

The Forest Service ADVENT program and mimic spreadsheet was used to fully calculate present net value, costs, benefits, and other information such as net cash flow. Additional models were built locally to analyze the effects of FORPLAN solutions

Big-game habitat capability and population trends were computed based on an elk winter range Habitat Effectiveness Index (HEI) model devised by Thomas et al. (1988), and the model was applied to both summer and winter ranges. See Appendix B, Section III G, for further discussion of the model

3 The Analysis of the Management Situation (AMS) and Benchmark Analysis

The first step in developing alternatives was to look at current information about the various market and nonmarket outputs which the Forest could provide; the range within which multiple use alternatives could be developed was defined. These limits are called benchmarks because they define this "decision space"

The resource and economic potential of the Forest was identified by a set of eight management scenarios called benchmarks, as required by 36 CFR 219.12(e). These benchmarks identified potentials under current management direction, as well as under present legal requirements (i.e., Management Requirements - MRs) and regulations on timber harvest (e.g., culmination of mean annual increment). In addition, present net value is maximized because it is such an important part of defining net public benefits.

The benchmarks summarized are described in detail in the Benchmark Formulation section of Appendix B, and the outputs and effects associated with these eight benchmarks are also displayed in Appendix B. Following the summary of each benchmark, Figure II-1 displays the decision space for five major indicators—timber sale program quantity, present net value (PNV), big-game use, anadromous fish commercial harvest, and permitted grazing.

The benchmarks considered in this analysis were

Minimum Level Management - Determines the minimum costs (with resultant outputs and effects) necessary to retain the National Forest lands in federal ownership, subject to certain environmental constraints and protection of life, health, and safety of incidental users.

Present Net Value (PNV Assigned) - Estimates the Maximum Present Net Value (Max PNV) that might be attained by maximizing the net value of market resources under a nondeclining evenflow policy, and assigning values to the production and output of all nonmarket resources (see Glossary for market and nonmarket resources). This benchmark serves as a basis for an economic comparison between benchmarks and alternatives, as well as a basis for determining the effects of various constraints on outputs and costs.

Present Net Value (PNV Market) - Estimates the Maximum Present Net Value that might be attained by maximizing the net value of market resources under a nondeclining evenflow policy. The difference between this benchmark and the present net value (assigned) benchmark is that this benchmark does not assign values to the nonmarket resources such as wildlife habitat, visuals and other resources that are not sold in a market.

Current Direction - Estimates the outputs and effects of maintaining direction and policy found in existing unit plans, timber and other resource plans, special area management plans, and Malheur National Forest policy. This benchmark provides the basis for the No Change and No Action Alternatives. (Outputs are reported for the No Action Alternative in Figure II-1 and Table II-1)

Max Timber - Defines the highest sustainable timber harvest levels for the Forest, subject to legal requirements for other resources and nondeclining evenflow policy. The

objective was to maximize timber production on the Forest

Max Big Game - Estimates the maximum capability of the Forest to produce and sustain habitat for big game.

Max Anadromous Fish - Estimates the maximum capability of the Forest to produce anadromous fish habitat, and corresponding potential fish populations with the habitat provided

Max Range - Estimates the highest sustainable grazing levels for the Forest, subject to legal requirements for other resources. The objective was to maximize forage production for cattle grazing on the Forest

a *Supply and Demand*

In Table II-2, the demand and supply projections for various market and nonmarket outputs are displayed to present supply-demand relationships for the various benchmarks. The demand estimates shown reflect the future output/effect levels anticipated by several public agencies, including the Forest Service. These projections are discussed in Chapters III and IV, and in the Forest Analysis of The Management Situation (on file at the Supervisor's Office in John Day, Oregon). A brief discussion of the projected demand and probable supply for some resources follows

The projected demand for timber from the Malheur National Forest displayed in Table II-2 is derived from the discussion in Chapter III. The demand figures presented in the table reflect the midpoint of the range of projected demand for Malheur National Forest timber. Demand projections in Tables III-7 and IV-2 include projected demand for *all* sources of timber in Grant and Harney counties, this cumulative demand would be partially supplied by private ownership and other National Forests (Ochoco, Umatilla) in Grant and Harney counties

