# Appendix F

## Management Requirements

# Appendix F

# Analysis of Management Requirements

This appendix presents information responding to decisions of the Chief of the Forest Service and the Deputy Assistant Secretary of Agriculture regarding Appeal Number 1770, brought by the Northwest Forest Resource Council on September 18, 1986. The appeal centered on direction from the Regional Forester to incorporate management requirements (MR's) into Forest Plan alternatives.

The appellant requested that the appropriateness of the management requirements be examined through the environmental impact statement process. This analysis is intended to address the issue raised by the appellant In the analysis, alternate ways of meeting the management requirements are examined and certain opportunity costs (losses in economic efficiency and timber available for harvest) are considered

# Background

## What are Management Requirements?

Many laws and regulations guide Forest Service activities. One law in particular, the National Forest Management Act of 1976 (NFMA), and its implementing regulations, provides direction for the forest planning process. The regulations for National Forest System Land and Resource Management Planning, in Section 36 of the Code of Federal Regulations, Part 219 ( 36 CFR 219) specify: 1) the minimum specific management requirements to be met in accomplishing the goals and objectives of the National Forest System (36 CFR 219 27) and 2) the minimum requirements for integrating individual forest resource planning into the forest plan (36 CFR 219.14 through 219.26). The term "management requirement" will be used in this appendix to refer to these NFMA regulations. Previously, the term "minimum management requirements" or "MMR's" was applied. The regulations do not use either of these terms and their use is discontinued hereafter.

Some requirements are procedural and need not be dealt with here Some were analyzed and available for public review during the Regional Guide Environmental Impact Statement process and are also not dealt with here The primary management requirements applying to the Ochoco National Forest are summarized in Table F-1. The management requirements treated in this supplement that required additional analysis are: size and dispersion of created openings, providing adequate habitat to maintain viable populations of existing native vertebrate species and water quality. Each of these is discussed in more detail later in this appendix. Additional information on management requirements and process may be found in Appendix B.

## Legal Requirements vs. Implementing Methods (Ends vs. Means)

The management requirements from the planning regulations (36 CFR 219.27) are legal requirements, and as such are ends that must be achieved on-the-ground when the forest plan is implemented. For example, NFMA implementing regulations require that fish and wildlife habitat be managed to maintain viable populations of existing native vertebrate species and desired non-native vertebrate species in the planning area. Whatever implementation methods are chosen, this--and all other management requirements--must, by law, be met

## TABLE F-1.
## SUMMARY OF MAJOR OCHOCO NATIONAL FOREST MANAGEMENT REQUIREMENTS AND APPLICATION METHODOLOGY 1\

| MODELING REQUIREMENT | METHOD EMPLOYED |
|---|---|
| TIMBER | |
| Nondeclining yield at or below range sustained yield capacity | - FORPLAN constraints<br>- Impacts assessed in Analysis of Management Situation (AMS) and DEIS<br>-Departures formulated and evaluated |
| Management intensities and utilization standards consistent with Renewable Resources Planning Act (RPA) | - Full range of intensities examined and used in FORPLAN<br>- Utilization standards incorporated in yield tables |
| Rotations no earlier than culmination of mean annual increment (CMAI) | - Entry ages assigned in FORPLAN<br>- Impacts assessed in AMS and DEIS |
| Perpetual harvest meeting principle of sustained yield | - FORPLAN "ending inventory" constraint |
| Assure that restocking can occur within 5 years | - Acre limits set for natural regeneration in FORPLAN<br>- Suitability classification and typing |
| No timber harvesting on unsuitable lands | - No timber yield tables available for unsuitable analysis areas |
| Provide for dispersion of openings and maximum unit sizes 2/ | - R-6 harvest dispersion constraints in FORPLAN<br>- Impacts assessed in AMS and DEIS |
| FISH AND WILDLIFE | |
| Provide habitat to maintain viable populations | - Use of selected species for representative habitats (pileated *woodpeckers, primary cavity excavators)*<br>- Substantive requirements incorporated as FORPLAN constraints<br>- Impacts assessed in AMS |
| Provide habitat for threatened and endangered species 2/ | - Standards and guidelines in the Forest Plan |
| SOIL AND WATER | |
| Do not allow permanent impairment of the productivity of the land<br>No more than 10% of an activity area may be impacted by *soil compaction*<br>Meet riparian and equivalent clearcut area (ECA) requirements<br>No timber harvest on unsuitable lands | - *Costs reflect practices necessary to meet requirements*<br>- See Below<br>- See Below |
| Meet requirements of Clean Water Act by application of Best Management Practices (BMP's), ECA's and riparian requirements 2/ | - Scheduling constraints incorporated into FORPLAN<br>- Impacts assessed in AMS and DEIS<br>- See below |
| *No detrimental changes to temperature, chemical composition,* ordeposits of sediment which seriously or adversely affect water conditions or fish habitat | - *Standards, guidelines and management prescriptions incorporat*ing practices, and associated costs to meet the requirements assigned to riparian areas in FORPLAN<br>- Impacts assessed in AMS and DEIS |

| RANGE | |
|---|---|
| Protect, manage, and control wild horses | - Wild Horses Management Plan standards and guidelines in Forest Plan Appendix C1 provide for maintenance of existing herd |

1/ Management requirements listed here are those that may be directly attributable to NFMA requirements

2/ MR's that have an effect of two percent or more allowable sale quality, or PNV in the context of the maximum Benchmark (without MR's), are the requirements which will be analyzed further in this appendix supplement

Specifications or standards for achievement for each management requirement are established at the national level or through analysis at the regional level for most of the management requirements. These are listed in the regulations or as standards and guidelines in the Regional Guide. Additional specifications identified on the Forest are listed as standards and guidelines in the Final Environmental Impact Statement (FEIS) Appendix D The specifications must be based on knowledge of the resources involved. For example, in meeting the management requirements for viable populations of vertebrate species, it is necessary to define the type of habitat required by the species, the maximum distance between habitats which will still provide reasonable assurance of genetic interaction, and the size of habitat area needed to support a breeding pair.

