Kootenai National Forest Plan

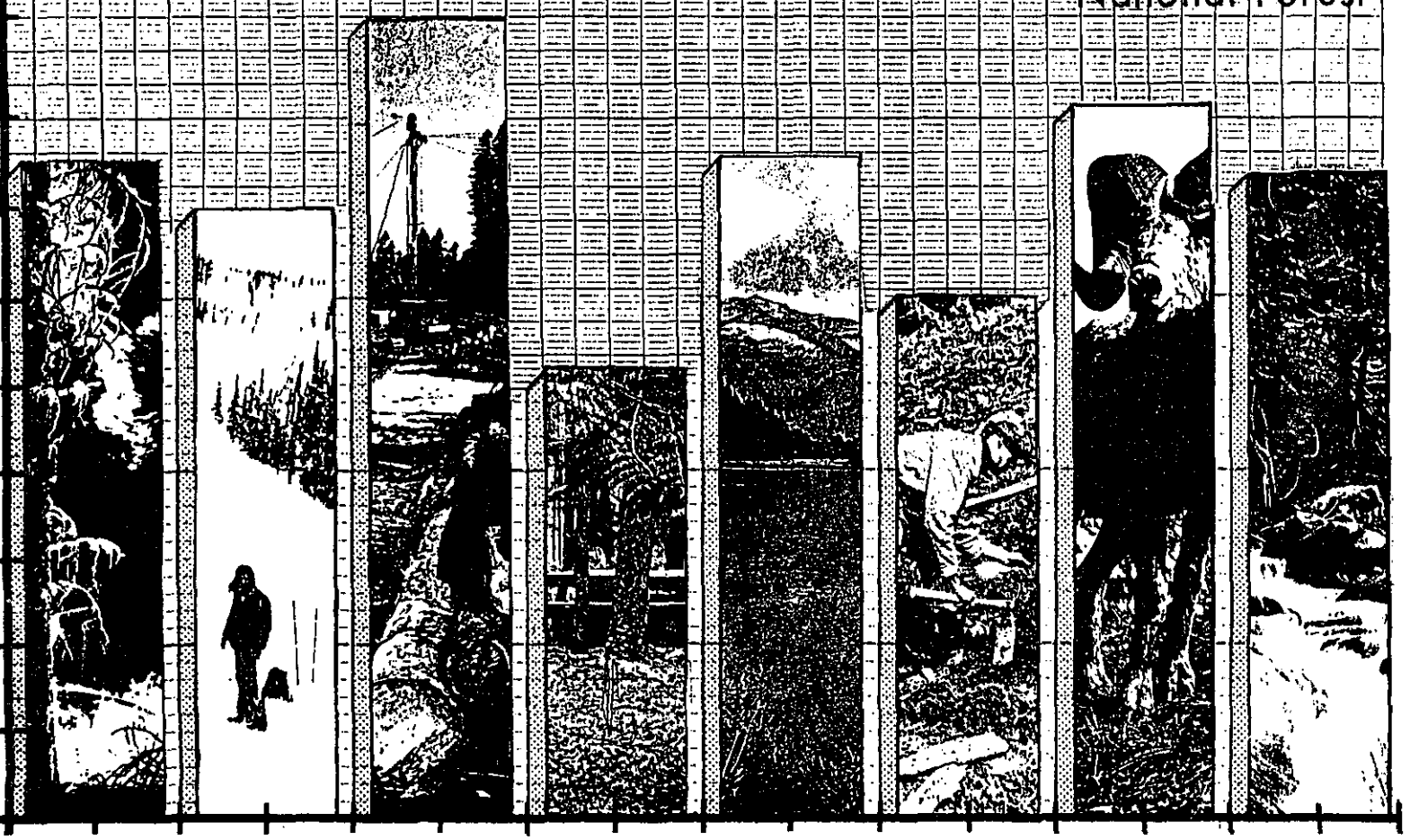
Final Environmental Impact Statement

Appendix B - Analysis Process

United States
Department
of Agriculture

Forest Service

Kootenai
National Forest



D. Thompson

ENVIRONMENTAL IMPACT STATEMENT

FOR THE

KOOTENAI NATIONAL FOREST PLAN

APPENDIX B

DESCRIPTION OF THE ANALYSIS PROCESS

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Table of Contents

APPENDIX B

DESCRIPTION OF THE ANALYSIS PROCESS

I. Introduction B-1

* Significant Changes from Draft to Final EIS B-1

A. Planning Problem B-1
B. Planning Process B-1
1. Inventory Data and Collect Information B-2
2. Analysis of the Management Situation B-2
3. Formulation of Alternatives B-2
4. Estimation of Effects of Alternatives B-2

II. Inventory Data and Information Collection B-3

* Significant Changes from Draft to Final EIS B-3

A. Forest Data Base B-3
1. Capability Areas B-3
a. Land Types B-3
b. Habitat Types B-3
c. Slope, Elevation and Aspect B-3
d. Known Wildlife Use B-4
e. Seen Area and Visual Sensitivity B-4
2. Analysis Areas B-4
3. Production Coefficients B-5
* 4. Suitable Lands B-5
5. Allocation and Scheduling B-7
6. Monitoring B-7
7. Plan Implementation Programs B-8
B. Sources of Data B-8

III. The Forest Planning Model (Including FORPLAN) B-10

* Significant Changes from Draft to Final EIS B-10

A. Overview B-10
B. Analysis Process and Analytical Tools B-11
C. Identification of Analysis Areas B-12
1. Level 1 Criteria - Wilderness, Inventoried Roadless Area or Some other Special Status . .B-13
2. Level 2 Criteria - Unused B-13
3. Level 3 Criteria - Grizzly Management Situation and Major Ecosystem B-14
4. Level 4 Criteria - Working Group B-14

* Indicates new or revised item.

5. Level 5 Criteria - Ecological Land Unit Group . B-14
6. Level 6 Criteria - Condition Class B-15
7. Analysis Areas and Timber Suitability B-15
D. Identification of Prescriptions B-16
1. Overview B-16
2. Design of Management Prescriptions B-16
3. Purpose, Criteria, and Assumptions for Prescription Categories B-19
a. Timber and Visual Category B-20
(1) Purpose B-20
(2) Criteria and Assumptions B-20
b. Wildlife Category B-20
(1) Purpose B-20
(2) Criteria and Assumptions B-20
c. Recreation Category B-21
(1) Purpose B-21
(2) Criteria and Assumptions B-21
d. Special Area Category B-21
(1) Purpose B-21
(2) Criteria and Assumptions B-21
e. Custodial Category B-21
(1) Purpose B-21
(2) Criteria and Assumptions B-22
4. Use of Cost Efficiency in Developing Prescriptions B-22
5. List of Prescriptions B-22
6. References B-25
E. Development of Timber Harvest Intensities B-26
F. Development of Yield Tables and Coefficients B-27
1. Overview B-27
2. Timber B-27
3. Recreation B-28
4. Elk B-29
5. Range B-29
6. Water Yield B-30
7. Roads B-30
8. Sediment B-31
9. Fisheries B-31
G. Analysis Done Outside FORPLAN B-32
1. Overview B-32
2. Developed Recreation B-32
3. Other Recreation B-32
4. Elk B-33
5. Other Big Game B-33
6. Roads B-33
7. Fixed Costs B-33
8. Grazing B-34
9. Energy B-34

* Indicates new or revised item.

IV. Cost-Efficiency and Net Public Benefit B-35

* Significant Changes from Draft to Final EIS B-35

A. Net Public Benefit B-35
B. Present Net Value (PNV) and Priced Outputs B-35
1. Priced Output Parameters Used in PNV B-36
a. Discounting B-36
b. Timber Demand Curve B-36
c. Real Dollar Adjustments B-36
2. Benefits and Costs Used in PNV B-37
a. Costs B-38
(1) Cost Data by Resource Component . . B-39
(a) Timber B-40
(b) Roads B-40
(c) Range B-41
(d) Recreation/Wildlife B-41
(e) Other Costs B-42
(2) Budget Costs B-44
b. Priced Benefits Used in PNV B-44
* (1) Timber Benefits B-45
(2) Range Benefits B-47
(3) Recreation/Wildlife Benefits B-48
3. Present Net Value (PNV) Calculations B-49
4. Opportunity Costs B-49
5. Other B-50
C. Net Subjective Value B-50
1. Definition B-50
2. Nonpriced Outputs B-51
a. Jobs and Community Stability B-51
b. Visual Quality Protection in Sensitive Areas B-52
c. Wilderness and Roadless Quality B-53
d. Accessibility for Minerals, Oil and Gas Exploration B-55
e. Grizzly Recovery B-56
f. Lodgepole Pine Risk Management B-57
(1) Stagnated Lodgepole Pine B-57
(2) Mountain Pine beetle B-58
g. Miles of Road B-59
h. First Decade Appropriated Budget B-60

V. Social and Economic Impact Analysis B-61

* Significant Changes from the Draft to Final EIS B-61

A. Overview B-61
B. Impact Analysis Area B-61
C. Economic Impact Model B-62
1. IMPLAN Data Base B-63
2. Final Demand Expenditures B-63
D. Base Year Employment and Income Information B-64
E. Returns to the U.S. Treasury and Local Government . B-66

* Indicates new or revised item.

F. Work Force B-67
G. Social Measures B-67
1. Social Zones of Influence B-67
a. Local Zone B-68
b. Regional Zone B-70
c. National Zone B-71
2. Social Variables B-71
a. Population Changes B-71
b. Community Cohesion B-72
c. Lifestyles B-72
d. Attitudes, Beliefs, and Values B-73
e. Aesthetics B-73
* H. Local Timber Supply Analysis B-74
* I. Timber Resource Supply/Suitable Land Evaluation . . B-81
*1. Definitions and Discussions B-83
*2. Classification of Timberlands - Past and Future B-86
*3. Local Timber Supply Options B-89
*J. Montana Timber Supply Study. B-91

VI. Analysis Prior to the Development of Alternatives . . . B-94

* Significant Changes from Draft to Final EIS B-94

A. Introduction B-94
B. Development of Management Requirements B-96
1. Minimum Management Requirements B-96
a. Conserve Soil and Water Resources B-97
b. Minimize Hazards from Flood, Wind, Wildfire, Erosion or Other Natural Physical Forces B-98
c. Reduce Hazards from Pest Organisms B-98
d. Protect Riparian Zones B-98
e. Diversity B-98
f. Adequate Fish and Wildlife Habitat to Maintain Viable Populations B-99
g. Consistency with Multiple Use Laws B-100
h. Protecting Threatened and Endangered Species Habitat B-100
i. Providing for Utility and Transportation Rights-Of-Way and Corridors B-101
j. Road Construction Standards B-101
k. Revegetating Temporary Roads B-102
l. Maintaining Air Quality B-102
m. Reforestation B-102
n. Forty-Acre Clearcut Limit B-102
2. Timber Policy Requirements B-103
a. Nondeclining Yield (NDY) B-103
b. Sequential Upper and Lower Bounds (Seq. U&L Bounds) - Harvest Floors B-103
c. Rotation Based Upon CMAI B-103
d. Rotation Based on Utilization Standards . B-103
3. Maximum Resource Output Objectives B-104

* Indicates new or revised item.

* 4. Analysis in Response to Comments on the DEIS . B-104
* a. Old Growth B-104
* b. Timber Values B-105
* c. Projected Budgets B-105
C. Displayed Benchmarks (Includes constraint analysis FORPLAN runs and development of the Final Plan) . . B-106
1. Overview B-106
2. Displayed Benchmarks B-108
a. Benchmark 114HH2 . . . . . B-112
b. Benchmark 114A09 . . . . . B-113
c. Benchmark 114U01 . . . . . B-113
d. Benchmark 114B06 . . . . . B-113
e. Benchmark 114C04 . . . . . B-113
f. Benchmark 114D04 . . . . . B-114
g. Benchmark 114V01-N B-114
h. Benchmark 114F01-A B-114
i. Benchmark 114GG1-M B-115
j. Benchmark 114JJ2 . . . . . B-115
k. Benchmark 114II2 . . . . . B-115
l. Benchmark 114W01-L B-115
m. Benchmark 114AA2-F B-116
n. Benchmark 114M01-H B-116
o. Benchmark 114DD1 . . . . . B-116
p. Benchmark 114Y12-I B-116
* 3. Development of the Final Plan B-117
* a. Run 11402B B-117
* b. Run 11412A B-117
* c. Run 11413A B-117
* d. Run 11414A B-119
* e. Run 11415A B-119
* f. Run 11416A B-119
* g. Run 11417A B-120
* h. Run 11421A B-120
* i. Run 11424A (Final Plan - Alternative JF) . B-120
* j. Run 11425A B-120
* k. Run 11428A B-120
* l. Run 11429A B-121
D. Benchmark Analysis - Summary of Opportunity Costs Associated With Modeling Constraints B-121
1. Opportunity Cost of Timber Harvest Floors and Ceilings B-121
2. Opportunity Cost of Minimum Management Requirements (MMR's) B-122
a. Endangered Species Act - Grizzly Bear . . B-122
b. Soil and Water Protection B-122
c. Diversity B-123
d. Forty-Acre Clearcut Limits B-123
e. All Minimum Management Requirements . . . B-123
(1) Rotations Based Upon CMAI - No Harvest Schedule Constraint . . . B-123
(2) Rotations Based Upon CMAI With NDY/LTSY Link B-124

* Indicates new or revised item.

(3) Rotations Based Upon Utilization Standards With Sequential Upper and Lower Bounds B-124
3. Opportunity Cost of Timber Policy Constraints . B-124
a. Rotations Based Upon CMAI B-124
b. NDY/LTSY Link B-125
(1) No MMR's, Rotations Based Upon CMAI No Bounds B-125
(2) All MMR's, Rotations Based Upon CMAI No Bounds B-125
(3) All MMR's, Rotations Based Upon Utilization Standards, U & L Bounds. B-125
c. Rotations Based Upon CMAI and NDY/LTSY Link B-126
d. Utilization Standards B-126
(1) Timber Volume Effect B-126
(2) Opportunity Cost B-126
4. Opportunity Costs of Valuing Market Values Only B-127
5. Opportunity Costs of Maximum Resource Output, Minimum Level, and Current Direction Benchmarks B-128
a. Maximum Timber B-129
b. Minimum Level B-129
c. Maximum Wildlife (Elk) B-129
d. Maximum Wilderness B-129
e. Current Management B-130
* 6. Development of the Final Plan B-130
* a. Opportunity Cost of Redesignation of Pillick Ridge to Recommended Wilderness. B-130
* b. Opportunity Cost of Unregulating Old Growth B-131
* c. Opportunity Cost of No Commercial Thinning and Delayed Conversion of Stagnated Lodgepole Pine B-131
* d. Opportunity Cost of No Pre-Commercial Thinning B-131
* e. Opportunity Cost of Maximizing Timber Production in Decade 1 With Non-Declining Yield B-132
* f. Opportunity Cost of RPA Timber Goals for 2 Decades Followed By Departure B-132
* g. Effects of Alternative Base Timber Values, Price Projections and Road Costs B-132
* h. Utilization Standards B-135
E. Resource Relationships B-137
1. Timber Harvest/Roadless and Wilderness Management B-137
2. Timber Harvest/Livestock Forage B-137
3. Timber Harvest/Elk Forage B-137
4. Livestock Forage/Elk Forage B-137
5. Livestock Forage/Roadless and Wilderness Management B-138
6. Elk Forage/Roadless Area and Wilderness Management B-138
7. Grizzly Habitat/Timber Harvest B-138

* Indicates new or revised item.

F. Production Potential B-138
1. Economic Potential of Maximum PNV (114GG1-M) . B-138
2. Fixed Costs of Public Land Ownership (114DD1) B-138
3. Timber Potential (114WO1-L) B-139
4. Elk Summer Range Forage Potential (114AA2-F). . B-139
5. Wilderness Potential (114MO1-H) B-140
6. Dispersed Recreation Potential B-140
7. Resource and Economic Potential Under Current Management (114Y12-I) B-140

VII. Formulation of Alternatives B-145

*Significant Changes from Draft to Final EIS B-145

A. Introduction B-145
B. Common Constraints B-147
C. Development of Alternatives B-149
1. Alternative A (114FO1) B-149
a. Goal B-149
b. Criteria and Assumptions B-149
c. Constraints B-149
d. Rationale B-150
2. Alternative B (114GO2) B-150
a. Goal B-150
b. Criteria and Assumptions B-150
c. Constraints B-150
d. Rationale B-151
3. Alternative C (114HO2) B-151
a. Goal B-151
b. Criteria and Assumptions B-151
c. Constraints B-151
d. Rationale B-152
4. Alternative D (114CC5) - RPA Alternative. . . . B-152
a. Goal B-152
b. Criteria and Assumptions B-152
c. Constraints B-152
d. Rationale B-153
5. Alternative E (114JO1) B-153
a. Goal B-153
b. Criteria and Assumptions B-153
c. Constraints B-154
d. Rationale B-154
6. Alternative F (114AA2) B-154
a. Goal B-154
b. Criteria and Assumptions B-154
c. Constraints B-154
d. Rationale B-155
7. Alternative G (114LO1) B-155
a. Goal B-155
b. Criteria and Assumptions B-155
c. Constraints B-155
d. Rationale B-156

* Indicates new or revised item.

8. Alternative H (114M01) - Maximum Wilderness . . B-156
a. Goal B-156
b. Criteria and Assumptions B-156
c. Constraints B-157
d. Rationale B-157
9. Alternative I (114Y12) - Current Direction . . B-158
a. Goal B-158
b. Criteria and Assumptions B-158
c. Constraints B-158
d. Rationale B-159
10. Alternative J (114009) - Proposed Action . . . B-159
a. Goal B-159
b. Criteria and Assumptions B-159
c. Constraints B-160
d. Rationale B-160
11. Alternative K (114FF5) - Departure on the Proposed Action B-160
a. Goal B-160
b. Criteria and Assumptions B-160
c. Constraints B-161
d. Rationale B-161
12. Alternative L (114W01) - Maximum Timber . . . B-162
a. Goal B-162
b. Criteria and Assumptions B-162
c. Constraints B-162
d. Rationale B-162
13. Alternative M (114GG1) - Maximum PNV Benchmark B-162
a. Goal B-162
b. Criteria and Assumptions B-162
c. Constraints B-163
d. Rationale B-163
14. Alternative N (114V01) B-163
a. Goal B-163
b. Criteria and Assumptions B-163
c. Constraints B-163
d. Rationale B-164
15. Alternative O (114S07) B-164
a. Goal B-164
b. Criteria and Assumptions B-164
c. Constraints B-164
d. Rationale B-165
* 16. Alternative JF (11424A - Final Plan) B-166
* a. Goal B-166
* b. Criteria and Assumptions B-166
* c. Constraints B-166
* d. Rationale B-167

VIII. Summary of Tradeoffs Within Selected Benchmarks and Alternatives B-168

*Significant Changes from Draft to Final EIS B-168

A. Overview B-168
B. Process for Evaluating Significant Constraints . . . B-168

* Indicates new or revised item.

C. Tradeoffs Among Alternatives B-168
1. Response to Issues and Concerns B-170
2. Tradeoffs B-173
a. Alternative A B-180
(1) Quantified Comparisons B-180
(2) Discussion B-180
(a) Cost Comparison B-180
(b) PNV Comparison B-180
(c) Comparison to Current Direction B-181
b. Alternative B B-182
(1) Quantified Comparisons B-182
(2) Discussion B-183
(a) Cost Comparison B-183
(b) PNV Comparison B-183
(c) Comparison to Current Direction B-183
c. Alternative C B-185
(1) Quantified Comparisons B-185
(2) Discussion B-185
(a) Cost Comparison B-186
(b) PNV Comparison B-186
(c) Comparison to Current Direction B-186
d. Alternative D B-188
(1) Quantified Comparisons B-188
(2) Discussion B-188
(a) Cost Comparison B-189
(b) PNV Comparison B-189
(c) Comparison to Current Direction B-189
e. Alternative E B-191
(1) Quantified Comparisons B-191
(2) Discussion B-191
(a) Cost Comparison B-191
(b) PNV Comparison B-191
(c) Comparison to Current Direction B-192
f. Alternative F (Maximum Elk Benchmark) . . B-193
(1) Quantified Comparisons B-193
(2) Discussion B-193
(a) Cost Comparison B-194
(b) PNV Comparison B-194
(c) Comparison to Current Direction B-194
g. Alternative G B-196
(1) Quantified Comparisons B-196
(2) Discussion B-196
(a) Cost Comparison B-196
(b) PNV Comparison B-197
(c) Comparison to Current Direction B-197
h. Alternative H (Maximum Wilderness) B-198
(1) Quantified Comparisons B-198
(2) Discussion B-199
(a) Cost Comparison B-199
(b) PNV Comparison B-199
(c) Comparison to Current Direction B-200
i. Alternative I (Current Direction) B-201
(1) Quantified Comparisons B-201

* Indicates new or revised item.

(2) Discussion B-201
(a) Cost Comparison B-202
(b) PNV Comparison B-202
j. Alternative J (Proposed Action) B-202
(1) Quantified Comparisons B-202
(2) Discussion B-203
(a) Cost Comparison B-203
(b) PNV Comparison B-203
(c) Comparison to Current Direction B-204
(d) Sustained Yield by Administrative Forest B-205
k. Alternative K (Departure on Proposed Action) B-207
(1) Quantified Comparisons B-207
(2) Discussion B-207
(a) Cost Comparison B-208
(b) PNV Comparison B-208
(c) Comparison to Current Direction B-208
l. Alternative L (Maximum Timber Benchmark) . B-210
(1) Quantified Comparisons B-210
(2) Discussion B-210
(a) Cost Comparison B-210
(b) PNV Comparison B-211
(c) Comparison to Current Direction B-211
m. Alternative M (Maximum PNV Benchmark with Departure from NDY) B-213
(1) Quantified Comparisons B-213
(2) Discussion B-213
(a) Cost Comparison B-213
(b) PNV Comparison B-214
(c) Comparison to Current Direction B-214
n. Alternative N B-215
(1) Quantified Comparisons B-215
(2) Discussion B-216
(a) Cost Comparison B-216
(b) PNV Comparison B-216
(c) Comparison to Current Direction B-216
o. Alternative O B-218
(1) Quantified Comparisons B-218
(2) Discussion B-218
(a) Cost Comparison B-218
(b) PNV Comparison B-219
(c) Comparison to Current Direction B-219
* p. Alternative JF (Final Plan) B-221
* (1) Quantified Comparisons B-221
* (2) Discussion B-221
* (a) Cost Comparison B-221
* (b) PNV Comparison B-221
* (c) Comparison to Current Direction B-222
* (d) Comparison to the Proposed Action B-224

References B-227
Index B-230

* Indicates new or revised item.

LIST OF TABLES

Table	Title	Page
B-1	Identification of Tentatively Suitable Timberland (Acres)	B-6
B-2	Number of Analysis Areas and Acres by Timber Productivity Class	B-15
B-3*	Comparison of Prescriptions to Standards and Guidelines	B-25
B-4	First Decade Timber Yield	B-28
B-5	Lumber Price and Production Cost Indices of Adams and Haynes	B-47
B-6	Prices for Recreation	B-48
B-7	Resource Flows	B-62
B-8	Forest Outputs and Impacts in 1980	B-65
B-9*	Private Sector Forest Related Jobs and Income by Alternative	B-66
B-10	Base Year Estimates - Returns to the U.S. Treasury 1980	B-67
B-11 *	Volume Harvested from State, Private and Forest Service Lands in the Five County Secondary Impact Area, 1976 to 1985	B-76
B-12 *	Timber Volumes Expected to be Available in the Next Decade	B-77
B-13 *	Average Timber Volume Harvested in the Past Ten Years and Average Timber Volume Available for Harvest in the Next Ten Years	B-77
B-13a*	Timber Resource Land Suitability	B-82
B-13a(1)*	Future Timber Supply Opportunities on the Kootenai National Forest	B-90
B-13b*	Range of Potential Timber Requirements Compared to the Kootenai Forest Final Plan	B-91
B-14	Summary of Constraints Used in the Benchmark Analysis	B-107
B-15	Resource Outputs of the Benchmarks	B-111,141
B-16 *	Effects of "New" Economics on the PNV Benchmark	B-133
B-17 *	Effects of "New" Economics on a Heavily Constrained Run	B-133
B-18 *	Effects of "New" Economics on the Final Plan	B-134
B-19	Current Vs Proposed Utilization Standards	B-135

* Indicates new or revised item.

B-20 * Comparison of Volume by Tree Species and Tree Diameters Current Vs Regional Guide Utilization Standards B-136
B-21 Land Assignments by Management Emphasis For Benchmarks B-143
B-22 Present Value Benefits and Costs for Resource Groups by Benchmark (4%) B-144
B-23 * Comparison of Alternatives for Response to the Major Issues, Concerns and Opportunities B-171
B-24 * Alternatives in Order of Increasing Discounted Costs B-174
B-25 * Present Net Value, Present Value Benefits, and Present Value Costs by Alternative B-175
B-26 * Summary of Net Public Benefits B-176
B-27 Proclaimed N.F. and Administrative N.F. Long Term Sustained Yield (LTSY) and Suitable Acres B-205
B-28 Proclaimed National Forest and Administrative National Forest Allowable Sale Quantity B-206
B-29 * Comparison of Final Plan to Proposed Plan for Response to the Major Issues, Concerns and Opportunities B-224

LIST OF FIGURES

Figure	Title	Page
B-1	Private Sector Forest Related Employment as a Function of PNV - First Decade	B-52
B-2	Private Sector Forest Related Employment as a Function of Timber Harvest - First Decade . .	B-52
B-3	PNV as a Function of Visual Quality	B-53
B-4	Visual Quality as a Function of Timber Harvest . .	B-53
B-5	PNV as a Function of Roadless and Wilderness Management	B-54
B-6	PNV as a Function of Minerals, Oil and Gas Accessibility for Exploration	B-55
B-7	PNV as a Function of Grizzly Habitat with No Scheduled Harvest	B-56
B-8	PNV as a Function of Stagnated Lodgepole Pine Converted	B-58
B-9	PNV as a Function of Lodgepole Pine Harvest in Decade 1	B-58
B-10	PNV as a Function of Total Road Miles Needed For Management	B-59
B-11	PNV as a Function of Decade 1 Appropriated Budget	B-60
B-12	Lincoln County Population in an Historical Perspective	B-69

* Indicates new or revised item.

B-13 * Five County Timber Supply Situation Past and Future B-77
B-13a* Future Timber Resource Land Suitability B-88
B-13b* Previous Commercial Forest Land Classification . . B-88
B-13c* Potential Timber Requirements and Supply Relationships - Kootenai National Forest B-92
B-14 * Foregone PNV of the Major Constraints Explored in the Analysis B-109
B-15 * FORPLAN Runs Linked to Decision Points - Draft to Final EIS B-118
B-16 Kootenai Proclaimed National Forest and Administrative National Forest Allowable Sale Quantity - Proposed Action B-206

* Indicates new or revised item.

APPENDIX B

DESCRIPTION OF THE ANALYSIS PROCESS

I. Introduction

Significant Changes from Draft to Final EIS

There were no significant changes in this section of Appendix B.

A. Planning Problem

The Forest Service is responsible for determining how best to manage National Forest lands based on public desires and land capabilities. The capability of the Kootenai National Forest to respond to public desires is influenced by its terrain, weather, and soils along with the current condition of its resources. Four percent of the Forest is currently wilderness. The remainder of the Forest supports a variety of roaded and roadless recreation activities including big-game hunting, fishing, viewing scenery, camping, hiking, skiing, snowmobiling, horseback riding and pleasure driving. In addition a variety of commercial activities such as timber harvesting and livestock grazing take place. It is the interface between these activities which generates many forest management questions. This analysis addresses the sometimes complementary and sometimes conflicting relationships between these activities and management for the traditional forest resources of wood, water, wildlife, range, recreation and wilderness.

Public interest includes divergent viewpoints about the use of commodities such as timber, grazing and minerals and non-commodities such as wilderness, unroaded recreation, scenery, wildlife, old growth and diversity. Additional concerns center on the management and control of Forest users. (e.g. Road closures). The Forest's major planning goal is to provide enough information to help decisionmakers determine which combination of goods, services and multiple use land designations will maximize net public benefit. (Defined as the overall value to the Nation of all outputs and positive effects, benefits, less all the associated Forest inputs and negative effects, costs, of producing priced and nonpriced outputs from Forest lands). See Section IV of this Appendix for more discussion of Net Public Benefit (NPB).

The National Forest Management Act (NFMA) and the regulations developed under NFMA (36 CFR 219) provide the analytical framework to address this objective, and also state that the requirements of the National Environmental Policy Act (NEPA) and its regulations (40 CFR 1500-1508) must be applied in this analysis process.

B. Planning Process

The planning and environmental analysis process brings a new outlook and a new technology to National Forest land management, principally: (1) processes formerly used to make individual resource decisions are now combined to help make integrated management decisions, and (2) new mathematical modeling techniques are used to assist in the land designation problem including identifying the most cost efficient pattern of multiple-use land management.

