II

ALTERNATIVES

CHAPTER II. ALTERNATIVES

INTRODUCTION

This chapter describes the alternatives analyzed in the planning process. In this planning process, each alternative describes management direction designed to guide the management of Forest lands and resources from their current state to a desired future condition. Many combinations of resource uses and management activities are possible in formulating a reasonable range of alternatives.

The Resources Planning Act of 1974 (RPA), the National Forest Management Act of 1976 (NFMA), and the associated federal regulations [36 CFR 219.12(f)] guide alternative formulation in this planning process. The National Environmental Policy Act of 1969 (NEPA) and 36 CFR 1500-1508 describe how alternatives must be developed in environmental analyses and presented in Environmental Impact Statements. Additional requirements for alternative formulation are found in the Forest Service Manual (FSM 1920) and Land Management Planning Direction for the Pacific Southwest Region (Region 5).

The Forest planning Interdisciplinary (ID) Team followed the guidelines taken from the above sources in developing the alternatives. Each of these alternatives is potentially a Forest Plan. As such, each alternative includes goals and objectives for resource management and resource program direction, including standards, guidelines, and prescriptions applied to specific areas of land to achieve the stated goals and objectives.

The full range of planning alternatives is defined at the lower level by the Minimum Management Requirements (MMR) specified in 36 CFR 219.27 and at the upper level by the physical and biological capability of the land to provide resources and services (the supply potential of the Forest). The number of alternatives to be considered within this range is guided by national and regional requirements and the need to respond to all significant Forest issues and concerns in at least one alternative.

An important component of the alternative formulation process is the consideration of cost-efficiency in resource management. The concept of Present Net Value (PNV) is used in Forest planning as a measure of cost-efficiency. The PNV of a given alternative is the monetary value of resource outputs minus the cost of managing the Forest under that alternative.

Although cost-efficiency is an important factor in the formulation of alternatives, it is not the only important factor. The Forest Service is mandated to manage all resources wisely, not just those with monetary value. The concept of net public benefit is used to describe total benefits, including those with monetary value (priced benefits or commodities) and those without (non-priced benefits or amenities). A given alternative will emphasize objectives for amenities, commodities, or a mix of the two. The economic efficiency of the alternative is then calculated by meeting the stated objectives of the alternative in the manner that maximizes PNV.

In response to these many considerations, the ID team developed alternatives with different themes, different mixes of resource management direction, and different output levels of goods and services.

ALTERNATIVE DEVELOPMENT PROCESS

PRELIMINARY STEPS

Alternatives were formulated after the ID team accomplished the preliminary planning steps summarized below. Additional information about the processes and products of each step is filed in the planning records.

1. Public issues and management concerns were identified. This process involved an initial formal public involvement period and monitoring of issues and concerns as they changed, were resolved, or evolved during the planning process.

2. Process criteria were derived from issues, concerns, and legal requirements to guide the subsequent planning steps.

3. A comprehensive multiple-resource data base for the Forest was developed and stored in a computerized retrieval system.

4. An Analysis of the Management Situation (AMS) was conducted for each resource on the Forest. Current and projected future management; supply and demand; issues, concerns, opportunities; and the need to establish or change direction were addressed. Although an initial AMS was developed and documented, the AMS is an open-ended process that continues to evolve as additional information is gained.

5. The social and economic characteristics of the Forest's zone of influence were described in a social assessment of the management situation.

6. Forest-wide Standards and Guidelines common to all alternatives were developed.

7. The planning computer model (FORPLAN) was constructed, using the following steps:

   - Forest modeling requirements that would apply to all planning alternatives were identified.

   - FORPLAN prescriptions (combinations of management activities) were developed.

   - The types of land suitable for the application of each prescription were identified. This suitability determination was based on such factors as the land classification (e.g., wilderness or general National Forest), vegetation type, and slope. The determination of suitability of lands for given

prescriptions was a process that evolved as more information became available during the FORPLAN analysis.

- The management costs and resource outputs (with associated dollar values) for each prescription were calculated. Output and cost figures were based on the management activities of the prescription and the physical and biological characteristics of each type of land to which the prescription could be applied.

- The FORPLAN application of prescriptions to the Forest land base was verified by mapping key prescriptions and determining whether the lands chosen for those prescriptions were, indeed, appropriate.

8. Minimum and maximum potential supply levels for specific resources were projected in the benchmark analysis. These minimum and maximum levels defined the boundaries, or "decision space," for the range of alternatives considered.

ALTERNATIVE DEVELOPMENT STEPS

The actual process of developing alternatives followed the steps described below.

1. Eleven preliminary alternatives, representing a variety of themes, were generated. Some of the alternatives were based on national and Regional planning themes; the others were developed in response to issues, concerns, and opportunities specific to the Inyo National Forest.

2. Each preliminary alternative was analyzed through the FORPLAN computer model. FORPLAN was programmed with the prescriptions, land suitability criteria, and cost and benefit values described above. The key objectives of the alternative were then inserted in the model, and it was programmed to maximize economic efficiency (Present Net Value or PNV) while meeting those objectives.

   The results of the FORPLAN analysis for each alternative were a schedule of management activities applied to the Forest land base, the resulting resource outputs, and the monetary value of those outputs and the cost of producing them.

3. When the FORPLAN analysis was complete, the results were examined to determine whether the alternatives represented a reasonable range of management options, costs and benefits, commodity and amenity outputs, and responded to public issues and management concerns.

4. Of the eleven preliminary alternatives, six were eventually selected for more detailed study. Selection was based on a screening procedure that assessed resource compatibilities, responsiveness to issues, and practicality.