Often, the pool of scientific knowledge is insufficient to provide the entire basis for defining the specific conditions or standards that will satisfy or meet a management requirement. When this happens it is necessary to rely on field experience and the professional judgement of knowledgeable professionals, and to establish monitoring and research that will provide better information for future planning efforts

Implementation methods are the means or ways of meeting the ends (management requirements). Using the pileated woodpecker as an example, the end is to provide adequate habitat to maintain a viable population of pileated woodpeckers into the foreseeable future. The means of providing this habitat involves designing and implementing a set of practices that will assure that nesting and feeding areas meeting the needs of pileated woodpeckers are available in the future, and that these habitats are located closely enough together to allow woodpeckers occupying adjacent habitat areas the opportunity to interact, thus assuring continued genetic diversity and continued viability of the species.

Unfortunately, the distinction between ends and means is not always clear. For example, the requirement regarding viable populations of vertebrate species, stated above, is well defined In contrast, the size and dispersion of created openings management requirement (end) is rather general: NFMA specifies that maximum size limits for areas to be cut in one harvest operation be established for areas to be clearcut (Sec. 6[g][3][F][iv]), but does not specifically state the objective (end) to be accomplished by doing so. Nonetheless, the implementing regulations and the Regional Guide have specified maximum unit sizes and dispersion requirements.

## How Implementation Methods for Management Requirements are Developed

Often there is more than one way of achieving a management requirement. Considering and analyzing different means (or ways) of meeting a specific management requirement are particularly important if there are potentially large opportunity costs involved.

A six-step process was used for identifying alternative ways and means of meeting management requirements. The steps used are as follows:

1. Identify the desired "end" for each management requirement.
2 Assemble information about the resources affected by each management requirement.
3. Analyze the existing information to determine what conditions or specifications need to exist on-the-ground (specifications) to assure that the management requirement would be met.
4. Develop the ways, means, or methods to achieve the desired conditions. Usually, conditions were simulated using the FORPLAN model.
5 Evaluate the effectiveness of the alternative ways, means, or methods in meeting the management requirement. The opportunity costs, that is, the effect on both economic efficiency as measured by present net value (PNV) and timber availability as measured by allowable sale quantity (ASQ), were analyzed for each alternative way or means.
6. If the opportunity costs of meeting a management requirement with the most efficient means were found to affect the PNV or ASQ of a maximum present net value benchmark by two percent or more, the process used to determine the optimum means was analyzed further and is presented in this appendix Two percent was used because differences less than two percent would not be significant in terms of the opportunity costs of the alternatives.

Table F-2 displays the management requirements

**TABLE F-2**
**MANAGEMENT REQUIREMENTS ANALYZED FOR OPPORTUNITY COST**

| Ends | Summary of Specifications |
|---|---|
| *Openings created by timber harvest activities are* dispersed and limited in size | - Maximum created opening size of 40 acres (with some exceptions)<br>- Limit to 1/3 the size and 1/3 the perimeter of adjacent natural openings.<br>- Corners of two or more created openings may touch, but are considered a single opening and cannot exceed 40 acres (with some exceptions) if they are not stocked with trees 4 1/2 feet tall<br>- Protect vegetation along edge of natural openings at all times<br>- Site must be adequately stocked with trees 4 1/2 feet tall before a harvest area is considered a closed stand and not an opening |
| Habitat provided that maintains viable populations *of existing native and desired non-native* vertebrate species | - Maintain old growth and mature forest stands (nesting habitat) and feeding areas of adequate size and distribution to permit interaction among breeding pairs of dependent species (Table I-5) |
| Protect riparian habitat | - Land approximately 100 feet from edges of all perennial streams, lakes, and other bodies of water require special attention<br>1 to maintain streambank stability<br>2 to maintain stream channel stability<br>3 to avoid unacceptable erosion and sedimentation that would exceed State standards, and<br>4 to meet Clean Water Act standards |
| Protect water quality | - Limit the amount of a watershed in cutover state at any point in time<br>- Meet Clean Water Act Standards |

and the alternative means analyzed for opportunity costs on the Ochoco National Forest. Table F-2 also displays the management requirements analyzed for opportunity costs and a summary of the specifications or standards used to measure the achievement of those ends. Complete specifications are noted in the FEIS.

In analyzing the effects that alternative ways of meeting the management requirements had on PNV and ASQ, FORPLAN runs were made with and without constraints designed to simulate meeting the management requirement. A run that portrays the mix of management activities that would result in the highest level of economic efficiency (PNV) in managing the Ochoco National Forest resources (run #3 of the benchmark run sequence, 1920, 5/17/83) was used for this analysis. This benchmark contains no management requirements, therefore, inserting one management requirement at a time would likely result in higher opportunity costs than if the same analysis was conducted in a fully developed benchmark or alternative. It also identifies the ASQ associated with the most economically-efficient mix of management activities and the maximum opportunity costs. A benchmark rather than an issue-based Forest Plan alternative was used for the comparison because management practices used to meet other objectives of an issue-based alternative might have partially or fully met the management requirement, thus clouding any analysis of opportunity costs induced by the management requirement. The true effect when measured against a fully developed alternative is significantly less because the objectives of that alternative may satisfy the management requirements to a large extent

Results of this analysis are displayed in Table F-3,

TABLE F-3

APPROXIMATE CHANGE (OPPORTUNITY COST)
ASSOCIATED WITH MEETING THE MANAGEMENT REQUIREMENTS
WITH SELECTED OPTIMUM IMPLEMNTATION METHOD 1\

| | First-Decade ASQ MMCF/Yr | Estimated Percent Change in ASQ | PNV 2\ MM$ | Percent Change in PNV |
|---|---|---|---|---|
| Maximum PNV benchmark without MR as displayed in the DEIS | 23 4 | -- | 494 0 | -- |
| Estimated Opportunity Cost of Meeting All Selected Management Requirements | 1 | 4 | 16 4 | 3 3 |
| Opportunity Cost of Providing Adequate Habitat to Maintain Viable Populations MR (Old Growth) | 6 | 2 6 | 15 9 | 3 2 |
| Opportunity Cost of Meeting Water Quality MR | 1 0 | 4 3 | 44 4 | 9 0 |
| Opportunity Cost of Meeting Riparian MR | 3 | 1 3 | 7 | .2 |

MMCF/Yr = Millions of cubic feet per year
MM$ = Millions of dollars

1\These effects represeent the maximum potential impact since the efficiency of methods meeting more than one MR, or other resource objectives for an alternative were not considered The potential effects of MR's are displayed as if they were additive, although there may be overlap

2\PNV figures taken directly from FORPLAN reports and are not fully comparable to PNV's displayed elsewhere in DEIS For comparison purposes here, however, the figures are applicable

including the PNV and the first-decade ASQ for a maximum PNV benchmark as shown in the FEIS (Appendix B, Table B-6-1, pg. B-92 ), the reduction in PNV and ASQ resulting from application of the selected means of meeting the management requirements, and the percent change in ASQ and PNV.

