26. Visual Management Corridors

(This includes all visual management areas outside of other special management areas, e.g. Highway 26, Summit Trail, etc.)

Emphasis

Maintain the natural-appearing character of the Forest along major travel routes, where management activities are not evident, or are visually subordinate to the surrounding landscape.

Desired Condition

Prescription Area A

This area will encompass about 86 miles of Forest roads and include approximately 9,300 acres of associated landscape. The outer boundary of the Management Area will generally not exceed 600 feet on each side the road. Retention will be the visual quality objective. Long-term management activities will not be visually evident to the casual observer.

Forest visitors will encounter a diverse landscape which reflects ecosystems where management activities appear as a natural condition.

Vegetation will be manipulated, but will reflect a natural forest setting. Stands of trees will exist in multiple age classes, from young seedlings to mature old growth in both uneven- and even-aged conditions. Unique characteristics of the landscape, such as rock bluffs and aspen clones, will be highlighted, where they are currently hidden from view due to existing vegetation.

Prescription Area B

This area will encompass about 174 miles of Forest roads and include approximately 23,960 acres of associated landscape. The outer boundary of the management area will generally not exceed 600 feet on each side the road Partial retention will be the visual quality objective. Long-term management activities may be evident but will be visually subordinant to the characteristic landscape. Forest visitors will encounter a near-natural scenic view, with a diverse ecosystem reflecting a low level of management.

Vegetation will appear manipulated. Stands of trees, in multiple age classes in both uneven- and even-aged conditions, will occur in a background of rock outcrops, aspen clones and native grass communities.

Prescription Areas A and B

An established road system will be in place, but will have been designed to minimize the visual effect on the landscape. Grazing by livestock may or may not be visible immediately adjacent to these roads.

As a consequence of visual management, an abundance of wildlife may be viewed in the corridor. This might include big game, a variety of bird species, and fish. The affects of fire will be periodically evident as a result of natural and prescribed burning.

MA-F27. Round Mountain National Recreation Trail

Emphasis

Protect and manage for scenic qualities which make the trail corridor an attractive recreational setting. Rehabilitate trail sites where management activities conflict with National Recreation Trail objectives.

Desired Condition

The visitor will note a naturally appearing forest along the majority of the trail route (visual quality objective of retention). The outer boundary of the management area will generally not exceed 600 feet

on either side of the trail. The Round Mountain National Recreation Trail will be linked to trails on Lookout Mountain and the access road to the Summit of Round Mountain, as well as to Walton Lake Campground, through appropriate signing. Recreational improvements will be evident in those locations where necessary to protect the land, for public safety, and to enhance the public's enjoyment of the area.

Old growth stands will be seen within the management area. Fire occurrence will be evident where natural lightning and human-caused starts occur. Rehabilitation will be done in areas visually impacted by past management activity.

MA-F28. Facilities

Emphasis

Provide a safe, efficient, and healthful working environment where structure design and layout of the site blend with the surroundings.

Desired Condition

Sites will be efficiently designed work areas consistent with type and intensity of use. Employee wellness and public safety will be the primary design criteria. Color and design of structures and facilities will blend with the surrounding environment.

Traffic controls and signing will be designed to provide a safe driving environment. Roads and trails will be planned, designed, operated and maintained to levels sufficient to provide safe use for the intended traveler.

The historical significance of buildings and structures will be considered during any modifications to the site.

Employee residential areas will be designed to meet employee needs.

Management activities, such as timber harvest, thinnings, and fuel treatments for the protection of facilities from wildfire, may be apparent on a short-term basis.

Grassland Management Areas

MA-G1. Antelope Winter Range

Emphasis

Manage for optimum winter range conditions for antelope.

Desired Condition

This Management Area will consist of generally open grassland with shrub heights at or below 24 inches, but not over 30 inches in height. Range improvements that facilitate antelope migration will be constructed. Harassment and stress on wildlife caused by motorized vehicle traffic will be reduced.

Fall greenup will be reserved for use by antelope during winter.

MA-G2. Metolius Deer Winter

Emphasis

Manage for big game winter range habitat.

Desired Condition

Management in this area will support the Oregon Department of Fish and Wildlife management objectives for the wintering deer population. A 60/40 forage/cover ratio, and a vigorous shrub overstory will be maintained Private land will be acquired when possible. The implementation of seasonal road closures will reduce harassment and stress on wildlife from motorized traffic. Early season livestock grazing will be used as a vegetative management tool to maintain forage in a palatable condition. Fall greenup will be reserved for deer forage. A management plan for the entire winter range area will be developed in coordination with Oregon Department of Fish and Wildlife.

MA-G3. General Forage

Emphasis

Manage for forage production and utilization in a manner consistent with general standards and guidelines for other resources.

Desired Condition

Structural and nonstructural range improvements, prescribed fire to increase the palatability of desirable species, and livestock management will be used to maintain or increase forage production. The natural composition and cover values of native grasses, sedges, forbs and palatable shrubs will be retained. Competition from undesirable forage plants, such as sagebrush and juniper, that decrease range productivity will be reduced. Proper stocking levels and distribution will be employed to effectively utilize forage production without adversely affecting plant communities. Areas planted in crested wheat grass will proceed through natural succession to reestablish native plant species, unless specific resource management objectives can be better met by maintaining certain pastures in crested wheat grass. Aspen clones will be allowed to regenerate. The occurrence and increase of noxious weeds will be prevented. A variety of native and introduced grasses, sedges, and forbs will be provided for grazing animals. Improvements that facilitate stock distribution and the effective use of available forage will be installed.

MA-G4. Research Natural Areas

Emphasis

These tracts of land are areas where natural processes are maintained for research purposes and education. They will provide baselines against which other activities may be measured, sites for study of natural processes in undisturbed ecosystems, and gene pool preserves for both plant and animal species.

Desired Condition

Natural conditions will be maintained. Any management activities within the RNA's will be directed at maintaining the natural conditions of the area, and these human-caused changes to the ecosystem will not be readily evident. Continuing, nondestructive baseline studies may be occasionally visible in terms of equipment, instruments, and related activities.

Fire occurrence will be evident where natural lightning and human-caused fire starts occur.

If available, the private land on Haystack Butte RNA will be acquired.

MA-G5. Juniper Old Growth

Emphasis

Provide habitat for wildlife species dependent on old growth stands.

Desired Condition

The common flicker is the management indicator species. Stands at least 40 acres in size and not more than five miles apart will be maintained. Trees should be large with hollow centers and have broad, irregular-shaped crowns or spike tops. Most of the large trees, both live and dead, should support lichen growth. Cavities should be evident in the trees from either bole splits and/or limbs that have broken away from the tree bole. Some younger trees may be present along with various grasses, forbs, and shrubs Management activities and roads will generally not be evident. Fire occurrence will be evident where lightning and human-caused starts occur. Grazing by livestock, as well as by big game wildlife species, may be evident.

MA-G6. Crooked River Recreation Area

Emphasis

Maintain the appearance of a natural landscape to enhance and protect recreational values.

Desired Condition

The natural and scenic qualities of the river corridor will be preserved, as required by the Wild and Scenic Rivers Act.

A trail system and dispersed campsites will be developed to assist in public enjoyment of the area

MA-G7. Deschutes River Scenic Corridor

Emphasis

Manage for scenic quality and natural appearance of the landscape.

Desired Condition

The natural and scenic qualities of the river corridor will be preserved as required by the Wild and Scenic Rivers Act. A trail system will be developed to provide access to the area. Dispersed campsites will be designated to aid in management of the area.

MA-G8. Squaw Creek

Emphasis

Provide opportunities for semiprimitive nonmotorized recreation in a pristine canyon setting while protecting and enhancing the deer winter range habitat and fisheries. A 1,370-acre corridor along the creek will be managed for its scenic quality as a "scenic river."

Desired Condition

A travel management program will restrict vehicle access seasonally, except for administrative and special uses. Private inholdings which facilitate management of the area will be acquired when possible. Recreational use, livestock grazing, prescribed fire and wildfire will occur, but the area will appear natural. Wildlife and fish species indigenous to the area will continue to exist at levels consistent with the available habitat. Fire occurrence will be evident where lightning and human-caused starts occur.

A corridor along the creek from the Grassland boundary to the confluence with the Deshutes River has been determined to be suitable for designation as a scenic river under the Wild and Scenic Rivers Act 1 This corridor will be managed to preserve and, or enhance its natural and scenic qualities.

MA-G9. Riparian

Emphasis

Maintain riparian habitat, including streambank stability and fish habitat capability, at existing levels where the desired condition is met. On sites where the desired condition is not met, take steps necessary to bring riparian condition to its ecological potential. Allow no activities that will result in a deterioration of water quality in perennial and fish bearing streams.

Desired Condition

General: On-the-ground work and management changes are needed to improve riparian conditions on approximately 1,250 acres of the Grassland, all but 400 acres have been completed. Remaining work will be completed in the first decade. However, it will take from 20 to 60 years for some of these areas to heal and function fully as natural systems.

Rehabilitation activities include fencing, seeding, planting, and installation of physical structures such as rock structures, check dams, and log weirs Changes in livestock management are an important part of this strategy. Range allotment plans will reflect forage utilization levels necessary to meet brush and hardwood protection or enhancement needs.

Specific projects are shown in the Riparian Improvement Schedule in Appendix A.

Work to restore riparian areas will have been completed, but not all riparian areas will have had time to recover to full biological potential. Many streams that presently flow only seasonally will flow yearround. The potential for overland flows and delivery of sediment to streams from upland areas will have been reduced by construction of improvements such as fences, the development of dispersed water sources, and adjustments in grazing systems. Water quality will be maintained or improved to meet state standards for temperature and turbidity.

Stream Channels: Establish a shady, brushy condition with a canopy of alder, willow, aspen, or other deciduous vegetation. Sites unable to support a canopy of deciduous species will be characterized by vigorous stands of forbs, grasses, and grasslike riparian species. Although cobble and gravel are often prominent features during the development of riparian stream courses, they become covered by sandy loam soils as riparian vegetation filters and traps stream sediments. As stream banks are rebuilt and stabilized, a narrower, deeper channel will gradually develop.

Springs: Manage springs to maximize water storage and support excellent condition riparian vegetation. These ecosystems should support deciduous vegetation where such vegetation was present in the past

At spring sites not associated with deciduous vegetation manage the riparian area to support vegetation associated with excellent condition. These spring areas will not show signs of compaction, channeling, or head cuts.

Wet Meadows: Manage wet meadows to support vegetation associated with excellent conditions such as forbs, grasses, reeds, sedges, and rushes. These areas will not show signs of channeling or gully development of sufficient size to lower the seasonally saturated zone and change the plant community type. These zones should be showing no signs of invasion from nonriparian species such as rabbitbrush, sagebrush, or juniper.

MA-G10. Rimrock Springs Wildlife Area

Emphasis

Provide unique habitat (wetlands, ponds, springs) within the juniper-sagebrush steppe. Provide for nonconsumptive (viewing, photography) wildlife uses in a natural setting. Improve present habitat conditions and promote habitat diversity.

Desired Condition

Increased opportunities for wildlife viewing and photography, including a barrier-free interpretive trail and a brochure will be provided. Barrier-free toilet facilities will be available at the trailhead. Interpretation of unique cultural resources will preserve early history of the area. Prescribed fire will be used to improve habitat.

MA-G11. Haystack Reservoir

Emphasis

Provide users with a system of quality facilities that are safe and environmentally sound. Continue to emphasize camping, picnicking, boating, fishing, and swimming.

Desired Condition

The existing partnerships will be continued and new ones explored to provide for the needs of the recreational users. Bureau of Reclamation (BOR) lands around the reservoir will be acquired to simplify management of the area; BOR would retain ownership and management of the dam. New and upgraded facilities will provide for barrier-free opportunities.

MA-G12. Cove Palisades State Park

Emphasis

Manage for developed campgrounds and water related recreational activities.

Desired Condition

The landbase needed by the State to operate a high-quality developed recreational facility on the shores of Lake Billy Chinook will be provided. Other resources within the park boundary will be managed to support this goal.

MA-G13. Lake Billy Chinook View Area

Emphasis

Maintain the natural appearing character of the viewshed from Lake Billy Chinook, where management activities are not evident or are visually subordinated to the surrounding landscape.

Desired Condition

The natural and scenic qualities of the management area will be preserved.

MA-G14. Dispersed Recreation

Emphasis

Provide and maintain a near-natural setting for outdoor recreational experiences.

Desired Condition

Within the immediate dispersed site, management activities will not be evident to the casual observer. Activities may be evident in areas adjacent to the site, depending on the management prescription applied to them. Primitive, user-constructed structures or facilities, consistent with the sites' use, will be seen. Sites will be managed so that users tend to feel relatively isolated. A strategy will be developed that encourages individuals or groups to "find their own place." Livestock grazing may be evident, but the successful application of allotment management requirements will also be evident.

MA-G15. Gray Butte Electronic Site

Emphasis

Manage the site to provide low power output electronic equipment. Limit transmitters to a maximum of 150 watts.

Desired Condition

All development should meet partial retention from important viewpoints. Minimize interference potential through facility design, location, spacing, capacity and establishment of site-noise floor limits. Meet user needs, and maximize utilization of the site. Three buildings and three towers will be allowed at the site.

MA-G16. Utility Corridors

Emphasis

Accommodate energy-transmission facilities.

Desired Condition

Future development will be confined to existing corridors. No windows for future development will be designated. Identify exclusion and avoidance areas. Through design and management, the use of lands allocated to power facilities will be optimized. The proliferation of separate rights-of-way will be discouraged to reduce the cumulative environmental impact of linear facilities. The creation of corridors in addition to those currently designated will be discouraged.

Modeling Characteristics

Many new management prescriptions have been developed and included in the FEIS. In Table B-3-5, it is evident that many of the management emphases from the DEIS and FEIS are similar in their treatment of the resources. Because the Ochoco's FORPLAN model deals primarily with those activities that manipulate vegetation, it is possible for the Ochoco's FORPLAN model to group many different management areas if their vegetation treatment activities are similar. Table B-3-6 displays the FORPLAN groupings for all management area prescriptions. The following text explains some of the modeling characteristics of each.

Certain parts of the Forest and Grassland may be designated to meet wildlife, recreation, aesthetic, or scientific objectives in a particular alternative. Prescriptions applied to these areas contain moderate to completely binding constraints on timber and range management. These prescriptions include all those described above except the timber/range management area prescription (Group VII). The Group VII management prescriptions in the DEIS emphasize only timber and/or range production and allow a high degree of flexibility in the application of activities to the ground. Depending upon the analysis area to which they are applied, several dozen to several hundred columns represent these activities in the LP. In the FEIS, the Group VII management area prescription had Management Intensities, timing choices, and Right Hand Side constraints added to address resource concerns (uneven-age management, rotation ages, big game cover). As a result, other resource objectives besides timber and range may be emphasized.

The emphasis for management area prescription Groups VI and VIII are similar in that the primary objective is to produce elk habitat through control of cover and forage unit, amounts, sizes, and spacings. The key factors in regulating habitat conditions on the Ochoco are the control of cover and road use. The main factors affecting cover are the presence or absence of precommercial thinning, stocking level, and whether it is a ponderosa pine or mixed conifer working group. Relative cover values are used as coefficients in the LP based upon the concept that a stand provides differing levels of protection to an animal depending upon stand density. Use of relative cover values based upon the crown closure of the stand refines the ability of the LP to differentiate among eligible columns in order to satisfy big game cover and forage objectives. These are expressed as Right Hand Side constraints and applied to contiguous blocks of land. Considerable flexibility for response to multiple objectives or constraints is contained in the applicable columns.

Although management objectives differ, management area prescriptions in Group I are modeled in a similar manner. Each of these prohibits timber harvesting and the application of intensive range

TABLE B-3-5
PRESCRIPTION STANDARDS AND GUIDELINES

This Table Summarizes and Compares the Following Elements for Each Management Area Prescription

Pre-scrip-tion	Timber	Range	Recreation	Wildlife	Access	Protection
MA-D1 MA-F9 MA-F22 MA-F21	Scheduled timber harvest, full yield, maximize either PNV or timber volume	Range management to optimize forage utilization; forage production based on economic efficiency	Manage for roaded modified/roaded natural opportunity; visual quality is modification to maximum modification	Manage for deer and elk cover as compatible with timber objectives; snag level can vary from MR to 40% level	High open road densities, good access, except F9 which has no long-term road development, mainly trail access for MA-D1; F22 <3 miles/section.	Confine, contain, or control suppression strategies utilized in accordance with economic efficiency analysis for each preattack block
MA-D2 MA-F20	Scheduled timber harvest, reduced yield, objectives to optimize big game winter range habitat Uneven-aged mgmt allowed in Alt C-Mod	Most range management practices allowed as long as they don't interfere with big game objectives	Manage for roaded modified/roaded natural opportunity, visual quality is modification to maximum modification	Manage for high elk and deer use, snag level can vary from MR to 80% level	Reduced access, open road density no higher than 2 mi /sq mi (3 mi for F20), seasonal road closure to 1 mi. for big game winter habitat	Confine, contain or control suppression strategies utilized in accordance with economic efficiency analysis for each preattack block.
MA-D3	Scheduled timber harvest, reduced yield, objectives to optimize big game summer range habitat Uneven-aged mgmt allowed in Alt C-Mod	Most range management practices allowed as long as they don't interfere with big game objectives	Manage for roaded modified/roaded natural opportunity, visual quality is modification to maximum modification	Manage for high elk and deer production, snag level can vary from MR to 80% level	Reduced access, open road density no higher than 2 mi/sq mi	Confine, contain or control suppression strategies utilized in accordance with economic efficiency analysis for each preattack block
MA-D4 MA-F6	No scheduled timber harvest, cultural treatments allowed in areas not currently in "old growth" to facilitate reaching old growth conditions as soon as possible	No scheduled improvements, full forage utilization	Use will be not be emphasized, visual quality is retention	Manage for pileated woodpecker and common flicker; snag level at 100%	Construction of new roads avoided whenever possible If essential, work would not be performed between 2/1 through 7/15	Control suppression strategy utilized
MA-D5 MA-F25 Parts of MA-F26 MA-F7	Schedules timber harvest, reduced yield, management objective is to retain or enhance the natural beauty	No scheduled improvements, full forage utilization	Visual quality is retention, management activities will not be visually evident, recreation opportunities provided in roaded natural setting	Snag level at 100%	Avoid construction of local roads other than at needed junctions	Confine, contain or control suppression strategies utilized in accordance with economic efficiency analysis for each preattack block, emphasize minimum physical disturbance

Prescription	Timber	Range	Recreation	Wildlife	Access	Protection
MA-D6 Parts of MA-F26 MA-F7	Scheduled timber harvest, reduced yield; management objective is to retain or enhance the natural beauty	No scheduled improvements, full forage utilization	Visual quality is partial retention, management activities may be evident but will remain visually subordinate to the natural landscape.	Snag level at 100%	Avoid construction of local roads other than at needed junctions	Confine, contain, or control suppression strategies utilized in accordance with economic efficiency analysis for each preattack block, emphasize minimum physical disturbance
MA-D7	Scheduled timber harvest, reduced yield, management objective is to partially retain the natural beauty	Most range management practices allowed as long as they don't interfere with visual quality objective	Visual quality is partial retention, management activities may be evident but will remain visually subordinate to the natural landscape	Snag level can vary from MR to 40% level, habitat improvement may be implemented	Avoid construction of local roads other than at needed junctions	Confine, contain, or control suppression strategies utilized in accordance with economic efficiency analysis for each preattack block
MA-D8 MA-F1 MA-F2 MA-F3 MA-F4 Parts of MA-F7	No timber management activities	No scheduled improvements, full forage utilization	Visual quality objective is preservation, recreation opportunities provided in a semiprimitive setting.	No habitat manipulation scheduled, snag level at 100%	Trails only, nonmotorized	Confine and contain most natural ignition fires, control all person caused fires, emphasize minimum physical disturbance
MA-D9 MA-F8 MA-F10	No scheduled timber harvest, salvage harvests allowed for the purpose of maintaining a healthy, attractive semiprimitive setting	No scheduled improvement, full forage utilization	Visual quality objective is retention, nonmotorized opportunities provided in a semiprimitive setting	Habitat improvement allowed if they meet visual objectives, snag level at 100%	No (long term) toad development, mainly trail access	Confine and contain mostly, control may be considered emphasize minimum physical disturbance
MA-D10	Scheduled timber harvest, reduced yield, uneven-aged and patch cut systems	No scheduled improvement, full forage utilization	Visual quality objective is partial retention, motorized opportunities in a semiprimitive setting.	Habitat improvement allowed if they meet visual objectives, snag level at 100%	Access restricted, primitive road system developed to provide a challenging ORV experience	All suppression strategies allowed, confine and contain given emphasis, minimize physical disturbance
MA-D11 MA-F13	No scheduled timber harvest, harvest is allowed for the purpose of maintaining a safe, functional and attractive site.	No scheduled improvement, domestic livestock grazing excluded except when needed to meet recreation objectives	Visual quality objective is retention, provide and maintain sage, healthful and aesthetic facilities	Habitat improvements allowed providing they meet VCO's and do not distract from recreational values	Road standards comparable with the ROS level	Strategy is to contain or control, emphasize minimum physical disturbance
MA-D12 MA-F5	No timber management activities	No scheduled improvements, domestic livestock grazing excluded except when it is essential for maintaining a vegetation type or for research purposes	Prescription results in VQO level of preservation, recreational use discouraged	Habitat improvements allowed only as related to research, snag level at 100%	Access restricted, low standard roads needed for research may be constructed	Natural fires undisturbed unless they threaten escape or uniqueness of the RNA

Pre-scrip-tion	Timber	Range	Recreation	Wildlife	Access	Protection
MA-D13	Scheduled timber harvest, reduced yield, logging system constraints	Scheduled improvements allowed if they meet riparian objectives, reduced forage utilization when riparian conditions need to be improved to meet riparian objectives	VQO is partial retention	Habitat improvement allowed, snag level at 100%.	When possible avoid new construction, strict standards to avoid any adverse environmental consequences	Confine and contain are the principle strategies, minimize soil and vegetation disturbance
MA-D14 MA-F15	Scheduled timber harvest, reduced yield, logging system constraints	Scheduled improvements allowed if they meet riparian objectives, reduced forage utilization when riparian conditions need to be improved to meet riparian objectives.	VQO is partial retention	Habitat improvements allowed, snag level at 100%	When possible avoid new construction, strict standards to avoid any adverse environmental consequences	Confine and contain are the principle strategies, minimize soil and vegetation disturbance
MA-F11A	No scheduled timber harvest	No scheduled improvement, full forage utilization	Visual quality objective is retaining nonmotorized opportunities provided in a semiprimitive setting	Habitat improvement allowed if they meet visual objectives, snag level at 100%	No (long-term) road development, mainly trail access.	Confine and contain mostly, control may be considered emphasize minimum physical disturbance
MA-F11B	No scheduled timber harvest	Most range management practices allowed as long as they don't interfere with big game or recreation objectives	Manage for roaded modified/roaded natural opportunity, visual quality is modification to maximum modification	Manage for high elk and deer use, snag level can vary from MR to 100% level	Reduced access, road closed after use	Confine, contain, or control suppression strategies utilized in accordance with economic efficiency analysis for each preattack block
MA-F16	Harvest timber to provide a natural setting while maintaining forest health	Most range management practices allowed as long as they don't interfere with recreation objectives	VQO is retention, management activities will not be evident, roaded natural setting	Manage for high production of elk and deer, if compatible with objectives.	Reduced access, primitive road system, mainly trail access.	Confine, contain, or control suppression strategies utilized in accordance with economic efficiency analysis for each preattack block, emphasize minimum physical disturbance
MA-F17	Scheduled timber harvest, reduced yield, uneven-aged and patch cut systems	Most range management practices allowed as long as they don't interfere with recreation objectives	VQO is retention, management activities will not be visually evident, roaded natural setting	Manage for high production of deer and elk is compatible with objectives	When possible avoid new construction strict standards to avoid any adverse environmental consequences	Control suppression strategy utilized
MA-F18	Scheduled timber harvest, reduced yield, management objective is to retain or enhance the natural beauty and provide for big game habitat	Most range management practices allowed as long as they don't interfere with recreation objectives	VQO is partial retention, management activities may be evident but will remain visually subordinate due to the natural landscape	Snag level at 100%, manage for high deer and elk use	Avoid construction when possible, strict standards to avoid any adverse environmental consequences	Confine, contain, or control suppression strategies utilized in accordance with economic efficiency analysis for each preattack block, emphasize minimum physical disturbance

Prescription	Timber	Range	Recreation	Wildlife	Access	Protection
MA-F19	Scheduled timber harvest, reduced yield, uneven-aged and patch cut systems, enhance the natural beauty	Most range management practices allowed as long as they don't interfere with recreation objectives	VQO is retention, manage for roaded natural/roaded modified	To provide habitat for big game while meeting primary emphasis for specific management area.	Avoid construction when possible, strict standards to avoid any adverse environmental consequences	Confine, contain, or control suppression strategies utilized in accordance with economic efficiency analysis for each preattack block, emphasize minimum physical disturbance
MA-F23	Scheduled timber harvest, reduced yield, management objective is to retain the natural beauty	No scheduled improvements, full forage utilization	Visual quality is partial retention, management activities may be evident but will remain visually subordinate to the natural landscape, roaded natural	Snag level at 80%, habitat improvement may be implemented	Nonmotorized use of trails, access restricted	Confine, contain , or control suppression strategies utilized in accordance with economic efficiency analysis for each preattack block
MA-F24	Scheduled timber harvest, reduced yield, uneven-aged and patch cut systems	No scheduled improvement, full forage utilization	Visual quality objective is partial retention, motorized opportunities in a semiprimitive setting	Habitat improvement allowed if they meet visual objectives, snag level at 100%	Avoid construction of local roads other than at needed junctions	All suppression strategies allowed, confine and contain given emphasis, minimum physical disturbance
MA-F28	No scheduled timber harvest, harvest allowed for the purpose of maintaining a safe, functional and attractive site	No scheduled improvement, domestic livestock grazing excluded except when needed to meet recreation objectives	VQO is retention, managed for roaded natural /roaded modified	Habitat improvements allowed providing they meet VQO's and do not distract from recreational values, snag level 0%	Avoid construction of local roads other than at needed junctions	Strategy is to contain or control, emphasize minimum physical disturbance
MA-G1	No scheduled timber harvest	Reserve fall green-up for antelope, most range practices allowed	Manage for roaded modified/roaded natural opportunity, VQO is modification to maximum modification	Manage for high production of antelope	High open road densities, high clearance	Confine, contain or control suppression strategies utilized in accordance with economic efficiency analysis for each preattack block
MA-G2	No scheduled timber harvest	Most range management practices allowed, stress early season use	Manage for roaded modified/roaded natural opportunity, VQO is modification to maximum modification	Manage for high winter deer use.	Reduced access, high clearance	Confine, contain, or control suppression strategies utilized in accordance with economic efficiency analysis for each preattack block
MA-G3	No scheduled timber harvest	Range management to optimize forage utilization, forage production based on economic efficiency	Manage for roaded modified/roaded natural opportunity, visual quality is modification to maximum modification.	Manage for habitat as compatible with mgmt objectives	High open road densities, high clearance	Confine, contain, or control suppression strategies utilized in accordance with economic efficiency analysis for each preattack block

Prescription	Timber	Range	Recreation	Wildlife	Access	Protection
MA-G4	No scheduled timber harvest	No scheduled improvements, domestic livestock grazing excluded except when it is essential for maintaining a vegetation type or for research purposes	Prescription results in VQO level of preservation, recreational use discouraged	Habitat improvements allowed as long as they meet objectives of the RNA, snag level at 100%	Access restricted, low standard roads needed for research may be constructed	Natural fires undisturbed unless they threatened escape or uniqueness of the RNA
MA-G5	No scheduled timber harvest	No scheduled improvements, full forage utilization	Use will be de-emphasized, visual quality is retention	Manage for common flicker.	Construction of new roads avoided whenever possible If essential, work would not be performed from February through July 15	Control suppression strategy utilized
MA-G6 MA-G7	No scheduled timber harvest	No livestock grazing	VQO is preservation, recreation opportunities provided in a semiprimitive setting.	Manage for and permit improvements that are compatible with primary objectives.	No long-term road development, mainly trail access.	Confine and contain mostly, control may be considered, emphasize minimum physical disturbance
MA-G8	No timber management activities	No livestock grazing in lower canyon, other must be compatible with deer habitat	VQO is partial retention, motorized opportunities in a semiprimitive setting	Optimum habitat for deer use	No long-term road development, mainly trail access	Confine and contain mostly, control may be considered, emphasize minimum physical disturbance
MA-G9	No scheduled timber harvest	No scheduled improvement, forage utilization reduced when riparian conditions need to be improved to meet objectives	VQO is partial retention	Habitat improvement allowed, manage for brook and rainbow trout, and upland birds	When possible avoid new construction, strict standards to avoid any adverse environmental consequences.	Confine and contain are the principle strategies, minimize soil and vegetation disturbance.
MA-G10	No scheduled timber harvest	Most range management practices allowed as long as they don't interfere with wildlife objectives	VQO is modification	Habitat improvement allowed if they meet visual quality objectives, manage for wetland species	No long-term road development, mainly trail access	Confine, contain, or control suppression strategies utilized in accordance with economic efficiency analysis for each preattack block
MA-G11	No scheduled timber harvest	No scheduled improvement, domestic livestock grazing excluded except when needed to meet recreation objectives	VQO is retention, provide and maintain safe, healthful, and aesthetic facilities.	Manage for and permit improvements that are compatible with primary objectives	Road standards comparable with the ROS level	Control suppression strategy utilized

Prescription	Timber	Range	Recreation	Wildlife	Access	Protection
MA-G12	No timber management activities	No scheduled improvements, domestic livestock grazing excluded except when it is essential for maintaining a vegetation type or for research purposes	VQO is retention, provide and maintain safe, healthful, and aesthetic facilities	Manage for and permit improvements that are compatible with primary objectives	Road standards comparable with the ROS level	Control suppression strategy utilized
MA-G13	No scheduled timber harvest	Most range management practices allowed, stress early season use	VQO is partial retention	Manage for permit improvements that are compatible with primary objectives.	When possible avoid new construction, strict standards to avoid any adverse environmental consequences	Confine, contain, or control suppression strategies utilized in accordance with economic efficiency analysis for each preattack block
MA-G14	No scheduled timber harvest.	Most range practices allowed if they don't interfere with management objectives	Manage for roaded modified/roaded natural opportunity, visual quality is modification to maximum modification	Use adjacent management area objectives	When possible avoid new construction, strict standards to avvoid any adverse environmental consequences.	Confine, contain, or control suppression strategies utilized in accordance with economic efficiency analysis for each preattack block
MA-G15	No scheduled timber harvest	Range management to optimize forage utilization, forage production based on economic efficiency.	Manage for roaded modified/roaded natural opportunity, VQO is modification to maximum modification	Use adjacent management area objectives	Access restricted.	Confine and contain are the principle strategies, minimize soil and vegetation disturbance

TABLE B-3-6
FORPLAN Groupings For Management Area Prescriptions 1/

GROUP I	
MA-F1	Black Canyon Wilderness
MA-F2	Bridge Creek Wilderness
MA-F3	Mill Creek Wilderness
MA-F4	N F C R Wilderness Study
MA-F5	RNA's
MA-F6	Old Growth
MA-F7	Summit Trail (preservation)
MA-F8	Rock Creek/Cottonwood Creek Unroaded
MA-F10	Silver Creek Unroaded
MA-F11	Lookout Mountain
MA-F28	Facilities
MA-D4	Old Growth
MA-D8	Deschutes Canyon-Steelhead Falls WSA
MA-D9	Semiprimitive Nonmotorized
MA-D10	Semiprimitive Motorized
MA-D11	Developed Recreation
MA-D12	RNA's

GROUP II	
MA-D13	Riparian in Acceptable Condition
MA-D14	Riparian in Excellent Condition
MA-F15	Riparian

GROUP III	
MA-D10	Semiprimitive Motorized
MA-F17	Stein's Pillar
MA-F19	Deep Creek
MA-F24	N F.C R Scenic River

GROUP IV	
MA-F7	Summit Trail (retention)
MA-F12	Eagle Roosting
MA-F13	Developed Recreation
MA-F14	Dispersed Recreation
MA-F16	Bandit Springs
MA-F25	Highway 26 Corridor
MA-F26	Visual Management (retention)
MA-F27	Round Mountain National Recreation Trail
MA-D5	Retention Foreground

GROUP V	
MA-F7	Summit Trail (partial retention)
MA-F18	Hammer Creek
MA-F23	N F C R Recreation River
MA-F26	Visual Management (partial retention)
MA-D6	Partial Retention

GROUP VI	
MA-F20	Winter Range
MA-D2	Big Game Winter Range

GROUP VII	
MA-F9	Rock Creek/Cottonwood Creek Helicopter
MA-F21	General Forest Winter Range
MA-F22	General Forest
MA-D7	General Forest

GROUP VIII	
MA-D3	Big Game Summer Range

GROUP IX	
MA-D7	Partial Retention Middleground

1/ Management area prescriptions were not developed for Grassland management areas in alternatives A, E, and NC

practices. Consequently, they are represented in the LP as single columns. The effects of applying these prescriptions are simulated. Information about resource trade-offs and allocation efficiencies were developed through successive model runs. Objectives for the size, distribution, and stability of old growth units, and an evaluation of the trade-offs required from other resources led to the use of this dedicated stand approach for old growth (see Planning Records, 1920, 6/21/84).

Two groups of prescriptions, Groups II and III, are dealt with in a similar manner. Management activities are very constrained in these areas, although some timber harvesting is permitted. These areas are, in effect, pre-scheduled so that negligible room for optimization exists. Accordingly, these prescriptions are modeled in the LP as single columns so that the effects of their application can be simulated.

Although the management objectives differ for management area prescriptions in Group IV, V, and IX, they share modeling characteristics. Although the numbers differ for all three, extended rotation ages and restrictions on timber cutting unit rates and sizes distinguish scenic prescriptions from the rest. Spatial control achieved within our modeling framework allows the imposition of Right Hand Side rate of cut constraints on the management Areaaas a unit. Several dozen columns representing alternative activities and schedules contribute to this constraint. Rotation age constraints are represented in the per acre treatment columns.

Modeling Prescriptions

In order to understand the details of how management prescriptions are structured in the LP, some knowledge of FORPLAN data structures and terminology is required. Two types of modeling prescriptions are recognized in FORPLAN. "Existing prescriptions" are specific to each analysis area and cover treatments applied from the present until the stand is regenerated. These prescriptions apply to the entire planning horizon for options not involving regeneration of timber stands. "Regenerated prescriptions" cover one full rotation from reforestation to regeneration harvest and apply to specific regeneration classes In general, there are fewer regenerated prescriptions than existing prescriptions, because there are more analysis areas than regeneration classes, and only those existing prescriptions involving timber harvest need to link with a regenerated prescription. These prescriptions are structured into the LP differently depending upon whether a Model I or Model II matrix (Johnson and Scheurman 1977) is being generated by FORPLAN. The example given earlier is a Model I formulation, as is the Ochoco model. Each column contains a set of activities over the entire planning horizon. Eash set is composed of an existing prescription plus the number of cycles of the associated regenerated prescription necessary to reach the end of the planning horizon. Both existing and regenerated prescriptions are structured at three levels in FORPLAN. The broadest level is termed the "management emphasis" of a prescription, which in the Ochoco's case ties directly to management prescriptions. There may be multiple sets of activities within each management emphasis labeled as different "management intensities". Each of these management emphasis-management intensity combinations may contain a range of intermediate and regeneration harvest timings at the third level. A specific column, then, is composed of one activity schedule covering the entire planning horizon for a particular management emphasis and intensity for both existing and regenerated prescriptions.

The modeling prescriptions used in FORPLAN are best described in terms of the activities represented by each. Again, these practices are the timber and range activities affecting vegetative growth and yield Timber practices modeled included overstory removals for existing two-story stands, uneven-aged (single tree or group selection) management, commercial thins, precommercial thins, reforestation methods, and shelterwood and clearcut regeneration harvests. In many cases stocking levels and timing patterns also differed from one management intensity to another. Within a management intensity, the timing of intermediate cuts was fixed for regenerated prescriptions to reduce model size but flexible for existing prescriptions. Uneven-aged management

entry cycles were fixed for a particular management emphasis but varied between emphasis.

Regeneration harvest can be scheduled in every eligible period of the planning horizon for existing prescriptions. There is a range of five periods in which regeneration harvest may occur for regenerated prescriptions. Rotation ages range upward from 95 percent of culmination of mean annual increment for the Group VI, VII, and VIII management emphases, with longer rotations for the other prescriptions. There is one exception to this in the FEIS. In Alternative I, the rotation age for pine stands was increased well beyond culmination in Groups VI and VII. Choice of regeneration harvest method depends upon site specific factors that could not be reasonably modeled. Recognizing that these assumptions would not apply on every case but would in aggregate balance out, all pine regeneration harvests were modeled as shelterwoods and mixed conifer harvests as clearcuts. A similar situation occurs for choice of logging method. The assumption in this case was that tractor logging would be used on slopes less than 30 percent, and cable methods for steeper analysis areas. Range practices modeled included mechanical or non-mechanical forage treatments and the associated structural improvement levels. Scheduling flexibility was built into prescriptions calling for these practices, allowing their implementation anytime during the first five decades. Once the activity is implemented, periodic treatments to maintain that production level are scheduled.

The selection of management intensities for each management emphasis was designed to ensure that either cost-efficient combinations of practices appropriate for specified objectives were represented, or to ensure the objectives would be met. For example, uneven-aged management intensity was forced into solutions in several management emphasis. A broad, evenly dispersed sample of the potential production possibilities for most management emphases was also maintained. Silvicultural options for existing stands and range practices could all be reasonably accommodated within FORPLAN. However, more potential treatment options for managed stands exist than could be included in the LP. Thus, the Ochoco undertook an economic analysis of a wide array of managed timber yield tables (see Planning Records, 1920 12/22/82 and 8/31/82). This analysis is referred to as "Stage II".

Stage II

The Stage II analysis considered over 30 different combinations of reforestation practices (planting vs. natural regeneration, stocking level, presence or absence of precommercial thins). Timing and number of commercial thins were tested for ponderosa pine and mixed conifer, for both under and over 30 percent slope.

Each of the thirty-four timber yield tables for managed stands had a soil expectation value (SEV) calculated using the rotation age of culmination of mean annual increment, and a four percent discount rate. These are displayed in Table B-3-7 for both tractor and cable ground. Soil expectation value was judged to be the best measure for establishing a relative ranking of managed yield tables, since the sequence of practices starts from bare ground. These rankings are sensitive to cost and value assumptions. In general, the less intensive management regimes ranked higher in SEV. However, these regimes also have longer rotation ages and provide considerably less volume which, if selected, would result in a lower rate of harvest of the existing high valued stands. These observations point out the need to provide the LP with the opportunity to perform this balancing act by providing a wide range of intensities and scheduling possibilities.

A set of criteria, of which SEV was only one, were developed and used to guide the process of selecting the managed yield tables to be included in the Forest's FORPLAN (LP) model. One of the primary criteria was to provide a wide range of intensities to ensure examination of a full range of management opportunities. Related to this criterion was the need to provide a wide range of scheduling opportunities to ensure maximum flexibility for the LP. Accordingly, the timber management strategy includes yield tables with early rotation ages and/or early thinning volumes, as well as an intensity maximizing total merchantable volume. Economic criteria also weighed

TABLE B-3-7
STAGE II ANALYSIS
SUMMARY OF PER ACRE SEV 1/ FOR MANAGED YIELD TABLES

PONDEROSA PINE				
YT ##	Rotation Age 2/	Practices	Tractor $/Acre	Cable $/Acre
2	100	P+Pct CT3	-252	-317
3	100	P+Pct CT2	-261	-324
4	100	P+ Pct CT1	-269	-292
5	100	P Pct CT2 or 3	-221	-262
6	100	P Pct CT2	-229	-267
7	100	P Pct CT1	-229	-250
8	100	P Pct	-243	-255
10	100	P CT2	-207	-259
11	110	P CT1	-229	-259
12	100	P	-232	-248
21	120	N Pct CT3	-122	-146
22	110	N Pct CT2	-123	-147
23	110	N Pct CT1	-123	-147
24	110	N Pct	-135	-146
26	120	N CT2	-87	-111
27	120	N CT1	-86	-112
28	120	N	-95	-101
31	90	P+Pct CT1 3/	-273	-333
32	60	Pt Pct	-281	-340

MIXED CONIFER				
YT ##	Rotation Age 2/	Practices	Tractor $/Acre	Cable $/Acre
52	90	P+ Pct CT3	-192	-308
54	90	P+Pct	-238	-287
55	100	P Pct CT2 or 3	-157	-219
56	100	P Pct CT2	-170	-233
57	100	P Pct CT1	-197	-240
58	90	P Pct	-218	-245
60	90	P CT2	-154	-214
61	100	P CT1	-180	-460
62	100	P	-208	-229
71	110	N Pct CT3	-85	-178
73	110	N Pct CT1	-96	-175
76	110	N CT2	-63	-150
77	110	N CT1	-57	-136
78	120	N	-84	-148
81	90	P+Pct CT1 3/	-208	-264

1/ Rotation age used was that of culmination of mean annual increment, except for Table 32 which was 95% of culmination
2/ This set of practices include a higher stocking level and a delayed commercial thinning
3/ Soil Expectation Level (SEV) calculated using a 4% discount rate

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P+ Plant to increased stocking levels
P Plant at current stocking levles
N Natural regeneration
Pct Precommercial thinning
CT1 One commercial thinning
CT2 Two commercial thinnings, 20 year interval for ponderosa pine and mixed conifer
CT3 Three commercial thinnings, 20 year interval for ponderosa pine and mixed conifer

heavily in the selection process. A table that maximized per acre SEV, and a minimum investment yield table were included. Additionally, when other factors were nearly equal, the table with the highest SEV was selected. The resource emphasis of each strategy was also of primary importance.

The quantity and quality of big game cover was a primary criterion for big game-oriented management strategies. Range emphasis requires relatively open stands with multiple entries. Riparian standards require less intensive management, with few entries and provision for shade. The semi-primitive motorized management strategy also requires less intensive management in an attempt to provide a "natural" appearing environment. Scenery prescriptions depend mostly on longer rotation ages and provision for large, yellow-bark trees. One final criterion used was that, if every other criterion was equally satisfied, practices reflecting current management were favored. Table B-3-8 depicts the tables selected for each management strategy and the particular criteria underlying each choice. In most cases several criteria influenced the selection of a particular yield table.

TABLE B-3-8
ACTIVITIES REPRESENTED IN EXISTING PRESCRIPTIONS FOR ANALYSIS
AREAS ELIGIBLE FOR COMMERCIAL THINS

			Activities	
Management Emphasis	Management Intensity Class	Regenerated Condition Class	Timber 1/	Range 2/
Group VII	1	Timber	RH	NT-EX
	2	Timber/	CT-RH	NT-EX
	2	Range		NM-EX
	3		NC	NT-EX
Group VIII	1	Big Game	RH	NT-EX
	2	Big Game	CT-RH	NT-EX
	3		NC	NT-EX
Group VI	1	Big Game	RH	NT-EX
	2	Big Game	CT-RH	NT-EX
	3		NC	NT-EX
Group I	1		NC	NT-EX
Group II	1	Riparian	RH	NT-EX
	2	Riparian	CT-RH	NT-EX
	3		NC	NT-EX
	4	Riparian	Uneven	NT-EX
Group III	4	Recreation	Uneven	NM-EX
Group I	1	No Treatment	NC	NM-EX
Group IV	1	Visual	RH	NM-EX
	2	Visual	CT-RH	NM-EX
	3		NC	NM-EX
Group V	1	Visual	RH	NM-EX
	2	Visual	CT-RH	NM-EX
	3		NC	NM-EX
Group IX	1	Visual	RH	NT-EX
	2	Visual	CT-RH	NT-EX
	3		NC	NT-EX

1/ Timber Activity Abbreviations

OR = Overstory removal
CT = Commercial thin
NC = No cut
N = Natural regeneration
P = Planting @ reduced stocking levels
PCT/NW = Precommercial thin
PCT/OP = Precommercial thin @ 18 x18' spacing
Uneven = Uneven aged management
P = Planting at present stocking levels
P+ = Planting @ increased stocking level
RH = Regeneration Harvest

2/ Range Activity Abbreviations

2/ Range Activity Abbreviations
NT = No treatment
NM = Nonmechanical treatment
FL = Full distribution level
M = Mechanical treatment
EX = Existing distribution level

Development of Yields

Timber

Timber yield tables containing both harvest and inventory volumes were constructed for all of the modeling prescriptions described in the previous section. Detailed documentation of the assumptions made and procedures followed are contained in Ochoco planning files (Existing Yield Tables, 4/13/83; Managed Yield Tables, 4/18/83). Yield tables used for the existing prescriptions were based upon empirical yield tables constructed by Regional Office personnel from data gathered in the 1981-1982 Ochoco timber inventory, and show merchantable growth into the future. These yields are specific to each of the eight inventory components modeled: 1) ponderosa pine-seedlings/saplings, 2) ponderosa pine-poles, 3) ponderosa pine-sawlogs, 4) ponderosa pine-two storied, 5) mixed conifer-seedlings/saplings/poles, 6) mixed conifer-sawlog, 7) mixed conifer-two storied, and 8) ponderosa pine-low site. Some of these categories contain acreages and averaged yields from other components merged together because of small acreages. Yield tables for existing prescriptions calling for overstory removals or intermediate harvests also relied upon information developed for managed yield tables with the Prognosis Model (Wykoff et.al. 1982).

The forest silviculturist calibrated the North Idaho variant of Prognosis for use on the Ochoco. This model was used to develop managed yields for ponderosa pine and mixed conifer regenerated prescriptions. Growth and yield patterns were developed that reflected reforestation practices, stocking levels, thinning, and regeneration harvests. Ponderosa pine-low site managed yields were constructed from a local model called Growth and Yield IV (Wood 1979) and a Regional Managed Yield Tables Program (USDA-Forest Service, not dated). No additional yield differentiations were made for productivity variations or unroaded areas. Use of timber yield tables representing one forest-wide average productivity for ponderosa pine, and one for mixed conifer resulted primarily from our timber inventory being conducted at that level of resolution. Forest-wide average yields limit the degree of optimization attainable and the level of geographic specificity feasible. Yield tables for different management emphases have reductions for snag levels built into the yield stream. In many cases several yield tables have been constructed with the same set of activities but with different snag levels. We then altered the snag level of a prescription set to meet different mixtures of objectives and to evaluate associated trade-offs.