The 10-step planning process is discussed in the NFMA regulations and in Chapter I of this document. Appendix B describes the analysis phase of this process including steps 3, 4, 5 and 6. The judgement phase, steps 1, 2, 7 and 8, is described in Chapters I, II, and in Appendix A. The execution phase, steps 9 and 10, is presented in the Proposed Forest Plan.

1. Inventory Data and Collect Information (Planning Step 3)

The interdisciplinary team determined what data was necessary based on public issues and management concerns. The analysis of the management situation, formulation of alternatives and monitoring require data on resource capabilities and conditions, existing supply and demand, expected outputs, benefits and costs. Existing data was used whenever possible, but was supplemented with new data to help resolve sensitive issues or management concerns. Data is on file in the Forest Supervisor's Office.

2. Analysis of the Management Situation (Planning Step 4)

This analysis examines resource supply and market conditions and determines suitability and feasibility for resolving issues. A multiple-use land analysis model (FORPLAN) was used to address a number of specific requirements, including benchmarks. Requirements include: (a) the projection of the Forest's current management program; (b) determining the Forest's ability to produce a range of goods and services from minimum management to maximum production; (c) evaluating the feasibility of reaching the national production goals (RPA targets) and social demands identified as issues and concerns; and (d) identifying monetary benchmarks which estimate the output mix which maximizes present net value (or minimizes the cost) of resources having an established market or assigned value.

3. Formulation of Alternatives (Planning Step 5)

The information gathered during the first four planning steps is combined and analyzed to formulate alternative management plans. The alternatives reflect a range of resource management direction. Each major public issue and management concern was addressed in one or more alternatives. Management prescriptions and practices were formulated to represent the most cost efficient way of attaining the objectives for each alternative. Both priced and nonpriced outputs are considered in formulating the alternatives (Miller, 1982).

4. Estimation of Effects of Alternatives (Planning Step 6)

The physical, biological, economic and social effects of each alternative were estimated and analyzed to determine how each responds to the range of goals and objectives assigned by the RPA program. FORPLAN was used to estimate some of the economic and physical output effects while other methods were used for remaining effects. The analysis included: (a) direct effects; (b) indirect effects; (c) relationships with other Federal, State, local and Indian tribe land use plans; (d) other environmental effects; (e) energy requirements and conservation potential; (f) natural or depletable resource requirements and conservation potential; (g) historic and cultural resources; and (h) means of mitigation.

II. Inventory Data and Information Collection

Significant Changes from Draft to Final EIS

No further analysis of timber suitability was performed, however additional documentation of the process was developed and included in the planning records: "An Analysis of Timber Resource Land Suitability", Haugen, June 10, 1986 (with a map). Portions of section II.A.4., below, were revised and expanded to clarify the distinction between Stage I and Stage II analysis and provide details of the process.

A. Forest Data Base

1. Capability Areas

The basic resource data storage unit is the capability area. Capability areas are lands delineated for the purpose of estimating their response to various management practices, resource values, output coefficients, and multi-resource or joint production functions (FSM 1920.5). There are approximately 6421 capability areas on the Forest with an average size of about 350 acres. Forest capability areas were developed using the following basic components:

a. Land Types

A land type is a unit of land with similarly designated soil, vegetation, geology, topography, climate and drainage. A complete description of the land types identified on the Forest is contained in Kuennen and Gerhardt, 1984.

b. Habitat Types

A habitat type is a land area potentially capable of producing similar plant communities at climax. A detailed discussion of habitat typing is contained in Pfister et al, 1977. Information on the habitat types of the Kootenai National Forest is available in the Forest planning records.

c. Slope, Elevation and Aspect

As well as being linked to land type, slope has important consequences with regard to the types of activities and equipment which can be used in an area. This, in turn, directly affects management costs and constraints. Slope is also an important factor in determining the capability of a particular piece of land to provide certain types of wildlife habitat. Slopes were defined as ranging from zero to twenty percent, twenty-one to forty percent, forty-one to fifty-five percent and over fifty-five percent. Maps based upon USGS topographic quadrangles are among the Forest planning records.

Elevation and aspect are also important indicators of suitability for wildlife use during particular seasons of the year. This information is contained on the USGS quadrangle maps.

d. Known Wildlife Use

Capability areas are defined in part by known wildlife use. This is particularly critical in defining capability to support grizzly and elk.

e. Seen Area and Visual Sensitivity

The "seen area" is the total area which is observed from major travel corridors or from specific user areas. Visual sensitivity is a measure of people's concern for the quality of the view of the seen area. Both concepts are useful in defining the capability of an area to be managed for visual quality. Seen area and visual sensitivity maps are among the planning records.

The land type and habitat type components are combined to produce ecological land units which are, in turn, combined with slope groups to define timber capability. Habitat type in combination with elevation, aspect and known wildlife use combine to define wildlife capability. Seen area and visual sensitivity combine to produce visual capability. All of these factors were combined to produce the management units used in the Unit Planning Process. These management units were further modified by Ranger District boundaries, State and County lines, watershed boundaries, recreation experience units, wilderness study area boundaries and water to produce capability areas. Professional judgement was used in defining capability area boundaries where, for example, a watershed boundary almost matched a recreation experience unit. These sorts of judgement calls prevented generation of a large number of tiny capability areas with essentially identical characteristics.

2. Analysis Areas

Analysis areas are one or more capability areas combined for the purpose of analysis in formulating alternatives and estimating various impacts and effects (FSM 1920.5). Capability areas were further stratified by existing timber types or condition classes and grizzly habitat situations then aggregated into analysis areas based on similarities in capability, timber types, and economic effects. There are 389 analysis areas. These Analysis Areas are critical components of the FORPLAN model. They are discussed in detail in Section III of this Appendix.

3. Production Coefficients

Resource outputs were developed for each analysis area by linking resource suitability and economics to analysis areas. Analysis areas suitable for timber production were linked to timber type maps which were linked to timber outputs. Cattle grazing outputs were related to analysis areas by habitat type, slope and cutting practice. Outputs of elk are a factor of inherent habitat potential as modified by management emphasis and the timing of management activities. Recreation coefficients were tied to population trends and the capacity of the land base to support recreationists. Water coefficients were developed for both naturally occurring and management induced runoff. Other resource data including costs, benefits, slope, geology, roadless situation, clearcut equivalents, grizzly bear habitat and riparian areas were utilized to further refine or constrain outputs.

Production coefficients used on the Forest were expressed in the following units:

Timber	Thousand cubic feet/acre
Dispersed recreation	Rec. visitor days/acre/year
Elk population	Elk/acre
Livestock	Animal Unit Months/acre/year
Water	Acre-feet/year
Road construction	Miles/decade
Road reconstruction	Miles/decade
Clear cut equivalents	Clear cut acres/cut type
Visual quality objective	VQO/management emphasis

Note that the timber coefficient used throughout the discussions in this Appendix sums to the live green component and is sometimes referred to as the "regulated" volume. This is the component that is modeled in FORPLAN. To determine the allowable sale quantity, the non-interchangeable component (salvage from suitable lands) must be added.

4. Suitable Lands

Forest personnel used resource data to determine acres tentatively suitable for management practices. All areas were considered suitable for some form of recreation and some type of wildlife use. Roadless area size and evidence of human activities were used to determine wilderness suitability. Forest habitat type, soils, timber type, and legal status were used to determine areas tentatively suitable for timber production. Forest habitat type and slope were used to determine areas tentatively suitable for domestic livestock management practices. Habitat type was used to determine areas tentatively suitable for elk summer and winter range. The Yellowstone Guidelines as modified for local situations were used to identify suitable grizzly bear habitat.

Stage I Timber Suitability Analysis. The Stage I analysis was designed to identify lands not suited for timber production because of their physical characteristics. The lands of the Kootenai National Forest were categorized as required by the regulations. The following table describes the acreage in each category. There were 1,788,000 acres of land determined to be tentatively suitable for timber production.

Table B-1

Identification of Tentatively Suitable Timberland (Acres)

Total net Forest area	2,245,000
Water	37,000
Nonforest land	45,000
Forest land (at least 10% stocked with trees)	2,163 000
Forest land not capable of industrial wood prdctn	291,000
Productive Forest land	1,872,000
Land withdrawn from timber prod. by congress	32,000
Land withdrawn from timber prod. by Chief FS	3,000
Available productive Forest land	1,837,000
Technologically unsuited for timber prod.	0
Irreversible resource damage	49,000
Restocking not assured	0
Tentatively suitable for timber prod.	1,788,000

The above categories were identified from land use classes developed for previous timber management planning efforts.

There are 13,565 acres of productive forest land in the Cabinet Mountains Wilderness area (94,360 acres total) so that area is included as productive timber land withdrawn from production by Congress. The remaining acres in the Cabinet Mountains Wilderness are shown as not capable of producing industrial wood.

The Ten Lakes Wilderness Study Area has 18,390 productive acres which are also shown as withdrawn by congress and 15,840 shown as not capable.

The acres of available productive forest land which are not tentatively suitable due to irreversible resource damage were those acres which could not be harvested if all the minimum management requirements are satisfied. The 3000 acres shown as withdrawn by the Chief include administrative and other developed sites.

Lands not capable of producing industrial wood were determined before September 30, 1982, and a breaking point of 20 cubic feet/acre/year was one of the criteria used (36 CFR 219.29b).

Stage II Timber Suitability Analysis. The tentatively suitable timber lands were further analyzed with the help of the Forest Planning Model (FORPLAN). A detailed analysis of the maximum PNV per acre generated by various timber management intensities is provided in a planning record entitled "Established Market Prices vs Assigned Monetary Values in FORPLAN" (Haugen, December 21, 1984).

Intensities of timber management were modeled as different management areas. Several management areas provide for no harvest and can be said to be the least intensive management schemes. The no harvest management areas include 1, 2, 3, 5, 6, 7, 8, 9, 10, 18, 19, 20, 21, 22, 23, 24, 27, 28, and 29. The various timber harvest management intensities are described by management areas 11, 12, 13, 14, 15, 16, and 17 (note that as a result of public comment MA 13 was moved to the no harvest category in the Final plan).

FORPLAN run 114A09 was used for this analysis. This run is described in section VI.C. of this Appendix. The run has few constraints. Harvest levels are allowed to fluctuate without limits, no minimum management requirements are in effect, and all available productive forest lands have the option to be harvested (note from Table B-1, above, that the "available productive" land acreage is greater than the "tentatively suitable" acreage). The option for no harvest at all also exists on all available productive forest lands. This configuration allows the model to freely select prescriptions based upon economic considerations.

Of the timber harvest management areas available for selection, only MA-12 (oriented toward development of big game summer range) and MA-15 (focusing on timber production) were ever selected. The no harvest option was selected in certain analysis areas, indicating that management without timber harvest made the largest contribution to PNV. Of the 1,837,000 acres of available productive land on the Kootenai, about 6 percent fell into the "no harvest" category while 17 percent fell into MA 12 and 77 percent into MA 15.

It is important to note that each alternative in the DEIS operates under a different set of constraints which affect the ultimate suitability of any piece of ground. Once the minimum management requirements are applied certain acres become unsuitable because they can not be scheduled for harvest without violating these constraints. A paper entitled "The Effects of Updated Economics on the Suitable Timber Land Base and A Comparison of the Final Forest Plan to Suitabilities When PNV is Maximized" (Haugen, June 10, 1986) provides more insight on how this works in practice. The lands identified as "not capable" in the Stage I analysis were carried forward, with refinements as necessary, to the Proposed and Final Plan. Each alternative in the DEIS includes specific acres ultimately defined as suitable and unsuitable to meet the objectives of the alternative.

5. Allocation and Scheduling

The condition classes of existing vegetation were used as a basis to schedule management activities over time for the various benchmarks and alternatives.

6. Monitoring

Forest planning data provides a base from which changes can be measured and will also be used to monitor implementation activities.

7. Plan Implementation Programs

The data base provides biological and physical data that will help develop subsequent programs for plan implementation. As more information is available, the data base will be updated and improved.

B. Sources of Data

Sources of existing inventory data used in the analysis are as follows (also see the reference list at the end of this Appendix):

1. Forest Service Manual, Management Information Handbook (MIH 1309.11) provided definitions for outputs, activities, effects and other information.

2. Vegetative habitat types were inventoried in conjunction with unit plans completed from 1973 to 1977. The process is documented in Forest Habitat Types of Montana (Pfister et al, 1977).

3. Land types for the Kootenai National Forest are rigorously described in A Soil Resource Inventory and Analysis for Land-Use Planning and Proposed Project Work by Kuennen and Gerhardt, 1984.

4. The national watershed identification system was used to identify regions and subwatersheds on the Forest. Maps are among the Forest Planning records.

5. Compartments are the timber compartments identified in the timber inventory system and are subdivisions of the subwatersheds. Maps are among the Forest Planning records.

6. Administrative boundaries are delineated on the Kootenai National Forest Map, 1981.

7. Slope was used in conjunction with land types to help delineate analysis areas. The slopes were extracted from U.S. Geological Survey maps.

8. Timber outputs were derived from the 1972 timber inventory. Timber types or size and condition classes were developed by Forest Service personnel.

9. U.S. Geological Survey maps, 1962-1978, and infrared aerial photos, 1975, were utilized to delineate streams, lakes, and riparian areas.

10. The recreation opportunity spectrum was utilized to map opportunities and develop capacity coefficients. The Recreation Information Management System was utilized to develop recreation visitor days. Hunting recreation was developed from success ratios and related information in the Montana Statewide Comprehensive Outdoor Recreation Program , Montana Department of Fish and Game, 1978 and is linked to estimated elk populations over time.

11. Livestock forage information was developed as described in Criteria for the Analysis of the Management Situation - Coefficients, Kootenai National Forest, 1981 (Dillon, 1980)

12. Elk population coefficients were based upon available habitat acres and the effectiveness of that habitat. Background information is contained in the "Western Montana Elk Habitat Timber Relations Guidelines"; the Montana Cooperative Elk-Logging Studies 1976-1979 ; Schoen,1977; Knight, 1970; and Irwin, 1978.

13. Mineral potential was developed utilizing the McKelvey system and mining claims officially recorded with the Bureau of Land Management.

14. Background sediment and sediment from management activities were predicted from Guide For Predicting Sediment Yields from Forested Watersheds, Cline et al, 1981, as modified for use on the Kootenai National Forest.

15. Background water yields and yields from management activities were predicted from A Computer Model for Determining Water Yield from Forest Activities, Isaacson, 1977, as modified for use on the Kootenai National Forest.

16. The visual resource was mapped using the Visual Management System (USDA Forest Service, 1977).

17. Economics. Stumpage value (except as noted) was based on bidder transaction evidence for 1974 to 1980; price trends from Haynes and Adams (1980); other resource values (price trends) from 1980 RPA reports (Beasley, 1978); and costs were developed by Forest personnel as documented in, Miller, 1982.

III. The Forest Planning Model (Including FORPLAN)

Significant Changes from Draft to Final EIS

All timber harvest was removed from MA-13 in part of the analysis leading to the Final Forest Plan (Alt. JF), timber yield tables were reviewed, and another approach to recreation projections was explored. Appropriate references have been added to this section. Note that throughout this Appendix all timber volumes mentioned are the live green component only. To arrive at the allowable sale quantity, the non-interchangeable component (salvage from suitable lands) must be added. The FORPLAN models include only the live green component. All commercial thinning was removed in Alternative JF.

A. Overview

The planning model consists of information and various analytic techniques combined to address planning questions and issues. The major analytic model is called FORPLAN.

FORPLAN is a computer program which provides the tools needed to construct and use large scale linear programing computer models. These models are designed to analyze thousands of possible management activities, practices, and resource outputs on specific land areas in order to select an optimal set capable of meeting various management constraints and goals (objective functions). For simplicity, these models will be referred to as 'FORPLAN' in this Appendix.

The specific land areas, analysis areas, were delineated by characteristics which have a fairly uniform response to management activities, costs, and benefits. Management activities and practices were assigned to analysis areas based on their suitability (see Part C of this section). Specific combinations of activities and outputs were assigned to analysis areas to represent various multiple use prescriptions called management prescriptions. Each of the 389 analysis areas has from 1 to 13 management prescriptions assigned to it. Resource outputs or production coefficients were developed for each combination of analysis area and management prescription. FORPLAN assigns those management prescriptions to analysis areas which produce the goods and services that maximize the objective function, after meeting all constraints. The objective function is said to be optimized when its value is as large as possible after all constraints are satisfied.

Alternatives are generated by constraining management prescriptions available to analysis areas, constraining the access to analysis areas for timber harvest in a particular decade, or constraining the outputs from analysis areas or groups of analysis areas. These constraints were designed to achieve the goals of an alternative. The conditions set by the constraints must be satisfied before the objective function is optimized. The analysis of the benchmarks and alternatives utilized the same objective function, to maximize present net value (See Section IV). In other words, after meeting all constraints the FORPLAN model assigned the remaining opportunities to produce the most economic value.

B. Analysis Process and Analytical Tools

Analyses leading up to the use of FORPLAN included designing management prescriptions (Planning Record: Management Prescriptions,Jan.27,1981), assigning practices to prescriptions (Planning Record: Management Area Prescriptions file), developing management costs and benefits (Miller, 1982),methods for determining practices (Planning Record: Management Prescriptions,Jan.27,1981) and predicting resource outputs (Planning Record: Criteria For the Analysis Of The Management Situation,Vol.4,Feb.,1981). Outputs predicted include timber yield, elk population, range forage, water yield, sediment, grizzly population, recreation potential, clearcut equivalents, road closures, visual quality objective and road construction and reconstruction. Certain outputs are calculated by the FORPLAN model and others are calculated using other models.

Cost efficiency was considered by the interdisciplinary team while they were developing a realistic and flexible set of management prescriptions. Professional judgment played a major role. FORPLAN was used to examine the comparative cost efficiencies of prescriptions. This is discussed further in section II.D.4., below.

Practices which required analysis included road closures, road construction, road density, and timber management guidelines for reforestation, silvicultural systems, logging method and rotation age. The growth prognosis model was used to develop existing and regenerated managed and unmanaged timber yield tables (Wykoff et al, 1981).

Major decisions that resulted from the preliminary analysis include the following that apply to all prescriptions:

1. all roads will be built and maintained to Forest-wide standards and guidelines. Variations occur by land types. Local road costs range from $27,500 to $84,000/mile depending on slope and soil stability (ELU group). (recent real cost reductions in road construction are discussed in Section VI.D.6.g. of this Appendix)

2. Timber sales are planned and administered to Forest-wide standards and guidelines, including coordination with cultural, visual, wildlife, soil, and water resources. This is to ensure meeting prescription objectives, including minimum management requirements.

3. Timber slash disposal and reforestation activities will take place in all timber harvest prescriptions.

4. Access controls to protect and/or enhance wildlife and recreation values were also included.

FORPLAN was utilized to provide the basis for optimal land designation and management prescription selection and scheduling for each analysis area. This process results in selection of the most cost-efficient management prescriptions and land designations that meet a given set of constraints and an objective function of maximizing present net value.

A social impact assessment and the identification of baseline socio-economic conditions were developed for the local area. Developed and dispersed recreation (including wilderness, big game and elk hunting, semi-primitive non-motorized recreation, semi-primitive motorized recreation, roaded recreation and primitive recreation) benefits and costs, were analyzed outside of FORPLAN. Budgets for recreation and wildlife programs, part of the range budget and "other" costs were also developed and analyzed. Receipts from mineral leases and special use permits were also projected outside FORPLAN.

C. Identification of Analysis Areas

Analysis Areas are the means used to tie multiple-use management prescriptions to the land. An analysis area is one or more capability areas grouped for purposes of analysis. They are grouped together on the basis of common physical, biological and economic characteristics. Analysis area delineation plays an integral role in resolving issues, management concerns, and identifying opportunities. Each analysis area was assigned one or more multiple use management prescriptions which were examined in the FORPLAN model. The combinations most effective in meeting the goals of each alternative were then selected by the FORPLAN model (Planning Record: Analysis Areas file).

The following general criteria were used during the development of Analysis Areas:

1. Analysis areas need not be contiguous. This means that one analysis area may be located at various places all across the Forest.

2. Analysis areas will be the same for all alternatives. This is essential in order for comparisons to be made among the alternatives. It provides a common base for the analyses.

3. The number of Analysis Areas will be kept at a practical level so that the FORPLAN models can function properly. As in any mathematical system calculations take time. If an unduly large number of Analysis Areas were used, the number of calculations and the time involved to perform them would exceed available computing resources.

The process used to identify analysis areas began with the determination of which items were needed to examine the issues and concerns and to identify critical effects. Several iterations were used to arrive at the final set of analysis areas. The final number of analysis areas is 389. The stratification is based on the following characteristics:

1. Wilderness, inventoried roadless area or some special status.
2. Interagency Grizzly Management Situations and major ecosystem
3. Working Group (timber).
4. Ecological Land Unit Group
5. Age class of the timber.

The following are the specific criteria used to aggregate capability areas into analysis areas according to the five listed characteristics.

1. **Level 1 Criteria - Wilderness, inventoried roadless area or Some Other Special Status**

This category includes the following areas:

a. Existing wilderness - Cabinet Mountains.
b. All water bodies
c. Ten Lakes Wilderness Study Area (S393) Roadless area 683.
d. Scotchman Peaks Roadless area (662)
e. Trout Creek roadless area (664)
f. Cabinet Face West roadless area (670)
g. Cabinet Face East roadless area (671)
h. Government Mountain roadless area (673)
i. McKay roadless area (676)
j. Chippewa roadless area (682)
k. Rock Creek roadless area (693)
l. Roderick roadless area (684)
m. Galena roadless area (677)
n. Cataract roadless area (665)
o. Buckhorn roadless area (661)
p. N.W. Peaks roadless area (663)
q. North Fork of Elk Creek roadless area (692)
r. Gold Hill roadless area (668)
s. Gold Hill West roadless area (176)
t. Berray Mountain roadless area (672)
u. East Fork of Elk Creek roadless area (678)
v. Lone Cliff-Smeads roadless area (674)
w. McNeeley roadless area (675)
x. Flagstaff roadless area (690)
y. Roberts Mountain roadless area (691)
z. Grizzly Peak roadless area (667)
aa. Zulu roadless area (166)
bb. Marston roadless area (172)
cc. Willard Lake-Estelle roadless area (173)
dd. Cube-Iron roadless area (784)
ee. Thompson-Seton roadless area (483)
ff. Administrative Sites
gg. Developed Recreation Sites
hh. General Forest lands

Existing wilderness is split out because designation changes are not allowed. The inventoried roadless areas and the congressionally designated wilderness study areas are kept separate for analysis purposes.

2. **Level 2 Criteria - Unused**

3. Level 3 Criteria - Grizzly Management Situation and Major Ecosystem

As an endangered species the grizzly bear requires special consideration (Rare and Endangered Species Act of 1973). This analysis area identifier level is used to subdivide the forest into the Cabinet/Yaak ecosystem and the Northern Continental ecosystem because they represent relatively independent populations of grizzly bear. These two ecosystems are further divided into Grizzly Management Situations which were based upon those developed for the Yellowstone area and modified for use on the Kootenai National Forest (Brooks, 1984). These guidelines involve differing management requirements to satisfy the requirements of the Act.

a. Cabinet/Yaak Ecosystem - Grizzly situation 1
b. Cabinet/Yaak Ecosystem - Grizzly situation 2
c. Cabinet/Yaak Ecosystem - Grizzly situation 3
d. Northern Continental Ecosystem - Grizzly situation 1
e. Northern Continental Ecosystem - Grizzly situation 2
f. Northern Continental Ecosystem - Grizzly situation 3
g. non-grizzly habitat

4. Level 4 Criteria - Working Group

Each analysis area is identified by a working group. These working groups are used to specify the type of timber that can be produced on the analysis area and the relative productivity of the land:

a. Mixed Conifer - High Productivity
b. Mixed Conifer - Low Productivity
c. Lodgepole Pine
d. Non-forest Land
e. reserved (Water, Cabinet Mountains Wilderness, Administrative Sites and Developed recreation sites)

5. Level 5 Criteria - Ecological Land Unit Group

Each analysis area is defined by an ecological land unit group. These groups are generally defined by the physical characteristics of the soil and geology. They strongly relate to slope and are indicative of costs of management including road costs.

a. Erosional - generally moderately steep slopes 41-60% slope
b. Depositonal - generally flat or sloping valley bottoms 0-40% slope
c. Breaklands - steep, often rocky slopes over 60% slope

6. Level 6 Criteria - Condition Class

This criteria was used to identify existing timber conditions on the Forest. This information is used to predict response coefficients for timber, cover/forage relationships, old growth, grazing, and management costs. It is also responsive to the timber, wildlife and grazing issues. The condition classes used are:

a.	NONSTK	Nonstocked
b.	SEESAP	Seedlings and saplings
c.	POLIMS	Poles and immature sawtimber
d.	MATSAW	Mature sawtimber
e.	STAGLP	Stagnated lodgepole pine

7. Analysis Areas and Timber Suitability

Table B-2 summarizes how the analysis areas are classified according to timber productivity. Differences between the following table and Table B-1 are a result of rounding and the separation of the Cabinet Mountains Wilderness into a separate Analysis Area. All lands listed below as productive are considered to be tentatively suitable except for about 18,000 acres of productive land in the Ten Lakes Wilderness Study Area which has been withdrawn by Congress, 3,000 acres of developed and administrative sites withdrawn by the Chief of the Forest Service and 49,000 acres which could never be managed for timber within the 200 year time horizon of the FORPLAN model without violating some minimum management requirement.

Table B-2

Number of Analysis Areas and Acres by Timber Productivity Class

	Analysis Areas	Thousand Acres
Productive Land (except Cab)	321	1,860
Non-Productive Area (except Cab)	67	292
Cabinet Mountain Wilderness	1	94
Total	389	2,246

The following special areas were included in the suitable and unsuitable timberlands; however, the acreage of each, by analysis area, has been determined to facilitate adjustments in analysis area acreage and the distribution of outputs:

Ten Lakes Montana Wilderness Study Area
Research Natural Areas
Developed Recreation Sites
Administrative Sites

D. Identification of Prescriptions

1. Overview

NFMA regulations define management prescriptions as "management practices and intensities selected and scheduled for application on a specific area to attain multiple-use and other goals and objectives" (36 CFR 219.3). Generally, a management prescription is a set of treatments or practices used to develop and/or protect some combination of resources on a particular land type.

2. Design of Management Prescriptions

The interdisciplinary team reviewed the public issues and management concerns, used professional judgment, consulted existing policy and legislative direction and research for guidance in developing twenty-nine cost efficient, multiple-use management prescriptions which were eventually narrowed to twenty-two as displayed in the Forest Plan document. This set of management prescriptions portrays a broad range of management emphasis, intensities, practices, standards and guidelines. The management standards and guidelines needed to accomplish the goals of a prescription include the necessary mitigation and resource coordination measures that are required by existing laws, policies and regulations. The management standards and guidelines are contained in the Forest Plan, and are also available in the Forest Planning Records. Management practices, standards and guidelines were then developed and assigned to each goal statement by interdisciplinary work groups. Practices were developed and assigned based on current research, feasibility, cost efficiency, potential for resource damage and ability to meet minimum management requirements.

The management prescriptions were designed to:
- Project the current program to evaluate implications
- Explore resource potentials
- Explore opportunities to improve efficiency
- Explore opportunities to resolve issues and concerns
- Explore opportunities to meet national goals (RPA)

Prescriptions were also created to help explore the cost efficiency of alternatives.

Development of management prescriptions began with the "Consolidated Unit Plans", broad categories of resource emphasis (e.g., timber, wildlife, recreation and wilderness) further broken down by differences within each broad category (e.g. big game winter range, big game winter range/timber, grizzly, grizzly/timber).

During the week of September 15 - 19, 1980, the ID team wrote management prescriptions to describe the current situation, using the unit plans as a basis.

The following guidelines and criteria were used to develop the management prescriptions for the current situation:

a. prescriptions will be used to describe as closely as possible what is actually happening now, not what we might wish were happening. This implies both an emphasis and an intensity or level of expenditure. Note that this is constrained a bit due to the need for generalization.

b. in some cases the Unit Plans are silent as to an activity which we know is occurring under some guidelines (e.g. off road vehicle management). These should be stated in the prescription only if they are not mandated elsewhere. When doubt existed, the guidance was included in the prescription.

c. specialists were thinking "what operating standards are necessary to meet laws and regulations and the intent of the management emphasis" and "which of these standards are we currently using?" In addition, specialists were acutely aware of interactions with other specialties.

d. the specialists know what level of detail is necessary to be reasonably sure that the results that are achieved are the desired results. The intent is to delineate the range of activities that can occur while attaining the desired outputs without squelching creative or innovative approaches developed later.