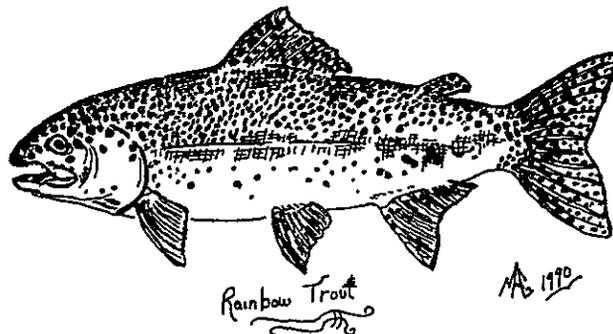
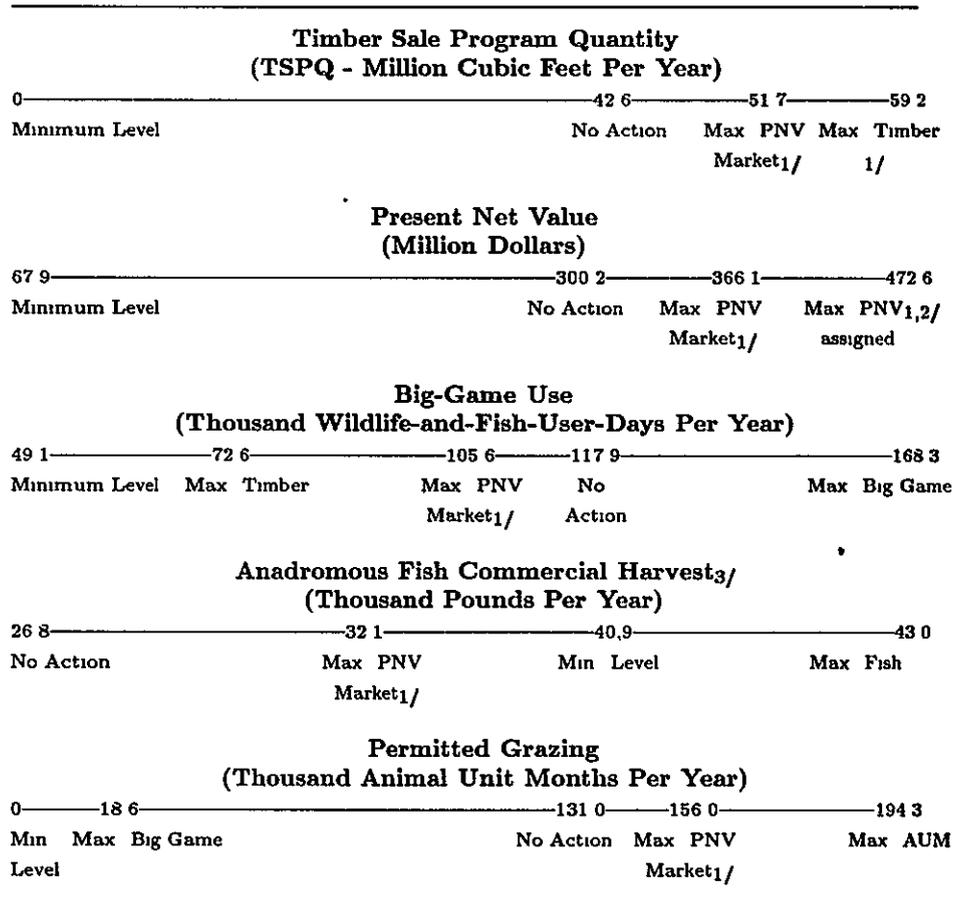


FIGURE II-1: Benchmark Decision Space for Five Major Resource Indicators (First Decade Outputs)



^{1/}Max PNV Market includes Management Requirements and is Benchmark 11 in EIS, Appendix B. Due to the time period involved between benchmark preparation and Final EIS distribution, benchmarks were not updated to 1990 conditions for legislative or technical changes using FORPLAN. If they were, it is estimated that timber (TSPQ) and economic outputs (PNV) would be reduced by approximately 3-4 percent. Other listed resource outputs are not expected to be sensitive to these changes.

^{2/}Max PNV assigned includes Management Requirements and is Benchmark 7 in the EIS, Appendix B.

^{3/}Revisions in estimating outputs have resulted in non-comparability in outputs between benchmark analyses and development of the Final Environmental Impact Statement alternatives. See Appendix B, Section III G for a more detailed discussion.

As displayed by the results of the Maximum Timber Benchmark, the Forest has the physical capability to fully meet demand in the Forest zone of influence (Grant and Harney counties) through the year 2030. Changes in demand for the Malheur National Forest timber supply could result from increases or decreases in supply from adjacent sources of timber (e.g., other National Forests).

Projected demand for big-game use on the Malheur National Forest includes elk and mule deer hunter-days, as estimated in the Forest Analysis of The Management Situation. An increase of about 10-15 percent per decade is projected over time. The proportion of mule deer to elk hunter-days is about 2 to 1; the increase over time is in about the same proportion. Projections were derived from regression curves based on Oregon Department of Fish and Wildlife hunter-days data.