5. The alternatives studied in detail were expanded to include the resource program direction that would be applied under the alternative and to describe the Forest in the year 2030 if the alternative were implemented. The environmental consequences in Chapter IV address only those alternatives that were studied in detail.

6. The Preferred Alternative in the Draft EIS was revised to reflect the expressed demands of the public in the public comments received as a result of the Draft EIS and Plan. These comments were reviewed by the Forest management and interdisciplinary teams in the construction of the Final Preferred Alternative which is displayed in this document and more clearly defined in the Plan.

RANGE OF ALTERNATIVES

The Inyo National Forest has certain physical and Congressional or administrative designations that confine management options. These limit the range of alternatives that can be implemented. The following are two of the primary limiting factors.

1. Designated wilderness accounts for 565,142 acres, or 30 percent of the Forest. Other lands under administrative or congressional designation for special management represent 92,250 acres, or 5 percent of the total land base. The range of management options on such lands is limited by these designations.

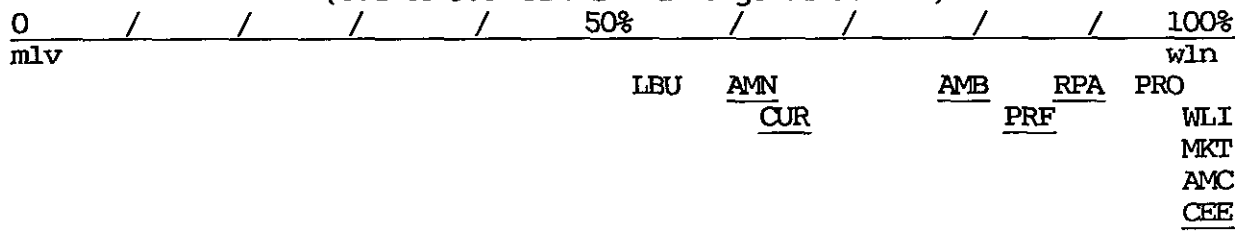
2. Of Forest land outside wilderness, 27 percent lies on slopes steeper than 60 percent, 34 percent on slopes between 30 and 60 percent, 21 percent on slopes between 15 and 30 percent, and only 18 percent on land flatter than a 15 percent slope. Slope is a limiting factor for many types of resource management.

Given these limitations, the Forest has developed a set of alternatives representing a range of resource outputs and cost and benefit values. The following table illustrates the range of alternatives for key factors.

Quantities are expressed as a percent of the difference between the minimum and maximum levels projected in the benchmarks. The numerical difference between minimum and maximum levels is indicated in parentheses. Outputs represent average annual figures for the fifth decade. Alternatives studied in detail are underlined; alternatives eliminated from detailed study are not; benchmarks are indicated by lower-case letters.

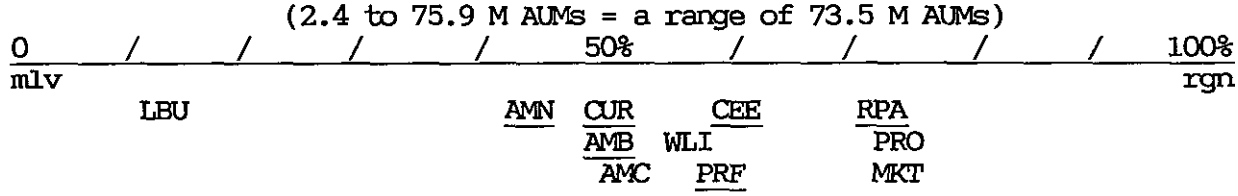
TOTAL RECREATION USE

(0.4 to 9.6 MMRVDs = a range of 9.2 MM)



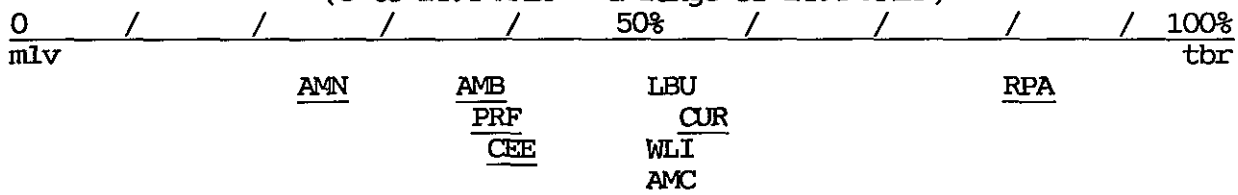
TOTAL GRAZING USE

(2.4 to 75.9 M AUMs = a range of 73.5 M AUMs)



TIMBER ALLOWABLE SALE QUANTITY*

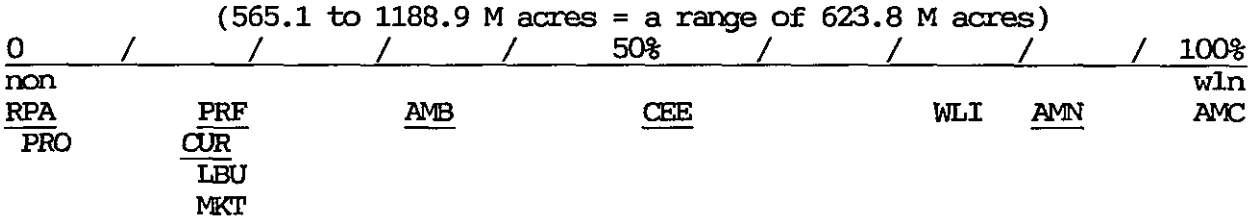
(0 to 24.4 MMBF = a range of 24.4 MMBF)



*PRO and MKT alternatives projected timber harvest above "tbr" by dropping the non-declining yield policy. Therefore they did not fall within the decision space for timber as defined by the benchmarks.