Between the DEIS and FEIS, the Forest developed uneven-aged yield tables in response to public comments. Again the PROGNOSIS model was used and tables were developed for ponderosa pine two-story and sawlog stands. It was felt that uneven-age management was biologically inappropriate, too costly, or involved too few acres to be applied to the other stand types (See Planning Record 1920). The Forest also developed new managed yield tables for ponderosa pine. These tables have a new pre-commercial thin spacing. The purpose was to provide some protection against Mountain Pine Beetle susceptibility; yet provide some cover for big game. The Forest also evaluated its managed pine tables in the context of extended rotations beyond the culmination of the mean annual increment. In this case it was felt that the yield tables were suitable and the changes were made in the FORPLAN prescriptions.

Livestock Forage

Livestock AUM (animal unit month) yields were monetarily valued in the LP using the values obtained for the Ochoco through the USDA-Economic Research Service ranch budget study (see Planning Records, 1/24/83). The process used for estimating AUM yields was based upon forage production figures obtained by averaging yields in the "Plant Communities of the Blue Mountains in Eastern Oregon and Southeastern Washington" (Hall 1973) for the productivity types modeled. Basic yield categories were established for the five major cover types, i.e. 1) ponderosa pine, 2) mixed conifer, 3) timbered lands producing less than 20 ft/ac/yr, 4)

tree shrub types, and 5) grassland types. One average yield was used for ponderosa pine, and one for mixed conifer types. Yield variation associated with differences in existing timber stand density, and changes in stand density according to the treatments prescribed were modeled as joint production functions with timber. Broad productivity distinctions were modeled for the three remaining cover types as indicated by the working group and condition class analysis area identifiers (Table B-3-4). The application of mechanical or non-mechanical range treatments to the ground results in increased forage yields. Several of the management prescriptions allow these types of activities. Tables B-3-9 through B-3-14 display the structure of these practices in the modeling prescriptions.

The translation of forage production into livestock production occurred through the use of two related factors. The first, a utilization factor, represents the amount of forage produced that is utilized by livestock. This factor is distinctly different for analysis areas with slopes less than 30 percent versus those with steeper slopes. Utilization differences are incorporated into the riparian prescriptions to allow attainment of different objectives. Other prescriptions use the same utilization factors.

The high producing grassland types (non-native wheatgrasses) are a special case requiring greater amounts of utilization to maintain plant vigor. The second factor represents the amount of area, expressed as a percentage, over which the average utilization is expected to occur. This distributional factor is tied to the level of water developments present on an allotment as well as topographical features. The modeling recognizes different distribution percentages for the National Grassland versus the National Forest based upon the types of developments in place, and the differing purposes of the two units. Major variations also occur according to the slope break. Management prescriptions state whether or not additional water developments are appropriate.

The scheduled outputs used for AUM yields incorporate all of the elements just described into a periodic livestock output. The use of scheduled outputs for mechanical and non-mechanical treatments provides the ability to control the amount of treatment allowed within a management area. This control is necessary to meet management area objectives since we are using homogeneous per acre variables. A scheduled output table is also necessary to incorporate correct costs into the matrix for range treatments. Costs are included for mechanical and non-mechanical treatments on the different cover types. Also, broad average costs are associated with the livestock distribution levels.

Cover for Big Game

Another major use of scheduled outputs is to track and control the provision of cover for elk. Tables showing the effects of each ponderosa pine and mixed conifer modeling prescription on cover are input to FORPLAN. Use of relative thermal cover values based upon the crown closure of the stand refines the ability of the LP to differentiate among eligible columns in order to satisfy big game habitat objectives expressed as right hand side constraints. Geographic control in the model is necessary to ensure that these constraints are applied to contiguous blocks of land. The theoretical framework for these relative values derives from several sources as documented in Ochoco planning records ("Process for Evaluating Elk Habitat", undated). The main concept is that a stand provides more or less protection to an animal depending upon stand density. Values used are keyed to the annual energy balance of an individual elk in Central Oregon. Patterns of cover, based on timber practices, and the values used are considerably different for ponderosa pine versus mixed conifer. The main activity affecting provision of cover is the presence or absence, and stocking level of precommercial thins and the amount of uneven-aged management. Different values are used for the summer range and winter range prescriptions.

TABLE B-3-9
ACTIVITIES REPRESENTED IN EXISTING PRESCRIPTIONS FOR ANALYSIS AREAS WITH MATURE SAWTIMBER

			Activities	
Management Emphasis	Management Intensity Class	Regenerated Condition Class	Timber 1/	Range 2/
Group VII	1	Timber	RH	NT-EX
	2	Timber/	RH	NT-EX
	2	Range	RH	NM-EX
	3		NC	NT-EX
	9	Uneven	Uneven	NM-EX
Group VIII	1	Big Game	RH	NT-EX
	2	Big Game	NC	NT-EX
	3		NC	NT-EX
	9	Uneven		
Group VI	1	Big Game	RH	NT-EX
	2	Big Game	NC	NT-EX
	3	Big Game	NC	NT-EX
Group I	3		NC	NT-EX
Group II	1	Riparian	RH	NT-EX
	2	Riparian	CT	NT-EX
	3	Riparian	NC	NT-EX
	4	Riparian	Uneven	NT-EX
Group III	4	Recreation	Uneven	NM-EX
Group I	3		NC	NM-EX
Group IV	1	Visual	RH	NM-EX
	2		CT	NM-EX
	3		NC	NM-EX
Group V	1	Visual	RH	NM-EX
	2		CT	NM-EX
	3		NC	NM-EX
Group IX	1	Visual	RH	NT-EX
	2		CT	NT-EX
	3		NC	

1/ Timber Activity Abbreviations

- OR = Overstory removal
- CT = Commercial thin
- NC = No Cut
- N = Natural regeneration
- P- = Planting @ reduced stocking levels
- PCT/NW = Precommercial thin
- PCT/OP = Precommercial thin @ 18'x18' spacing
- Uneven = Uneven aged management
- P = Planting at present stocking levels
- P+ = Planting @ increased stocking level
- RH = Regeneration Harvest

2/ Range Activity Abbreviations

- NT = No treatment
- NM = Nonmechanical treatment
- FL = Full distribution level
- M = Mechanical treatment
- EX = Existing distribution level

TABLE B-3-10
ACTIVITIES REPRESENTED IN EXISTING PRESCRIPTIONS
FOR TWO-STORIED ANALYSIS AREAS

			Activities	
Management Emphasis	Management Intensity Class	Regenerated Condition Class	Timber 1/	Range 2/
Group VII	1	Timber	RH	NT-EX
	2	Timber	OR-PCT/NW-CT-RH	NT-EX
	3	Timber	NC	NT-EX
	4	Range	OR-PCT/OP-CT-RH	NM-EX
	5	Range	OR-PCT/OP-CT-RH	NM-FL
	6		NC	NT-EX
	9	Uneven	Uneven	NT-EX
Group VIII	1	Big Game	RH	NT-EX
	2	Big Game	OR-PCT/NW-CT-RH	NT-EX
	3	Big Game	NC	NT-EX
	4	Big Game	OR-CT-RH	NT-EX
	5		NC	NT-EX
	9	Uneven	Uneven	
Group VI	1	Big Game	RH	NT-EX
	2	Big Game	OR-PCT/NW-CT-RH	NT-EX
	3	Big Game	NC	NT-EX
	4	Big Game	OR-CT-RH	NT-EX
	5		NC	NT-EX
	9	Uneven	Uneven	
Group I	1		NC	NT-EX
Group II	1	Riparian	RH	NT-EX
	2	Riparian	OR-PCT/NW-CT-RH	NT-EX
	3		NC	NT-EX
	4	Riparian	Uneven	NT-EX
Group III	4	Recreation	Uneven	NM-EX
Group I	3		NC	NM-EX
Group IV	1	Visual	RH	NM-EX
	2		CT	NM-EX
	3	Visual	NC	NM-EX
Group V	1	Visual	RH	NM-EX
	2	Visual	OR-PCT/OP-CT-RH	NM-EX
	3		NC	NM-EX
Group IX	1	Visual	RH	NT-EX
	2	Visual	OR-PCT/OP-CT-RH	
	3		NC	NT-EX

1/ Timber Activity Abbreviations

OR = Overstory removal
CT = Commercial thin
NC = No cut
N = Natural regeneration
P- = Planting @ reduced stocking levels
PCT/NW = Precommercial thin
PCT/OP = Precommercial thin @ 18'x18' spacing
Uneven = Uneven aged management
P = Planting at present stocking levels
P+ = Planting @ increased stocking level
RH = Regeneration Harvest

2/ Range Activity Abbreviations

NT = No treatment
NM = Nonmechanical treatment
FL = Full distribution level
M = Mechanical treatment
EX = Existing distribution level

TABLE B-3-11
ACTIVITIES REPRESENTED IN EXISTING PRESCRIPTIONS FOR PONDEROSA PINE - LOW-SITE ANALYSIS AREAS

			Activities	
Management Emphasis	Management Intensity Class	Regenerated Condition Class	Timber 1/	Range 2/
Group VII	1	Timber	RH	NT-EX
	2	Range	RH	NT-EX
	3		NC	NM-EX
	4		NC	NM-FL
	5		NC	NT-EX
Group VIII	1		NC	NM-EX
	2		NC	NT-EX
	3		NC	NT-EX
Group VI	1		NC	NT-EX
	2		NC	NT-EX
Group I	1		NC	NT-EX
Group II	1		NC	NT-EX
	2		NC	NT-EX
Group III	4	Recreation	Uneven	NM-EX
Group I	1		NC	NM-EX
Group IV	1	Visual	Uneven	NM-EX
	2		NC	NM-EX
Group V	1	Visual	Uneven	NM-EX
	2		NC	NM-EX
Group IX	1	Visual	RH	NT-EX
	2		NC	NM-EX
	3		NC	NT-EX

1/ Timber Activity Abbreviations

- OR = Overstory removal
- CT = Commercial thin
- NC = No cut
- N = Natural regeneration
- P- = Planting @ reduced stocking levels
- PCT/NW = Precommercial thin
- PCT/OP = Precommercial thin @ 18'x18' spacing
- Uneven = Uneven aged management
- P = Planting at present stocking levels
- P+ = Planting @ increased stocking level
- RH = Regeneration Harvest

2/ Range Activity Abbreviations

- NT = No treatment
- NM = Nonmechanical treatment
- FL = Full distribution level
- M = Mechanical treatment
- EX = Existing distribution level

TABLE B-3-12
ACTIVITIES REPRESENTED IN EXISTING PRESCRIPTIONS FOR NON-TIMBERED ANALYSIS AREAS

			Activities	
Management Emphasis	Management Intensity Class	Regenerated Condition Class	Timber 1/	Range 2/
Group VII	1 2 3 4 5 6			M-FL* M-EX* NM-FL NM-EX NT-FL NT-EX
Group VIII	1 2			NM-EX NT-EX
Group VI	1 2			NM-EX NT-EX
Group I	1			NT-EX
Group II	1 2			NT-EX NT-EX
Group III	1			NM-EX
Group I	1			NM-EX
Group IV	1			NM-EX
Group IX	1 2			NM-EX NM-EX

* - Mechanical treatments can only be applied to analysis areas with <30% slope

1/ Timber Activity Abbreviations

OR = Overstory removal
CT = Commercial thin
NC = No cut
N = Natural regeneration
P- = Planting @ reduced stocking levels
PCT/NW = Precommercial thin
PCT/OP = Precommercial thin @ 18'x18' spacing
Uneven = Uneven aged management
P = Planting at present stocking levels
P+ = Planting @ increased stocking level
RH = Regeneration Harvest

2/ Range Activity Abbreviations

NT = No treatment
NM = Nonmechanical treatment
M = Mechanical treatment
EX = Existing distribution level
FL = Full distribution level

TABLE B-3-13
ACTIVITIES REPRESENTED IN REGENERATED PRESCRIPTIONS FOR PONDEROSA PINE REGENERATION CLASSES

			Activities	
Management Emphasis	Management Intensity Class	Regenerated Condition Class	Timber 1/	Range 2/
Group VII	1	Timber	P+-PCT-CT(3)-RH	NT-EX
	2	Timber	P-PCT-CT(1)-RH	NT-EX
	3	Timber	P-PCT-CT(3)-RH	NT-EX
	4	Timber	N-RH	NT-EX
	5	Range	P-PCT-CT(2)-RH	NM-EX
	6	Range	N-PCT-CT(3)-RH	NM-FL
	7	Range		NT-FL
	9	Uneven	Uneven	NT-EX
Group VI, VIII	1	Big Game	P-PCT-CT(1)-RH	NT-EX
	2	Big Game	P-CT(1)-RH	NT-EX
	3	Big Game	P-RH	NT-EX
	4	Big Game	P+-PCT-CT(1)-RH	NT-EX
	9	Uneven	Uneven	NT-EX
Group VII	4	Recreation	Uneven	Nm-EX
Group II	1	Riparian	N-RH	NT-EX
	2	Riparian	N-CT-RH	NT-EX
	3	Riparian	N-PCT-CT-RH OR P-PCT-CT-RH	NT-EX
	4		Uneven	NT-EX
Group IV, V	1	Visual	P-PCT-CT(3)-RH	NT-EX
	2	Visual	P-PCT-CT(1)-RH	NT-EX
	3	Visual	P-CT(2)-RH	NT-EX

1/ Timber Activity Abbreviations

OR = Overstory removal
CT = Commercial thin
NC = No cut
N = Natural regeneration
P = Planting @ reduced stocking levels
PCT/NW = Precommercial thin
PCT/OP = *Precommercial thin @ 18'x18' spacing*
Uneven = Uneven aged management
P = Planting at present stocking levels
P+ = Planting @ increased stocking level
RH = Regeneration Harvest

2/ Range Activity Abbreviations

NT = No treatment
NM = Nonmechanical treatment
FL = Full distribution level
M = Mechanical treatment
EX = Existing distribution level

TABLE B-3-14
ACTIVITIES REPRESENTED IN REGENERATED PRESCRIPTIONS FOR MIXED CONIFER REGENERATION CLASSES

			Activities	
Management Emphasis	Management Intensity Class	Regenerated Condition Class	Timber 1/	Range 2/
Group VII	1	Timber	P+-PCT-CT(3)-RH	NT-EX
	2	Timber	P-PCT-CT(1)-RH	NT-EX
	3	Timber	P-PCT-CT(3)-RH	NT-EX
	4	Timber	N-RH	NT-EX
	5	Range	P-PCT-CT(2)-RH	NM-EX
	6	Range	N-PCT-CT(3)-RH	NM-FL
	7	Range		NT-FL
	9	Uneven	Uneven	NT-EX
Group VI, VIII	1	Big Game	P-PCT-CT(1)-RH	NT-EX
	2	Big Game	P-PCT-RH	NT-EX
	3	Big Game	P-RH	NT-EX
	4	Big Game	P+-PCT-CT(1)-RH	NT-EX
	9	Uneven	Uneven	NT-FL
Group VII	4	Recreation	Uneven	NM-EX
Group II	1	Riparian	N-RH	NT-EX
	2	Riparian	N-CT-RH	NT-EX
	3	Riparian	N-PCT-CT-RH OR P-PCT-CT-RH	NT-EX
	4		Uneven	NT
Group IV, V	1	Visual	P-PCT-CT(3)-RH	NT-EX
	2	Visual	N-CT(1)-RH	NT-EX
	3	Visual	P+-PCT-CT(2)-RH	NT-EX

1/ Timber Activity Abbreviations

OR = Overstory removal
CT = Commercial thin
NC = No cut
N = Natural regeneration
P- = Planting @ reduced stocking levels
PCT/NW = Precommercial thin
PCT/OP = Precommercial thin @ 18'x18' spacing
Uneven = Uneven aged management
P = Planting at present stocking levels
P+ = Planting @ increased stocking level
RH Regeneration Harvest

2/ Range Activity Abbreviations

NT = No treatment
NM = Nonmechanical treatment
FL = Full distribution level
M = Mechanical treatment
EX = Existing distribution level

Overview of Constraints

Different types of constraints are used in the LP to represent different types of objectives Some are incorporated directly into the columns through the yield tables. Snag levels and rotation age constraints are the primary objectives and policies treated in this manner. Another category of constraints are those applied to the selection of prescriptions. Acreages of management emphases by analysis area are constrained as previously described to ensure management prescription objectives are validly modeled. The remaining type of constraint is applied as a *Right Hand Side constraint to some subset of columns* in order to satisfy management requirements, meet harvest flow policies, attain the objectives of a management prescription or alternative, or evaluate economic implications. Section 7 describes these constraints more fully.

Management requirements modeled with right hand side constraints included timber harvest dispersion and riparian area harvest restrictions. Dispersion constraints necessary to meet water quality standards, and to meet Regional requirements, were applied on an individual analysis area basis, and reflect watershed conditions (see Appendix E). These limit the amount of area that can be regeneration harvested in one decade. Riparian area harvest limitations were also designed to meet water quality standards, by ensuring shade and limiting disturbance.

Three different types of constraints are necessary to meet harvest flow policies. The nondeclining yield policy is imposed through a series of constraints limiting the harvest of any decade to an amount greater than or equal to that of the previous decade. The policy of limiting harvests to an amount equal to or less than the long run sustained yield is also met through the nondeclining yield constraint in conjunction with constraining the last decades harvest to not exceed that quantity. The ending inventory constraint provides some assurance that the projected harvest levels can be maintained over time by requiring standing volume to equal or exceed the average inventory of the regulated forest according to the regenerated prescriptions selected. Departure policies were also allowed by adjusting the long run sustained yield constraint, and by loosening the nondeclining yield constraints to allow some downward flow variation.

Several groups of constraints are applied as right hand side constraints in order to meet the objectives of management prescriptions. Amounts of thermal cover provided, rates of harvest in visual zones, and acreage limits on range practices fall into this category. Elk cover constraints apply separately to the ponderosa pine and mixed conifer cover types at the district level. The process of determining the specific constraint values to use in the LP begins with the habitat objectives expressed in Ochoco management prescriptions. For any given run the location of big game management areas is determined and based on the total acres of these areas and the objectives of the prescription the amount of cover desired is calculated. Through map overlays accomplished with the Ochoco R2MAP data base amounts of cover provided by other management areas and non-timber cover types are subtracted from the total desired and the remainder distributed to the ponderosa pine and mixed conifer cover types. These values are then input as a range to the FORPLAN matrix generator.

Scenic area rate of cut constraints are also written separately for the ponderosa pine and mixed conifer cover types specific to the district level. These right hand side constraints limit the proportion of the area within these zones that can be regeneration harvested per decade. These proportions were developed based on the experience and judgment of landscape architects on the Forest. Acreage constraints limiting the area that can be treated by mechanical or non-mechanical methods are similar to scenic area rate of cut constraints. These limits derive from management area objectives and are applied at the district level for the timber/range and big game prescriptions. Budget constraints and output level controls were also used to meet the objectives of an alternative, or to evaluate budgetary and administrative implementation concerns

Economic Efficiency Analysis

(Section 4)

Overview

This section describes the costs and benefits, as well as some concepts, involved in economic efficiency analysis, how they were derived, and how they were used in the Forest Planning process. Economic efficiency analysis is required by the National Forest Management Act Regulations (36 CFR 219) and played an important role in the development and evaluation of Forest Planning Benchmarks and Alternatives. Specifically, the Regulations (36 CFR 219.12(f)) state that:

> "The primary goal in formulating alternatives, besides complying with NEPA procedures, is to provide an adequate basis for identifying the alternative that comes nearest to maximizing net public benefits."

They follow up in 36 CFR 219.12(F)(8) by stating that:

> "Each alternative shall represent to the extent practicable the most cost efficient combination of management prescriptions examined that can meet the objectives established in the alternative."

Changes Between the DEIS and FEIS

Clarification of opportunity cost and trade-offs and the updating of certain activity costs are the only major changes in this section.

Basic Concepts

Priced Benefits

Priced outputs are those that are or can be exchanged in the market place. Their quantitative values are determined by actual market transactions or by estimation methods that produce prices commensurate with those determined by market transactions. Timber, forage, and minerals are examples of commodities which are bought and sold in the market. Their values are determined through the interaction of buyers and sellers based on the supply and demand conditions in the market at the time of the transaction. RVD's, on the other hand, are not normally exchanged via market transactions. Their market values are estimated by using some market transaction data in combination with various theoretical techniques. Conceptually, these assigned values should be consistent and comparable to those values which were actually derived via market transactions (Rosenthal and Brown, 1985). Therefore, both assigned and market values for priced outputs are appropriate to use for calculating quantitative measures of efficiency such as Present Net Value.

Nonpriced Benefits

Non-priced outputs are those for which there is no available market transaction evidence and no rea-

sonable basis for estimating a dollar value commensurate with the market values associated with the priced outputs. In these cases, subjective non-dollar values must be attributed to their production. These values are qualitatively described rather than quantitatively. They may be either positive or negative. In fact, what may be considered to be a benefit to someone may represent a cost to someone else. Examples of nonpriced outputs include the maintenance of threatened and endangered species, natural and scientific areas, historical and anthropological sites, visual quality, and clean air.

Discounting

Financial analyses of alternative investment options usually involve cash flows over a fixed period of time in the future. Inherently, there is a time value associated with money. Due to man's propensity to consume now, a dollar today is worth more than a dollar ten years from now. Discounting is a process for adjusting the dollar values of costs and benefits which occur at different periods in the future to dollar values for a common time period so that they may be compared. Usually the common time period is the present. In which case, the discounted cash flow is referred to as the present value.

Present Net Value (PNV)

Present Net Value is the difference between the discounted value (benefits) of all outputs to which monetary values or established prices are assigned and the total discounted costs of managing the planning area. The maximization of Present Net Value was the criterion used to help assure that each alternative was the most economically efficient combination of outputs and activities needed to meet the objectives established for that alternative. Present Net Value calculations consider only the benefits for which market prices exist or can be assigned. On the Ochoco, the priced benefits included timber, recreation, wildlife, special uses, and range. These were compared against all Forest Service fixed and variable costs associated with managing the planning area, irregardless of whether they were incurred for the production of either priced or non-priced outputs, or as overhead expenses for general maintenance of the organization. Therefore, PNV is an estimate of the current market value of the priced forest resources after all costs of producing both priced and non-priced outputs and meeting other multiple-use objectives have been considered.

Net Public Benefits (NPB)

The maximization of net public benefits is a goal of the Forest Planning process. Net public benefits is the overall value to the nation of all outputs and positive effects (benefits) less all the associated Forest Service inputs and negative effects (costs) whether they can be quantitatively valued or not. Net public benefits cannot be expressed as a numeric quantity because it includes qualitatively valued nonpriced outputs.

Conceptually, net public benefits is the sum of the Present Net Value of priced outputs plus the full value of all non-priced outputs. The full value of non-priced benefits is used because the costs associated with their production is accounted for in the calculation of PNV. It is only necessary to identify the marginal values of non-priced outputs when management inputs are increased in order to provide these outputs at levels above current standards or legal requirements. In such cases, it is important to depict the physical, biological, and social dimensions of the non-priced outputs, as well as who will benefit and who will suffer from their production. Account should also be taken of any changes that may occur among the other non-priced outputs as a result of providing a particular non-priced output. In assessing the net public benefits of a particular alternative, it is necessary to judge whether the subjective value to society of its non-priced outputs exceeds the opportunity costs associated with their production.

Opportunity Costs/Trade-offs

Opportunity costs are defined as the value of a resource's foregone net benefit in its most economi-

cally efficient alternative use (FSM 1970.5). In its simplest terms it means "revenue foregone." In relation to the economic analysis performed for Forest Planning, it represents the decrease in maximized PNV of an alternative or benchmark when some alternative level of resource outputs are forced into solution. Therefore, opportunity costs measure the change in PNV for priced resource outputs, and can be used to measure the economic value traded off in order to produce other less efficient priced benefits or non-priced benefits included in net public benefits. On this forest, timber harvest is the most efficient use, therefore, the opportunity cost is associated with timber. This is not meant to imply that opportunity cost must always be tied to a loss of timber volume or that opportunity cost is the only criteria used to evaluate effects (see Trade-offs).

Trade-offs on the other hand are not consigned solely to economic parameters (revenue foregone). Trade-off is a more general term meaning forgoing of one thing in return for another.

Income Distribution Effects

There is another level of effects which are also a concern of National Forest Policy and Management. These are the welfare distribution effects influenced by the mix and level of outputs produced by the National Forest. They can be either positive or negative. Their impacts can also be local, regional, or national in scope. Some distributive effects such as changes in consumer prices or taxpayer costs have national level impacts. Others, such as induced jobs and income, or payments in lieu of taxes are more local or regional in nature. They are more related to questions of equity (ie. who pays and who benefits) rather than efficiency. They are not assessed in the context of the efficiency criteria associated with the PNV and net public benefit concepts. However, these positive and negative distributive effects need to be assessed in conjunction with the net public benefit measures since equity objectives often influence efficiency objectives and vice versa These will be discussed in more detail in Section 5.

Parameters

Introduction

In order to calculate the Present Net Value for each alternative, several assumptions had to made regarding discount rates, demand curves, real dollar adjustments, and real price and cost trends. This section will summarize these decisions and their resulting parameters. A more detailed discussion can be found in various process records in the Supervisor's Office.

Discount Rates

Discounting requires the use of a discount rate which is an interest rate that represents the cost or time value of money in determining the present value of future costs and benefits. Two discount rates were used to calculate the Present Net Values for each benchmark and alternative. Both of them were real discount rates meaning that they were adjusted to exclude the effects of inflation (Real dollar adjustments will be discussed more below) According to FSM 1971.71:

> For evaluations of long-term investments and operations in land and resource management in the 1980-1985 planning period, a four percent real discount rate shall be used. Evaluations should also discount benefits and costs at the real discount rate used in the most recent RPA to determine sensitivity of alternatives to variations in the discount rate.

The four percent rate approximates the "real" return on corporate long-range investments above the rate of inflation (Row, et al., 1981). The 4 percent rate was used to solve FORPLAN and calculate the PNV for each benchmark and alternative. The 1985 RPA program used a real discount rate of 7-1/8 percent. An analysis of the sensitivity of the preferred alternative to the discount rate was performed by solving FORPLAN using both the 4 percent and the 7-1/8 percent discount rates. For all other benchmarks

and alternatives, the Present Net Values were merely recalculated using this second discount rate (FSM 1971.71). Finally, all costs and benefits were discounted from the midpoint of the decade in which they were incurred.

Demand Curves and Real Price Trends

As specified by the Washington Office (1920 letter to Regional Forester, "Downward Sloping Demand Curves," 2/3/81) and in keeping with FSM 1971.65, horizontal demand curves for timber and nontimber resources were used to analyze the benchmarks and alternatives for the DEIS. Many factors can influence the demand for stumpage from any one forest (Adams and Haynes, 1985). Some of these factors include trends in (1) interest rates, (2) the species and products mix of forest products consumption, (3) use of wood for energy, (4) forest products exports, (5) the cost of wood in Canada, (6) the rate of technical improvements in wood and fiber processing, and (7) the levels of other national forests harvests. All of these contain some degree of uncertainty regarding their future states of nature. Neither the empirical nor the theoretical bases have been well enough developed to derive reasonable estimates of the demand functions for the resources offered at the Forest level. Evidence does exist, however, that suggests that the elasticity in the portion of the timber demand curve for which the Forest can influence output levels is such that prices would be relatively insensitive to some "reasonable" range of quantity offerings. In other words, it appears that the timber demand curve for the range of output levels analyzed during the development of alternatives is nearly horizontal.

As a surrogate for resource demand curves, real price trends were developed and used to represent the rate at which resource values will change over time as a result of anticipated supply and demand interactions in the market place. As specified by the Regional Office (1920 letter to Forest Supervisors, "Timber Price Trends, Values, and Costs," 9/25/84), a 1 percent per year real price trend for stumpage was used for FORPLAN harvest scheduling analyses. These were applied for the first 50 years, and then a 0 percent price trend was assumed for the remaining 100 years of the harvest scheduling planning horizon. These imply that nominal stumpage prices (ie. those which include the effects of inflation) will increase during the next 50 years at a rate of one percent greater than the rate of inflation, and equal to rate of inflation from there on after.

Since price trends are reflections of expected futures, there is an inherent uncertainty involved with making such projections. In recognition of this uncertainty, we performed a sensitivity analysis by rerunning Run-3 of the benchmarks using alternative stumpage price trends of 0, and 3 percent.

The results of these runs are quite complex and are discussed in detail in the Forest Planning Document titled "A Summary of the Analysis of the Management Situation." Generally, higher price trends make silvicultural investments economically more attractive, but they also tend to result in the substitution of lower valued species for higher valued species in sale offerings during the early decades since it pays to hold the higher valued timber on the stump as far as maximizing PNV is concerned.

Based on Washington Office direction, a 0 percent real price trend for all other resources was used during the development of the benchmarks and the alternatives. In other words, their future nominal values will change at rates equal to inflation.

Real Cost Trends

As with price trends, there is an inherent uncertainty with projecting future costs. In recognition of this uncertainty we performed a sensitivity analysis by rerunning Run-3 using 20 percent reduction in forest expected costs. As with the use of higher price trends this resulted in the more intensive silvicultural investments becoming economically attractive Based on Washington Office direction, 0 percent real cost trends were used for all future costs used in the development of the benchmarks and alternatives. In other words, the costs of labor, fuels, mate-

rials, and all other factors of production involved with managing the Forest are assumed to change at a rate equal to the rate of inflation.

Base Year Dollars

Future prices and costs can be expressed in both nominal and real terms. The projection of nominal values includes the effects of inflation on these values. The projection of real values does not. For example, assume that the future prices for commodity XYZ are projected to increase annually by 8 percent. Also assume that the rate of inflation is anticipated to be 5 percent. In real terms, the prices are increasing by only 3 percent per year above and beyond the rate of inflation. Real value changes are the result of the interactions of supply and demand forces in the market place. They do not include the effects of inflation.

All future values and costs used in the Forest Planning process were expressed in real 1982 dollars, consistent with the 1985 RPA program. The GNP implicit price deflator index was used to convert both historical and future nominal prices and costs to this common base (FSM 1971.32b).

Costs

Introduction

This section describes the costs used to perform economic efficiency analysis for each of the benchmarks and alternatives considered during the development of the DEIS.

All Forest Service costs were included for purposes of estimating budgets and calculating Present Net Values for each alternative. At the outset, each cost was categorized as either a fixed or a variable cost. If it was identified as a variable cost, decisions were made as to whether it would be analyzed in FORPLAN, or some form of electronic spreadsheet. Costs were determined by examining: (1) the PAMARS database, (2) Advent RPA budget files, (3) historical records and contracts, and (4) the results of time-motion studies. Professional judgement was also an important factor when it came to making assumptions regarding what bearing historical costs had on anticipated future costs. All costs were developed and reviewed by the Forest Analyst/ Economist and the appropriate staff and sub-staff personnel. In the following discussion, we will summarize the cost breakdowns and how they were incorporated into the efficiency analyses for each alternative. A more detailed presentation of the specific costs and their functions in the analytical tools can be found in the process records at the Supervisor's Office. Table B-4-1 lists all costs and the categories used in estimating budgets and calculating PNV for each alternative. Costs are listed according to whether they are fixed or variable, capital investment or operation and maintenance, or in or out of FORPLAN. If the cost has changed between the DEIS and FEIS it is also included in the table.

Fixed Costs

Most costs that did not vary significantly by alternative are classified as fixed costs. These costs did not relate directly to specific activities within any management area prescription nor to the production of specific amounts of outputs. As a result, they did not vary by alternative and were not included in FORPLAN. They were a component of budget estimates and the PNV calculations for each alternative. Fixed costs ranged between 20 and 30 percent of the total cost for all the alternatives.

Capital Investment Operation and Maintenance

Capital investment costs include trails, roads, reforestation, timber stand improvement, prescribed burnings, and physical structures for range, recreation, fish and wildlife. In any alternative, capital

TABLE B-4-1
COSTS FOR PNV AND BUDGET CALCULATIONS

	DEIS			FEIS		
Cost Categories	Variable/ Fixed	In FORPLAN	Cost	Variable/ Fixed	In FORPLAN	Cost
RECREATION						
Capital Investment						
Trailhead (Foot)	Variable	No	1,660/T H	Fixed	No	0-346,000
Trailhead (Horse)	Variable	No	2,360/T H>	Variable	No	2,360/T H
Campgrounds	Variable	No	100,000/20 Unit	Fixed	No	0 3,300,000
New Trails	Variable	No	14,050/Mile	Fixed	No	0 5,989,000
Rehab/Reconstruction	Fixed	No	22,430	Fixed	No	22,430
Operation and Maintenance						
Support for Timber Management	Variable	No	1 0/MCF	Variable	No	1 0/MCF
Support for Other Resources	Fixed	No	13,000	Fixed	No	13,000
General Operations Maintenance						
Wilderness	Fixed	No	23,700	Fixed	No	23,700
Dispersed Recreation	Variable	No	11/RVD	Variable	No	11/RVD
Developed Recreation	Variable	No	1 51/RVD	Variable	No	1 51/RVD
CULTURAL RESOURCES						
Operation and Maintenance						
Support for Timber Mgmt	Variable	No	4 5/MCF	Variable	No	4 5/MCF
Support for Other Resources	Fixed	No	52,000	Fixed	No	52,000
FISH AND WILDLIFE						
Capital Investments						
Road Closures	Variable	No	1 22 1 75/Ac 1/	Variable	No	1 22-1 75/Ac
Wildlife Improvement	Fixed		123,000/decade	Fixed		23,000 593,000 (45/Ac Enhanced 1st Decade
Fish Structures(See Riparian)						
Operation and Maintenance						
Support for Timber Mgmt	Variable	No	5 20/MCF	Variable	No	5 20/MCF
Support for Other Resources	Fixed	No	16,800	Fixed	No	16,800
Program Mgmt	Fixed	No	74,000	Fixed	No	74,000
General Operation and Maint.	Fixed	No	40,000	Fixed	No	40,000
RANGE						
Capital Investments						
Construction	Variable	No	837,000 Times (% of land base allocated to TR & G)	Variable	No	1,940/structure
Reconstruction	Variable	No	132,040 Times (% of land base allocated to TR & B) 22,580 Timber (% of land base allocated to TR & B) 1/	Fixed	No	927,000
Non-Structural	Variable	Yes	5 72/Ac	Variable	Yes	5-72/Ac
Operation and Maintenance						
Support for Timber Mgmt	Variable	No	5 2/MCF	Variable	No	5 2/MCF
Support for Other Resources	Fixed	No	16,800	Fixed	No	16,800
General Operation & Maint.						
Wild Horses	Fixed	No	20,000	Fixed	No	20,000
Admin & Planning	Variable	No	2 62	Variable	No	2 62
TIMBER						
Capital Investment						
Reforestation	Variable	Yes	121-326/Ac 1/	Variable	Yes	121-326/Ac 1/
Timber Stand Improvement	Variable	Yes	32 179/Ac	Variable	Yes	32 179/Ac
Operation and Maintenance						
Support for Other Resources	Fixed	No	2,830	Fixed	No	2,830
Program Management	Variable	No	13 03/MCF	Variable	No	13 03/MCF
Stand Exam, Sale Prep, Admin	Variable	No	42 58/MCF	Variable	No	42 58/MCF
Salvage Administration	Variable	No	1,110/MCF	Variable	No	1,110/MCF
Insect and Disease Control	Fixed	No	3,150	Fixed	No	3,150
Firewood Administration	Variable	No	23 14/MCF	Variable	No	23 14/MCF
Genetics	Fixed	No	42,350	Fixed	No	42,350

Cost Categories	Variable/ Fixed	In FORPLAN	Cost	Variable/ Fixed	In FORPLAN	Cost
SOIL AND WATERSHED						
Capital Investment						
Riparian Structural	Variable	No	16 5/Ac of Enhancement	Variable	No	79/Ac of Enhancement (1st Decade)
Operation and Maintenance						
Support for Timber Management	Variable	No	3 86/MCF	Variable	No	3 86/MCF
Support for Other Resources	Fixed	No	9,000	Fixed	No	9,000
Program Management	Fixed	No	60,420	Fixed	No	60,420
General Operation & Mgmt	Variable	No	140 0/MCF	Variable	No	140 0/MCF
MINERALS						
Operation and Maintenance						
Program Management	Fixed	No	866,080	Fixed	No	66,100
HUMAN RESOURCES						
Operation and Maintenance	Fixed	No	224,200	Fixed	No	224,200
LANDS						
Operation and Maintenance						
Program Management	Fixed	No	75,520	Fixed	No	75,520
Land Line Location	Fixed	No	151,040 (Decade 1)	Fixed	No	151,040 (Decade 1)
Land Line Location	Fixed	No	94,400 (Decade 2)	Fixed	No	94,400 (Decade 2)
FACILITIES						
Capital Investment						
FA&O-Construction	Fixed	No	212,400 (Decade 1) 141,600 (Decade 2)	Fixed	No	212,400 (Decade 1) 141,600 (Decade 2)
PRC-Construction						
(Arterial/Collector)	Variable	Yes	0-4,140,000	Variable	Yes	0-4,140,000
PRC-Reconstruction						
(Arterial/Collector)	Variable No	No		Variable		
Local Road Construction	Variable	Yes	22-170	Variable	Yes	22-170
Local Road Reconstruction	Variable	Yes	18 43	Variable	Yes	18-43
Operation and Maintenance						
Program Management Admin	Variable	No	50/MCF	Variable	No	50/MCF
FA&O Maintenance	Fixed	No	141,600	Fixed	No	141,600
FR&T Maintenance	Fixed	No	623,000	Fixed	No	623,000
Coop Maintenance	Variable	Yes		Variable	Yes	
PROTECTION						
Capital Investment						
Natural Fuels Treatment	Variable	No	33- 78/Ac	Variable	No	33- 78/Ac
Operation and Maintenance						
Support for Timber Mgmt	Variable	No	2.91/MCF	Variable	No	2 91/MCF
Support for Forest	Fixed	No	9,980	Fixed	No	9,980
IHC (Regional Shared Res)	Fixed	No	99,580	Fixed	No	99,580
Forest Fire Protection	Variable	No	1 29/MCF	Variable	No	1 29/MCF
Brush Disposal	Variable	Yes	45/Ac	Variable	Yes	45/Ac
GENERAL ADMINISTRATION						
General Administration	Fixed	No	936,530	Fixed	No	936,530
KV	Variable	No	15% of KV	Variable	No	15% of KV
Coop	Variable	No	15% of Coop	Variable	No	15% of Coop
Salvage	Variable	No	15% of Salvage	Variable	No	15% of Salvage
Brush Disposal	Variable	No	15% of Brush Disposal	Variable	No	15% of Brush Disposal

1/ Represents per decade cost.

investment costs pertain mostly to roads and timber stand improvements. For example, capital investment cost associated with road construction and timber management range from a minimum of 76 percent in Alternative C-Modified to a maximum of 95 percent in Alternative A.

Operation and maintenance costs are those costs associated with operating and maintaining facilities, program management and support for management of other resources. The majority of operation and maintenance costs in all alternatives are program management, followed by support funds necessary to carry out timber programs. Capital investment costs range from a high of 43 percent (Alternative A) to a low of 37 percent (Alternative C-Modified) of the total first decade cost in any alternative.

Costs within FORPLAN

In general, FORPLAN contains all the variable costs associated with implementing vegetation management activities associated with the timber and range resources. The activities included; range nonstructural improvements, site preparation, reforestation, and timber stand improvements. Costs associated with initial arterial/collector road construction and local road construction and reconstruction are also included in the model.

Costs for sale prep and administration along with non-Forest costs (logging, haul, manufacturing) were also included. These non-Forest costs are included in FORPLAN's PNV calculation but do not influence the Forest Service budget estimates.

These costs were usually expressed in terms of dollars/acre or dollars/MCF. The costs which were expressed in units of volume were also developed by diameter classes. This was true for both the marginal non-federal logging costs, and the sale preparation/ administration costs. For each FORPLAN cost category, a range of costs were entered into the model based on the Management Prescriptions, and the characteristics of the analysis areas to which they applied. All in all, 136 different FORPLAN economic tables were developed to cover the different cost and value combinations to which prescriptions could be assigned in the Model.

Values other than those associated with timber, range, and roads were calculated outside of FORPLAN. This was necessary because of their unique spatial or non-linear characteristics, unknown or poorly defined joint production relationship or poor economic information.

The network model was used to calculate the cost of reconstruction of the arterial/collector system. All other costs were calculated with the use of electronic spreadsheets.

The remaining variable costs were a function of the amount of output and emphasis a particular benchmark or alternative was designed to provide for this resource, the land allocation scheme, timber management or other resource activities and outputs. Basically, the costs associated with these activities were estimated by comparing the amount of relevant land allocations under activity levels in a particular alternative to experienced costs, and projecting the cost based on these relationships.

Benefits

Introduction

This section describes both the priced and non-priced benefits which were incorporated in the economic efficiency analyses for each benchmark and alternative considered during the development of the DEIS.

Resource outputs to which dollar values were assigned constitute the priced benefits included in the Present Net Value calculations. Like all of the costs included in the analyses, only those benefits incurred during the 50 year RPA planning horizon were incorporated in the PNV calculations The economic efficiency analysis for each alternative also considered non-priced benefits. These are outputs for which there is no available market transac-

tion evidence and no reasonable basis for estimating a dollar value commensurate with the market values associated with the priced outputs. In these cases, a subjective qualitative value must be attributed to their production. Conceptually, the addition of the non-priced benefits to PNV is used to derive the net public benefits associated with each alternative. Both priced and nonpriced outputs and their associated values will be summarized below. More detailed documentation of the specific values and the process used to develop them can be found at the Supervisor's Office.

Priced Benefits

Introduction

Priced benefits fall into one of two categories: market and nonmarket (assigned). The market values constitute the unit price of an output normally exchanged in a market after at least one stage of production, and are expressed in terms of what people are willing to pay as evidenced by market transactions. Nonmarket values constitute the unit price of a nonmarket output not normally exchanged in a market at any stage before consumption, and thus must be imputed from other economic information (FSM 1970.5). They are valued in terms of what reasonable people would be willing-to-pay (above participation costs) rather than go without the output. These values were derived directly from the 1985 RPP program assignment. In either case their values are theoretically commensurate and appropriate for inclusion in PNV calculations. The resources for which dollar values were estimated on the Ochoco consisted of timber, range, special uses, and developed, dispersed, and wildlife oriented recreation.

Timber

Timber mill pond values were used in FORPLAN. These values were expressed in terms of dollars/MCF. The mill pond values were developed for both existing natural and future managed stands. The values were specific for each working group (Ponderosa Pine and Mixed Conifer) and diameter class.

The process for calculating the mill pond values was quite complex. Essentially the process used the procedures directed by the Regional Office, 1920, 4/27/84 (See process record 1920; 6/84). We will summarize it here. All calculations were performed in terms of constant 1982 dollars. Also, since most of the source data was expressed in terms of dollar/MBF, it was necessary to convert these to dollars/MCF. The mill pond values were first calculated for each individual species and then converted to working group mill pond values based on the species composition of each working group modelled in FORPLAN. Also, since none of the source data was diameter specific, assumptions had to be made regarding the average diameter of trees sold for each species during the period for which the data sources covered. The diameter specific values and costs were then developed based on diameter class relative indices for stumpage values.

The first step was to use the stumpage values calculated by the Regional Office from the Ochoco National Forest's Cut and Sold Reports covering the period April 1977 through September 1983. The second step was to adjust the regionally developed price-diameter relationship to Ochoco values

This was done by placing the 100 percent value or the average DBH of that species sold between 1977-1981. Relative values for the lower DBH classes were established using the same ratios as the regional tables. DBH classes higher than the average were all assigned the 100 percent value. Shifting the diameter which received the 100 percent level to the average DBH was necessary because these values would be applied to the average stumpage value for that species.

The next step was to convert these species relative values to working group relative values. Weighted average relative values were developed for the PP and MC working groups. The PP working group percentage weights are ponderosa pine - 87 percent, Douglas fir - 13 percent. The MC working group percentage weights are ponderosa pine - 49 percent, Douglas fir - 24 percent, white fir - 18 percent, western larch - seven percent and lodgepole pine - two percent. These mixtures represent the major

species harvested on the Ochoco National Forest. The percentages by working group were developed from a comparison of sell records and inventory data

Weighted average stumpage values for the two working groups were then developed using the species stumpage rates furnished by the Regional Office and the same species percentage weightings as listed above.

Average logging cost developed from the Forest's 2400-17 forms was added to the stumpage values, giving mill pond values for the two working groups. FORPLAN also had Analysis Area logging cost. This was done so that when management area prescriptions were applied to analysis areas the stumpage values would be adjusted to better reflect site specific differences.

Average board feet/cubic feet conversion factors for the two working groups was derived from the 1982 inventory data. These values were then applied to the millpond value based on board feet to convert this to a value per cubic feet.

The final step was to apply the adjusted price diameter index to those mill pond values to establish values by diameter groups. These values were then entered into FORPLAN.

Table B-4-2 presents the diameter specific working group mill pond values.

Range

The range outputs represent the amounts of forage permitted to be grazed and are measured in units of animal unit months (AUM's). AUM values were calculated as the value of the marginal product of an AUM in the production of a marketable animal. The Forest Service entered into a cooperative agreement with the USDA Economic Research Service to develop livestock enterprise budgets for each National Forest. The Range Budget Approach was used for this analysis. Because Forest AUM's are not actually priced in a free competitive market, the calculated price is an estimate of market value. First, returns from all ranch products were determined. Then, all costs of production were subtracted. The remaining returns plus the cost of the Forest Service permits became the residual value of the AUM This residual value of an AUM to ranch livestock production is comparable to conversion surplus timber values. Based on the information provided in the RPA 1985 Program analysis for the DEIS, and a Regional Office Memo (2340, 9/30/83), the AUM value for the Ochoco National Forest in 1982 dollars is $11.75.

Although range outputs were explicitly represented in FORPLAN some adjustments were done outside the model. FORPLAN derived AUM's were adjusted based upon the number of structural improvements and acres of riparian enhancement. Both of these factors have unique spatial characteristics not easily represented in FORPLAN. All other priced benefits were analyzed with electronic spreadsheet outside of FORPLAN.