The set of evaluation criteria used in developing the management prescriptions were as follows:

A management prescription must:

a. provide enough information so it is possible to identify the unique features within a prescription that distinguish it from all other prescriptions. This makes the development of FORPLAN coefficients more concise and less redundant.

b. be applicable in a practical manner to the situation where it is to be applied. Don't, for example, develop a prescription for primitive recreation on fully developed timber areas.

c. be a reasonably accurate description of the existing situation.

d. supply sufficient information so that all the analysis areas to which the prescription may be applied can be identified.

e. allow for alternative intensities of management while aiming toward the same goal.

f. provide sufficient guidance so that, when managers are operating within the standards and guidelines, the goal of the prescription will be consistently approached.

The sum of all the prescriptions must:

allow full consideration in FORPLAN of a wide range of options, for any particular area.

A management prescription should:

a. supply sufficient information so that realistic assumptions about the results of the prescription can be made by specialists when analyzing the effects of an alternative Forest Plan.

b. not restate requirements of law or regulations.

c. not be oriented toward specific projects.

d. be realistically achievable.

e. be sufficiently descriptive so that the public and Forest Service have a common understanding of what will be occurring on any area managed under the prescription.

f. allow sufficient latitude to land managers to use innovative approaches to achieve the goals of the prescriptions.

g. not restate general guidance.

h. not force a practice to occur on a portion of an analysis area where it is not applicable.

The current situation prescriptions were completed and distributed for internal review on September 24, 1980. During the week of October 13-17, 1980, the ID team met to develop an updated set of prescriptions that could be applied to the development of alternatives other than the current situation. The same criteria were used except that the intent was to develop prescriptions with different intensities or emphases as needed to describe other situations which could occur. This second set of prescriptions were distributed for internal review on October 26, 1980. The ID team met again on November 20, 1980 to revise the prescriptions based upon input derived from the internal review. Since 1980, various minor revisions have been made to the prescriptions with the consent of the ID team.

Forest-wide standards and guidelines were developed to cover practices which are common to all prescriptions which apply the practice. The major Forest-wide standards and guidelines are related to road construction, recovery of the grizzly population and protection of soil and water.

Some of the prescriptions emphasize (within a multiple-use context) a specific resource such as the timber, wildlife, range, riparian, and visual prescriptions. Originally intensities of management were allowed to vary within prescriptions increasing the range of choices available to the FORPLAN model. The series of FORPLAN analyses which were developed for the EIS released in 1982 demonstrated that these intensities had little affect upon the results produced by the model. For this reason alternative intensities within a given prescription were not applied in the analyses described in this document. Other prescriptions serve a single purpose such as the administrative site prescription. Cost efficiency was considered by the team during the development of these prescriptions. A variety of research was used in the development of the prescriptions. This research is documented in the references listed in Section II-B and in the reference list at the end of this Appendix.

Completed prescriptions were reviewed, discussed and revised as necessary by the management team, the interdisciplinary team and the core team. From the basic set of prescriptions appropriate yield and cost tables were developed for use in FORPLAN. These prescriptions were used for the development of both benchmarks and alternatives, after additional screening, to ensure that they were cost efficient. Alternatives having similar outputs for some resources may differ widely in how the land is designated (assigned) to various prescriptions. These differences are apparent when comparing the alternative maps. The review criteria used by the management team included:

> "Determine if all applicable practices have been included that are necessary to accomplish the prescription goal statement."
>
> "Test the standards and guidelines for accuracy and completeness."
>
> "If a piece of ground is allocated to this prescription, are these the things we would do to efficiently emphasize this resource?"

3. Purpose, Criteria, and Assumptions for Prescription Categories

The purposes of specific prescriptions are to portray a management activity presently being practiced on the Forest, to respond to a particular issue or group of issues, and to provide a range of management options that could be applied to various land areas.

Comparative outputs between prescriptions were also examined. This information is useful in the explanation of trade-offs that occur when numerous prescriptions interact within individual alternatives. Forest planning records contain detailed information.

The prescriptions used in FORPLAN can be grouped into general categories by major resource element or application. The categories are timber, wildlife, recreation, visual and special.

a. Timber and Visual Category

(1) Purpose

This set of prescriptions was developed to provide an option for timber management on every acre of tentatively suitable timberland. In addition a range of silvicultural techniques is used to explore the desirability of providing various levels of scenic beauty while trading off outputs from other resources.

(2) Criteria and Assumptions

Provide an option for maximum production of timber using a range of economical and viable logging systems and silvicultural techniques.

Recognize and provide for other resource uses compatible with timber harvest production at full yields.

Develop standards, guidelines and costs using commonly accepted management practices currently in use.

Use the basic concepts of the Forest Service visual management system in concert with available silvicultural techniques to provide a range of visual quality objective options.

b. Wildlife Category

(1) Purpose

This category of prescriptions was developed to address the issues of big game management, grizzly bear recovery and the retention of viable populations of all vertebrate species distributed across the Forest.

(2) Criteria and Assumptions

Design the prescriptions for use in high and regular elk summer range habitat and important winter range.

Provide for other uses which are compatible with or complimentary to management for big game habitat.

Provide for recovery of the grizzly bear population.

Provide a diversity of habitats and habitat components to insure survival of all native vertebrate species.

Design standards, guidelines, and costs using commonly accepted management practices currently in use.

c. Recreation Category

(1) Purpose

This set of prescriptions was developed to address the issues surrounding the various sorts of recreation experiences including the potential for the Kootenai National Forest to supply varying amounts of wilderness recreation.

(2) Criteria and Assumptions

Design the prescriptions for roadless recreation so that they can be applied to areas that are currently essentially roadless.

Each inventoried roadless area has an option to remain in a roadless condition to support non-motorized recreation. Non-commercial analysis areas and portions of partly roaded analysis areas may be assigned the non-motorized recreation prescription if suitability for that sort of recreation exists.

In accordance with the Regional Guide, developed recreation will be retained on the acres currently assigned that use.

Assign prescriptions for the various kinds of recreation experiences only on areas where appropriate suitabilities exist.

Develop standards, guidelines and costs using commonly accepted management practices currently in use.

d. Special Area Category

(1) Purpose

This category includes those prescriptions designed to model special situations which exist across the Forest.

(2) Criteria and Assumption

Where existing uses are in effect, and no change in management is contemplated, pattern the management after the current approved direction.

Develop standards, guidelines and costs using commonly accepted management practices currently in use.

e. Custodial Category

(1) Purpose

These prescriptions were developed for application to nonforest lands and lands not suitable for timber production due to unstable soils, regeneration problems or low productivity. Included in this category is the Minimum Management prescription involving maintenance of productivity but deference of timber harvest activities beyond the 200 year horizon.

(2) Criteria and Assumptions

Provide for a mix of uses compatible with adjacent areas, excluding timber management, which preserves management options for an extended period.

4. Use of Cost Efficiency in Developing Prescriptions

Cost efficiency was considered in developing prescriptions in the following manner. Objectives, standards, and guidelines were established for each prescription by resource element. Given the objective of the prescription, costs were estimated for resource elements to meet the standards or guidelines of the prescription. Costs of producing the outputs that would result from implementing the prescription were developed and compared to the benefit values produced. Additional detail on the analyses of prescriptions and their use in FORPLAN is provided in "Established Market prices vs assigned Monetary Values in FORPLAN" (Haugen, 1984) and "The Effects of Updated Economics on the Suitable Timber Land Base and a Comparison of the Final Forest Plan to Suitabilities When PNV is Maximized" (Haugen, 1986). Both documents are in the Forest Planning records. The second document is summarized in section VI.D.6.g. of this Appendix. FORPLAN Objective Function diagnoses 9 and 10 provide an analysis of the costs and benefits of the various management prescriptions assigned to an analysis area. We also used a computer program called XMAS to examine the PNV of every possible managment prescription for each category of land and for each possible decade of implementation. For more on this subject refer to section II.A.4 of this Appendix. Prescriptions were carried forward if they were cost efficient in achieving prescription goals.

Two basic assumptions used in developing prescription costs were: costs experienced in implementing past practices were a reasonable basis from which to predict future costs; and the funding for production of outputs would include only the necessary funding.

5. List of Prescriptions

Following are the prescriptions used in FORPLAN. Additional details are available in the Forest Plan and among the Planning Records.

TIMBER AND VIEWING CATEGORY:

TMBOPT - Timber Optimization (MA-15)
Manage timber for a high level of production using primarily a clearcut harvest type and precommercial thinning along with two commercial thins on the most productive lands and one commercial thin elsewhere.

TMVIEW - Timber/Viewing (MA 16)
Manage timber for fairly high levels of production while maintaining a modification Visual Quality Objective (VQO) through the use of about 50% shelterwood cuts along with thinning as described for TMBOPT.

VIEWTM - Viewing/Timber (MA 17)
Manage for a partial retention VQO while producing a moderate level of timber. Use shelterwood cuts 75% of the time (modeled as 100%) and precommercial thins along with a single commercial thin.

VEWING - Viewing (MA 5)
Manage to maintain or enhance the landscape to provide a retention VQO without scheduled timber harvest.

WILDLIFE CATEGORY:

BGWRGE - Big Game Winter Range (MA 10)
Maintain or enhance the habitat for winter use by big game species without scheduled timber harvest.

BGWRTM - Big Game Winter Range/Timber (MA 11)
Maintain or enhance the habitat for winter use by big game species by means of cover/forage ratio manipulation accomplished through programmed timber harvest using clearcuts.

BGSRTM - Big Game Summer Range/Timber (MA 12)
Maintain or enhance non-winter habitat for big game species while producing a programmed flow of timber using 20% shelterwoods and 80% clearcuts (modeled as 100% clearcuts to keep the size of the model within reasonable limits) and no thinning.

GRIZTM - Grizzly/Timber (MA 14)
Maintain or enhance grizzly bear habitat, reduce grizzly/human conflicts and assist in the recovery of the grizzly bear population while producing a programmed flow of timber using silvicultural techniques as described for BGSRTM.

WLDTIM - Wildlife/Timber (MA 13)
Provide the special habitat necessary for old growth dependent species by using 20% shelterwood and 80% clearcut (modeled as 100% clearcut to keep the size of the model within reasonable limits) harvests and thinning, on the most productive sites, with a rotation extended beyond 240 years. In much of the analysis used to develop Alternative JF, all timber harvest options were removed from this prescription (see sections VI.C.3. and VI.D.6 of this Appendix).

RECREATION CATEGORY:

WILDER - Wilderness (MA 7)
Manage to allow natural processes to continue without interference by humanity.

PWLDER - Proposed Wilderness (MA 8)
Manage to retain wilderness characteristics and values pending action by Congress.

WLDSTD - Wilderness Study (MA 9)
Ten Lakes Montana Wilderness Study Act area managed to retain wilderness characteristics pending a recommendation by the Forest Service and action by Congress.

PRIMRC - Primitive Recreation (MA 29)
Manage to maintain a natural condition free from the evidence of humanity with maintenance an enhancement of wildlife habit.

SPNMRC - Semi-Primitive Non-Motorized Recreation (MA 2)
Manage to provide for the protection and enhancement of roadless recreation use in concert with wildlife without programmed timber harvest.

SPMREC - Semi-Primitive Motorized Recreation (MA 3)
Manage to provide opportunities for dispersed recreation activities in a naturally appearing setting using trails and primitive roads for motorized access. No programmed timber harvest.

DEVREC - Developed Recreation (MA 6)
Manage to provide safe and sanitary developed recreation in a setting that is pleasant and visually attractive.

SPECNT - Special Interest (MA 21)
Manage to preserve and protect the qualities from which a special interest is derived while providing access and interpretation to users.

SPECIAL CATEGORY:

ADMSIT - Administrative Sites (MA 20)
Maintain sites for the administration of the Forest in a safe and efficient manner.

LNDEXG - Land Exchange (MA 27)
Manage to retain the basic land value for possible exchange.

WATERS - Water Bodies (MA 28)
Manage to provide water based recreation experiences.

CORDOR - Corridors (MA 23)
Provide for the safe and efficient transmission of electricity while protecting the character of adjacent land designations.

CUSTODIAL CATEGORY:

MINREG - Minimum Use Due To Regeneration Problems (MA 18)
Maintain existing vegetation until techniques are available to insure that timber can be harvested and regenerated within five years then reevaluate the designation.

MINSLO - Minimum Use Due To Unstable Slopes (MA 19)
Insure soil stability and water quality by maintaining the vegetation in a healthy condition and by minimizing surface disturbance.

MINYUK - Minimum Use Due To No Suitability For Use (MA 24)
Insure soil stability and water quality by minimizing soil disturbance.

6. References

Management prescription practices, standards, and guidelines are documented in Planning Record: Management Prescriptions, January 27, 1981. The prescription intensity details are documented in the same Planning Record. Table B-3 compares the prescriptions to the standards and guidelines. See the list of references at the end of this Appendix for more items.

TABLE B-3
Comparison of Prescriptions to Standards and Guidelines

MANAGEMENT PRE-SCRIPTION	Road Density Mi/SqMi	Regulated Harvests	Reforest in 5 years	Rotation Period Years	Opening Size Acres	VQO	ROS Class	Road Sedmnt Mtgate Percent
TMBOPT	1.1-5.8	YES	YES	80-130+	<40	MM	Rural	25-75
TMVIEW	1.1-5.8	YES	YES	80-130+	<40	M	RNA	25-75
VIEWTM	1.1-5.8	YES	YES	80-140+	<40	PR	RNA	25-75
VEWING	NA	NO	NA	NA	NA	R	RNA	NA
BGWRGE	NA	NO	NA	NA	NA	vary	RNA	NA
BGWRTM	1.1-5.8	YES	YES	70-130+	<40	vary	RNA	25-75
BGSRTM	1.1-5.8	YES	YES	80-140+	<40	vary	RNA	25-75
GRIZTM	1.1-5.8	YES	YES	80-140+	<40	vary	RNA	25-75
WLDTIM	1.1-5.8	YES	YES	240-260+	<40	vary	RNA	25-75
WLDTIM**	NA	NO	NA	NA	NA	vary	RNA	NA
WILDER	NA	NO	NA	NA	NA	P	Prim	NA
PWLDER	NA	NO	NA	NA	NA	P	Prim	NA
WLDSTD	NA	NO	NA	NA	NA	P	Prim	NA
PRIMRC	NA	NO	NA	NA	NA	R	Prim	NA
SPNMRC	NA	NO	NA	NA	NA	R	SPNM	NA
SPMREC	NA	NO	NA	NA	NA	R-M	SPM	50-60
DEVREC	NA	NO	NA	NA	NA	R	RNA	75
SPECNT	NA	NO	NA	NA	NA	R	RNA	75
ADMSIT	NA	NO	NA	NA	NA	R	RNA	75
LNDEXG	NA	NO	NA	NA	NA	vary	RNA	25-75
WATERS	NA	NA	NA	NA	NA	NA	NA	NA
CORDOR	NA	NA	NA	NA	NA	MM	Rural	70
MINREG	NA	NO	NA	NA	NA	vary	RNA	25-75
MINSLO	NA	NO	NA	NA	NA	vary	RNA	25-75
MINYUK	NA	NO	NA	NA	NA	vary	RNA	25-75

* Road sediment mitigation percent varies because variable miles of road are closed

** Indicates the WLDTIM prescription with no timber harvest as used in development of Alternative JF.

E. Development of Timber Harvest Intensities

Timber management regimes were developed for the various management prescriptions by considering the types of silvicultural practices that are feasible and sound for each working group for each condition class. The growth prognosis model (Wykoff and others, 1981) was utilized to predict timber yield for various silvicultural systems and intensities within each combination of working group and condition class. Several reviewers of the DEIS commented on the timber yield tables. As a result, the tables were carefully reviewed and determined to be reasonable. For more details on this analysis, refer to letter #301 in Appendix E. Costs and benefits were developed for practices and outputs associated with each regime.

Yield tables for each combination of working group (productivity class) and condition class (age) were developed for the following regimes:

No management

Precommercial thinning at age 20 to 30

Precommercial thinning at age 20 to 30 with commercial thinning at age 70 to 80

Precommercial thinning at age 20 to 30 with commercial thinning at age 40 to 50 and again at age 70 to 80. This is only used on highly productive sites (MIXCON I) under intensive management in Management Area 17 and 18 and under moderate intensities in Management Area 15 (TMBOPT prescription). The FORPLAN diagnoses used in the analysis described here did not use the intensive level of management on Management Areas 17 and 18 as discussed earlier.

Regeneration harvest ages were established for combinations of working group and condition classes depending upon the management prescription involved. As an example the timber yield tables assigned to management area 17 were based upon shelterwood harvest at a rotation of 110 to 140 years.

The next step was to analyze these practices and regimes both from a timber yield and economic standpoint to see if there were opportunities to eliminate intensities which didn't contribute to an adequate range. The details of this process are documented in: Criteria for the Analysis of the Management Situation, Volume 4, Coefficients, February 1981.

The assignment of silvicultural regimes to analysis areas varies by working group and management prescription. Shelterwood cutting was used in FORPLAN only with management prescriptions with a viewing emphasis. The use of two commercial thins was originally permitted on highly productive sites where regeneration difficulties were expected or viewing was intensively emphasized. Experience with modeling two commercial thins in these areas showed that they were not cost effective and generally impractical thus this regime is not used in the current set of diagnoses except under the TMBOPT prescription.

Rotation ages were expanded to reflect the requirements of each management prescription. For example, the wildlife timber prescription as used in the development of most of the alternatives requires a rotation of about 240 to 260 years; therefore, the harvest entry periods in FORPLAN must allow trees to grow to this age. In order to meet certain minimum management requirements, it was also necessary to allow harvest beyond the rotations noted in the above table which, in turn, allowed more flexibility to schedule harvest.

Detailed analysis of assignment logic is found in Planning Record: Management Prescriptions, January 27, 1981.

F. Development of Yield Tables and Coefficients

1. Overview

This section describes how the yields for each resource, road construction and sediment production were developed. Some yields were developed for analysis in FORPLAN and some were analyzed outside of FORPLAN.

2. Timber

Yield tables for existing and regenerated analysis areas were developed from 1972-78 timber inventory data using the growth prognosis model (Wykoff and others, 1981). The timber inventory data was updated to 1980 prior to the growth projections. The growth prognosis model was modified to reflect Forest stocking capacities and to provide yields based on the utilization standards projected in the Regional Guide. Several reviewers of the DEIS commented on the timber yield tables. As a result, the tables were carefully reviewed and determined to be reasonable. For more details on this analysis, refer to letter #301 in Appendix E. The Regional Guide identifies the preferred utilization standard as 6 inch d.b.h. for lodgepole pine and 7 inch d.b.h. for all other species.

The results of individual stand projections were summarized by working group and condition class using a program developed by Northern Region personnel. Each stand in a group was weighed by a factor based on the sampling procedure used in the timber inventory. The process resulted in yield tables based on more than one stand. These yield tables were adjusted by form and defect factors developed by destructive sampling in the timber inventory. Both cubic foot and board foot tables were developed. See Planning Record: Criteria for the Analysis of the Management Situation, Volume 4, Coefficients, February 1981, for a detailed description of the timber yield table construction.

Timber yields vary by condition class, working group, silvicultural system, and time. First decade (1988) existing stand board foot/cubic foot volumes and regenerated yields at age 140 are shown in Table B-4.

Table B-4
First Decade Timber Yield
(MBF/MCF per Acre)

Condition Class	Productivity Class MIXCON I	MIXCON II	LPP
Existing timber			
High Risk Sawtimber (LPP)	NA	NA	12.57/3.93
Mature Sawtimber	21.60/4.32	12.77/2.78	NA
Poles and Immature Sawtimber (combined with LPP mature)	9.73/2.78	8.12/2.46	5.69/1.90
Existing seed/sap regen regen at 140 yrs	25.76/5.60	26.14/5.68	23.18/5.39

Shelterwood seed cut removal volumes range from 60 to 75 percent of the above volumes depending on working group and prescription.

3. Recreation

Recreation visitor day capacities by management emphasis are in FORPLAN. These capacity estimates were adjusted with updated RVD per acre values as documented in Planning Record: Haugen, 1984. Demand for the various sorts of recreation is based upon area population growth projections and historic use levels. Demand was developed outside of FORPLAN. Projections of demand are independent of the capacity supplied by the Forest. The demand projections are documented in Planning Record: Haugen, 1984b.

As a result of comments received on the DEIS (#305), a different demand projection was developed based upon Montana population trends and non-resident visitor projections. A model as described in the 1983 Montana Statewide Comprehensive Outdoor Recreation Plan (SCORP) was tested. This model projected use levels 2% higher in the second decade and 4% higher by the fifth decade than the projections used in developing the DEIS. The original demand projections were retained in the FEIS for two reasons: (1) a difference of 2% to 4% is minor considering a projection of this sort, and (2) the SCORP model is based upon a 3% per year increase in non-resident use projected for the Flathead Valley (Glacier National Park), an area which has a greater diversity of recreational opportunity and is thus likely to experience a larger increase in non-resident use than the Kootenai National Forest. More details are provided in "Development of a Response to State of Montana Comments on the Kootenai National Forest Plan and DEIS - Recreation Use Projections" (Haugen, 1986), in the Planning Records.

Elk hunter recreation estimates were based upon herd populations, a 15% harvest and hunter success ratios. The 1978 Montana Statewide Comprehensive Outdoor Recreation Plan (SCORP) estimates that forty percent of total big game hunting RVD's are associated with elk. The other big game hunting RVD's are therefore estimated at 1.5 times the elk hunter RVD's.

4. Elk

Elk outputs are determined from habitat potential as modified by management emphasis. Actual elk numbers are based on the acres of habitat available and the effectiveness of that habitat to supply the needs of elk as measured by the "Western Montana Elk Habitat Timber Relations Guidelines". The Kootenai FORPLAN model calculates the potential elk capacity based upon the types of activities which occur in individual management areas over the long run. This number is adjusted outside the model to account for the actual amount of timber harvest in MA 12 and MA 14 in each decade. (Planning Records include more discussion on elk habitat requirements).

5. Range

The forage production estimated within FORPLAN is based upon the following assumptions:

1. All livestock range on the Kootenai National Forest is transitory in nature and is classified as commercial forest land
2. Guidelines governing proper use of forage plants are followed
3. Suitable forage production varies by habitat type group, slope, average forage value and timber cutting practices

The Forest was broken into four habitat type groups as follows:

Douglas-fir I (dry sites)
- Habitat types: 130, 160, 140, 210, 350, 320, 340, 230
- Total Acres: 226,372

Douglas-fir II (wetter sites)
- Habitat types: 250, 260, 270, 280, 290, 420, 450
- Total Acres: 298,294

Grand Fir
- Habitat types: 520
- Total Acres: 149,617

Subalpine Fir (low)
- Habitat types: 620,670, 730, 740
- Total Acres: 558,096

Production tables in pounds of forage production by habitat type group and cutting practice were developed. These values were converted to AUM's and adjusted for 50% proper use (FSM 2210). In addition a slope factor was used to reduce the useful AUM's on steeper slopes. The reduction was 30% on slopes from 20 to 40 %, 90% on slopes between 40 and 60%, and 100% on slopes over 60%.

For details on the process used, refer to Forest Planning Record: Dillon, 1980.

Demand for AUM's has been relatively constant on the Forest at about 13,000 AUM's per year. This is primarily related to problems of winter weather and costs of using the sort of transitory range available on the Forest. It is assumed that this demand will remain constant so only AUM outputs up to this level are valued and reported. FORPLAN outputs were adjusted accordingly.

6. Water Yield

Impacts from timber harvesting and road construction on Forestwide water yield were estimated using the Equivalent Clearcut Area (ECA) concept (USDA, 1975). This concept was developed from field observations, research and data from the Northern Rockies on streamflow responses to Forest management activities. The analysis produced reasonable indications of water yield trends, relative differences between alternative actions, and approximate, quantified, expected outputs for water yield.

To perform the water yield computations, acres of timber harvest by silvicultural treatment from FORPLAN were obtained by decade. The existing, baseline, and outputs by alternative were determined by a computerized version of Forest Hydrology, Part II: Hydrologic Effects of Vegetation Manipulation (USDA, 1975) that estimated the water yield situations for all third to fifth order watersheds on the Forest.

Even though water yield was not a public issue or management concern, a minimum management requirement in the form of a scheduled output constraint on clear cut equivalents was used in FORPLAN to model the legal considerations for the hydrologic integrity of stream channels.

7. Roads

The FORPLAN road output is millions of feet of local road construction and local road reconstruction per decade during the planning period. Roads are modeled as built during the first entry of the existing stand. Since FORPLAN can only calculate those roads built within any particular cutting unit and not those roads necessary to get to the unit, the FORPLAN output was adjusted outside the model. The total length of roads constructed over the planning horizon was converted to miles and used as calculated. The construction schedule was adjusted based upon observed trends of the miles of road work (construction and reconstruction) per MMBF of harvest. The ratio of construction to reconstruction was initially determined from FORPLAN and gradually decreased to conform to observed trends. The result is a schedule of road construction which builds all needed local roads within a two to three decade period and a schedule of continuing reconstruction.

The miles of road needed per acre within each analysis area varies by ELU group which is indicative of logging system (tractor, mixed or aerial) and the miles of road which currently exist within each analysis area. Reconstruction miles needed per acre vary by the existing miles of road and the miles of road yet to be built.

Roads are reconstructed periodically in the model using a scheduled output for reconstruction of roads in existence prior to decade one and another output for reconstruction of roads that are built later. These outputs were summed and adjusted outside FORPLAN to account for the same situation as was described above for road construction.

The costs vary by ELU group and were adjusted outside FORPLAN to properly account for the revised construction and reconstruction schedules.

8. Sediment

The sediment yield production procedure used on the Kootenai National Forest was developed by a work group composed of soil scientists, hydrologists, and watershed specialists of the Northern Region, Intermountain Region, and the Intermountain Forest and Range Experiment Station. The procedure is applicable to the Northern and Intermountain Region's forested watersheds. Entitled "Guidelines for Predicting Sediment Yields," draft 1980, the procedure was developed principally for watersheds in or generally associated with the Idaho Batholith, but was modified for use on the Kootenai.

The model is applied on watersheds that are stratified using land systems inventory map units. For individual land types or groups of land types, the model produces quantified estimates of sediment yields prior to any management (natural sediment yield) and sediment yields in response to four management activities for any number of years. The types of management activities modeled on the Kootenai were roading, logging, fire, and crawler tractor site preparation. The model, as designed, estimates on site erosion for a given management activity, modifies the amount of erosion according to general land unit characteristics, and delivers the eroded material to the stream system. The model has the additional capacity to route the sediment through the watershed to a critical stream reach where interpretations are made and where monitoring for achievement of planning objectives should take place.

The model simplifies, for analysis, an extremely complex physical system and is developed from a limited data base and scientific knowledge pool. Although it provides specific quantitative values for sediment yield, the results should be treated as rather broad estimates of how real systems may respond. The validity of this model is best when the results are used to compare alternatives, not for predicting specific quantities of sediment yields.

9. Fisheries

Fish yields are calculated in smolts, resident fish and their sum outside of the FORPLAN model. Primary input to the fish yield model comes in the form of sediment production by subdrainage from the sediment yield model described above. This model has the same inherent limitations as the sediment yield model and is thus primarily useful for comparison of alternatives and identification of general trends. The model considers the following: (1) spawning suitability of particular stream reaches in each subdrainage,(2) the percentage change in sediment yield over the base level, (3) data on current populations collected from stream surveys, and (4) estimated fish per stream acre by spawning suitability and sediment concentration. This data is then used to generate estimates of smolt and resident fish population by stream reach. Resident fish populations were then adjusted upward to account for mitigation for direct habitat improvement carried out with KV funding. Further information is contained in the Planning Record: Criteria for the Analysis of the Management Situation, Volume 4 - Coefficients, February 1981.

G. Analysis Done Outside FORPLAN

1. Overview

The preceding section briefly indicates the processes used to generate the yields displayed elsewhere in this appendix and the body of the EIS. As noted, some of these analyses were developed within the FORPLAN model and others were generated outside the FORPLAN model. In most cases those generated outside of FORPLAN used information generated by FORPLAN as input to other models. Where outputs from FORPLAN were valued in that model or had their values calculated outside the model it was necessary to externally adjust benefits, costs and PNV. This section will describe how the various outputs were developed and used to adjust the PNV from FORPLAN.

2. Developed Recreation

The Northern Regional Guide, June 10, 1983, notes that increases in developed site capacity will occur only in locations where use presently exceeds capacity or will exceed capacity by 1990. Under the assumption that users can be accommodated up to a level of 75% of theoretical site capacity, the Forest should have adequate capacity through decade 15. On this basis it was assumed that there would be no increase in developed recreation capacity in any of the alternatives. Demand levels were developed based upon population projections and 1984 use. For each decade the lessor of demand or capacity was valued at $3.00 per RVD and appropriately discounted outside the model. There were no recreation values included in the model so constraints were used to achieve desired capacity levels.