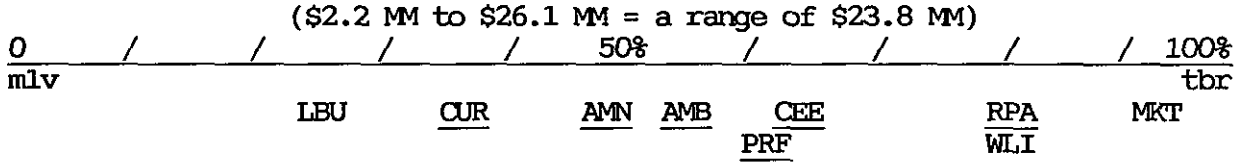
DESIGNATED WILDERNESS

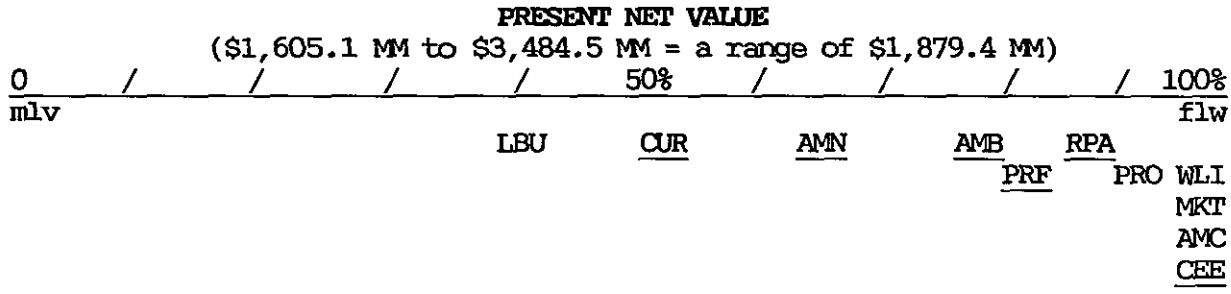
(565.1 to 1188.9 M acres = a range of 623.8 M acres)



TOTAL COST

($2.2 MM to $26.1 MM = a range of $23.8 MM)





BENCHMARKS

INTRODUCTION

Benchmarks are analytical models that serve three functions: (1) to determine resource costs and outputs at the minimum level of management; (2) to determine the maximum physical and biological capability of the Forest to produce certain key resources; and (3) to calculate the most economically efficient mix of management activities by maximizing Present Net Value (PNV) under different sets of objectives.

The purpose of analyzing benchmarks for minimum and maximum single-resource outputs is to develop a decision space within which to develop feasible alternatives with a multiple-resource emphasis. The output levels for each resource under each alternative will be above the minimum benchmark and below the maximum benchmark. The benchmarks also provide a basis for comparing alternatives in terms of resource outputs.

The objective of benchmarks that maximize PNV for different combinations of activities is to objectively evaluate the economic costs and trade-offs of various planning alternatives.

Benchmarks are not limited by Forest Service policy or budget, optional requirements, spatial feasibility, or program and staffing requirements. For this reason, while benchmarks may be technically possible, they can not necessarily be realistically implemented.

The benchmark analysis was a valuable tool in the formulation of alternatives. By examining the minimum allowable management level and the maximum supply potential for each key resource, the ID team was able to visualize the range of options available. The alternatives were developed with the intention of establishing realistic points along the scale between minimum and maximum levels for major resources.

Using the planning linear computer program (FORPLAN), the Forest analyzed nine benchmarks during the Forest planning process. The benchmarks are discussed below in terms of each benchmark theme and knowledge gained from the analysis. Key resource outputs, costs, and PNV for the benchmarks are displayed in Table 2. A more detailed description of the benchmarks, their purpose and modeling specifications, is contained in Appendix B.

INDIVIDUAL BENCHMARK DISCUSSION

1. Code: MLV

Theme: Minimum level management. The purpose of this benchmark is to show the unavoidable costs and benefits of public ownership of the Forest and to establish the basis for comparing the outputs, costs, benefits, and other impacts of the planning alternatives.

Only those benefits that are incidental to protecting life, health, and safety would be provided. Management would be oriented toward preventing environmental damage to lands in other ownerships. Unavoidable land uses, such as utility corridors and private land access across National Forest lands would be allowed. Management activities would include fire suppression and law enforcement. No timber, domestic livestock grazing, developed recreation, or wildlife habitat improvement outputs would be produced. No Further Planning Areas would be recommended for wilderness. There would be some incidental outputs, including dispersed recreation use, water yield, and wild horse and burro grazing.

This benchmark is the basis for the marginal analysis of economic efficiency for all benchmarks and alternatives.

Knowledge gained: This benchmark has a positive PNV ($1,605.1 million), reflecting primarily the large amount and high value of residual water coming off the Forest. Other smaller benefits come from background levels of dispersed recreation, hunting, and fishing. Damage from wildfire would be expected to increase to levels well above the current annual average because of reduced staffing and longer travel to fires. Outputs related to timber harvest, developed recreation, wildlife habitat improvement, and domestic livestock grazing would not be produced. For this reason, and because of high fire losses, the PNV of this benchmark is only about 45 percent of the PNV of other benchmarks.