TABLE B-4-2
WORKING GROUP MILL POND VALUES
($/MCF)

DBH Class	Ponderosa Pine	Ponderosa Pine Low-Site	Mixed Conifer
7.0	116.2	116.2	113.6
12.0	135.3	135.3	133.1
15.0	147.4	147.4	144.4
18.0	159.5	159.5	154.2
+21.0	173.4	173.4	162.3

Recreation

The non-wildlife related recreation and wilderness outputs represent the amount of use consumed on the Forest and are measured in terms of recreation visitor days (RVD's). The wildlife related recreation use is measured in terms of wildlife and fish user days (WFUD's). The values used for these priced outputs were derived directly from the 1985 RPA program assessment. This discussion is a summary of the write-up found in Appendix F of the 1985 RPA DEIS.

The development of recreation, wilderness, and wildlife values for the 1985 RPA Program analysis consisted of two steps: (1) development of recreation and wildlife benefit values by activity per RVD or WFUD; and (2) adjustment of values to reflect standard and less-than standard levels of management.

The Resource Evaluation Group at the Rocky Mountain Forest and Range Experiment Station conducted an extensive literature search to develop the 1985 activity values for recreation. Benefit values for recreation, wilderness, and wildlife activities were developed from recent travel cost models and contingent valuation research (Loomis and Sorg, 1982). In-service and academic specialists reviewed the research and activity values and adjusted the initial values to achieve methodological consistency to apply them to regional conditions. The values represent total willingness to pay for an additional recreation site, animal unit, or wilderness area. The RVD values by recreation activity that were generated by this study can be found in Table F.4 of the 1985 RPA DEIS. For program evaluation purposes, these values were subsequently adjusted downward because:

> The travel cost method represents a total willingness-to-pay. Other resource values in the RPA evaluation represent market price or value of the marginal product. Consequently, the willingness-to-pay values were adjusted in an effort to make the recreation values more compatible with values used for other resource outputs.
>
> The travel cost method estimates values on a site-by-site basis. The method does not address the question of whether regionally or nationally a given quantity of RVD's will, in fact, be consumed if that price were changed.
>
> It is believed that the travel cost studies are typically done at higher quality sites, do not take into account substitutes to individual sites, and do not accurately measure trip length; consequently, values from these studies may be on the high side when applied to average situations on a region-wide basis.

In response to the first concerns, the values were adjusted based on the relationship between the proportion of recreation provided by the Forest Service and estimates of an average nationwide demand elasticity for outdoor recreation. It is estimated that nationally, roughly a 5 percent increase in price will result in a 1 percent decrease in quantity demanded (Lewis, Hughes, and Lloyd, date unknown). It is also estimated that in 1982 the Forest Service provided 7.5 percent of all outdoor recreation. Consequently, it is roughly estimated that there will be a 5 percent decrease in price for each percent of the 7.5 percent Forest Service market share or a total decrease of 37.5 percent for clearing the market. Therefore, the initial willingness-to-pay values were reduced 37.5 percent for use in comparing resource allocation choices.

In response to the quality factor, the concept of standard and less-than-standard service was introduced, and the resulting impact on the value of the experience to the recreationist was estimated. If recreation facilities are not fully maintained, the quality of the experience will be lowered. Two different sets of values were developed to account for the standard and less-than-standard outputs. A special study showed that on the average the less-than-standard RVD's are valued at about 53 percent of the value of standard RVD's. Accordingly, different capital investment, and operations and maintenance costs were developed for the standard and less-than-standard recreation outputs. All alternatives except the current direction alternative manage all the recreation resources at a standard service level.

Finally, these values were expressed in terms of the recreation opportunity spectrum (ROS) activity

TABLE B-4-3
1985 RPA RECREATION BENEFIT VALUES
(1982 $)

Recreation	Value ($/RVD)
Primitive (STD)	11 25
Primitive (LSTD	5 96
Semiprimitive Nonmotorized (STD)	13 25
Semiprimitive Nonmotorized (LSTD)	7 02
Semiprimitive Motorized (STD)	12 13
Semiprimitive Motorized (LSTD)	6 43
Roaded Natural (STD)	9 38
Roaded Natural (LSTD)	4 97
Rural (STD)	8 47
Rural (LSTD)	4 49
Urban (STD)	11 38
Urban (LSTD)	6 03
Wilderness	**Value ($/RVD)**
Primitive (STD)	17 50
Primitive (LSTD)	9 28
Semiprimitive Nonmotorized (STD)	17 50
Semiprimitive Nonmotorized (LSTD)	9 28
Wildlife & Fish	**Value ($/WFUD)**
Big Game	30 00
Nongame	25 00
Resident Fish	15 00
Anadromous Fish*	30 00
Other Game	19 00
WL/F Recreation (STD)	21 00
WL/F Recreation (LSTD)	14 00

STD - Standard
LSTD - Less than standard

* In addition for anadromous fish, an RPA value of $1 05 per lb is assigned

categories in accordance with the way they were developed and tracked during the process of analyzing alternatives. The resulting values are depicted in Table B-4-3.

In addition, for anadramous fish, the RPA value of $1.05 per lb is assigned.

Soil and Water

The values used for these priced outputs were taken directly from the 1985 RPA program assessment. Values considered pertained to increase in water yields, sediment reduction, improved water quality and maintained water quality. Increased water yields are assumed to have no additional value in the Pacific Northwest. Almost all area water meets the quality goals, as a result no additional value will be assigned. The two water related values the Forest included were increased value from sediment reduction ($6.00/M ton) and maintaining water quality ($.20/acre feet).

Minerals

The minimum bid value of $2.50 per acre leased is used. With no experience in what actual bed values may be combined with no difference in the estimate of acres leased.

Nonpriced Benefits

Introduction

The calculation of PNV enables the comparison of alternatives with regards to their output levels for priced resources, and their efficiency in producing them. However, other factors also influence the decision making process. In some cases, the importance of nonpriced benefits for which it is impossible to assign monetary values can outweigh the advantages of producing higher levels of priced outputs. The importance of the need to consider these subjectively valued benefits in Forest management decisionmaking is addressed in the NFMA Regulations which charge the Forest Service with identifying the alternative which comes nearest to maximizing net public benefits (36 CFR 219.12(F)).

Net public benefits (NPB) represent the overall value to the nation of all outputs and positive effects (benefits) less all associated inputs and negative effects (costs), whether they can be quantitatively valued or not (36 CFR 219.3). Net public benefits include both priced and nonpriced resource outputs, less all costs associated with managing the area

As stated earlier, all priced outputs and all costs associated with managing the Forest are included in the calculation of PNV. To this, the net subjective values of the nonpriced outputs must be added in order to arrive at the overall NPB of an alternative. Some of the most important nonpriced benefits addressed during the Ochoco National Forest planning process revolve around maintaining and enhancing the following:

Lifestyles;

Diversity and quality of recreation opportunities;

Biological diversity;

Old growth and snag habitat;

Scenic quality;

Historical and cultural resources,

Riparian condition; and

Air quality.

These are all outputs and effects which are influenced to a large degree by decisions regarding how to manage the Forest. They are all the topic of one or more issues and concerns which were identified at the outset of the planning process. So they are important, but it is not possible to measure their importance in dollar terms which are comparable to market values. Their values must be subjectively determined.

The provision for many of the nonpriced benefits is achieved by applying constraints to the production of priced outputs (ie. such as timber harvesting constraints in FORPLAN). These constraints usually result in a decrease in the PNV of the priced outputs to which the constraints were applied. Subjective judgments are then necessary in assessing whether the benefits of producing the non-priced outputs exceed the opportunity costs associated with producing fewer priced outputs. If a PNV tradeoff induced by the provision of a nonpriced output is judged acceptable, then a positive contribution to NPB has resulted, and the alternative is overall more efficient.

The nonpriced outputs considered during the development and evaluation of alternatives are discussed below. While the quantitative dollar values of each can not be determined, they can generally be evaluated by examining such quantitative indicators as acres of appropriate allocations, resource inventories, or timber production related activities and outputs.

Lifestyles

Surveys of the Central Oregon populous have shown that many people enjoy living in the area because of the outdoor lifestyles it provides. A Forest with a broad recreation base in a pleasing environment could be an asset to the Central Oregon area while still providing goods and services necessary for stable Forest based economies.

Central to maintaining and enhancing the Central Oregon lifestyle is the provision of diverse recreation opportunities, and clean air and water to enjoy them. The freedom and ability to cut personal use firewood is also important. To the extent that an alternative results in reduced or less diverse recreation opportunities, lower quality water, smokier air, or more restrictive access to personal use firewood, the alternative will be less desirable from a lifestyle point of view. Many of these effects are directly related to land allocations and resource management goals which emphasize the production of wood at the expense of amenity values.

The stability of jobs and income in the area is also an element of the concern about lifestyles. For this purpose, each alternative was analyzed with regards to its potential impacts on jobs and income in the 3 county zone of influence (refer to Section 5). Any indications that the implementation of an alternative would result in fewer jobs and less income would be considered disruptive of the current lifestyles.

Diversity and Quality of Recreation Opportunities

The number of recreation visitor days and their associated priced values are included in the PNV calculations for each alternative. However, the assigned dollar values per RVD do not reflect the

value of providing a diversity of recreation opportunities and settings. The Forest currently provides adequate recreation diversity as indicated by the reasons many people choose to live and recreate in the area. However, some aspects of the recreation opportunity spectrum are becoming more difficult to retain. For example, as remaining roadless areas are either designated as wilderness, or roaded and developed for other uses, there are fewer opportunities for the semiprimitive and primitive recreation experiences outside of wilderness areas. Related to this is the idea that as more and more roadless areas are either developed or designated as wilderness, future generations will have fewer options regarding how to best manage them to meet changing needs. To the extent that retaining roadless areas in undeveloped conditions does not overly restrict the efficient production of priced outputs, both the recreation diversity and the future options which they offer are considered a nonpriced benefit. For each alternative, the recreation allocations and projected carrying capacities are categorized according to the recreation opportunity spectrum. This can be used to assess the recreation diversity which an alternative provides.

Biological Diversity

Maintaining plant and animal diversity over time is also considered as a nonpriced component of net public benefits. Benefits generally associated with biological diversity are gene pool maintenance, preservation of long-term productivity, maintenance of forest health, and insurance of viable populations of plant and animals, especially Threatened and Endangered Species. Since animal diversity is to a large extent dependent upon plant diversity, attention is focused particularly on the number of acres for each working group in each successional stage. The amount of old growth provided is especially important since this grazing component would be the most difficult to replace once it disappears. Timber harvesting and fire are the chief means of manipulating vegetative diversity. The effects of scheduled timber harvesting on vegetative diversity were evaluated through a combination of FORPLAN reports and some special software programs which were developed specifically for that purpose. To a certain extent, the more old growth and riparian areas in excellent condition and snags provided for in a particular alternative, the higher the benefits associated with this non-priced output.

Old Growth and Snag Habitat

Besides influencing biological diversity calculations both old growth and snags provide specific habitat for non-adaptive wildlife species. While enhancing biological diversity both the habitat and species present increase non-consumptive wildlife opportunities and visitor experiences. As a result, the more old growth and snag habitat provided in a particular alternative, the higher the benefits associated with these non-priced outputs.

Scenic Quality

While the value of scenic quality is not directly included in the PNV calculations, its value is indirectly represented through the consideration of recreation as a priced benefit. It is safe to assume that the provision of positive visual experiences has a direct relationship to the quantity and quality of recreation on the Forest. However, a large number of people who benefit from the visually appealing scenery are not tallied as recreation users of the Forest. For example, there is a major highway which passes through the Forest. The people who drive on this pass through some quality scenic areas. Yet they are not counted as RVD's. There are also the people who live in or around the Forest who everyday enjoy scenic qualities associated with the forested mountain environment. Again, these beneficiaries are not tallied as RVD's. These benefits are nonmeasurable.

The alternatives each vary in their emphases to satisfy scenic quality objectives. This can be measured in terms of the percentage of all sensitive retention and partial retention scenic quality objectives which are being met through the implementation of an alternative.

Historical and Cultural Resources

A large number of scientifically and historically valu-

able cultural resources are identified on the Forest. Over 50 new sites, mainly prehistoric Indian campsites, are found each year as a result of the Forest's cultural resource inventory program. Cultural resources are an issue in the sense that many people are concerned about how many and how adequately these cultural sites are being preserved and protected in the face of ground disturbing projects and vandalism that occurs on the Forest. The more areas that are opened up to development for road construction, timber harvesting, and minerals and energy development, the more difficult it will be to protect these resources.

Riparian Condition

The number of fish user days and their associated priced values are included in the PNV calculations for each alternative. However, the assigned dollar value per WUD do not reflect the total value of providing excellent riparian conditions. As discussed in Chapters 3 and 4 of the DEIS, riparian zones represent a small but unique opportunity on the Forest. As a result, use has been concentrated and some degradation of the resource has occurred due to road location, timber and livestock management and recreational pressure. Improving riparian conditions will have unquantified benefits to dispersed recreation users, wildlife, biological diversity, and scenic quality. The more an alternative emphasizes wood production or livestock use in riparian areas the lower the benefits associated with these non-priced outputs.

Air Quality

Air quality is another important aspect of the Central Oregon area For the most part, air quality conditions are good. During certain times during the winter, temperature inversions create woodstove pollution problems, and during the spring and summer, prescribed burning activities reduce air qualty.

Most of the firewood supply utilized in the area comes from the Forest. Different approaches for making firewood available to the public were explored in some alternatives. As a result, firewood burning and its related pollution problems will continue to exist.

Air quality degradation resulting from fuels treatment and prescribed burning activities is closely related to the amount of scheduled timber and vegetative management activities associated with an alternative. The more acres of these activities called for in an alternative, the lower the quality of the air during certain seasons of the year.

Socio-Economic Impact Analysis

(Section 5)

Overview

Each of the alternatives will have economic and social effects on the surrounding areas. The ICO's which the alternatives address all represent blends of economic and social concerns. The ones which most specifically address these issues are the first two: "What should be the level of timber production?" and "How can activities on the Forest and Grassland benefit social and economic wants and needs of local communities?"

To address these ICO's, two economic and four social measures were examined. The economic measures, computed by the IMPLAN program, are:

Employment; and

Personal Income.

The social measures were selected on the basis of Forest expertise. These measures are:

Work related lifestyle;

Leisure activities;

Effects on community cohesion and community stability; and

Effects on minorities and women.

Area Analyzed

These measures were used to analyze the alternatives' effects in Crook, Harney and Wheeler Counties. Jefferson County was examined in the DEIS, but only minor effects were found; the analysis was omitted from the FEIS. Deschutes and Grant Counties were not modeled because of the limited effects of the Ochoco National Forest on these counties. Because the economies of Crook, Harney, and Wheeler counties are not especially interrelated, each of the counties was modeled separately in the IMPLAN analysis.

Economic Model (IMPLAN)

IMPLAN is an input-output model developed by the Forest Service. Like all input-output models, it simulates an economy, and can examine the effects on the whole economy of changes made in particular sectors. This means that IMPLAN is forced to assume that the basis for the economy will remain static. This means, among other things, that there will be no technological changes, no new industries or industries that cease to exist, and no changes in the patterns in which industries purchase from one another. The industries may change in size only, not in makeup.

This assumption is assumed to be realistic for the Ochoco National Forest models for the first decade. No IMPLAN runs were made for further decades because for them the assumption was judged not to be reasonable.

IMPLAN (specifically, IMPLAN Version 2 0) is based on a 528 sector national model. This model derives its interindustry relationships from the 1977 Department of Commerce I-O model, but is updated to 1982. Individual county models are derived from the national model by examining county data to determine which sectors of the national model are present in that county. The county model is then created as a subset of the national model. This process requires the assumption that the county interindustry linkages resemble the national picture. This assumption is reasonable for the Crook, Harney and Wheeler county economies.

Data Used in the Model

The process just described creates a county model - a description of what industries are present in the county. But additional information must be provided which defines the level at which each local industry is producing. This information is also provided, in rough form, by IMPLAN. It is mostly taken from various censuses published by the Department of Commerce Bureau of the Census. The data is for the year 1982.

The 1982 economic figures were reviewed for accuracy. The fact that 1982 was a recession year with low employment does not in itself pose a problem to the analysis. However, if there were changes in industry structure - either because of the recession, or since the recession - the data needs to be recomputed.

The Forest determined that the data for Wheeler County was adequate. For Crook and Harney counties, we judged the wood products industry data needed to be updated and the rest of the data was accurate. (For a more general discussion of changes in the wood products industry, see the "Social and Economic Setting" section in Chapter 3.) To update the data for the wood products industries, we asked the various manufacturers in the two counties for data on their operations, which they kindly gave to us. From this data, combined with published local and national data, we constructed a picture of the wood products sector as it existed in 1987.

Expenditures Associated with One Unit of Output

The final step in building the IMPLAN model was to determine the effect on the economy of varying one unit of forest output - one MMBF, one MAUM, one MRVD. This data is called expenditure data, since it measures the expenditures in the economic sectors which are associated with one unit of output.

To determine timber-related expenditures, it had to be determined how much of the timber was milled and how much was re-milled before leaving the local area. These figures were provided from Forest Service data and data gathered from local mills.

The timber harvest of the years 1980-1988 was analyzed. The results obtained are shown in Table B-5-1.

Forage expenditures were computed from USDA Economic Research Service data for the Forest and Grassland. The total value of the herd was multiplied by the percentage of the forage that came from the Forest/Grassland to obtain the value due to the Forest/Grassland; then that figure was divided by the number of AUM's to get the value per AUM. This method makes two assumptions. First, it is

TABLE B-5-1
MILLING LOCATION OF OCHOCO NATIONAL FOREST TIMBER

	Crook County	Harney County	Elsewhere
D1, D2, D3 Ponderosa Pine	90%	–	10%
D1, D2, D3 Associated Species	38%	–	62%
D4 Ponderosa Pine	16%	70%	14%
D4 Associated Species	61%	31%	8%

assumed that all the cows and yearlings come either from calves produced by the herd or calves purchased immediately after birth. Second, it is assumed that the value of the Forest/Grassland forage is equal to the average forage value.

Expenditure data for RVD's (recreation) were obtained from the RO, classified by RIM category. These figures were applied to the Ochoco recreation pattern.

The remaining expenditure data are related to Forest Service budgets and to 25 percent monies. The Forest Service salaries and the portion of the 25 percent monies that go to teachers' salaries were proportioned according to the average consumer expenditure pattern for each county. Forest Service non-salary monies were proportioned according to the general federal government expenditure pattern. Twenty-five percent monies that went to roads were allocated to 75 percent road maintenance and 25 percent new road construction. Twenty-five percent monies that went to schools that were not spent on salaries were proportioned according to the education expenditure pattern for each county.

Current Situation

IMPLAN can compute either absolute or relative results. The Forest's process was to define a "current situation" and then compare the alternatives to it. The current situation for timber harvest levels is the 1980-1988 average, as described above. For recreation, averages were computed for the last twenty years and values were chosen which represent the 1985 levels. For grazing, 1985 levels were also used.

Basic Economic Cause and Effect Relationships

Table B-5-2 shows the effect upon a county's economy of a change in one unit of Forest output - one MMBF, one MAUM, one MRVD. The coefficients were computed independently for the three counties, but they are similar because the counties' economies are similar.

Description of Economic Effects

Tables B-5-3, B-5-4, and B-5-5 show the changes in employment and income for Crook, Harney, and Wheeler counties

In Section 5 of Appendix B of the DEIS, the document displayed tables similar to the above except that results were displayed for two decades. This was done to reveal results due to the selection of a Departure for a Preferred Alternative. However, the Preferred Alternative in the FEIS is not a Departure, and results are displayed only for the first decade.

TABLE B-5-2
EMPLOYMENT AND INCOME EFFECTS PER RESOURCE UNIT

Resource Unit	Jobs Effect	Income Effect
1 MMBF Ponderosa Pine	11	220,000
1 MMBF Associated Species	3	60,000
1 MAUM	25	2,000
1 Hunting MRVD	50	9,000
1 Fishing MRVD	50	8,000
1 Dispersed Recreation MRVD	1	13,000
1 Developed Recreation MRVD	50	7,000
1 Roadless Recreation MRVD	1 5	15,000
1 Wilderness Recreation MRVD	1	10,000

TABLE B-5-3
CHANGES IN JOBS AND INCOME
CROOK COUNTY
(Income Expressed in Thousands of 1982 Dollars)

		B-MOD	E-DEP	I Preferred	A	C-MOD
Logging						
	Jobs	13	6	5	3	-6
	Income	246	123	97	65	-113
Sawmills						
	Jobs	25	15	11	8	-10
	Income	620	360	270	209	-257
Remanufacturing						
	Jobs	43	28	16	9	-40
	Income	684	455	252	140	-637
Retail Trade						
	Jobs	33	46	39	18	21
	Income	409	493	410	217	147
All Other Economic Sectors						
	Jobs	47	50	32	14	-33
	Income	731	779	499	235	-506
Total						
	Jobs	161	146	103	54	-68
	Income	2,692	2,212	1,527	869	-1,367

TABLE B-5-4
CHANGES IN JOBS AND INCOME
HARNEY COUNTY
(Income Expressed in Thousands of 1982 Dollars)

		B-MOD	E-DEP	I Preferred	A	C-MOD
Logging						
	Jobs	1	3	0	1	-1
	Income	23	74	4	33	-37
Sawmills						
	Jobs	0	3	-1	1	-4
	Income	1	81	-20	15	-86
Remanufacturing						
	Jobs	-8	1	-8	-6	-15
	Income	-178	30	-181	-148	-359
Retail Trade						
	Jobs	4	19	12	3	0
	Income	26	191	89	25	-4
All Other Economic Sectors						
	Jobs	10	17	8	3	-7
	Income	175	279	127	49	-141
Total						
	Jobs	8	43	12	1	-8
	Income	46	656	18	-26	-145

TABLE B-5-5
CHANGES IN JOBS AND INCOME
WHEELER COUNTY
(Income Expressed in Thousands of 1982 Dollars)

		B-MOD	E-DEP	I Preferred	A	C-MOD
Livestock						
	Jobs	0	0	0	0	0
	Income	1	1	1	1	0
Retail Trade						
	Jobs	0	0	0	0	0
	Income	2	2	1	0	-4
All Other Economic Sectors						
	Jobs	7	6	3	1	-7
	Income	123	112	60	17	-141
Total						
	Jobs	7	6	3	1	-8
	Income	127	115	62	17	-145

Social Effects

The social effects by alternative are listed in Chapter 4. The social measures used to describe these effects are based on the Forest Service *Economic and Social Analysis Handbook* (FSH 1909.17). The handbook suggests analyzing six social measures.:

Lifestyles;

Attitudes, beliefs, and values;

Social organization: Community institutions, community cohesion and community stability;

Population characteristics;

Land use patterns; and

Civil rights (effects on minorities and women).

Of these measures, we judged that "population characteristics" and "land use patterns" would not be affected by any of the alternatives. "Attitudes, beliefs and values" was used as a measure of social effects in the DEIS. However, attitudes, beliefs and values seem to be measured well by the rest of the social measures taken together. For this reason, the separate "attitudes, beliefs and values" category was omitted. For the same reason, we omitted "community institutions" from the "social organization" category.

The "lifestyle" classification was examined extensively in the Socio-Economic Overview (pp 62-92). Six lifestyle categories were described there:

Native American;

Farmer;

Loggers;

Millworker;

Small town merchants; and

Government employees.

Except for the "Native American" category, these lifestyles are related to employment choices although they are not limited to these choices. See the Socio-Economic Overview for more information on "lifestyles "

Since leisure activities are important, they were added as a separately defined social effect. Therefore, the final list of social measures is the following:

Work-related lifestyle;

Leisure activities;

Community cohesion and community stability; and

Effects on minorities and women.

Analysis Prior to Development of Alternatives

(Section 6)

Introduction

The primary analysis performed prior to the development of alternatives was the "Analysis of the Management Situation" (AMS). During this step, the conditions of the Forest, its ability to produce outputs, and society's demands for its resources were assessed. The analysis performed during this step helped to define the "decision space" within which the Forest can operate. The detailed results of this analysis step can be found in the planning documents titled "Analysis of the Management Situation."

The purpose of benchmarks is to define the range within which integrated alternatives will be developed.

Benchmark analysis will enable the Forest to:

Comply with planning regulation direction to establish management requirements (36 CFR 219.27);

Estimate the schedule of management activities, resource outputs, effects, costs, and PNV appropriate to achieving the purpose of the benchmarks; and

Analyze the implications of legal and policy constraints and economic assumptions.

Benchmarks will:

Be approximately implementable;

Not be constrained by budget;

Will generally use a Maximum PNV objective function to obtain a final analytical solution when FORPLAN is used, and

Meet management requirements.

The required benchmarks are:

Minimum level;

Maximum PNV using market prices only,

Maximum PNV including assigned values,

Maximum resource levels; and

Current Level.

For the Ochoco National Forest and Crooked River National Grassland, the following Maximum Resource Levels are displayed:

Timber;

Range,

Big Game; and

Recreation.

Changes Between DEIS and FEIS

The major changes discussed in this section are

Dropping an MR (thermal cover),

The effects of being characterized as having a

"surplus" inventory;

The smaller change in PNV and timber volume between the Max PNV and timber benchmarks,

The effects of different demand assumptions, timber outputs, costs, production relationships and how they relate to the production of market vs. nonmarket outputs,

The potential to maximize various resources, and

The addition of four new ICO's.

Management Requirements

Development and Efficiency Analysis

Management requirements are directed toward assuring that a viable level of resources will be provided for, both short term and over time.

These requirements stem from the National Forest Management Act as interpreted by the implementing regulations (36 CFR 219.27). The following sections of 219.27 contain the basic direction for management requirements:

Resource Protection;

Vegetative Manipulation,

Silvicultural Practices,

Even-Aged Management;

Riparian Areas;

Soil and Water; and

Diversity.

Further direction for incorporating these requirements has been provided to the Forest in the form of "Regional Guidelines for Incorporating Minimum Management Requirements in Forest Planning" (1920 2/9/83). Those minimum management requirements described in the Regional Guidelines address:

Requirements that are outside the Forest Service's authority to change;

Requirements which impose substantive standards (as opposed to procedural),

Requirements that can be dealt with in the analysis, and

Requirements which are likely to have an impact on the analysis.

Other direction which helped form the basis for the Ochoco's approach are: April 16, 1984, RO 1920 Clarification of Wildlife MMR Direction by J. Simon, June 1986, RO, A Report on Minimum Management Requirements for Forest Planning on the National Forests of the Pacific Northwest Region, USDA Forest Service; June 1986, RO, A Background Document on the Development and Review of Minimum Management Requirements for Forest Planning on the National Forests of the Pacific Northwest Region, USDA Forest Service.

The Forest Interdisciplinary (ID) Team worked over a period of several years attempting to interpret and define specific management requirements applicable to the Ochoco National Forest and Crooked River National Grassland. Those requirements pertinent to the Ochoco where the Forest has discretion in the methods used to meet the requirement include old growth, riparian areas, harvest dispersion, soil and water conservation, and other wildlife habitat. In each of these cases the Forest evaluated alternative methods of meeting the requirement and, where identical effects resulted, chose the method with the least impact on PNV. Chosen methods have been incorporated into the Forest FORPLAN model.

In the fall of 1986 the Northwest Forest Resource Council filed an appeal contesting these management requirements. The appeal resulted in the Ochoco National Forest issuing a supplement to the DEIS in the fall of 1988. The supplement in part dealt with the same information discussed here. Appendix F in

the FEIS contains a more detailed discussion of this information.

In the case of old growth, the Ochoco followed Regional planning direction (1920 11/10/83) which states that this assessment can take a variety of forms, including "1) use mapping systems and logic to distribute the species in a way that minimizes the impact on the commercial forest land base but still achieves the distributional requirements of the species, 2) conduct Regional analysis to determine whether setasides or long rotations are least impactful..." The Ochoco constructed a map to the minimum level of old growth habitat following recent revision of Regional direction (1920 4/16/84).

While there was little flexibility left because of the distributional requirements, logic was applied to minimize the impact on the suitable timber land base. Examples include placing the maximum number of stands in designated Wilderness areas, the RNA, and in areas with a high probability of less intensive timber management such as visual corridors, riparian areas, and less economically viable unroaded areas. Other Forests in the region with a similar timber inventory structure to the Ochoco's have conducted some analysis of the relative efficiencies of a dedicated or managed approach. The Siuslaw found that a dedicated approach was more efficient on the order of a two to four percent difference in PNV. The Wallowa-Whitman also found a dedicated approach to be more efficient with a difference of less than one percent in PNV. Both of these Forests performed their analysis by comparing FORPLAN runs with all constraints except for old growth remaining constant between runs Additionally, an analysis conducted on the Ochoco showed the dedicated approach to be more efficient.

The basic procedure followed was to calculate the percent of a rotation that would be in old growth, the area needed to support a given level of old growth with those rotation ages, and the resultant difference in mean annual increment (MAI). Forest-wide yield differences on a MAI basis were then calculated. Various management schemes using different rotations and different levels of old growth for both mixed conifer and ponderosa pine were examined and in every case a dedicated approach was found to be more efficient (Ochoco planning files 8/16/82). In summary, dedicated stands were mapped in a manner to minimize the impact on the suitable timber land base Results of FORPLAN analysis conducted by forests with a similar timber inventory structure, and an analysis conducted on the Ochoco showed the dedicated approach to be more cost-efficient. Therefore, the Forest elected to use the dedicated habitat modeling approach.

Several methods of meeting management requirements for riparian areas were considered. The more direct method involved dedicating riparian areas to non-timber harvest prescriptions. This would most directly ensure meeting management requirements but would also have the greatest impact on timber harvest and, therefore, the most impact on PNV.

The ID team thus sought to find alternative standards and guidelines that would meet riparian requirements but have less impact on PNV. The approach decided upon relies on a mix of practices and project level standards and guidelines, as well as harvest restrictions. These guidelines include the following:

Use of designated skid trails;

Use of non-mechanical slash disposal;

Use of non-mechanical site preparation;

Cable logging systems on slopes greater than 30 percent;

Limits on road density and stream crossings;

Extended rotations (200 years) and/or uneven-aged management;

Limitation in the amount of riparian areas available for timber harvest in any one decade, and

Manipulation of grazing utilization standards rather than structural improvements.

In addition, after ID team evaluation, the Forest decided that restrictions in riparian areas should only be placed on Class I and II streams and not the much more numerous Class III and IV streams. Thus, these requirements affect approximately 18,000 acres (less than two percent of the land area).

The DEIS contained a requirement of ten percent cover in winter range. This requirement came directly from Regional direction. Since then, Regional direction has been modified and this requirement was dropped. The Forest is explicitly modeling cover in the Ochoco FORPLAN model. This allows the linear program to select the most efficient set of management intensities and the scheduling thereof to meet overall Forest objectives as well as the thermal cover constraint. Considerable effort was expended by the Forest, as documented in planning files (1920 5/16/84, 1920 9/10/84), to assure that the best set of management intensities and schedulings is available for the model to select from.

Harvest dispersion constraints are also explicitly portrayed in the Ochoco FORPLAN model. Following the two-step process in the Regional planning direction (1920 11/10/83), a theoretical dispersion factor was first calculated and then validated by extensive mapping (1920 5/31/84). This factor has been thoroughly evaluated by the IDT and tested by both Forest and District personnel. This analysis showed that a 33 percent limit on regeneration harvest by analysis area was appropriate. One distinction made in the Forest's modeling is between planting and natural regeneration. This has a direct effect on dispersion since natural regeneration takes twice as long to grow out of the opening stage. This difference is portrayed by explicitly modeling openings and allowing the linear program to select from among various management intensities with either planting or natural regeneration to most efficiently meet Forest objectives and the harvest dispersion constraint. Again, extensive analysis was conducted to assure that the best set of practices is available for the model to select from.

An option briefly considered early in the Forest's planning efforts was to use an altogether different modeling approach where alternative harvest schedules would be determined prior to running the model, averaged over time to reflect harvest dispersion, and input to the model. Since most Forest issues and concerns, as well as the major portion of the Forest's costs and values, revolve around harvest scheduling, this scheme for modeling dispersion was dropped. Far too few of the hundreds of potential schedules available for an analysis area could be represented with this approach, thus unnecessarily limiting PNV.

Analysis of benchmark runs in the AMS indicated individual watersheds had equivalent clearcut acres exceeding 45% in the first and later decades. The Forest Management Team decided this level would not meet management requirements for soil and water. The Forest's watersheds were then analyzed and assigned harvest level thresholds which they could absorb without significant impacts to the soil and water resources. Numerous FORPLAN runs were made to find the modeling techniques with the least impacts on PNV and timber volume while meeting this objective.

These final dispersion constraints include regeneration harvest limitation of between 17 and 23 percent (depending upon proportion of analysis area within low, moderate, or high sensitivity watersheds), and a 50 - 67 percent limitation on first decade overstory removals. Regeneration harvest limitations are applied to a scheduled output that tracks the difference between natural and artificial regeneration in terms of the time it takes to grow out of the opening stage. (See planning record 1920 8/13/85.)

Management requirements for the provision of snags outside of areas dedicated to old growth management relate to snags 12 inches in diameter or less Analysis of benchmark runs showed that these levels could be provided through normal mortality and that no constraints or allocations are necessary to meet this requirement.

Opportunity Costs

Several FORPLAN runs were made with different MR constraints present so that the impacts of management requirements and National and Regional direction could be determined. All of these runs used run #3 (BM5) in Cargill's (1920, May 17, 1983) benchmark run sequence as a basis for comparison This run maximized PNV subject to nondeclining yield and rotations restricted by CMAI. The runs used for comparison differ from run BM5 only in the presence of constraints designed to meet one or

TABLE B-6-1
MANAGEMENT REQUIREMENT ANALYSIS RESULTS

		Annual Timber Output MMCF 2/		
ID 1/	Management Requirement Constraints	Decade 1	LRSY	PNV (MM$) 3/
BM5	None	23 4	23 4	494 0
BMA	Old Growth Only	22 8	22 8	478 1
BMB	Cover Only 4/	23 2	23 2	492 0
BMD	Harvest Dispersion Only	23 3	23 3	477 6
BMC	Watershed Dispersion Only	22 4	22 5	449 6
B7E	All	21 3	21 6	429 1

1/ All of these runs maximize PNV subject to non-declining yield and use of CMAI rotations
2/ Volume figures do not include unregulated salvage All runs produce at the LRSY level in decade 1 except BMC (watershed dispersion) and B7E (maximum PNV benchmark)
3/ These PNV figures are taken directly from the FORPLAN reports and are not 100% comparable to PNV s given elsewhere in the DEIS For comparison purposes, however, these figures are accurate
4/ Dropped as a management requirement in the FEIS

more MMR. Table B-6-1 shows the results of these runs. Comparisons in this narrative will be in terms of the change in PNV. Timber volume trade-offs in cubic feet can be determined from the table. The effect of not providing for these MR's is addressed in more detail in Appendix F.

When constraints to meet all management requirements are present, the total impact on PNV is a reduction of 13.2 percent (run BM5 compared to run B7E). Three other runs were made to look at the impact of individual MR constraint sets (old growth, harvest dispersion and watershed dispersion). A forth MR constraint, special riparian area prescriptions, was not examined individually due to the minor impact on PNV (one percent). PNV reductions caused by the constraints individually amounted to 3.2 percent for old growth (run BMA compared to run 607BM5), 3.4 percent for harvest dispersion (run BMD compared to run 607BM5), and nine percent for watershed dispersion (run BMC compared to run BM5). The reduction in PNV for harvest dispersion while timber outputs remain unchanged is due to the difference between planting and natural regeneration in the amount of time required to grow out of the opening stage. To meet dispersion requirements, more expensive planting is frequently required.

Results of comparisons of individual management requirements would represent the maximum impact of that constraint. The linear program would not have an opportunity to consider any overlapping or interactive effects in its optimization procedures. However, these particular constraints are largely independent of one another except for harvest dispersion and watershed dispersion. In this case the watershed dispersion constraints are much more restrictive and completely overlap the harvest dispersion constraints. The independent nature of these constrains can be seen by comparing the total impact of 13.2 percent to the sum of the individual impacts, excluding harvest dispersion impacts (15.5 percent). In the context of a particular alternative, however, more overlapping of constraints, hence less of an impact on PNV, would be expected

The preceding discussion relates directly to the DEIS. Since then changes in some of the relationships and model updates would result in minor changes. Due to the probable magnitude of the changes and the high cost and time to update, these analyses were not updated.

Timber Harvest Policy Benchmark Analysis

In response to National and Regional direction, the Ochoco followed the benchmark run sequence (1920 8/8/83, 1920 11/10/83) in order to develop information to display the impacts of timber harvest policies (see Table B-6-2). The two types of constraints examined were nondeclining yield and rotations restricted to culmination of mean annual increment (CMAI). Using the results of the benchmark run sequence, these two policies can be examined either independently or in combination, and either with or without management requirements. As with the preceding section's management requirements, this analysis has been carried forward from the DEIS.

Looking first at rotations restricted by CMAI, the Ochoco found that the impacts on PNV are less than one percent under nondeclining yield (run #6 compared to run #7) and 1.1 percent with 25 percent sequential bounds (run #4 compared to run #5). This is not surprising since the Forest spent considerable effort constructing harvest schedules for the numerous two storied stands which most efficiently provide volume in the critical decades of the conversion period with rotations at CMAI. The small increase in PNV with a two percent increase in timber volume can be attributed to the fact that, because of the early rotation ages in the future and LRSY not being binding in BM3, more of the high volume and high valued existing stands can be harvested now. All four of these runs include constraints necessary to meet management requirements. Model updates described in Section 3, have resulted in the model characterizing the Ochoco as a surplus forest in which the LRSY is binding on the ASQ. As a result, rotation short of culmination has little to no effect on ASQ because moving rotation ages forward from their biological potential has a tendency to reduce LRSY which would further impact the ASQ.

Results of comparing runs made with and without strict nondeclining yield requirements, however, show a much more significant impact. With CMAI rotation constraints the nondeclining yield constraints reduce PNV by 1.1 percent (run #7 compared to run #5). Without the CMAI restrictions PNV is reduced by 1.4 percent (run #6 compared to run #4) with strict nondeclining yield. Timber volume on the other hand, is reduced by 15 percent in both runs under NDY (runs 6 and 7) This large decrease in timber volume with only a minor drop in PNV is a result of the departure run's additional volume coming from lower value/higher cost stands which were not

TABLE B-6-2
TIMBER HARVEST POLICY ANALYSIS

	Annual Timber Output 2/		
Benchmark Run Sequence Number 1/ (FORPLAN Run ID)	Decade 1 (MMCF/M)	LRSY 2/ (MMCF)	PNV 3/ (MM$)
1 BIA (NDY-CMAI)	24 5	24 5	379 0
2 BM4 (Dep, UTIL)	41 2	22 5	532 2
3 BM5 (NDY-CMAI)	23 4	23 4	494 0
4 BM1 (Dep-UTIL,MMR)	25 4	21 4	438 5
5 BM2 (Dep-CMAI-MMR)	25 2	21 6	433 8
6 BM3 (NDY-UTIL-MMR)	21.8	21 8	432 2
7 B7E (NDY-CMAI-MMR)	21 3	21 6	429 1

1/ Run numbers follow the convention established in Cargill's 1920 letter of 8/8/83 and use the constraints and objective function defined in that direction
2/ Volume figures do not include unregulated salvage All runs with the nondeclining yield constraint produce at the LRSY level in decade 1 except B7E
3/ These PNV figures are those taken directly from the FORPLAN reports and are not 100% comparable to PNV's given elsewhere in the AMS For comparison and relative purposes, however, these figures are accurate

selected by the runs with a nondeclining yield formulation. All four of these runs include constraints necessary to meet management requirements. It is also expected that with a surplus inventory a departure schedule would have little to no effect. Even with shorter rotations, the existing inventory will still have control over the departure schedule. This is because the existing inventory will still need to be meted out until new stands (short of culmination) are available for harvest.

The effects of these two requirements (CMA and NDY) in combination can also be extracted from the results of the benchmark run sequence. In general, since the CMAI restrictions have such a small effect, results are very similar to those obtained looking only at the nondeclining yield requirements With all management requirements met, the effect on PNV of the nondeclining yield constraints and CMAI restrictions together is 2.2 percent (run #7 compared to run #4). Without management requirement restrictions the impact on PNV is 7.1 percent (run #3 compared to run #2). The greater difference in PNV between these four runs and that shown between runs 7 and 5 and 6 and 4, which were discussed above, indicates that it is the management requirements which prevent a departure schedule from dramatically increasing PNV while increasing harvested volume.

Because the assigned value and market value benchmarks treat the timber resource in the same way, the impacts of timber harvest policies (NDY and CMAI) will be the same for both.

The effect of removing the nondeclining even flow constraint results in elk and deer numbers remaining similar to today's level for the first two decades. A drastic reduction occurs in the fourth decade and is only slightly above viable population levels in the fifth decade.

The decline in big game populations after the third decade is due to intensive timber harvesting during the earlier decades. This results in low amounts of cover, which is poorly dispersed, and high road densities.

Removing nondeclining even flow increases sediment production between 1.4 and 1.9 times more than the other benchmark runs in the first decade. However total sediment projections are less than the total sediment for Maximum Timber, PNV, Range, and Current Situations benchmarks. Water runoff on the other hand only increases seven percent over non-departure benchmarks.

Benchmark Descriptions

Minimum Level

Description and Purpose

The minimum level benchmark is a determination of the minimum costs and resultant outputs necessary to retain National Forest lands in Federal ownership. Minimum environmental constraints and protection of the life, health and safety of users must be provided.

The purpose of developing the minimum level benchmark is:

To determine the minimum costs involved with maintaining National Forest lands in the National Forest system; i.e., a cost level that is not discretionary in the Programming and Budgeting process; and

To determine the outputs and effects related to this "minimum expenditure" level.

Assumptions and Constraints

In the process of formulating benchmarks and alternatives certain assumptions must be made and constraints specified in order to model or portray complex relationships and estimate costs, outputs, and effects. Those assumptions and constraints with significant bearing on cost, output, and effect estimation are listed below

Wild horse numbers are managed at today's levels according to the Big Summit Territory Management Plan.

Big game user days (WFUD's) change directly in response to changes in big game habitat capability.

Riparian based recreation use increases when riparian conditions are enhanced.

The quantity and quality of thermal cover directly affect big game habitat capability. Hiding cover and forage are both available in abundant supply and do not limit habitat capability.

Practices and costs are only those necessary to keep the Forest in public ownership.

Some costs are necessary to protect the life, health, and safety of incidental users; to prevent environmental damage to lands or resources of adjoining ownerships, administer unavoidable special uses; and to not allow significant impairment of the productivity of the land.

Outputs associated with this benchmark include only uncontrollable outputs and uses, such as naturally occurring water runoff, wildlife and fish, and dispersed recreation.

Costs for a transition "close down" are not included, as per Regional direction (11/10/83).

No Action with NFMA Requirements

Description and Purpose

This benchmark is also Alternative A in the FEIS.

In the DEIS the purpose behind this particular analysis is to isolate the outputs and costs that can be attributed to NFMA requirements not currently incorporated in the Current Situation Alternative, as well as to present a version of the current situation alternative updated to reflect NFMA requirements. In the FEIS, Alternative A has been modified and now incorporates all NFMA requirements. As a result, there is no difference between the No Action benchmark and Alternative A(No Action). The No Action Benchmark is displayed here for comparative purposes only.

Assumptions and Constraints

In the process of formulating benchmarks and alternatives certain assumptions must be made and constraints specified in order to model or portray complex relationships and estimate costs, outputs, and effects. Those assumptions and constraints with significant bearing on cost, output, and effect estimation are listed below.

Timber harvest is scheduled only on lands classified as suitable for timber harvest through the Stage I suitability analysis (see Appendix for acreages).

Sufficient ending timber inventory must remain at the end of the modeling horizon to sustain timber harvest at the long run sustained yield capacity.

Regeneration harvests cannot be scheduled until stands have reached 95% of culmination of mean annual increment.

Wild horse numbers are managed at today's levels according to the Big Summit Territory Management Plan.

Big game user days (WFUD's) change directly in response to changes in big game habitat capability.

Riparian based recreation use increases when riparian conditions are enhanced.

Allocations used are those specified in current unit plans as interpreted by the IDT and Forest Management Team.

Timber harvest cannot decrease in any decade as compared to the immediately preceding decade (NDY).

Timber harvest cannot exceed the long run sustained yield capacity in any decade.

An objective function of maximizing timber for the first decade was used. Timber outputs were then "rolled over" to a second run which used a maximum PNV objective function for 15 periods.

Maximum PNV Using Market Values Only

Description and Purpose

This benchmark estimates the maximum PNV that might be attained on the Forest by valuing only those outputs that have an established market price (timber, range, and developed recreation), subject to management requirements, rotation age restrictions (CMAI), and non-declining yield.

The purpose of developing this benchmark is to estimate the level of goods and services produced by a maximum PNV objective and to permit a comparison of this PNV and associated outputs with the PNV and outputs of other benchmarks and plan alternatives.

Assumptions and Constraints

In the process of formulating benchmarks and alternatives certain assumptions must be made and constraints specified in order to model or portray complex relationships and estimate costs, outputs, and effects. Those assumptions and constraints with significant bearing on cost, output, and effect estimation are listed below.

Timber harvest is scheduled only on lands classified as suitable for timber harvest through the Stage I suitability analysis (see Process Record 1920 1/84 for acreages).

Timber harvest cannot exceed the long run sustained yield capacity in any decade.

Sufficient ending timber inventory must remain at the end of the modeling horizon to sustain timber harvest at the long run sustained yield capacity.

Timber harvest cannot decrease in any decade as compared to the immediately preceding decade (NDY).

Regeneration harvests cannot be scheduled until stands have reached 95% of culmination of mean annual increment.

Regeneration harvests are dispersed to meet Regional Guidelines for size and separation of harvest units.

Regeneration harvests and overstory removals are dispersed to meet management requirement for soil and water.

Less intensive silvicultural practices are scheduled in riparian areas to meet management requirements for soil and water.

Old growth units are dedicated according to Regional Guidelines for distribution and amount to meet management requirements for primary cavity excavators.

Wild horse numbers are managed at today's levels according to the Big Summit Territory Management Plan.