Where the opportunity costs exceeded two percent, the analysis of the alternative means for meeting management requirements is presented in subsequent discussion. The following sections present an analysis of the management requirements where alternative ways of meeting that requirement were considered.

# Significant Management Requirements

## Management Requirements for the Size and Dispersion of Created Openings

### Source of the Management Requirement

Direction for the size and dispersion of created openings comes from the National Forest Management Act (NFMA)(Section 6 (g)(3)(F)), the planning regulations (36 CFR 219.27(d), and the Regional Guide (pp. 3-7 and 3-8).

### Specifications for the Management Requirement

The specifications or standards for achievement of the size and dispersion of created openings management requirement have been published in the 1984 "Regional Guide for the Pacific Northwest Region" and are as follows:

1 A harvested area will no longer be considered a created opening for silvicultural purposes when stocking surveys carried out in accordance with Regional instructions indicate that prescribed tree stocking is at least 4 1/2 feet high and free to grow.

2. The maximum size limit of harvest openings on the Ochoco National Forest is 40 acres. Some exceptions may be permitted in specific situations.

3. Harvested openings will be separated by blocks of land that are adequately stocked with trees that are at least 4 1/2 feet high and that contain one or more logical harvest units of similar size.

4. Harvested openings that touch each other are not precluded, but will be considered a single opening in determining harvest area maximum size limits

5. Harvested openings contiguous to 30-acre or larger natural openings are subject to the 40 acre maximum size limit, but normally should not exceed one-third the size of the natural opening and not occupy more than one-third of the natural opening perimeter.

6. Harvest openings should not be created adjacent to any natural openings (regardless of size) unless adequate vegetation along the edge of the natural opening can be developed or retained in sufficient density to protect wildlife and meet visual management objectives.

### Alternative Ways of Meeting the Management Requirement For the Size and Dispersion of Created Openings.

As required in the planning regulations (36 CFR 219), standards were developed in the Regional Guide for controlling the size and dispersion of created openings. The Regional Guide allows some flexibility in applying these standards by permitting exceptions to the maximum opening sizes These however are exceptions and not relief from the standards themselves. That is, these exceptions may be considered when deciding how the standards should be reflected in the planning process, not if the standards should be reflected.

Original Regional direction relating to the size and dispersion of created openings did not focus on how the various Forests should interpret the requirements, but instead repeated the dispersion requirements of the Regional Guide, recommended computer modeling techniques, and established documentation and review procedures. The responsibility for determining how to meet the dispersion requirements was deferred to the Forests.

The Region's initial effort in addressing this management requirement focused on how to develop a dispersion factor to be applied in FORPLAN to represent the limitation on harvest location that the dispersion requirement imposes. This factor was intended to represent the percentage of lands that could be assigned to a regeneration timber harvest prescription creating an opening in a single FORPLAN period. A recommended process was developed for Forests to use if they chose, or for Forests to use as a check on any other process they thought would serve the same purpose. The recommended process consisted of developing a theoretical dispersion factor based on specific Forest conditions, and then testing this factor on sample areas of the Forest to verify or adjust it.

This testing was designed to recognize the limitations of the theoretical factor. First, the theoretical factor assumed that the area to be harvested was homogeneous, when in fact most acres outside roadless areas already have existing harvest patterns that affect the flexibility to lay out harvest units. Second, the theoretical factor assumed that all harvest units were the same size, when in fact the size of logical harvest units necessary to separate created openings does not have to be the same size. Therefore, Forests were advised to examine their own situations to determine if the theoretical results could be applied to a sample area for the first harvest period. If harvesting up to the theoretical percentage was difficult, they were to look for possible reasons why, and adjust the dispersion factor accordingly.

Once an appropriate factor was determined to ensure compliance with the requirements for the size and dispersion of created openings, a corresponding constraint in FORPLAN was applied as a maximum percentage of the acres allocated to a timber harvest prescription that could be final harvested by period in an analysis area.

The requirement specifications were incorporated into the Ochoco FORPLAN model. The theoretical dispersion factor was developed and validated by extensive mapping (1920 5/31/84) and the factor was evaluated by the Forest interdisciplinary team. This analysis indicated that a 33 percent limit on regeneration harvest by analysis area was appropriate.

An assumption was made in the model that it takes twice as long for an area left to natural regeneration to grow out of the opening stage than it does for an area that is planted. This was portrayed by modeling created opening regeneration rates and allowing the linear program to select from various management intensities using either planting or natural regeneration to most efficiently meet the minimum requirement.

Because many of the Forest's issues and concerns, as well as costs and values, revolve around harvest scheduling, another option was considered. It used a different modeling approach where alternative harvest schedules would be determined prior to running the model and averaged over time to reflect harvest dispersion, and input to the model. This scheme for modeling dispersion was eventually dropped because only a few of the hundreds of potential schedules available for an analysis area could be represented with this approach, thus unnecessarily limiting PNV.