This benchmark was not carried forward into the alternative analysis because it did not allow the Forest to meet current commitments (e.g., to developed recreation and grazing permittees) or to manage the land for multiple-use outputs such as timber, range, and developed recreation.

2. Code: FLW

Theme: Maximize Present Net Value (PNV). This benchmark demonstrates the most economically efficient level of production for resources with assigned dollar values. Management activities are constrained only by the production limitations of the land and by the requirements of technical feasibility. This benchmark is used as the basis for evaluating the cost of Minimum Management Requirements. This benchmark responds to the issue/concern of evaluating the cost-efficiency of resource management.

Knowledge gained: As this benchmark maximizes resource outputs with monetary value and applies the fewest requirements, it has the highest PNV of any benchmark ($3,484,500). The following conditions would be found under this benchmark:

- Developed and dispersed recreation would be provided to meet projected demand (where the supply was available), including the development of all recreational facilities and the maintenance of facilities at standard levels of operation over the 50-year planning horizon.

- Wilderness would increase by 339,800 acres over the existing level for a total of 904,900 acres on the Forest. The Further Planning Areas recommended for wilderness would be Coyote Southeast, Laurel-McGee, Tioga Lake, Hall Natural, Log Cabin-Saddlebag, and White Mountains.

- Fish and wildlife habitat improvement projects would increase to meet the projected demand for fishing and hunting. All potential fish habitat improvement would occur within the planning horizon.

- Livestock grazing would increase an average of 12 percent over base year levels by the end of the planning horizon as a result of rejuvenation of decadent vegetation and increased water developments.

- Wildfire acres burned would be reduced 40 percent below the background level represented in MLV, above.

- Timber harvest, unconstrained by the requirement of non-declining yield, would average about 1.3 MMCF (8.7 MMBF) per year over the first 50 years. This level represents about 83 percent of base year programmed harvest.

This benchmark produces the highest PNV because it includes no constraints on the Forest's ability to optimize resource outputs. The benchmark illustrates that over 85 percent of the potential benefits that could occur on the Forest would arise from developed and dispersed recreation use. In areas where timber harvest competes with developed recreation and potential alpine ski areas, timber harvest is displaced on the basis of economics and Present Net Value.

This benchmark does not meet Minimum Management Requirements for goshawk nesting territories or riparian area protection, or the Minimum Implementation Requirement for visual quality; for these reasons, it was not carried forward into the analysis of alternatives.

3. **Code: MMR**

Theme: Maximize Present Net Value (PNV) under Minimum Management Requirements. This benchmark demonstrates the opportunity costs of the Minimum Management Requirements considered collectively. It forms the basis for evaluating additional requirements beyond the Minimum Management Requirements. This benchmark responds to the issue/concern of evaluating the cost-efficiency of resource management.

Knowledge gained: The PNV of this benchmark is $3,484,200, representing a $0.3 million drop (less than one percent) relative to FLW, above. The small size of that change demonstrates that the imposition of Minimum Management Requirements (MMRs) would have virtually no economic consequences. The application of MMRs would result primarily in changing the spatial arrangement and timing of vegetation treatments, and would provide for non-declining yield and even flow. The slight reduction in total timber yield can be attributed equally to goshawk habitat protection and limitations on harvest in riparian areas. This benchmark produces a mix of management practices and outputs nearly identical to those in FLW, with the following differences:

- Riparian areas and goshawk habitat would be maintained at levels needed to meet Minimum Management Requirements.

- Timber harvest would meet the requirement of non-declining yield and would represent only slightly reduced volumes.

- The same Further Planning Areas would be recommended for wilderness as in FLW; they are: Coyote Southeast, Laurel-McGee, Tioga Lake, Hall Natural, Log Cabin-Saddlebag, and White Mountains.

As this benchmark does not meet the Minimum Implementation Requirement for visual quality, it was not carried forward intact into the analysis of alternatives; the addition of the visual Minimum Implementation Requirements to this benchmark resulted in Alternative CEE, which was studied in detail.

4. **Code:** MKV

Theme: Maximize PNV for only those resources with market value, applying Minimum Management Requirements. The purpose of this benchmark is to estimate the most cost-effective mix of resource management practices for producing outputs with established market prices (i.e., timber, fuelwood, geothermal energy, livestock forage, and developed recreation). This benchmark responds to the issue/concern of evaluating cost-efficiency in resource management.

Knowledge gained: The outputs of market resources under this benchmark would not differ significantly from those in the MMR Benchmark described above, in which both market and non-market outputs were valued. This fact demonstrates the low level of conflict between market and non-market outputs on the Forest. Because they were not valued economically in this benchmark, outputs of non-market resources declined significantly, resulting in a PNV of $3159.8 million. The large drop in PNV from the MMR benchmark indicates the relative importance of non-market values on the Inyo National Forest.

The most significant differences between MKV and MMR are:

- Dispersed recreation opportunities would be provided at below-current levels.

- Timber outputs would drop because the non-market outputs induced from timber harvest were not given economic value.

- Wilderness would be maintained at current levels with no additional acreage recommendations in response to demand.

- Wildlife habitat improvements would be provided at near-minimum levels, with a resulting drop in hunting and fishing use.

- Range outputs would increase as a result of reduced competition with wildlife and wilderness resource values.

The significant drop in timber, dispersed recreation, and wildlife outputs disqualified this benchmark from analysis as an alternative.

5. Code: TBR

Theme: Maximize timber production for one decade. This benchmark defines the maximum possible timber output for the first decade, applying Minimum Management Requirements and non-declining yield. This benchmark responds to the issue/concern of establishing a regulated forest on virtually all available, suitable timber land.