Big game user days (WFUD's) change directly in response to changes in big game habitat capability.

Riparian based recreation use increases when riparian conditions are enhanced.

The quantity and quality of thermal cover directly affect big game habitat capability. Hiding cover and forage are both available in abundant supply and do not limit habitat capability.

Objective function used is to maximize present net value for the entire modeling horizon using only market values.

Areas of the forest not allocated to old growth, riparian, wilderness, or research natural areas are allocated to the timber/range prescription

Maximum PNV Using Assigned Values

Description and Purpose

This benchmark estimates the maximum PNV that might be attained on the Forest by valuing outputs with either market or assigned values, subject to minimum management requirements, rotation age restrictions (CMAI), and non-declining yield.

The purpose of developing this benchmark is to estimate the level of goods and services produced by a max PNV objective and to permit a comparison of this PNV and associated outputs with the PNV and outputs of other benchmarks and plan alternatives.

Assumptions and Constraints

In the process of formulating benchmarks and alternatives certain assumptions must be made and constraints specified in order to model or portray complex relationships and estimate costs, outputs, and effects. Those assumptions and constraints with significant bearing on cost, output, and effect estimation are listed below.

Timber harvest is scheduled only on lands classified as suitable for timber harvest through the Stage I suitability analysis (see Process Record 1920 1/84 for acreages).

Timber harvest cannot exceed the long run sustained yield capacity in any decade.

Sufficient ending timber inventory must remain at the end of the modeling horizon to sustain timber harvest at the long run sustained yield capacity.

Timber harvest cannot decrease in any decade as compared to the immediately preceding decade (NDY).

Regeneration harvests cannot be scheduled until stands have reached 95% of culmination of mean annual increment.

Regeneration harvests are dispersed to meet Regional Guidelines for size and separation of harvest units.

Regeneration harvests and overstory removals are dispersed to meet management requirement for soil and water.

Less intensive silvicultural practices are scheduled in riparian areas to meet management requirements for soil and water.

Old growth units are dedicated according to Regional Guidelines for distribution and amount to meet management requirements for primary cavity excavators

Wild horse numbers are managed at todays levels according to the Big Summit Territory Management Plan.

Big game user days (WFUD's) change directly in response to changes in big game habitat capability.

Riparian based recreation use increases when riparian conditions are enhanced.

The quantity and quality of thermal cover directly affect big game habitat capability. Hiding cover and forage are both available in abundant supply and do not limit habitat capability.

Objective function used is to maximize present net value for the entire modeling horizon including both market values and assigned values.

Analysis summarized below showed that the only adjustment to the FORPLAN allocation of lands for costs and benefits not included in the model that should be made according to the maximization of PNV criterion when assigned values are included was to use the enhance riparian prescription.

Areas of the forest not allocated to old growth, riparian, wilderness, or research natural areas are allocated to the timber/range prescription.

Maximum Recreation/ Unroaded

Description and Purpose

This benchmark estimates the maximum capability of the Forest and Grassland to provide semi-primitive nonmotorized, semi-primitive motorized, roaded natural, and developed recreation opportunities subject to management requirements, rotation age restrictions (CMAI), and non-declining yield.

Assumptions and Constraints

In the process of formulating benchmarks and alternatives certain assumptions must be made and con-

straints specified in order to model or portray complex relationships and estimate costs, outputs, and effects. Those assumptions and constraints with significant bearing on cost, output, and effect estimation are listed below.

Timber harvest is scheduled only on lands classified as suitable for timber harvest through the Stage I suitability analysis (see Process Record 1920 1/84 for acreages).

Timber harvest cannot exceed the long run sustained yield capacity in any decade.

Sufficient ending timber inventory must remain at the end of the modeling horizon to sustain timber harvest at the long run sustained yield capacity.

Timber harvest cannot decrease in any decade as compared to the immediately preceding decade (NDY).

Regeneration harvests cannot be scheduled until stands have reached 95 percent of culmination of mean annual increment.

Regeneration harvests are dispersed to meet Regional Guidelines for size and separation of harvest units.

Regeneration harvests and overstory removals are dispersed to meet management requirements for soil and water.

Less intensive silvicultural practices are scheduled in riparian areas to meet management requirements for soil and water.

Old growth units are dedicated according to Regional Guidelines for distribution and amount to meet management requirements for primary cavity excavators.

Wild horse numbers are managed at today's levels according to the Big Summit Territory Management Plan.

Big game user days (WFUD's) change directly in response to changes in big game habitat capability.

Riparian based recreation use increases when riparian conditions are enhanced.

The quantity and quality of thermal cover directly affect big game habitat capability. Hiding cover and forage are both available in abundant supply and do not limit habitat capability.

Objective function used is to maximize Present Net Value for the entire modeling horizon.

All currently inventoried semi-primitive nonmotorized and semi-primitive motorized areas are allocated to prescriptions maintaining that character.

Riparian areas receive additional protection to enhance riparian conditions.

Construction of new facilities results in increased developed recreation use.

The Deschutes Canyon Further Planning Area would be recommended for wilderness in this benchmark.

Remaining areas of the Forest and Grassland are allocated to big game prescriptions with the corresponding thermal cover constraints and road closure costs.

Maximum Timber

Description and Purpose

This benchmark estimates the maximum level of timber volume that can be attained on the Forest, subject to rotation age restrictions, nondeclining yield, and management requirements.

The purpose of developing this benchmark is to determine the maximum level of timber volume that can be produced on the Forest, subject to management requirements, rotation age restrictions (CMAI), and nondeclining yield.

Assumptions and Constraints

In the process of formulating benchmarks and alternatives certain assumptions must be made and constraints specified in order to model or portray complex relationships and estimate costs, outputs, and

effects. Those assumptions and constraints with significant bearing on cost, output, and effect estimation are listed below.

Timber harvest is scheduled only on lands classified as suitable for timber harvest through the Stage I suitability analysis (see Process Record 1920 1/84 for acreages).

Timber harvest cannot exceed the long run sustained yield capacity in any decade.

Sufficient timber inventory must remain at the end of the modeling horizon to sustain timber harvest at the long run sustained yield capacity.

Timber harvest cannot decrease in any decade as compared to the immediately preceding decade (NDY).

Regeneration harvests cannot be scheduled until stands have reached 95 percent of culmination of mean annual increment.

Regeneration harvests are dispersed to meet Regional Guidelines for size and separation of harvest units.

Regeneration harvests and overstory removals are dispersed to meet management requirements for soil and water.

Less intensive silvicultural practices are scheduled in riparian areas to meet management requirements for soil and water.

Old growth units are dedicated according to Regional Guidelines for distribution and amount to meet management requirements for primary cavity excavators.

Wild horse numbers are managed at today's levels according to the Big Summit Territory Management Plan.

Big game user days (WFUD's) change directly in response to changes in big game habitat capability.

Riparian based recreation use increases when riparian conditions are enhanced.

The quantity and quality of thermal cover directly affect big game habitat capability. Hiding cover and forage are both available in abundant supply and do not limit habitat capability.

Timber harvest levels are determined through the following process:

A run is made which maximizes timber for the first decade.

Using that run's results for the first decade, another run maximizes timber for all 15 decades.

Constraining in the results of the second run, a third run is made in which the objective function is to maximize Present Net Value for the entire modeling horizon.

Areas of the Forest other than old growth, riparian, wilderness, or research natural areas are allocated to the timber/range prescription.

Maximum Range

Description and Purpose

This benchmark estimates the maximum capability of the Forest and Grassland to provide commercial livestock grazing, subject to management requirements, rotation age restrictions (CMAI), and nondeclining yield.

The purpose of this benchmark is to show the maximum level of commercial livestock grazing.

Assumptions and Constraints

In the process of formulating benchmarks and alternatives certain assumptions must be made and constraints specified in order to model or portray complex relationships and estimate costs, outputs, and effects. Those assumptions and constraints with significant bearing on cost, output, and effect estimation are listed below.

Timber harvest is scheduled only on lands classified as suitable for timber harvest through the Stage I suitability analysis (see Process Record 1920 1/84 for acreages).

Timber harvest cannot exceed the long run sus-

tained yield capacity in any decade.

Sufficient ending timber inventory must remain at the end of the modeling horizon to sustain timber harvest at the long run sustained yield capacity.

Timber harvest cannot decrease in any decade as compared to the immediately preceding decade (NDY).

Regeneration harvests cannot be scheduled until stands have reached 95 percent of culmination of mean annual increment.

Regeneration harvests are dispersed to meet Regional Guidelines for size and separation of harvest units.

Regeneration harvests and overstory removals are dispersed to meet management requirements for soil and water.

Less intensive silvicultural practices are scheduled in riparian areas to meet management requirements for soil and water.

Old growth units are dedicated according to Regional Guidelines for distribution and amount to meet management requirements for primary cavity excavators.

Wild horse numbers are managed at today's levels according to the Big Summit Territory Management Plan.

Big game user days (WFUD's) change directly in response to changes in big game habitat capability.

Riparian based recreation use increases when riparian conditions are enhanced.

The quantity and quality of thermal cover directly affect big game habitat capability. Hiding cover and forage are both available in abundant supply and do not limit habitat capability.

Forage output levels are determined through the following process:

A run is made which maximizes forage for all 15 decades.

Constraining in the results of the first run, a second run is made in which the objective function is to maximize the PNV for the entire modeling horizon.

Areas of the Forest other than old growth, riparian, wilderness, or research natural areas are allocated to the timber/range prescription.

Acreage limitations on mechanical treatments were set so that only operable soils with range in poor to fair condition are scheduled for treatment.

Acreage limitations on non-mechanical treatments were set at operationally feasible levels to prevent extreme disruptions in grazing programs.

Maximum Big Game

Description and Purpose

This benchmark estimates the maximum capability of the Forest and Grassland to produce big game subject to management requirements, rotation age restrictions (CMAI), and non-declining yield.

The purpose of this benchmark is to show the maximum level of big game.

Assumptions and Constraints

In the process of formulating benchmarks and alternatives certain assumptions must be made and constraints specified in order to model or portray complex relationships and estimate costs, outputs, and effects. Those assumptions and constraints with significant bearing on cost, output, and effect estimation are listed below.

Timber harvest is scheduled only on lands classified as suitable for timber harvest through the Stage I suitability analysis (see Process Record 1920 1/84 for acreages).

Timber harvest cannot exceed the long run sustained yield capacity in any decade.

Sufficient ending timber inventory must remain at the end of the modeling horizon to sustain timber harvest at the long run sustained yield

capacity.

Timber harvest cannot decrease in any decade as compared to the immediately preceding decade (NDY).

Regeneration harvests cannot be scheduled until stands have reached 95 percent of culmination of mean annual increment.

Regeneration harvests are dispersed to meet Regional Guidelines for size and separation of harvest units.

Regeneration harvests and overstory removals are dispersed to meet management requirements for soil and water.

Less intensive silvicultural practices are scheduled in riparian areas to meet management requirements for soil and water.

Old growth units are dedicated according to Regional Guidelines for distribution and amount to meet minimum management requirements for primary cavity excavators.

Wild horse numbers are managed at today's levels according to the Big Summit Territory Management Plan.

Big game user days (WFUD's) change directly in response to changes in big game habitat capability.

Riparian based recreation use increases when riparian conditions are enhanced.

The quantity and quality of thermal cover directly affect big game habitat capability. Hiding cover and forage are both available in abundant supply and do not limit habitat capability.

Objective function used is to maximize present net value for the entire modeling horizon.

Areas of the forest other than old growth, riparian, wilderness, or research natural areas are allocated to big game prescriptions with the corresponding thermal cover constraints and road closure costs.

Opportunity Cost of Maximum Production, Minimum Level and No Action Benchmarks

An analysis of benchmarks was conducted to ascertain opportunity costs associated with the resolution of ICO's. These evaluations were completed using a common constraint set to localize the effect directly attributable to achieving a specific resource objective. The opportunity cost displayed here are in addition to these associated with management requirements and timber harvest policy. The following two sections treat this information in more detail.

The discussion and values in the next three sections are taken from the DEIS. Although the values would change if updated, no change in relationships is expected. When values or relationships change, the effect will be discussed. Table 3-3B contains some of the same information (updated) as Table 3-3A.

Max Timber Benchmark

Runs compared:	B7E	(PNV 479 MM$)
	BT5	(PNV 441 MM$)

Opportunity Cost: 38 MM$ (eight percent reduction)

Land assignments selected by FORPLAN to maximize timber production are identical to those selected to maximize PNV. This is primarily due to timber's significant contribution to PNV, relative to other resource values. Opportunity costs associated with maximizing timber production occur because less efficient acres are brought into solution earlier in the planning horizon. In addition, the model selects less efficient management intensities than it would select under Max PNV. PNV declines eight percent ($38 million); average annual first decade timber production increases seven percent (1.5 MMCF). Between the DEIS and FEIS, changes in the timber yield tables and analysis area data have resulted in a smaller decline in PNV and a smaller increase in ASQ.

Max Unroaded Benchmark

Runs Compared: B7E (PNV 479 MM$)
BR3 (PNV 453 MM$)

Opportunity Cost: 26 MM$ (five percent reduction)

All presently unroaded land was placed under custodial management in this benchmark which reduced the available/suitable timber base relative to Max PNV. The remainder of the suitable acres is assigned to big game prescriptions, which limits the intensity of management and harvest scheduling flexibility. Average annual first decade timber yield is reduced 5.3 MMCF (29 percent). A reduction in PNV (five percent) occurs with the reduction in timber harvest as the increased recreational use is not sufficient to completely offset the loss in timber revenues.

Max Range Benchmark

Run Compared: B7E (PNV 479 MM$)
BF5 (PNV 425 MM$)

Opportunity Cost: 54 MM$ (11 percent reduction)

Average annual first decade timber yield increased .3 MMCF due to an increase in management intensity relative to the Max PNV. PNV was reduced 11 MM$ because increased livestock use could not offset the foregone timber values (lower value, higher cost relative to the Max PNV benchmark).

Max Big Game Benchmark

Runs Compared: B7E (PNV 479 MM$)
BE3 (PNV 422 MM$)

Opportunity Cost: 57 MM$ (12 percent reduction)

Management intensities required to achieve optimum habitat for big game species reduce the harvest scheduling flexibility relative to the Max PNV. Average annual first decade timber harvest declined 4.7 MMCF. Reductions in PNV (12 percent) are primarily due to the reduction in timber harvest. The increase in wildlife user days was not enough to offset forage and timber values.

Min Level Benchmark

Runs Compared B7A (PNV 479 MM$)
MINLVL (PNV 176 MM$)

Opportunity Cost: 303 MM$ (63 percent reduction)

The Min Level Benchmark defines the costs and benefits of operating the Forest in a custodial fashion, with no production of controllable goods and services such as timber or developed recreation. Management under this benchmark reduces PNV by 63 percent and essentially terminates all market outputs with the exception of anadromous fish for commercial harvest.

No Action Benchmark

Runs Compared: B7E (PNV 479 MM$)
5A6 (PNV 388 MM$)

Opportunity Cost: 91 MM$ (19 percent reduction)

Land assignments in this benchmark are identical to those of the "No Action" Alternative. The multiple-use orientation of this benchmark reduces average annual first decade timber harvest 2.5 MMCF (11 percent), relative to Max PNV. PNV declines 91 MM$ to meet the resource objectives specified in existing management plans.

Significant Relationships in the Production of Market and Nonmarket Outputs

Comparison of outputs, costs, and effects for the Max PNV benchmark which includes assigned values shows only minor differences as compared to Max PNV with only market values. A determination of how the allocation and scheduling of lands and resources would differ if assigned values were also used requires an analysis of the relationships and

trade-offs between resource outputs with market based values and those with assigned values. Outputs with assigned values that could affect the allocation and scheduling of market valued resources include semiprimitive nonmotorized RVD's, semiprimitive motorized RVD's, big game WFUD's, fishing WFUD's, and soil and water outputs. Other outputs with assigned values do not change from one benchmark to another. Results of the analysis conducted by the Forest are summarized below.

Semiprimitive nonmotorized and motorized RVD's can only be produced on areas of the Forest in a currently unroaded or near unroaded condition. When these areas are allocated to prescriptions enabling maintenance of semiprimitive recreation opportunities there results an increase in present value of $11,551,000 due to increased SPNM and SPM RVD's (BR3), an increase in present costs of $1,978,000 due to trail and trailhead construction (BR3), and a decrease in net present value of $27,100,000 due to foregone timber harvest (BR1 compared to B7A). The total change in PNV is -$17,523,000, which leads to the conclusion that no change in the allocation and scheduling of market resources should occur according to the maximization of present net value criterion by using the assigned values for semi primitive RVD's. Between the DEIS and FEIS both the timber model component and SPNM demand estimates were updated. As a result, both discounted timber benefits and RVD's are somewhat lower.

A comparison of the contribution to the present value of big game WFUD's and timber outputs in runs BE3 and B7E shows the trade-offs involved in present value from timber harvest necessary to obtain greater value from big game WFUD's. The only difference in these two runs is the presence of thermal cover constraints in BE3 designed to improve big game habitat capability. In run B7E, $472,990,000 of present value is attributed to timber harvests and $79,733,487 of present value is attributed to big game WFUD's. In run BE3, $398,742,000 of present value is attributed to timber harvests and $89,343,507 can be attributed to big game WFUD's. A reduction in present value of $74,248,000 from the timber resource was incurred to produce an increase of $9,609,000 in present value from the big game resource. A major reason that significant differences in big game habitat capability do not show up as significant differences in present value is that these differences mostly occur after the first two decades and are heavily discounted in present dollar terms. With non-declining yield requirements, constraints necessary to produce improved habitat capability in the future translate into early decade losses in timber contributed present value. In general those areas of the Forest that require the least trade-off of timber value (predominantly mixed conifer) are the same areas that have the best habitat capability currently and show the least change in habitat capability.

Wildlife user days associated with hunting are relatively higher in the FEIS than in the DEIS. This fact, combined with slightly lower discounted timber benefits, would lower the loss in PNV due to big game habitat but will not change the relationship

An analysis of fishing WFUD's shows the area of conflict requiring some trade-off is with livestock AUM's. Changes in timber-generated value are relatively insignificant whether a "maintain riparian conditions" prescription or an "enhance riparian prescription" is employed. However, with enhanced conditions an increase in fishing WFUD's occurs, generating an increase in present value of $12,266,100. Livestock AUM's also decrease, with an associated present value of $1,369,740. Cost decreases for livestock administration are approximately offset by increases in structural improvements necessary to obtain enhanced riparian conditions. The total change in PNV when enhancing all Class 1 and 2 streams is an increase of $11,396,360. The results of analysis in this case show that a reallocation should occur when assigned values are considered according to a maximization of PNV criterion.

Between the DEIS and FEIS the livestock/riparian interactions and fishing demand assumptions were reevaluated. This resulted in significant changes in outputs. Firstly, the amount of fishing is predicted to be higher. Also, in the FEIS anadromous fishing was valued. Capital investments needed to improve the habitat are significantly higher. Finally, the loss of

AUM's due to habitat improvement is less in the FEIS. The increase in RVD's would increase the change in the PNV while the higher cost and less reductions in AUM's would offset it. It is expected that improving riparian conditions is still more cost efficient.

Consideration of the assigned values contributed from soil and water outputs, however, shows that the magnitude of the changes in present value from soil and water is negligible as compared to the change in present value from timber that is linked to soil and water values. When comparing the resource benchmarks (excluding the minimum level) the difference in present value from the benchmark with the least soil and water value (maximum timber) to the one with the most (maximum recreation) is only $580,000. The difference in present value between benchmarks due to timber contributed value is on the order of tens of millions of dollars. Considering the minimum level benchmark where soil and water values are highest, present value attributed to soil and water increases $1,101,000 as compared to the maximum timber benchmark. The loss in present value due to foregone timber values, however, is on the order of hundreds of millions of dollars.

An additional analysis performed on the Forest was designed to ensure that the particular intensities and scheduling patterns modeled as choices in the timber-range prescription contained all of the choices used by the model to maximize Present Net Value. This analysis considered both per acre and Forest-wide scheduling aspects and is documented in planning files (1920 5/16/84 and 1920 9/10/84). Necessary changes were made as a result of this analysis, and the timber-range prescription now contains all of the flexibility in management intensity and scheduling patterns necessary to maximize PNV.

Given the conclusions of the analysis described above, it is apparent that very little difference exists in outputs, effects, and costs result due to consideration of all assigned values. The differences that do show up are attributable to use of the prescription to enhance riparian conditions.

Resource Maximization Potentials

The benchmark runs discussed earlier were made in order to explore the maximum potentials of the Forest to produce various outputs. These outputs include present net value, range, recreation, timber, and big game. In addition to helping define the maximum resource production capabilities of the Forest and the decision space within which alternatives can be developed to address the planning ICO's, some idea can be obtained about the magnitude of output tradeoffs that are incurred when various resources are emphasized.

The analysis was performed by providing FORPLAN with the land allocations and prescriptions which would lead to the maximization of a particular resource (i e., range or PNV, or recreation, or timber, or big game). FORPLAN was then run with a maximum PNV objective function for the Max PNV, maximum recreation and maximum big game benchmarks. On the other hand, the Maximum Timber Benchmark and Maximum Range Benchmark were first run with a maximize timber objective function, and maximize forage objective function. The timber and forage outputs from these runs were then "rolled over" to a second run which was executed with a maximum PNV objective function.

The resource output's discounted benefits and costs were calculated with electronic spreadsheets outside of FORPLAN. The budget estimations and the overall present net value calculations were also performed with the use of electronic spreadsheets.

Table B-6-3A displays the outputs and effects associated with the various resource maximization benchmarks.

A comparison of the two PNV benchmarks (market values only and assigned values plus market values) has already been presented above and for this comparison benchmark #3 (B7E, market plus assigned values) will be used as the reference point The PNV of benchmark B7E is 479 million dollars. This includes a total present value of 712 million dollars of which 215 million can be attributed to assigned

TABLE B-6-3A
OUTPUTS AND EFFECTS OF REQUIRED BENCHMARKS
DEIS

	Minimum Level	Max PNV	Max Timber	Max Range	Max Big Game	Max Unroaded Recreation	No Action
Social-Economic							
PNV (MM $)	176	479	441	425	422	453	388
Return to Treasury	0	21 6	20 7	19 3	17 2	16 2	16 5
Change In Jobs From Current Situation	-1156	69	99	20	-250	-195	118
Discounted Benefits (MM $)							
Timber	0	473	480	456	399	378	385
Recreation	73	91	91	91	91	119	88
Range	0	24	25	29	19	18	20
Fish & Wildlife	132	121	101	104	114	132	114
Soil & Water	3	5	3	3	3	3	3
Discounted Costs (MM $)	4	232	259	258	204	196	232
Harvest Levels (MMCF)							
Decade 1	0	21 8	23 3	22 1	17 1	15 5	19 3
Decade 2	0	21 8	23 3	22 1	17 1	15 5	19 3
Decade 3	0	21 8	23 3	22 1	17 1	15 5	19 3
Decade 4	0	21 8	23 3	22 1	17 1	15 5	19 3
Decade 5	0	21 8	23 3	22 1	17 1	15 5	19 3
Long Run Sustained Yield (MMCF)	0	21 6	22 8	22 7	19 2	17 6	19 5
Recreation Use (MRVD) Annual First Decade							
Developed	0	120	116	116	119	120	117
Dispersed	395	369	358	358	367	407	382
Wildlife Population Levels							
Elk (# - 5th Decade)	5,300	1,900	1,500	1,600	4,500	4,100	2,330
Deer (# - 5th Decade)	22,600	20,500	13,400	17,100	22,600	22,600	22,600
Woodpeckers (% of Blo Pot.)	100	20	20	20	20	25	55
Big Game Use Days (MWUD's-5th Decade)	225 1	156 6	128 5	141 4	209 6	203 0	187 7
Fish Use Days (MWUD's) (1st Decade Avg Annual)	185 8	188 4	174 6	174 6	185 8	191 6	179 5
Old Growth (Acres)	80,000	31,800	31,800	31,800	31,800	56,000	60,000
Range Livestock Use (MAUM s) (Annual-1st Decade)	0	89	96	110	73	66	73

TABLE B-6-3B
OUTPUTS AND EFFECTS OF REQUIRED BENCHMARKS
FEIS

	Minimum Level	Max PNV	Max Timber	Max Range	Max Big Game	Max Unroaded Recreation	No Action
PNV (MM $)	Unknown	512	480	424	429	454	421
Change in Jobs From Current Situation	-1028	234	226	149	-93	-107	57
Payments to Counties (MM $)	0	6 0	5 6	4 7	4 2	4 0	4 3
1st Decade Avg Annual ASQ MMCF MMBF	 0 0	 22 9 139	 23 4 142	 22 1 132	 17 1 102	 15 5 93	 19 3 115
Elk (No of Elk 5th Decade)	7,950	1,510	1,270	1,350	4,270	4,040	2,670
Deer (No of Deer 5th Decade)	22,600	20,470	13,350	17,060	22,600	22,600	2,260
Forage Production (MAUM's/Yr)	0	82.0	80 6	105 3	71 0	71 0	77 5
Old Growth (M Acres 5th Decade)	94	39	39	39	40	75	53 0
Snag Habitat for Cavity Nesters (% of potential 5th Decade)	70	30	30	30	60	45	52
Riparian Areas in Excellent Condition (M Acres 5th Decade)	17 1	17 1	1 9	1 9	17 1	17 1	5 4
Roadless - Allocated (M Acres)	59 9	0	0	0	0	59 9	31 2

values and 496 million to market values. The majority of the 541 million comes from timber harvest (473 million). The basic thrust of this benchmark is to capture as much value from the existing timber stands as possible under nondeclining yield. This is accomplished by balancing the higher reforestation costs but less constraining harvest dispersion constraints associated with planting against the lower cost but more constraining dispersion constraints associated with natural regeneration. Consequently, reforestation scheduled in the first five decades is a mix of planting and natural regeneration. This results in somewhat lower timber yields as compared to the maximum timber benchmark. Range yields on transitory range are produced at levels commensurate with the timber scheduling that maximizes PNV. Range values can not compete with timber values to influence the harvest scheduling. Analysis of runs made with and without range outputs valued in the maximize PNV objective function showed no significant change in the harvest schedule (TIE and TIF). Range output increases due to non-structural improvements do not generally increase PNV except in the small numberof meadows on the Forest Additional structural improvements, on the other hand, do generate positive PNV and are included in this and other benchmarks. Analysis conducted by the Forest showed that an opportunity for construction of approximately 300 water developments exists that would increase PNV and result in an additional 22,000 AUM's Re-analysis between the DEIS and FEIS indicated that most developments would not support as many AUM's (10,000 instead of 22,000) and would cost significantly more. Only 140, instead of 300, are cost effective and increase PNV. Recreation use cannot compete with timber harvest in monetary terms and is produced at background values commensurate with timber harvest in this benchmark. The fishing aspect of recreation use, however, does not compete with timber harvest but successfully competes with livestock use in monetary terms. Therefore, riparian prescriptions calling

for enhanced conditions are employed resulting in higher fishing WFUD's and lower AUM's. Soil and water outputs with assigned values cannot compete with timber harvest and are produced at levels resulting from the timber harvest schedule that maximizes PNV. More detail on these relationships is contained in Section 3.

The two benchmarks with the second highest and lowest PNV, maximum recreation (453 million) and maximum big game (422 million) are very similar. In both cases most of the Forest is allocated to big game prescriptions. However, the maximum recreation benchmark allocated currently unroaded areas to semiprimitive prescriptions and invested money into trail, trailhead, and campground development. The main reason for the differences between these two in terms of PNV is that the maximum recreation benchmark generates more present value from the higher discounted benefits and lesser cost associated with the semiprimitive RVD's than does the additional timber and big game benefits but higher costs in the maximum big game benchmark. The presence of big game cover constraints for big game in both cases limits capturing the value in the existing stands as fast as in the maximum PNV benchmark.

The two commodity oriented benchmarks, maximum timber and maximum range, have a lower PNV than the PNV benchmark, due to the large investments required to get the last 5-20 percent of output for the maximum. In the case of maximum timber (PNV of $447 million) an increase of seven million dollars in present value from timber, as compared to the maximum PNV benchmark, occurs but the increase in reforestation and TSI costs over the first 50 years is 33 million dollars (18 million in present costs). Other costs such as roads, administration, and support are also higher. In the case of maximum range (PNV of 425 million dollars), an increase of $7 million in present value from range, as compared to the maximum PNV benchmark, occurs at an increased cost of $21 million in non-structural improvements over the first 50 years ($9.4 million in present costs). A more substantial cost is the present value from timber foregone when harvest scheduling is designed to maximize livestock on transitory range ($17 million), as well as the increased costs of timber management resulting from higher reforestation costs and TSI costs.

The benchmark with the lowest PNV is the minimum level (PNV of $175 million). This represents essentially a background value attributable to various recreation, hunting, and fishing uses. The much lower PNV of this benchmark portrays the foregone opportunity to capture the high values in our existing stands of timber.

Most of the explanation of differences in costs is contained in the above paragraphs describing the differences in PNV. All resource benchmarks show costs that decline after the first decade. Road costs and precommercial thinning costs are the items common to all benchmarks that decline after the first decade. More acres are entered in the first decade due to the opportunity to do overstory removals in existing two story stands which leads to higher road costs and precommercial thinning costs that are higher than in managed stands. In the case of the maximum range and maximum recreation benchmarks, additional dollars for structural improvements are also included in the first decade costs Costs in all benchmarks rise between the third and fifth decades. This is largely a result of increased reforestation costs as more acres are planted.

The changes in local jobs and income are mostly a function of the total harvest level and species mix (see Chapter 4 and Section 5). As a result, those benchmarks (PNV, Timber and Range) which have a harvest level higher than today's will have an increase in jobs The effect of species mix is portrayed by comparing the Max Range Benchmark with the Max PNV Benchmark. Although the Max Range Benchmark has a higher timber harvest level, it creates fewer jobs because it harvests substantially less pine volume than does the Max PNV Benchmark.

The Max Recreation and Max Big Game Benchmarks both lose jobs compared to the current situation because they harvest substantially less timber volume. Their loss in timber related jobs is offset to a degree by the increase in service related jobs tied to the increase in recreational visitor days (RVD's).

Although the increase in RVD's offsets the loss in total jobs, it has less of an impact on income because service related jobs are not as valuable as timber generated jobs (see Section 5).

Although the Max Recreation Benchmark harvests substantially less timber than does the Max Big Game Benchmark it loses fewer jobs. This is a result of its harvesting the same amount of pine volume, providing the same amount of big game RVD's and having a substantial increase in SPNM RVD's. This translates into a slight decrease in timber related jobs, no change in service jobs related to big game opportunities and a substantial increase in service jobs related to SPNM opportunities. The net result is less total jobs being lost.

Potential to Resolve Issues and Concerns, and to Capture Management Opportunities

The following paragraphs summarize the ability of the Forest and Grassland to resolve the twelve issues that were identified to guide this planning process.

Timber

The Forest lacks the capability to meet the local demand for timber as indicated by the installed mill capacity. Current levels of timber harvest could be sustained, however, if reforestation and TSI investments were to be increased and some compromise in allocations to other resources were made. If management of other resources were to be reduced to the lowest level while still meeting management requirements, timber outputs could be increased 10-15 percent. The above comments pertain to timber harvest as measured in cubic feet. All analyses show declining harvests as measured in board feet. The maximum timber benchmark shows a board foot harvest in the fifth decade that is five percent lower than the current harvest level and 15 percent lower than in the first decade.

Conflicts with other resources and, to a degree, concerns about economic efficiency will impact timber harvest levels in most alternatives. Provision of old growth, roadless recreation opportunities, visual zones, riparian area management, high quality big game habitat, and snags all result in a reduced harvest level. Economic analyses show that natural regeneration competes economically with planting Natural regeneration results in a somewhat lower harvest level.

Socio-Economic

Results of analyses show the opportunity to make progress on both the major aspects of this issue and concern; i.e., local jobs and economic efficiency. Emphasis on increased timber outputs leads to an increased number of local jobs. Emphasis on economic efficiency could lead to an increase in PNV of 63 million dollars. These two alternative directions are not identical, however, in that attainment of the highest timber output levels and local jobs leads to a lower PNV than the maximum. In general, production of resource outputs that conflict with timber outputs result in a lower number of local jobs and PNV than could otherwise be produced.

Range

Analysis of forage production on the Forest and Grassland shows that significantly higher levels of livestock outputs could be generated if substantial investments were made. Significantly higher levels of funding would have to be available for reconstruction of existing structures as well as for new construction Existing levels of AUM's could be maintained without additional construction but an increase in reconstruction funding is necessary to maintain this level over time. The major conflict

with livestock production is the use and condition of riparian areas. Enhancement of these areas requires some reduction in livestock production.

Riparian Areas

Riparian areas could be enhanced to provide higher quality water and fish habitat and higher levels of recreation use. Standards and guidelines for timber harvest, silviculture, and road management require more costly practices to enhance these zones. Continuation of current livestock practices in riparian areas would prevent improvement of riparian area conditions.

Transportation System

The Forest and Grassland can respond to the various aspects of this issue through the mix of prescriptions utilized in a particular alternative and through the array of alternatives considered. The portion of the issue dealing with road design standards is dealt with by the use of the most cost efficient road construction standards for local roads, and by a network analysis for each alternative which shows the most efficient schedule of investments for the arterial and collector system. Some of the considerations included in this analysis will be the timber volume flowing over the network and the degree of emphasis recreation is receiving in the assigned prescriptions. This results in a shift in traffic service levels. The road access aspect of the issue will also be analyzed through the mix of prescriptions assigned for a particular alternative. Different prescriptions call for different levels of open road density.

Big Game

The Forest and Grassland have the capacity to substantially increase big game numbers over time, resulting in increased numbers of hunters. Allocations resulting in increases will reduce timber harvests. Maintenance of today's levels of big game requires allocations that produce similar amounts of cover as that found in the current land allocations (big game, old growth, roadless areas).

Roadless Recreation

The Forest and Grassland has the ability to meet identified demands for this type of recreation over the next fifty years if allocations are made that maintain the unroaded character in some unroaded areas. If all non-wilderness unroaded areas are allocated to roaded management then first decade demands will not be met. The major conflict is with timber harvest levels.

Scenic Resources

Management designed to retain natural appearing landscapes in visual corridors could be either decreased or increased from today's level. The main conflict is with timber harvest levels.

Old Growth

Allocations of old growth could either be increased or decreased from today's level. The main conflict is with timber harvest levels.

Firewood

The Forest has the ability to produce more firewood through several options. Higher timber harvest levels produce more residue for firewood, salvageable material could be reserved for firewood, thinnings could be designed for firewood; lodgepole pine management could be geared for firewood; firewood use could receive higher priority than pole or chip users; and snag management policies could be altered.

Snag Level

Snag levels, either at today's level, or below or above that level, could be provided on the Forest. The main conflict is with timber harvest levels.

Winter Sports

Opportunities for cross-country skiing could be enhanced with a trail development and maintenance program. Conflicts between skiing and snowmobiling that occur in some specific areas, such as Lookout Mountain, may be resolved by designating separate access routes.

New Issues in FEIS

Anadromous Fish

Anadromous fisheries are a subset of the riparian issue. Due to the relative inaccessibility of these streams, they are generally in good condition.

Historic Trail Preservation

This issue encompasses two factors: the Forest could protect and manage the historic resource as it does other cultural resources, and/or manage the trail as it does other scenic corridors. The major conflict with the latter is with timber harvest levels.

Off-Road Vehicle (ORV) Use

This issue has two facets. On one hand, ORV use could be more restricted on the Forest and Grassland. On the other hand, with an expanded trail system, more acres on the Forest and Grassland could be available for ORV use.

Round Mountain

This issue is similar to other recreation issues, such as roadless areas and big game, where special management is proposed for a specific area. The main conflict is with timber harvest levels.

Ability to Meet RPA Goals

Comparisons with the 1980 RPA outputs distributed to the Forest and Grassland through the Regional Guide are difficult for two reasons. First, RPA timber harvest levels are depicted for a Forest regulated under nondeclining yield in board feet when all of the Ochoco's analyses are based on regulating the Forest in cubic feet. Since conversion ratios change with the diameter of the material harvested and the average diameter harvested changes over time, comparison of first decade board foot harvest levels can be misleading. Second, it is very difficult to interpret some RPA outputs, such as acres of habitat improvement, in terms of outputs useful for resolving an issue (e.g., numbers of elk). Given this situation, the only RPA outputs that it appears the Forest and Grassland will have trouble meeting are the timber outputs.

An annual board foot harvest level (programmed sales offered) of 150 MMBF, as depicted in the Regional Guide, does not appear to be sustainable under any foreseeable circumstance. The maximum timber benchmark harvests 147 MMBF in the first decade, 144 MMBF in the second, and declines to 125 MMBF by the fifth decade. Harvest levels that reflect current land allocations are substantially lower than the maximum timber benchmark. The amount of acres scheduled for reforestation in RPA (1100-1400 acres annually) is not coordinated with the timber harvest levels shown. For example, the maximum timber benchmark reforests between 4900 and 6800 acres annually for the first fifty years.

Need to Alter Management Direction

Several elements of the current situation continue to be areas of conflict. One area of concern is the sustainability of board foot harvests over time. All of

the Ochoco's analyses indicate declining harvests in board feet (see Section 5). Another concern is the selection of silvicultural systems. There is very little emphasis on uneven-aged management under current plans. Another area of concern is the compatibility of cover requirements for big game in the unit plans with current timber harvest levels. Again, analysis indicates incompatibilities at present (Chapter 4). A third area of concern is the compatibility of current AUM output levels with direction for riparian area management in the unit plans. Analysis of output tables in Chapter 4 shows that there is indeed some conflict. Finally, conflict among user groups continues as to the appropriate type of management for Lookout Mountain. It is evident that this issue has not been resolved.

Formulation of Alternatives

(Section 7)

Introduction

Definition of An Alternative

A Forest Plan alternative is a mix of management prescriptions and activity schedules applied in specific locations of the Forest and Grassland in order to achieve the desired management goals and objectives. Alternatives produce a unique mix of goods and services for the public, and different combinations of resource outputs, land uses and environmental effects.

Changes Between the DEIS and FEIS

The major changes discussed in this section are: the dropping of alternatives, the addition of a new alternative; the modification of certain alternatives; and the update of the cost (in terms of PNV and ASQ) of the resource objectives for each alternative.

Required Alternatives

The following were alternatives in the DEIS which were required by regulation and National and Regional direction.

No Action

This is the "No Action" alternative required by the Council on Environmental Quality (CEQ) regulations (40 CFR 1502.14). This alternative would continue the management of the Ochoco National Forest and Crooked River National Grassland as defined by existing direction in approved management plans; continuation of existing policies, standards, and guidelines; current budget updated for changing costs over time; and, to the extent possible, production of current levels and mixes of resource outputs.

Alternative A was the Current Direction Alternative (or the "No-Action" Alternative) in the DEIS.

No Change Alternative

The No Change Alternative, Alternative NC, was developed in response to decisions made regarding appeal number 1588, brought by the Northwest Forest Resources Council on May 19, 1986. The appeal questioned the decision by the Regional Forester to "require inclusion of minimum requirements (MR's) in the No Action Alternative for each Forest Plan." The substance of the appeal was that a "true no action alternative representing current management plans" was not included in the Forest Plan DEIS's. The No Change alternative is designed to represent the existing 1979 Timber Resource Plan and unit plans and, consequently, does not comply with all provisions of NFMA and regulations promulgated to implement NFMA.

Emphasis on Market Opportunities

This alternative has an emphasis on outputs that have an established market price (timber, domestic livestock use, developed recreation opportunities, and minerals). Management for other resources will be at economically and environmentally feasible levels consistent with the emphasis on market-oriented outputs

Alternative H was the alternative in the DEIS which emphasized market opportunities for the Forest and Grassland.

Emphasis on Nonmarket Opportunities

This alternative puts an emphasis on water, fish and wildlife, recreation and other amenity values. Management for other resources will be at economically and environmentally feasible levels consistent with the emphasis on amenity values.

Alternative C was the alternative in the DEIS which emphasized nonmarket opportunities

Emphasis on the Current RPA Program

This alternative will determine how the Current (1980) RPA Program distributed to the Forests through the Regional Guide can best be implemented.

Alternatives B and B-Departure were the current RPA Program alternatives in the DEIS.

Emphasis on Nondevelopment and Intensified Management

This alternative retains all currently roadless areas in an unroaded condition while increasing commodity production on those areas already roaded. Its purpose is to analyze the economic effects of not beginning commodity production in roadless areas.

Alternative F was the alternative which best emphasized roadless management and intensified commodity management in the DEIS.

Emphasis on Economic Efficiency

This alternative emphasizes management of outputs with market or assigned values at their most economically efficient levels.

Alternative H-Departure was the alternative which met this emphasis.

The following required alternatives were brought forward into the FEIS.

Alternative A (updated to include MR's).

Alternative NC.

Alternative B, as represented by Alternative B-Modified.

Alternative C, as represented by Alternative C-Modified.

All other required DEIS alternatives were eliminated from further study in the FEIS.

Process Used to Develop Alternatives

Requirements Concerning the Development of Alternatives

Several sources of direction guided the Forest in the development of alternatives. The implementing regulations of the National Forest Management Act (36 CFR 219) prescribe a general process for formulating alternatives, particularly in parts 219.12(e) and (f). Major points from these sections require:

Alternatives shall be distributed between the minimum resource potential and the maximum resource potential to reflect to the extent practicable the full range of major commodity and environmental resource uses and values that could be produced from the forest. Alternatives shall represent a range of resource outputs and expenditure levels.

Alternatives shall be formulated to facilitate analysis of opportunity costs and of resource use and environmental tradeoffs among alternatives and between benchmarks and alternatives.

Alternatives shall be formulated to facilitate evaluation of the effects on present net value, benefits, and costs of achieving various outputs and values that are not assigned monetary values, but are provided at specified levels.

Alternatives shall provide different ways to address and respond to the major public issues, management concerns, and resource opportunities identified during the planning process.

Reasonable alternatives which may require a change in existing law or policy to implement shall be formulated if necessary to address a major public issue, management concern, or resource opportunity identified during the planning process.

Each alternative shall represent to the extent practicable the most cost efficient combination of management prescriptions examined that can meet the objectives established in the alternative.

Each alternative shall state at least-

The condition and uses that will result from the long-term application of the alternative.

The goods and services to be produced, the timing and flow of these resource outputs together with associated costs and benefits.

Resource management standards and guidelines.

The purpose of the management direction proposed.

The regulations also require that alternative development processes follow the NEPA (National Environmental Policy Act) procedures contained in Title 40 CFR 1502.14.

Within the framework given by these legal requirements, the Pacific Northwest Region of the Forest Service issued further direction (1920 11/10/83) on the development of alternatives. In addition to expanding on the need for a broad range of evenly distributed alternatives, this direction required development of alternatives that:

Meet the State of Oregon goals for timber and big game,

Strongly emphasize unpriced amenities,

Strongly emphasize priced commodities,

Closely examine economic efficiency,

Thoroughly evaluate roadless areas, and

Analyze timber volume flows over time that depart from non-declining yield.

Formulating a broad range of reasonable management alternatives for a National Forest is an extensive and complex process. Each alternative is a combination of land uses, Forest management activities, and schedules. Alternatives must consider the resource capabilities (both the limitations and the potentials) of many different areas of the Forest. Each alternative is designed to manage the land to achieve specific goals and objectives. Some of these objectives, such as maintaining air and water quality, are common to all alternatives; other objectives, such as the mix and amount of resource outputs, vary among the alternatives.

By managing the Forest and Grassland lands and resources in different ways, varied objectives can be achieved which respond to different issues and provide different combinations of public benefits. Forest management can vary by what is done, where it is done, and when it is done. These varying combinations of management activities, management areas, and schedules will result in different resource outputs and environmental conditions, thus meeting the unique objectives of the alternatives.

Formulation of Alternatives

The Ochoco National Forest and Crooked River National Grassland used the following steps to formulate alternatives.

Public Issues and Management Concerns

The issues and concerns discussed in Chapter 1 were condensed and grouped from hundreds of comments received by the Forest from local individuals, Forest Service employees, and other governing agencies or councils. National concerns were also included. This process of sorting, screening, and condensing represented the first step in the alternative development process since alternatives attempt to resolve issues and concerns. Appendix A described this process in detail.

Analysis of the Management Situation (AMS)

The analysis conducted during the AMS produced essential information for the development of alternatives. Benchmarks, discussed more fully in Section 6 p.71 to p. 94, and in Chapter 2 were used to:

Define the maximum potentials of the Forest and Grassland to produce various resource output levels and economic benefits,

Evaluate the complementary and conflicting relationships between and among major market and non-market benefits,

Identify the range within which integrated alternatives could be developed (decision space), and

Analyze the implications of continued management under current direction.

Maximum production potentials developed with benchmarks enabled the Forest to compare supply potentials with expected demands. Instances where the demand exceeded the potential, or where the potential greatly exceeded the demand, were noted. These, along with the issues and concerns, provided a focus for later steps in the process.

Information gathered during these steps was assimilated and analyzed to guide the formulation of alternatives. The alternatives reflect a range of future resource management options for the Forest. Each major issue, concern, and opportunity was addressed in one or more of the alternatives. The need to satisfy legal and regulatory mandates was also a factor in the development of the alternatives. Finally, cost efficiency was a consideration throughout the process. The following discussion is a summary of the planning actions involved in the formulation and analysis of the alternatives. The focus will be upon the roles which the ICO's and the benchmarks played in their development.

Development of Alternative Themes and Objectives

The Forest used a process to develop alternative themes and objectives that would help ensure a broad range of reasonably distributed alternatives Based upon the minimum and maximum resource output levels developed in the AMS, the Forest Interdisciplinary (ID) team established a number of output levels for each issue or concern. These outputs roughly corresponded with the "quantified indicators" of issue resolution discussed in Appendix A. In some cases outputs represented production levels, such as volume of timber, and in other cases they represented conditions, such as acres of old growth habitat. The ID team began to create alternative themes and objectives by grouping compatible output levels for each issue or concern. By including each output level for each issue or concern in an alternative, the ID team ensured that a broad range of evenly distributed alternatives was considered.