3. Other Recreation

Recreation benefits for roaded recreation, semi-primitive motorized recreation, semi-primitive non-motorized recreation, and wilderness recreation were developed similarly to those calculated for developed recreation. The capacity available for these sorts of recreation varies by alternative based upon designated uses of the Forest land base. Demand estimates were developed for each type of recreation and the lessor of demand or capacity was valued at $3.00 per RVD except wilderness which was valued at $8.00 per RVD. Since developed recreation is defined here as a subset of roaded recreation, the developed recreation adjustment was subtracted from the roaded recreation adjustment before being applied to PNV. Only the roaded recreation capacity value was calculated by FORPLAN. It was in the model as a non-scheduled output and thus had no associated dollar value.

4. Elk

Elk was valued in terms of elk hunter recreation at the rate of $21.00 per RVD. The RVD use and capacity are based upon elk populations over time, harvest ratios and estimated success ratios. In this situation demand was assumed to be equal to capacity. The FORPLAN model generated elk capacity numbers which were adjusted outside the model to account for timber activities in elk habitat that would tend to reduce the effectiveness of the habitat. The costs associated with elk hunter recreation from the Forest Service perspective are based upon actual past expenditures and amount to $3.27 per RVD. Total values and costs were developed for each decade and appropriately discounted and subtracted to provide the adjustment to overall PNV.

5. Other Big Game

Other big game was also valued in terms of hunter RVD's. The level of other big game hunting RVD's was based upon an estimate from the Montana Statewide Comprehensive Outdoor Recreation Plan that 40% of all big game hunting is for elk. A factor was applied to the elk hunter RVD's to arrive at the other big game hunter RVD's. Values and costs were the same as used for elk hunting and the PNV adjustment procedure was identical to that for elk.

6. Roads

As discussed above, road related outputs were calculated in FORPLAN and then adjusted outside the model to account for the need to gain access to stands as well as build or reconstruct roads within a stand. Since road construction and reconstruction were scheduled outputs in FORPLAN, their costs show up in the PNV calculated by the model. The costs in FORPLAN related to road construction and reconstruction were removed from the PNV calculation and the new schedule of costs were appropriately discounted and placed back into the PNV calculation. In addition major collector and arterial road construction mileages and costs were developed outside of FORPLAN based upon an analysis of overall access needs on the Forest. A Forest-wide MINCOST model was developed and used for this analysis. Costs per mile for the construction and reconstruction of the roads originally calculated by FORPLAN were carried forward because they reflect the mix of construction conditions encountered in the land designation scheme generated by the model.

7. Fixed Costs

Fixed costs amounting to $5 million per year were included in the adjustment to overall PNV. Included are program management and general administration costs for a range of activities (see section IV.B.2.a.(1)(e) of this appendix). Details on the sources of these costs are discussed in Planning Record: Economic Information Used in the Forest Plan, October 20, 1981.

8. Grazing

The FORPLAN model included a scheduled output for grazing AUM's and an associated value. This output included a total potential AUM number associated with transitory range. In general the demand for this type of grazing is very low. It was thus assumed that current use was representative of demand and would be constant over time for all alternatives. Since the FORPLAN model valued all the potential AUM's, the initial PNV was inflated. The FORPLAN PNV was adjusted to remove the values associated with potential AUM's and add the values associated with the demand level. The assumptions were that 13,000 AUM's would be used each year under all alternatives. A cost of $6.07, as developed by Miller in Economic Information Used in the Forest Plan, October 20, 1981, and a value of $8.67 per AUM, from the 1980 RPA analysis were used. In the FORPLAN diagnoses developed for the FEIS, the grazing output was dropped and the constant use level and value was added to the PNV that these models generated.

9. Energy

The calculation of energy consumed by Forest activities was performed outside the FORPLAN model. It has no economic implications. Energy consumption for each alternative was calculated on the basis of the level of road construction, timber administration, other administration, logging, road reconstruction, road maintenance, and recreation. The energy needed to operate administrative buildings is also included. Energy use in BTU's was calculated by a model developed by Brickell of the Region One office based upon energy consumption coefficients developed by Olsen in Forest Planning Record: Criteria for the Analysis of the Management Situation, Volume 4, Coefficients, February 1981.

IV. Cost-Efficiency and Net Public Benefit

Significant Changes from Draft to Final EIS

Additional discussion about the demand curve that was used for timber has been added to section IV.B.2.b.(1).

This section describes cost-efficiency criteria and explains how net public benefits are derived. This analysis is required by National Forest Management Act regulations (36 CFR 219) and plays an important part in the development, comparison, and selection of Forest planning alternatives. The following diagram conceptually displays the factors included in net public benefit:

PRESENT NET VALUE (PNV)			= Total PNV ($)
Priced Outputs			
Nonmarket (e.g. Recreation)	+	Market (e.g. Timber)	

= NET PUBLIC BENEFIT (Non-numeric)

NET SUBJECTIVE VALUE (NSV)			= Total NSV (Non $)
Nonpriced Outputs			
Nonquantitative (e.g. Recreation Quality)	+	Quantitative (e.g. no. of jobs)	

A. Net Public Benefit

Maximization of net public benefit is a goal of the Forest planning process. Net Public Benefit is the overall value to the nation of all outputs and positive effects (benefits) less all the associated Forest inputs and negative effects (costs) of producing priced and nonpriced outputs from National Forest lands. Thus, net public benefit conceptually represents the sum of priced outputs (PNV) plus the net subjective value of nonpriced outputs. Net public benefit cannot be expressed as a numeric quantity because PNV cannot be added to qualitatively valued nonpriced outputs. In addition, not all resource outputs have been assigned monetary values and costs.

B. Present Net Value (PNV) and Priced Outputs

PNV represents the dollar difference between the discounted value of all priced outputs and all Forest costs over the 200-year planning period. Two discount rates, 4 percent and 7 1/8 percent were used to represent the real cost of money over time. Priced outputs include those outputs with market values (timber, forage, mineral leases, developed recreation, and special use permits) and those outputs with assigned nonmarket prices (dispersed recreation).

Each benchmark and alternative was designed to achieve its goals and objectives in a manner that produces the greatest PNV. This was accomplished by solving FORPLAN with the objective function of maximizing PNV while meeting the specified constraint of the benchmark or alternative. The PNV calculated in FORPLAN is modified by including benefits and costs not modeled in FORPLAN. The modified values were used to evalute the benchmarks and alternatives. The benefits and costs not included in FORPLAN were those which do not influence and are not significantly influenced by land designation and output scheduling. This section describes how the prices and costs were calculated.

1. Priced Output Parameters Used in PNV

a. Discounting

Two discount rates representing the real cost of money over time were used to solve FORPLAN and to calculate the economic consequences of the benchmarks and alternatives. The 4 percent rate approximates the real return on long-range corporate investments, above the rate of inflation (Row and others, 1981). Inflation was not included in the discount rates, benefits, and costs due to the difficulty of estimating future inflation rates and because inflation would equally affect both costs and prices. Four percent was used to solve FORPLAN and is the primary rate used to evaluate benchmarks and alternatives. The PNV of all Benchmarks and Alternatives was recalculated (using the 4 percent FORPLAN solution) at 7-1/8 percent for comparison purposes. In addition, the Proposed Action was re-optimized using the 7-1/8 percent rate. All costs and benefits are discounted from the midpoint of each planning period (decade).

b. Timber Demand Curve

No local demand curve for timber was used in the FORPLAN model. None of the available techniques for developing Forest level demand functions has a strong enough theoretical basis that it can be suggested for use in Region One. Available evidence also indicates that if a reliable Forest level demand function could be calculated, the elasticity would be such that the use in FORPLAN would not be significant. As specified by the Washington Office (1920 letter to the Regional Forester, "Downward Sloping Demand Curves," dated 2/3/81), the demand curve is assumed to be horizontal.

c. Real Dollar Adjustments

All prices and costs are expressed in first quarter 1978 dollars, consistent with the 1980 RPA. The Gross National Product (GNP) implicit price deflator index is used to inflate or deflate price and cost data to this common base (FSM 1971.32b).

2. Benefits and Costs Used in PNV

Priced outputs determine the dollar benefits used in the PNV calculations. Priced outputs include only those resources that are or could be exchanged in the market place. On the Kootenai National Forest only timber prices were based on locally estimated market values. Grazing values are derived from the 1980 RPA analysis. Recreation prices are national level estimates of willingness to pay. Willingness to pay values were derived in the 1980 RPA analysis and represent what consumers would be willing to pay (above and beyond the direct costs of participation) for a recreational experience rather than to forego the opportunity. Only the timber and grazing values along with baseline prices and costs (as an output called "other resources prices and costs") and various costs to be discussed later were included in the FORPLAN model. The recreation and related values were added to PNV outside the FORPLAN model.

Costs used in PNV include both the costs necessary to produce the priced benefits and the dollar costs necessary to produce non-priced outputs. PNV does not contain the value of all benefits or costs because some are non-priced.

The compilation and analysis of data used to determine cost and benefit information for the alternatives and benchmarks involved two procedures. First, those costs and benefits which contributed to land designation and scheduling of prescriptions in the FORPLAN model were compiled and entered into the model through the use of economic yield tables. These tables relate costs and priced output values to management practices and production levels. The tables were assigned to individual analysis area prescriptions and allowed FORPLAN to assign the most cost efficient prescription to any given analysis area to maximize overall PNV subject to the constraints built into the model. Second, the prices and costs not associated with land designation or prescription assignment but associated with alternative formulation were compiled. These include the benefits of recreation and other items which could not compete with market-priced resources on a prescription-by-prescription basis but which play a role in the overall PNV when their outputs are generated through constraints on the model.

A more detailed analysis of the benefits and costs used to determine PNV can be found in the Forest Planning Records: Economic Information Used in the Forest Plan, November 1, 1982, and "Adjustments to PNV at 4%", various dates.

a. Costs

Agency costs were estimated for the 200 year planning period for all benchmarks and alternatives. This section discusses how costs were developed and the major expenditure categories. Costs were developed by Forest Service personnel in conjunction with developing standards and guidelines for the management prescriptions. Agency cost estimates were determined for all activities and classified according to FSH 1309.11 Management Information Handbook (MIH) codes. These individual MIH codes were further combined to define management practices for the various resource categories. Management practices were used to define the primary unit costs associated both with the FORPLAN and external analyses. Unit costs were based upon actual 1980 activity and were expressed in 1978 dollars.
Many costs include expenditures necessary to produce both priced and non-priced outputs. The costs are based upon historical data and professional judgement and are the minimum funds needed to achieve the standards and guidelines in the management prescriptions. Cost data was used in developing feasible and cost efficient prescriptions, consistent with FSM 1970.2, "Economic and Social Analysis Objectives." The costs which are dependent on land designation and timber harvest schedule were modeled in FORPLAN. These costs were entered in the economics tables in FORPLAN. By solving FORPLAN to maximize PNV, the cost efficient level of agency expenditures was estimated for 200 years of management of the Forest as a whole. Other costs which were not modeled in FORPLAN were developed by the planning team to meet the objectives of each benchmark and alternative. The actual cost data is discussed later in this section. More detailed information is in the Forest Planning Records.

Costs can be divided into four major categories:

Fixed Costs represent the inescapable costs of managing the Forest in the absence of producing controllable outputs. These are costs associated with meeting minimum management requirements and legal standards, avoiding undue environmental damage, and providing for the safety of incidental users. Fixed costs are assumed to be constant and are calculated outside FORPLAN for all alternatives and benchmarks. These costs do not contribute to the FORPLAN objective function that maximized PNV nor do they affect land designation. Fixed costs are added to the Forest costs, present value costs and PNV outside the model. An average annual fixed cost of $5.159 Million was added to each alternative.

Variable Costs are associated with activities that vary in amount and timing from one prescription to another and from one alternative to another. These costs are calculated in FORPLAN. Each management prescription has a set of variable costs which depend upon the timing and application of the prescription to a particular analysis area. Variable costs directly influence the land designation and activity scheduling processes in the FORPLAN model. They are listed in the FORPLAN reports (FORPLAN output) for each run of the model. The costs reported include the following: roads, site preparation, precommercial thinning, reforestation, sale preparation, silvicultural exam, and grazing.

Other Resource Costs are the costs of non-timber activities described in the prescription guidelines. They are included in the FORPLAN model, vary by management prescription (but not timing), and influence the land designation process in the FORPLAN model. These costs are included in the FORPLAN reports and vary by alternative.

Production Costs are referred to as logging costs in the FORPLAN report. These costs actually include non-Forest Service logging and manufacturing costs. They are calculated as the difference between lumber price and stumpage value:

(production cost)=(lumber selling price, log scale)-(stumpage value)

The Kootenai stumpage evaluation equation was used to develop these costs. Production costs vary with timber yield, species mix, logging method, harvest type, and diameter class. They are included in FORPLAN and influence the land designation and scheduling processes, but they are not included as Forest Service costs because they are borne by the timber purchaser.

Adjustments were made to the local road construction miles needed per decade. This required adjustments in the associated costs. FORPLAN schedules road work only for the acres actually harvested even though it is often necessary to build or rebuild additional roads just to get to the cutting unit. The result is an underestimate of the road work needed in the early decades and an overestimate in the later decades. Adjustments to account for this were performed outside of the model. The FORPLAN model calculated grazing values and costs based upon potential outputs rather than actual outputs. This necessitated another adjustment outside of the model so that the situation would be properly depicted. In the FORPLAN diagnoses developed for the FEIS, grazing was deleted. The value of expected grazing use was added to the PNV generated by FORPLAN for each diagnosis to assure consistent comparisons between these and earlier diagnoses.

(1) Cost Data by Resource Component

Costs were associated with each resource output component for timber, roads, range, recreation/wildlife, and other joint costs. The joint costs such as fire and general administration are not separated into resource categories. Costs are reported as annual averages for each alternative and benchmark for 20 decades.

It is important to note that some costs which are required to carry out a management prescription may contribute to more than one resource. For example, slash disposal is carried as a timber related cost even though that disposal may be mitigating damages to visual quality and wildlife mobility. The cost is inseparable and is included here as a timber cost. This illustrates that the costs by resource output do not always relate directly to the benefits by resource. In general, calculating PNV by individual resource is misleading.

(a) Timber

Most timber related costs are considered variable and were calculated in the FORPLAN model. These costs include only those which would be needed in a Forest Service budget to carry out the timber portion of Forest Service activities. The following costs are included:

- site preparation
- precommercial thinning
- reforestation
- sale preparation and administration
- timber road preconstruction

These costs were entered in the FORPLAN model via the economics tables which assign costs to specific management prescriptions. They are calculated for all alternatives and benchmarks and are listed in FORPLAN Economic Reports 2, 3, 4, and 7.

In addition to the above costs, the following timber related costs were included among the fixed costs and show up in the "other" category described later:

- timber management planning and inventories
- silvicultural examination and prescription
- genetic tree improvement program
- management of sale preparation
- right-of-way cost-share agreements
- transportation system planning and inventory
- road operation

These costs are a minor portion of the total timber related costs. They total $321,897 per year as calculated outside of FORPLAN.

(b) Roads

The costs of road preconstruction, local road construction, local road reconstruction and purchaser road credits were considered variable costs and were entered into the FORPLAN model in the economic yield tables. They are reported by decade in FORPLAN Economic Reports 1, 5, and 7. The local road construction and reconstruction costs which include both purchaser credits and appropriated funds were adjusted outside FORPLAN as noted earlier. In addition a schedule for collector construction and arterial and collector reconstruction was developed outside FORPLAN and added to the road costs. Construction engineering costs based upon the miles of road constructed and reconstructed was also calculated outside FORPLAN and added to these costs.

The total miles of road constructed and their total cost were calculated in FORPLAN. The adjustments retained these totals, but developed a more realistic schedule as discussed earlier. In summary the road preconstruction costs are carried in the timber costs. Road maintenance is among the "Other" costs. The costs for local road construction, local road reconstruction, collector construction, collector reconstruction and arterial reconstruction (all arterials have already been built) plus construction engineering are shown as road costs. These costs are further broken out by purchaser credit and appropriated (capital investment) dollars based upon an estimate of maximum available purchaser credits. This breakdown was developed outside the FORPLAN model.

(c) Range

Range costs were included in the FORPLAN model as variable costs by linking the range scheduled output to the economics tables. The costs include the following:

range resource management
range structural improvements

This cost is $6.07 per animal unit month (AUM). The unit cost used in FORPLAN was applied to the total potential forage that could be produced from transitory range. It did not take into account the fact that the use of and demand for this range is constrained by the lack of opportunity for and high costs associated with over wintering facilities and other factors outside of Forest Service control. It was thus assumed that, based on historical evidence, the Forest is likely to supply 13,000 AUM's per year under all alternatives and benchmarks except the minimum management level benchmark. The range costs of $78,910 per year reflect this level of use. To simplify the FORPLAN model, the grazing output was removed from models used in developing the FEIS. The value of the 13,000 AUM's of grazing was added outside the FORPLAN model.

(d)Recreation/Wildlife

Motorized recreation (RVDMOT), non-motorized recreation (RVDHIK) and elk population (ELK) were included in FORPLAN as non-scheduled outputs, but they had no costs or prices directly associated with them. The costs for these resources were calculated outside the FORPLAN model based upon the following per RVD unit costs:

roaded recreation: $1.12
semi-primitive motorized recreation: $1.05
semi-primitive non-motorized recreation: $1.14
wilderness recreation: $2.15
elk hunter recreation: $3.27
other big game hunter recreation: $3.27

The RVD outputs were also developed externally to the model based upon the lessor of demand or capacity. Capacity was based upon the set of land designations developed for each alternative. Demand was linked to projected population change and current (1984) use levels. The cost of supplying developed recreation was assumed constant at $1.17 million per year for each alternative. The following activities are included in the unit costs noted above:

visual resource improvement
recreation or VIS site construction
recreation or VIS site rehabilitation
visitor information services - planning
visitor information services - full service management
installation or construction of VIS facilities not on VIS sites
developed recreation sites - full service management
dispersed recreation - full service management
wilderness area - full service management
trail preconstruction
trail system management
non-structural wildlife habitat improvement
structural wildlife habitat improvement
habitat access controlled by closures

(e) Other Costs

Other costs constitute the balance of activities required to carry out the resource programs already described. Some of these costs are built into the model as scheduled output 4 and are linked to land designation through the economic tables. The remainder are contained in the fixed costs. Those in the FORPLAN model are the following:

water resource monitoring
water resource improvement
special use management (non-recreation)
property boundary location
land exchange
rights-of-way acquisition
soil monitoring
cooperative law enforcement
insect and disease management
arterial road preconstruction
collector road preconstruction
treatment of activity fuels
fuelbreak construction
program management
fire management
road management

These costs are shown on FORPLAN economic report 5 for each alternative and benchmark. Those "Other" costs included in the fixed costs as developed outside the FORPLAN model are program management and general administration costs for the following:

recreation planning and inventory
cultural resource management
visual resource inventory and planning
visitor information services - reduced service management
developed recreation sites reduced service management (public sector)
dispersed recreation reduced service management
recreation management (private and other public sector)
visual resource monitoring
visual resource planning
wilderness area - planning and inventory
wilderness area reduced service management
fish and wildlife prescriptions
fish and wildlife impact surveys
wildlife habitat maintenance
fish habitat maintenance
wildlife and fish cooperation with other agencies
range resource planning and inventory
range forage improvement
maintenance of range structural improvements
timber resource management planning and inventories
silvicultural examination and prescription
timber sale preparation
genetic tree improvement program
water resource planning
water resource inventory
water resource monitoring
mining law compliance and administration
minerals management - oil and gas
minerals management - non-energy
geological planning and inventory
Senior community service employment program
special use management (non-recreation)
rights-of-way cost-share agreements
forest land and resource planning
soil resource inventory
soil resource planning
transportation system planning and inventory
road operation
Forest administration and other facility maintenance.
trail system management
trail inventory and planning
insect and disease management
Forest-wide general administration

The total of the fixed costs is $5.16 million per year. The "Other" costs included in the FORPLAN model vary from alternative to alternative.

(2) Budget Costs

Budget costs are derived from the costs described above. Here those costs are broken into the following resource components:

Purchaser Credit Road Costs -	further broken out by construction and reconstruction
Capital Investment Road Costs -	further broken out by construction and reconstruction
Operations and Maintenance Costs	

Purchaser credit road costs are not appropriated dollars in the same sense as are the other costs. They are included here since they are an accountable budget item.

Purchaser Credit Road Costs are defined as the portion of total road costs which can be expected to be paid via purchaser credits. The components of total road costs were discussed in the preceding section. Precise estimates of purchaser credit costs are difficult to develop because they are dependent upon the way in which individual timber sale packages are put together. From the perspective of the Forest Plan, which does not include the development of specific sale packages, it was necessary to grossly estimate this component of road costs. The estimate is based upon the assumption, using historic data, that about $24,000 per MMBF would be available for purchaser credit construction and reconstruction of local roads. If the local road costs exceeded this amount it was assumed to be necessary to use appropriated (capital investment) funds to cover the remaining costs.

Capital Investment Road Costs are defined as that portion of the total road costs which can be expected to be paid via appropriated dollars. This is simply the total road costs minus the purchaser credit road costs. It consists of local road construction and reconstruction for which it is estimated that there will be insufficient purchaser credit plus all collector construction and reconstruction and arterial road reconstruction. The collector and arterial road work is considered to be a capital investment cost because these are the major access routes for all resource users and can not be entirely linked to timber sales. Other capital investment costs such as range improvements and administrative building construction as considered to be so small as to be inconsequential in relation to the road costs.

Operations and maintenance costs are those costs associated with Forest Service support of all resource activities except road related work.

The sum of these three cost categories equals the total Forest Service costs discussed earlier.

b. Priced Benefits Used In PNV

All priced benefits were estimated for the 200-year period for all benchmarks and alternatives. Priced outputs include those resources that are or could be exchanged in the marketplace including timber, range, recreation, and special uses. This section discusses the methods used to estimate current and future values.

The prices used in the analysis reflect onsite values for all resources, i.e., the value of the resource on the Forest. The values are consistent with cost estimates for activities which produce onsite resources. Priced benefits are classified as market values (timber and range) or nonmarket values (recreation and wildlife). Furthermore, a portion of the benefits are actual receipts or in-kind payments to the government. These receipts serve as a base for 25 percent fund payments to local governments. Finally, some of the benefits accrue even without active Forest Service management. These benefits are associated with recreational activities which would occur on the Forest even if most other operations were closed down.

(1) Timber Benefits

The value assigned to timber reflects the onsite value of stumpage to the Forest Service. Stumpage is a variable benefit. The value is the difference between the lumber price and production costs of logging and milling. The price varies by species mix, median dbh, net volume per acre, and logging systems. The values are:

Bid value/mbf = -178.88
+ (0.447) X (Lumber Price Log Scale)
- (0.3902) X (Percentage volume jammer logged)
+ (39.81) X Ln(median dbh)
+ (1.465) X (volume per acre harvested)
- (0.6426) X (percentage volume skyline logged)

The values were developed from data on 44 sales sold on the Forest between 1974 and 1980. The sample was selected from sales exceeding one million board feet in volume. This type of sale represents ninety percent of the sawtimber volume sold on the Forest during the five year period. This five year period was chosen because it represents one full cycle in the lumber market. The stumpage prices are modeled in FORPLAN. Lumber prices vary by working group (MIXCON I, MIXCON II and LPP). Logging systems vary by land class (Erosional, Depositional and Breaklands). Volume per acre and dbh varies by working group, condition class (age), and treatment as specified in the management prescriptions (precommercial thinning, commercial thinning and so on).

Stumpage values represent both the benefit value to the taxpayer as well as the actual gross receipts to the US Treasury. All timber outputs from the forest are expected to be consumed.

Projections of real increases in stumpage prices were made for the 1980 RPA program and are used in this analysis (Adams and Haynes, 1980). These projections are based, in turn, on separate projections of lumber prices and production costs (logging and manufacturing costs plus profit). Using the residual value formula, the relationship between these factors is:

SV = LP - PC
where:
SV = stumpage value/mbf
LP = lumber price log scale (end product value)
PC = production costs

An assumption of a 10 percent increase in milling efficiency (from 1980 to 2030) was built into the lumber price projections. The stumpage value formula used in FORPLAN is:

$$SV_t = LP_t - PC_t$$

where
SV_t = stumpage price/mbf at time "t"
LP_t = projected lumber prices at time "t"
PC_t = projected production costs plus profit at time "t"

The following table shows these projections as applied to Regional average values (based on 1975 - 1984 data). The variables LPI and PCI represent the proportionate increase in value from the present for lumber prices and production costs, respectively.

Table B-5

1980 RPA
Lumber Price, Production Cost and Stumpage Value Projections
(1978$/MBF)

YEAR	LUMBER PRICE	LPI	PRODUCTION COSTS	PCI	STUMPAGE PRICE
1980	308.98	1.000	243.73	1.000	65.25
1985	353.78	1.145	272.49	1.118	81.29
1995	440.30	1.425	332.69	1.365	107.61
2005	510.74	1.653	367.79	1.509	142.95
2015	575.63	1.863	377.05	1.547	198.58
2025	640.52	2.073	385.34	1.581	255.18
2030+	676.05	2.188	388.75	1.595	287.30

The demand curve for timber was assumed to be horizontal; therefore, no downward sloping demand curve was used in the FORPLAN computer model. None of the available techniques for developing Forest level demand functions have a strong enough theoretical basis. This assumption means that fluctuations in timber volume from this Forest between zero and the maximum possible will not significantly affect prices. This Forest contributes a small percentage of the nation's lumber. The lumber produced here competes in national markets where prices are established without regard to production levels on this National Forest. See Downward Sloping Demand Curves (Reid, 1981 February 12) and section IV.B.1.b. of this Appendix. For a discussion of the sensitivity of the analysis to changing base timber prices and real price increases, see sections VI.B.4.b. and VI.D.6.g. of this Appendix.

(2) Range Benefits

The value assigned to range forage reflects potential dollar returns from the range resource to the taxpayers even though only part of the price is actually collected by the Forest. The price is the net value to the rancher above the cash costs for grazing on the Forest. The value on the Forest is $8.61/AUM from the 1980 RPA analysis. Due to the small demand for the grazing output on this Forest, there was assumed to be no real price increase.

As noted earlier, the FORPLAN model calculated the total value of all potential forage outputs even though demand is expected to stay relatively constant at a level much below the potential for forage production. Demand is expected to stay low due to the high costs associated with using the transitory range (access, overwintering and so on) on this Forest. An adjustment outside of the FORPLAN model reduced the total value to account for only those forage outputs which are expected to be used (13,000 AUM's per year). As noted above, grazing was removed from FORPLAN for development of the Final Plan thus the values described here were added to the results of those FORPLAN diagnoses.

The value of the range program associated with minimum level benchmark is the value of the current program until allotments expire. The value in other benchmarks and alternatives is assumed constant based upon the $8.61/AUM value and the 13,000 AUM annual use level.

(3) Recreation/Wildlife Benefits

The value assigned to recreation reflects potential dollar returns from recreation to the taxpayers even though most dollar values are not actually collected by the Forest. The value is the difference between the total value of a recreation experience to the recreation user and the cost of participating. The prices vary by type of experience and are estimated as remaining constant in the future. The values for the Forest are displayed in Table B-6.

Table B-6
Prices for Recreation
(1978 Dollars, $/recreation visitor day)

Big-game hunting	$21.00
Wilderness	$ 8.00
Semi-Primitive Non-Motorized	$ 3.00
Semi-Primitive Motorized	$ 3.00
Rural and Roaded Natural	$ 3.00
Developed	$ 3.00

Source: 1980 RPA Program Values (FSM 1971.4)

Recreation use is projected to increase on the Forest as the population in Western Montana increases. In some decades in some alternatives certain types of recreation demand (projections of use) are less than the available capacity and in some decades they exceed capacity. Only the recreation that can actually be expected to occur is valued. This level of use is always the lessor of capacity or demand. Capacity is based upon the way in which land uses are designated on the Forest so the amount of recreation which is valued varies by alternative.

The exception to this process is big game hunting which is linked to estimated elk herd size and harvest ratios over time. Big game hunting is all valued because demand, as constrained by hunting license sales, is assumed to be always equal to supply (at a given license price).

Receipts from developed recreation and special use programs consist of fees paid at campgrounds and fees paid for special uses. Fees are projected to continue at $80,000/year, which is the value for 1980.

The value of recreation was calculated outside FORPLAN.

Much of the recreation value is fixed, i.e., it will occur, even in the absence of Forest Service management, once lands are designated for the various uses.

3. Present Net Value (PNV) Calculations

PNV was calculated to determine the relative cost efficiency of each alternative and benchmark. PNV is the difference between the discounted values of all outputs to which monetary values or established market values were assigned, and the total discounted costs of all management activities necessary to produce those outputs. PNV was calculated over the entire 200 year horizon for each alternative and benchmark.

In order to determine PNV, the present value of costs and the present value of benefits were calculated for each of the following resource components:

COST	BENEFITS
Timber	Timber
Roads	
Range	Range
Recreation and Wildlife	Recreation and Wildlife
Other	

Recreation and wildlife benefits were calculated outside of FORPLAN for each decade of the planning horizon. The associated costs were extracted from the FORPLAN reports by a manual calculation. Range costs were assumed constant based upon 1980 costs. Range benefits were assumed constant based upon a constant use level and RPA benefit values. Road costs were FORPLAN costs with schedules adjusted to account for construction needed to get to harvested stands in addition to the roads actually in the stands that FORPLAN calculated. Timber costs and benefits were calculated within the FORPLAN model. Other costs are those which could not be associated with a single resource.