Knowledge gained: The timber cut increased to nearly three times that of MMR, but the cost of harvesting was 48 percent greater than the total value of the timber, and five times the timber cost reported in MMR. The average annual harvest on the Forest under this benchmark would be 3.4 MMCF (22.1 MMBF) on 107,662 acres of suitable timber land. The following conditions would also result:

- Developed recreation, primarily alpine skiing, would be 1.5 million RVDs lower in TBR than MMR by the fifth decade.

- Dispersed recreation and wilderness use would be lower than in MMR because of timber harvest in concentrated recreation areas and Further Planning Areas respectively.

- The following Further Planning Areas would be recommended for wilderness: Coyote Southeast, Tioga Lake, Hall Natural, and White Mountains.

- Water yield would increase slightly over MMR in the second through the fifth decades.

This benchmark results in a PNV of $3279.9 million, a reduction of $204.2 million from MMR. The reduction is caused chiefly by the high cost of aerial logging of timber on 30-60 percent slopes, and reduced recreation outputs.

This benchmark was not analyzed as an alternative, primarily because it did not meet the Minimum Implementation Requirements for visual quality and because the cost of timber harvest was substantially higher than the value of the timber harvested.

6. **Code:** WLN

Theme: Maximize PNV with all Further Planning Areas recommended as wilderness. This benchmark responds to the issue/concern of recommending more wilderness on the Forest.

Knowledge gained: All Further Planning Areas, encompassing 623,800 acres, would be added to the existing 565,100-acre Forest wilderness base for a total of 1,188,900 acres of wilderness. Wilderness recreation would increase to 870,230 average annual RVDs by the fifth decade. This use figure is still well below the projected demand of 1,564,700 RVDs, as public demand is greater than the Forest's ability to provide wilderness use opportunities. As pointed out in MKV above, there are low levels of conflict between market and non-market values on the Forest; consequently, outputs with market value differ little from MMR. The following conditions resulted from the benchmark:

- There was a loss of PNV resulting from the cost of developing trails and trailheads to manage marginally suitable lands under wilderness designation.

- There was a slight reduction in both timber and range outputs due to a reduction in the land base available for intensive vegetation management.

Despite these differences, a less than 5 percent drop in PNV relative to MMR indicates a very slight economic effect over the long term. This fact indicates, in turn, that only a small proportion of total resource benefits with monetary value would be foregone if wilderness were maximized on the Forest.

This benchmark, with a slight re-ordering of objectives, was carried into the analysis of alternatives as Alternative AMC.

7. **Code:** NON

Theme: Maximize PNV while recommending no Further Planning Areas for wilderness. This benchmark responds to the issue/concern of establishing no more wilderness on the Forest.

Knowledge gained: This benchmark is similar to MMR, except that it has only 565,100 total acres of wilderness (vs. 904,900 acres in MMR), and that range outputs increase slightly with the reduction of wilderness acres. A comparison of NON with WLN indicates that, although wilderness designation does not significantly affect PNV on the Forest, the greatest PNV would be attained by recommending 339,800 acres (54 percent of Further Planning Areas) for wilderness.

Because this benchmark does not meet the visual quality MMR, it was not considered in the analysis of alternatives. Alternative RPA, which was studied in detail, responded to the issue of recommending no new wilderness on the Forest.

8. Code: RGN

Theme: Maximize domestic livestock grazing for five decades. The purpose of this benchmark is to estimate the maximum capability of the Forest to provide commercial livestock grazing over the planning horizon, subject only to Minimum Management Requirements. This benchmark responds to the issue/concerns of increasing range grazing and meeting the President's target for increased red meat production on the National Forests.

Knowledge gained: Livestock forage production would reach 75.9 average annual AUMs in the fifth decade. The following conditions would also result:

- Approximately 69,000 acres of non-commercial (pinyon) and unproductive commercial timber lands would be converted to bitterbrush and grass over the planning horizon.

- Maximum range production would preclude wilderness designation on 321,400 acres of Further Planning Areas selected for wilderness in MMR.

- The Further Planning Areas that would be recommended for wilderness are: Tioga Lake, Hall Natural, and Log Cabin-Saddlebag.

- Key deer winter range would be lost to intensive domestic livestock use.

This benchmark results in a PNV of $3460.7 million, a reduction of $23.4 million from the MMR. This reduction results primarily from reduced dispersed recreation RVDs due to smaller wilderness acreage and from the reduced density of dispersed recreation use where grazing occurs in concentrated recreation areas (e.g., the Lower Rock Creek and McGee Creek drainages).

This benchmark was not considered in the analysis of alternatives due to the conflict with wildlife and the fact that it does not meet the visual quality management.

9. Code: H20

Theme: Maximize water yield for five decades. This benchmark estimates the maximum capability of the Forest to provide water over the planning horizon, subject only to Minimum Management Requirements. This benchmark responds to the issue/concern of responding to the public demand for more water.

Knowledge gained: It was found that the potential for increasing water yield on the Forest is slight; the average annual water yield in this benchmark increases less than one percent when compared to FLW. The Further Planning Areas recommended for wilderness would be the same as in MMR: Coyote Southeast, Laurel-McGee, Tioga Lake, Hall Natural, Log Cabin-Saddlebag, and White Mountains.

Vegetation removal for timber harvest or ski area development was the primary method used to increase water yield. (As timber harvest was more effective than ski area development in producing water, it displaced skiing wherever both options were available.) The only area on the Forest that is both available (outside wilderness) and that has the vegetation, soil, and climate needed to achieve increased water yield is the San Joaquin Ridge area between Mammoth and June Lake. The reduction in PNV relative to MMR stems primarily from the high costs of timber harvest on steep slopes and the reduction in developed recreation RVDs, (primarily from loss of downhill ski areas to timber harvest).