The Forest next entered a second stage of alternative theme and objective evaluation. The initial set of alternatives was evaluated to make sure that every identified issue or concern was resolved in at least one alternative in an acceptable manner. The competitive and complementary relationships of the ICO's were used as a guide in this process. Alternatives were then evaluated to ensure that they were sufficiently unique to warrant full development. As a result of this review, some preliminary alternatives were consolidated, added, or refined. A previous section in Chapter 2, Alternatives Considered but Eliminated from Detailed Study (DEIS, pp. 17-18), described the preliminary alternatives not fully developed. A detailed description of alternative themes and objectives, alternative development, and how they were derived in response to the Ochoco's ICO's is contained in Ochoco's Planning Records, 1920 9/4/84.

In December 1984, the Forest met with the Regional Forester and his Directors to review the Ochoco AMS and proposed alternatives. The basic set of eight alternative themes and objectives was approved at that time by the Regional Forester with a few relatively minor refinements. The Forest also agreed with the Regional Forester that three of the eight should be evaluated and fully developed with timber harvest schedules that depart from non-declining yield Thus, a set of eleven alternatives was

then approved for full development and analysis.

In the fall of 1989, the Ochoco National Forest issued a supplement to the DEIS. In that supplement a new alternative (NC) was developed and added to the 11 other DEIS alternatives. Formulation of Alternative NC (No Change) was different than the other alternatives. As mentioned previously, it was formulated as a result of an appeal by the Northwest Forest Resource Council. Alternative NC is designed to represent the existing Timber Management Plan and, does not comply with all provisions of the National Forest Management Act (NFMA) and regulations promulgated by the Secretary of Agriculture to implement NFMA.

Alternatives Considered But Eliminated From Detailed Study Between the DEIS and FEIS

Analysis and evaluation of public comment resulted in the development of a new alternative (I), the modification of alternatives B and C, the update of alternative A to reflect the No Action benchmark and E-Departure and NC being carried forward as a reference point from the DEIS to the FEIS. Alternatives B, B-Departure, C, D, E, F, G, H, and H-Departure are eliminated from further detailed analysis in this FEIS. These alternatives were adequately addressed in the planning process and displayed in the DEIS and have contributed to the consideration of a reasonable range of alternatives in the development of the Forest and Grassland Plans. Based on a thorough review of the public comments and management concerns, it was determined that these alternatives could be eliminated at this point. The modified alternatives carried forward and the new alternative respond to planning issues considered in the DEIS and offer a reasonable and appropriate range of choice for the decision on the Forest and Grassland Plans.

See Table B-7-1 for alternatives: eliminated in the FEIS, modified, and created.

Model Formulation and Analysis in Relation to ICO's and Cost Efficiency

Alternative development and evaluation is a very complex process during which an enormous amount of information must be considered. Major factors contributing to this complexity include the following.

Potential management activities must be scheduled and evaluated over a long period of time.

TABLE B-7-1

DISPOSITION OF ALTERNATIVES CONSIDERED IN THE FINAL

	ALTERNATIVES															
TREATMENT	A	B	B Dep	B Mod 1/	C	C Mod	D	E	E Dep	F	G	H	H Dep	I Pre 2/	NC	CD BNCH 3/
Detailed Alts in DEIS	X	X	X		X		X	X	X	X	X	X	X		X	X
DEIS Alts Detailed in FEIS									X						X	X
DEIS Alts Eliminated in FEIS	X	X	X		X		X	X		X	X	X	X			
New Alts Detailed in FEIS				X		X								X		

/1 Alternative B-Mod represents evolution and change of Alternative B-plus proposed by timber industry Alternative B-Mod is a new industry alternative It is different than B-Departure in the draft, the latter of which was much the same as Alternative B

/2 Preferred Alternative I

/3 Current Direction Benchmark with National Forest Management Act (NFMA), Alternative A in this FEIS

The entire Forest and Grassland, nearly one million acres that are highly diverse, must be assessed simultaneously.

Potential management activities must be assessed relative to multiple resource criteria.

Scheduled management activities must be cost-efficient.

Cost effectiveness and resolution of the ICO's has driven the entire process from data and information collection through model design, alternative formulation and the iterative analysis process. It was necessary to consider these factors in all stages of the analysis to ensure the formulation of a wide range of reasonably distributed and cost efficient alternatives that responded to the identified issues and concerns.

Many sources of data were used to incorporate the best resource information and cost and dollar value information available into the Ochoco model. Resolution of the ICO's and cost efficiency were met through careful design of the FORPLAN model, use of the model to select and schedule prescriptions for each alternative, use of the model in sequential analyses to help design alternatives and by conducting supplemental analyses.

The following paragraphs describe how model development, alternative formulation, and the analysis performed relate to resolution of the ICO's and cost efficiency. Sections 2, 3, and 5 contain more detailed descriptions of the data collection, model design and analysis performed. See these sections for the changes between the DEIS and FEIS.

The central model in this analysis process is called FORPLAN (FORest PLANning Model). FORPLAN is a computerized linear programming model which allows a great deal of flexibility in formulating a mathematical representation of forest management interactions and activities. The major reason for using FORPLAN is to select the most efficient method of achieving a set of goals and objectives. Tens of thousands of management options can be considered simultaneously by FORPLAN. The Ochoco FORPLAN model is specifically designed by the Forest ID Team to analyze the economic and production trade-offs associated with the issues and concerns described in Chapter 1.

The first key step in the development of the FORPLAN Model was to divide the total Forest and Grassland into analysis areas. Analysis areas are tracts of land with similar characteristics in terms of the costs, outputs, and effects that are being analyzed in the FORPLAN Model. Their boundaries represented the significant physical, biological, and economic differences in the way the land responds to alternative management strategies. And, of course, the delineations focused upon the planning issues and concerns. An example of an analysis area on the Forest is all two-storied ponderosa pine stands, on steep slopes, contained in roadless areas, on the Big Summit Ranger District. The Forest developed analysis areas several times, testing different combinations of land classifications each time, finally leading to use of analysis area data that most efficiently reflected the ICO's and economic factors (see Planning Records, 1920 7/7/83).

In the FORPLAN model, analysis areas were allocated to management strategies in order to achieve the resource management objectives of a particular benchmark analysis or alternative. These strategies are associated with management areas and contain a set of standards and guidelines describing how the resources in that area are to be managed. Management areas are delineated by applying a Management Strategy (Prescription) to a particular piece of land. The Forest ID Team developed a complete set of strategies designed to achieve a wide range of goals and objectives The Forest's issues and concerns guided this process. From six to ten different management strategies were available to each analysis area depending upon its resource production opportunities.

The Forest then developed several maps of potential management areas for each management prescription that could be applied to different portions of the Forest and Grassland. These maps considered resource conditions and capabilities, multi-resource and other-ownership compatibilities, economic efficiency, and non-priced benefits.

Each of these potential management areas was analyzed to develop trade-off information. The Forest's FORPLAN model was used to assist in this process. Relative impacts on PNV, big game numbers, RVD's, and timber outputs were assembled for each potential management area. Using this data and other information presented on the relative benefits of managing one area versus another under a given management prescription, an expanded Forest Management Team assigned priorities to management areas for each alternative. The expanded management team consisted of the Forest Supervisor and Staff Officers, the Forest ID Team, and the District Rangers and their principal staff. Using these priorities and the alternative themes and objectives, final management area maps were developed. See Planning Records, 1920 10/02/85 for a detailed description of this analysis.

Once the management strategies were designed, "modeling prescriptions" were developed to represent different methods of management to achieve the multiple use objectives of each management strategy. These specific modeling prescriptions were developed, tested, and selected based to a large degree upon cost efficiency analysis (see Planning Records, 1920 9/10/84). In FORPLAN these are referred to as combinations of management emphases and intensities. Modeling prescriptions are combinations of scheduled activities and practices, and their associated outputs and effects. The modeling prescriptions and their range of timing choices are represented as decision variables in FORPLAN. In other words, specific options concerning how to manage a particular piece of land over time serve as the basis for choice in the model. The outputs and effects associated with the prescription choices are represented as mathematical coefficients in the respective decision variables. FORPLAN had from one to twenty modeling prescriptions to choose from for each management emphasis for each analysis area. In addition, dozens of different timing patterns and rotation ages were provided for most management emphasis/management intensity combinations on timbered lands.

Cost efficient coefficients used in the model to represent management choices were developed with the aid of various processes and models (including FORPLAN). These specific modeling procedures and scheduling options were evaluated and refined based upon cost efficiency analysis. For example, the Forest elected to manage and model old growth habitat with a dedicated stand system based in part upon economic efficiency considerations (see Planning Records, 1920 6/21/84). Final procedures for modeling dispersion of harvest units were adopted to minimize the impacts on present net value (PNV) while meeting dispersion objectives (see Planning Records, 1920 6/13/85). Scheduling options for management of two-storied stands (the largest timbered stand component on the Forest) were evaluated and refined based upon a cost efficiency analysis (see Planning Records, 1920 9/10/84).

Development of potential timber volume yields from management of existing timber stands required a Forest-wide timber inventory in 1981 to 1982. Yields from future stands were developed by calibrating testing areas using the Ochoco PROGNOSIS Model This per acre analysis was then combined with a Forest-wide prescription scheduling analysis within FORPLAN. As a result of this analysis, additional yield tables were developed with different practices and timing mixes. This iterative process culminated in the Ochoco's Model having a wide range of management intensities to ensure examination of a full range of management opportunities and provided for maximum flexibility to the Ochoco's FORPLAN Model for optimization.

Forage yields were adaptations of Regional averages to Ochoco conditions. Range water developments were analyzed and those which were economically efficient were included in all benchmarks and alternatives. The relationship between timber stand conditions and big game animal energetics was developed and tied to elk cover quality and represented directly in yield tables. Having this relationship directly represented in the Model allows FORPLAN to pick the most cost efficient means of meeting the big game requirements under the various benchmarks and alternatives.

The trade-offs between livestock and recreation uses in riparian areas were also examined in an economic analysis and used accordingly in all benchmarks and alternatives.

Other types of analyses were performed with FORPLAN, both to evaluate different mixes of goals and objectives, and to fully evaluate choices not explicity analyzed within FORPLAN. An analysis in the latter category examined the relative cost efficiencies of different management prescriptions and the timing of initial entry, as applied to individual roadless areas. The Ochoco FORPLAN model was not able to validly analyze these choices with a single model run, so sequential analyses were performed to provide economic efficiency trade-off data (see Planning Records, 1920 10/03/85).

Different mixes of goals and objectives were examined to provide cost efficiency information relative to competition between market and assigned values. The opportunity costs and cost efficiency of economic assumptions, management requirements and timber harvest policies were also examined.

A final analysis concerning the ICO's revolved around a series of feasibility screens applied to the scheduling results of all alternatives. Items considered included: 1) timber volume available in the Burns-Hines timbershed over time, 2) timber species mix, 3) logging systems mix, 4) reforestation methods mix, and 5) ability to meet watershed requirements. Minor adjustments needed to produce implementable alternatives were made, and the alternatives prepared for complete analysis and evaluation. (See Planning Records, 1920 10/O4/85 for a complete discussion of this analysis.)

The processes described above have provided reliable coefficients that were developed with the ICO's and cost efficiency in mind. They result in the Ochoco's FORPLAN model being capable of determining cost efficient prescription assignment and scheduling under the various goals and objectives of all benchmarks and alternatives. This guarantees valid results because these coefficients provide the bases for the model to discriminate between the various management options available.

Cost Efficiency and Scheduling of Management Activities

Having assured that the Ochoco's FORPLAN model design was valid, responsive to the ICO's, and cost efficient, and that management area assignment best fit the goals and objectives of the alternative and/or benchmark, the final step in assuring a cost efficient solution for a particular alternative or benchmark was to schedule management activities over time in a most cost efficient manner. This was accomplished using the Ochoco's FORPLAN Model.

The model was used to analyze the most economically efficient outputs and effects associated with the achievement of the multiple use objectives of an alternative. Which prescriptions FORPLAN selected depended upon the objective function and the set of constraints used to represent a particular benchmark or land management plan alternative. Usually, the objective function was to maximize PNV or the production of timber. These were subject to first satisfying all the specified constraints. The constraints were designed to guarantee the spatial and temporal feasibility of land allocation and harvest scheduling choices in order to achieve multiple use objectives. The following is a list of some of the types of constraints used:

Constraints on timber harvest flow, rotation length, and ending inventory,

Harvest dispersion objectives,

Constraints on the acreages of analysis areas available to certain management strategies,

Rate of timber harvest restrictions in riparian areas and scenic corridors, and

Cover requirements for elk.

Once the model had determined that a feasible solution existed by satisfying all of the constraints, it would then search for the set of prescriptions and timing choices which permitted it to optimize the solution according to the specified objective function.

In the case of those benchmarks and alternatives which used a maximize PNV objective function, this

ensured a cost efficient schedule of management activities. Those alternatives or benchmarks using an objective function other then maximize PNV were then "rolled over." This means that the outputs which were maximized became constraints and the model was run again using a maximize PNV objective function.

Several computerized models and systems were used to facilitate and supplement the use of FORPLAN in the evaluation of an alternative. Operation of the Ochoco FORPLAN model required frequent calculation of acreage data. A computerized grid cell mapping system (R2MAP) was built and used to meet this need and provide other essential information. After obtaining a feasible FORPLAN solution that met the applicable goals and objectives, several additional models were used to help analyze economic implications. These are described in more detail in Sections 3 and 4. An input-output model derived from the IMPLAN system was calibrated to local conditions and used to estimate the effects on local jobs and income by alternative or benchmark. Timber volumes scheduled by analysis area and management prescriptions were distributed onto a road network model (MINCOST) to determine the most cost efficient road investment and maintenance program. The final modeling link in the analysis process used a computerized spreadsheet program to calculate total budget costs, economic values and receipts, efficiency measures, and other intermediate results.

Common Constraints

The FORPLAN model was used to estimate the timber related management activities, economic consequences, and outputs by reflecting the multiple use resource management objectives of each alternative through a given set of constraints. Many of the constraints used to help formulate and characterize the different alternatives were the same across all alternatives. These were necessary in order to meet minimum management requirements, existing laws and policies, or the objectives of prescriptions. There were also constraints which, while serving common purposes across all of the alternatives, varied in the amounts and locations to which they were applied. In addition, there were constraints which were totally unique to a particular alternative.

In the following discussion, those constraints which were applied in common to all alternatives will be presented in terms of their purpose and rationale. The common constraints will be separated into 3 categories: 1) those needed to meet legal and management requirements; 2) those needed to ensure biological feasibility, and 3) those needed to ensure administrative/operational feasibility. The constraints which were more or less unique and those whose amounts and locations vary between the alternatives will be discussed in the next section pertaining to the development of alternatives.

Constraints Needed to Meet Legal, Policy and Management Requirements

Ending Inventory Constraints

Purpose:

The use of this constraint ensures that the total inventory volume left at the conclusion of the harvest scheduling planning horizon (150 years) will equal or exceed the volume that would occur in a regulated forest managed in accordance with the prescriptions selected for regenerated timber.

Rationale:

If this constraint were not used, the FORPLAN model would have no incentive to leave enough inventory at the end of the harvest scheduling horizon to sustain the harvest levels into perpetuity.

Tradeoff:

Since some volume which is available for harvest at the end of the harvest scheduling horizon must be reserved for future decades, timber related outputs and benefits will be reduced.

Link to Long-Term Sustained Yield Constraint

Purpose:

Assures that timber harvest in the last period of the planning horizon is equal to or less than that which can be harvested indefinitely.

Rationale:

This along with the Ending Inventory Constraint ensures that harvest equals or is close to growth in perpetuity.

Tradeoff:

As with the ending inventory constraints this constraint may result in the reduction of timber related outputs and benefits.

No Regeneration Harvest Until Stands Have Reached 95% of Culmination of Mean Annual Increment

Purpose:

Ensures a minimum tree size and full site utilization.

Rationale:

The model could potentially harvest stands before the full utilization of the site and where the average tree diameter is inappropriate.

Tradeoff:

The Ochoco's FORPLAN model characterizes the Ochoco as a deficit forest in which the LRSY level is not binding on the ASQ. As a result, rotation short of culmination has a positive effect on the ASQ level because higher yield managed stands are brought into production earlier. An analysis determined that restricting rotation ages to CMAI results in a maximum decrease of one percent in PNV and a two percent decrease in first decade timber volume.

Model updates described in Section 3 have resulted in the model characterizing the Ochoco as a surplus Forest in which the LRSY land is binding on the ASQ. As a result, rotation short of culmination has little to no effect on ASQ because moving rotation ages forward from their biological potential has a tendency to reduce LRSY which would further impact the ASQ.

Timber Harvest Scheduled Only on Lands Classified as Suitable Through the Stage I Suitability Analysis

Purpose:

Prevent scheduled harvest from lands not meeting Stage I suitability criteria.

Rationale:

It is very likely that FORPLAN would schedule harvest from these lands if given the choice.

Tradeoff·

Because some of these lands contain merchantable timber volume, timber related outputs and benefits will be reduced.

Forty-Acre Unit Size/Logical Leave Unit Dispersion Constraints

Purpose:

This constraint is used so that the resulting FORPLAN harvest scheduling solution is in compliance with the Regulations 36 CFR 219.27(d)(2) which states that even-aged regeneration harvest units do not exceed 40 acres in size and that these openings are separated by logical harvest units.

Rationale

If these constraints were not used, the FORPLAN model could schedule for harvest in one decade large contiguous acreages of stands in order to best meet its objective function. To prevent this, upper limit constraints are placed on the proportion of an area that can be in harvest created openings at one time. The area is specified by combining analysis area and management emphases.

Tradeoffs.

These constraints have the potential to restrict FORPLAN's freedom in the way it schedules the harvesting of timber to meet its objectives. Analysis performed on these constraints during the AMS

indicated that a maximum of 3.4 percent reduction in PNV and no reduction in the ASQ is possible when the ASQ is set using a maximize PNV objective function. When the ASQ is set with a maximize timber objective function some reduction in ASQ is also expected. The cost of these constraints would be offset slightly due to the increase in elk they produce. Application of these constraints also eliminates the need for, or reduces the impact of, various feasibility constraints such as constraints on species mix, slope and condition class.

These constraints are completely overlapped by the watershed dispersion constraints. As a result they will have no impact within an alternative.

Watershed Dispersion Constraints

Purpose:

The upper limit of a watershed in a cutover state is limited to 25 percent to 35 percent depending on the watershed's sensitivity level. These constraints are used so that the resulting FORPLAN harvest scheduling solution is in compliance with the regulations 36 CFR 219.27(a,d&c), (Conservation of Soil and Water Resources).

Rationale:

Without these constraints FORPLAN could schedule more harvest activities in individual watersheds than their sensitivity levels indicate they can absorb.

Trade offs:

These constraints have the potential to restrict FORPLAN's freedom in the way it schedules the harvesting of timber to meet its objectives. Analysis performed on these constraints during the AMS indicated that a maximum of 9 percent reduction in PNV and a 4.3 reduction in the ASQ is possible.

The cost of these constraints would be offset slightly due to the increase in elk they produce. Application of these constraints also eliminates the need for or reduces the impact of various feasibility constraints such as constraints on species mix, slope and condition class.

Harvest Scheduling Constraints and Less Intensive Silvicultural Prescriptions Applied to Riparian Areas

Purpose:

To meet management requirements for riparian areas as stated in Regulations 36 CFR 219.27(e).

Rationale:

General forest scheduling and prescriptions are too intensive to ensure meeting riparian requirements.

Tradeoff:

Analysis conducted for the AMS indicated that a maximum of 1 percent in timber related outputs and benefits would be expected.

Inventory Constraints for Old Growth Dependent Wildlife Species

Purpose:

These constraints are applied to ensure that the wildlife habitat management requirements for pileated woodpeckers, pine martens, etc. are satisfied in accordance with the regulation.

Rationale:

All of these species are dependent upon mature and overmature stands of trees for their habitat. These constraints were designed to maintain at least the MR levels of habitat for these species. If they were not applied, it is very likely that FORPLAN would convert all or most of the mature and overmature suitable habitat to young managed plantations by the fifth decade.

Trade offs:

Timber related outputs and benefits will be reduced because timber harvesting is excluded on 18,000 acres of forested lands. Analysis indicates that the maximum effect would be a reduction of 2.6 percent on ASQ and 3.2 percent on PNV.

For a more detailed discussion of constraints 4 through 8 see section 6 of Appendix B and Appendix F.

Constraints needed to meet Biological Concerns

Limit Amount of Commercial Thinning Allowed on Ponderosa Pine Sapling Stands.

Purpose:

Because of the aggregation of data within the model, not all acres in this condition class are capable of being thinned. The main reasons are due to age and/ or stand condition.

Rationale:

The model could possibly schedule commercial thinning on more acres of this class than is actually feasible.

Trade offs:

These constraints have the potential to restrict FORPLAN's freedom in the way it schedules the harvesting of timber to meet its objectives. Their potential effect on ASQ and PNV is minor.

Limit Amount of Overstory Removal in Mixed Conifer Two-Storied Stands

Purpose·

Not all acres in this condition class are capable of having the understory managed due to the understory's condition, species mix, remaining volume and/or residual fuels.

Rationale:

The model potential could schedule overstory removal on more acres than is feasible.

Trade offs:

These constraints have the potential to restrict FORPLAN's freedom in the way it schedules the harvesting of timber to meet its objectives. Their potential effect on ASQ and PNV is minor.

Limit Amount of Acres that can be Reforested by Planting at Increased Stocking Levels

Purpose:

Planting at increased stocking levels is not feasible on all soil types.

Rationale:

The model could potentially schedule all acres to be planted at increased stocking levels regardless of soil types.

Trade offs:

Under alternatives which manage the timber resource more intensively than is economically efficient, these constraints could result in a minor reduction in ASQ and a slight increase in PNV.

Reforestation with Natural Regeneration Limited in both Pine and Mixed Conifer Stands

Purpose:

Not all areas of the forest are suited to natural regeneration. This is due either to an unacceptable time lag to become satisfactorily stocked and/or potential disease problems.

Rationale:

FORPLAN could schedule more acres than feasible with natural regeneration.

Trade offs:

Potentially, these constraints could have a minor effect on PNV (negative) and ASQ (positive).

Limitation on Acres FORPLAN can Schedule for Range Improvement

Purpose:

Treatment will be allowed only on those acres which are biologically feasible and/or cost efficient.

Rationale:
FORPLAN could potentially schedule treatment on more acres than feasible or cost efficient.

Trade offs:
This limits the amount of forage production which in turn limits the amount of AUM's. This will increase PNV slightly.

Total Effects for all Biological Constraints

An in/out analysis, performed on all the above biological constraints, using the maximum PNV benchmark, indicates a maximum decrease of a tenth of a percent in ASQ and an increase of a tenth of a percent in PNV.

Constraints Needed to Meet Administrative/Operational Concerns

Limit Acres of Two-Story Pine on Slopes (Less than 30 Percent) Able to Receive Overstory Removal and Precommercial Thinning of the Understory

Purpose:
Due to the heavy fuel loading in these natural stands, only a percentage of these stands needing precommercial thinning could feasibly have the resulting slash treated.

Rationale:
The model could potentially schedule more acres of this stand component to receive a precommercial thinning than is feasible.

Trade offs:
Potentially, these constraints could have a minor effect on PNV (negative and ASQ (positive).

Limit Low Site Pine Regeneration Harvest to 20 Percent per Decade

Purpose:
This condition class is comprised of scattered patches around the fringes of the main pine stands. It is not feasible to harvest these as a separate component. Instead they would have to be sold mixed in with other pine sales.

Rationale:
Because these are an independent analysis areas the model could schedule the entire condition class for harvest in a single decade.

Trade offs:
These constraints have the potential to restrict FORPLAN's freedom in the way it schedules the harvesting of timber to meet its objectives. Their potential effect on ASQ and PNV is minor.

Limit Timber Harvest Activities on Slopes Less than 30 Percent

Purpose:
These constraints are applied to ensure FORPLAN scheduled timber harvests are applied to a mix of slope classes. This is necessary to accommodate local logging capabilities and logical sale layout

Rationale:
Without this constraint FORPLAN could schedule an unacceptable mix of slope classes and fluctuation between decades.

Trade offs:
Potentially these constraints could have a minor effect on PNV (negative) and ASQ (positive).

Total Effects of All Administrative/ Operational Constraints

An in/out analysis, performed on all the above administrative/operational constraints, using the Max PNV Benchmark indicates a maximum decrease of a tenth of a percent in PNV and an increase of a tenth of a percent in ASQ.

Development of Alternatives

Introduction

The following discussion pertains to the development of the twelve alternatives displayed in the DEIS, the updated DEIS alternatives brought forward, and the new FEIS alternatives. The focus will be upon describing the purpose of each alternative and identifying the constraints used to characterize them so that their multiple resource management objectives were achieved as efficiently as possible. As previously discussed, the "No Change" Alternative was developed in response to decisions made by the Chief of the Forest Service and Deputy Assistant Secretary Douglas MacCleary regarding appeal number 1588, brought by the Northwest Forest Resource Council on May 19, 1986. The appeal centered on a decision by the Regional Forester to "require inclusion of (MR's) in the current Direction Alternative for each Forest Plan". The substance of the appeal was that a "true no-action alternative representing current management plan" was not included in Forest Plan EIS's. The No Change Alternative is designed to represent the existing Timber Management Plan and does not comply with all provisions of the National Forest Management Act (NFMA) and regulations promulgated by the Secretary of Agriculture to implement NFMA.

Each alternative is a combination of land uses, forest management activities, and resource outputs. As such, alternatives must consider the resource production capabilities (both the high and low limitations) of the many different areas on the Forest and Grassland. Each alternative is designed to manage the land to achieve predetermined goals and objectives. Some of these objectives, such as maintaining clean air and water, are common to all of the alternatives, other objectives, such as providing a certain mix and amount of resource outputs, vary between the alternatives. Several steps were involved in the development and analysis of the alternatives. They can be summarized as follows.

National and Regional direction, the planning Issues, Concerns and Opportunities, and the benchmark analyses were all used to help define a broad range of reasonable management alternatives which needed to be developed.

Within that range, alternatives with different management philosophies, goals and objectives were developed so as to reflect a wide range of choices concerning the best way to manage the Forest in order to maximize net public benefits.

Once the management philosophies, goals and objectives for all of the alternatives were determined, a land use pattern for the Forest was developed to reflect the intent of each alternative.

Other resource management objectives for each alternative were formulated in terms of constraints on activities, resource mixes and output levels, etc. in order to fully characterize the purpose of the alternative.

FORPLAN was then used to analyze the timber and range related outputs and effects for each alternative.

The results from the original FORPLAN runs were examined with regards to how well the predetermined goals and objectives of the alternative were achieved. Biological and administrative/operational concerns were also considered at this time. Depending on how well the alternative met all these considerations, land allocations and/or constraints to protect other resource objectives were adjusted and FORPLAN run again. This process continued until all objectives and concerns for all alternatives were adequately resolved.

The Transportation Network Model, and various customized software packages and electronic spreadsheets were then used to evaluate other outputs and effects associated with each alternative. Based on the results of this analysis, additional FORPLAN runs may or may not have been necessary to finish the alternative.

In the following discussion, the purpose of each alternative, the criteria and assumptions underlying its development, and its accompanying constraints

are presented. The constraints presented are those which were used in the final FORPLAN formulation of the alternative as it appears in the DEIS.

The tradeoffs associated with the individual constraint sets within each alternative are also discussed per the requirements of the May 17th outline for Appendix B, Section 7 Part C, and Section 8 Part D. The requirements of these two sections seemed to duplicate each other, so they were combined into this one section.

"With and without" constraint analysis was performed on the Max PNV Benchmark and a multiple use issue driven alternative (see Planning Records, 1920 11/85). Table B-7-2 summarizes this information and shows the maximum and minimum cost for each constraint type developed with this process. The following paragraph described the "with and without" process.

The opportunity costs associated with the Max PNV Benchmark should represent close to the maximum possible for an individual constraint within the context of any alternative. Development of these "maximum" individual constraint costs was accomplished by applying a few acres to the constraint in question and running the Max PNV Benchmark over. The fewer acres to which the constraints are applied, the less ability the model has to minimize their impact. As a result these costs should represent the maximum in the context of any alternative. Development of the constraint cost was accomplished by comparing the change in PNV between this run and the Max PNV Benchmark and dividing by the number of acres it was applied to. This process was used for all constraint types. The opportunity cost associated with the multiple use issue driven alternative followed the same procedures. In this case, acres were removed from the constraint type and the alternative run again. Because these costs were developed with all constraint types present and applied to large acreage these costs should represent close to the minimum these constraints would cost in the context of any alternative.

TABLE B-7-2
RANGE OF OPPORTUNITY COSTS FOR CONSTRAINTS

	1st Decade ft³/Ac		Dollars/Ac	
	Benchmark (Maximum)	Alternative (Minimum)	Benchmark (Maximum)	Alternative (Minimum)
Visuals				
Retention	361 48	139 99	864 96	148 74
Partial Retention	344 49	133 41	807 79	138 91
Semiprimitive				
Nonmotorized	400 34	295 95	720 64	205 17
Motorized	188 68	141 98	401 92	114 43
Big Game	53 14	45 65	125 42	49 54
Old Growth	362 57	272 84	873 07	248 57
Maintain Riparian	0	0	670 60	670 60
Wilderness	400 34	295 95	720 64	205 17
RNA	400 34	295 95	732 17	218 17
Snags (every 20%)	2 - 2 5% of total value		2 - 2 5% of total value	

"With and without" analysis was not performed for each alternative. The process would have been complex and the cost would have been prohibitive.

Alternative NC

The purpose of the "no change" alternative (Alternative NC) was in response to Appeal 1588, filed May 19, 1986, by the Northwest Forest Resource Council in which they requested that a "true no action alternative representing current management plans be included in Forest Plans and environmental impact statements.

Alternative NC is very similar to the no action alternative (Alternative A) described and analyzed in the Draft Environmental Impact Statement. Both were originally developed without National Forest Management Act (NFMA) requirements. This NC Alternative is based on the Timber Resource Plan which, in turn, is based on land allocations and other management decisions made in the three unit plans: Ochoco-Crooked River (1979), Silvies-Malheur (1978), and South Fork (1978).

Alternative NC differs from Alternative A in this FEIS in that each is based on a different computer model, timber inventory, and yield tables. Also, there are some differences in the way old growth and big game habitat would be managed, resulting in potential differences in environmental effect, and finally Alternative A has incorporated MR's.

Criteria and assumptions underlying the development of this Alternative are:

Unit Plan direction was incorporated if it does not conflict with Timber Resource Plan direction.

It will be based on existing management direction provided by the Timber Resource Plan.

Only NFMA requirements that are part of a current direction as established in the Timber Resource Plan and unit plans are included.

The yield tables used in the 1979 Timber Resource Plan (the basis for Alternative NC) were developed in 1975 for the entire Blue Mountain area without benefit of computer models. One set of yield tables was made for each timber type (Appendix D, Timber Resource Plan, 1979).

The Timber Resource Plan was modeled using Timber RAM (Resource Allocation Method), a linear program that is less sophisticated than the FORPLAN model used to develop the other alternatives. Timber RAM cannot consider economics or other resource constraints as FORPLAN does. All calculations were based on application of shelterwood silvicultural system with planting,, but the option of using other prescriptions was left open (Timber Resource Plan, pp. 15-16).

Alternative NC was based on the 1972 timber inventory. Alternative A (and all other alternatives) were based on the 1982 timber inventory.

The method for determining timber land suitability in Alternative NC was different from the NFMA-mandated methods used for Alternative A (and all other alternatives).

The suitable timber base in Alternative NC was taken from the Timber Resource Plan. Land allocations from the unit plans were deducted from the timber base in the reserved or deferred categories, or included as commercial forest land in one of four categories: standard component, special component, marginal component, or unregulated. The commercial forest land in the Timber Resource Plan (adjusted for the Oregon Wilderness Act) is 535,253 acres.

Alternative A (No Action)

The purpose of the "No Action" Alternative required by NFPA is to portray a description of the outputs and effects that could be expected to occur if the current management direction is continued This alternative was formulated using the four Unit Plans (Ochoco-Crooked River, Silvies-Malheur, South Fork of the John Day, and the Crooked River National Grassland), and the Timber Resource Plan.

It was not specifically designed to address the identified planning Issues, Concerns and Opportunities. The interpretations the Forest made results in an alternative with a blend of resource emphasis. The timber, range, big game, roadless, scenic, riparian, old growth, snag dependent wildlife species and dispersed recreation resources are all managed at levels less than maximum but more than minimum.

Criteria and assumptions underlying the development of this Alternative are:

It will be based on existing land use patterns and management direction provided by the four Unit Plans and the Timber Resource Plan.

Timber harvest is scheduled on a nondeclining yield basis. Current direction is to intensively manage timbered stands to the degree consistent with other resource requirements identified in the Unit Plans. This involves planting harvested units with genetically superior seedlings, planting at increased stocking levels, precommercial thinning to control the spacing of trees, one to three commercial thinnings both to harvest trees early and concentrate growth on the remaining trees, and managing for a rotation age close to the time where average annual growth is highest. This type of management is planned for the majority of the Forest's acres. Other resource requirements for some lands may either prohibit timber harvesting (old growth and roadless recreation management), lengthen rotations (riparian areas and scenic corridors), or alter thinning practices (big game emphasis areas).

Current direction is to make forage available for livestock use at levels that do not cause conflicts with other resources. Livestock numbers will be similar to current levels.

Additional Constraints

In addition to the common constraints described in Section 6, other unique constraints were also used in order to help achieve the objectives of this Alternative. These additional constraints were incorporated into the development of the Alternative for which the results are summarized in Table B-7-3. The purpose, rationale and tradeoffs associated with each of these unique individual constraints, or constraint sets, is discussed below.

Nondeclining Yield Constraints

Purpose:

To ensure that the timber volume harvested in any decade is greater than or equal to the timber volume harvested in the preceding decade. Current management direction is based on nondeclining yield.

Rationale:

Without these constraints, FORPLAN could schedule harvest levels which rise and fall erratically. This would not be consistent with current management plans.

Trade offs:

Since both the Max PNV Benchmark and Alternative A schedule the harvesting of timber under nondeclining flow, the tradeoffs of imposing these constraints on this Alternative are not measurable by comparing the two. However, by imposing the nondeclining flow constraints, the model's flexibility to harvest timber in such a way as to maximize PNV is reduced. Therefore, early decade economic returns and timber output levels are traded off in exchange for stable long term harvest levels. Comparing departure timber harvest schedules within other alternatives indicates that it is possible that relaxing this constraint could result in a maximum increase of 16 percent in the first decade ASQ and a two percent increase in PNV.

Snag Level Constraints

Purpose.

Habitat for cavity dwelling species (snags) is managed to provide for 55 percent of maximum potential populations across the Forest. Current management direction is providing for this level. In order to meet this objective all timber yield tables for timber, range and big game emphases provided snag habitat at the 40 and 60 percent level respectively

Rationale:
Without specifically providing for this level, FORPLAN would select timber yield tables which only provide snag habitat at the MMR level.

Trade offs:
Because these constraints limit the volume of timber that can be harvested on a per acre basis, they reduce both the ASQ and PNV.

Limit the amount of planting at increased stocking levels in any one decade to 75 percent for any working group needing reforestation.

Purpose:
Not only is there a biological limit on the total acres for this practice (see Common Constraints), but an operational limit as well. Because the soil types amenable to this practice are intermixed with other soil types, it is practical to schedule this reforestation method on only a portion of those acres needing reforestation in any one decade.

Rationale:
Because of the intensity of timber management in this alternative, FORPLAN could schedule this practice on all acres needing reforestation in the early decade.

Trade offs:
Since planting at increased stocking results in higher future stand volumes and or earlier rotation ages, these constraints restrict FORPLAN's harvest scheduling flexibility. Analysis indicates that imposition of these constraints has a slightly negative effect on first decade ASQ (less than one percent) and because of the high cost of this activity, a slightly positive effect on PNV (less than one percent).

Use of a maximize timber objective function to set the ASQ

Purpose:
Current management direction is to manage intensively for timber production.

Rationale:
Without the use of this objective function it would not be possible to meet both the current harvest level and other resource objectives.

Trade offs:
Under this objective function, the Model selects more intensive management practices and schedules harvest from more costly and less valuable stands which have higher growth potential than would be selected with the use of a maximize PNV objective function. As a result, first decade ASQ is significantly higher and PNV is significantly lower.

Resource Objective Constraints

Purpose:
These constraints were applied so that the multiple resource land use pattern of the current land management plans would be correctly represented across all of the FORPLAN analysis areas.

Rationale:
Many of the wildlife, recreation, and other resources on the Forest are not represented with output and value coefficients in FORPLAN. In the absence of these constraints, the Model would only have timber and range related values available to it for making land allocation choices. These constraints indicate how many acres of each analysis area are allocated to particular multiple resource management objective. These acreage figures are in addition to those found in the Max PNV Benchmark. FORPLAN then decides which schedule of management activities, and which level of capital investment is the most efficient in order to meet the overall objectives of the Alternative. The breakdown of acres allocated to the various resource objectives for this Alternative is displayed in Table B-7-3.

TABLE B-7-3
RESOURCE OBJECTIVES FOR ALTERNATIVE A

Resource Objective	Acres
Big Game	
Summer & Winter Range	93,930
Old Growth	19,200
Scenic Views	
Retention Foreground	32,172
Partial Retention Foreground	55,312
Semiprimitive Nonmotorized	31,455
Riparian - Acceptable	12,210

Trade offs·
As Table B-7-4 indicates, all resource objectives have a negative impact on both PNV and first decade ASQ. This is a result of these resource objectives limiting the percentage of an emphasis area that can be harvested in a decade, extending rotation ages or limiting the intensity of management. All resource objectives have a significant cost This is a result of large acreage being applied to all these resource objectives.

Alternative B-Modified

The intent of this alternative in the DEIS (Alternative B) was to meet the 1980 RPA timber and range program targets, as identified for the Forest and Grassland in the Regional Guide, with a timber harvest schedule based on nondeclining yield. This alternative was very similar to the max timber benchmark. This alternative focuses heavily on intensive management to produce timber and range products Special provisions were also made to provide enough firewood to meet identified local demand Other resources were managed at minimum levels. Alternative B's basic philosophy of intensive timber management has been modified to emphasize other resource management where compatible with timber Also, for some resources (selected roadless areas, visual corridors, etc), timber volume was given up to provide for these resources.

The criteria and assumptions underlying the development of this Alternative are:

Forage would be made available for livestock use at the current level (75,000 AUM's).

Timber harvest is scheduled on a nondeclining yield basis. Intensive timber management practices would be applied to many of the suitable acres. This involves

TABLE B-7-4
ALTERNATIVE A
OPPORTUNITY COST OF RESOURCE OBJECTIVES 1/

Resource Objective	PNV (M $)	ASQ (1st Decade MMCF)	Discount Benefits (M $)	Discounted Costs (M $)
PNV Benchmark	512	229	754	242
Alternative A	421	193	657	236
Total Cost	-91	-36	-97	-6

	PNV (M $)	ASQ (1st Decade MMCF)
Increased ASQ *	-17 6	+8 5
Visual		
Retention	-7 2	-7 0
Partial Retention	-11 7	-8 0
Semiprimitive Nonmotorized	-9 7	-10 1
Big Game	-7 2	-4 9
Old Growth	-7 2	-5 6
Riparian	-5 8	
Snags	-24 6	-8 9

* Intensity of timber management increased through the use of a maximized timber objective function

1/ Only those resource objectives which have an opportunity cost are portrayed

planting harvested units with genetically superior seedlings, planting at increased stocking levels, precommercial thinning to control the spacing of trees, up to three commercial thinnings both to harvest trees early and concentrate growth on the remaining trees, and managing for a rotation age close to the point in time where average annual growth is highest.

Approximately 120,000 acres of ponderosa pine stands would be managed under an uneven-age management system.

All riparian areas would be managed to achieve and/or maintain an "excellent" classification.

Big game habitat would receive some special management on 171,500 acres of General Forest Winter Range.

Corridors along many of the principal roadways would be managed to retain their scenic values (34,000 acres).

Old growth would receive a low emphasis (18,000 acres).

Habitat for cavity dwelling species (snags) would be managed at the 20 percent of potential populations (MR level).

Portions of Lookout Mountain and Silver Creek would be managed to retain their roadless character. A modified roadless area (Squaw Creek) would also be created.

Special protection would be provided for dispersed recreation sites (Deep Creek, Bandit Springs, Steins Pillar, and Round Mountain recreation trail management areas).

Additional campgrounds would be added and the trail system would be significantly expanded.

Additional Constraints

In addition to the common constraints described in Section 7, other unique constraints were also used in order to help achieve the objectives of this Alternative. These additional constraints were incorporated into the development of the Alternative. The results are summarized in Table B-7-5. The purpose, rationale and trade-offs associated with each of these unique individual constraints, or constraint sets, is discussed below.

Nondeclining Yield Constraint

Purpose·

To ensure that the timber volume harvested in any decade is greater than or equal to the timber volume harvested in the preceding decades to meet the requirements set in CFR 219.16(a).

Rationale:

Without this constraint FORPLAN could schedule harvest levels which rise and fall erratically. This would not meet the intent of the CFR regulations or the objective of the alternative.

Trade offs.

Since both the Max PNV Benchmark and Alternative B schedule the harvesting of timber under nondeclining flow, the tradeoffs of imposing these constraints on this alternative are not measurable by comparing the two. However, in general, by imposing the nondeclining flow constraints, the model's flexibility to harvest timber in such a way as to maximize PNV is reduced. Therefore, early decade economic returns and timber output levels are traded off in exchange for stable long term harvest levels. Comparing departure timber harvest schedules within other alternatives, it is possible that relaxing this constraint could result in a maximum increase of 16 percent in the first decade ASQ and a 2 percent increase in PNV.

Limit the amount of planting at increased stocking levels to 75 percent for any working group needing reforestation in any one decade

Purpose:

Not only is there a biological limit on the total acres for this practice (see Common Constraints), but an operational limit as well. Because the soil types amendable to this practice are intermixed with other soil types, it is practical to schedule this reforestation method on only a portion of those acres needing reforestation in any one decade.

Rationale.

Because of the intensity of timber management in

this alternative, FORPLAN could schedule this practice on all acres needing reforestation in the early decade.

Trade offs
Since planting at increased stocking results in higher future stand volumes and or earlier rotation ages, these constraints restrict FORPLAN's harvest scheduling flexibility. Analysis indicates that imposition of these constraints has a slightly negative effect on first decade ASQ (less than one percent) and because of the high cost of this activity, a slightly positive effect on PNV (less than one percent).

Use of a Maximized Timber Objective Function to set the ASQ

Purpose.
To help meet RPA timber harvest targets.

Rationale:

Without the use of this objective function this alternative could not meet RPA timber targets.

Trade offs:

Under this objective function, the model selects more intensive management practices, and schedules timber harvests from more costly and less valuable stands with higher growth potential, than would be selected with the use of a maximize PNV objective function. As a result, first decade ASQ is significantly higher and PNV is significantly lower.

Constrain 120,000 acres of ponderosa pine to uneven-aged management

Purpose.
To ensure the Forest Plan selects a portion of the ponderosa pine stands for uneven-aged management.

Rationale:
Without it FORPLAN would not select any acres for uneven-age management in this alternative.

Trade offs
This alternative uses a maximum timber objective function to set the ASQ and LRSYC is binding. As a result, forcing the model to select acres for uneven-age management will have a negative effect on ASQ.

Resource Objective Constraints

Purpose·
These constraints were applied so that the multiple resource land use pattern needed to achieve the objectives of this Alternative would be correctly represented across all of the FORPLAN analysis areas.

Rationale
Since many of the wildlife, recreation, and other resources on the Forest are not represented with output and value coefficients in FORPLAN, in the absence of these constraints the Model would only have timber and range related values available to it for making land allocation choices. These acreage figures are in addition to those found in the Max PNV Benchmark. These constraints indicate how many acres of each analysis area should be allocated to particular multiple resource management emphases. FORPLAN then decides which schedule of management activities, and which level of capital investment is the most efficient in order to meet the overall objectives of the Alternative. The breakdown of acres allocated to the various resource objectives for this Alternative are displayed in Table B-7-5.

TABLE B-7-5
RESOURCE OBJECTIVES FOR ALTERNATIVE B-MODIFIED

Resource Objective	Acres
Scenic Views	
Retention Foreground	6,850
Partial Retention Foreground	27,550
Semiprimitive Nonmotorized	10,660
Special I 1/	9,240
Special II 2/	1,830
Special III 3/	3,240

1/ Special I is comprised of management areas that fall into FORPLAN Group IV (see Section 3) and are not visual corridors This includes parts of MA F7, and all of MA-F13, 14, 16, and 27

2/ Special II is comprised of management areas that fall into FORPLAN Group V (see Section 3) and are not visual corridors This includes parts of MA F7 and all of MA F18 and 23

3/ Special III is comprised of management areas that fall into FORPLAN Group III (see Section 3) and are not visual corridors This includes MA F17, 19, and 24

Trade offs:
As Table B-7-6 indicates, all resource objectives have a negative impact on both PNV and first decade ASQ. This is a result of these resource objectives limiting the percentage of an emphasis area that can be harvested in a decade, extending rotation ages or limiting the intensity of management. Both the scenic and SPNM objectives have low costs associated with them because very few acres are involved Riparian conditions, on the other hand, have a high cost because they are applied to the maximum amount of acres.

Alternative C-Modified

The purpose of this alternative is to respond to issues raised during the planning process regarding amenity resources found within the Forest and Grassland. This alternative is very similar to the Max Recreation and Big Game Benchmark.

This alternative will emphasize resources associated with amenity values, such as water, visuals, fish and wildlife, and dispersed recreation. Management for other resources (timber and range) will be at economically and environmentally feasible levels consistent with the emphasis on amenity values. This alternative is similar to Alternative C in the DEIS The major change involves reducing big game cover objectives in order to allow most of the ponderosa pine acres to be managed with uneven-aged silvicultural systems.

TABLE B-7-6
ALTERNATIVE B-MODIFIED
OPPORTUNITY COST OF RESOURCE OBJECTIVES 1/

Resource Objective	PNV (M $)	ASQ (1st Decade MMCF)	Discount Benefits (M $)	Discounted Costs (M $)
PNV Benchmark	512	229	754	242
Alternative B-Modified	455	219	714	262
Total Cost	-57	-10	-40	+20

	PNV (M $)	ASQ (1st Decade MMCF)
Increased ASQ *	-19 7	+13 0
Visual		
Retention	-3 3	-2 1
Partial Retention	-12 8	-7 7
Semiprimitive Nonmotorized	-8 6	-5 3
Special I	-1 8	-3 3
Special II	- 4	- 2
Special III	-1 6	- 9
Uneven-aged	-5 6	-3 5

* Intensity of timber management increased through the use of a maximized timber objective function

1/ Only those resource objectives which have an opportunity cost are portrayed

The criteria and assumptions underlying the development of this alternative are:

Additional campground units would be added to the Delintment Lake, Antelope, and Falls campgrounds.