The present value of each resource component was derived by discounting decade total costs and benefits for each of the 20 decades from the midpoint of the decade to the present. The sum of these discounted values is the present value of costs or benefits as appropriate. The sum of all resource component costs was subtracted from the sum of all resource component benefits to produce the present net value for each alternative and benchmark. The discounting process was done once with a 4% and once with a 7-1/8% discount rate. The benefit/cost ratio was calculated for each alternative at the 4% discount rate by simply dividing the discounted benefits by the discounted costs.

4. Opportunity Costs

In order to determine the relative cost efficiency of the various alternatives and benchmarks, opportunity costs were derived to show the difference in PNV between the alternatives. Opportunity costs are defined as the value of a resource's foregone net benefit in its most economically efficient alternative use (FSM 1970.5). An opportunity cost is considered acceptable only if the assumed, subjectively measured, value of what is gained is equal to or more than the value of the opportunity cost required to achieve it. In relation to this analysis, the opportunity cost is the difference in PNV between the alternative under consideration and the benchmark with the highest possible PNV (Alternative M - 114GG1 for the comparison of alternatives).

5. Other

In addition to the various parameters and categories of economic information described above, the priced resource benefits were broken into the categories of market and non-market benefits. The market benefits include timber and range; the non-market benefits include recreation and wildlife.

Returns to the U.S. Treasury were also calculated for each decade. These returns are the sum of the following:

Timber returns calculated as stumpage value of timber within FORPLAN

Range returns calculated as collected grazing fees in 1980 and assumed constant

Special use returns based on total collected in 1980 and assumed constant. This includes all special use permit receipts as well as user fees collected at developed recreation sites

Purchaser credits are included in returns to the treasury because they are included in the calculations for returns to the states. To determine actual cash flow to the treasury, purchaser credits can be subtracted from the returns to the treasury shown on Table B-21 at the end of this appendix.

Returns to the states were calculated as 25% of the returns to the treasury.

C. Net Subjective Value

1. Definition

Net subjective value is the total qualitative value of all resources or outputs whose value cannot be measured in dollars. Market transaction evidence is not available for these outputs and therefore no basis exists for making market value estimates comparable with priced outputs. Nonpriced outputs are valued subjectively. In general, as the subjective value of nonpriced outputs increases, the monetary value of priced outputs as measured by PNV decreases. The magnitude of the monetary value foregone is measured and displayed as an opportunity cost. "Net" implies that both nonpriced benefits and costs can occur.
The most important nonpriced outputs in this analysis are associated with the outputs of:

Jobs and community stability
Visual quality protection in sensitive areas
Wilderness and roadless quality
Mineral accessibility
Grizzly recovery
Lodgepole pine risk management
Miles of road needed for management (access)
First decade appropriated budget

Different levels of nonpriced outputs can be produced by applying management prescriptions to specific areas and/or by applying output and inventory constraints. Any dollar costs associated with nonpriced outputs are included in PNV calculations. How well an alternative resolves issues is a general measure of its net subjective value.

2. Nonpriced Outputs

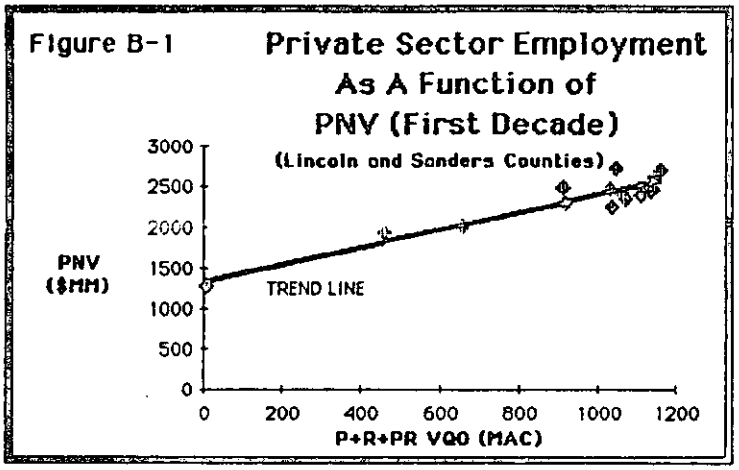
This section summarizes major nonpriced outputs, who is affected by changes in output levels, what indicators were used to measure output changes, and how the changes in the output levels affect present net value. Nonpriced outputs, as issues, are discussed in Appendix A.

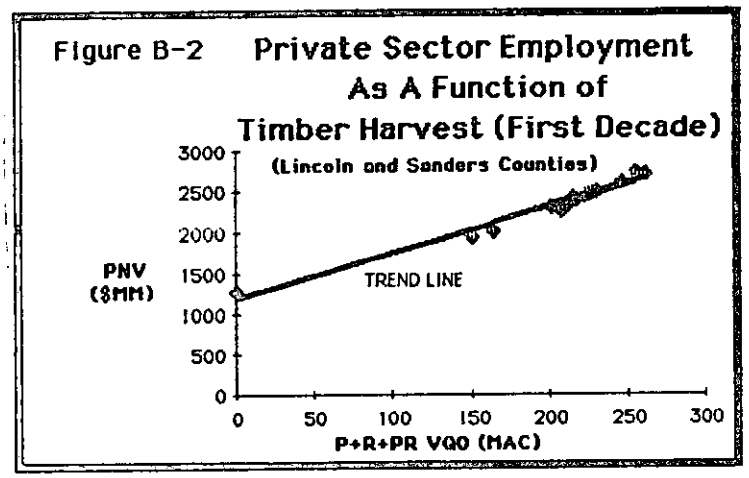
a. Jobs and Community Stability

Jobs and community stability, which are linked,are major nonpriced benefits. Their value is associated with the value of life satisfaction to individuals. Life satisfaction of individuals is, in turn, linked to satisfaction with work and standard of living ("The Prediction of Perceived Well Being", Bharadwaj and Wilkening in Social Indicators Research 4(1977)). The ability to have a job is, of course, directly related to these elements of life satisfaction.

In January of 1984, the total number of people working in Lincoln County in logging related businesses totaled 1,339 or 31.5 % of the workforce. In addition government employees involved in work relating to logging numbered 443 thus bringing the total percentage of people involved in this sort of work to 41.9 % (Libby Office - Montana Job Service). About 75% of the Kootenai National Forest is in Lincoln County and the most direct impacts of Forest activities can be seen in Lincoln County, but Sanders County is in a similar situation.

The forest products sector is largely dependent on the Forest for raw materials. Changes in the timber harvest program on the Forest will influence jobs, incomes, and lifestyles directly in the forest products industry as well as indirectly in all sectors. In general, the PNV of the Forest increases as the level of private sector Forest related employment in the first decade increases, because more timber is harvested. One exception to this rule occurs when harvests are forced to occur on lands which do not have a positive return, thus causing a decline in PNV, a relatively high harvest level and more jobs. Another exception occurs when lands with differing, but positive, cash flows associated with harvest are added to or taken from the suitable base by constraining particular acres to non-harvest management prescriptions. In the latter case the lands available for harvest allow a lower PNV even though more timber is harvested and more jobs can be expected. Figures B-1 and B-2 display the situation:





As the level of harvest decreases it is generally the case that roadless types of recreation opportunity increase thus to some extent timber related jobs are replaced by jobs in industries which service the increased number of recreation users. The relationship between the decline in timber harvest and increase in roadless sorts of recreation is such that a net decline in jobs occurs as timber harvest declines.

Community stability is best served when drastic and rapid changes in population is avoided. The number of available jobs is a fair predictor of population. Thus, a gradual increase in jobs is seen as most desirable because this would allow at least a portion of new job hunters (both new comers and young adults just entering the job market) to stay in the area. A constant or gradually declining number of jobs would be preferable to a rapid decline because lifestyles could be gradually adjusted causing less of an overall impact on community services and allowing time to develop plans to deal with foreseen difficulties. Likewise a gradual increase provides more opportunity for mitigation than would a rapid increase.

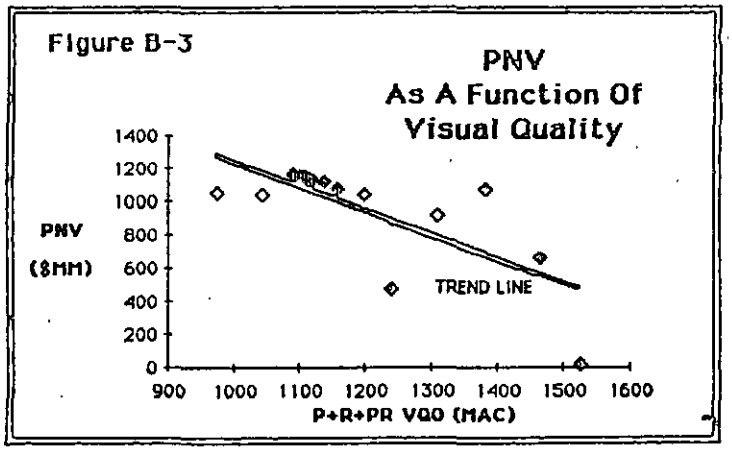
The measurable indicator of stability in the local community is the number of Forest related jobs in the private sector for the two county Lincoln and Sanders area. It is assumed that a change in the number of jobs of more than 20% in a decade would produce social disruption. This rate of change can be compared to the 44% increase from 1950 to 1960 and from 1960 to 1970 caused by the spruce logging activities and the Libby Dam construction respectively. Both of these decades saw rapid expansion and associated community growing pains which could be avoided with a slower rate of change.

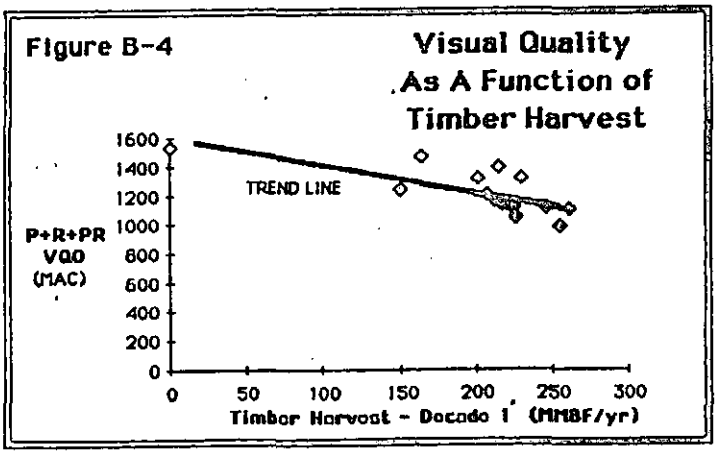
b. Visual Quality Protection in Sensitive Areas

Visual quality is a major issue because over 50 percent of the nonwilderness area is visible from major travel corridors and population centers. Changes in the visual quality of the Forest may affect the people who live in or visit the area as well as those who travel through the Forest. The dollar value of visual quality to people who hike and drive in the Forest is partially included in the value assigned to recreation. However, these assigned prices do not

reflect the total value of scenery on the Forest. The value of visual quality to the people who live in the area, as well as the people who visit the area was not assigned a monetary value in the planning process.

Visual quality is maintained or enhanced as more of the Forest is managed to satisfy recommended visual quality objectives (VQO's). As the level of visual quality is increased from maximum modification to preservation, the PNV tends to decrease because cost-efficient timber management activities are replaced with more costly practices. Visual quality generally increases or is maintained as the timber cut is decreased and the acres of roadless management and wilderness increases. The PNV relationship is sometimes masked when a low PNV is coupled with a high timber cut and the associated lower quality visual situation. The following figures display the situation with PNV as a function of visual situation and Visual Situation as a function of timber harvest:





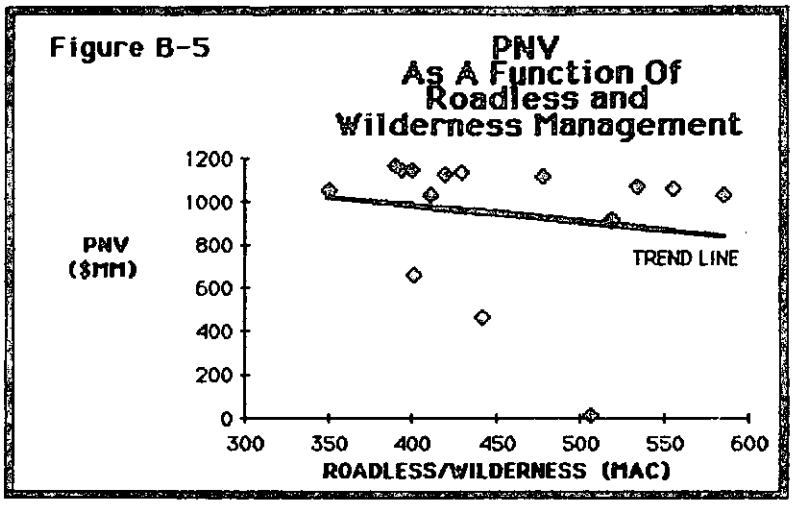
The indicator of visual quality is the area in the VQO categories of preservation, retention and partial retention in visually sensitive areas on the Forest.

c. Wilderness and Roadless Quality

A major issue on the Forest is how to allocate 403,700 acres of roadless area made up of 32 areas on the Forest. While an average monetary value has been assigned to wilderness and dispersed recreation, these prices do not account for the total value of an above average quality wilderness and roadless recreation experience on the Forest. The benefactors are recreationists who desire undeveloped, roadless recreation even though they may never use it and those that want areas reserved for the future or just to know they are there.

The measurable indicator is acres of wilderness and/or roadless land. Present net value decreases as the availability of cost-efficient timberlands decreases and the recreation budget increases.

Visual quality, wildlife diversity, water quality, old growth, and non-motorized recreation related employment increase with an increase in wilderness and/or roadless areas. Timber harvest, forests products industry employment, and motorized recreation related employment will normally decrease as wilderness and roadless increase. The following figure displays PNV as a function of Roadless and Wilderness management:

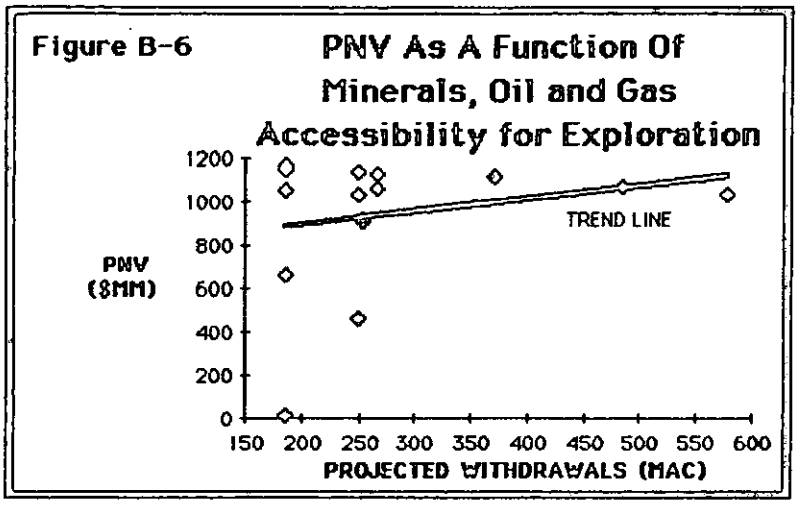


d. Accessibility for Minerals, Oil and Gas Exploration

The preservation of the option to explore for minerals, oil and gas deposits has a social value even though it was not assigned a monetary value in the analysis. This value can be forgone by designating land to management prescriptions which preclude such exploration. These prescriptions include Wilderness, recommended wilderness, wilderness study, developed recreation and administrative sites (management areas 7, 8, 9, 6 and 20 respectively) which would be withdrawn from entry. Existing withdrawals include 16,000 acres for oil and gas and 53,000 acres for locatable minerals. The existing withdrawals include portions of some of the management areas noted above plus some special withdrawals for items such as the railroad tunnel and Koocanusa Reservoir. Accessibility for exploration decreases with increases in lands designated to the noted management prescriptions. The figure below shows that there is a trend toward slightly increasing PNV associated with increases in withdrawals. It also shows that the entire range of PNV can be developed with a given acreage of withdrawals. On a site by site basis, as the land which would be withdrawn increases, commercial timberland is eventually withdrawn. As commercial timberland is withdrawn the PNV will decrease. This situation is masked in the figure by other relationships which increase PNV even though there are more acres withdrawn. The declining trend can be seen on the figure if only those points associated with the maximum PNV for a given withdrawal acreage are studied. One technical point, such exploration is not precluded for minerals until and unless the area actually receives Congressional designation as Wilderness. The analysis here addresses the situation under the assumption that the noted acres will become official Wilderness under the respective alternative.

The unit of measure for the accessibility concern is total acres that will be withdrawn if the alternative is implemented. This includes both the specified management areas and the existing withdrawals outside those areas.

The following Figure displays PNV as a function of projected withdrawals:

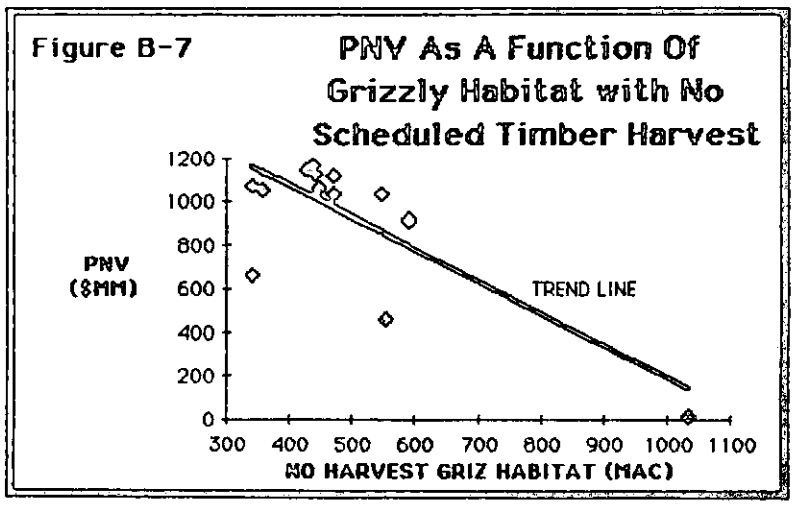


e. Grizzly Recovery

All alternatives and benchmarks have been designed to include a minimum management requirement intended to assure recovery of the grizzly population. This is a minimum requirement that will satisfy the letter of the Endangered Species Act of 1973. Any effort to retain a dynamic yet irreplaceable asset such as a grizzly population entails some level of risk. There are many factors which can affect the grizzly population and many of these are beyond the control of any manager. Some may be beyond the level of knowledge defined as the current state-of-the-art. Any effort to accommodate the known needs of the grizzly bear beyond those that will minimally satisfy the requirements of law reduces the risk of losing the population. The existence of the Endangered Species Act is evidence that retaining the population has value. The opportunity cost of the minimum management requirement is one way of monetarily valuing the population. Any other effort which reduces the risk of losing the population has additional value. It is this additional value, which is not quantified, that is of concern here.

The minimum management requirement that is modeled in FORPLAN involves removing timber harvest options from grizzly habitat unless due consideration is given to grizzly habitat needs. In addition the model is constrained so that only a limited amount of acreage in grizzly habitat is harvested each decade. Beyond this minimum management requirement the alternatives provide varying amounts of land designated to uses with no scheduled timber harvest in grizzly habitat. These designations provide reduced potential for human/grizzly encounters and reduced potential for grizzly (and human) mortality. As more land in grizzly habitat is designated to uses with no scheduled harvest, the risk of losing the population is decreased as is the PNV. The relationship between PNV and land designations is direct on an acre by acre basis, but may be obscured by other factors in the FORPLAN model which involve unrelated lands and issues. The following Figure displays PNV as a function of grizzly habitat which is not harvested:

Figure B-7



f. Lodgepole Pine Risk Management

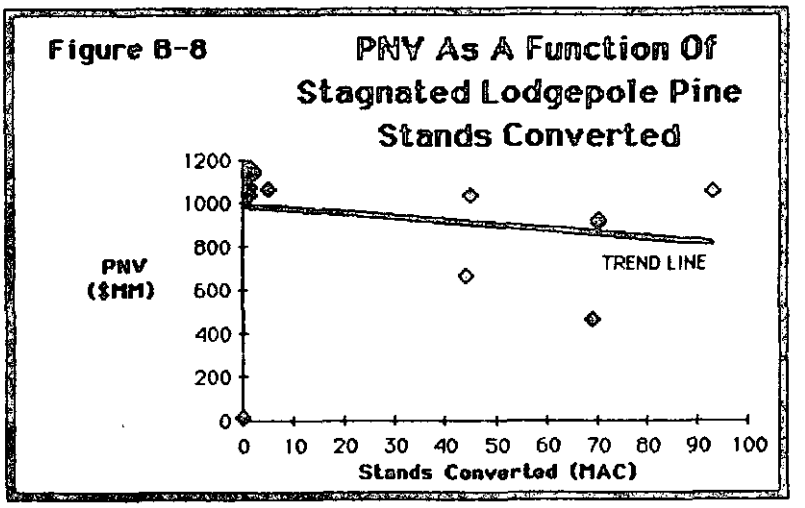
The costs and values associated with managing lodgepole pine are included in the FORPLAN model. There are other values associated with managing lodgepole pine stands which are not quantified in the model, but which are addressed here.

(1) Stagnated Lodgepole Pine

A stagnated stand is a stand which, due to excessive stocking, has essentially stopped growing at a size that is not merchantable. Lodgepole pine is associated with conditions that result in stagnation more than other species. The typical way of returning these stands to a condition where merchantable timber can be produced is to remove the existing trees then start a new stand, usually with a mix of species, and manage the new stand through precommercial and/or commercial thinning to prevent stagnation. Thinning in a stand which has already stagnated usually does not help much because it usually is permanently stunted. The PNV associated with management of a stagnated stand is very low, and usually negative, because of the high costs associated with removing the existing trees and starting a new stand and the long delay before the trees are large enough to be sold. For this reason the FORPLAN model will not usually convert these stands unless forced to by other resource objectives (maximizing timber or wildlife).

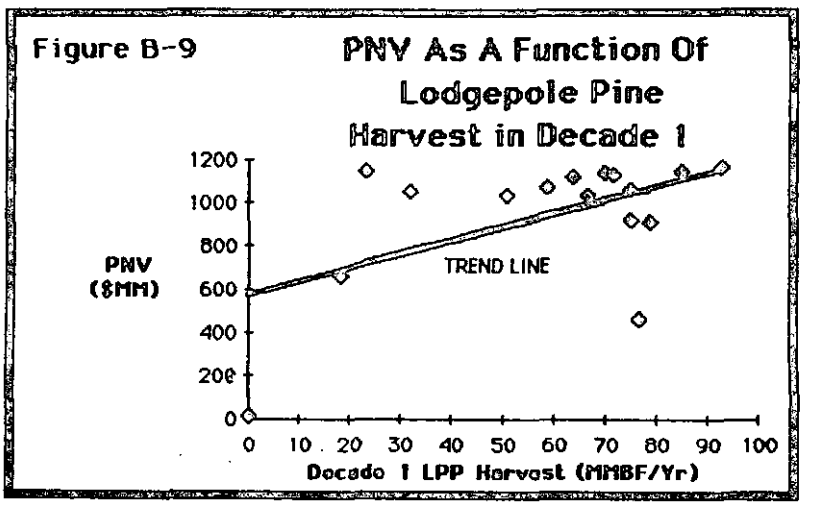
There is a non-priced value in converting these stands. This value derives from the improvement in big game and grizzly bear habitat quality along with reductions in fire hazards and potential for lodgepole pine beetle infestation. Elk and other big game are often restricted from even travelling through these stands because of the quantity of dead and down material and the density of the stand. A stagnated lodgepole pine stand will provide no forage and only low quality cover to these species. The dead materials in these stands are generally associated with blowdown and lodgepole pine beetle activity. This dead material provides excellent fuel and increases the risk of forest fire. Removing the stand would reduce this risk. A stagnated stand is generally less healthy than a similar but non-stagnated stand and thus can not survive a pine beetle attack as well. The question of lodgepole pine beetle will be discussed in the next section.

As the acres of stagnated lodgepole pine converted increases, the PNV tends to decrease but the unquantified values discussed above tend to increase. The situation is depicted in the following figure:



(2) Mountain Pine Beetle

Mountain pine beetles are endemic to the Forest and there is no reasonable way to eliminate them. Losses related to infestation of this beetle are considered in the FORPLAN model to some extent because the LPP timber yield tables take into account the associated mortality. The primary non-priced value associated with harvesting dead or high risk lodgepole pine is the reduced risk of catastrophic fire. Fires destroy much of the value of standing timber and are generally expensive to fight. Harvesting lodgepole pine directly reduces the risk of fire by removing those trees which are likely to die and produce fuel concentrations. Indirectly, the harvest of mature lodgepole pine removes the food source for the beetles and tends to slow their impacts upon adjacent stands. The lodgepole pine that is merchantable now provides the largest element of risk. The indicator of reduced risk is the volume harvested in the first decade. As the volume harvested goes up the PNV tends to increase because more stands are brought into solution and most have a positive contribution to PNV. The following figure displays the situation:



g. Miles of Road (Access)

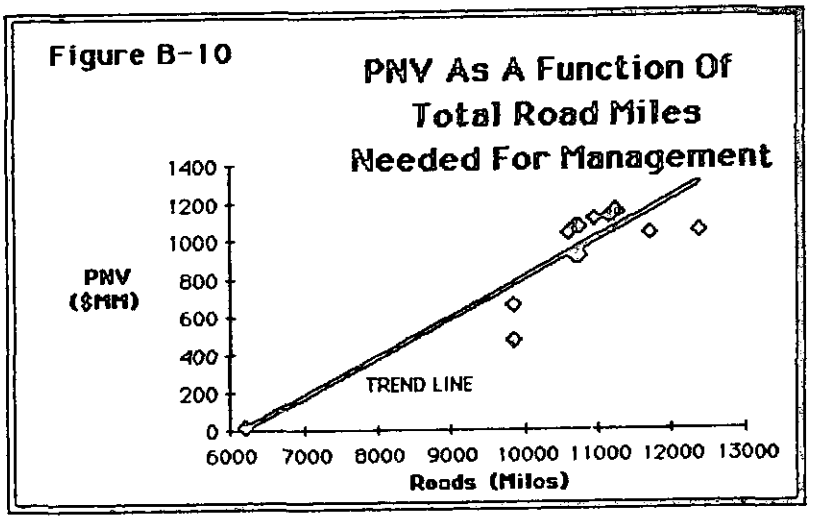
Roads are considered in the FORPLAN model in terms of their construction, reconstruction and maintenance costs, but there is a value to having fewer roads beyond the reduced costs associated with fewer roads. The unquantified values associated with fewer roads come from several sources.

First, roads impact the soils upon which they are built and contribute, to at least some degree, to potential increased sedimentation and reduced water quality. In addition, the alterations of drainage patterns and runoff rates may all have negative impacts.

Second, the construction of roads effectively removes options for future non-roaded management. Primitive, semi-primitive and wilderness recreation categories are most directly affected.

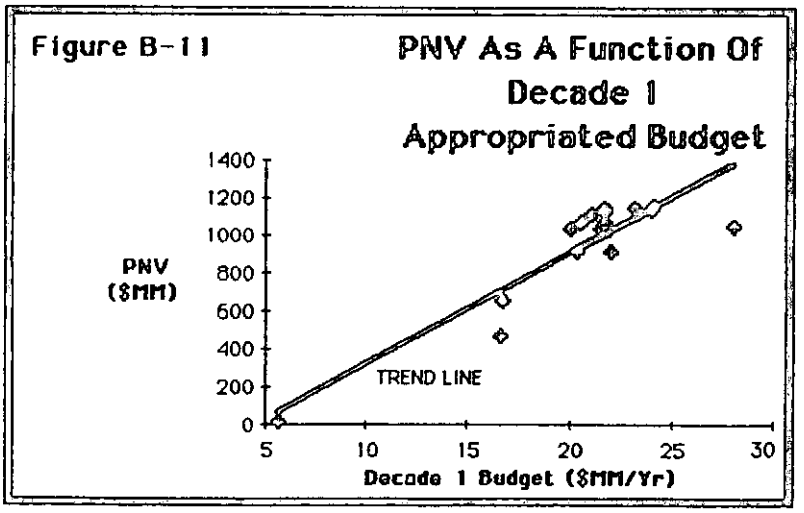
Third, fewer roads implies greater assurance of improved security for wildlife. The assurance is greater because access is non-existent rather than simply closed to use.