## Evaluation of Implementing Methods to Meet the Size and Dispersion of Created Openings Management Requirement

### Opportunity Costs and Consequences of Methods (Ways and Means)

The opportunity costs associated with achieving the requirement of limiting the size and dispersion of created openings has only a minor effects on the

allowable sale quantity (Table F-3, Pg. F-7), but does affect the PNV by 3.3 percent. Alternative practices for implementation such as regeneration methods, which can affect the rate or time it takes to recover, were analyzed and employed in the modeling. An assumption was made that natural regeneration takes approximately twice as long to establish a 4 1/2 foot tall stand of trees in created openings as would planting. This assumption is reflected in the opportunity cost in the PNV. The potential alternative means of a priority harvest schedule development, and adjustment of dispersion factors, were determined to be impractical solutions to satisfy the requirement. In reality, the costs of this management requirement are masked by the method employed to meet the water quality minimum requirement which is similar in application, but more stringent. The opportunity costs reflect the regeneration methods chosen.

### Rationale for Selected Method

The means to achieve the requirement were selected through processes developed by specialists at the regional and forest level, and reviewed by the interdisciplinary teams. The 33 percent factor developed was determined to have the least effect on efficiency and harvest scheduling while still meeting the intent of the management requirement. To assist rapid recovery of created openings, artificial regeneration is chosen as the primary means. The model does have the potential to select natural regeneration where it is more efficient. Artificial regeneration adds to the cost of stand establishment, thus decreasing the PNV. It does, however, provide more flexibility in scheduling and a potential positive effect on the ASQ.

The Wallowa-Whitman National Forest assessed the option of a longer time period for trees to attain the 4 1/2 foot height requirement for a stand to convert from an opening to a forested area. This option was not analyzed on the Ochoco National Forest because it was felt that the 4 1/2 foot standard is still the real means to the end. The longer time frame option did not present a real alternative means. A true alternative would have been to alter the height requirement. This was not done because of the Regional direction to use the 4 1/2 foot standard.

### Implications for Forest Plan Alternatives

The alternatives and benchmarks considered in the FEIS have no direct opportunity costs associated with meeting the size and dispersion of created openings management requirement. This is because the means used to meet the water quality management requirement are more restrictive than those for the size and dispersion of created openings. In the context of an alternative, if the requirement for water quality was abolished, the opportunity cost for the size and dispersion of created openings would be less than displayed in Table F-3. The opportunity costs displayed, as discussed above, reflect regeneration methods. All alternative means incorporate the management requirement for the size and dispersion of created openings.

### Role of Monitoring and Research

The size and dispersion of created openings requirement will be monitored to determine whether actual outputs are consistent with those projected by the FORPLAN model. The actual time required for new stands to reach 4 1/2 feet in height will be monitored for both natural and artificially regenerated stands. This is important in testing the appropriateness of the selected modeling assumptions.

## Management Requirements for Providing Adequate Habitat to Maintain Viable Populations of Existing Native Vertebrate Species

### Source of the Management Requirement

The planning regulations state:

"Fish and wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area. For planning purposes, a viable population shall be regarded as one which has the estimated numbers and distribution of reproductive individuals to insure continued existence in the planning area. In order to insure that viable populations will be main-

tained, habitat must be provided to support, at least, a minimum number of reproductive individuals and that habitat must be well distributed so that those individuals can interact with others in the planning area" (36 CFR 219.19).

## Description of the Management Requirement

In assessing those wildlife species that could be put at risk as a result of future management activities, the types of habitat existing today and how they would change in the future were examined. Through this review, it was determined that most types of habitat existing on the Forest today would continue to exist in similar quantities in the future. The significant exception to this was the old growth/mature forest habitat type. Unless management activities were specifically designed to retain a component of old growth and mature forest, it was apparent that wildlife species dependent on this habitat could experience significant reductions in their population sizes and distribution.

Management requirements also exist for primary cavity excavators, bald eagles, and peregrine falcons, but there are no measurable opportunity costs associated with providing adequate habitat to maintain viable populations on the Ochoco National Forest Consequently, they were not analyzed here.

There are approximately 100 wildlife species on the Ochoco National Forest that use old growth or mature forests to some extent. In this analysis, pileated woodpecker requirements were used because they

**TABLE F-4**
**Species Matrix for Addressing Management Requirements**
**For Wildlife 1/ and Threatened and Endangered Species**

| Habitat | Zone 1<br>North Coastal | Zone 2<br>Westside Cascades | Zone 3<br>Eastside Cascades | Zone 4<br>Blue Mountains |
|---|---|---|---|---|
| Mature and Old Growth (Seral stages V and VI) | Northern Spotted Owl<br>Marten<br>Pileated Woodpecker | Northern Spotted Owl<br>Marten<br>Pileated Woodpecker | Northern Spotted Owl<br>Marten<br>Pileated Woodpecker<br>Northern 3-toed Woodpecker | Marten 2/<br>Pileated Woodpecker<br>Northern 3-toed Woodpecker |
| Dead and Defective | Primary Cavity Nesters | Primary Cavity Nesters | Primary Cavity Nesters | Primary Cavity Nesters |
| Riparian | | | | Native Trout |
| Big Game | | Mountain Goat | Mountain Goat (Wenatchee) | |
| Threatened and Endangered Species | Bald Eagle<br>Peregrine Falcon<br>Brown Pelican<br>Aleutian Canada Goose | Bald Eagle<br>Peregrin Falcon | Bald Eagle<br>Peregrin Falcon<br>Grizzly Bear<br>Woodland Caribou (Colville) | Bald Eagle<br>Peregrin Falcon |

1/ The species listed were selected as management indicators because they are representative of all species requiring the identified habitats

2/ The Ochoco National Forest has little habitat for Marten or Northern 3-toed Woodpeckers (or the species they represent) Consequently, the Regional Forester in September 1984, agreed that the pileated woodpecker would serve as the sole indicator species for old growth species on the Ochoco

best represent other species dependent on old growth or mature forest habitats occurring on the Ochoco. That is, by managing and monitoring in a way that will ensure the woodpeckers viability, it is believed that the other species with similar habitat requirements will be protected. Habitats descriptions were based on broad seral stages of groups of plant communities from Kuchler's vegetation classification system. For example, the pileated woodpecker habitat represents mature and old growth timber across 12 different plant communities.