The trail system on the Forest and Grassland would be significantly expanded. These developments would primarily be in association with Wildernesses and roadless management areas.

Corridors adjacent to all of the principal pathways throughout the Forest and Grassland would be managed to attain or retain pleasing scenery.

The Silver Creek, Cottonwood, Rock Creek, and Lookout Mountain roadless areas would be managed to maintain the present roadless character. Green Mountain would be partially developed to provide a semi-primitive setting with primitive roads for recreational use. Deschutes Canyon would be recommended for Wilderness in this alternative.

Big game receives a special management emphasis on the majority of the Forest and Grassland (679,000 acres). In these areas, road use and thermal cover quantity, quality, and distribution would be controlled to provide high quality big game habitat.

A relatively large amount of land would be specially dedicated to old growth habitat in this alternative (45,000 acres). The Wildernesses and roadless management areas provide an additional 29,000 acres of old growth.

Habitat for cavity dwelling species (snags) would be provided for at high levels, sustaining dependent species at 80 percent of their potential population levels.

Forage would be made available at low levels, approximately 12 percent lower (65,800 AUM's) than currently allowed. Heavy emphasis on improvement of riparian conditions, and timber management designed to maintain dense timber stands for big game cover, account for the diminished level of forage for livestock use.

Timber harvest is scheduled on a nondeclining yield basis. Timber management activities which are most economically efficient would be used while meeting other resource objectives. Resource requirements for this alternative may either prohibit timber harvesting (old growth and roadless recreation management), lengthen rotations (riparian areas and scenic corridors), or alter thinning practices (big game emphasis areas).

Approximately 170,000 acres of ponderosa pine stands would be managed under uneven-aged management systems.

Relatively low volumes of personal use firewood would be available in this alternative due to the diminished rate of timber harvest. Road closures for big game might limit access to firewood.

Management in riparian areas would be directed toward achieving and maintaining excellent streambank stability, stream temperature, and fish habitat within fifteen years. All watersheds on the Forest and Grassland would be managed to meet these goals

Additional Constraints

In addition to the common constraints described in Section 7, other constraints were also used to help achieve the objectives of this Alternative. These additional constraints were incorporated into the development of the Alternative for which the results are summarized in Table B-7-7. The purpose, rationale, and tradeoffs associated with each of these unique individual constraints, or constraint sets, are discussed below.

Nondeclining Yield Constraints

Purpose·

To ensure that the timber volume harvested in any decade is greater than or equal to the timber volume harvested in the preceding decades. To meet the requirements set in CFR 219.16(a).

Rationale:

Without this constraint FORPLAN could schedule harvest levels which rise and fall erratically. This would not meet the intent of the CFR regulations or the objective of the alternative.

Trade offs.

Since both the Max PNV Benchmark and Alterna-

tive C schedule the harvesting of timber under nondeclining flow, the tradeoffs of imposing these constraints on this alternative are not measurable by comparing the two. However, in general, by imposing the nondeclining flow constraints, the model's flexibility to harvest timber in such a way as to maximize PNV is reduced. Therefore, early decade economic returns and timber output levels are traded off in exchange for stable long term harvest levels. Comparing departure timber harvest schedules within other alternatives, it is possible that relaxing this constraint could result in a maximum increase of 16 percent in the first decade ASQ and a two percent increase in PNV.

Snag Level Constraints

Purpose:

Habitat for cavity dwelling species (snags) is managed to provide for 80 percent of the maximum potential populations across the Forest. One of the main objectives of this alternative is high population levels of cavity nesters. In order to meet this objective, management emphases which do not automatically provide the 100 percent level were provided with timber yield tables which provide for the 60 percent level.

Rationale:

Without specifically providing for this level, FORPLAN would select timber yield tables which only provide snag habitat at the MMR level.

Tradeoff:

Because these constraints limit the volume of timber that can be harvested on a per acre basis, they reduce both the ASQ and PNV.

Resource Objective Constraints

Purpose:

These constraints were applied so that the multiple resource land use pattern needed to achieve the objectives of this Alternative would be correctly represented across all of the FORPLAN analysis areas.

Rationale:

Since many of the wildlife, recreation, and other resources on the Forest are not represented with output and value coefficients in FORPLAN, in the absence of these constraints the Model would only have timber and range related values available to it for making land allocation choices. These constraints indicate how many acres of each analysis area should be allocated to particular multiple resource management emphases. These acreage figures are in addition to those found in the Max PNV Benchmark. FORPLAN then decides which schedule of management activities, and which level of capital investment is the most efficient in order to meet the overall objectives of the Alternative. The breakdown of acres allocated to the various resource objectives for this Alternative is displayed in Table B-7-7.

Trade offs:

As Table B-7-8 indicates, all resource objectives have a negative impact on both PNV and first decade ASQ. This is because these resource objectives limit the percentage of an emphasis area that can be harvested in a decade, extend rotation ages or limit the intensity of management. These resource objectives have the highest total cost in terms of PNV and first decade ASQ of all the alternatives. This is a result of the high acreage to which all the objectives are applied.

TABLE B-7-7
RESOURCE OBJECTIVES FOR ALTERNATIVE C-MODIFIED

Resource Objective	Acres
Big Game	
Summer & Winter Range	686,925
Old Growth	27,260
Scenic Views	
Retention Foreground	67,756
Partial Retention Foreground	38,961
Semiprimitive Nonmotorized &	
Addition to Wilderness	43,960
Semiprimitive Motorized	7,000
Research Natural Areas	2,620
Uneven-aged Management	170,000

TABLE B-7-8
ALTERNATIVE C-MODIFIED
OPPORTUNITY COST OF RESOURCE OBJECTIVES 1/

Resource Objective	PNV (M $)	ASQ (1st Decade MMCF)	Discount Benefits (M $)	Discounted Costs (M $)
PNV Benchmark	512	229	754	242
Alternative C-Modified	395	156	608	213
Total Cost	-117	-73	-146	-29

	PNV (M $)	ASQ (1st Decade MMCF)
Visual		
Retention	-19 3	-12 2
Partial Retention	-10 3	-6 7
Semiprimitive Nonmotorized & Additions to wilderness	-18 7	-18 0
Semiprimitive Motorized	-1 6	-1 4
Big Game	-33 2	-20.0
Old Growth	-13 0	-9 8
Research Natural Areas	-1 1	- 9
Snags	-13 3	-4 0
Uneven-aged	-6 5	0

1/ Only those resource objectives which have an opportunity cost are portrayed

Alternative I

The purpose of this alternative is to respond to ICO's raised since the issuance of the DEIS.

This alternative emphasizes a combination of roadless recreation, big game habitat, timber production, dispersed recreation opportunity, and uneven-aged management. A blend of resource uses provides for a high quality of life and contributes to local job stability. Almost all resources are managed at moderate levels.

The criteria and assumptions underlying the development of this alternative are:

The trail system on the Forest and Grassland would be greatly expanded. Foot and horse developments would mostly be in association with Wildernesses and roadless management areas.

A moderate number of travel corridors would be managed for scenery. These include major roads and access roads to roadless management areas.

Portions of the Rock Creek and Cottonwood Creek areas would be managed for unroaded recreation. Green Mountain would be managed under General Forest and General Forest Winter Range. The Silver Creek roadless area would be managed to retain the present roadless character. The Broadway area would be managed for General Forest. Lookout Mountain will remain roadless for the first decade. The lower portion of the Management Area would be managed for the enhancement of forest health, scenery, wildlife and recreation from the second through the fifth decades, leaving a 7,550 acre area unroaded.

A portion of the Deschutes River Canyon-Steelhead Falls Wilderness Study Area and an additional area outside the WSA Squaw Creek are combined to form a 7,840 acre management area emphasizing semiprimitive, nonmotorized recreational opportunities and wildlife habitat management.

Big game receives a special management emphasis on 230,500 acres of the Forest and Grassland. Most of this represents high priority winter range.

In these areas road use and cover quantity, quality, and distribution would be controlled to provide high quality big game habitat.

A small amount of land would be specially dedicated to old growth habitat in this alternative (19,990 acres).

Habitat for cavity dwelling species (snags) would be managed at fairly high levels, sustaining dependent species at 55 percent of their potential population levels.

Special management is proposed for dispersed recreation sites, Deep Creek, Bandit Springs, Stein's Pillar, Historic trail, and Round Mountain recreation trail.

Several areas would be proposed as new RNA's with this alternative. The Island, Stinger Creek, Silver Creek, and Dry Mountain, and a portion of Haystack Butte all fulfill research needs and would be managed in accordance with research priorities. The existing Ochoco Divide RNA would continue to be managed as such.

Forage would be made available for use at the current situation level (75,000 AUM's)

Timber harvest is scheduled on a nondeclining yield basis. Timber management activities which are most economically efficient would be used while meeting other resource objectives. Resource requirements for this alternative may either prohibit timber harvesting (old growth), lengthen rotations (riparian areas, scenic corridors, and ponderosa pine stands), or alter thinning practices (big game emphasis areas).

Approximately 100,000 acres of ponderosa pine stands would be managed under uneven-aged management strategies.

Relatively low volumes of personal use firewood would be available in this alternative, due to a lower rate of timber harvest than currently practiced.

Management in all riparian areas would be directed toward achieving and maintaining excellent streambank stability, stream temperature, and fish habitat within fifteen years

Additional Constraints

In addition to the common constraints described in Section 7, other unique constraints were also used to help achieve the objectives of this Alternative. These additional constraints were incorporated into the development of the Alternative for which the results are summarized in Table B-7-9. The purpose, rationale, and tradeoffs associated with each of these unique individual constraints, or constraint sets, is discussed below.

Nondeclining Yield Constraint

Purpose:

To ensure that the timber volume harvested in any decade is greater than or equal to the timber volume harvested in the preceding decades. To meet the requirements set in CFR 219.16(a).

Rationale:

Without this constraint FORPLAN could schedule harvest levels which rise and fall erratically. This would not meet the intent of the CFR regulations or the objective of the alternative.

Trade-off:

Since both the Max PNV Benchmark and Alternative E schedule the harvesting of timber under nondeclining flow, the tradeoffs of imposing these constraints on this Alternative are not measurable by comparing the two. However, in general, by imposing the nondeclining flow constraints, the model's flexibility to harvest timber in such a way as to maximize PNV is reduced. Therefore, early decade economic returns and timber output levels are traded off in exchange for stable long term harvest levels. Comparing departure timber harvest schedules within other alternatives, it is possible that relaxing this constraint could result in a maximum increase of 16 percent in ASQ and a two percent increase in PNV in the first decade.

Snag Level Constraints

Purpose:

Habitat for cavity dwelling species (snags) is managed to provide for 55 percent of maximum potential populations across the Forest. A moderate population level of cavity nesters reflects the objectives of this alternative. In order to meet this objective the timber/range management emphasis pro-

vides snags at the 40 percent level and the big game management emphasis provides snags at the 60 percent level.

Rationale
Without specifically providing for this level, FORPLAN could chose timber yield tables with snag habitat provided at the MMR level.

Trade offs.
Because these constraints limit the volume of timber that can be harvested on a per acre basis, they reduce both the ASQ and PNV.

Harvest Flow Constraints (Districts 1 and 2)

Purpose:
To ensure that the harvest schedule did not fluctuate dramatically in the early decades.

Rationale.
These constraints were applied because the FORPLAN scheduled harvest levels which fluctuated drastically in the early decades.

Trade offs
These constraints could limit the model's flexibility, thus reducing PNV and/or ASQ. In the context of Alternative I they have a minor effect on PNV and no effect on ASQ.

Upper Limit on Ponderosa Pine Working Group Volume

Purpose:
To ensure that ponderosa pine volume remains fairly stable in the early decades.

Rationale·
Without this constraint FORPLAN would schedule more ponderosa pine in the first decade and less in the second. The pine volume decrease between the first and second decade did not meet the intent of the Alternative.

Trade offs:
These constraints could limit the model's flexibility, thus reducing PNV and/or ASQ. This constraint had a slightly negative effect on PNV and no effect on ASQ

Upper Limit on the amount of Uneven-aged Management per Decade

Purpose.
Limit the fluctuation of acres treated and species volume harvested per decade.

Rationale:
Without this constraint the model started the uneven-aged cycle on all 100,000 acres in the first decade. This resulted in widely fluctuating acres treated and species volume between decades.

Trade offs:
These constraints could limit the model's flexibility, thus reducing PNV and/or ASQ. This constraint has a slightly negative affect on PNV and no effect on ASQ.

Resource Objective Constraints

Purpose
These constraints were applied so that the multiple resource land use pattern needed to achieve the objectives of this Alternative would be correctly represented across all of the FORPLAN analysis areas.

TABLE B-7-9
RESOURCE OBJECTIVES FOR ALTERNATIVE I

Resource Objective	Acres
Big Game	230,500
Old Growth	1,250
Scenic Views	
Retention Foreground	9,300
Partial Retention Foreground	23,960
Semiprimitive Nonmotorized	30,590
Special I 1/	18,800
Special II 2/	8,000
Special III 3/	3,240
Research Natural Areas	2,365

1/ Special I is comprised of management areas that fall into FORPLAN Group IV (see Section 3) and are not visual corridors This includes parts of MA-F7, and all of MA-F13, 14, 16, and 27

2/ Special II is comprised of management areas that fall into FORPLAN Group V (see Section 3) and are not visual corridors This includes parts of MA F7 and all of MA F18 and 23

3/ Special III is comprised of management areas that fall into FORPLAN Group III (see Section 3) and are not visual corridors This includes MA-F17, 19, and 24

Rationale.
Since many of the wildlife, recreation, and other resources on the Forest are not represented with output and value coefficients in FORPLAN, in the absence of these constraints the Model would only have timber and range related values available to it for making land allocation choices. These constraints indicate how many acres of each analysis area should be allocated to particular multiple resource management emphases. These acreage figures are in addition to those found in the Max PNV Benchmark. FORPLAN then decides which schedule of management activities and which level of capital investment is the most efficient in order to meet the overall objectives of the Alternative. The breakdown of acres allocated to the various resource objectives for this Alternative is displayed in Table B-7-9.

Trade offs:
As Table B-7-10 indicates, all resource objectives have a negative impact on both PNV and first decade ASQ. This is a result of these resource objectives limiting the percentages of an emphases area that can be harvested in a decade, extend rotation ages or limit the intensity of management. Most resource objectives are applied to a moderate amount of acres. This results in a moderate cost which is split fairly evenly amongst the resources.

Alternative E-Departure

The purpose of this alternative is to address both amenity and commodity values. Short term community stability is also heavily emphasized. This alternative has not been modified between the DEIS and FEIS.

TABLE B-7-10
ALTERNATIVE I
OPPORTUNITY COST OF RESOURCE OBJECTIVES 1/

Resource Objective	PNV (M $)	ASQ (1st Decade MMCF)	Discount Benefits (M $)	Discounted Costs (M $)
PNV Benchmark	512	229	754	242
Alternative B-Modified	475	190	701	227
Total Cost	-37	-39	-53	-15

	PNV (M $)	ASQ (1st Decade MMCF)
Visual		
Retention	-2 5	-2 4
Partial Retention	-5 3	-5 5
Semiprimitive Nonmotorized	-6 2	-10 8
Special I	-4 9	-4 8
Special II	-2 1	- 5
Special III	- 8	- 6
Big Game	-6 2	-6 0
Old Growth	- 8	- 6
Research Natural Areas	- 8	-1 2
Snags	-3 7	-3 3
18" Pine	-3 7	-3 3

* Intensity of timber management increased through the use of a maximized timber objective function

1/ Only those resource objectives which have an opportunity cost are portrayed

This alternative emphasizes a combination of timber production, roadless recreation, and big game habitat. Timber is scheduled as a departure from nondeclining yield. Timber volumes are scheduled so that first decade harvests remain close to current harvest levels, and then decline gradually over the next 50 years. A blend of resource uses is attempted that both maintains local jobs in the short term, and provides for a high quality of life. Almost all resources are managed at moderate levels.

The criteria and assumptions underlying the development of this alternative are:

The trail system on the Forest and Grassland would be greatly expanded. These developments would be in association with Wildernesses and roadless management areas. Additional campground units would be added to the Delintment Lake, Antelope and Falls campground.

A moderate number of travel corridors would managed for scenery (46,160 acres). This would apply to major roads, access roads to roadless management areas, and a recreation travel corridor on the Big Summit District.

The Rock Creek, Cottonwood, and Silver Creek roadless areas would be managed to retain the present roadless character. The Broadway area would be managed under a big game emphasis. Green Mountain and the top of Lookout Mountain would be partially developed to provide a semiprimitive setting with primitive roads for recreational use.

Big game would receive a special management emphasis on 226,400 acres of the Forest and Grassland. Most of this represents high priority winter range. In these areas road use and thermal cover quantity, quality, and distribution would be controlled to provide high quality big game habitat.

A fairly small amount of land would be specially dedicated to old growth habitat in this alternative (26,300 acres). The Wildernesses and roadless management areas provide an additional 21,000 acres of old growth.

Habitat for cavity dwelling species (snags) would be managed at fairly high levels, sustaining dependent species at 55 percent of their potential population levels.

Several areas would be proposed as new RNA's with this alternative. The Island, Stinger Creek, Silver Creek, and Dry Mountain, and a portion of Haystack Butte all fulfill research needs and would be managed in accordance with research priorities. The existing Ochoco Divide RNA would continue to be managed as such.

Forage would be made available for use at levels approximately five percent higher (79,000 AUM's) than currently allowed.

Timber harvest is scheduled as a departure from the nondeclining yield harvest levels set in Alternative E. The objective is to maintain current harvest levels for one decade (130 million board feet annually), and then gradually decline over the following 40 years to a sustainable level. Timber management activities which are most economically efficient would be used while meeting other resource objectives. Resource requirements for this alternative may either prohibit timber harvesting (old growth and roadless areas), lengthen rotations (riparian areas and scenic corridors), or alter thinning practices (big game emphasis areas).

Moderate volumes of personal use firewood would be available in this alternative due to the increased rate of timber harvest in the first decade (13,000 cords). Future firewood availability would decline significantly.

Management in many riparian areas would be directed toward achieving and maintaining excellent streambank stability, stream temperature, and fish habitat within fifteen years. Watersheds on the Forest and Grassland which contain anadromous fish, and high-valued resident trout will be managed to meet these goals.

Additional Constraints

In addition to the common constraints described earlier in this section, other constraints were also used to help achieve the objectives of this alterna-

tive. These additional constraints were incorporated into the development of the alternative for which the results are summarized in Table B-7-11. The purpose, rationale, and tradeoffs associated with each of these unique individual constraints, or constraint sets, is discussed below.

Scheduled Output Constraint

Purpose:
First decade harvest level is constrained at the current level (132 MMBF). The objective of this Alternative is to provide high levels of amenity resources and maintain local jobs in the short term. Because most job increases and decreases are tied to timber harvest levels, maintaining current timber harvest levels will maintain the current level of forest related jobs.

Rationale:
Because of resource objectives besides the ASQ, it was impossible to meet current harvest levels without specifically constraining the Model to provide this level.

Trade offs:
By allowing the ASQ to depart from nondeclining yield both the first decade ASQ and PNV increase significantly.

Harvest Flow Constraints

Purpose.
Because the first decade harvest level was not sustainable, it was necessary to allow the model to schedule declining volumes in latter decades. The model was allowed to schedule up to a ten percent decrease in volume between decades one and two and again between decades two and three. Between decades three and four and four and five volume was allowed to decrease five percent. From the fifth decade on the harvest flow was controlled by nondeclining yield.

Rationale:
The rationale behind these flow constraints was to have a timber harvest level which declines as gradually as possible to minimize the negative impact on dependent communities, yet ensures a feasible solution.

Trade offs:
These constraints limit the rate which the ASQ can decline between decades. As a result they limit the potential increase in first decade ASQ and PNV that could have been obtained under a departure timber harvest schedule.

Snag Level Constraints

Purpose:
Habitat for cavity dwelling species (snags) is managed to provide for 55 percent of maximum potential populations across the Forest. A moderate population level of cavity nesters reflects the objectives of this alternative. In order to meet this objective the timber/range and big game management emphasis provide snags at the 40 percent and 60 percent level respectively.

Rationale:
Without specifically providing for this level, FORPLAN could choose timber yield tables which only provide snag habitat at the MMR level.

Tradeoff:
Because these constraints limit the volume of timber that can be harvested on a per acre basis, they reduce both the ASQ and PNV.

Resource Objective Constraints

Purpose:
These constraints were applied so that the multiple resource land use pattern needed to achieve the objectives of this Alternative would be correctly represented across all of the FORPLAN analysis areas.

Rationale:
Since many of the wildlife, recreation, and other resources on the Forest are not represented with output and value coefficients in FORPLAN, in the absence of these constraints the Model would only have timber and range related values available to it for making land allocation choices. These acreage figures are in addition to those found in the Max PNV Benchmark. These constraints indicate how many acres of each analysis area should be allocated to particular multiple resource management emphases. FORPLAN then decides which schedule of management activities, and which level of capital investment is the most efficient in order to meet the

TABLE B-7-11
RESOURCE OBJECTIVES FOR ALTERNATIVE E-DEPARTURE

Resource Objective	Acres
Big Game	
Summer & Winter Range	226,400
Old Growth	8,570
Scenic Views	
Retention Foreground	13,730
Partial Retention Foreground	28,690
Semiprimitive Nonmotorized	27,315
Semiprimitive Motorized	7,000
Riparian - Acceptable	7,630
Research Natural Areas	2,570

overall objectives of the Alternative. The breakdown of acres allocated to the various resource objectives for this Alternative is displayed in Table B-7-11.

Trade offs:
As Table B-7-12 indicates, all resource objectives have a negative impact on both PNV and first decade ASQ. This is a result of these resource objectives limiting the percentages of an emphasis area that can be harvested in a decade, extending rotation ages or limiting the intensity of management. Alternative E-Departure's resource objectives result in a moderate cost, spread fairly evenly among resources.

TABLE B-7-12
ALTERNATIVE E-DEPARTURE
OPPORTUNITY COST OF RESOURCE OBJECTIVES 1/

Resource Objective	PNV (M $)	ASQ (1st Decade MMCF)	Discount Benefits (M $)	Discounted Costs (M $)
PNV Benchmark	512	229	754	242
Alternative E-Departure	471	206	693	236
Total Cost	-41	-23	-61	-21

	PNV (M $)	ASQ (1st Decade MMCF)
Relaxed timber flow (maintain current harvest level)	+6 0	+24 0
Visual		
Retention	+6 0	+24 0
Partial Retention	-3 5	-5 7
Semiprimitive Nonmotorized & Additions to wilderness	-6 4	-10 2
Semiprimitive Motorized	- 7	-1 1
Big Game	-8 7	-14 0
Old Growth	-1 9	-3 0
Riparian - Maintain	-14 7	
Research Natural Areas	- 7	-1 1
Snags	-8 7	-9 3

* Departure from nondeclining yield timber harvest schedule

1/ Only those resource objectives which have an opportunity cost are portrayed

Effects of Benchmarks, Constraints, and Alternatives

(Section 8)

Introduction

This section provides a detailed discussion of the outputs and effects of the Alternatives. The focus is upon the tradeoffs between the Alternatives as they provide different levels and mixes of goods and services, and as they address the planning Issues, Concerns and Opportunities (ICO's) in different ways. The purpose of presenting a discussion pertaining to the outputs and effects of each alternative, the consequences of the constraints used to help formulate them, and their relationship to the benchmarks, is to facilitate the identification of the alternative which comes closest to maximizing net public benefits. In order to accomplish this objective, there needs to be an understanding of the abilities of the Forest to produce different goods and services in response to the ICO's, and the tradeoffs involved with the decisions to produce one mix of outputs as opposed to another. As such, this comparative analysis provides the basis for selecting a proposed action, which is Step 8 of the planning process.

Process of Evaluating Significant Constraints

The multiple resource management objectives associated with a particular benchmark or land management alternative were represented in FORPLAN as a combination of constraints, and an objective function. The final objective function used in the development of an alternative or benchmark was to maximize Present Net Value. This objective function guided the FORPLAN model in the selection of the most economically efficient combination of prescriptions, activity scheduling choices, and resource output levels which satisfied the multiple resource management objectives of a particular benchmark or alternative.

However, the maximization of Present Net Value was subject to first satisfying all of the constraints which were used to represent the other resource management objectives not provided for by the economic efficiency objective function The imposition of the constraints often, but not always, reduced the PNV for a particular alternative. The PNV given up in response to achieving the objectives of a constraint is referred to as the "opportunity cost". In order to isolate the opportunity cost associated with a particular constraint, or set of constraints, the resulting solutions of FORPLAN runs made with and without the constraints included in them were examined for their differences in PNV (and other outputs and effects of interest). As long as the only difference between the runs being compared was the addition of the constraints, the reduction in PNV represented the opportunity cost (at the margin) of achieving the constraint's objective.

During the Benchmark Analyses, constraint sets which were needed in order to achieve the various multiple resource management objectives were developed and evaluated. For example, all of the different constraints which were proposed in order to achieve the MR's were evaluated both individually and collectively, to determine the magnitude of their tradeoffs and to assess the relative efficiency of alternative constraint sets designed to achieve common objectives. If one set of constraints achieved

a particular objective with less impact on the PNV than an alternative set of constraints designed to accomplish the same purpose, it was considered more efficient and was used throughout the remainder of the process of developing and analyzing alternatives. Sometimes, alternative approaches to formulating constraints to meet a common objective were not available. In these cases, the analysis was performed solely to determine the opportunity costs associated with the constraints.

Discretionary constraints (those not legally required) were also examined in order to assess the magnitude of their opportunity costs. These constraints were often used in conjunction with special prescriptions in order to produce the desired multiple habitat management objectives (i.e., scenic quality, wildlife habitat, recreation settings, etc.) of an alternative. Land allocation constraints necessary to meet resource objectives were fully analyzed in order to assess their opportunity costs. The policy constraints associated with nondeclining flow and rotations based on CMAI were also evaluated in the context of their effects on PNV and timber output levels. Finally, sensitivity analyses were performed in order to provide information regarding the consequences involved in making assumptions about timber management costs, and future stumpage values (i.e., price trends).

The results of these analyses are provided in the "Summary of the Analysis of the Management Situation" planning document, other planning documents, Appendix E, and in Section 6 and 8 of this Appendix. Since they are discussed in detail in these documents, they will not be repeated here.

The opportunity costs associated with the individual constraints in each alternative were not evaluated individually due to the prohibitive costs of performing this type of analysis. However, many of the constraints used to formulate the alternatives were examined in the Benchmarks, land allocation process and iterative alternative development process so their approximate trade-offs can be determined from that analysis. Also, constraints with potential significant opportunity costs, were analyzed using an in/out procedure on a representative sample of Benchmarks and/or Alternatives. Finally, by comparing the alternatives in their final forms, the economic tradeoffs of their different collective multiple resource management objectives was assessed. These efficiency tradeoffs were then compared to the environmental and socio-economic consequences in order to help identify the alternative, or alternatives, which came closest to maximizing net public benefits.

Analysis of Tradeoffs Among Alternatives

In this section, the tradeoffs between the alternatives are discussed. The focus will be upon the resolution of ICO's, resource outputs, environmental consequences, economic and social effects, and the overall tradeoffs incurred in attempting to address the ICO's.

Response to Major ICO's

Except for Alternative A and NC, which are designed to portray the outputs and effects associated with continuing on with current management direction, the alternatives were specifically tailored to reflect different ways of addressing the planning issues, concerns, and opportunities. The following discussion highlights some of the variation in the way the major issues were treated between them. Table B-8-1 tabularly summarizes the differences for all issues. For a more complete description of the ICO's and the role they played in the forest planning process, refer to Appendix A, Chapter 2 of the FEIS and the following portions of this Appendix which present the detailed outputs and effects of the alternatives with regards to their responses to the ICO's.

The factors relating to the timber issues key around how much and what kind of timber will be sold on an annual basis This was addressed in the alternatives by varying how much of the Forest was available for timber production, by varying the objective function

which influences the intensity of timber management by extending rotation ages in pine stands, by applying varying amounts of uneven-aged management with different diameter targets, and by exploring departure timber schedules in order to achieve higher wood outputs than could be produced under nondeclining flow. The resulting wood outputs were expressed in terms of average annual millions of cubic feet, and average annual millions of board feet. These outputs were also estimated for the three timber working groups: 1) ponderosa pine, 2) ponderosa pine low site, and 3) mixed conifer.

The factors relating to the wildlife issues key around what the population levels should be for certain key species such as mule deer, elk, trout, pileated woodpecker, and other cavity dwellers. The issues were treated by applying prescriptions to appropriate areas of the Forest in order to provide habitat which could support more or less numbers than currently exist. While population numbers were estimated for deer, trout, and elk, numbers of pairs or percent of potential populations were estimated for the other species.

The recreation issue centered around providing an opportunity for roadless recreation. Dispersed recreation was also a consideration. The alternatives varied in the amount of unroaded recreation opportunities which they offered over the long term. The output levels were expressed in terms of millions of recreation visitor days per year and acres.

New recreational issues that surfaced since the DEIS revolved around ORV use and the Round Mountain area. The ORV issue is dealt with in the FEIS by restricting use and/or developing a trail system for their use. The Round Mountain issue is measured by the number of acres protected.

Related to the recreation issues are concerns about scenic quality. This issue was addressed in the alternatives by applying prescriptions which provide for scenic quality to different areas of the Forest. The new historic trail is addressed in a similar manner. The extent to which scenic quality was provided for in each alternative was measured by the number of acres where scenic quality objectives were met in sensitive travel corridors.

The availability of personal use firewood is a key local issue. A range of options from making no special provisions for personal use firewood to fully meeting the demands for it was explored in the alternatives. The amount provided was expressed in terms of thousands of cords per year.

The factors relating to livestock grazing key around how much grazing should be allowed and how intensive management should be. The livestock use by alternative is a function of economic efficiency and the need to regulate use to meet other resource objectives.

The major factor relating to riparian areas is how they should be managed to produce the various resources they are capable of providing. The new anadromous fisheries issue is a subset of the riparian issue. All alternatives manage for excellent riparian condition where anadromous fisheries are involved. Concern is high because riparian conditions represent only a small portion of the total land base (two percent) but offer the greatest potential to meet multiple resource objectives of the Forest. Because of this, use has been concentrated, conflicts have merged and the riparian environment has been degraded. In all alternatives the present condition in these riparian areas will be maintained or improved if degraded. The extent to which the riparian issue varies by alternative is measured by the number of acres where conditions are managed to ensure meeting a condition classification of "excellent."

The broad social and economic issue contains several factors. First, local communities are highly dependent on forest related jobs and income, and payments to Counties in lieu of taxes. As a result, economics is the major facet in measuring the effect an alternative has on social-economic makeup of affected communities. At the same time, people expect the Forest to provide jobs and protect the economic well being of the communities. They also expect and desire recreational opportunities such as hunting and fishing. The consequences of the alternatives with respect to this issue were estimated by examining a variety of outputs and effects. They are: jobs, income, payment to Counties, PNV, recreation opportunities, firewood and scenic quality.

Resource Outputs, Effects, and Environmental Consequences

The implementation of any one of the alternatives will result in the production of certain outputs and effects and their associated environmental consequences. Some of the consequences are direct while others are indirect. Some of the consequences are short term while others are cumulative or long term. Chapter 4 of the FEIS describes the associated environmental consequences. Much of the analysis performed to develop these outputs, effects, and consequences is quite complex and is described in Chapter 2 and previous sections of this Appendix. Therefore, in order to fully understand the resource outputs, effects, and environmental consequences associated with each alternative, and their derivation, it is recommended that Appendix B be read along with Chapters 2 and 4 of the FEIS.

Tables B-8-1 and B-8-2 present the direct, indirect, and cumulative resource outputs and effects associated with each alternative and certain selected benchmarks. By examining these tables, a better understanding of the relationship between issue resolution and the resulting outputs and effects for each alternative can be obtained. At the same time, it is also necessary to associate the anticipated environmental consequences that would result from the production of these outputs and effects.

The most significant environmental consequences are those associated with the manipulation of vegetation. Vegetation management in the form of timber harvesting results in changes in the appearance of the forest, changes in wildlife habitat; the short term creation of dust, smoke, and noise; and soil disturbances. The magnitude of these consequences varies between the alternatives depending on how many acres are harvested.

On areas of the Forest where producing timber is one of the primary objectives, existing old growth and mature tree stands will be converted to new and younger stands. The trees in the long term will be smaller and organized in a more uniform manner. There will be less dead and downed material except in areas where it is specifically provided. Therefore, as old and mature stands of trees are replaced with younger stands, overall plant and animal diversity shifts from species associated with old growth communities to species associated with younger communities. Also, as existing mature stands are converted to plantations, more forage is available for grazing by domestic livestock and wildlife.

Some of the alternatives require the development of roadless areas. This would introduce human activity into areas where little human activity presently occurs. This could disturb some species of wildlife, especially elk and deer. Once an area is developed, its wilderness values are diminished, if not lost, and future options for managing the area as Wilderness are forgone. Roading unroaded areas also reduces the limited opportunity for unroaded dispersed recreation on the Forest, but at the same time increases the opportunities to develop other resources such as timber or range production which, in turn, have the potential to provide economic returns to the Federal and local governments.

Ground disturbing activities will displace and compact soils, but within acceptable limits as outlined by the standards and guidelines. Some compaction will occur, however, as a result of roads, skid trails, and construction of facilities. Also, the more ground disturbing activities an alternative has, the more it risks water quality.

To different extents, the alternatives provide for livestock grazing. The higher the livestock grazing levels, the greater the chances are for competition between livestock and deer and elk. Livestock use can also cause damage to young trees in plantations and result in increased reforestation costs, and some loss of tree growth. Also, vegetation is trampled in areas where livestock tend to concentrate near water sources or salt. However, livestock use levels in riparian zones are controlled to prevent damage to the vegetation and soils and to protect water quality.

Providing for different levels and types of resources also affects other resources. Providing for undeveloped recreation and big game habitat reduces the amount of timber that could be harvested and limits

other types of development such as range improvements.

All of the alternatives have their associated socio-economic effects as well as environmental effects. For the most part, the social effects are keyed around lifestyles and expectations of Forest users. The major social concerns are related to economics (including timber and livestock use), and recreational opportunities (including hunting, fishing and nonconsumptive wildlife, scenic quality and personal use firewood). Some of the alternatives would tend to polarize people and communities. This is particularly true of both the high amenity and the high commodity alternatives since they are not well balanced regarding the development and use of the Forest. Alternatives with a commodity emphasis tend to result in fewer provisions for scenic quality, recreation opportunity, and other amenity values. On the other hand, an alternative with a commodity emphasis can result in more jobs and higher revenues. Alternatives with an amenity emphasis do more to protect the scenic quality on large areas of the Forest, and provide high recreation opportunities and other amenity values, but jobs and revenues will be less. The alternatives represented in the FEIS do not represent the extremes from the DEIS. For example, the most amenity-oriented alternative in the FEIS has a higher ASQ, and the most timber-oriented alternative has a lower ASQ and more amenity value resource objectives.

Table B-8-1 displays the average annual quantifiable resource outputs and effects by alternative. The table is quite comprehensive and will be referred to time and again throughout the remainder of this document. Most of the outputs and effects for each alternative are displayed for the decades 1, 2, and 5.

Note that the output levels for some resources during the first two time periods are similar across all of the alternatives. This makes it appear as though there are no differences between the alternatives. However, there usually are. The elk population outputs are a good example for this discussion. The output levels across all alternatives during Decade 1 vary from 3000 elk for Alternative I to 3740 for Alternative C-Modified, a relatively narrow range. However, there is quite a wide range of differences between these Alternatives in the amount and location of lands managed for elk habitat The short term differences in elk populations between the alternatives are relatively small. The differences become greater over time as the different carrying capacities produced by different elk habitat between the alternatives begin to affect the ability of the Forest to produce and maintain elk populations. In essence, many of the consequences resulting from decisions made in the alternatives will not be apparent in the short-term, but will become more noticeable in the longrun outputs and effects. The same is true for the projections of recreation use and other wildlife population changes.

While evaluating the outputs and effects of the alternatives and assessing their ability to address the Planning ICO's, it is sometimes useful to know how the output levels of a particular alternative compare with the total potential of the Forest to produce those outputs. Table B-8-2 presents the output levels of certain key resources for each alternative and selected benchmarks and compares them to the capabilities of the Forest to produce those outputs. The rows in the table display the benchmarks and alternatives while the columns represent various outputs and effects which vary significantly across the alternatives. Two numbers are displayed for each row and column intersection in the table. The top number is the production level associated with a particular alternative (row) and output (column) The bottom number is the percent of the potential capability represented by the alternative's output level.

For example, the maximum PNV benchmark has a Present Net Value of $512 million (row 1 and column 1). Since this benchmark was developed to estimate the maximum Present Net Value of the priced resources (timber, range, and recreation) on the Forest, its Present Net Value represents 100 percent of the potential capability. The seventh row of the same column displays the Present Net Value of Alternative B-Modified at $455 million, or 94 percent of the potential capability. The remainder of the table may be interpreted in a similar manner.

Comparison of the Economic and Social Effects of the Alternatives

This section compares and discusses the economic consequences of the alternatives and benchmarks. The section will begin with a general discussion of PNV and the factors which influence it between the alternatives and benchmarks. The section will then cover the implications of the alternatives with regards to noncash benefits, and economic impacts on the local communities. Finally, the significant incremental changes in PNV from one alternative to another will be summarized. The focus of this discussion will be on the tradeoffs between priced and nonpriced outputs and their effects on the overall ability of the alternatives to address certain key issues, concerns, and opportunities.

PNV, Discounted Costs and Benefits, and Their General Relationships to Both Priced and Nonpriced Outputs

Present Net Value (PNV) is the primary quantitative measure of economic efficiency for each benchmark and alternative. PNV is the sum of market and nonmarket priced values less all management costs for the 50 year planning horizon discounted to present values at a four percent interest rate.

The PNV of the Max PNV Benchmark (B7F) and the six management alternatives are displayed in Table B-8-3. The alternatives are ranked in order of decreasing PNV. Table B-8-3 shows the differences in PNV between adjacent pairs of the successionally ranked alternatives. These figures are estimates of the net economic values of the priced resources that would be foregone if a lower-ranked alternative is selected over the preceding one.

Before comparing the PNV's, it is first necessary to discuss some of the components of the PNV calculations in order to get a better understanding of the true differences between the alternatives Displayed in Table B-8-3 are the present values of the costs and benefits associated with each of the alternatives. Table B-8-4 present a more detailed breakdown of the benefits and costs of major resource categories for all benchmarks and alternatives. The PNV for each alternative is the difference between discounted costs and discounted benefits.

The discounted cost is the sum of all Ochoco National Forest expenditures for 50 years, discounted to their present value using a four percent interest rate. The maximum discounted costs for management of the Forest is $260 million for Alternative B-Mod while the minimum is $213 million for Alternative C-Mod. As shown in Table B-8-4, the difference in discounted costs between alternatives is primarily accounted for in the amount of funding necessary for timber management, roads and organizational support in order to implement the alternatives.

The discounted benefits for each alternative is the sum of the present values of all market and nonmarket priced benefits over the 50 year planning horizon. As shown in Table B-8-4 and B-8-5, B7F provides the largest amount of discounted priced benefits ($720 million). Of the alternatives, Alternative B-Modified produces the most discounted priced benefits at $715 million while Alternative C-Mod and results in the fewest ($608 million). The differences between the alternatives can be attributed primarily to the timber related benefits and secondarily to recreation, including fish and wildlife.

Market and nonmarket resources can both be priced outputs which are or may be exchanged in the market place. Market values expressed in terms of what people are willing to pay as evidenced by actual sales transactions. Market resources on the Forest include: timber, livestock grazing, campgrounds, mineral leases, and special use permits. Nonmarket values constitute the unit price of an output not normally exchanged in a market and must be estimated. They are valued in terms of what reasonable people would be willing to pay rather than go without. Nonmarket resources include dispersed, wilderness, semi-primitive and wildlife dependent recreation. The purpose of assigning dollar values is to reflect an economic value even though none or only part of that value associated with a particular resource is actually directly collected. Thus, one can directly compare alternatives with regard to their

TABLE B-8-1
QUANTITATIVE RESOURCE OUTPUTS, ENVIRONMENTAL EFFECTS, ACTIVITIES, AND COSTS BY ALTERNATIVE
(AVERAGE PER YEAR UNLESS NOTED)

		ALTERNATIVES					
Resource/Activity/Effect	Unit of Measure	NC	B MOD	E DEP	I Preferred	A	C-MOD
AIR QUALITY							
Total Suspended Particulates by Prescribed Fire	M Tons/Yr						
Decade 1		12 6	12 9	12 9	12 3	12 6	13 3
2		12 8	11 6	12 4	12 6	12 8	13 1
5		12 4	13 0	11 0	12 8	12 4	14 6
BIOLOGICAL DIVERSITY							
Riparian Areas in Excellent Condition	M Acres						
Decade 1			10 0		10 0		10 0
2			11 2		11 2		11 2
5		5 4	17 5	9 4	17 5	5 4	17 5
Riparian Areas Designated for Connective Habitat	M Acres						
Decade 1		0	0	0	1 0	0	0
2		0	0	0	1 0	0	0
5		0	0	0	1 0	0	0
Snag Habitat for Cavity Nesters (Average across the Forest) 1/	Percent of Potential						
Decade 1		Unknown	43	46	47	46	51
2		Unknown	41	50	49	52	59
5		Unknown	33	55	54	52	69
Existing Old Growth	M Acres						
Decade 1		93 8	93 8	93 8	93 8	93 8	93 8
2		80 0	80 6	82 5	83 9	73 0	85 8
5		40 0	42 4	55 0	55 1	53 0	78 2
Acres of Forested Land by Successional Stage 2/							
Stage I and II	M Acres						
Decade 1		Unknown	9	9	9	9	9
2		Unknown	55	40	30	37	19
5		Unknown	45	41	34	43	21
Stage III	M Acres						
Decade 1		Unknown	146	172	151	170	138
2		Unknown	140	181	151	176	147
5		Unknown	69	88	63	106	42
Stage IV	M Acres						
Decade 1		Unknown	205	159	184	159	191
2		Unknown	167	127	192	123	158
5		Unknown	192	205	190	178	166
Stage V	M Acres						
Decade 1		Unknown	118	138	134	139	140
2		Unknown	129	142	115	151	162
5		Unknown	224	183	230	191	265
Stage VI	M Acres						
Decade 1		Unknown	94	94	94	94	94
2		Unknown	81	82	84	84	86
5		Unknown	42	55	55	53	78
Acres of Nonforest Land by Plant Community Type							
Timberline Meadows	M Acres	3450	3450	3450	3450	3450	3450
Meadows	M Acres	16,850	16,850	16,850	16,850	16,850	16,850
Juniper Dominant	M Acres	137,650	137,650	137,650	137,650	137,650	137,650
Grass Dominant	M Acres	50,900	50,900	50,900	50,900	50,900	50,900
Sagebrush Dominant	M Acres	80,100	80,100	80,100	80,100	80,100	80,100
Biscuit Root-Scabland	M Acres	12,550	12,550	12,550	12,550	12,550	12,550

1/ Management indicator species (MIS) for snag dependent wildlife on the Forest and Grassland are the primary cavity excavators such as the Pileated woodpecker (also see Ch 3 pp 13 16)

2/ Acres are from the 1980 Timber Resource Plan and are adjusted for the Oregon Wilderness Act as per Timber Management Plan Ammendment No 1

TABLE B-8-1 (Continued)

		ALTERNATIVES					
Resource/Activity/Effect	Units of Measure	NC	B-MOD	E DEP	I Preferred	A	C MOD
CULTURAL RESOURCES							
Sites Documented	Number/Yr						
Decade 1		Unknown	140	130	120	120	120
2		Unknown	120	110	100	100	100
5		Unknown	70	60	60	60	60
Sites Enhanced/Interpreted	Number/Yr						
Decade 1		Unknown	3	3	3	3	3
2		Unknown	3	3	3	3	3
5		Unknown	2	2	2	2	2
Nat'l Register Nomination	Number/Decade						
Decade 1		Unknown	2	2	2	2	2
2		Unknown	2	2	2	2	2
5		Unknown	2	2	2	2	2
FIRE							
Wildfire Effectiveness Index	$/1000 Ac Protected						
Decade 1		725	720	725	715	725	732
2		726	720	725	715	726	732
5		729	720	733	715	729	732
Precribed Burning	M Acres/Yr						
Natural Fuels							
Decade 1		12 3	9 8	11 7	10 4	12 3	13 2
2		12.3	9 8	11 7	10 4	12.3	13.2
5		12 3	9 8	11 7	10 4	12 3	13 2
Activity Fuels	M Acres/Yr						
Decade 1		12 9	15 9	14.1	14 2	12 9	13 5
2		13 3	13 3	13 2	14 8	13 3	13 1
5		12 6	16 1	10 4	15 2	12 6	16 1
FISH							
Anadromous Fish							
Steelhead	SHCI 4/ (M Smolt)						
Decade 1		121	121	121	121	121	121
2		136	136	136	136	136	136
5		220	220	220	220	220	220
Resident Fish (Rainbow and Brook Trout)	M Numbers						
Decade 1		656 1	816 6	712 8	816 6	656 1	816 6
2		749 25	1150 5	891 0	1150 5	749 25	1150 5
5		1215 0	2820 0	1782 0	2820 0	1215 0	2820 0
FORAGE							
Potential Forage Production 3/	M AUM s/Yr						
Decade 1		77 5	75 0	79 0	75 0	79 1	73 1
2		Unknown	82 0	78 9	81 5	78 9	73 3
5		Unknown	85 0	79 4	84 6	86 5	74 4
Structural Improvements	Number						
Decade 1		27	138	138	138	27	0
2		0	0	0	0	0	0
5		0	0	0	0	0	0
Nonstructural Improvements	Acres						
Decade 1		N/A	13097	12477	12832	12530	8760
2		N/A	4337	3717	4072	3770	0
5		N/A	4337	3717	4072	3770	0
Wild Horses	Number						
Decade 1		60	60	60	60	60	60
2		60	60	60	60	60	60
5		60	60	60	60	60	60

3/ Forage production as displayed is the "potential," based on estimates by allotment, that could be achieved with the proposed schedule of range and riparian improvements by alternative These potentials may not be achieved and are at the minimum, directly dependent upon the implementation of the proposed improvements in the first decade It is reasonable to expect that some or all allotments may experience up to a 10% reduction in AUM s during the first decade to allow the accomplishment of riparian management objectives

4/ Steelhead Habitat Capability Index, thousands of smolt.