Road construction is directly linked to timber volume harvested, so, as noted earlier, when PNV increases with increased harvest - road miles also increase. The situation is displayed in the following figure:



h. First Decade Appropriated Budget

The first decade appropriated budget is a direct function of the activities which are necessary to produce the outputs from any alternative. As discussed above most of the budget costs are included in the FORPLAN model. In as much as a lower budget involves lower costs it can be seen as a benefit and can be quantified. The unquantified benefit of a lower budget is associated with the added options that the Federal government has when deciding how to allocate funds to competing agency needs, to debt reduction, to tax decreases or to other uses. At issue is not the increase in funds that would be available for other uses, because that can be quantified, but rather the added value in being able to divide the total funds differently. The indicator of this value is the first decade appropriated budget. This excludes purchaser credit because unused purchaser credit is essentially trees that are left to grow and this value is quantified in the FORPLAN model. The following figure shows that PNV tends to decrease with decreases in budget except where activities which do not contribute to increased PNV are pursued:



V. Social and Economic Impact Analysis

Significant Changes from the Draft to Final EIS

An analysis of historic and potential future timber supply from all ownerships in the secondary impact area (five counties) was completed. That analysis is summarized in Section V.H.

A. Overview

Social and economic impact analysis estimates the relationship of Forest activities to people. Short-term impacts are of primary concern with consideration given to longer term effects (over 10 years) occurring within the impact area of the Forest.

Issues and concerns (Chapter I of the EIS and Appendix A) include areas for which social and economic information can provide useful insights. For instance, many resource outputs (recreation, timber, and minerals) cause economic effects on people in the impact area.

Forest-related economic impacts on employment, income, and state and local government revenues are directly related to the social well-being of people in the impact area. Additionally, the population's lifestyles, attitudes, beliefs, values, and social organization are linked to Forest management activities.

Prior to the development of alternatives, information was gathered on the existing social and economic situation of the impact area.

B. Impact Analysis Area

The Forest's primary impact area is Lincoln and Sanders Counties in Montana. The secondary impact area also includes Flathead County, Montana, and Bonner and Boundary Counties, Idaho. This impact area is based upon economic influences that exist and is assumed to capture most of the area within which social and economic effects would occur. Table B-7 shows the percent of resource flows to the impact area.

TABLE B-7
Resource Flows
(percent of total use)

POLITICAL SUB-DIVISION	Forest Area	Tmb Vol Under Contract 1984	Disp Rec Users 1984	Dev Rec Users 1984	Wlder &Prim Acres	Min-erals 1984	Out-fitters 1984	Gra-zing 1984
Lincoln Co.	77	31	45	40	60	67	43	85
Sanders Co.	19	2	15	20	40	33	46	15
Flathead Co.	2	47	10	10	0	0	0	0
Bonner Co.	1	5	1	1	0	0	0	0
Boundary Co.	1	15	1	1	0	0	0	0
Idaho Other	0	0	13	10	0	0	0	0
Washington	0	0	13	10	0	0	0	0
Canada	0	0	1	7	0	0	0	0
Other	0	0	1	1	0	0	11	0
TOTAL	100	100	100	100	100	100	100	100

C. Economic Impact Model

An input-output model (IMPLAN) was used to estimate the employment and income impacts of Forest outputs and activities. Direct, indirect, induced, and total impacts were calculated.

Economic input-output (I-O) analysis is a procedure for describing the structural interdependencies of a regional economy or impact area and serves as a short-term predictive model for evaluating the impacts of shifts in Forest outputs and activities.

I-O analysis is based upon the interdependence of production and consumption sectors in the impact area. Industries must purchase inputs from other industries, as well as primary sources like natural resources, for use in the production of outputs which are sold either to other industries or to final consumers.

Flows of industrial inputs can be traced via the I-O accounts to show linkage among the industries in the economy. The accounts are also transformed into a set of simultaneous equations that permit the prediction of economic effects resulting from changes in Forest outputs and activities.

I-O analysis is based on assumptions that limit the accuracy of projections. The assumptions are related to the basis for the data that went into the model. The model is, in effect, a snapshot of the interrelationships in the economy that occurred on a national basis in 1977 projected to the local area based upon local area activities. This assumes that the national relationships hold for the local area and will be unchanged over time. One corollary assumption that holds particular significance is that technology will remain

constant. If new technology is applied that alters the relationship between outputs (e.g. lumber) and inputs (e.g. labor), the estimates of jobs and income will prove incorrect. Therefore, the numbers presented are relative indicators rather than absolute projections.

1. IMPLAN Data Base

The I-O model data base consists of (1) a national level technology matrix and (2) a county-by-county file of estimated activity levels for total gross output, six components of final demand, three components of final payments and employment for 466 industrial/business sectors. (See USDA Forest Service, 1983 for more information on the I-O model.)

The national technology matrix is based on a 1972 Commerce Department I-O model converted to an industry by industry basis and updated to 1977 using the RAS procedure (Clopper and others, 1974). The county level information is based on a 1977 data set constructed by Engineering Economics Associates of Berkeley, California.

Utilizing the national technology matrix and the regional control totals for the local impact area, a data reduction method was used to develop a regional input-output table. The method uses the property of "openness" displayed by regional economies compared with the national economy (Richardson, 1972). Smaller regional economies exhibit much greater tendencies or are more open to import and export than is observed at the national level. Based on the assumption that trade balances are the principal difference between national and regional purchase patterns, the supply-demand pool technique for data reduction was adopted (Schaffer and Chu, 1969).

2. Final Demand Expenditures

The I-O model translates Forest outputs and activities into employment and income impacts. An intermediate step is the translation of outputs into final demand dollars. Final demand expenditures are different from the values used in the efficiency analysis. Final demand expenditures represent the dollars spent by the final consumers of the finished products derived from Forest outputs. For instance, timber is processed into lumber which has a sale value at the mill. The sale value represents the amount of "new" money that will be directly generated for the local impact area--assuming that most is sold outside the impact area, this causes the local impact. The efficiency analysis examines only stumpage or the market value of the raw material that leaves the Forest.

This modeling step is accomplished by applying a final demand expenditure per unit of output to total outputs and linking the resulting dollar amount to the sectors in which the direct expenditure takes place. This process determines the change that takes place in the existing economy. Expenditure information is contained in the planning records. Background information on the I-O process can be found in Miernyk, 1965.

D. Base Year Employment and Income Information

Forest outputs for 1980 were identified and analyzed with the I-O model to provide a base situation from which employment and income changes could be measured. Table B-8 contains 1980 outputs levels, employment and income amounts associated with 1980 outputs, and the response coefficients per unit of output. Table B-9 shows employment and income for alternatives and benchmarks.

Table B-8
Forest Outputs and Impacts in 1980
Lincoln and Sanders Counties - Private Sector Only

Output	1980 Production	Employment: Direct Jobs	Employment: Total Jobs	Employment: Jobs/Unit	Income ($MM): Direct	Income ($MM): Total	Income ($MM): Income/Unit
Softwood sawtimber	156 MMBF	500	925	5.9/MMBF	10.63	19.07	$122/MBF
Picknicking	38.1 MRVD	15	20	0.5/MRVD	0.16	0.28	$ 7/RVD
Camping	139.4 MRVD	14	19	0.1/MRVD	0.12	0.27	$ 2/RVD
Skiing	2.6 MRVD	6	8	3.1/MRVD	0.06	0.12	$ 46/RVD
Water-based rec	119.6 MRVD	32	42	0.4/MRVD	0.32	0.54	$ 5/RVD
Dispersed nonmotorized recreation	47.3 MRVD	29	39	0.8/MRVD	0.28	0.47	$ 10/RVD
Dispersed motorized recreation	220.3 MRVD	140	185	0.8/MRVD	1.26	2.10	$ 10/RVD
Big-game hunting	61.0 MRVD	59	78	1.3/MRVD	0.64	1.01	$ 17/RVD
Small-game hunting	18.8 MRVD	8	10	0.5/MRVD	0.09	0.15	$ 8/RVD
Nongame wildlife	18.7 MRVD	9	12	0.6/MRVD	0.09	0.15	$ 8/RVD
Fishing	56.8 MRVD	15	20	0.4/MRVD	0.15	0.27	$ 5/RVD
Livestock	13.0 MAUM	2	10	0.8/MAUM	0.05	0.13	$ 10/AUM
Forest operations maintenance and capital investment	2.36 MM$	10	15	6.4/MM$	0.21	0.31	$.13/$
Forest salaries	14.50 MM$	210	282	19.5/MM$	3.60	4.97	$.34/$
Total		1049	1666		17.66	29.84	

$\frac{29.84}{17.66} = 1.7$

Table B-9
Private Sector Forest Related
Jobs and Income by Alternative *

Alternatives	Jobs Decade 1	Jobs Decade 2	Income (MM$) Decade 1	Income (MM$) Decade 2
A	2457	2666	43.20	46.93
B	2436	2685	42.77	47.01
C	2447	2703	43.02	47.40
D - RPA	2457	2727	43.21	47.75
E	2391	2616	41.92	45.68
F	2006	2273	34.08	38.60
G	2343	2559	41.04	44.59
H	2237	2399	39.48	42.04
I - Current	1931	2047	32.44	33.91
J - Proposed	2299	2584	39.91	44.87
JF - Final	2299	2584	39.91	44.87
K - Departure	2492	2644	43.83	46.06
L	2727	2680	48.53	46.90
M - Max PNV	2706	2498	48.29	43.28
N	2608	2619	46.23	45.64
O	2401	2706	41.94	47.25

* 1980 Base year Employment = 1666 jobs
1980 Base Year Income = $29.84 Million

E. Returns to the U.S. Treasury and Local Government

Predicted returns to the U.S. Treasury and local governments for each alternative and benchmark were calculated in the analysis to show the effects on revenue programs administered by the Kootenai National Forest. These returns illustrate the impact of management on both Federal Government receipts collected as a result of revenue producing programs on the Forest, and the resultant change in revenues passed on to local government. Comparisons were made between the average annual returns per period for each alternative and benchmark, and the base year (1980).

Returns to the U.S. Treasury were calculated by deriving the revenue of income producing programs on the Forest which correspond to FSM 6531.12b "Annual Collections Statement," or the National Forest Fund, including purchaser credit and K-V funds. Total Treasury returns were broken down into three categories: timber, grazing, and special uses (includes recreation, land use, power, and mineral fees). Timber returns were calculated for each FORPLAN run from the value of timber revenues (Economics Report 6). Grazing returns were assumed equal for all alternatives based upon 1980 use levels as discussed in section III of this Appendix. Other returns were calculated as the sum of fees collected for recreation, land use, power, and minerals in 1980 and were

assumed constant for all alternatives. Table B-10 summarizes the base year returns to the U.S. Treasury.

Table B-10
Base Year Estimates - Returns to the U.S. Treasury 1980

Resource	U.S. Treasury Returns (1978$)
1. Timber	10,700,000
2. Range	20,000
3. Recreation, Special Uses	80,000
Total	10,800,000

Returns to local governments are Treasury funds paid to the State of Montana and eventually passed to local governments resulting from revenue producing programs on the Forest. The basis of this fund, Returns to the U.S. Treasury, is discussed above. Calculation of returns to local governments is defined as 25% of the returns to the treasury discussed above.

F. Work Force

Forest Service work force for each alternative and benchmark was based on the ratio of work year equivalent jobs to total budget in 1983. This figure (24.43 WYE/$MM budget) was applied to the first decade budget in each case. Note that the coefficient used does not equate to the inverse of average salary because the total budget includes many items other than salary.

G. Social Measures

Social impact analysis estimates how Forest policies and actions affect the quality of life or social well-being. The analysis is done by projecting future social conditions in an area influenced by Forest Service actions if current management were unchanged, then comparing this projection with conditions likely to occur as a result of implementing management alternatives.

Social impacts were measured by social variables and social groups. Social groups are those affected by Forest Service activities, and social variables define how people are affected and the relationship between people and the natural environment. The following describes the social measures and how they were used.

1. Social Zones of Influence

The following is a description of the groups of people or communities within the impact analysis area.

a. Local Zone

The local zone of influence is defined as Lincoln and Sanders County, Montana. The secondary zone of influence is defined as Flathead County, Montana, and Bonner and Boundary Counties, Idaho.

The economies within this zone of influence are closely tied to resource extraction, primarily timber and minerals. The minerals and mining industry sparked the early migration to the region where gold and silver were prospected and mined in the 1890's. The fluctuation and eventual decline in gold and silver prices, coupled with the playing out of the more easily extracted ore bodies, led to a falling off of mining activity in the 1930's. A revival of mining interest has occurred in the last ten years with the discovery of lead and silver in the Bull River valley and the construction of ASARCO's Troy mine.

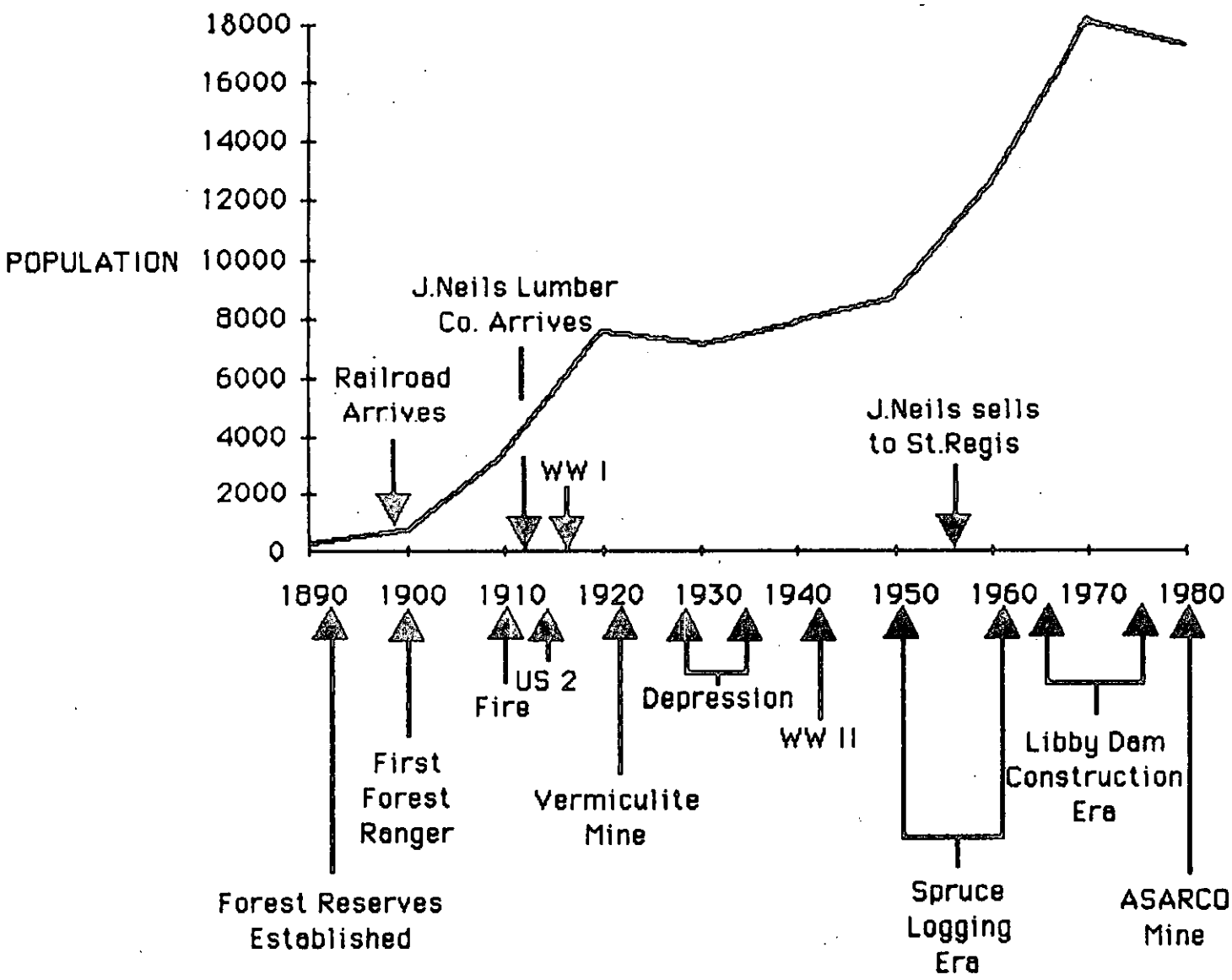
The timber industry has traditionally been the major employer in the impact area. The fluctuations in the housing market and the effect on the demand for timber, has led to periods of instability and chronic high unemployment, particularly during the winter months. The following figure illustrates the various activities which have impacted Lincoln County, and by extension much of the area, by comparing population over time to those factors:

The presence of the Kootenai National Forest is a major factor in the economies of Lincoln and Sanders Counties. About 72% of Lincoln County is Kootenai National Forest land while about 22% of Sanders County is Kootenai Forest land. In addition, portions of the Lolo National Forest are located in Sanders County making the total National Forest land 58% of the County total. Timber from Kootenai Forest timber sales is an important part of the local mill operations. The Kootenai usually employs 300-400 seasonal employees in addition to a permanent workforce of 400 people. This, added to the special manpower programs, makes the Kootenai a major employer.

People who have elected to live in the area, despite the economic uncertainty of the major industries, have done so because of the natural environment and small town atmosphere. Based on past opinion surveys and on the Social Impact Assessment prepared as part of the Forest Plan, people characterize themselves as independent and self-reliant and admire those traits in others. Outdoor recreation is considered an important aspect of living in the area with hunting, skiing, fishing, hiking, and camping being popular activities. Thus, National Forest management is of major interest and concern to the local public.

Figure B-12

LINCOLN COUNTY POPULATION IN AN HISTORICAL PERSPECTIVE 1890 - 1980



The local zone can be divided into four sub-areas as follows:

Libby - This area contains the town of Libby, the county seat of Lincoln County, and the immediate environs. About 67% of the population of Lincoln County, or 12,000 people live in the area. The timber industry, represented by the St. Regis operation and several independent "gyppo" loggers, W.R. Grace vermiculite mine, and the Kootenai National Forest represent the major employers in the area. The ASARCO mine in the Bull River Valley also employs people from this area but most ASARCO employees live either in Troy or in the Bull River Valley area. Because of the concentration of people, Forest activities are very apparent and concerns are often expressed for protection of the municipal watershed and over access-related issues (more or less road closures).

Troy-Yaak-Bull River Valley - This area contains the town of Troy (population 1,100), the sparsely settled Yaak River Valley, and the expanding Bull River Valley. The ASARCO's Mt. Vernon mine has become a major impact on the economy of this area, reflected primarily in the increase in the population of the Bull River Valley. Bull Lake is a popular recreation area, attracting much use in the summer. Forest management is a concern to the recreation oriented population around Bull Lake.

Independent logging is the primary occupation in the Troy-Yaak area. The Yaak valley is populated by a variety of people; retirees, Forest Service employees, and homesteaders. Most who live in the area are seeking a country living situation which relies on Forest resources. Troy residents characterize themselves as small town, closeknit, and cohesive. Issues most commonly heard concern timber harvest and the local economy.

Eureka-Fortine - This area is located in the Tobacco Valley area of Lincoln County. The flavor of this area includes more grazing and farming because of the suitability of the Tobacco Valley for these activities. Timber harvest is also important, especially Christmas tree production. There are about 1,000 people in Eureka. The area can be categorized as rural. The Eureka-Fortine area receives substantial recreation use from the Kalispell area, a large part focused in the Ten Lakes Scenic Area. Issues commonly voiced concern timber, recreation, and wilderness/nonwilderness for Ten Lakes.

Noxon-Trout Creek - This area is located in Sanders County, along the Clark Fork River. Towns and communities situated in this band along the river include Heron, Noxon, and Trout Creek. Also included is the area in the southern Bull River Valley. The population is primarily employed in the timber industry. There is much concern for environmental issues and with wildlife management; the elk herd in the area has State-wide significance and attracts heavy use in the Fall.

b. Regional Zone

The regional zone is defined roughly as the area between the Forest boundary and the nearest large urban areas. This includes the Kalispell - Missoula area (the Flathead Valley) and the Sandpoint-Coeur d'Alene-Spokane area.

Contributions from the Forest to the economies of this general area are minimal in terms of commodity outputs. Timber, for the most part, is processed within

the local zones or secondary impact areas, i.e. Libby, Troy, Eureka, Trout Creek, Columbia Falls, and Moyie Springs, Idaho.

The primary importance of the Forest in the regional area is for recreation. Areas such as the Cabinet Mountains Wilderness, Koocanusa Reservoir, the Ten Lakes Scenic Area, and the Yaak River Valley attract a large share of regional recreation use, approximately 413,700 RVD's per year. This represents 30% of the Forest use. Most of the use is for hiking, hunting, and fishing.

Individuals in the regional area who use the Forest have shown a strong attachment to and interest in, how it is managed. A number of public interest groups, as well as individuals, have taken an active part in helping shape Forest management priorities. This is often expressed in the form of appreciation for amenity or aesthetic values. Except for aesthetics, however, even dramatic changes in Kootenai Forest outputs are perceived as having only limited effect on the regional economy as a whole and almost no effect on the personal lifestyles of most of its residents.

c. National Zone

The national zone of influence is not significantly affected in terms of response to changes in Forest outputs for a given level of management. For instance, a change in timber outputs would not significantly vary supply or demand on a national scale. However, changes in policy affecting amenity values such as scenic quality, water quality, wildlife and fisheries management, and similar values will continue to draw attention from special interest groups at the state and national levels. This is evidenced in the past, by these interest groups' involvement in issues regarding designations of roadless areas.

2. Social Variables

In order to quantify the impacts of social factors in each zone of influence with regard to the varying outputs of the different alternatives, it was necessary to define five variables to conduct the quantification or measurement. These are defined as:

a. Population Changes

Population change is an occurrence that can be measured. However, a very significant facet of this sociological variable is people's perception of change. For most people, increases in population are seen in a negative sense, as an erosion of one of the qualities that make living in the area attractive; namely, low density population. Public opinion surveys performed in the area have consistently revealed that the small area population is one reason those surveyed have chosen to remain in the area.

Some people fear that the changes are already occurring and wish to limit developments that might attract further increases. In fact, census records reveal that the population has remained relatively stable during the last ten years.

Population changes have distinct impacts on community cohesion - newcomers with lifestyles, values, and experiences different from long time residents do not necessarily feel the communal links with the whole community - they more often tend to communicate and interact among themselves. Population changes have diversified the Libby/Troy area; are changing the Trout Creek/Noxon/Heron area and less obviously causing an impact in the Eureka/Fortine area. A wider variety of lifestyles and land use ethics now characterize the area than 10 years ago, but employment opportunities have not significantly increased resulting in high unemployment, lack of job security, and high mobility.

Any alternative which did not result in rapid and drastic population changes would be acceptable.

b. Community Cohesion

"The quality of adherence to a particular community cause; a zealous collective support of community; community pride and loyalty; people working together for mutual benefit; a sense of belonging that is associated with mutual community interests and goals; the regard and respect people hold for their community and each other" (Bowen, et al., 1978). This variable speaks directly to the degree to which individuals and groups support or denounce broadbased social issues. It is important only at the local level.

In general, the local area can be categorized as being in agreement over what the land resource issues are, but polarization has occurred as to the method to resolve the issues. In terms of community cohesion, the polarization is most pronounced in Libby due to its relatively large changing population and less marked in Eureka-Fortine, and Troy.

Throughout the local area, there is a high level of community pride and a strong sense of association within the local area. An alternative which promotes or maintains this cohesiveness would be acceptable.

c. Lifestyles

This variable pertains to preserving the traditional way of living commonly associated with the local zone and the subareas within it. It is important to note that most of the local people view their traditional level as being centered around individuality, freedom, permanency, and a strong identification with the area. Although moderate change in this lifestyle is not viewed as detrimental, most individuals would prefer to see little or no change.

By far, the majority of local uses of Forest lands and resources involve motor vehicles and consumptive activities. Extractive recreational use is most prevalent, such as hunting, fishing, firewood gathering, berrypicking, etc. The local population closely identifies with the Forest, considered by many to be their backyard. Restrictions on use or access are not generally acceptable. Any alternative which minimizes change to people's traditional use of the forest would be most acceptable.

d. Attitudes, Beliefs, and Values

Attitudes, beliefs, and values are reflected in people's likes, dislikes, perceptions, hopes, aspirations, and fears. Changes in Forest Service policy may result in practices that affect people's feelings about and understandings of the Forest.

First, this variable refers to the symbolic meaning people attach to the places and resources on, or from, the Forest. Although people may not be economically dependent upon the Forest, they may receive rational psychological benefit or symbolic meaning from resources.

A second component is a sense of freedom from control by others, such as outside or government interference. People often view the lack of local control over resource decisions as a problem. Local control over programs or proposals is often perceived as limited or nonexistent because policies come from Washington.

Third is self-sufficiency or the ability to live one's life in one's own way and use whatever resources are necessary to get along without any, or a minimum of, outside help. Certain quantities and qualities of Forest resources may be necessary for people to be independent.

Certainty and uncertainty, a fourth component, refers to the probability that certain things can be counted on in living a desired way. It refers to the lack of confidence (uncertainty) or confidence (certainty) people may have about being able to stay in a community because of the changes in use of resources, or because the resources are in limited supply. Loggers, guides and outfitters, ranchers, and recreational businesses are often quite dependent upon the natural resources for their livelihood.

e. Aesthetics

"Feelings of attachment" characterize this variable with regard to the perception of local individuals and their attitudes. Residents have close attachments to the area, but their reasons differ. Many people consider aesthetic values (preservation of wilderness, clean air, clean water, unblemished appearance) as the most important factors, while others maintain that use of the Forest for timber harvest and other extractive uses are more important issues. Alternatives can be analyzed as to what the emphasis of the management is perceived to be and what values are best satisfied within each.

H. Local Timber Supply Analysis

Several comments received in response to the DEIS and Proposed Forest Plan indicated concern as to future supplies of timber in the local area. In general, there seemed to be some concern that even if the National Forests made more timber available for purchase, an anticipated decline in private supplies would offset these increases. This has implications with regard to anticipated social and economic impacts in the area.

A representative of Louisiana-Pacific, a large timber processing firm, described the situation as follows:

> "Louisiana-Pacific is almost totally dependent on federal timber for the plants in north Idaho. As with most companies, we speculated too much in the late '70s and early '80's and consequently we have a lot of expensive timber under contract. Our plans are to deplete this expensive timber over the next few years by mixing it with feasibly priced timber that we are currently acquiring on today's market. This has forced us to depend heavily on the open log market which is composed of a high percentage of private timber. The results of most companies being in this position is that the private lands, including industrial fee lands, are being overcut and cannot support their harvest indefinitely. As time goes on, this will create much more demand for federal timber than we have seen in the past. This situation will be compounded if the proposed reduced cuts materialize on the Panhandle and Flathead Forests. The companies dependent on the timber supply from those Forests will be forced to depend more on the Kootenai's supply."

If the amount of timber being processed by mills in the area were to remain constant into the future, we could expect that the dynamics of the past would continue. In general this would include gradually decreasing numbers of jobs associated with increased mill efficiencies. In the past this trend has been very difficult for those directly affected, but the community has absorbed the changes without serious disruption. Higher volumes of timber being processed would result in more jobs and generally more economic activity in the area. Lower volumes of timber would result in fewer jobs and lower levels of economic activity.

The volume of timber processed is not under the control of the Forest Service. Since most of the lumber that is produced is exported from the impact area, national market dynamics play heavily on production levels. Interest rates and associated housing construction levels are critical factors.

The Forest Service does control much of the standing timber that is available for sale to processors. In the extreme situation, if no Forest Service timber were available, the volume of timber processed would have to be lower. If the Forest Service were to increase the amount of timber available, the industry may elect to process the volume or not; depending upon market conditions at the time. Under these conditions, predictions of future impacts upon local communities is quite difficult.

In order to determine the Forest Service role in the area of community stability, a study of past and future supply of timber in the five-county impact area (Lincoln, Sanders and Flathead, Montana; Bonner and Boundary, Idaho) was completed. Details of the study are provided in the planning records "Development of Response to Public Comments - Timber Supply Situation", (Haugen, July 24, 1986).

The following table displays the actual timber volume harvested from all major ownerships in the five-county area over the last ten years. This is used as a basis for comparison of impacts due to anticipated supply level changes in the future.

Table B-11
VOLUME HARVESTED FROM STATE, PRIVATE and FOREST SERVICE LANDS
IN THE FIVE-COUNTY SECONDARY IMPACT AREA
1976 TO 1985
MMBF

COUNTY	76*	77	78	79	80	81	82	83	84	85	AVG
Lincoln	314.5	317.3	284.7	265.4	219.0	255.0	231.6	301.3	314.1	269.8	273.1
Sanders	135.6	112.9	122.8	121.6	81.5	77.4	78.9	107.3	84.2	94.8	101.0
Flathead	217.3	197.3	157.3	175.0	184.9	195.7	156.0	183.4	196.6	188.0	183.0
Bonner	126.9	156.8	114.1	137.9	117.2	106.0	103.1	105.9	129.1	124.8	120.9
Boundary	80.2	83.9	71.7	82.9	82.0	44.2	68.6	78.7	72.7	105.5	76.0
TOTAL:	874.5	868.4	750.6	782.8	684.6	678.3	638.2	776.6	796.7	782.9	754.0

* The Forest Service portion includes the transition quarter
The National Forests that contribute volume are the Kootenai, Flathead, Lolo and Idaho Panhandle.