Identification of management requirement species was made on a Regional (all the National Forests in Oregon and Washington) and a subregional basis. The results, by subregion, are shown in Table F-4. The Ochoco National Forest is a part of the Blue Mountain subregion. The Regional Forester made an exception to management requirement species for the Ochoco National Forest in September 1984. In Table F-4, Pileated Woodpecker, marten and the Northern Three-toed Woodpecker would all be indicator species for the Blue Mountain subregion forests. The Ochoco however has very little habitat for marten and the Northern Three-toed Woodpecker Because of the insignificant amount of habitat for these two species, and hence associated species, and the impracticability of managing this small area forest wide, the pileated woodpecker was selected to represent the old growth dependent species across the Forest.

Once the management requirement species were identified, the Region defined habitat requirements and biological characteristics for the species. These are the basis for providing for species habitat, and also for deciding how best to represent the species' needs in the planning process and in the FORPLAN model Habitat needs were defined using information from *Wildlife Habitats in Managed Forests· The Blue Mountains of Oregon and Washington,* Thomas, J. W., 1979 and other resources (see bibliography for this appendix). This information was used to define the habitat conditions, habitat dispersal, and habitat sizes necessary to meet the management requirement When information was available, but did not exactly fit the management requirement context, professional judgment was used to apply the information in estimating habitat needs. When information was not available, habitat needs were developed from the professional judgment of a number of the more knowledgeable biologists on the subject. Information from existing research was used whenever possible.

This information for each species was provided for three habitat factors described below and presented specifically thereafter for each indicator species.

(1) Principal Habitats Used

Information about the seral stages and Kuchler vegetation types used by the various species is documented in many research papers for individual species. Information as to which Kuchler type and/or seral stage are primary or secondary habitat, and the amount of dependency upon each habitat, is based mostly on professional judgment. (Guenther and Kucera, 1978, Phillips, et al, 1981.)

(2) Dispersal Distance Between Habitats

Research information is generally not available for optimum dispersal distance between habitats As a result, dispersal distance is based on observations, experience, and professional judgment. Dispersal distance is determined by the ability of an individual species to travel to the next habitat with a frequency to prevent isolation of subpopulations. Distances are adjusted to consider the network and overlap of habitat formed by the species (e g , pileated woodpecker and marten).

(3) Size of Habitat Areas

The size of individual habitat areas provided for each wildlife species is based on the habitat acreage needed to support the basic social or reproductive unit of the species, in this case breeding pairs. Both home range and species density information are used to estimate the needed size of habitat area Again, professional judgement is used where data is not available for the specific habitat types being managed.

The specific Regional direction for the identified indicator species and the scientific source of that direction are discussed in the following section. This direction is summarized from "A Report on Mini-

mum Management Requirements for Forest Planning on the National Forests of the Pacific Northwest Region, USDA Forest Service" (USDA Forest Service, June 1986) In developing the report, various habitat sizes and dispersal distances were considered. Based on that analysis, minimum habitat sizes and maximum dispersal distances were identified for each species Since those minimums are based on the best available data, and there are no data specific to the Blue Mountains or the Ochoco National Forest area that would indicate different habitat needs, alternate minimums were not considered in developing the Forest Plan.

Irwin (1987) points out that the key item may involve maintaining a minimum amount of habitat components that are more or less continuously distributed through time and space. The following discussion and analysis outlines how this is being accomplished and the alternatives considered.

## Pileated Woodpecker

### Principal Habitats Used

Pileated woodpeckers represent species that need mature or old growth stands of timber for nesting and feeding. Habitats were identified in Bull and Meslow (1977), Guenther, et al. (1978), and Thomas (1979).

### Dispersal Distance Between Habitats

The initial five-mile maximum dispersal distance between habitats was the result of professional judgment as documented in Phillips and Roberts (1985). In June 1986, the distance between habitats was changed to one habitat for every 12,000 to 13,000 acres to allow greater flexibility in application.

Irwin (1987) has pointed out the distance could probably be greater, but given the uncertainty of information on the subject, the Forest Service has chosen (in the judgement of professional biologists)

**TABLE F-5**
**Pileated Woodpecker Habitat Requirements**

| | Zone 1 | Zone II | Zone III | Zone IV |
|---|---|---|---|---|
| Principal Habitats Used Reproducing (Seral Types V & VI) | Kuchler Types K1, K2, K3, K5, K12 and riparian | Kuchler Types. K1, K2, K3, K5, K29 K29 and riparian | Kuchler Types· K1, K2, K3, K5, K7, K10, K11, K12, K13, K14 and riparian | Kuchler Types K11, K12, K14, K15 and riparian |
| Feeding | All seral stages of Kuchler Types listed for reproducing habitat, provided snags are present | | | |
| Dispersal Distance Between Habitats | One habitat area for every 12,000 to 13,000 acres | | | |
| Size of Area to Which Wildlife Prescriptions Apply | 600 acres per pair | | | |
| Habitat Requirements To Be Used in Analyses (Within a 1,000 acre unit) | - Maintain 300 acres of conifers in seral stages VI and/or V, per pair for reproducing<br>- Maintain a minimum average of 2 hard snags per acre greater than or equal tp 12 inches DBH, within the 300 acre reproductive area Forty-two of these 600 snags should be greater than or equal to 20 inches DBH<br>- When possible, maintain reproductive area in 300 contiguous acres If not possible, habitat may be arranged in blocks no less tha 50 acres and no more that 1/4 mile apart<br>- Maintain a minimum average pf 2 hard snags per acre greater than or equal to 10 inches DBH, or an additional 300 acres for feeding | | | |

to maintain the June 1986 spacing. The original alternative of five-mile maximum distance was not used in the Final.

### Size of Habitat Areas

The size of nesting areas in Region 6 for the pileated woodpecker has been identified as falling in the range of 100 to 540 acres. The Region defined 300 acres of old growth or mature timber as nesting area, plus 300 acres of feeding area as a Region-wide requirement to meet the needs of pileated woodpeckers both east and west of the Cascades. Three hundred acres of nesting area appears to be an average for different habitats. As more data, specific to westside and eastside habitats (eastside may be further subdivided), becomes available, the size of the nesting area may be adjusted (Bull and Meslow, 1977, Bull, 1975; Mannan, 1982). A 1,000-acre unit was established as the size of territory that a pair of woodpeckers would defend as determined from research data Snag size and density were taken from Thomas (1979), and acreage figures from Bull (1975), and Bull and Meslow (1977). Habitat specifications for the pileated woodpecker are summarized in Table F-5.