The supply of and demand for wildlife on the Malheur National Forest has been presented in terms of Wildlife-and-Fish-User-Days (WFUDs), i e., primarily wildlife-oriented recreation The demand for wildlife-oriented recreation (primarily consumptive use and of substantial economic value to the local economy) is contingent upon the quality and/or quantity of the animals being sought Consequently, as deer and elk herds on the Forest increase in quality and/or quantity, the demand (exhibited in hunting pressure) would increase also.

TABLE II-2 Summary of Projected Supply and Demand for Key Resource Elements (Average Annual Outputs)

	Decade 1	Decade 2	Decade 5
Timber Sale Program Quantity (Million Cubic Feet Per Year)			
Projected Supply			
Minimum Level Management	0	0	0
No Action	42.6	42.6	43.0
Max PNv (with MRs)	51.7	52.0	52.3
Maximum Timber Benchmark	59.2	59.4	60.1
Projected Demand _{1/}	36.9	39.2	41.5
Big-Game Use (Thousand Wildlife-and-Fish-User-Days)			
Projected Supply			
Minimum Level Management	49.1	49.1	49.1
No Action	117.9	126.2	128.7
Max PNv (with MRs)	105.6	70.4	109.2
Maximum Big-Game Benchmark	168.3	162.4	194.7
Projected Demand _{2/}	95.1	110.6	157.0
Anadromous Fish Commercial Harvest_{3/} (Thousand Pounds Per Year)			
Projected Supply			
Minimum Level Management	40.9	61.6	70.6
No Action	26.8	28.0	31.6
Max PNv (with MRs)	32.1	32.1	32.1
Maximum Anadromous Fish	43.0	68.6	77.6
Benchmark			
Projected Demand _{4/}	Numerical Data Not Available		
Livestock Grazing (Thousand Animal Unit Months Per Year)			
Projected Supply			
Minimum Level Management	0	0	0
No Action	131	135	131
Max PNv (with MRs)	156	200	189
Maximum AUM Benchmark	194	247	274
Projected Demand _{5/}	120	120	120

1/Projected demand for timber is discussed in Chapter III A constant board foot per cubic foot conversion ratio of 5.72 was assumed in projecting decadal demand

2/Projected demand in the Forest Analysis of the Management Situation (March 1985)

3/Revisions in technical data have resulted in slight changes to comparisons of outputs between benchmark analyses and of the Final Environmental Impact Statement alternatives See Appendix B, Section 3 G for more detailed discussion

4/Quantitative demand projections not currently available Refer to the following discussion, and the Forest Analysis of The Management Situation for qualitative projections of probable demand

5/Projected demand displayed here is based on historic permitted grazing levels See the Forest Analysis of The Management Situation and the following discussion for more information

Quantified projections of the demand for anadromous fish from the Malheur National Forest have not been performed at this time. As stated in the Forest Analysis of The Management Situation, however, the demand for Chinook salmon and steelhead trout in the Columbia Basin exceeds the current supply. Indications of demand exceeding supply include court cases involving allocation of fish stock between Indian and non-Indian harvest groups, reduced or canceled sport-fishing seasons, and legislation designed to protect depleted stocks of fish for commercial fishery operations. Consequently, the assumption was made that all anadromous fish produced from waters within the Malheur National Forest would be demanded (i.e., utilized). However, the production potential of the Forest is a very small percentage of the total increase necessary in the entire Columbia River Basin to meet demand.

The demand for forage, primarily for domestic livestock, from the Forest is affected by the price that permittees have to pay. In past years, the price of National Forest forage has been relatively low, i.e., below the pasture rents private landowners receive. Consequently, despite declines in the beef-producing industry, the demand for National Forest permitted grazing remains high because of the price permittees pay. Expectations are that the demand for National Forest forage will remain strong until the price of National Forest forage approximates the price received by private landowners. As displayed by the Maximum AUM Benchmark, the Forest has the capability to fully meet or exceed demand in the Forest zone of influence throughout the planning period.

The demand for dispersed and developed recreation on the Malheur National Forest is expected to increase over time (from 200,000 Recreation Visitor Days of annual dispersed use currently to about 300,000 Recreation Visitor Days by 2030). The demand for wilderness use on this Forest is expected to increase slowly, and the benchmarks and alternatives do not vary significantly in the supply of wilderness. Demand projections generated were derived from historical use patterns, and National and Regional trends applied to the local situation. The supply of recreation opportunities available on the Malheur National Forest currently exceeds the demand for all types of recreation.

b *Opportunity Costs*

The analysis of benchmarks provided information regarding output potential, resource interactions, and the decision space within which the Forest could operate. This information was important in the formulation of alternatives, and provided understanding of both the opportunities for and limitations on resolution of public issues and management concerns.