TABLE B-8-1 (Continued)

		ALTERNATIVES					
Resource/Activity/Effect	Units of Measure	NC	B MOD	E DEP	I-Preferred	A	C MOD
FOREST RESIDUES							
Existing Residues	Million Tons	19 5	20 4	19 9	20 0	19 6	19 6
Minimum Site Requirements	Million Tons	10 4	10 4	10 4	10 4	10 4	10 4
Residues Removed							
Activity	Million Tons						
Decade 1		*3 7*	*4 7*	*4 2*	*4 3*	*3 9*	*4 1*
2		3 7	3 7	3 7	4 1	3 7	3 7
5		2 7	3 5	2.3	3 3	2 8	3 5
Natural							
Decade 1		1 2	1 0	1 2	1 0	1 2	1 3
2		1 1	0 9	1 1	0 9	1 1	1 2
5		0 7	0 6	0 7	0 6	0 7	0 8
Total Residues Remaining							
Decade 1		14 5	14 6	14 5	14 7	14 5	14 2
2		13 6	14 0	13 7	13 8	13 6	13 4
5		13 0	13 1	13 3	13 1	13 0	12 7
FUELWOOD							
Fuelwood	M Cords/Yr						
Decade 1		14 0	15 0	13 1	13 0	14 0	12 0
2		12 4	14 0	12 3	12 0	12 4	10 0
5		11 6	13 0	10 0	11 0	11 6	9 0
LANDS							
Special Use Permits	Number	105	105	105	105	105	105
MINERALS AND ENERGY							
Oil and Gas	M Acres Leased						
Decade 1		147	140	140	140	140	140
2		687	670	670	670	670	167
5		157	140	140	140	140	140
Geothermal	Acres Leased						
Decade 1		0	0	0	0	0	0
2		0	0	0	0	0	0
5		0	0	0	0	0	0
Minerals Access Restrictions	Percent						
Withdrawn		4	4	4	4	4	4
High		*11*	*8*	*8*	*9*	*11*	*18*
Moderate		11	27	14	28	11	39
Low		74	63	74	59	74	40
OLD GROWTH 5/							
Old Growth in wilderness and wilderness study (F1, F2, F3, F4, D8, D12)	M Acres						
Ponderosa Pine			2 3	2 3	2 3	2 3	2 3
Mixed conifer			18 2	18 2	18 2	18 2	18 2
Total			20 5	20 5	20 5	20 5	20 5
Allocated to Old Growth management area (F6, D4, G5)							
Existing Old Growth	M Acres						
Ponderosa Pine			7 0	N/A 6/	6 9	N/A 6/	14 0
Mixed conifer			10 8	N/A	11 1	N/A	25 0
Juniper		*0 7*	0 7	0 7	0.7	0 7	0.7
Capable Old Growth 7/			---	N/A	1 3	N/A	5 3
Total			18 7	28 3	20 0	37 0 8/	45 0

5/ Management Indicator Species (MIS) for Old Growth on the Forest is the Pileated woodpecker The common flicker is the MIS for old growth juniper on the Grassland

6/ NA - Data not available

7/ That which does not currently meet the characteristics described for "suitable", but exists on a site "capable" of producing it some time in the future

8/ This was based on managing these stands with timber harvest with long rotations

TABLE B-8-1 (Continued)

		ALTERNATIVES					
Resource/Activity/Effect	Units of Measure	NC	B MOD	E DEP	I-Preferred	A	C MOD
Old Growth in roadless management areas with no programed harvest (F5, F8, F10, F11, D4, G5)	M Acres						
Ponderosa Pine			1 1	N/A	4 1	N/A	5 4
Mixed Conifer			2 0	N/A	12 5	N/A	12 9
Juniper			0 5	0 5	0 5	0 5	0 5
Total			3 6	N/A	17 1	N/A	18 8
Existing Old Growth areas in areas programmed for harvest (F7, F9, F11B, F12, F13, F14, F15, F16, F17, F18, F19, F20, F21, F22, F23, F24, F25, F26, F27, F28)	M Acres						
Ponderosa Pine			12 8	N/A	9 8	N/A	1 5
Mixed conifer			39 6	N/A	28 8	N/A	14 5
Total			52 4	N/A	38 6	N/A	16 0
Total Existing Old Growth	M Acres						
Pondersoa Pine							
Decade 1		23 2	23 2	23 2	23 2	23 2	23 2
2		18 0	16 2	18 5	18 2	20 0	19 2
5		5 0	9 2	13 0	13 0	12 0	19 0
Mixed Conifer							
Decade 1		70 6	70 6	70 6	70 6	70 6	70 6
2		62 0	64 4	64 0	65 7	53 0	66 6
5		35 0	33 2	42 0	42 1	41 0	59 2
Total Existing Old Growth Forest	M Acres						
Decade 5		40 0	42 4	55 0	55 1	53 0	78 2
Total Existing and Capable Old Growth							
Decade 1	M Acres	93 8	93 8	93 8	95 1	93 8	99 1

RECREATION

Developed Recreation Supply/Demand	M RVD's	S	D	S	D	S	D	S	D	S	D	S	D
Decade 1		141 0	129 8	159 4	129 8	149 0	129 8	159 4	129 8	141 0	129 8	159 4	129 8
2		141 0	145 9	159 4	145 9	149 0	145 9	159 4	145 9	141 0	145 9	159 4	145 9
5		141 0	191 9	159 4	191 9	149 0	191 9	159 4	191 9	141 0	191 9	159 4	191 9
Dispersed Recreation Roaded Natural Roaded Modified Supply/Demand	M RVD's												
Decade 1		1477 3	373 8	1230 3	373 8	1220 3	373 8	1204 1	373 8	1232 6	373 8	1125 3	373 0
2		1477 3	411 4	1230 3	411 8	1220 3	411 4	1204 1	411 4	1232 6	411 4	1125 3	411 4
5		1477 3	520 2	1230 3	520 2	1220 3	520 2	1204 1	520 2	1232 6	520 2	1125 3	520 2
Semiprimitive, Nonmotorized Supply/Demand	M RVD s												
Decade 1		11 1	34 2	11 4	34 2	35 2	34 2	47 2	34 2	11 1	34 2	55 4	34 2
2		11 1	37 4	11 4	37 4	35 2	37 4	47 2	37 4	11 1	37 4	55 4	37 4
5		11 1	48 1	11 4	48 1	35 2	48 1	47 2	48 1	11 1	48 1	55 4	48 1
Semiprimitive, Motorized Supply/Demand	M RVD's												
Decade 1		0	18 0	0	18 0	7 0	18 0	0	18 0	0	18 0	7 0	18 0
2		0	19 4	0	19 4	7 0	19 4	0	19 4	0	19 4	7 0	19 4
5		0	25 1	0	25 1	7 0	25 1	0	25 1	0	25 1	7 0	25 1

TABLE B-8-1 (Continued)

		ALTERNATIVES					
Resource/Activity/Effect	Units of Measure	NC	B-MOD	E DEP	I Preferred	A	C-MOD
Hunting Use	WFUD s						
Decade 1		Unknown	173,200	172,500	169,100	176,400	170,600
2		Unknown	168,000	169,500	166,600	172,400	170,600
5		Unknown	143,200	164,600	161,400	163,000	189,900
Resident Fishing Use	WFUD s						
Decade 1		76,400	94,300	82,900	94,300	76,400	94,300
2		84,900	109,100	93,600	109,100	84,900	109,100
5		99,500	123,800	108,300	123,800	99,500	123,800
Anadromous Fishing Use	WFUD's						
Decade 1		5644	5644	5644	5644	5644	5644
2		10,968	10,968	10,968	10,968	10,968	10,968
5		27,158	27,158	27,158	27,158	27,158	27,158
Trails Summer Non-Motorized	Miles						
Construction							
Decade 1		0	109 6	132	186 9	0	186 9
2		0	182 4	0	184 9	0	184 9
5		0	0	0	0	0	0
Reconstruction							
Decade 1		9	20 5	29 3	13 0	9	13 0
2		9	20 5	15 0	25 0	9	25 0
5		9	38 8	15 0	25 0	9	25 0
Total Available							
Decade 1		96	206 4	228	283 7	96	283 7
2		96	388 8	228	468 6	96	468 8
5		96	388 8	228	468 6	96	468 6
Trails-Summer ATV	Miles						
Construction							
Decade 1		0	95	0	95	0	95
2		0	95	0	95	0	95
5		0	0	0	0	0	0
Reconstruction							
Decade 1		0	0	0	0	0	0
2		0	15	0	15	0	15
5		0	15	0	15	0	15
Total Available							
Decade 1		0	90	0	90	0	90
2		0	190	0	190	0	190
5		0	190	0	190	0	190
Trails Winter X-Country	Miles						
Construction							
Decade 1		0	100	0	100	0	100
2		0	40	0	40	0	40
5		0	0	0	0	0	0
Reconstruction							
Decade 1		0	5	0	5	0	5
2		0	20	0	20	0	20
5		0	20	0	20	0	20
Total Available							
Decade 1		0	109	0	109	0	109
2		0	149	0	149	0	149
5		0	149	0	149	0	149
Trails-Winter Snowmobile	Miles						
Construction							
Decade 1		0	210	0	210	0	210
2		0	40	0	40	0	40
5		0	0	0	0	0	0
Reconstruction							
Decade 1		0	10	0	10	0	10
2		0	40	0	40	0	40
5		0	40	0	40	0	40
Total Available							
Decade 1		0	285	0	285	0	285
2		0	325	0	325	0	325
5			325		325		325
Wild and Scenic Rivers	Acres						
Wild		0	0	0	0	0	0
Scenic		1480	2845	1480	2845	1480	1480
Recreation		2550	2550	2550	2550	2550	2550
Further Study							

TABLE B-8-1 (Continued)

Resource/Activity/Effect	Units of Measure	ALTERNATIVES					
		NC	B-MOD	E DEP	I-Preferred	A	C-MOD
RESEARCH NATURAL AREAS 9/							
Ochoco Divide	Acres	2035	2035	2035	2035	2035	2035
The Island	Acres	39	0	39	39	39	39
Haystack Butte	Acres	0	0	58	58	0	58
Dry Mountain	Acres	0	0	1187	1187	0	1187
Stinger Creek	Acres	0	0	453	453	0	453
Silver Creek	Acres	0	0	844	844	0	844
SCENIC							
Preservation	M Acres	38 3	39 5	43 3	42 0	38 3	50 9
Retention	M Acres	102 2	60 7	70 7	96 8	102 2	155 8
Partial Retention	M Acres	71 4	28 1	59 4	32 4	71 4	81 5
Modification and Maximum Modification	M Acres	743 2	827 8	781 8	784 9	743 2	687 1
SOCIAL AND ECONOMIC							
Social							
Change in Jobs 10/	Number	Unknown	176	196	118	57	-101
Change in Income	Million $	Unknown	2 9	3 0	1 6	0 9	-2 2
Economic							
Total National Forest Planned Budget	Million Dollars						
Decade 1		12 0	12 1	10 5	10 2	10 9	9 5
2		Unknown	10 7	9 2	9 3	10 3	8 8
5		Unknown	11 1	8 7	9 7	10 0	9 0
Returns to Government	Million $						
Decade 1		19 5	19 7	20 2	19 4	17 2	14 0
2		Unknown	23 1	22 7	22 3	21 1	16 5
5		Unknown	22 6	18 4	21 5	20 3	18 8
Present Net Value (PNV)	Million $	380	452	471	475	421	395
Payment to Counties	Million $	Unknown	4.9	5.1	4 9	4 3	3 5
SOIL							
Soil Loss (Off Forest)	M Tons/Yr						
By Major Activity							
Timber Harvest & Roads							
Decade 1		1 9	1 7	1 8	1 7	1 5	1 7
2		1 5	2 2	1 3	2 1	1 8	1 9
5		1 3	2 1	1 2	1 9	1 5	1 9

9/ RNA = that would be recommended for inclusion in the National Forest System (FSM 4063)

10/ Change in jobs relative to the "current situation" discussed

TABLE B-8-1 (Continued)

Resource/Activity/Effect	Units of Measure	ALTERNATIVES					
		NC	B MOD	E DEP	I-Preferred	A	C-MOD
TIMBER							
Lands Tentatively Suitable for Timber Production	Thousand Acres	552 3 11/	533 2	533 2	533 2	533 2	533 2
Lands Suitable for Timber Production	Thousand Acres	534 0 11/	511 3	495 0	493 7	488 6	471 4
Lands with Timber Yield Reductions	Thousand Acres						
Full Yield		413 8 12/	484 5	0	0	0	0
50-99%		88 8 11/	26 8	495 0	491 9	488 6	471 4
1-49%		32 4 11/	0	0	1 8	0	0
Long-Term Sustained Yield Capacity	Million CF	31 1 11/	21 8	19 3	19 0	19 5	15 6
Allowable Sale Quantity	Million BF						
Decade 1		N/A	130	123	115	115	94
Total Pine	Million BF						
Decade 1			85	87	82	79	63
Allowable Sale Quantity	Million CF						
Decade 1		N/A	21 8	20 6	19 0	19 3	15 6
2		N/A	21 8	19 7	19 0	19 3	15 6
5		N/A	21 8	16 1	19 0	19 3	15 6
Potential Yield 13/	Million BF	136 5	N/A	N/A	N/A	N/A	N/A
Timber Sale Program Quantity	Million BF						
Decade 1		N/A	141 0	135 0	125 0	126 0	103 0
Timber Sale Program Quantity	Million CF						
Decade 1		N/A	23 8	22 9	20 9	21 4	17 1
2			23 3	21 4	20 5	21 4	16 6
5			23 1	17 1	20 1	20 4	16 5
Available Timber Harvest Prescriptions in First Decade	Thousand Acres 14/						
Even-aged							
Clearcut		0	25 3	14.4	8 7	18 7	15 0
Shelterwood		118 6	49 8	25 4	21 1	18 2	3 6
Overstory Removal		63 5	21 2	113 2	53 1	105 6	31 6
Uneven-aged							
Selection		Unknown	67 5	4 0	62 2	0 9	98 4
Reforestation	Thousand Acres						
Decade 1		118 6	75 1	40 0	29 8	37 0	18 6
2		71 7	30 1	42 0	24 8	60 0	18 4
5		30 6	52 0	48 0	29 9	52 0	26 8
Timber Stand Improvement	Thousand Acres						
Decade 1		48 0	53 2	19 0	53 0	40 0	68 3
2		66 0	48 2	13 0	54 0	12 0	61 5

11/ For the NC alternative, these lands are the regulated commercial forest lands These lands were not classified using the suitability criteria, but were arrived at using the 1972 land classification system provided for by Amendment #1 of the 1985 Timber Plan These lands are the standard, special and marginal components of commercial forest lands

12/ For the NC alternative, these lands are the standard component of the regulated commercial forest base

13/ Potential yield applies only to the "No Change" alternative and comes from the Timber Resource Plan The potential yield for the next ten years is the maximum harvest that could be planned to achieve the optimum perpetual sustained yield harvesting level attainable with intensive forestry on regulated areas considering the productivity of the land, conventional logging technology, standard cultural treatments, and interrelationships with other resource uses and the environment.

14/ See Appendix E, Selection of Harvest Cutting Methods

TABLE B-8-1 (Continued)

		ALTERNATIVES					
Resource/Activity/Effect	Units of Measure	NC	B MOD	E DEP	I Preferred	A	C-MOD
TRANSPORTATION SYSTEM							
Arterial and Collector Road Construction	Miles/Decade						
Decade 1		8	14	4	8	8	4
2		12	12	0	6	12	0
5		0	0	0	0	0	0
Arterial and Collector Road Reconstruction	Miles/Decade						
Decade 1		174	174	168	174	174	168
2		168	168	163	168	168	163
5		148	148	148	148	148	148
Forest Service Roads, Open and Maintained	Total Miles						
Decade 1		4774	4800	4776	4734	4774	4743
2		4992	5072	4962	4935	4992	4982
5		5326	5484	5253	5304	5326	5187
Passenger Car Use, Open and Maintained	Total Miles						
Decade 1		844	850	840	844	844	840
2		856	862	840	850	856	840
5		856	869	840	850	856	840
High Clearance Use, Open and Maintained	Total Miles						
Decade 1		3236	3037	3046	2332	3236	2384
2		3210	2993	2936	2210	3210	2099
5		2736	2492	2331	2269	2736	1123
Roads Closed, Seasonally or Yearlong	Total Miles						
Decade 1		694	913	890	1558	694	1520
2		926	1217	1186	1875	926	2043
5		1734	2123	2082	2185	1734	3224
UNROADED AREAS							
(Roadless Criteria Acres)							
Acres Remaining Unroaded	M Acres						
Lookout Mountain							
Decade 1		166	76	29	157	166	166
2		166	76	29	76	166	166
5		166	76	29	76	166	166
Rock Creek/Cottonwood Creek							
Decade 1		*0*	*0*	197	118	*0*	197
2		0	0	197	118	0	197
5		0	0	197	118	0	197
Deschutes Canyon/Steelhead Falls							
Decade 1		100	51	25	51	100	100
2		100	51	25	51	100	100
5		100	51	25	51	100	100
Silver Creek							
Decade 1		25	31	32	31	25	32
2		25	31	32	31	25	32
5		25	31	32	31	25	32
Green Mountain (SPM)							
Decade 1		0	0	70	0	0	70
2		0	0	70	0	0	70
5		*0*	*0*	70	*0*	*0*	70

TABLE B-8-1 (Continued)

Resource/Activity/Effect	Units of Measure	ALTERNATIVES					
		NC	B-MOD	E DEP	I Preferred	A	C MOD
WATER							
Water Quality							
Watershed Condition	% above Threshold						
Decade 1		21	0	0	0	0	0
2		0	0	0	0	0	0
5		0	0	0	0	0	0
Watershed/Riparian Improvement	Acres/Yr						
Decade 1		360	890	740	890	360	890
2		360	87	120	87	360	87
5		32	32	32	32	32	32
Total in Enhanced Condition	M Acres						
Decade 1			10 0		10 0		10 0
2			11 2		11 2		11 2
5		5 4	17 5	9 4	17 5	5 4	17 5
Water Yield	M Acre Feet/Yr						
Decade 1		591	585	584	575	588	572
2		575	574	572	563	580	560
5		559	582	566	567	574	562
Relative Risk of Affecting Watersheds	Ranking 1 - 6, 1 highest, 6 lowest						
Decade 1		1	2	2	3	2	3
2		3	3	3	4	3	4
5		2	2	4	4	3	4
WILDERNESS							
Existing Wilderness	Acres						
Bridge Creek		5400	5400	5400	5400	5400	5400
Black Canyon		13,400	13,400	13,400	13,400	13,400	13,400
Mill Creek		17,400	17,400	17,400	17,400	17,400	17,400
Recommended Wilderness	Acres						
Deschutes Canyon/Steelhead Falls		0	0	2500	0	0	10000
Total Wilderness Capacity		36,200	36,200	38,700	36,200	36,200	46,200
Wilderness Supply	MVRD's	25 7	25 7	26 6	25 7	25 7	28 3
Wilderness Demand	M RVD's	S D	S D	S D	S D	S D	S D
Supply/Demand							
Semiprimitive							
Decade 1		25 7 16 5	25 7 16 5	26 6 16 5	25 7 16 5	25 7 16 5	28 3 16 5
2		25 7 19 2	25 7 19 2	26 6 19 2	25 7 19 2	25 7 19 2	28 3 19 2
5		25 7 27 5	25 7 27 5	26 6 27 5	25 7 27 5	25 7 27 5	28 3 27 5
Wilderness 15/	Acres						
Primitive Trailed							
Decade 1		0	3300	0	3300	0	3300
2		0	3300	0	3300	0	3300
5		0	3300	0	3300	0	3300
Primitive Nontrailed							
Decade 1		0	3000	0	3000	0	3000
2		0	3000	0	3000	0	3000
5		0	3000	0	3000	0	3000
Semiprimitive							
Decade 1		36,200	29,900	38,700	29,900	36,200	39,900
2		36,200	29,900	38,700	29,900	36,200	39,900
5		36,200	29,900	38,700	29,900	36,200	39,900

15/ Black Canyon's WROS classification is presently incomplete and is presently displayed in total as semiprimitive

TABLE B-8-1 (Continued)

		ALTERNATIVES					
Resource/Activity/Effect	Units of Measure	NC	B-MOD	E DEP	I Preferred	A	C-MOD
WILDLIFE							
Deer Population	Number						
Decade 1		Unknown	22,600	22,600	22,600	22,600	22,600
2		Unknown	22,600	22,600	22,600	22,600	22,600
5		Unknown	17,206	22,600	22,600	22,600	22,600
Elk Population	Number						
Decade 1		Unknown	3210	3170	3000	3370	3740
2		Unknown	2950	3030	2870	3160	3660
5		Unknown	1700	2780	2620	2690	3700
Wildlife Habitat Improvement	Acres/Yr						
Decade 1		Unknown	768	302	768	132	468
2		Unknown	400	100	400	100	200
5		Unknown	100	100	100	100	150
Snag Habitat for Cavity Nesters (Average across Forest)	% of Potential						
Decade 1		Unknown	43	46	47	46	51
2		Unknown	41	50	49	52	59
5		Unknown	33	55	54	52	69
Habitat for Old Growth Dependent Species							
Allocated Old Growth	Acres	32,860	18,740	26,340	19,990	36,970	45,030
Supplemental Feeding Areas			18,000	26,340	19,250	36,970	45030
Unallocated Old Growth 16/							
Decade 1		26,500	24,100	N/A	37,600	N/A	39,300
2		26,500	24,100	N/A	37,600	N/A	39,300
5		26,500	24,100	N/A	37,600	N/A	39,300
Total Habitat 17/							
Decade 1		59,360	60,840	N/A	76,840	N/A	129,360
2		59,360	60,840	N/A	76,840	N/A	129,360
5		59,360	60,840	N/A	76,840	N/A	129,360
Eagle Roosting Areas (Bald and Golden)	Acres	570	570	570	570	570	570

16/ Old Growth in management areas with no programmed timber harvest.

17/ Total Old Growth in management areas which is allocated, Old Growth in management areas not allocated but with no programmed timber harvest, and supplemental feeding areas

** The outputs, effects, activities, and costs included in this table are estimates and projections based on available inventory data, use of various modeling techniques and analyses, professional judgement and are subject to the annual budgetary process

TABLE B-8-2
COMPARISON OF OUTPUTS AND PERCENT OF POTENTIAL CAPABILITY

	PNV Millions	Timber Harvest MMCF	MAUM's 1/	Elk 1/	Scenic Corridors (M Acres)	SPNM/Additional Wilderness (M Acres)	Old Growth M Acres	Excellent Riparian Acres
Maximum PNV Benchmark	512 100%	22 8 98%	82 0 78%	1510 35%	0	0	39 42%	17 1 90%
Maximum Timber Benchmark	480 94%	23 4 100%	80 8 77%	1270 30%	0	0	39 42%	1 9 10%
Maximum Recreation Benchmark (Unroaded)	424 83%	15 5 66%	71 0 67%	4040 95%	0	0	75 80%	17 1 90%
Maximum Big Game Benchmark	429 84%	17 1 73%	71 0 67%	4270 100%	0	0	40 43%	17 1 90%
Maximum Range Benchmark	454 89%	22 1 94%	105 3 100%	1350 32%	0	0	39 42%	1 9 10%
ALTERNATIVES								
NC	380 74%	N/A	77 5 74%	Unknown	83 5 81%	29 1 44%	40 0 43%	5 4 28%
B Mod	452 88%	21 8 93%	75 0 71%	1700 40%	27 0 26%	15 8 24%	42 4 45%	17 1 90%
E-Dep	*471* 92%	*20 6* 88%	*79 0* 75%	*2780* 65%	*47 7* 46%	*51 5* 77%	*55 0* 59%	*9 4* 50%
I	475 93%	19 0 81%	75 0 71%	2620 61%	44.0 43%	27 6 42%	55 1 59%	17 1 90%
A	421 82%	19 3 82%	77 5 74%	2690 63%	83 5 81%	29 1 44%	53 0 57%	5 4 28%
C	395 77%	15 6 66%	73 1 69%	3700 87%	102 7 100%	66 5 100%	78 2 83%	17 1 90%

1/ 5th Decade

priced output levels and their efficiency in producing them. Market related benefits in any alternative are attributed mostly to timber. The nonmarket benefits are primarily related to fish and wildlife, and recreation (Table B-8-4). Table B-8-4 also shows that the market resources provide most of the discounted benefits for all alternatives. For example, their contribution ranges from a high at 70 percent of the total economic benefits in Alternative B-Mod to a low of 60 percent in Alternative C-Mod.

Noncash benefits is yet another aspect of discounted benefits. Noncash benefits refer to the benefits individual resource users receive who are charged less for the resource than they are willing to pay, or current market prices indicate they should pay. They are the difference between the full economic value of the resource and the fees actually paid to use that resource. Noncash benefits are measured by the difference between total discounted benefits less the discounted receipts that are generated by each alternative. The Forest receives revenues for stumpage, grazing permits, campground fees, mineral leases, and other special use permits. Yet, the Forest generates benefits to users which are not realized in terms of cash flows. This is because dollar prices are assigned to nonmarket resources on the Forest in order to reflect their full economic value even though none or only part of that value is collected as fees under current laws and policies. Timber is the only resource for which the discounted benefits are equivalent to discounted revenues. For all of the other resources, recreation being the primary one, discounted benefits exceed revenues. Table B-8-5 displays the relationships between total receipts, net receipts, and noncash benefits for each alternative in order of decreasing net receipts. The size of the noncash benefit is directly related to the amount of recreation (primarily) and range (secondarily) benefits generated by each alternative.

Differences in PNV between Benchmarks

The Max Recreation Benchmark (unroaded, big game) (BR3) has a PNV of $454 million. This is $58 million less than the Max PNV Benchmark (B7G). The decrease in PNV is a result of managing 61,000 acres in an unroaded condition Although this management results in less costs associated with timber and roads and higher economic benefits associated with recreation, fish and wildlife, the foregone timber values far outweigh these advantages, causing a reduction in PNV.

TABLE B-8-3

PRESENT NET VALUE AND DISCOUNTED COSTS AND BENEFITS OF ALTERNATIVES
(Million Dollars)
(Ranked by Decreasing PNV)

Alternative/ Benchmark	Present Net Value	Change	Discounted Costs	Change	Discounted Benefits	Change
Max PNV Benchmark 7	512		241		754	
Alternative I	475	-37	227	-14	701	-53
Alternative E-Dep	471	-4	221	-6	693	-8
Alternative B-Mod	452	-19	262	+41	714	+21
Alternative A	421	-31	236	-26	657	-57
Alternative C-MOD	395	-26	213	-23	608	-49
No Change	380	-15	245	+32	653	+45

TABLE B-8-4
DISCOUNTED BENEFITS AND COSTS BY RESOURCE GROUPS
(Millions of Dollars) 1/

	ALTERNATIVES (Ranked by Decreasing PNV)					
	I	E Dep	B Mod	A	C-MOD	NC
PNV	475	471	452	421	395	380
DISCOUNTED PRICED BENEFITS BY RESOURCE						
Timber	422 6	415 9	446 1	392 4	322 4	413
Developed & Dispersed Recreation	84 8	85 1	76 7	75 7	86 4	72 3
Fish & Wildlife	154 8	152 1	151 0	149 7	161 5	103
Range	20 5	20 5	20 8	20 2	19 1	18 6
Minerals	19 0	19 0	19 0	19 0	19 0	18 2
DISCOUNTED COSTS BY MAJOR CATEGORIES						
Timber	49 6	50 7	70 1	64 8	41 1	69
Roads	86 2	82 8	95 7	84 0	80 5	87
Developed & Dispersed Recreation	11 7	8 2	11 3	5 2	12 7	5 1
Fish & Wildlife	6 9	6 9	7 4	5 7	9 4	6
Range	8 1	8 3	8 3	7 9	7 5	8
Other 2/	59 4	59 9	63 5	63 7	57 7	55
Soil & Water	4 8	4 7	5 1	4 6	4 4	4

1/ Direct comparisons of benefits and costs by individual resource provide broad indications of specific relationships, but they may be misleading because many costs are nonseparable under multiple-use management

2/ These costs include general administration, cultural resources, lands and minerals, human resources, and protection

The Max Timber Benchmark (BT7) has a PNV of $480 million which is $32 million less than B7G. The decrease in PNV is a result of the intensity of timber management. The timber benchmark manages the timber resource much more intensively than does the Max PNV benchmark. This results in higher harvest levels and, as a result, higher timber generated receipts, but the timber and road cost associated with these higher harvest levels outweigh the benefits generated. This higher intensity of timber management also results in less benefits being generated from fish and wildlife resources. The combined effect results in a lower PNV.

The Max Range Benchmark (BF5) has a PNV of $424 million, $88 million less than the Max PNV benchmark's. As with the Max timber benchmark, this benchmark manages a resource more intensively than is economically efficient. In this case it is the forage resource not the timber resource as it was with BT6. This benchmark manages both the timbered and non-forest lands for maximum forage production. This results in a minor increase in forage values and major benefits foregone from timber, fish and wildlife resources.

The Max Big Game Benchmark (BE3) has a PNV of $429 million, $83 million less than the Max PNV benchmark. This benchmark manages the timber resource to maximum big game habitat. As a result, it forgoes much of the timber value for a relatively smaller increase in value from big game. This results in a decrease in PNV.

Changes from Draft to Final

Updated timber yield tables and analysis area acres have resulted in the ASQ and PNV's of the Max PNV and timber benchmarks being much closer together in the FEIS as compared with the DEIS.

Differences in Present Net Values

Present Net Value (PNV) is the primary quantitative measure of economic efficiency used for all benchmarks and alternatives. It is also an important measure of the dollar value of the alternatives. PNV has been calculated to be the sum of all market and nonmarket priced values, less all management costs for the 50-year planning horizon, discounted to present values using a four percent interest rate. The relationship between PNV and net public benefits is discussed in Section 4.

The Max PNV benchmark and six alternatives are ranked by decreasing PNV in Table B-8-3. Table B-8-4 provides further detail on discounted costs and benefits by resource group. The Max PNV benchmark is provided as a reference point only. It is an estimate of the discounted net economic returns the Forest could receive for its priced resources if they were managed solely to maximize Present Net Value.

The main factor influencing patterns in PNV, benefits, and costs is timber management. Timber values represent from 53 percent to 65 percent of the total dollar values in the alternatives. Values produced from selling timber are, in general, far in excess of related costs. As timber harvest levels decrease across alternatives, discounted costs and benefits, and PNV usually decrease as well. This pattern is due in large part to non-timber resource objectives restricting timber practices and harvests Although recreation related benefits (including hunting and fishing) do make up a significant portion of the total dollar benefits (28 percent to 41 percent), increases in these dollar benefits do not make up for the PNV lost from timber. Therefore, the greater the non-timber resource objectives, the lower are the timber discounted benefits and costs, and PNV.

This general pattern is modified by the intensity of the timber management activities employed. Some alternatives schedule timber practices and harvests at the most economically efficient level, given other resource objectives (Alternatives C-Modified, I, and E-Departure). Other alternatives apply more intensive timber practices to achieve the highest timber volumes possible, given other resource objectives (Alternatives A, B-Modified, and NC). This results in higher timber benefits, but also higher costs and lower PNV. In each of these two groups of alternatives the general pattern discussed above holds. The exact combination of non-timber resource objectives and timber management intensity determines the ranking in PNV of these two groups together.

The PNV of the NC Alternative is an estimate. It is

also based on a programmed harvest level of 129 MMBF. If the estimate was based on the potential yield of 136 5 MMBF, the PNV would be significantly higher.

The Forest and Grassland are considered to have potential energy resources However, very little testing and development has taken place to date. No estimates have been made of future extractions, so energy values were not included in the economic analysis, but oil and gas leasing provides significant returns to the Treasury and to counties. The alternatives have little effect on mineral activities.

Differences in Costs

Capital investment costs include trails, roads, reforestation, timber stand improvement, prescribed burning, and physical structures for range, recreation, fish, and wildlife. Other costs include operating and maintaining facilities, program management, and support costs associated with management of other resources. Capital investment costs pertain mostly to roads and timber stand management. For example, from 76 percent (Alternative C-Modified) to 95 percent (Alternative A) of capital investment costs are associated with road construction and timber management. The majority of operation and maintenance costs are program management, followed by support funds necessary to carry out timber programs.

Because most costs are associated with timber management, the higher the timber output, the higher the costs. Generally, capital investment costs decrease significantly over time due to declining road construction and timber stand improvement practices. Operation and maintenance costs remain fairly constant over time except for Alternative E-Departure, where timber volume declines over time.

Fixed costs represent a relatively small portion of the total costs (20 percent to 30 percent). The remainder of the cost for each alternative varies with the objectives of the alternative.

Costs associated with timber practices and harvests constitute a large portion of the total costs. Alternative B-Modified has the highest cost of any alternative, and only 29 percent of the discounted cost is directly attributed to resources other than timber and roads. Road construction and reconstruction is almost entirely tied to timber harvests on this Forest. Alternative C-Modified has the lowest cost of any alternative and the highest benefits associated with amenity outputs, yet only 35 percent of the costs can be attributed to resources other than timber.

Differences in Economic Benefits and Cash Flows

The total economic benefits of the alternatives come from priced resources which include both outputs termed "market" outputs, and those with "assigned" values. Market values represent the unit price of an output that is normally exchanged in a market. On this Forest, timber is the primary market output, accounting for over 90 percent of the market outputs and 50 percent to 65 percent of the total economic benefits of the alternatives. Other market outputs include livestock grazing, campground use, special use permits, and minerals leasing. Assigned values represent the unit price of an output not normally exchanged in a market. Various analytical techniques were used to estimate values that people would be willing to pay for these benefits. Outputs with assigned values include dispersed recreation, wilderness use, hunting, fishing, and water quality improvement. Hunting and fishing are the major assigned values, comprising from 16 to 26 percent of the total economic benefits. The remaining 18 to 24 percent are split in different proportions, depending on the alternative, among livestock grazing, developed recreation use, dispersed roaded recreational use, and dispersed non-roaded recreational use.

Total market values range from 62 percent (Alternative C-Modified) to 70 percent (Alternative B-Modified) of the total economic benefits. Alternatives in the high end of this fairly narrow range have relatively high timber benefits and/or relatively lower fish, wildlife, or recreational values. The opposite is true for alternatives in the low end of the range

Cash receipts are revenues returned to the Forest and Grassland for stumpage, grazing permits, campground fees, leasable minerals, and special use permits However, the Forest generates economic

benefits to users which are not realized in terms of cash flows. These are referred to as "noncash benefits". They refer to the benefits individual resource users receive when they are charged less for the resource than they would be willing to pay, or current market prices indicate they should pay. Noncash benefits are the difference between the full economic value of the resource and the fees actually paid to use that resource. Table B-8-5 displays the relationships between total receipts, total budget costs, net receipts, and noncash benefits for each alternative in order of decreasing net receipts. All alternatives receive more money then they spend (net receipts are positive). Fish and wildlife provides the most noncash benefits in all alternatives, followed by recreation, then range. Timber provides nearly all of the cash receipts.

Generally the proportion noncash benefits contribute to total economic benefits increases as net receipts decrease. The decrease in net receipts as noncash benefits increase is a result of more land and resources being allocated to producing noncash benefits, thus lessening the resources available to produce cash receipts.

Table B-8-5 (Decade One) as compared to Table B-8-3 shows that alternatives with higher net receipts in Decade One generally have higher PNV's. This trend holds true in all but one case.

This case involves Alternative NC. In Table B-8-3, Alternative NC has the lowest PNV but in Table B-8-5 it has the third highest net receipts. The cause of this is two-fold; first, it has the lowest non-cash benefits of all the alternatives, and second, Alternative NC is different from the other alternatives in that it does not ensure meeting all management requirements. This allows more of the higher value ponderosa pine stands to be harvested in Decade One. However, to satisfy particular harvest scheduling requirements, cash receipts drop off dramatically after the first decade. Table B-8-5 shows that the net receipts for Alternative NC drop in rank from third in the first decade, to last in the fifth decade. Alternative NC also harvests timber at levels beyond that which is efficient in order to meet current sale levels. This results in higher total receipts, but also higher costs resulting in lower PNV's. As a result, Alternative NC has relatively high net receipts in Decade One, but a relatively low PNV.

Effect of Nonpriced Outputs on PNV between Alternatives

The differences in PNV between the alternatives can also partly be attributed to the levels of nonpriced outputs which they provide. While these outputs can not be valued in dollar terms, their output levels can often be measured in terms of other units. Table B-8-6 presents information which is useful in understanding the relationships between some of the key nonpriced outputs and Present Net Value. It is important to keep in mind that this table is intended to present only general relationships between the nonpriced benefits and PNV. The differences in the output levels and effects should not be interpreted as absolute measurable tradeoffs.

Note that the provisions of some nonpriced benefits are complementary to the production of priced outputs while the provisions of others are contradictory. The contradictory relationships generally mean that more nonpriced outputs can only be provided at the expense of producing fewer priced outputs (primarily timber) and, therefore, lower PNV's. It is a subjective decision as to whether the foregone priced benefits are compensated for by the increased outputs of nonpriced benefits.

Maintaining and enhancing the lifestyles of Central Oregonians was identified as one of the more important nonpriced benefits. This is comprised of several components, including economic stability, the opportunity for diverse recreation experiences in a visually pleasing environment, and clean air and water. For this discussion we will cover these as separate nonpriced outputs and in no particular order of importance.

Maintaining and enhancing economic viability can mean many things to different people and can be measured in various ways. Table B-8-6 presents the change in the number of jobs in the local economy during the first decade that could result from the implementation of an alternative. To some extent, the payments to county also provide some insight

TABLE B-8-5
FIRST AND FIFTH DECADE AVERAGE ANNUAL CASH FLOWS 1/
AND
NONCASH BENEFITS BY ALTERNATIVE
(Million Dollars)
(Alternatives Are Ranked in Order of Decreasing Net Receipts)

	ALTERNATIVES					
	I	E-Dep	NC	B-Mod	A	C-MOD
DECADE 1						
Total Receipts	19 4	20 2	20 2	17 9	17 2	14 0
Total Costs	12 0	12 8	13 1	14 5	13 0	11 4
Net Receipts	7 4	7 4	7 1	3 5	4 2	2 6
Non-cash Benefits to Users	10 8	10 9	10 3	10 7	10 5	11 0
DECADE 5						
Total Receipts	21 5	18 4	18 7	25 3	20 2	18 7
Total Costs	10 9	9 5	10 9	12 4	10 7	10 0
Net Receipts	10 5	8 9	7 8	12 8	9 5	8 7
Non-cash Benefits to Users	13 6	13 2	11 6	12 5	12 5	14 3

1/ Payments to counties and expenditures by cooperators are excluded

TABLE *B-8-6*

PNV AND RESOURCE OUTPUTS

	Maxi-*mum* Outputs	NC	B-MOD	E-DEP	I Pre-ferred	A	C-MOD
PNV (MM $)	512	380	452	471	475	421	395
Change in Jobs from Current Situation	234	Unknown	176	196	118	57	-101
Payments to Counties (MM $)	60	50	49	51	49	43	35
1st Decade Average Annual ASQ MMCF MMBF	 234 142	 N/A N/A	 218 130	 206 123	 190 115	 193 115	 156 94
Elk (No of Elk 5th Decade)	4040	Unknown	1700	2780	2620	2690	3700
Deer (No of Deer 5th Decade)	22,600	Unknown	17,210	22,600	22,600	22,600	22,600
Forage Production (1st Decade MAUM's/Yr)	1053	775	750	790	750	775	731
Old Growth (M Acres 5th Decade)	940	400	424	550	551	530	782
Snag Habitat for Cavity Nesters (% of potential, 5th Decade)	70	52	33	55	54	52	69
Riparian Areas in Excellent Condition (M Acres 5th Decade)	54	54	175	94	175	54	175
Roadless - Allocated (M Acres) 1/	599	291	107	273	384	312	410
Scenic Corridors (M Acres) 2/	1027	835	344	462	417	835	1011
Timber Harvest 3/		1821	1638	1570	1451	1434	1465

1/ Total acreage for lands allocated to management areas with unroaded recreation emphasis (D9, F8, F10, F4, G8)

2/ Total acreage for lands allocated to managment areas with visual resource emphasis (D5, D6, D7, G13, F25, F26, F27)

3/ First decade - Acres with timber harvest prescription

into the economic base from which the local Governments can provide services to residents of the area In general, both of these have complementary relationships with the production of priced benefits. "Payments to counties" is calculated as 25 percent of total Forest Service receipts, 95 percent of which are related to harvesting timber. In turn, many jobs in the local economy are directly related to the amount of timber and recreation supplied from the Ochoco National Forest. Table B-8-6 indicates that, as the production of priced timber decreases, so do the payments to counties and potential number of jobs in the economy. The ranking of jobs and payments to counties does not necessarily fall on the ranking of PNV, because some alternatives' timber harvest levels and species mix may have a positive effect on jobs and payments to counties but a negative effect on PNV.

The ease of accessibility to personal use firewood from the Forest is also a component of the Central Oregon lifestyle. This is considered a nonpriced benefit. Different alternatives investigated various ways of supplying this material. To the extent that personal use firewood permits are priced below what this material would normally sell for on the competitive market, the rationing of personal use firewood supplies has a slight downward pressure on PNV (although the amount of decrease in PNV would be small).

The maintenance or enhancement of scenic quality in sensitive scenic areas is another nonpriced benefit In Table B-8-6 this output is presented in terms of the amount of acres of retention and partial retention scenic quality objectives met in each alternative. While some timber harvesting is acceptable, and even necessary, in order to meet the management objectives in scenic areas, the provision of scenic quality on the Forest usually comes at some expense to the amount of timber that could be harvested. As more acres are allocated to scenic management across the alternatives, the PNV tends to be lower

The provision and maintenance of old growth and snag habitat for pileated woodpeckers and other cavity dwellers is also considered a nonpriced benefit. Timber harvesting is excluded from old growth areas and timber volumes reduced to provide snag habitat. Table B-8-6 depicts the amount of habitat provided for these species for each alternative. Generally, as the amount of acres managed for their habitat increases, PNV decreases.

The maintenance and enhancement of clean air and water, and the protection of historical and cultural resources, are also, at least to some extent, contradictory to the harvesting of timber. While the provision of these benefits has not been a serious problem in the past, alternatives which greatly increase the amount of acres harvested will make it more difficult to protect these resources. Table B-8-6 shows that, as ASQ increases, so do the number of acres harvested.

Economic Impacts on the Local Communities

Changes in the levels of timber harvests, recreation use, grazing, and Forest Service expenditures on the Ochoco National Forest have the potential to impact the employment and income levels in the local economy. Many of the local communities are particularly dependent upon the Forest based timber resource as the mainstay of their economies. Therefore, the potential economic impacts on the local economy of Central Oregon resulting from the implementation of any one of the alternatives is an important element in the process of selecting a preferred alternative. It was identified as one of the ICO's at the outset of the planning process. The following paragraphs examine this issue.

The primary economic impacts resulting from changes in output levels on the Ochoco National Forest are felt in Crook and Harney Counties and small portions of Wheeler, Jefferson and Grant Counties. Crook, Harney, and Wheeler Counties will be used as a surrogate for the total area of influence. (For more detail on the economic impact analysis, refer to Section 5).

The primary economic impact resulting from changes in output levels in the Ochoco National Forest are minor when compared to the total employment base of the counties. Total employment for the three

counties is estimated to be approximately 9,100 jobs. Approximately 20 percent of these jobs rely on Ochoco National Forest outputs.

All alternatives have less than two percent change in jobs. In terms of payments to counties the impact is much more significant. The Forest's contributions range from $3.5 million in Alternative C-Mod to a maximum of $5 million in Alternative E-Departure in the first decade. Looking at the wood products sector (logging, sawmill and mill works), the counties largest employer, the impact of the alternatives is slightly more significant. The change in jobs for this sector of the economy ranges from a decrease of three percent in Alternative C-Modified to an increase of four percent in Alternative B-Modified.

The timber (primary) and recreation (secondary) resources are the forest based outputs which are influencing the local economy. Since the recreation use levels will not change that dramatically in the short term from one alternative to another, it is the amount of timber that each alternative proposes to sell which most heavily influences the jobs and income levels during the first decade. Over the longer run (20 to 50 years), the differences between the alternatives in their recreation output levels increase and, therefore, become an important factor accounting for the variation in potential for long term economic opportunities.

The potential impacts on timber related jobs in the local economy are estimated as a function of the change in the amount of board feet sold by an alternative as compared to current sale levels. Timber volume is regulated in cubic feet for all alternatives. In all alternatives, diameter of harvested material will be decreasing over time. There are proportionally more board feet than cubic feet in larger material. As a result, board feet will be declining in all alternatives, even if managed under nondeclining yield. Since jobs and income are tied to board feet timber harvest, all alternatives will exert some downward pressure on local economies after the first decade. With regard to the timber related impacts, not only is the amount of wood offered for sale an important factor, but so is the species mix. Given the same amount of timber volume, pine would have more positive economic effects than mixed conifer. This is a result of pine being remilled in the local communities, thus creating more jobs and income per million board feet than does mixed conifer. Because the mix of species does not vary significantly between alternatives the effect between alternatives on local economics will be minimal.

The Ochoco National Forest is locally and regionally an important provider of recreation opportunities. Current estimates show the State's population to be increasing at an annual rate of roughly two percent. To the extent that an alternative emphasizes the development of capacity for diverse recreation opportunities, recreation use on the Forest is likely to increase at a comparable rate. So the service industry in the local economy can be expected to grow over the long run to facilitate the recreation visitors, although the jobs will generally be lower paying than the wood processing jobs.