## Alternative Ways of Meeting the Management Requirement for Providing Adequate Habitat to Maintain Viable Populations of Existing Native Vertebrate Species

The Region provided the following direction (filing designation 1920, November 10, 1983) for determining requirements for old growth: (1) distribute habitat in a way that minimizes impacts on the commercial forest land base while still achieving the necessary distributional needs of the species, and (2) conduct analysis to determine whether set asides ("dedicated" approach) or long rotations ("managed" approach) would minimize effects for the species

The Ochoco National Forest constructed maps of alternative levels of old growth habitat needed to provide habitat following recent revision of Regional direction (filing designation 1920, April 16, 1984). The distributional needs of the pileated woodpecker limit the flexibility in applying the requirements in a manner that minimizes the impact on the timber land base. However, by considering habitat provided in wilderness, research natural areas, and in other allocations with less intensive timber management and reduced yields, impacts to the timber base may be reduced.

Application of the Regional direction for size and dispersal of habitats to the Ochoco National Forest requires that a minimum of 18,000 acres of old growth forest, outside of wilderness or other lands not suitable for timber production, be retained as wildlife habitat for the pileated woodpecker and other species occupying the same habitat.

Another aspect related to dedicated areas is introduced here, the relationship of other non-dedicated areas such as riparian corridors and others that provide "connective habitat" or travel lanes likely to be utilized by species traveling between existing areas of old growth.

In the FEIS the Ochoco National Forest elected to provide old growth habitat by dedicating areas through the allocation of lands to a management area for old growth. Two other ways of meeting the management requirement were considered prior to selecting this strategy· (1) managed old growth on a 240-year rotation, and (2) managed old growth on a 320 years rotation.

Under a dedicated old growth strategy, each acre of old growth is withdrawn from timber production. Dedication of existing old growth stands assures that desired structural characteristics will be available for wildlife, but risks the loss of individual stands through catastrophe or decay. However, more recent research suggests that such risk is much less than once thought. Management of old growth on a long rotation may not provide all the characteristics important to old growth and may hasten the decline of the residual stand (Franklin, 1981). In managed old growth strategies it is assumed that existing old growth stands will be harvested and that other stands will grow into an old growth condition to replace them. Failure of the replacement stands to develop desired structural characteristics on schedule would

mean that old growth would be lost for a period of time or that harvesting of existing old growth stands would be delayed.

Under a managed old growth approach, harvest would be delayed on existing old growth stands reserved for wildlife habitat, and harvest would be prohibited on additional replacement stands. Depending on the rotation age (240 or 320 years), harvest would be restricted on an additional two to three stands. If a long-term replacement stand was also provided, harvest would be restricted on two additional stands.

## Evaluation of Implementing Methods to Meet the Management Requirements for Providing Adequate Habitat to Maintain Viable Populations of Existing Native Vertebrate Species

### Opportunity Costs

Table F-6 displays the opportunity costs associated with the three ways of meeting the management requirement. The cost of the feeding area requirement has been determined to be insignificant (0.2 percent), and is not discussed further. Present net value for the managed old growth methods is not displayed since opportunity costs were calculated by means other than the FORPLAN model.

**TABLE F-6**
**Estimated Opportunity Cost Associated**
**With the Vertebrate Species Management Requirement**

| | First Decade ASQ MMCF/Yr | Percent Change in ASQ 1/ | PNV MM$ | Percent Change in PNV |
|---|---|---|---|---|
| Maximum PNV benchmark as displayed in the DEIS | 23 4 | -- | 494 | -- |
| Opportunity cost of the selected way of providing adequate habitat to maintain viable populations (dedicated old growth/mature timber) | 6 | 2 6 | 15 9 | 3 2 |
| Opportunity cost using managed old growth/ mature timber with 320-year rotation | 7 | 2 8 | NE | NE |
| Opportunity cost using managed old growth/ mature timber with 240-year rotation | 7 | 3 1 | NE | NE |

NE = Not estimated ASQ opportunity costs were estimated outside of FORPLAN, and no PNV estimate was produced Since a larger number of acres are affected when "managing" for old growth, PNV opportunity costs would likely be larger, particularly when managing for immediate and long-term replacement

MMCF/Yr = Millions of cubic feet per year
MM$ = Millions of dollars

1/ Percent change calculated on cubic foot basis

### Consequences of Methods (Ways and Means)

Populations of pileated woodpeckers and other old growth forest-dependent species would not be expected to differ significantly under any of the different ways considered to meet the management requirement. There are, however, differences in the opportunity costs, as previously stated

### Rationale for the Selected Method

Based on the preceding analysis, it was determined that the dedicated old growth approach would best ensure achieving desired old growth/mature forest habitat, while having the least effect on outputs of other resources. The technology of managing stands on long-term rotations to provide old growth conditions is theoretically possible but has not been demonstrated through actual management. The dedicated approach to old growth carries a lower risk into the future, and because its opportunity costs are not significantly different, it is the logical means to apply at this point in time.

### Implications for Forest Plan Alternatives

Alternatives were designed to address public issues. As a result, most alternatives, including the preferred alternative, incorporate objectives for the retention of old growth and mature timber, for wildlife, for visual purposes, and for recreational purposes at levels higher than needed to meet the basic management requirement. Consequently, there are no significant differences in opportunity costs between the various alternatives.

The range of alternatives also shows the range and variation in harvest levels within the available decision space as needed to respond to public issues. If these alternatives had been formulated without adding the constraints necessary to meet the management requirement, there would have been some increase in ASQ and PNV. The gains, however, would be less than the costs calculated in Table F-6.

## Role of Monitoring and Research

The monitoring plan (Forest Plan, Chapter 5) calls for monitoring populations and habitats of pileated woodpeckers. In future planning efforts, this data will be used to help determine the suitability and effectiveness of the selected means of meeting the management requirement. In this manner, the appropriateness of the selected means will be tested over time.