This benchmark was not analyzed as an alternative because the cost of timber harvest exceeds the timber value, and the Minimum Implementation Requirement for visual quality is not met.

CONCLUSIONS DRAWN FROM THE BENCHMARK ANALYSIS

The following are some of the conclusions that can be drawn about Forest resources on the Inyo, and about the relationships and interactions among those resources, based on the the benchmark analysis.

- Because of the high benefit values associated with recreation, developed and dispersed recreation opportunities would always be provided at levels needed to meet projected demand (or to completely utilize the Forest recreation supply, whichever was the limiting factor) under the objective of maximizing PNV. The production of recreation outputs is very cost-effective, and more than 90 percent of the potential benefits (beyond residual output benefits) in the MMR benchmark result from recreation use. Limitations on the production of recreation outputs, when compared with limitations on outputs for any other resource, can potentially cause the greatest loss in PNV. For example, timber harvest in potential ski areas reduced PNV in both TBR and H2O.

- Designation of additional wilderness on the Forest shows an economic effect only in benchmarks that maximize single resources: RGN recommends the least acreage to wilderness, followed by TBR. In contrast, the benchmarks that maximize PNV demonstrate that no significant loss of commodity outputs would result from recommending all Further Planning Areas for wilderness (as seen by comparing WLN with MMR). This relationship indicates that wilderness recommendations will eventually be based more on the benefits, costs, and management considerations associated directly with wilderness designation, rather than on trade-offs with other resources and opportunities.

- The benchmarks demonstrate that livestock grazing, even when provided at maximum levels in the RGN benchmark, makes up a relatively minor part of the total PNV on the Forest. Where the objective is to maximize PNV, the benchmarks demonstrate that the Forest would be managed for an increase in grazing of slightly more than 22 percent, averaged over the five-decade horizon. On the other hand, maximum range production requires vegetation rejuvenation, type conversion,

fencing, and water developments, which are costly, preclude wilderness, and displace deer from key winter range.

- Despite other differences in the benchmarks, timber outputs would be maintained near the MMR level (except in TBR and H20, where the cost of timber production exceeded the value of the timber harvested). Timber makes up a proportionally small part of the total PNV on the Forest; i.e., less than four percent, even in the maximum timber benchmark. In addition, discounted public benefits in TBR would amount to only $0.67 for every dollar expended. The amount of suitable timber acreage in TBR was 9,500 acres greater than in MMR, because timber in potential developed recreation sites (primarily ski areas) harvested in TBR is not harvested when the objective function is to maximize PNV. This in part accounts for the difference in harvest levels between MMR and TBR.

- Water yield would increase only slightly under the objective of maximizing water, with increases coming primarily from timber harvest in ski areas. This benchmark demonstrates that the net value received from increased water yield due to increased timber harvest would be slight, since increased cutting is offset by the high cost of timber harvest on steeper slopes and the loss of potential ski area use.

- Because of the low Forest-wide costs associated with losses to wildfire, maximizing PNV would implement a reduced fire management organization, thereby accepting an increase of 200 acres in average annual acres burned. Furthermore, the fire organization would shift to a greater emphasis on fire suppression relative to prevention, which is more cost-effective than the current mix.

- The effect of Minimum Management Requirements on resource outputs and on PNV is very slight. This fact is demonstrated by the 0.1 percent decline in PNV and the minimal change in resource outputs between the FLW and MMR benchmarks. The impact was felt only on the timber harvest as a result of meeting goshawk and riparian area requirements.

- Resource outputs without market value, such as dispersed recreation, water, and wildlife, make up a major portion of total benefits from the Forest. The PNV from the MKV benchmark, in which only market resources are valued, is much lower than the benchmarks in which non-market values are considered. This relationship is true mainly because the largest single contribution to PNV is the background water yield coming from the Forest.

- As demonstrated by the MLV benchmark, PNV can be significantly reduced below the MMR benchmark when the budget is reduced. The MLV benchmark, with an objective function to minimize cost, indicates the largest possible reduction in PNV (nearly 54 percent below MMR). The reduction is chiefly attributed to losses in recreation, range, wildlife and timber outputs and a failure to reduce wildfire.

- In general, the resource outputs that most significantly contribute to PNV on the Forest are mutually compatible. Developed and dispersed recreation opportunities can be offered concurrently, with little consequence on other outputs. However, maximizing market outputs only reduces PNV and conflicts with wilderness recreation and wildlife outputs. The FORPLAN model tends to select non-market resources over market resources to maximize PNV; market resources (such as timber) benefit from compatible management with non-market resources, as seen when MKV is compared with MMR. Because certain non-market values associated with timber harvesting were not valued in MKV, the harvest schedule was reduced nearly 17 percent from the MMR harvest.