Another means by which the Forest Service can impact the local economy is through its payments to local governments in lieu of taxes. The Forest Service pays 25 percent of its total receipts to county governments. As was discussed above, most of the Ochoco National Forest receipts are generated by the selling of timber. To the extent that an alternative emphasizes the production of timber, the local governments will benefit financially. Stumpage receipts are not only related to the amount of volume which an alternative proposes to sell, but also the mix of species. With that in mind payments to counties by alternative will respond similarly to the change in jobs from the current situation between alternatives.

Responses to Major Issues, Concerns, and Resource Use and Development Opportunities

This section defines indicators that are used to show differences in how alternatives respond to the Issues, Concerns and Opportunities (ICO's). It also discusses indicators that are of central concern to

the nation as a whole. Appendix A fully discusses each of these ICO's and the relevance of the response indicators. The major ICO's with the greatest influence on the alternatives, and their associated response indicators are as follows.

1. Timber Supply and Forest Management:

   allowable sale quantity in cubic feet, first and fifth decade

   allowable sale quantity in board feet, first decade

   average annual salvage

   uneven-age management acres.

2. Social and Economic Wants and Needs of Local Communities:

   Present Net Value (PNV)

   number of Forest-dependent jobs

   payments to counties.

3. Livestock Grazing and Allotment Management:

   Permitted Livestock Use in AUM's, first and fifth decades.

4. Riparian Area Management:

   acres of riparian area in excellent condition, first and fifth decades.

5. Transportation System:

   miles of primary road, end of first decade.

6. Big Game Habitat:

   potential deer population, fifth decade

   potential elk population, first and fifth decades.

7. Roadless Areas and Wilderness Study Areas:

   acres allocated to roadless recreation.

8. Scenic or Visual Resources:

   acres allocated with scenic resource emphasis.

9. Old Growth:

   acres allocated/dedicated to old growth emphasis.

10. Fuelwood Supply:

    annual firewood supply in M acres, first and fifth decades.

11. Snag Dependent Wildlife:

    average percent of potential cavity nester habitat, first and fifth decades.

12. Winter Sports:

    areas available for winter recreation pursuits.

13. Anadromous Fish

    production of Steelhead smolt (smolt/meter sq.), first and fifth decade.

14. Historic Trail Preservation

    acres allocated for Summit Historic Trail.

15. Off Road Vehicle (ORV) Use

    miles of ATV trail, first and fifth decades.

16. Round Mountain

    area with recreation and scenic resource emphasis, planning period.

Interalternative Comparisons and Major Trade-offs

Introduction

This section summarizes relationships between economic values and the responses of the alternatives to the issues, concerns, and opportunities (ICO's). The purpose is to identify economic and noneconomic comparisons and trade-offs that can be quantified as ICO response indicators. To provide a partial framework for assessing comparisons and trade-offs, the long-term resource demands of the national, regional, and local communities have been summarized. Selected economic values and quantified indicators of responsiveness to ICO's are tabulated (Table B-8-7). Finally, differences and similarities

TABLE B-8-7
INDICATORS OF RESPONSIVENESS OF ALTERNATIVES TO ISSUES, CONCERNS, AND OPPORTUNITIES

		ALTERNATIVE					
Resource Output or Item	Unit of Measure	NC	B-MOD	E DEP	I-Preferred	A	C-MOD
Allowable Sale Quantity (ASQ)							
1st Decade	MMCF	N/A	21 8	20 6	19 0	19 3	15 6
5th Decade	MMCF	N/A	21 8	16 1	19 0	19 3	15 6
1st Decade	MMBF	N/A	130 0	123 0	115 0	115 0	94 0
Average Annual Salvage	MMBF		8	1 5	7	1 4	6
Uneven-Age Mgmt	M Acres	0	120	0	100	0	170
PNV	Million $	380	452	471	475	421	395
Estimated County Receipts	M $'s	Un-known	4 5	5 1	4 9	4 3	3 5
Estimated Change in Jobs	#	Un-known	176	196	118	57	-101
Livestock Use	M AUM's/Yr						
1st Decade		77 5	70 0	79 0	70 0	77 5	73 1
5th Decade		77 5	80 0	79 4	80 0	79 1	74 4
Riparian Areas in Excellent Condition							
1st Decade	M Acres	---	10 0	---	10 0	---	10 0
5th Decade	M Acres	5 4	17 5	9 4	17 5	5 4	17 5
Miles of Primary Road Open and Maintained -End of Planning Period	#Miles	4774	4800	4776	4734	4774	4743
Miles of Roads Closed	#Miles						
1st Decade		694	913	890	1558	694	1520
5th Decade		1734	2123	2082	2185	1734	3224
Deer Population							
5th Decade	#	Un-known	17,210	22,600	22,600	22,600	22,600
Elk Population	#						
1st Decade			3210	3170	3000	3370	3740
5th Decade		Un-known	1700	2780	2620	2690	3700
Acres Allocated-Unroaded 1/	M Acres	29 1	10 7	27 3	38 4	31 2	41 0

Resource Output or Item	Unit of Measure	NC	B-MOD	E DEP	I-Preferred	A	C-MOD
Scenic Resources							
Preservation	M Acres	38 3	39 5	43 3	42 0	38 3	50 9
Retention	M Acres	102 2	60 7	70 7	96 8	102 2	155 6
Partial Retention	M Acres	71 4	28 1	59 4	32 4	71 4	61 5
Allocated 2/	M Acres		34 4	46 2	41.7	83 5	101 1
Old Growth (Allocated) 3/	M Acres 32,860		18,740	26,340	19,996	36,970	45,030
Fuelwood Supply	M Cords						
1st Decade		14 0	15 0	13 1	13 0	14 0	12 0
Snag Habitat for Cavity Nesters	% of Potential						
1st Decade		Unknown	43	46	47	46	51
5th Decade		Unknown	33	55	54	52	69
Area Allocated To Recreation Emphasis 4/	Acres		28,630	35,065	58,120	31,950	48,710
Anadromous Steelhead	SHCI 5/ (M Smolt)						
1st Decade		121	121	121	121	121	121
5th Decade		220	220	220	220	220	220
Total Miles of ATV Trails	#Miles						
1st Decade		None	95	0	95	0	95
5th Decade		None	190	0	190	0	190
Round Mountain Recreation Emphasis 6/	Acres	N/A	1,000	0	1,000	0	0

1/ Total acreage for lands allocated to management areas with unroaded recreation emphasis (D9, F8, F10, F11, G8)

2/ Total acreage for lands allocated to management areas with visual resource emphasis (D5, D6, D7, G13, F25, F26, F27)

3/ Total acreage for lands allocated to management areas with old growth emphasis (D4, F6, G5)

4/ Total acreage for lands allocated to management areas with recreation emphasis (D9, D10, D11, F7, F8, F10, F11, F13, F14, F16, F17, F19, G8, G11, G12, G14)

5/ SHCI Steelhead Habitat Capability Index, thousands of smolt

6/ Acres on Round Mountain with recreation emphasis (applies to Round Mountain National Recreation Trail)

among individual alternatives are summarized in terms of major trade-offs among competing objectives or responses to expressed issues, management concerns, or resource use and development opportunities. A complete understanding of differences among alternatives requires reading all of Chapters 2 and 4.

National, Regional, and Local Overview

National projections predict demand will rise for all outputs from National Forests (RPA). At the same time, there is also strong demand to protect and enhance environmental quality. Demands and prices for commodity production are generally determined in national and regional markets. Demand for timber from this Forest is high. Most timber sales are competitively bid to prices significantly higher than appraised prices. When national and regional markets are strong, prices are frequently bid upwards of $200 per thousand board feet for ponderosa pine. Demand for livestock forage is also high since the Forest and Grassland are the primary sources of summer forage in this area. All allotments are currently grazed, and the desire to utilize additional forage, or take over any unused allotments, is always high.

Demands for outdoor recreation uses are essentially local or regional. Recreationists on this Forest are predominantly local. The main exceptions are the fall hunting seasons which draw hunters from more populated areas of the state. Total recreation use of the Forest is predicted to rise about 59 percent in the next 50 years (see Tables 3-14 & 3-15, FEIS, Chapter 3).

Timber Supply and Forest Management

Comparison of Past, Present and Alternative Timber Harvest Levels

The potential yield (PY) under the current timber management plan is the total harvest level that could be sustained assuming intensive forestry practices on all available acres. This includes adjustments to meet multiple resource objectives This was calculated to be 20.86 MMCF (139.5 MMBF) and adjusted to 20.4 MMCF (136.5 MMBF) in 1984, as a result of the Oregon Wilderness Bill. A similar value was not calculated for the alternatives It would be equivalent to a maximum timber FORPLAN run for each alternative if unsuitable [1/] acres were included in the available acreage base.

The programmed allowable harvest under the current timber management plan is that part of the potential yield scheduled for harvest in a specific year (see Table B-8-8) It was calculated for the current plan by: (1) reducing the acreage base by the acres of marginal land [1/] that we did not plan to treat, and (2) by reducing yields based on difference in acres of intensive management (planting of genetically improved stock and precommercial thinning) predicted under the potential yield and what was actually planned to be accomplished (This process was known as the "earned harvest effect" (EHE)). This could be adjusted annually if there was significant change in acres of intensive management practices or in marginal land treated from what was programmed. This was originally calculated to be 19.86 MMCF (132.7 MMBF) and was adjusted in 1984 to 19.46 MMCF (129.8 MMBF). This is equivalent to the Allowable Sale Quantity (ASQ) plus the salvage volume.

Table B-8-8 displays the past actual sold and cut volume, planned harvest level from the existing plan, and range of harvest levels for each alternative. The range of harvest levels shown shows the highest and lowest predicted harvest level in board feet for the first decade All volumes are average annual figures for a particular decade. This table also displays the estimated volume of ponderosa pine for this same period. Additional timber resource information by alternative and benchmark is also presented in Table B-8-9.

The local industry is most interested in the ponderosa pine volume, and it has the greatest impact on the local economy, since much of the pine lumber is remanufactured to molding and other products locally.

[1/] The current plan did not have a category called "unsuitable" so there was no reduction in the available land base for lands that could not be reforested It did have a category called "marginal" which included steep slopes and critical soils, and stagnated submerchantable lodgepole Some harvesting was programmed from these lands but it was a separate slope component and could not be substituted for "standard" volume or vice versa

TABLE B-8-8
COMPARISON - PAST, PRESENT, AND ALTERNATIVE TIMBER OUTPUTS 1/
(First Decade Volumes in MMBF)

TIMBER OUTPUT COMPONENT	ACTUAL 1979-88 Annual Ave.		EXISTING 1980 TM Plan	ALTERNATIVES PLANNED VOLUME BY ALTERNATIVE FOR FIRST DECADE					
	Sold	Cut	P A H 2/	NC	B-MOD	E DEP	I	A	C-MOD
SAWTIMBER (Chargeable)									
Green sales (ASQ)3/	136 9	111 6	127 1	127 1	130	123	115	115	94
Est. pine volume 4/	109 1	87 5	95	95	85	87	82	79	63
Salvage sales	include	above	2 7	2.7	4	5	4	4	3
SALVAGE SALES & SAWTIMBER (Est. percent change in next five decades) 6/	136 9 5/	111 6	129 8	129 8	134 (-7)	128 (-30)	119 (-10)	119 (-10)	97 (-10)
SAWTIMBER (Nonchargeable) negligable in existing or planned program	0	0	0	0	0	0	0	0	0
SUBMERCHANTABLE (Post, poles, cull)	1 3	1 3	Unestimated in existing or planned progam						
CONVERTIBLE PRODUCTS Firewood 7/	2 7	2 7	unestimated	unesti-mated	7	7	6	7	6
TOTAL (TSPQ)	138 2	110 1			141	135	125	126	103

1/ Note that due to different bases for calculation, these figures may not be directly comparable However, they may be used to show changes in specific comonents for calculations, over time All calculations were done in cubic feet. The volumes in this table are estimates based on board foot/cubic foot ratio

2/ Yield of timber projected for the period of 1980 to 1989, as calculated for the 1980 Timber Management Plan and adjusted for 1984 Oregon Wilderness Bill The Programmed Allowable Harvest (P A H) is the sawtimber from green and slaveage sales scheduled for harvest.

3/ Allowable sale quantity calculated for the current land and resource management plan direction, projected into the future using new scientific information, such as yield tables and suitability for timber harvest, and using FORPLAN analysis model

4/ Estimated volume of ponderosa pine that is included in green sale volume

5/ Average volume sold was not adjusted for "buy-back" volume

6/ Reduction in all but E DEP is due to change in BF/CF ratio and estimated reduction in salvage volume as more stands become managed Change in E DEP is mostly due to the planned departure from even flow

7/ Actual firewood volume is based on years 1985 to 1988 Essentially all of this was sold as personal use Planned volume is the estimated amount if firewood available Typically less than half of this will be utilized

TABLE B-8-9
Timber Resource Management Information by Benchmark and Alternative

		Inventory			First Decade Average Annual ASQ			LTSYC			Average Annual Net Growth		
Benchmark or Alternative 1/	Selected Suitable Lands (M Acres)	Begin (MMCF)	Begin/Acre (CF)	End (MMCF)	(MMCF)	% of Col (2)	(MMBF)	(MMCF)	% of Decade Col (4)	Met	CF/Acre Present	CF/Acre 2030	2030 MMCF
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Benchmark													
Max Timber	518	1152	2 2	730	23 4	2 0	142	23 4	3 2	2	27	43	22 3
Max PNV	518	1147	2 2	762	22 7	2 0	139	22 7	3 0	1	30	39	20 1
Alternative													
NC	534 2/	N/A	N/A	N/A	N/A	N/A	N/A	31 1	N/A	N/A	25	N/A	N/A
B MOD	511	1115	2 2	799	21 8	2 0	130	21 8	2 7	1	22	41	20 9
E-DEP	495	984	2 0	760	20 6	2 1	123	19 3	2 5	1	26	35	17 4
I Preferred	494	990	1 9	792	19 0	1 9	115	19 0	2 4	1	28	37	18 2
A	489	970	2 0	740	19 3	2 0	115	19 5	2 6	2	24	39	19 2
C-MOD	459	895	1 9	751	15 6	1 7	94	15 6	2 1	1	30	28	13 4

	Area and % of Suitable Land by Yield Level						First Decade				
	Full Yield		50-90% Yield		Under 50% Yield						
Benchmark or Alternative 1/	M Acres	% Col (1)	M Acres	% Col (1)	M Acres	% Col (1)	Clearcut M Acres	Shelter-woodM Acres	Overstory Removal M Acres	Selection M Acres	Harvest Total % Col (1)
Column	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
Benchmark											
Max Timber	506	98	12	2	0	0	22	45	64	3	26
Max PNV	506	98	12	2	0	0	13	17	88	25	28
Alternative											
NC	413	77	89	17	32	6	0	119	64	0	34
B-MOD	484	95	27	5	0	0	25	50	21	68	32
E-DEP	0	0	495	100	0	0	14	26	113	4	32
I Preferred	0	0	492	99	2	1	9	21	53	62	29
A	0	0	489	100	0	0	19	18	106	1	29
C-MOD	0	0	459	100	0	0	15	4	32	96	32

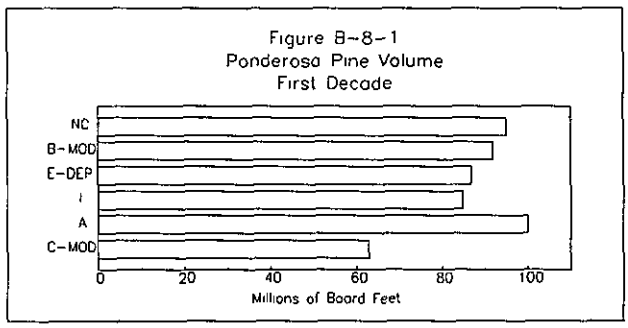
1/ Tentatively suitable land for all alternatives is 533 M Acres

2/ This is based on 1972 land classification system and adjusted for Amendment #1 of the Timber Plan

It is estimated that the sell volume has included 90 to 100 MMBF of pine in recent years. The current inventory shows 67 percent of the total volume is in ponderosa pine (see Appendix E). So the pine harvest in all alternatives will be 67 plus or minus five percent of the total harvest volume. However, the actual pine volume scheduled for harvest will vary considerably by alternative during the next five decades.

Effects of the Alternatives on the Ponderosa Pine Harvest

The range of ponderosa pine volume by alternative is displayed in Figure B-8-1



Alternative A has the highest volume of pine during the first decade due to the large proportion of harvesting in the first decade in two-story pine types. The volume decreases by about 30 MMBF after the first decade and remains at a relatively low level for the next four decades.

Alternative B-Modified would provide about 85 MMBF of pine during the first decade Alternative B-Modified would maintain the highest level of pine during the first five decades of all the alternatives.

Alternative E-Departure has a first decade volume of 87 MMBF and declines to an estimated 52 MMBF in the fourth decade.

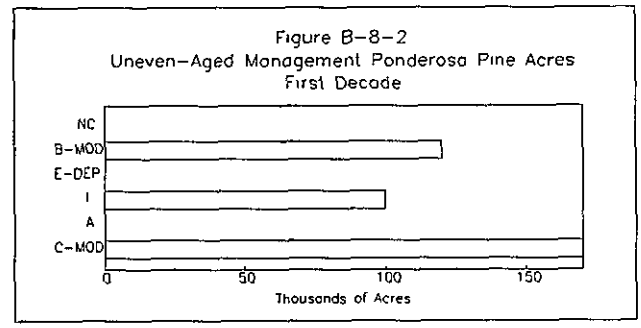
Alternative C-Modified would provide about 63 MMBF in the first decade, remaining constant through the fifth decade.

The pine volume in the long term (decades six and beyond) depends on harvest level and intensity of management Alternative I provides for a stabilization of the ponderosa pine harvest over time, as do the other alternatives.

Uneven-aged Management

Uneven-aged management has been included in Alternatives B-Modified, C-Modified and I. This silvicultural system was included in these alternatives in response to public interest in its application as an alternative to clearcutting. Expectations would be increased size of ponderosa pine crop trees (20 inch DBH), improved conditions of forested habitat for wildlife and more desirable scenic qualities.

The range of acreage of ponderosa pine which would be managed with uneven-aged silvicultural systems is shown in Table B-8-7 and Figure B-8-2.



Social and Economic Wants and Needs of Local Communities

This section compares and discusses the economic consequences of the alternatives. The comparisons focus on present net value (PNV), market and nonmarket values, costs, net receipts, returns to treasury, and non-cash benefits. Each alternative has non-quantifiable benefits and costs which should also be considered when attempting to rank the alternatives in terms of net public benefits. This section also discusses the social effects of the alternatives.

Differences in Present Net Values

Present net value (PNV) is the primary quantitative measure of economic efficiency used for all benchmarks and alternatives. It is also an important measure of the dollar value of the alternatives. PNV has

been calculated to be the sum of all market and nonmarket priced values, less all management costs for the 50-year planning horizon, discounted to present values using a four percent interest rate. The relationship between PNV and net public benefits is discussed in Section 4 of this appendix.

The Max PNV benchmark and six alternatives are ranked by decreasing PNV in Table B-8-10. Table B-8-12 provides further detail on discounted costs and benefits by resource group. The Max PNV benchmark is provided as a reference point only. It is an estimate of the discounted net economic returns the Forest could receive for its priced resources if they were managed solely to maximize present net value.

The main factor influencing patterns in PNV, benefits, and costs is timber management. Timber values represent from 53 percent to 65 percent of the total dollar values in the alternatives. Values produced from selling timber are, in general, far in excess of related costs As timber harvest levels decrease across alternatives, discounted costs and benefits, PNV usually decrease as well. This pattern is due mainly to non-timber resource objectives restricting timber practices and harvests. Although recreation related benefits (including hunting and fishing) do make up a significant portion of the total dollar benefits (28% to 41%), increases in these dollar benefits do not make up for the PNV lost from timber. Therefore, the greater the non-timber resource objectives, the lower the timber discounted benefits and costs, and PNV.

This general pattern is modified by the intensity of the timber management activities employed. Some alternatives schedule timber practices and harvests at the most economically efficient level, given other resource objectives (Alternatives C-Modified, I, and E-Departure). Other alternatives apply more intensive timber practices to achieve the highest timber volumes possible, given other resource objectives (Alternatives A, B-Modified, and NC). This results in higher timber benefits, but also higher costs and lowered PNV. In each of these two groups of alternatives the general pattern discussed above holds. The exact combination of non-timber resource objectives and timber management intensity determines the ranking in PNV of these two groups together.

The PNV of the NC Alternative is an estimate. It is also based on a programmed harvest level of 129 MMBF. If the estimate was based on the potential yield of 136 5 MMBF, the PNV would be significantly higher.

The Forest and Grassland are considered to have potential energy resources. However, very little testing and development has taken place to date. No estimates have been made of future extractions, so energy values were not included in the economic analysis. However, oil and gas leasing provides significant returns to the Treasury and to counties. The alternatives have little effect on mineral activities.

Differences in Costs

Capital investment costs include trails, roads, reforestation, timber stand improvement, prescribed burning, and physical structures for range, recreation, fish, and wildlife. Other costs include operating and maintaining facilities, program management, and support costs associated with management of other resources. Capital investment costs pertain mostly to roads and timber stand management. For example, 76 percent (Alternative C-Mod) to 95 percent (Alternative A) of capital investment costs are associated with road construction and timber management. The majority of operation and maintenance costs are program management, followed by support funds necessary to carry out timber programs.

Because most costs are associated with timber management, the higher the timber output, the higher the costs. Generally, capital investment costs decrease significantly over time due to declining road construction and timber stand improvement practices. Operation and maintenance costs remain fairly constant over time except for alternative E-departure's where timber volume declines over time.

Fixed costs represent a relatively small portion of the total costs (20% to 30%). The remainder of the cost for each alternative varies with the objectives of the alternative.

Costs associated with timber practices and harvests constitute a large portion of the total costs Alternative B-Modified has the highest cost of any alternative and only 29 percent of the discounted cost is directly attributed to resources other than timber and roads. Road construction and reconstruction is almost entirely tied to timber harvests on this Forest. Alternative C-Modified has the lowest cost of any alternative and the highest benefits associated with amenity outputs, yet only 35 percent of the costs can be attributed to resources other than timber.

Differences in Economic Benefits and Cash Flows

The total economic benefits of the alternatives come from priced resources which include both "market" outputs, and those with "assigned" values. Market values represent the unit price of an output that is normally exchanged in a market. On this Forest, timber is the primary market output, accounting for over 90 percent of the market outputs and 50 percent to 65 percent of the total economic benefits of the alternatives. Other market outputs include livestock grazing, campground use, special use permits, and minerals leasing. Assigned values represent the unit price of an output not normally exchanged in a market. Various analytical techniques were used to estimate values that people would be willing to pay for these benefits. Outputs with assigned values include dispersed recreation, wilderness use, hunting, fishing, and water quality improvement. Hunting and fishing are the major assigned values, comprising from 16 to 26 percent of the total economic benefits. The remaining 18 to 24 percent is split in different proportions, depending on the alternative, among livestock grazing, developed recreational use, dispersed roaded recreational use, and dispersed non-roaded recreational use.

Total market values range from 62 percent (Alternative C-Modified) to 70 percent (Alternative B-Modified) of the total economic benefits. Alternatives in the high end of this fairly narrow range have relatively high timber benefits and/or relatively lower fish, wildlife, or recreational values. The opposite is true for alternatives in the low end of the range.

Cash receipts are revenues returned to the Forest and Grassland for stumpage, grazing permits, campground fees, leasable minerals, and special use permits. However, the Forest generates economic benefits to users which are not realized in terms of cash flows. These are referred to as "noncash benefits." They refer to the benefits individual resource users receive when they are charged less for the resource than they would be willing to pay, or current market prices indicate they should pay. Noncash benefits are the difference between the full economic value of the resource and the fees actually paid to use that resource. Table B-8-11 displays the relationships between total receipts, total budget costs, net receipts, and noncash benefits for each alternative in order of decreasing net receipts. All alternatives receive more money than they spend (net receipts are positive). Fish and wildlife provide the most noncash benefits in all alternatives, followed by recreation, then range. Timber provides nearly all of the cash receipts.

Generally the proportion noncash benefits contribute to total economic benefits increases as net receipts decrease. The decrease in net receipts as noncash benefits increase is a result of more land and resources being allocated to producing noncash benefits, thus lessening the resources available to produce cash receipts.

Table B-8-11 (decade one) as compared to Table B-8-10 shows that alternatives with higher net receipts in decade one generally have higher PNV's This trend holds true in all but one case.

This case involves Alternative NC. In Table B-8-10, Alternative NC has the lowest PNV, but in Table B-8-11, it has the third highest net receipts. The cause of this is two-fold: first, it has the lowest noncash benefits of all the alternatives, and secondly, Alternative NC is different from the other alternatives in that it does not ensure meeting all management requirements. This allows more of the higher value ponderosa pine stands to be harvested in decade one. However, to satisfy particular harvest scheduling requirements, cash receipts drop off dramatically after the first decade. Table B-8-11 shows that the net receipts for Alternative NC drop in rank

TABLE B-8-10

PRESENT NET VALUE AND DISCOUNTED COSTS AND BENEFITS OF ALTERNATIVES

(Million Dollars)

(Ranked by Decreasing PNV)

Alternative/ Benchmark	Present Net Value	Change	Discounted Costs	Change	Discounted Benefits	Change
Max PNV Benchmark 7	512		241		754	
Alternative I	475	-37	227	-14	701	-53
Alternative E-Dep	471	-4	221	-6	693	-8
Alternative B-Mod	452	-19	262	+41	714	+21
Alternative A	421	-31	236	-26	657	-57
Alternative C-MOD	395	-26	213	-23	608	-49
No Change	380	-15	245	+32	653	+45

TABLE B-8-11
FIRST AND FIFTH DECADE AVERAGE ANNUAL CASH FLOWS 1/ AND NONCASH BENEFITS BY ALTERNATIVE

(Million Dollars)

(Alternatives Are Ranked in Order of Decreasing Net Receipts)

	ALTERNATIVES					
	I	E-Dep	NC	B-Mod	A	C-MOD
DECADE 1 Total Receipts	19 4	20.2	20 2	17 9	17 2	14 0
Total Costs	12 0	12.8	13 1	14 5	13 0	11 4
Net Receipts	7.4	7 4	7 1	3 5	4 2	2 6
Non-cash Benefits to Users	10 8	10 9	10 3	10 7	10 5	11 0
DECADE 5 Total Receipts	21 5	18 4	18 7	25 3	20 2	18 7
Total Costs	10 9	9 5	10 9	12 4	10 7	10 0
Net Receipts	10 5	8 9	7 8	12 8	9 5	8 7
Non-cash Benefits to Users	13 6	13 2	11 6	12 5	12 5	14 3

1/ Payments to counties and expenditures by cooperators are excluded

TABLE B-8-12
DISCOUNTED BENEFITS AND COSTS BY RESOURCE GROUPS
(Millions of Dollars) 1/

	ALTERNATIVES (Ranked by Decreasing PNV)					
	I	E-Dep	B-Mod	A	C-MOD	NC
PNV	475	471	452	421	395	380
DISCOUNTED PRICED BENEFITS BY RESOURCE						
Timber	422 6	415 9	446 1	392 4	322 4	413
Developed & Dispersed Recreation	84 8	85 1	76 7	75 7	86 4	72 3
Fish & Wildlife	154.8	152 1	151 0	149 7	161 5	103
Range	20 5	20 5	20 8	20 2	19 1	18 6
Minerals	19 0	19 0	19 0	19 0	19 0	18 2
DISCOUNTED COSTS BY MAJOR CATEGORIES						
Timber	49 6	50 7	70 1	64 8	41 1	69
Roads	86 2	82 8	95 7	84 0	80 5	87
Developed & Dispersed Recreation	11 7	8 2	11 3	5 2	12 7	5 1
Fish & Wildlife	6 9	6 9	7 4	5 7	9 4	6
Range	8 1	8 3	8 3	7 9	7 5	9
Other 2/	59 4	59 9	63 5	63 7	57 7	55
Soil & Water	4.8	4.7	5 1	4 6	4 4	4

1/ Direct comparisons of benefits and costs by individual resource provide broad indications of specific relationships, but they may be misleading because many costs are nonseparable under multiple-use management

2/ These costs include general administration, cultural resources, lands and minerals, human resources, and protection

from third in the first decade, to last in the fifth decade. Alternative NC also harvests timber at levels beyond that which is efficient in order to meet current sale levels. This results in higher total receipts, but also higher costs resulting in lower PNV's. As a result, Alternative NC has relatively high net receipts in decade one, but a relatively low PNV.

When decade five from Table B-8-11 is compared with Table B-8-10, the relationship between net receipts and PNV's is not as strong as it was for the first decade. The ranking of alternatives from highest net receipts to lowest net receipts shows the same changes from decade one to decade five. Alternatives E-Departure and NC have higher net receipts in the first decade than in later decades, while Alternative B is ranked higher by net receipts in decade five than in decade one. Because of the PNV discounting computations, high returns in early decades will affect the PNV more than high returns in later decades. The exception is NC, because the drop in net receipts is so sharp the net receipts in decades two to five outweigh the high first decade receipts, thus lowering the PNV.

Comparing the first and the fifth decades in Table B-8-11, all alternatives show an increase in net receipts. The major factor is a decrease in costs because much less road building is necessary in the fifth decade. Also, real stumpage prices increase over time.

Noncash benefits for all alternatives increase from decade one to decade five. Part of this increase is a result of a projected increase in recreation demand. The rest of the increase can be attributed to habitat management for big game and fish. The time lag between habitat improvement and an increase in hunting and fishing causes benefits to show up most dramatically in future decades. The percent increase between decades one and five in noncash benefits ranges from 13 percent in the high commodity alternatives, to 28 percent in Alternative C, an amenity oriented alternative.

Social Effects

Direct Effects

The direct effects of the alternatives include the following:

Employment levels produced by the alternative's mix of outputs (see Table B-8-13);

The amount of the Forest budget;

The amount of 25 percent monies paid to the counties.

TABLE B-8-13
CHANGES IN EMPLOYMENT FOR VARIOUS ECONOMIC SECTORS BY ALTERNATIVE
(Number of Jobs - First Decade)

	B-MOD	E-DEP	I Preferred	A	C-MOD
Logging	14	9	5	5	-7
Sawmills	25	18	10	9	-14
Remanufacturing	35	30	8	3	-55
Retail Trade produced by Wood Products Industries and 25% monies	15	16	6	3	-22
Retail Trade produced by Recreation	21	49	45	18	51
Total, All Sectors	176	196	118	57	-101

Indirect Effects

The previously mentioned effects of the various alternatives would produce effects on the social fabric of the area as follows.

Effects on Occupational Lifestyles

For loggers and sawmill workers, Alternative B-Modified would increase employment by 44 jobs, which is around four percent of total logging and sawmill employment. Alternatives A, I, and E-Departure would produce increase of 14, 15, and 28 jobs respectively.

For workers in remanufacturing operations, the changes range from a three percent employment gain (Alternative B-Modified) to a three percent loss (Alternative C-Modified). None of these changes is considered to be significant. However, the remanufacturing industry will be affected by the Forest Plans of several Forests. This matter is discussed in the Cumulative Effects section in Chapter 4 of this FEIS.

Merchants benefit from any alternative. The smallest gain, 21 jobs, is in Alternative A; the largest gain, 65 jobs, occurs in Alternative E-Departure. Small town merchants hire a smaller proportion of employees than do other business. Therefore, these figures are considered to understate the gains to the merchants. When these merchants do hire employees, they often work part time and for low wages. These jobs are often taken by women. Often these jobs provide a secondary income for a family.

Effects on Leisure Lifestyles

Alternative C-Modified would provide for the most recreational activities. Elk and fish are at the highest levels of any of the alternatives, as are opportunities for roadless recreation. Landscapes appear most natural to the driver or hiker. Fuelwood gathering is the one activity which is at its lowest.

At the other end of the scale, Alternative A provides, in general, the least recreational opportunities. Roadless areas and fish are at the lowest levels. Unlike the other alternatives, there is no construction of trails for hiking, ATV's, cross-country skiing, or snowmobiling.

Generally speaking, Alternative B-Modified provides the next lowest level of recreational opportunities. Roadless areas and elk are low. The scenery is the lowest of all the alternatives. However, fuelwood is at its highest; and trail construction and increased numbers of fish improve the picture.

Alternatives E-Departure and I provide an intermediate situation. Alternative I provides more roadless areas, trails, and fish; while Alternative E-Departure offers slightly more elk plus a provision for a semiprimitive motorized area.

Effects on Social Structure: Community Cohesion and Stability

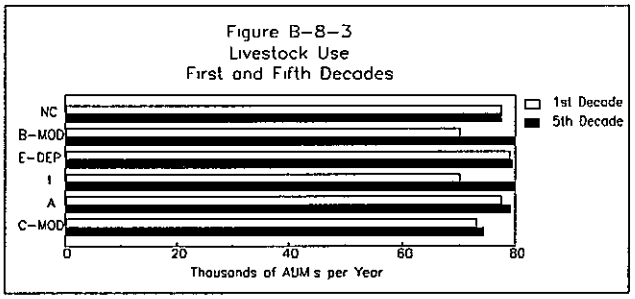
"Community Cohesion" is an estimation of whether a given alternative will tend to unify or polarize a community. While a diversity of opinions in a community is generally desirable, it is assumed that polarization of the community is harmful and that cohesion is beneficial. It is further assumed that polarization will be caused by the adoption of an alternative which greatly favors one point of view over others. In contrast, the selection of an alternative that meets to some extent the desires of diverse participants is assumed to produce cohesion.

Judging by this criterion, Alternatives B-Modified and C-Modified would produce polarization. The public response to E-Departure, the Draft Preferred Alternative, included many negative comments about its "departure" harvest schedule. Under Alternative A, existing polarization would not diminish. Alternative I is the one alternative judged likely to promote some degree of community cohesion.

Livestock Grazing and Allotment Management

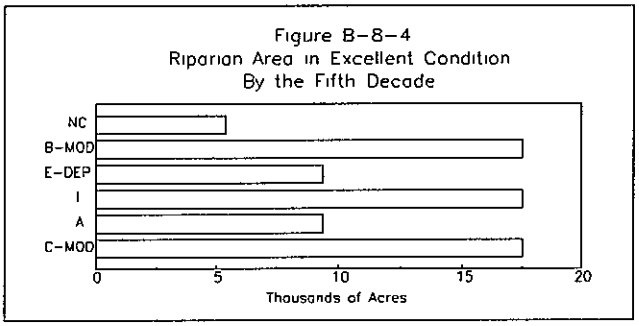
Alternatives E-Departure, I and B-Modified all seek to increase the forage available over time. Alternative B-Modified is the most aggressive of the three in its emphasis on forage production. Alternative C-Modified emphasizes amenities over commodity resource use and accordingly shows the lowest forage

production for livestock. Alternatives NC and A maintain about the current level of forage production over time.



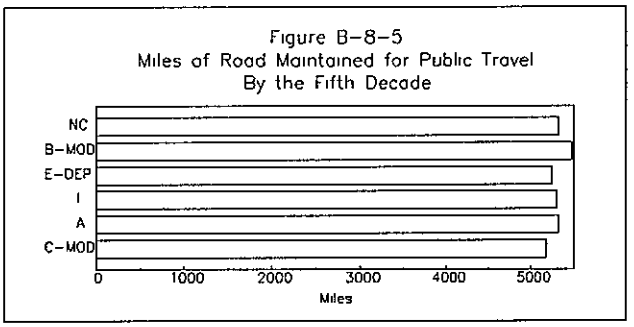
Riparian Area Management

All alternatives show some progress toward meeting the public and management concerns over livestock impacts to riparian areas. Alternatives NC and A would improve the least amount of riparian area over time, generally limiting the rehabilitation and enhancement to anadromous fisheries. Alternative E-Departure would improve more acreage by adding additional enhancement work on key trout fisheries, as well as to anadromous fisheries. Alternatives B-Modified, I and C-Modified would include rehabilitation and enhancement to bring 17,500 acres to "excellent" condition by the fifth decade. The desired future condition for these three alternatives would be "excellent" for all of the 20,240 acres of riparian area on the Forest and Grassland.



Transportation System

The primary difference between the alternatives is in the management strategy for the miles of road maintained open for public travel. All alternatives close and or restrict use on some roads to protect the investment, to provide for public safety, to reduce soil erosion and degradation of water quality, and to increase the wildlife habitat effective in key areas on the Forest and Grassland.



Big Game Habitat

A number of the alternatives provide for big game habitat through the dedication of or emphasis on management for winter range characteristics. The indicator for the responsiveness of the alternatives to this issue is the potential population levels of elk and deer that could be maintained. Table B-8-7 and Figure B-8-6 illustrate the responsiveness of each of the alternatives.

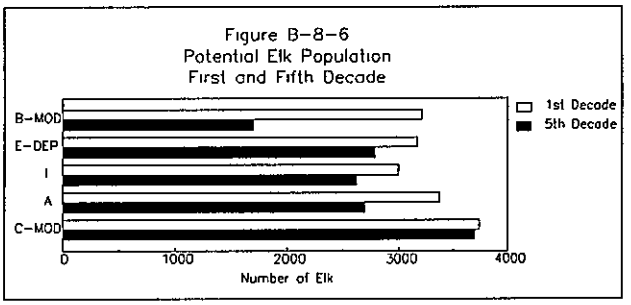
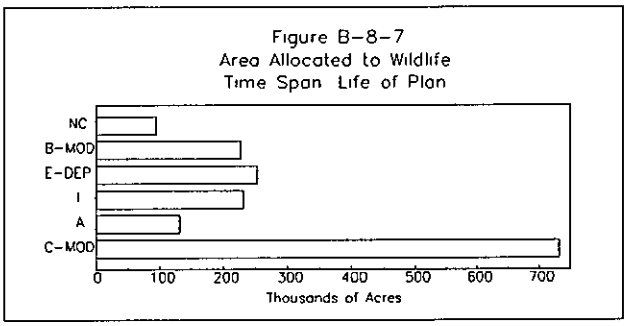


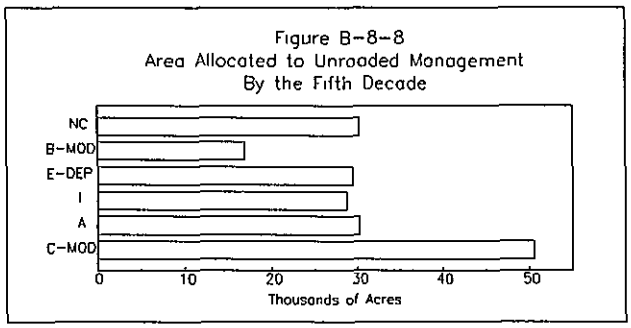
Table B-8-7 and Figure B-8-7 illustrate the areas allocated or dedicated to a wildlife management strategy (includes old growth and eagle roosting areas but is reflective of emphasis for big game).



Roadless Areas and Wilderness Study Areas

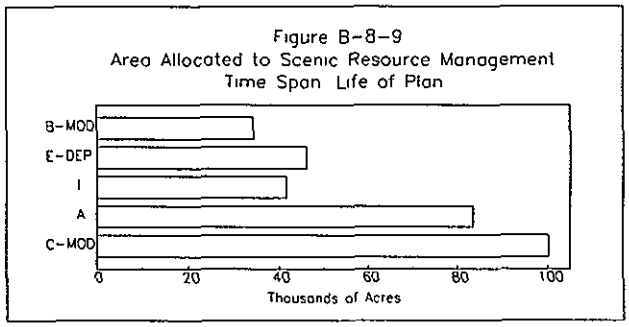
A number of the alternatives allocate or manage areas for unroaded recreation (nonmotorized and without roads). Table B-8-8 and Figure B-8-8 illustrate the area that will be maintained in an unroaded condition for the life of the planning period.

The North Fork of the Crooked River Wilderness Study Area, 1,125 acres, is incorporated in all the alternatives.



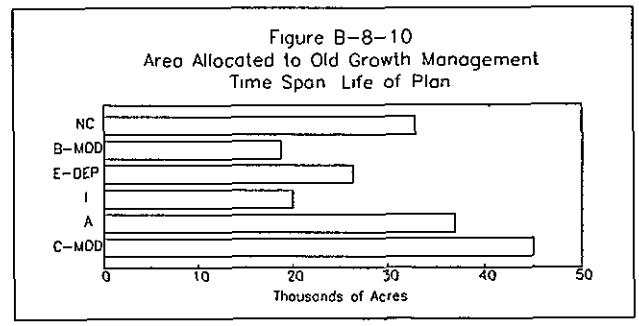
Scenic or Visual Resources

Public and management concerns for the maintenance of the scenic qualities on the Forest and Grassland resulted in provisions for scenic resource emphasis along key travel corridors for a number of the alternatives. This is in addition to the visual quality objectives assigned to all alternatives. Table B-8-7 and Figure B-8-9 illustrate the area allocated or dedicated to a visual resource management emphasis.



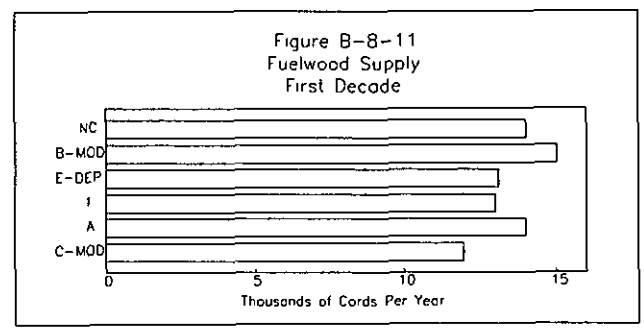
Old Growth

Old Growth areas have been designated according the Regional definition for all all the alternatives considered in this FEIS. The range of acreage allocated is presented in Table B-8-7 and Figure B-8-10. Those alternatives with higher emphasis on commodity outputs, such as Alternative B-Modified, have lower allocations with total existing old growth rapidly depleting over time. On the other end of the spectrum, alternatives such as C-Modified with amenity value emphasis, allocate larger areas to old growth and will retain larger acreages over time.



Fuelwood Supply

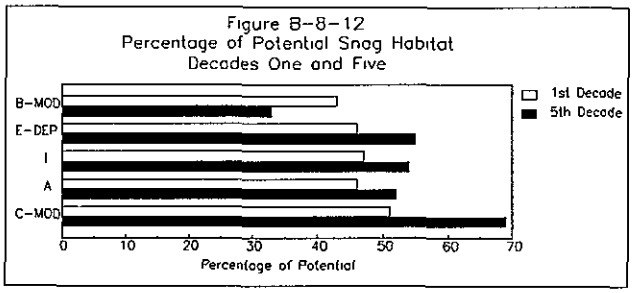
All the alternatives would supply a portion of the fuelwood demand on the Forest and Grassland Those alternatives that have higher levels of timber harvest activity would supply a higher percentage of the demand. The amenity alternative, C-Modified, would provide the least amount of fuelwood. Those alternatives such as I, which would stabilize the timber supply over time, would provide a more consistent supply than alternatives which depart from an even flow of timber harvest and experience a long-term reduction in harvest. A similar reduction in available fuelwood would shadow the decline in timber harvest.



The fuelwood supply for each alternative for decades one and five is presented in Table B-8-7 and is illustrated in Figure B-8-11.

Snag Dependent Wildlife

All the alternatives provide for the maintenance of a portion of the potential snag dependent species habitat. The ability of any alternative to provide snag habitat is directly related to its timber harvest strategy. Those alternatives with the higher timber harvest levels over time will have less ability to provide a portion of the potential habitat. The percentage of potential snag habitat is presented by alternative in Table B-8-7 and is illustrated in Figure B-8-12



Winter Sports

All the alternatives are responsive, to a degree, to the public interest in having areas available for winter recreation. All the alternatives except for NC and A would provide for winter recreation at Bandit Springs through a 1,580-acre management area allocation. This area is presently closed to snowmobilers to allow for cross-country skiing and similar nonmotorized winter recreation pursuits.

The top of Lookout Mountain would be open to snowmobile use on all the alternatives except for C-Modified and E-Departure.

Anadromous Fish

All the alternatives provide for the rehabilitation of key riparian areas along all anadromous fisheries, and schedule enhancement activities to provide for maintenance or enhancement of steelhead production. Estimated smolt production over time is displayed in Table B-8-7. It is planned to be the same for all the alternatives, that is anadromous fish production is assured at this level for all alternatives.

Historic Trail Preservation

The Summit Historic Trail is presently designated as a National Historic Trail and would retain that status for all the alternatives. Alternative I allocates 9,560 acres to protect the existing integrity of the trail and to preserve its historic and related scenic qualities.

Off-Road Vehicle (ORV) Use

The off-road vehicle use issue is an administrative problem for all the alternatives. At this point in time it is more of a social issue than one of resource impacts All the alternatives would have adequate regulations in place to deal with resource impacts. Off-road use by ATV's, snowmobiles and motorbikes is seen as not being compatible with some resource emphases. Off-road use would be prohibited on all the alternatives for areas allocated as wilderness, wilderness study areas, and wild and scenic rivers - a total of 41,355 acres amounting to four percent of the Forest and Grassland.

Off-road use would be restricted to designated routes and prohibited from December 1 to May 1 for eagle roosting management areas (570 acres) for all alternatives.

The Bandit Springs area, in Alternatives B-Modified, E-Departure, I and C-Modified, would prohibit snowmobile use on 1,580 acres.

Alternative I would include a number of additional off-road vehicle use closures and restrictions. Motorized use would be prohibited on an additional eight management areas, a total of 35,580 acres amounting to four percent of the Forest and Grassland. Off-road use would be restricted to the summer months (closed December through April) to protect such resources as big game winter range on 186,790 acres amounting to 20 percent of the Forest and Grassland.

Alternatives B-Modified, C-Modified and I would begin to develop an ATV trail system to manage off-road use. The Forest and Grassland program for ATV trails is illustrated in Tables B-8-1 and B-8-7. The intent would be to move towards designating off-road use on specified trail networks and special areas over time. Alternatives NC, A and E-Departure would control ORV use through existing regulations with no special programs planned.

Round Mountain

None of the alternatives provide for any special resource allocations for the Round Mountain area, except for Alternatives B-Modified and I which allocate 1,000 acres along the Round Mountain National Recreation Trail corridor to provide for management of its scenic and recreational values. Activities and uses which take place on Round Mountain are considered to be part of the multiple uses which occur in the general forest.