The output potentials determined through benchmark analysis represent the maximum obtainable level of each resource. While each individual output level can be reached, it would be impossible to produce all of the maximum levels simultaneously. Production of one output generally involves the tradeoff of other resource outputs. The following discussion summarizes significant tradeoffs involved in maximizing each of the Forest's principal outputs, as identified in the analysis of benchmarks. (Further detail may be found in Appendix B.)

Maximizing timber production results in some sacrifice among most other resource outputs. Present net value declines because timber management activities occur in stands which are economically unviable (i.e., costs in excess of revenues). Some wildlife populations would decline, fish production would be lower, and some types of recreation opportunities would be foregone. Visual quality would be lowered, and soil and watershed condition would be adversely affected.

Maximizing wildlife production (measured in recreational use of wildlife) results in reductions in some resource areas. Present net value declines primarily because of less timber production. Livestock grazing would be extensively reduced, resulting in major disturbance to the local ranching community.

Maximizing anadromous fish production results in a small reduction in present net value, primarily because riparian zones account for only about four percent of the Forest land-base. In addition, costs for stream protection are necessarily incurred in other resource areas to generate their respective output levels. Timber and livestock grazing outputs decline in order to achieve riparian improvement. Most other resource outputs would be near the output levels in the Maximum present net value Benchmark.

Maximizing livestock production results in reductions in most amenity resources (fish and wildlife, recreation, visual resources). Present net value reductions would occur due to reductions in timber harvests and inefficient expenditures to maximize forage production.

Other resource outputs which result in substantial tradeoffs on this Forest include old growth retention and unroaded area retention. Retaining old growth or unroaded areas results in substantial present net value losses due to reductions in timber harvest.

Analysis of the resource relationships which interact to form the Forest's decision space identified tradeoff patterns that proved useful in the formulation of alternatives and, subsequently, the interpretation of alternative outputs and effects. The benchmark results indicate that the tradeoffs in timber outputs and present net value when making small increases in old growth or unroaded area retention, and to a lesser degree wildlife production, are generally substantial. Tradeoffs in range outputs are evident when wildlife production is emphasized. Employing timber management strategies which emphasize the production of large-diameter ponderosa pine stands, rather than small-diameter mixed conifer stands, results in highly significant timber volume and present net value reductions. Visual quality and recreation opportunities can be provided with slight reductions in timber harvests, although the present net value tradeoffs (due to increased management costs) are significant. Understanding these tradeoff relationships was instrumental in the process of formulating alternatives. It served to identify both the areas in which a wide range of opportunities to resolve issues was available, and those in which such opportunities would be limited.

c Management Requirements

All alternatives, except Alternative NC must comply with applicable laws and regulations. To assure consistency in applying the laws and regulations to planning, Forest Service national and regional direction (dated October 14, 1981 and February 9, 1983, respectively) established those requirements which must be met in all alternatives, except Alternative NC. These requirements, called Management Requirements (MRs), were included in the design and development of each alternative, except Alternative NC considered in detail in order to accomplish the goals and objectives of the National Forest Management Act regulations (36 CFR 219).

While the benchmarks established various maximum management levels, the Management Requirements established various minimum levels of management. They were not designed to establish an appropriate level of management. Thus, the alternatives generally adopt management levels and standards at or above the Management Requirement levels consistent with the goals of the particular alternative. The Management Requirement analysis was one step in the process of determining the decision space available to alternatives.

These Management Requirements are applied in the planning process in one of two ways:

- 1 They are incorporated into the analysis process as constraints in FORPLAN, which simulates on-the-ground compliance and allows analysis of tradeoffs associated with meeting them, or
- 2 They are addressed in standards and set the bounds for conducting management activities to assure on-the-ground compliance.

The specific ways the Forest incorporated the Management Requirements into the analysis process are outlined in Appendix B and are addressed more fully in Appendix G; the standards for assuring compliance with Management Requirements are described in the Forest Plan.

Table II-3 below displays the economic and timber production tradeoffs due to each individual Management Requirement. The total effect is displayed by the Max present net value Benchmark with all Management Requirements. The following constraint analysis was developed for the Draft Environmental Impact Statement, published in 1987. Since then, costs have been updated and the present net value of some benchmarks has changed. Although present net value may have changed for some benchmarks, the constraint analysis is still valid; consequently, the analysis presented in Table II-3 uses information from the Draft Environmental Impact Statement.