The above table displays the actual volumes harvested over the past ten years as closely as they can now be determined. This is the raw material that was used from the five-county area. It can also be equated to the supply actually available and used in those years.

In order to estimate the future situation, several assumptions are necessary:

1. From a National Forest perspective we shall assume that over a ten-year period, with the absence of a "buy-back" bill, that timber offered will actually be sold and harvested. The Forest Plans display the total volume available for sale as the "Timber Sale Program Quantity". These volumes can be prorated out to the counties on the same basis as the historic cut volumes. Inherent, here, is the assumption that Forest Service budget levels will allow implementation of this timber program.

2. In general, state lands are managed for a continuous yield so future volumes from those lands will be assumed to be equal to the 1976 through 1985 average.

3. No specific information is available about private logging plans, but some in the industry have suggested that those lands will be severely depleted in 20 years. We will assume that the average volume available from private lands over the next decade will be half of what was cut in the last decade. The following discussion will address four scenarios ranging from no reduction to 75% reduction in harvest on private lands compared to the last decade of harvest.

Under these assumptions, the volumes expected to be available by county are as follows:

Table B-12
TIMBER VOLUMES EXPECTED TO BE AVAILABLE IN THE NEXT DECADE
(* Scenarios Described below)
MMBF Average Annual

SOURCE	LINCOLN	SANDERS	FLATHEAD	BONNER	BOUNDARY	TOTAL
Kootenai NF	211.4	11.1	6.2	1.4	0.9	231.0
Flathead NF	2.0	0.0	88.7	0.0	0.0	90.7
Lolo NF	0.0	31.2	0.8	0.0	0.0	32.0
Panhandle NF	0.6	0.0	0.0	58.3	48.4	107.3
State	3.8	2.2	9.8	6.6	6.1	28.5
Private:						
Scenario I	103.3	71.4	88.2	62.6	27.4	352.9
Scenario II	77.5	53.6	66.2	47.0	20.6	264.9
Scenario III	51.6	35.7	44.1	31.3	13.7	176.4
Scenario IV	25.8	17.9	22.0	15.6	6.8	88.1
TOTALS:						
Scenario I	320.9	115.9	193.7	128.9	82.8	842.2
Scenario II	295.1	98.1	171.7	113.3	76.0	754.4
Scenario III	269.4	80.2	149.6	97.6	69.1	665.9
Scenario IV	243.4	62.4	127.5	81.9	62.2	577.6

Definitions:
- Scenario I - No decline in private harvest from last decade.
- Scenario II - 25% decline in private harvest from last decade.
- Scenario III - 50% decline in private harvest from last decade. This is the assumed situation for the Final Plan.
- Scenario IV - 75% decline in private harvest from last decade.

The following table displays the past as compared to the future in terms of total timber volume available for harvest:

Table B-13
AVERAGE TIMBER VOLUME HARVESTED IN THE PAST TEN YEARS
AND
AVERAGE TIMBER VOLUME AVAILABLE FOR HARVEST IN THE NEXT TEN YEARS
(all volumes are average annual in MMBF)

COUNTY	PAST CUT 1976-1985	POTENTIAL FUTURE CUT: VOLUME AND % CHANGE FROM PAST SCENARIO I	SCENARIO II	SCENARIO III	SCENARIO IV
Lincoln	273.1	320.9 +18%	295.1 +8%	269.2 - 1%	243.4 -11%
Sanders	101.0	115.9 +15%	98.1 -3%	80.2 -21%	62.4 -38%
Flathead	183.0	193.7 + 6%	171.7 -6%	149.6 -18%	127.5 -30%
Bonner	120.9	128.9 + 7%	113.3 -6%	97.6 -19%	81.9 -32%
Boundary	76.0	82.8 + 9%	76.0 0%	69.1 - 9%	62.2 -18%
TOTAL	754.0	842.2 +12%	754.2 0%	665.7 -12%	577.4 -23%

This data is displayed in the following graphs:

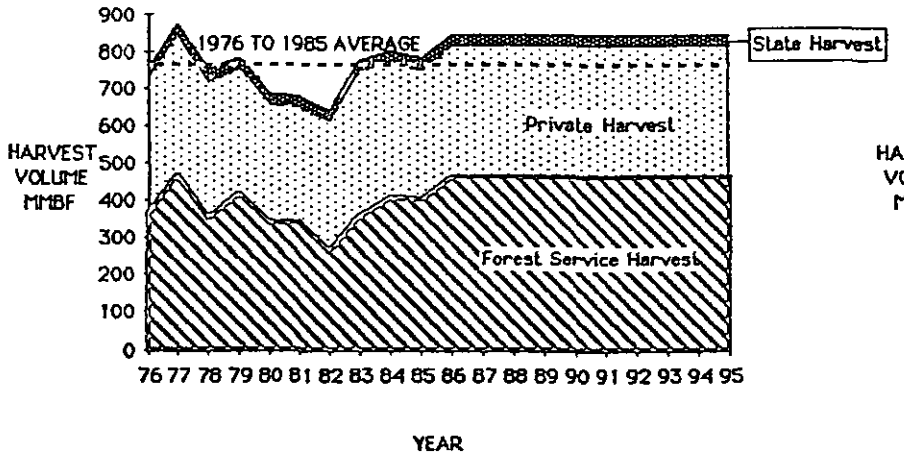
FIGURE B-13

FIVE COUNTY* TIMBER SUPPLY SITUATION PAST AND FUTURE

SCENARIO I: The future harvest from private lands will be the same as the last decade harvest level.

SCENARIO II: The future harvest from private lands will be three fourths of the last decade harvest level.

CUMULATIVE AREA CHART



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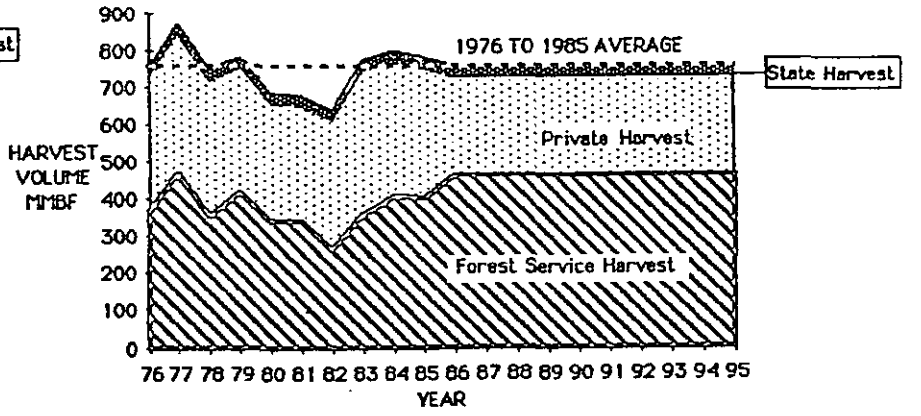

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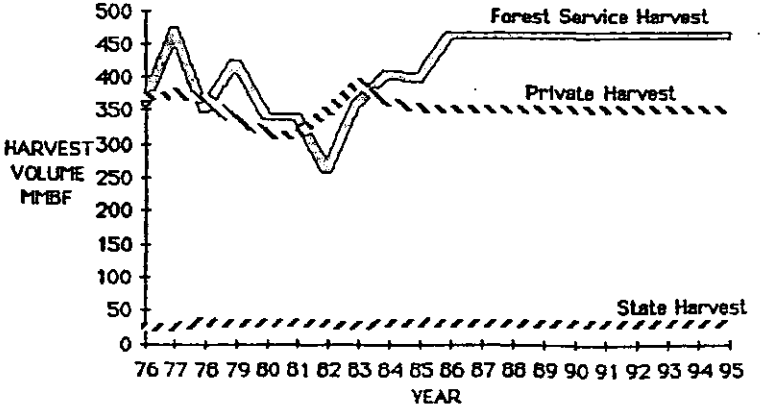

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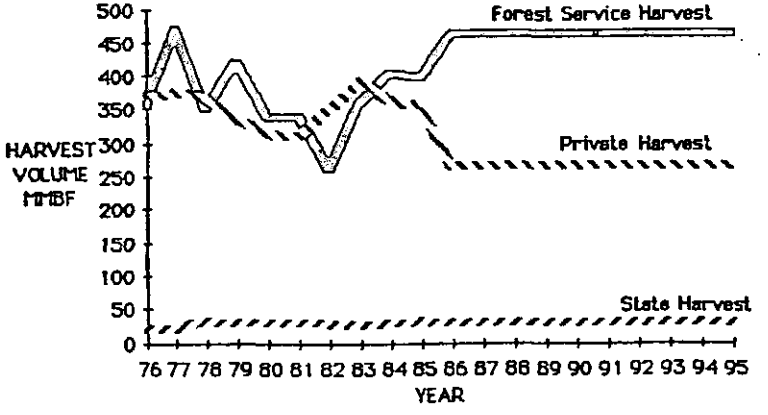


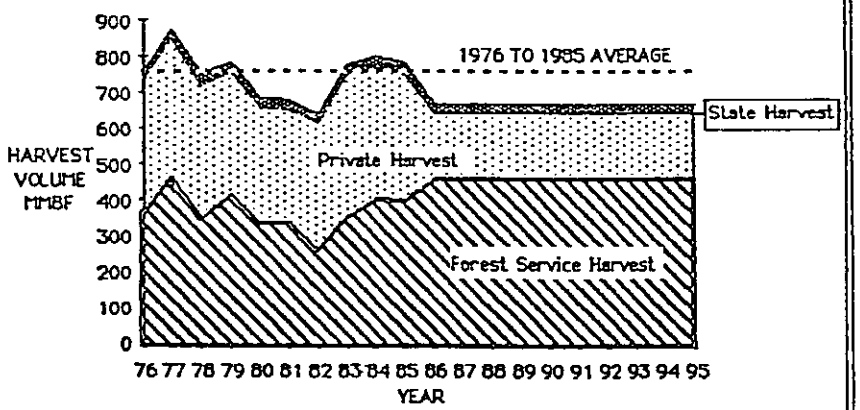
* Montana: Lincoln, Sanders, Flathead Counties
Idaho: Boundary and Bonner Counties

FIGURE B-13
(CONTINUED)

FIVE COUNTY* TIMBER SUPPLY SITUATION PAST AND FUTURE

SCENARIO III: The future harvest from private lands will be one half of the last decade harvest level. Assumption for the Final Plan.

CUMULATIVE AREA CHART



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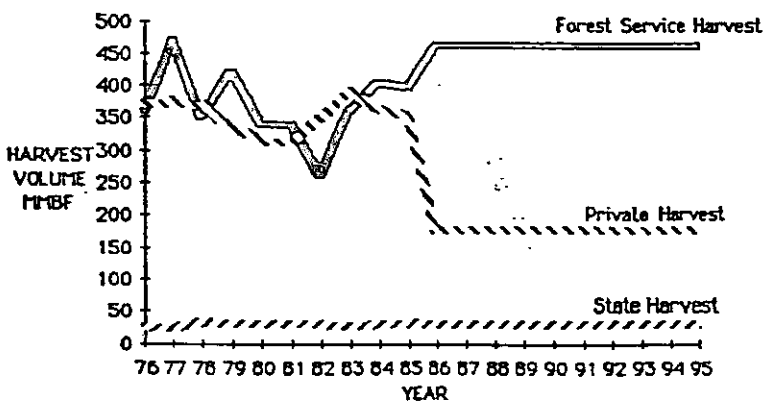
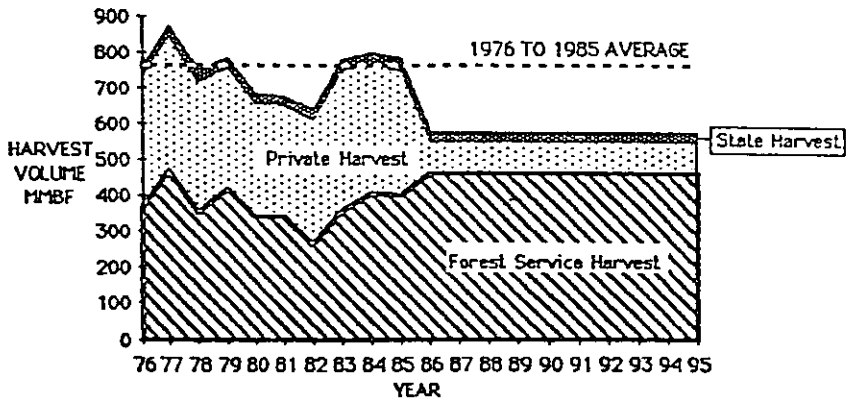


SCENARIO IV: The future harvest from private lands will be one fourth of the last decade harvest level.

CUMULATIVE AREA CHART



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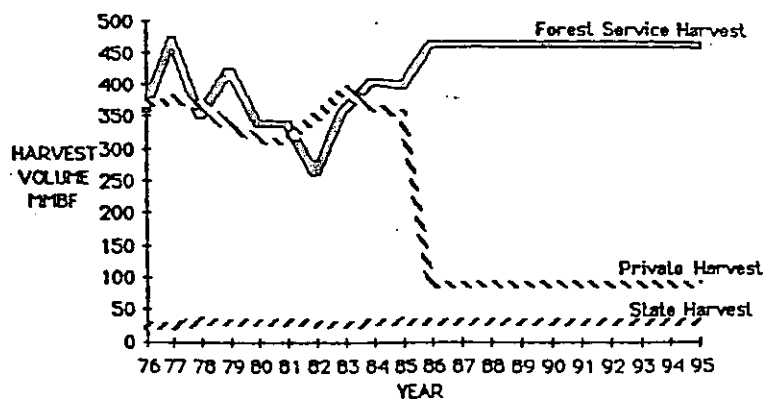


FS 1976 cut does not include the transition quarter

* Montana: Lincoln, Sanders, Flathead Counties
Idaho: Boundary and Bonner Counties

The assumption of Scenario III indicates that the total supply of timber in the five-county area will decline over the next decade compared to supplies available over the last ten years. This occurs because projected increases in harvest from all four National Forests in the area are offset by anticipated declines in harvest levels on private lands. The reduction in total timber supplies linked with increases in processing efficiency is estimated to cause a loss of 1,400 jobs in the five-county area over the next decade. This is about a three percent decline in total jobs and a five percent decline in total income. The overall economy will be adversely affected by this situation. Restructuring of supply sources is expected as relative efficiencies among the mills in the area change. In general the mills in the area will turn to Lincoln County, which should experience a smaller drop in total supply than the other counties, for more wood. They will be successful in competing with the Lincoln County mills to the extent that they can improve relative efficiencies and offset the haul advantage of the local mills.

The social impact described above can not be satisfactorily mitigated by increasing timber supplies from the National Forest lands. The decline in private harvest levels is estimated at 176 MMBF per year over the next decade for the five-county area. The Kootenai National Forest can not offset a decrease of that magnitude under the minimum management requirements. To come close to such an increase would involve a departure schedule with significant reductions in harvest levels before it is expected that private lands would be able to increase their contribution. Thus a short-term reduction in social impacts would likely be followed by even more severe future impacts.

As can be seen in Table B-12, above, the Kootenai National Forest is expected to contribute about 78% of the next decade's volume in Lincoln County. Since this percentage is so high, a non-declining harvest schedule from the Kootenai National Forest can contribute to community stability. Supplying the highest possible volumes in the near future without a future decline would be most stabilizing because it is unlikely that a future decline in National Forest cut could be balanced by an increased cut from other ownerships. This would be the most stabilizing option available to the Kootenai National Forest regardless of the scenario used to describe private harvest.

Note that if expanded mining activities occur, as now seems probable, a significant portion (about 2/3) of the jobs lost in the timber industry could be replaced by jobs in mining and secondary activities although some relocation within the five-county area would occur. Recreation activities would have to increase by a factor of about four (four times as much recreation as now exists) to offset the anticipated decline in timber related jobs. Recreation use is projected to increase at about 10 percent per decade (vs 400% needed), so it is unlikely that increased activity in the recreation sector can significantly mitigate the impacts in the timber sectors.

The employment and income impacts described in previous sections of this Appendix and in the body of the EIS are those associated with Forest Service activities. Since increased harvests are anticipated from Kootenai National Forest lands, increased jobs and income are displayed. This is the impact of the Final Plan for which the EIS was developed. The above discussion puts those impacts in the context of the total economy, but does not change the essentially positive impacts that the Forest Plan will have in the area of social and economic impact.

I. Timber Resource Supply/Suitable Land Evaluation

In light of the potential problems with local timber supply, described in Section H above, the supply potential from the Final Plan was further examined. Table B-1 identifies the tentatively suitable timber land on the Kootenai National Forest and classifies the remainder of the Forest into a variety of other categories. Table B-13a, below, displays additional details about land suitability. The discussion which follows the table provides definitions and explanation for each category and how it relates to the figures displayed in Table B-1. Additional information on potential timber supply is also displayed in Table B-13a(1) in Section 3.

Table B-13a

Kootenai National Forest
TIMBER RESOURCE LAND SUITABLITY

NOT SUITED LANDS	Acres	EFFECTS		
Non-Forest	82,000			
Not Capable	291,000			
Irreversible soil and watershed damage	49,000			
No Assurance of Adequate restocking	0			
Withdrawn from Timber production	35,000	FIRST DECADE		
SUBTOTAL NOT SUITED LANDS: . .	457,000	Harvest Acres annual	ASQ MMBF annual	LTSY MMBF
TENTATIVELY SUITABLE LANDS- SUITABLE PORTION				
Direct Benefits Exceed Direct Costs . .	1,051,000	13,700	190*	-
Meet Non-Timber Multiple Use Objectives	193,000	0	29	-
Local Jobs/Income	19,000	1,800	8	-
SUBTOTAL SUITABLE PORTION:	1,263,000	15,500	227	290
		RESOURCE OPPORTUNITY		
TENTATIVELY SUITABLE LANDS- NOT SUITED PORTION		FIRST DECADE		
Lands not cost efficient to meet objectives:		Harvest Acres annual	ASQ MMBF annual	LTSY MMBF
Future Timber Harvest possible	139,000	0**	0**	0
Multiple-Use Objectives Preclude Timber Production:				
Other Uses	352,000	-	-	-
Proposed Wilderness . .	34,000	-	-	-
SUBTOTAL NOT SUITED PORTION:	525,000	0**	0**	0
TOTAL NATIONAL FOREST AREA: . . .	2,245,000			

* Includes 25 MMBF of non-interchangeable volume of dead lodgepole pine in addition to 165 MMBF of live green volume of all other species including lodepole pine.

** Opportunity for 24 MMBF/year possible timber harvest is available in the second decade with a Forest Plan amendment.

See Table B-13a(1) in Section 3 for more detail on potential timber harvest possible in the 2nd decade and beyond.

1. Definitions and Discussion

Table B-13a divides the area of the Forest into two major categories. The first is "Not Suited" for timber management. This includes several sub-categories:

- Non-Forest: These are lands that are not at least 10 percent occupied by forest trees of any size, or formerly having had such tree cover and currently developed for non-forest use (36 CFR 219.14[a][1]). This amounts to the sum of water (37,000 acres) and non-forest land (45,000 acres) from Table B-1.

- Not Capable: Forest land not capable of producing industrial wood. Quantitatively defined as lands not capable of producing 20 cubic feet of wood per acre per year.

- Irreversible Soil and Watershed damage: Technology is not available to ensure timber production from the land without irreversible resource damage to soils productivity, or watershed conditions (36 CFR 219.14[1][2]). This is the acreage from Table B-1 called "Irreversible Resource Damage". These are lands that could not be harvested within the 200 year planning horizon without violating the soil and water minimum management requirements. Technically it is the difference between the acreage that would have been tentatively suitable for timber harvest and the acreage that could possibly be harvested as defined by the maximum timber benchmark.

- No Assurance of Adequate Restocking: There is not reasonable assurance that such lands can be adequately restocked (36 CFR 219.14[a][3]). If a tree ever reaches a size that could make a merchantable product it will not be cut because there is no way to assure that it can be replaced.

- Withdrawn from Timber Production: The land has been withdrawn from timber production by an Act of Congress, the Secretary of Agriculture or the Chief of the Forest Service (36 CFR 219.14[a][4]). This is the land shown on Table B-1 as withdrawn by Congress or the Chief of the Forest Service. It is the productive timberland included within the Cabinet Mountain Wilderness, the Ten Lakes Montana Wilderness Study Area, and the Adminisrative Sites on the Forest (Ranger Stations, Work Centers, etc.).

The second major category is "Tentatively Suitable". It is further divided into "Suitable" and "Not suitable" lands which are subdivided once again. Among the suitable lands we have the following:

- Direct Benefits Exceed Direct Costs: Direct benefits expressed as expected gross receipts to the government. Expected receipts are based upon expected stumpage prices and payments-in-kind from timber harvest considering future supply and demand situation for timber and upon timber production goals of the Regional Guide (see 36 CFR 219.14[b][2]). Table B-13a displays the acres of these lands derived by using the "new economics" (See NOTE below). The "old economics" would have produced 1,166,000 acres of this type land. All of the harvest except that associated with jobs and income and the allowable-cut effect, discussed below, comes from these lands. This amounts to 165 MMBF per year and 137,000 acres over the decade.

NOTE: The "new economics" included: (1) timber prices linked to transaction evidence sale data for the years 1975-1984, (2) timber price projections as used in the 1985 RPA process, and (3) road costs adjusted for real cost decreases experienced since 1978. In contrast, the "old economics" included: (1) timber prices linked to transaction evidence sale data for the years 1974-80, (2) timber price projections as used in the 1980 RPA process, and (3) road costs as experienced in 1978. In summary, the "new economics" resulted in lower timber values than the "old economics".

- Meet Non-Timber, Multiple-Use Objectives: Lands where timber production is necessary to achieve non-timber, multiple-use objectives even though direct timber production costs exceed expected gross receipts to the government. These objectives are not assigned monetary values, but are achieved at specified levels in the least cost manner. See 36 CFR 219.14(c) and 219.3 (definition of cost efficiency). Some of these lands are in the suitable timber base because they meet some objective of management, such as timber harvest in lodgepole pine stands in elk summer range or grizzly bear habitat. As touched upon above, in the discussion on cost-effective lands, one reason that these lands are included is that they contribute to increasing the PNV of the Forest as a whole even though they may individually generate a negative contribution to PNV. None of these lands are cut in the first decade thus the acreage effect is shown as zero. They do have what is known as an "allowable-cut effect" (ACE). The ACE is a result of having volume available for harvest in later decades so that first decade harvest can rise without violating the principle of non-declining yield. This will only occur if the contribution to PNV of the volume that is harvested early, offsets the negative contribution of that harvested later. It is estimated that the ACE amounts to 29 MMBF in the first decade.

- Local Jobs/Income: Lands necessary for timber production in order to maintain an appropriate level of employment and income. (No direct basis in the planning regulations; see 36 CFR 221.3(a)(3).) In order to address a public concern about local jobs and income, timber production was maximized in the first decade subject to non-declining yield and all the constraints discussed in section VII.C.16. The application of a constraint to maximize timber production in the first decade caused 19,000 acres of suitable land to be rescheduled earlier in the planning horizon. This earlier timber harvest scheduling resulted in a negative PNV on those acres because of the lower values of younger timber. About 18,000 of the acres were actually scheduled for harvest in the first decade. The ASQ rose by 8 MMBF with the addition of the maximum timber constraint. Note that much of the ACE generated by those acres which are in the suitable timber base to meet a non-timber management objective will come from harvest on the "jobs/income" acres in the first decade.

  Local jobs and income can also be maintained by providing additional timber harvest opportunities in the second decade and beyond to meet possible timber supply shortages in the future. One method to increase timber supplies is to convert 39,000 acres of stagnated lodgepole pine stands to healthy, vigorous timber stands. This will provide an ACE of 10 MMBF in the second decade at a cost of $3.1 million per year (See Table B-13a(1) for more detail on this potential timber opportunity). This conversion was

not done in the first decade in the Final Forest Plan because of the high budget requirement. (It is also hoped that a market can be developed for this small-stemmed material to avoid the investment cost of clearing and replanting.) The public response in the Draft EIS indicated that budget expectations should be as frugal as possible during the life of the Forest Plan in light of the current budget deficit-reduction climate. A budget requirement change of this magnitude would probably require a Forest Plan Amendment.

- Non-Interchangeable Component: The non-interchangeable components are increments of volume from the suitable land base or type of timber harvested from that base that are needed to meet management objectives. The total ASQ is derived from the sum of the timber volumes from all the non-interchangeable components. These increments cannot be substituted for each other for the purpose of programming harvest. Non-interchangeable components may be identified as parcels of land differentiated for purposes of Forest Plan implementation. Some conditions used to describe or differentiate these non-interchangeable components are: (1) species marketability, (2) whether it is dead or alive, (3) size class, and (4) operability. On the Kootenai National Forest, this component includes dead timber (mostly lodgepole pine) expected to be harvested from the suitable land base.

The second category under the tentatively suitable lands are those that were ultimately unsuitable.

- Lands not cost efficient to meet objectives - Future Timber Harvest possible: Lands not currently cost efficient for timber production but which could be brought into production if conditions change. These lands represent additional opportunities within the preferred alternative. Management Area 18 has moderate to high timber productivity, but involves habitat types that make regeneration difficult. Some parts of this MA have been harvested in the past and are presently understocked. Heavy competitive shrub cover is the major problem. MA 19 also has moderate to high timber productivity, but it is on steep, erodable slopes which can not be harvested with currently available equipment. If it became possible to resolve these problems, it is estimated that about 14,000 acres could be harvested each decade with about a 9 MMBF per year increase in ASQ (See Table B-13a(1) for more detail on this potential timber opportunity). Appropriate research needs have been identified in the Forest Plan to address these problems, and it is presumed that they will be resolved during the life of this plan.

  In addition to MA 18 and MA 19 lands mentioned above, other timberlands have been identified as being too expensive for scheduling regulated timber harvests during the life of the Forest Plan. These lands allow timber harvest to meet certain management objectives but the harvests are anticipated to be on an opportunistic basis. The Management Areas involved are MA 3 and MA 5 (Semi-Primitive Motorized Recreation and Viewing, respectively). The MA 3 lands provide motorized recreation opportunities for the public and the visual quality constraints make any timber harvesting very expensive because of the required helicopter logging. 12,000 acres of productive timberland is included within MA 3 which could provide 2 MMBF/yr if needed to resolve timber supply shortages in the

second decade (See Table B-13a(1) for more detail on these potential timber opportunities). The MA 5 lands provide scenic protection on steep lands which would also require helicopter logging. 10,600 acres of productive timberland is included within MA 5 which could provide 3 MMBF/yr if needed to resolve timber supply shortages in the second decade. See Table B-13a(1) for more information on these potential timber opportunities.

- Multiple-Use Objectives Preclude Timber Production - Other uses: Based upon a consideration of multiple-use objectives for the alternative, the land is proposed for resource uses that preclude timber production (36 CFR 219.14[c][1]). This category includes all of the designations for developed recreation, semi-primitive non-motorized recreation, old-growth timber retention and others that occur in the tentatively suitable timber base. Much of this area outside of MA 6 and MA 13 would contribute negatively to PNV if scheduled for harvest.

- Precludes Timber Production - Proposed Wilderness: There are 34,000 acres of tentatively suitable timber land in the Proposed Wilderness areas (MA 8). Most of these acres are not cost efficient for timber management due to their location, terrain and roadless condition.

2. Classification of Timberlands - Past and Future

Figure B-13a (Final Plan) and B-13b (Current Timber Management Plan) display the comparisons between the revised and previous timberland classifications. The narrative will refer to Table B-13a in the previous Section and Table B-13a(1) in this section.

Not Suited Lands - The Final Plan (Figure B-13a) displays 457,000 acres compared to the 436,000 acres entitled "Other" in Figure B-13b. These are the lands that are generally not capable or available for timber production as described in Table B-13a. The 21,000 acre difference is due to more recent experience with soils in harsh climatic situations.

Tentatively Suitable Lands - The Final Plan (Figure 13a) displays 1,788,000 acres compared to 1,787,000 acres shown as "Commercial Forest Land" in Figure B-13b. This is essentially the same land base and the difference is due to rounding. The 1,788,000 acres is the total of the "Suitable" and "Not Suited" timberland as displayed in Table B-13a in the previous Section.

Suitable Lands - Figure B-13a shows that 1,263,000 acres (71%) of the Tentatively Suitable base were designated as "Suitable" for scheduling regulated timber yields and timber sales. This Suitable land base corresponds to the total of the "Standard", "Special", and "Marginal" categories in Figure B-13b which totals 1,490,000 acres. This is a reduction of 227,000 from the Timber Management Plan and the difference in acres has been reclassified into the "Unsuitable" category and will be discussed below.