# Management Requirements for Water Quality

## Source of the Management Requirement

The management requirements for water quality are based on the planning regulations which direct forests to:

Comply with requirements of the Clean Water Act, the Safe Drinking Water Act, and all substantive and procedural requirements of Federal, State, and local governmental bodies with respect to the provisions of public water systems and the disposal of waste water [36 CFR 219.23(d)].

Evaluate existing or potential watershed conditions that will influence soil productivity, water yield, water pollution, or hazardous events [36 CFR 219.23(e)].

Conserve soil and water resources and not allow significant or permanent impairment of the productivity of the land [36 CFR 219 27(a)(1)].

The Clean Water Act seeks to control non-point sources of water pollution To comply with Section 208 of the Act, Region 6 of the Forest Service, the states of Oregon and Washington (which manage implementation of the Act in the respective states) and the Environmental Protection Agency (EPA) agreed on what constitutes compliance with the Act This agreement, contained in memoranda of understanding between the Forest Service and the respective states, established a process whereby each state certified the best management practices (BMP's) needed to meet or exceed state water quality standards (FSM 1561.5, R-6 Supplement 67, 4/88).

## Specifications for the Water Quality Management Requirements

State of Oregon water quality standards (Oregon Administrative Rules 340-41-205 through 325) provide specifications to be met by implementation methods selected by the forest. They are summarized as follows:

Dissolved oxygen concentration shall not be less than 90 percent of saturation at the seasonal low, or less than 95 percent of saturation in spawning areas during spawning, incubation, hatching, and fry stages of salmonid fishes.

On the Deschutes and Crooked Rivers and associated tributaries, no measurable increases shall be allowed when stream temperatures are 58 degrees Fahrenheit or greater, and no more than two degrees increase due to all sources combined when stream temperatures are 56 degrees or less shall be allowed On the John Day River, Silver and Emigrant Creeks, and associated tributaries, no measurable increases shall be allowed when stream temperatures are 68 degrees Fahrenheit or greater, and no more than two degrees increase due to all sources combined when stream temperatures are 66 degrees or less shall be allowed.

No more than a 10 percent cumulative increase in natural stream turbidity shall be allowed, as measured relative to a control point immediately upstream of the turbidity causing activity.

pH values shall not fall outside a range of 6.5 to 8.5.

## Analysis of Methods Designed to Meet Water Quality Management Requirements

Two non-point source pollution parameters, namely water temperature and suspended sediment, are the major determinants of water quality on the Forest. Higher water temperatures encourage the growth of certain nuisance organisms such as bacteria, algae and fungi, that in turn affect the levels of dissolved oxygen, pH, and turbidity, and the production of undesirable tastes and odors. The amount of shading in riparian areas determines the extent streams are warmed by solar radiation. The riparian prescription (Land and Resource Management Plan, Chapter 4, pp 4-74) contains the water temperature standards and the amount of shade necessary to meet those standards. Special riparian area alternatives for shade were not examined individually because of their effect on PNV would be less than one percent.

Sediment yield is largely determined by the amount and erodibility of exposed soil in a watershed. Timber harvest activities, including road construction, slash treatment and site preparation, not only affect the amount of exposed soil, but also alter the timing and quantity of water leaving a watershed. Following harvest activities, watersheds become more hydrologically sensitive for a period of time with storm events exhibiting more rapid and extreme responses. This greater sensitivity level to storm events results in more energy being available to transport sediment to stream channels. Thus the primary effort in maintaining water quality is directed at the timber harvest program and related rate of vegetation removal in a watershed over time.

There is potential to misinterpret findings on timber harvest/watershed interactions. It is possible to refer to literature elsewhere which reports results contrary to those found locally (Megahan, Umatilla N.F., et al) However, upon close inspection these vagrancies are generally related to local geoclimatic, geomorphic, or vegetation differences between study areas, and not to methods. Or methods may be applied with different assumptions. For example, watershed studies on the Umatilla National Forest were conducted on dry soils and <20 percent slopes with two times greater precipitation than the Ochoco receives. The findings there are generally not directly applicable to the Ochoco N.F. Likewise, Megahan's work was done in the Idaho batholith.

Preliminary analysis of FORPLAN runs indicated that if unconstrained, over 90 percent of the timber harvest in the first decade of the Plan would be scheduled on the high value, extensively roaded ponderosa pine stands located in drainages with predominantly south and southwest aspects.

Further analysis showed that up to 70 percent of the acres in some drainages would be treated in the first

decade. This would result in over 40 percent of a drainage being in an equivalent harvest (EHA) condition, a situation judged to have potentially unacceptable impacts on water quality. In addition, in the second decade the harvest would shift to the steeper, mixed conifer drainages characterized by more erosive soils and high value anadromous fishery streams, further exacerbating potential watershed damage (see FEIS Chapter 4, pg. 4-83).

The Forest Service Manual directs that where prescribed cutting methods may be detrimental to watershed conditions, including water quality, limits be set on the timing of operations and the percent of watershed coverage per entry (FSM 2405.13, 3b).

Research indicates that measurable changes in runoff occur when 20 to 30 percent of a drainage is in a cut over condition (Brown, et al, 1974; Rich and Thompson, 1984; Troendle and Leaf, 1980). Water quality and quantity and timing of runoff may all be affected. These changes may be negative and often are cumulative. The rate timber is harvested or vegetation removed is a major contributor to this effect To assess the effect of the rate of harvest, a Forest-wide threshold value (EHA) of 30.1 percent was established This assumes up to 30.1 percent of the Forest can be in a harvested condition at any one time without exceeding watershed capabilities to absorb the impacts of management activities. The 30.1 percent is an average for the 22 major watersheds on the Forest. The actual EHA values ranged from 25 to 35 percent. This is further discussed in Chapter 3 of the FEIS, pp. ?? and Appendix ?? of the Land and Resource Management Plan.

The principle behind managing a watershed at or below a threshold value is to utilize the natural ability of a watershed to withstand management induced impacts or changes (such as changes in runoff patterns, soil moisture, site disturbance, or sediment yield) while protecting other resource values (such as water quality, fisheries, and soil productivity).