Table 2
Average Annual Outputs by Decade for Benchmarks

Activity/Resource	Benchmarks		
	MLV	FLW	MMR
PNV (MM$)	1605.1	3484.5	3484.2
TIMBER (MMBF)			
Base Year*	10.5	10.5	10.5
Decade 1**	0	9.5	8.6
Decade 2	0	9.6	8.6
Decade 3	0	7.5	8.6
Decade 4	0	7.5	8.6
Decade 5	0	9.2	10.4
LONG TERM SUSTAINED YIELD			
(MMCF)	0	3.6	3.8
(MMBF)	0	23.2	24.8
GRAZING (M AUM)			
Base Year	41.4	41.4	41.4
Decade 1	2.4 ***	48.6	48.7
Decade 2	2.4	50.5	50.3
Decade 3	2.4	53.6	53.6
Decade 4	2.4	54.0	54.1
Decade 5	2.4	46.5	46.6
WATER YIELD (M Acre-Feet)			
Base Year	1093	1093	1093
Decade 1	1093	1101	1101
Decade 2	1093	1093	1093
Decade 3	1093	1093	1093
Decade 4	1093	1093	1093
Decade 5	1093	1093	1093
LAHONTAN CUTTHROAT TROUT (Threatened) (acres of stream habitat)			
Base Year	1	1	1
Decade 1	1	1	3
Decade 2	1	1	5
Decade 3	1	1	5
Decade 4	1	1	5
Decade 5	1	1	5
PAIUTE CUTTHROAT TROUT (Threatened) (acres of stream habitat)			
Base Year	3	3	3
Decade 1	3	3	13
Decade 2	3	3	18
Decade 3	3	3	18
Decade 4	3	3	18
Decade 5	3	3	18

* Base year is 1982
** Decade 1 is the period 1988-1997
*** Wild horses and burros

Benchmarks					
MKV	TBR	WLN	NON	RGN	H20
3159.8	3279.9	3475.7	3475.8	3460.7	3397.9
10.5	10.5	10.5	10.5	10.5	10.5
7.3	24.5	8.6	8.6	8.7	13.0
7.7	24.4	8.5	8.6	10.6	15.8
7.7	24.4	8.5	8.6	10.6	15.8
7.7	24.4	8.5	8.5	10.6	17.8
9.4	24.4	10.4	10.5	10.6	20.8
3.8	5.2	3.8	3.9	3.9	4.5
24.7	33.6	24.6	25.3	25.5	28.9
41.4	41.4	41.4	41.4	41.4	41.4
61.3	49.5	46.4	54.3	76.8	48.5
63.5	52.1	48.7	56.7	77.8	50.7
63.4	55.3	49.8	60.4	78.7	54.7
66.3	54.5	48.1	59.8	81.1	55.0
60.3	47.3	45.2	52.3	75.9	46.7
1093	1093	1093	1093	1093	1093
1093	1097	1101	1101	1101	1100
1093	1100	1093	1093	1093	1100
1095	1097	1093	1093	1093	1098
1095	1070	1093	1093	1093	1095
1093	1094	1093	1093	1093	1097
1	1	1	1	1	1
3	3	3	3	3	3
5	5	5	5	5	5
5	5	5	5	5	5
5	5	5	5	5	5
5	5	5	5	5	5
3	3	3	3	3	3
31	13	13	13	13	13
18	18	18	18	18	18
18	18	18	18	18	18
18	18	18	18	18	18
18	18	18	18	18	18

Table 2 (continued)
Average Annual Outputs by Decade for Benchmarks

Activity/Resource	Benchmarks		
	MLV	FLW	MMR
PEREGRINE FALCON (Endangered)			
(number of pairs)			
Base Year	0	0	0
Decade 1	0	0	2
Decade 2	0	0	2
Decade 3	0	0	2
Decade 4	0	0	2
Decade 5	0	0	2
BALD EAGLE (Endangered)			
(winter roosting areas)			
Base Year	1	1	1
Decade 1	1	1	1
Decade 2	1	1	1
Decade 3	1	1	1
Decade 4	1	1	1
Decade 5	1	1	1
MULE DEER			
(M animals)			
Base Year	12.0	12.0	12.0
Decade 1	12.6	11.9	11.9
Decade 2	13.0	11.6	11.6
Decade 3	13.3	11.1	11.1
Decade 4	13.7	10.7	10.7
Decade 5	14.1	10.3	10.3
SIERRA NEVADA MOUNTAIN SHEEP (number of animals)			
Base Year	300	300	300
Decade 1	330	350	350
Decade 2	360	400	400
Decade 3	390	450	450
Decade 4	420	500	500
Decade 5	450	550	550
NELSON MOUNTAIN SHEEP (number of animals)			
Base Year	130	130	130
Decade 1	130	140	140
Decade 2	130	154	154
Decade 3	130	154	154
Decade 4	130	154	154
Decade 5	130	154	154

Benchmarks					
MKV	TBR	WLN	NON	RGN	H2O
0	0	0	0	0	0
2	2	2	2	2	2
2	2	2	2	2	2
2	2	2	2	2	2
2	2	2	2	2	2
2	2	2	2	2	2
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
1	1	1	1	1	1
12.0	12.0	12.0	12.0	12.0	12.0
11.9	11.9	11.9	11.9	11.2	11.9
11.6	11.8	11.6	11.6	9.9	11.6
11.1	11.7	11.1	11.1	8.7	11.1
10.7	11.6	10.7	10.7	7.4	10.7
10.3	11.5	10.3	10.3	5.9	10.3
300	300	300	300	300	300
330	350	350	350	330	350
360	400	400	400	360	400
390	450	450	450	390	450
420	500	500	500	420	500
450	550	550	550	450	550
130	130	130	130	130	130
130	140	140	140	130	140
130	154	154	154	130	154
130	154	154	154	130	154
130	154	154	154	130	154
130	154	154	154	130	154