TABLE II-3: Summary of Management Requirements Constraint Analysis

Benchmark/ MR	Present	Long-Term		First Decade		
	Net Value ^{1/}	Change	Sustained Yield Capacity	Change	Allowable Sale Quantity	Change
	Millions of Dollars	2/	Millions of Cubic Feet Per Decade	3/	Millions of Cubic Feet Per Decade	3/
Max PNV (w/o MRs)	638.6		593.9		532.6	
Harvest Dispersion	583.4	-55.2	616.2	+22.3	508.1	-24.5
Old Growth	617.7	-20.9	586.5	-7.4	506.5	-26.1
Riparian	624.1	-14.5	594.6	+0.7	526.4	-6.2
Max PNV (with all MRs)	549.7	-88.9	572.3	-21.6	477.2	-55.4

^{1/}Discount rate equals four percent Present net value calculated in 1982 dollars

^{2/}Change from the Maximum Present Net Value (without MRs) Benchmark Also can be interpreted as opportunity costs of the MRs

^{3/}Change from the Max present net value (without MRs) Benchmark

A comparison of the Maximum Present Net Value Benchmark (with all Management Requirements) to the Maximum Present Net Value Benchmark (without Management Requirements) shows that the total effect of all significant Management Requirements taken together reduces present net value by 14 percent, long-term sustained yield capacity by 4 percent, and first decade Allowable Sale Quantity by 11 percent Further analysis shows the effects of each Management Requirement individually when compared to the Max Present Net Value (without Management Requirements) Benchmark.

The harvest dispersion Management Requirement establishes a maximum amount of acres that can be regenerated in any decade. This Management Requirement limits openings created by clearcutting to 40 acres or less with logical cutting units surrounding; shelterwood and overstory removals are limited to 80 acres or less to address watershed, wildlife diversity, and visual management concerns. In the Final Environmental Impact Statement, all created openings are limited to 40 acres with few exceptions (see Forest-wide

Standards in the Forest Plan for exceptions) The 80 acre unit size was eliminated in favor of meeting natural conditions and all resource objectives. This Management Requirement results in a substantial reduction in present net value (9 percent); first decade Allowable Sale Quantity decreases about 5 percent. Present net value reductions are primarily due to timber harvests foregone in valuable, mature timber in the first decade, and the implementation of more costly timber management practices over time. However, long-term sustained yield capacity is higher because of the mix of timber management practices.

The old-growth Management Requirement results in the dedication of acres of suitable timber land for wildlife habitat for old-growth dependent wildlife. Indicator species considered are pileated woodpeckers and pine marten. This Management Requirement results in a three percent decrease in present net value and a five percent decrease in first decade Allowable Sale Quantity. The reduction in long-term sustained yield capacity is due to the reduction in suitable forestland because of old-growth dedication.

The riparian Management Requirement was designed to minimally protect riparian zones on the Forest. Present net value and first decade Allowable Sale Quantity tradeoffs are small (present net value - less than three percent; ASQ - one percent). This MR has smaller tradeoffs because it is identified with specific areas which make up only four percent of the Forest, the harvest dispersion and old-growth Management Requirements have Forest-wide effects.

The Management Requirements for the Forest were designed to protect specific qualities of the Forest. Consequently, there is very little overlap in effect on present net value and Allowable Sale Quantity between Management Requirements, and the Management Requirements are mostly additive. Slight overlap between the riparian Management Requirement and the harvest dispersion Management Requirement accounts for the difference in total effect.

Snag and snag replacements are additional Management Requirements that have been established outside of FORPLAN analysis. A test for significance indicated that these do not exhibit significant effects upon indicators, and are not listed in Appendix G (Information Regarding Management Requirements). The snag MR is designed to provide minimum snag levels, uniformly across the forest. For a more detailed analysis of the significant Management Requirements (including extensive sensitivity analysis), refer to Appendix G.

4. Alternative Formulation Process

a. *Development of Preliminary Alternatives*

The alternative formulation process began with a review of Forest issues, concerns, and opportunities, resource inventories and resource production capabilities identified in the Analysis of the Management Situation, and applicable planning direction.

Based on a review of these items, the Forest leadership team developed management options, ranging from lower to higher intensity, for three resource areas: recreation, wildlife, and timber. Each option was comprised of management direction statements for the factors important for that particular resource. The resource management options were designed to incorporate issues, reflect a particular level of management intensity, and serve as a building block for Forest management alternatives.

Since timber, recreation, and wildlife are largely dependent on the assignment of land areas, to some degree each is in competition with the other. The options for these resources were, therefore, compared to each other to determine their compatibility. This comparison resulted in 58 combinations of these three resources that could be compatible within an integrated alternative.