Exceeding the threshold value over time involves risk and the need to apply additional and often costly specific mitigation measures. Mitigation might be, for example, installation of devices to trap and store sediment.

## Alternative Ways of Meeting the Management Requirements for Water Quality

Other methods of achieving water quality requirements were considered (see also FEIS Appendix G):

1) Changing the threshold level: the amount of disturbance allowed in a particular watershed may be changed based on the results of monitoring and evaluation.

2) Dedicated riparian areas (no timber harvesting).

3) The amount and kind of silvicultural activity allowed, e.g. selective harvesting under uneven-aged management, within the streamside buffer as well as the width of the buffer itself, are ways that were considered to assist in protecting riparian areas.

4) Use of in-stream structures to mitigate the effects of harvesting timber (see FEIS Chapter 4, pg. 4-88 ). Structures and devices to mitigate effects are employed by most alternatives. Exclusive reliance on this method alone is expensive and seldom totally effective.

The role riparian areas play in helping to meet the management requirement for water quality is separate and distinct from the management requirement for riparian areas per se The management requirement for protection of riparian areas [36 CFR 219.27(e)] does not in itself significantly affect ASQ or PNV.

## Evaluation of the Implementing Methods to Meet the Water Quality Management Requirements

### Consequences of Methods (Ways and Means)

The threshold level of 30.1 percent across the Forest was developed by an interdisciplinary team and represents the best estimate attainable with present information A higher or lower level of threshold could be used A lower threshold level would appear to unnecessarily constrain development activities while a higher level would exceed research recom-

mendations that a 25 to 30 percent EHA be set to avoid unacceptable changes in watershed characteristics (water quality and quantity, and timing of flows)

The riparian area means alone, such as dedicated areas and in-stream structure methods, deal with sediments as they are leaving a watershed and as a consequence do not address the loss of productivity and the need to protect the soil resource. Furthermore, approximately half (412 miles) of the riparian areas on the Forest are in less than acceptable condition and consequently not fully effective in maintaining water quality. Many of these areas have suffered the cumulative effects of past practices, and the loss of riparian vegetation following decades of grazing.

Additional methods for shade management along riparian areas have not been analyzed for the Forest. The condition of many of the riparian areas would not provide the opportunity for additional alternatives as they presently are below the desired shade conditions. The recovery and, or rehabilitation of riparian area vegetation is slow on the Ochoco and shade development may take up to 25 years in some areas to attain the desired 80 percent shade level.

In-stream structures (e.g., log weirs, loose rock, check dams) are expensive to construct and maintain, and benefits from them may not be realized for many years. While fairly effective at trapping and holding sediments, they do so at the expense of fish habitat as silt and sediment trapped by these structures cement spawning gravels, thus reducing rearing habitat.

Maintaining water quality at the expense of fish habitat is not a desired practice and the rehabilitation of spawning areas is expensive.

In view of the above, constraining the rates of disturbance and vegetation removal over time, within watersheds, is presently believed to be the most reasonable and effective way to protect soil, water, and riparian resources. The wisdom that an ounce of prevention is worth a pound of cure is particularly appropriate in dealing with watersheds

## Opportunity Costs

The opportunity costs of meeting the water quality minimum requirement are displayed in Table F-3. They are a 4.3 percent change in the ASQ and 9 percent in PNV.

## Rationale for Selected Method (see also Consequences)

Harvest scheduling constraints provide the best means for controlling the rate and amount of change in vegetation and soil disturbance across the Forest. The method relates to the ability of a watershed to absorb disturbance, both natural and human-caused, and recover in a reasonable period of time. It is assumed that recovery mechanisms (vegetation, bank stability, large woody debris, etc ) are functioning or can be improved (e.g. revegetation or use of in-stream structures) to an effective level. The FEIS, Chapter 4, (pp. 88) describes the methodology and amount of disturbance allowed by watershed by decade. The harvest constraints (threshold values) for the various watersheds were established through professional judgement, local experience, and watershed research.

Managing above a threshold level requires that the decision maker consider both the magnitude and duration of the expected impact. Magnitude is the intensity of the effect or impact. Duration is that period of time (window of vulnerability or period above the threshold) during which the hydrologic sensitivity of a drainage, following activities, is such that the occurrence of a major natural event (e.g., 10 to 25 year storm runoff) could combine to produce undesirable effects within the drainage or on downstream resources. The probability of this occurrence is part of determining the risk in making management decisions.

To aid the decision maker in evaluating risk, the Ochoco Harvest Effect Model accesses a standard probability table with the number of years harvest effects are above the assigned threshold value (window of vulnerability). From this we predict the probability of experiencing a 10, 25, or 50 year storm event on the watershed in question. For example, if the threshold were exceeded for six years, the chances

of experiencing a 10-year storm would be 40 percent, and a 25-year storm 26 percent. The longer a watershed exceeds the threshold, the greater the chance it will experience a damaging storm event.

## Implications for Forest Plan Alternatives

All the alternatives incorporate and meet the basic management requirement.

## Role of Monitoring and Research

The probability of experiencing or not experiencing a 10 or 25 year storm event during a fixed period of time may help explain the wide variability of effects recorded in monitored watershed experiments. In other words, a small test watershed may not experience a major climatic event while it is hydrologically sensitive regardless of whether it is harvested at 20, 50 or even 70 percent. Research studies simply have not treated large enough areas nor monitored them long enough to have witnessed a full range of possible climatic events. In this regard, managing a Forest through a rotation is strikingly different than a research study, for what is a statistically probable event on an individual test unit will occur with a high degree of certainty over time on a Forest. Only by monitoring a Forest, watershed by watershed, are we likely to develop a true understanding of the role chance events and natural variability play in determining actual threshold values for a drainage. The threshold value proposed compared against calculations of harvest effect will provide for the first time a baseline against which the Forest can monitor and evaluate the effects of harvest management activities. Monitoring and evaluation will provide the information to base any changes in future watershed threshold values. Threshold values and conversion factors can be modified in the future to reflect information obtained.

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