Table 2 (continued)
Average Annual Outputs by Decade for Benchmarks

Activity/Resource	Benchmarks		
	MLV	FLW	MMR
RESIDENT FISH (M Pounds)			
Base Year	1632	1632	1632
Decade 1	1632	1640	1640
Decade 2	1632	1649	1649
Decade 3	1632	1658	1658
Decade 4	1632	1667	1667
Decade 5	1632	1674	1674
GOSHAWKS (pairs in suitable timber)			
Base Year	15	15	15
Decade 1	15	12	14
Decade 2	15	9	13
Decade 3	15	6	12
Decade 4	15	3	11
Decade 5	15	0	9
TOTAL WILDLIFE & FISH USER DAYS (MWFUDs)			
MULE DEER			
Base Year	25.2	25.2	25.2
Decade 1	26.5	25.0	25.0
Decade 2	27.3	24.4	24.4
Decade 3	27.9	23.3	23.3
Decade 4	28.8	22.5	22.5
Decade 5	29.6	21.6	21.6
RESIDENT FISH			
Base Year	352.5	340.0	340.0
Decade 1	68.1	342.4	342.4
Decade 2	68.1	344.8	344.8
Decade 3	68.1	347.2	347.2
Decade 4	68.1	349.6	349.6
Decade 5	68.1	352.0	352.0
OTHER			
Base Year	25.8	25.8	25.8
Decade 1	5.1	26.9	26.9
Decade 2	5.1	2.0	32.0
Decade 3	5.1	37.1	37.1
Decade 4	5.1	41.3	41.3
Decade 5	5.1	49.2	49.2

Benchmarks					
MKV	TBR	WLN	NON	RGN	H20
1632	1632	1632	1632	1632	1632
1632	1640	1640	1640	1640	1640
1632	1649	1649	1649	1649	1649
1632	1658	1658	1658	1658	1658
1632	1667	1667	1667	1667	1667
1632	1674	1674	1674	1674	1674
15	15	15	15	15	15
14	14	14	14	14	14
13	13	13	13	13	13
12	12	12	12	12	12
11	11	11	11	11	11
9	9	9	9	9	9
25.2	25.2	25.2	25.2	25.2	25.2
25.0	25.0	25.0	25.0	23.5	25.0
24.4	24.8	24.4	24.4	20.8	24.4
23.3	24.6	23.3	23.3	18.3	23.3
22.5	24.4	22.5	22.5	15.5	22.5
21.6	24.1	21.6	21.6	12.4	21.6
352.5	340.0	340.0	340.0	340.0	340.0
98.0	342.4	342.4	342.4	342.4	342.4
98.0	344.8	344.8	344.8	344.8	344.8
98.0	347.2	347.2	347.2	347.2	347.2
98.0	349.6	349.6	349.6	349.6	349.6
98.0	352.0	352.0	352.0	352.0	352.0
25.8	25.8	25.8	25.8	25.8	25.8
19.7	26.9	26.9	26.9	26.9	26.9
20.5	32.0	32.0	32.0	32.0	32.0
21.7	37.2	34.2	38.5	38.5	36.7
22.6	41.9	38.3	40.9	43.3	42.6
24.0	49.6	43.7	48.3	44.5	49.4

Table 2 (continued)
Average Annual Outputs by Decade for Benchmarks

Activity/Resource	Benchmarks		
	MLV	FLW	MMR
DEVELOPED RECREATION (M RVDS)			
Base Year	2836	2836	2836
Decade 1	0	3686	3686
Decade 2	0	4673	4673
Decade 3	0	5383	5383
Decade 4	0	6143	6143
Decade 5	0	6272	6272
DISPERSED RECREATION (M RVDS)			
Base Year	1543	1543	1543
Decade 1	432	1852	1852
Decade 2	432	2524	2524
Decade 3	432	2910	2910
Decade 4	432	3086	3086
Decade 5	432	3268	3268
WILDERNESS (M Acres)			
Base Year	565.1	565.1	565.1
Decade 1	565.1	904.9	904.9
Decade 2	565.1	904.9	904.9
Decade 3	565.1	904.9	904.9
Decade 4	565.1	904.9	904.9
Decade 5	565.1	904.9	904.9
TOTAL COST (MM$)			
Base Year	10.3	10.3	10.3
Decade 1	2.2	12.8	12.8
Decade 2	2.2	14.7	13.6
Decade 3	2.2	15.6	14.7
Decade 4	2.2	15.5	16.5
Decade 5	2.2	17.9	18.3

Benchmarks					
MKV	TBR	WLN	NON	RGN	H20
2836	2836	2836	2836	2836	2836
3686	3686	3686	3686	3686	3686
4674	4672	4673	4673	4673	4673
5383	4690	5383	5383	5383	5383
6144	4708	6143	6143	6143	5517
6272	4756	6272	6272	6272	5634
1543	1543	1543	1543	1543	1543
1122	1834	1857	1828	1839	1840
1489	2500	2531	2493	2507	2508
1524	2889	2919	2862	2882	2892
1730	3050	3096	3020	3046	3069
1891	3260	3297	3213	3237	3246
565.1	565.1	565.1	565.1	565.1	565.1
565.1	891.0	1188.9	565.1	583.5	904.9
565.1	891.0	1188.9	565.1	583.5	904.9
565.1	891.0	1188.9	565.1	583.5	904.9
565.1	891.0	1188.9	565.1	583.5	904.9
565.1	891.0	1188.9	565.1	583.5	904.9
10.3	10.3	10.3	10.3	10.3	10.3
11.2	17.5	12.9	12.6	14.3	13.0
14.1	17.4	14.5	14.5	15.9	15.4
13.5	19.6	14.6	14.6	15.4	17.2
14.7	26.8	15.4	15.3	16.2	18.2
16.2	26.1	20.8	18.2	17.9	14.2