The "Cost Efficient" category in Figure B-13a (1,051,000 acres) corresponds to the "Standard" category (1,071,000) in Figure B-13b and the difference of 20,000 acres is included within the category shown as "Local Jobs & Income". As discussed in the previous Section, this 19,000 acres would have been cost efficient if they were not scheduled for harvest sooner to maintain historic timber sell levels. (The difference of 1,000 acres is due to rounding.)

The remaining 193,000 acres in the Suitable base in Figure B-13a shown as "Meet Non-Timber MA Objectives" corresponds to similar lands included within the "Special" category in Figure B-13b. The difference of 148,000 acres corresponds roughly to the "Opportunity" category (139,000 acres) which is discussed below. The difference of 9,000 acres has been placed within the "Other Uses" category which is also discussed below.

Not Suited Portion: The Final Plan (Figure B-13a) displays 525,000 acres of land (labeled "Future Timber Production Possible", "Other Uses", and "Proposed Wilderness") compared to 297,000 acres of "Unregulated" in Figure B-13b. The difference of 228,000 acres is described as follows:

"Future Timber Production" lands in Figure B-13a corresponds to an equal portion of the Special category in Figure B-13b. As discussed in the previous section, these lands include areas which permit timber harvesting (MA's 3, 5, 18 and 19) but because of the high costs and/or technical problems they have been removed from the Suitable timber base during the life of the Forest Plan or until the Forest Plan is amended or revised. These lands are available for reconsideration as Suitable timber lands if the cost and/or technical problems can be resolved. A Forest Plan Amendment or Revision would be needed to accomplish this change. For more detail on these Opportunity lands see Table B-13a(1) in the next Section.

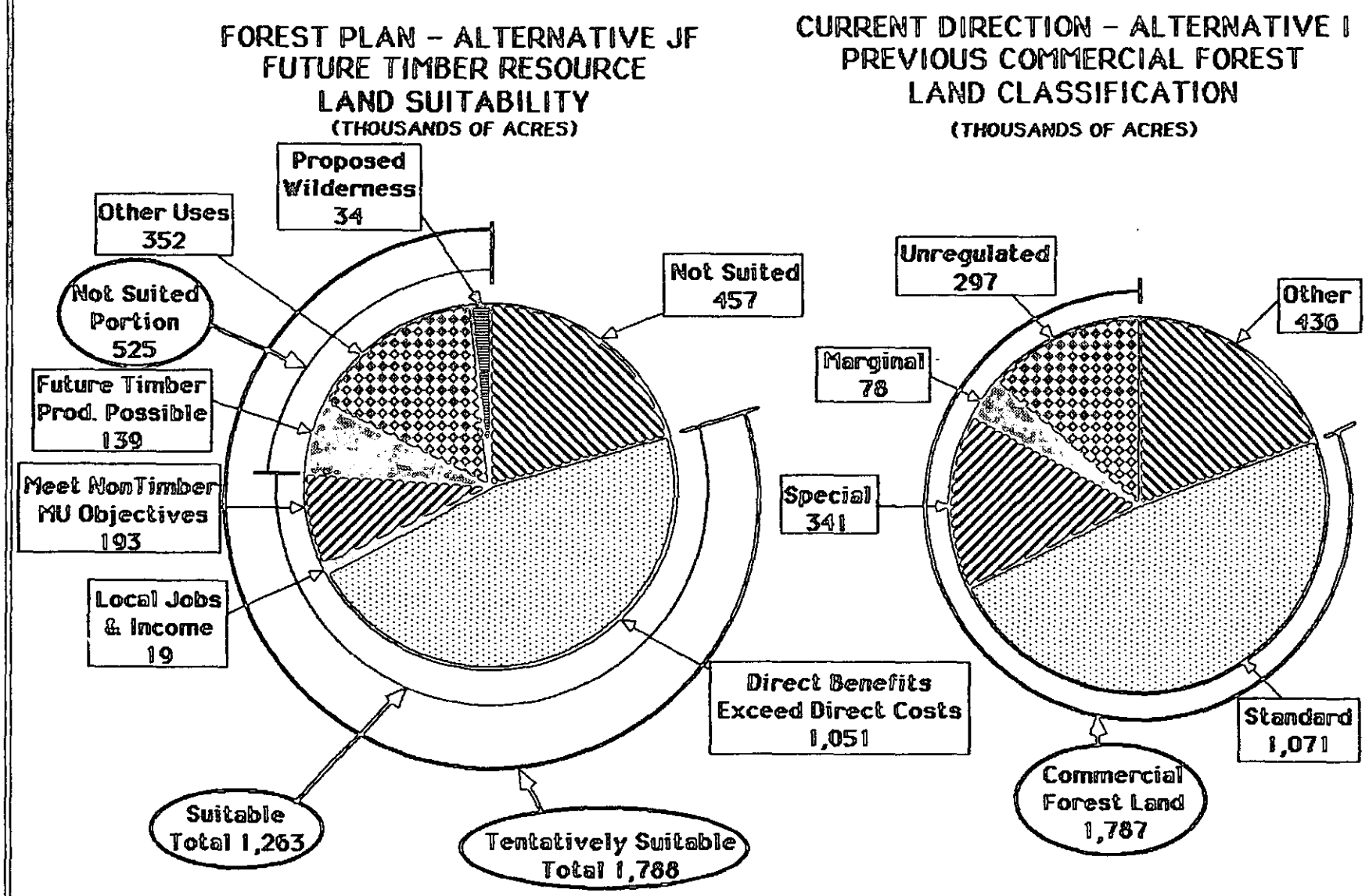
The "Other Use" category in Figure B-13a (352,000 acres) corresponds to the combined categories of "Marginal" and "Unregulated" in Figure B-13b (375,000 acres). (The difference of 23,000 acres roughly corresponds to the "Proposed Wilderness" category which is discussed below.) The previous timber management plan allowed timber harvesting on the Marginal and Unregulated lands and assumed that they would eventually be available for timber harvesting. The Final Forest Plan has analyzed these lands and determined that it is not appropriate to harvest on these lands to resolve other Forest Planning Issues such as Old-Growth Timber Management (126,000 acres), Special Interest Areas such as Research Natural Areas, etc. (10,800 acres), Roadless Management Areas, etc. Many of these lands would be very costly to manage for sustained timber yields and when compared to the other uses that they can provide, they appear to be more suitable for non-timber uses.

The "Proposed Wilderness" category in Figure B-13a does not have a corresponding category in Figure B-13b because these lands are associated with several new wilderness recommendations as a result of the Forest Planning process.

The following figures display the situation described in this discussion and Table B-13A. For more detail on the Opportunity Timberlands see Table B-13a(1) in the next Section. Also see Chapter IX of this Appendix for more details on the Timber Resource and how the Final Plan compares to the Current Direction.

Figure B-13a
and
Figure B-13b

FUTURE AND PREVIOUS CLASSIFICATION OF KOOTENAI NATIONAL FOREST LANDS



3. Local Timber Supply Options

As discussed in the previous section, there are opportunities to increase the suitable timberland base if certain conditions change (e.g., timber prices increase and regeneration and logging techniques are improved). Table B-13a(1) displays the potential results that could occur if timber prices increase significantly.

The first opportunity can be seen in the column labeled "ACE Due to..." under the title of "Future Timber Supply Opportunities." It indicates that 39,000 acres of Stagnated Lodgepole Pine stands could be converted to healthy timber stands with an allowable-cut effect (ACE) of 10 mmbf/yr. These stagnated stands are located in various Management Areas (MA's) throughout the suitable timber base in the Final Plan. This effect would take effect in the 2nd decade and beyond and would be the result of finding a market for the small-stemmed material or obtaining increased budget allowances for destruction and regeneration of these stands. These lands were not converted in the Final Plan in an attempt to reduce the budget requirements as requested by the Public's response to the Draft EIS. The significant amount of increased future budget would probably require a Forest Plan Amendment.

The other opportunities are displayed in the next three columns and indicate the additional timber volume that could be obtained by helicopter logging in Semi-Primitive Motorized Recreation Areas (MA 3), Sensitive Viewing Areas (MA 5), and Steep Lands and Regeneration Problem Lands (MA 19 and MA 18, respectively). 139,000 acres are available in these opportunities which were not provided in the Final Plan because of the high logging costs and resultant deficit timber sales. If timber prices increased significantly, helicopter logging would be feasible on all of these areas, and the regeneration problems on the MA 18 lands could be greatly reduced with increased revenues. 14 mmbf/yr could be obtained from these opportunities in the 2nd decade and beyond if these lands were brought back into the suitable base and managed for sustained yields. A Forest Plan Amendment would be necessary to provide these opportunities.

The Final Plan does not require commercial thinning in order to reduce budget needs and to generally make the plan more practical to implement (see sections VI.B.4.c; VI.C.3.e; VI.D.6.c; VIII.C.2.p(2)(a) and ; VIII.C.2.p(2)(b) of this Appendix for more details on this situation). If prices on the products generated by commercial thinning were to rise or additional funding were supplied to permit this type of sale, additional volume on the order of 10 to 20 MMBF per year could be supplied (associated impacts would also have to be acceptable as with all other opportunities discussed in this section).

Table B-13a(1) displays the additional budget and Capital Investment Road costs by decade and the probable decrease in PNV if these opportunities were initiated. The additional "Future Timber Supply Opportunity Totals" of 24 mmbf per year are displayed in the following Section which discusses the Montana Timber Supply Study and how it relates to the Kootenai National Forest.

Table B-13a(1) **Kootenai National Forest - FUTURE TIMBER SUPPLY OPORTUNITIES** (Under an Amended Forest Plan)
(Average Annual Outputs, except PNV)

KEY ITEMS	Averages for 1967-85	Proposed Action (DEIS)	BASE Final Plan (FEIS)	Future Timber Supply Opportunities: ACE Due to Conversion of Stagnated LPP Stands (Various MA's)	Harvest on Semi-Prim. Motorized Recreation Areas (MA 3)	Harvest on Sensitive Viewing Areas (MA 5)	Harvest on Steep & Regen. Problem Lands (MA 19 MA 18)	Future Timber Supply Oppor. TOTALS	Future Amended Forest Plan GRAND TOTAL
ACRES: (thousands)									
Suitable	1,400	1,306	1,263	(39)	+12	+11	+116	+139	1,402
Opportunity	297	116	139	-	-12	-11	-116	-139	0
Timber Precluded	55	286	386	-	-	-	-	-	386
Not Suited	381	457	457	-	-	-	-	-	457
VOLUME-1st Decade (mmbf)									
ASQ: (Suitable Lands)									
- Live & Recently Dead	162 /1/	202	202	0	0	0	0	0	-
- Non-interchangeable*	24	25	25	0	0	0	0	0	-
Unregulated:**	-	6	6	0	0	0	0	0	-
VOLUME-2nd Decade (mmbf)									
ASQ: (Suitable Lands)									
- Live & Recently Dead	-	233	230	+10	+2	+3	+9	+24	254
- Non-interchangeable*	-	16	16	0	0	0	0	0	16
Unregulated:**	-	6	6	0	0	0	0	0	6
VOLUME-3rd Decade (mmbf)									
ASQ: (Suitable Lands)									
- Live & Recently Dead	-	224	227	+10	+2	+3	+9	+24	251
- Non-interchangeable*	-	10	10	0	0	0	0	0	10
Unregulated:**	-	6	6	0	0	0	0	0	6
OPERATING BUDGET (million $)									
1st Decade	16.6 /2/	20.3	19.2	0	0	0	0	0	-
2nd Decade	-	19.4	19.5	+2.5	+0.06	+0.1	+0.3	+2.96	22.46
3rd Decade	-	17.1	16.0	+0.3	+0.06	+0.1	+0.3	+0.76	16.76
CAPITAL INVESTMENT ROADS (million $)									
1st Decade	2.0 /4/	3.7	3.6	0	0	0	0	0	-
2nd Decade	-	3.0	3.0	+0.6	+0.1	+0.06	+0.7	+1.46	4.46
3rd Decade	-	0.5	0.5	0	+0.08	+0.06	+0.7	+0.84	1.34
PNV (million $)	460 /3/	916	733	-15	-5	-4	-45	-69	664

NOTES: All dollars expressed in 1978 base, consistent with Forest Planning documents.
/1/ Average Annual Chargeable Volume Sold (1967-1985) exclusive of Timber Buy-Back & Salvage Volumes. Salvage volumes are shown in the Non-interchangeable entry. The Potential Yield Calculation is 277 MMBF for the 1,490,000 acres of Suitable Land, exclusive of Grizzly Bear and Old-growth Timber Management adjustments.
/2/ Average Appropriated Budget for 1980-1982 as used in the Current Direction (Alt. 1).
/3/ From the Current Direction Alternative (Alt. 1). /4/ Average Cost for 1982-1986.
* Older Dead Timber Salvage from Suitable Lands. ** All Volume from other than Suitable Lands.

J. Montana Timber Supply Study

A timber supply study was completed for the State of Montana to examine the possible supply scenarios, by ownership, from 1985 through 2030. The supply requirements for Region 1 are ultimately tied to work done for RPA using the TAMM model (Adams and Haynes, 1980). TAMM is an interregional timber supply requirement model that can be used to simulate the consequences of alternative policy decisions. Originally the equations used in the model were available only for a large region including all of the Rocky Mountains. Recently the functions for the base simulation run have been disaggregated to provide estimates of potential increases in timber supply requirements from the Forest Service's Region 1 (mostly Montana and North Idaho). The State of Montana has also developed an econometric model of timber requirements. In combination, these models were used to develop a range of potential timber supply requirements from Northwest Montana (Lincoln, Sanders, Flathead and Lake Counties) and from the Kootenai National Forest, specifically. The Planned and projected Allowable Sale Quantites (ASQ - regulated live green and recently dead timber only) from the Kootenai National Forest are compared to the range of potential timber requirements developed for Region 1 in the following Table:

Table B-13B

RANGE OF POTENTIAL TIMBER REQUIREMENTS COMPARED TO THE KOOTENAI FINAL FOREST PLAN

Decade	Forest Plan ASQ	Lower Range of Potential Requirements	Upper Range of Potential Requirements
1	227*	178	224
	Projected ASQ		
2	230	192	224
3	227	196	259
4	213	236	295
5	234	295	340

* Includes 25 MMbf of Non-interchangeable Volume

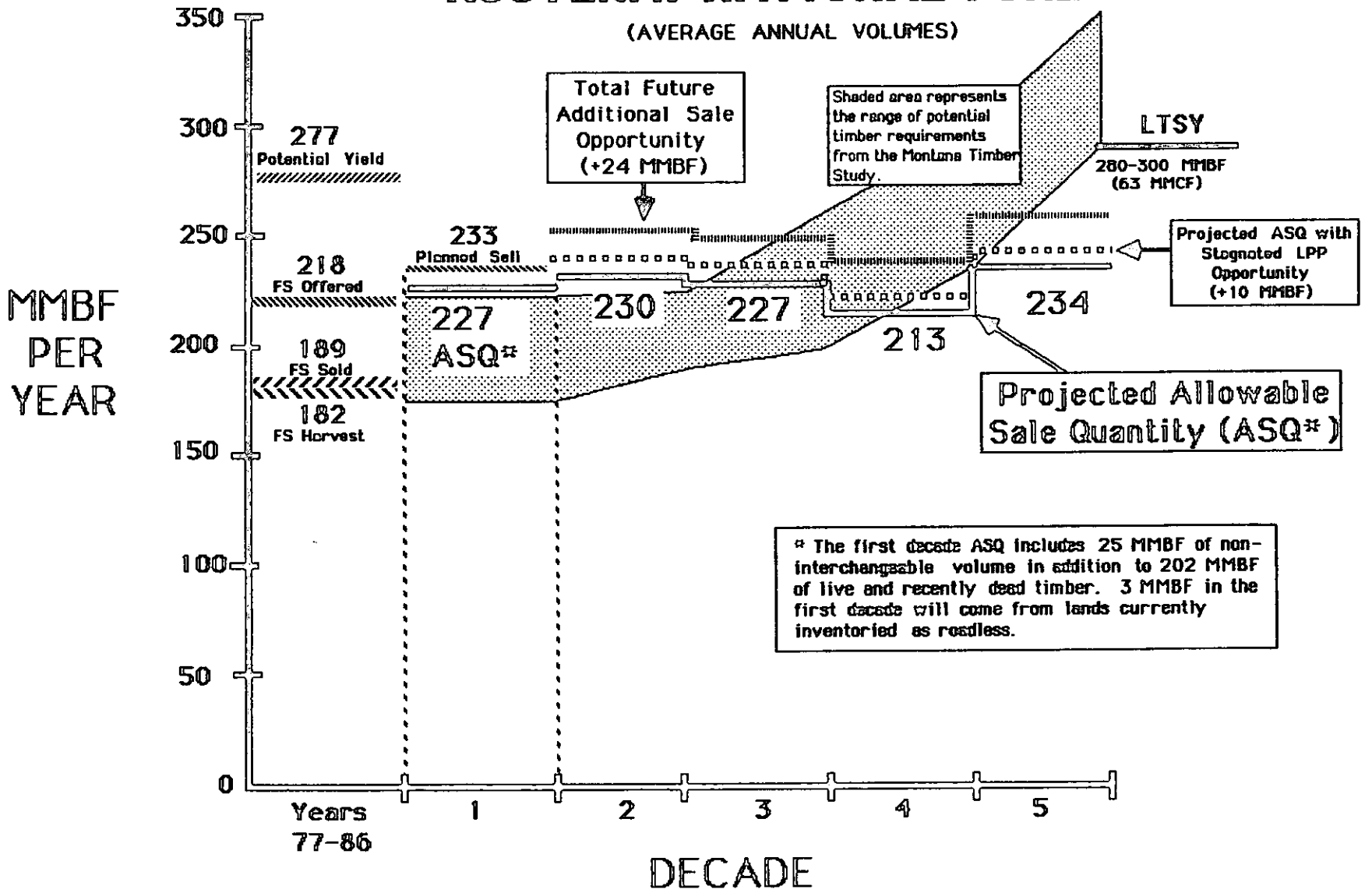
The increasing timber supply requirement from the National Forest is due, in part, from anticipated production declines from private lands. Details of the analysis process used to derive these values are provided in a paper developed by Region 1 of the Forest Service entitled "Timber Supply Analysis for Region 1". This document is among the Kootenai National Forest planning records.

The relationship between planned harvest and potential supply requirements are displayed in the following figure:

FIGURE B-13C

POTENTIAL TIMBER REQUIREMENTS AND SUPPLY RELATIONSHIPS KOOTENAI NATIONAL FOREST

(AVERAGE ANNUAL VOLUMES)



* The first decade ASQ includes 25 MMBF of non-interchangeable volume in addition to 202 MMBF of live and recently dead timber. 3 MMBF in the first decade will come from lands currently inventoried as roadless.

This figure shows that the Forest Plan and projected ASQ's will provide volumes in excess of historic levels sold and harvested. It also shows that the volumes projected for sale are within the range of timber supply requirements or in excess of that range until the fourth decade. Note that the Forest Plan was developed on a cubic foot volume basis and is constrained to non-declining flow in cubic feet. Variable board foot/cubic foot ratios result in declines from time to time when board foot measure is used. The additional sale opportunity of 24 MMBF is the volume described in Table B-13a(1) as "Future Timber Supply Opportunity Totals" in the 2nd and 3rd decade (See the preceding Section). If these opportunities were continued through the 4th and 5th decades, the timber supply levels could be significantly increased.

The five-county timber supply analysis for decade one, described previously in Section H, focuses upon a continued timber supply at historic levels and involves assumptions which differ from those inherent in the Montana Timber Supply study. A different area of analysis is also used. Alternative senarios to that presented in Section H are contained in a document entitled "Development of Response to Public Comments - Timber Supply Situation" (Haugen, 1986). One scenario has timber harvest from private lands declining by 25% in the first decade (rather than 50% as displayed in Section H). The result is a continuing timber supply similar to historic harvest levels which corresponds to the first decade analysis from the Montana Timber Supply study. "A Report on Idaho's Timber Supply", February 1987, indicates that timber supply for North Idaho is adequate to maintain recent harvest levels under the preferred alternatives of the various Forest plans. The first decade timber volumes presented in the FEIS are identical to those of the Proposed Action in the DEIS and reflect the maximum first decade production level possible, while still resolving the other issues as described elsewhere in this document.

VI. Analysis Prior to Development of Alternatives

Significant Changes from Draft to Final EIS

As a result of public comment on the DEIS and Draft Forest Plan, further analysis was done to develop a Final Plan which better addressed the public issues. The analysis that led to the Final Plan (Alt JF) is described in sections VI.B.4., VI.C.3. AND VI.D.6., below.

A. Introduction

The primary analysis prior to developing alternatives was the analysis of the management situation (AMS)--a determination of the ability of the Forest to supply goods and services in response to society's demands. This analysis process included compiling data (i.e., issues/concerns, demand projections, the current situation assessment, etc.), and using the FORPLAN model to process and/or develop information on Forest output production capability, economics, and resource interrelationships.

During the analysis of the management situation, resource supply potentials were determined by using FORPLAN to establish minimum and maximum production levels called benchmarks. Production capabilities were determined for single resources as well as for sets of multiple resource outputs produced in the most cost efficient way. This analysis established the benchmark levels required by National planning direction. The benchmarks serve as references from which the costs and effects of various objectives and constraints used in developing alternatives are evaluated.

The AMS provided a basis for assessing the need to change management direction and incorporating various approaches in developing a broad range of reasonable alternatives aimed at resolving the issues and concerns in various ways. There were four purposes for the benchmark analysis:

- estimate the schedule of management activities, resource outputs, effects, discounted benefits and costs, PNV, and acreages of prescription assignments appropriate to achieving the purposes of the benchmarks;

- define the resource production levels associated with maximizing single resource outputs;

- analyze the implications of legal and policy constraints;

- comply with the analysis of minimum management requirements as outlined in 36 CFR 219.27.

In order to fulfill these requirements, the Forest developed four types of benchmarks. These are:

1. Maximize Present Net Value Benchmarks - Maximizes present net value for various combinations of Forest constraints and displays the associated resource outputs. The benchmark with the highest PNV that meets minimum management requirements also serves as a point of reference from which the costs and effects of constraints are determined. For reference purposes these benchmarks will be labeled with the identification number from the FORPLAN run that was used

followed by the letter of the alternative if that run was carried forward as an alternative (114HH2, 114A09, 114U01, 114B06, 114C04, 114D04, 114V01-N, 114F01-A 114GG1-M, 114JJ2, and 114II2)

2. Resource Benchmarks - Defines the maximum potentials for timber production, elk, and wilderness (114W01-L, 114AA2-F, and 114M01-H, respectively).

3. Minimum Level Benchmark - Defines the minimum outputs associated with custodial management of the Forest and the unavoidable costs and benefits of maintaining public ownership (114DD1).

4. Current Level Benchmark - Specifies the management most likely to be implemented in the future if the current direction is followed. It forms the basis for the no action alternative (114Y12-I)

Several variations of the Max Present Net Value and Max Resource Benchmarks were run to determine the opportunity cost and resource tradeoffs of meeting specific constraints, objectives, regulations, and policies. In addition to these requirements, all benchmarks were designed to be approximately implementable from a physical standpoint (but not a political standpoint), were not constrained by budgets (except Min Level and Current Level),and used maximization of PNV as the objective function to obtain a fixed analytical base.

The results of this analysis form the framework within which alternatives were developed.

B. Development of Management Requirements

In order to perform the stepwise analysis of the benchmarks, various sets of management requirements were modeled in FORPLAN. These management requirements can be divided into three categories (a) minimum management requirements (MMR's); (b) timber policy requirements; and (c) maximum resource output constraints. The management requirements were incorporated into the FORPLAN model in two ways. First, many of the standards and guidelines for prescriptions were developed to include specific management requirements. These requirements are included in FORPLAN as cost and yield table variations reflecting management under these assumptions. Second, various management requirements were incorporated into FORPLAN by imposing constraints on the linear program. These constraints were used to insure that outputs, effects, and forest conditions will be produced in the proportions required to achieve the particular purposes of a benchmark.

In linear programming analysis, constraints override the objective function. Thus, if a predetermined level of outputs or minimum physical condition is entered as a constraint, it is always achieved (or no feasible solution is reached). Output levels and other desired effects entered as constraints then are implicitly assumed to contribute more to public benefits than the sum of their cost of production plus the foregone contribution to public benefits of any outputs they may have replaced. In the design of benchmarks, care was taken to insure that the effects of various constraints or sets of constraints on PNV could be quantified, and that these constraints constituted the most cost-efficient method for attaining the desired results. Following is a discussion of the management requirements used in the Kootenai FORPLAN model. The minimum management requirements (See 36 CFR 219.27) were identified and incorporated into the planning process. Several of the MMR's are a part of the design for management prescriptions assigned in the FORPLAN model to benchmarks and alternatives. In addition, a set of modeling constraints were developed for FORPLAN to approximate the effects of MMR's which could not be tied to management prescriptions.

Following is a discussion of how each MMR requirement was incorporated.

1. Minimum Management Requirements

The minimum management requirements in 36 CFR 219.27 are as follows:

a. Conserve soil and water resources.
b. Minimize hazards from flood, wind, wildlife, erosion, and other natural physical forces.
c. Reduce hazards from pest organisms.
d. Protect riparian zones.
e. Provide diversity.
f. Provide fish and wildlife habitat to maintain viable populations.
g. Adhere to multiple use laws.
h. Protect threatened and endangered species habitat.
i. Provide for rights-of-way and corridors.
j. Develop road construction standards.
k. Revegetate temporary roads.
l. Maintain air quality.

m. Reforest in 5 years.
n. Limit openings to 40 acres.

The methods used to meet these minimum management requirements include:

- Developing standards and guidelines and appropriate practices for mangement prescriptions.

- Assignment of management prescriptions and intensities to analysis areas in FORPLAN.

- Applying access, scheduled output and inventory constraints to analysis areas or groups of analysis areas in FORPLAN.

a. Conserve Soil and Water Resource

The mapping and spatial fitting of FORPLAN outputs, local experience, and research indicate that timber harvest timing, location and acreage disturbed by associated activities (including road construction, slash disposal and site preparation) are the primary activities which affect soil productivity and water quality.

A portion of this minimum management requirement is reflected in costs which recognize application of management practices which attempt to mitigate damage to the soil and water resources. For example road costs reflect construction standards that include drainage facilities which may affect the amount of erosion. In addition aerial logging systems are modeled on steep slopes (breaklands) so that fewer roads will be needed thus reducing the risk of erosion problems associated with construction and maintenance of roads on those slopes. The added logging and roading costs associated with timber harvest on steep slopes are included in the FORPLAN model.

The major questions of location, timing and acreage disturbed are modeled in FORPLAN via a scheduled output for clearcut equivalents (CCE's) which is constrained over time. A clearcut equivalent is the amount of cutting that produces runoff equivalent to that produced by one clearcut acre. For modeling purposes an acre of 60% thinning would be equated to 0.6 CCE's. The idea behind the clearcut equivalent concept is that watersheds can absorb a certain amount of timber cutting before generating increased runoff at a level that will damage stream channels or cause flooding. Since the trees grow back over time, it is possible to cut more trees later while remaining below the threshold level of clearcut equivalents. By constraining production of CCE's on an AA by AA basis which varied by the current condition and physical properties of the drainages in an AA, it was possible to spread timber harvest activities over time and space so that stream channels would not be damaged. The limitations on CCE's to prevent stream channel damage will also reduce soil loss, sedimentation and associated water quality degradation.

The constraints were applied to each AA which was greater than 1000 acres and which was not in the LPP working group. The constraints applied to the entire 200 year planning horizon. The constraints were limited to larger AA's due to limitations in the FORPLAN model. LPP AA's were not constrained because of the pine beetle situation which is killing those trees.

b. Minimize Hazards From Flood, Wind, Wildfire, Erosion, or Other Natural Physical Forces

The soil and water MMR discussed previously outlines the steps needed to minimize hazards from flood and erosion.

Wind can cause unnecessary damage to residual trees in timber sale areas if improper silvicultural systems are applied. This hazard is minimized by prescribing silviculturally sound systems by working group or habitat type. In most cases more than one system is provided to assure proper field application even though for modeling purposes only one system was used in a management area.

Each management prescription contains standards for fuel management and fire suppression tactics which are intended to reduce the risk of wildfire.

c. Reduce Hazards From Pest Organisms

Trees on the Forest are susceptible to mountain pine beetle, dwarf mistletoe, root rot and other pest organisms. Rather than let the natural process create favorable conditions for these pest organisms, several different management practices were considered to help prevent hazards from pest organisms.

For example, precommercial and commercial thinning is prescribed in many management areas to maintain stand health and reduce the risk of mountain pine beetle epidemics, control dwarf mistletoe, and minimize root rot.

The standards and guidelines provide for planting a species mixture where possible to prevent the creation of single species stands that favor insects and disease.

d. Protect Riparian Zones

In addition to the measures described above for soil and water conservation, the standards and guidelines include items specifically intended to protect the critical resources associated with riparian areas. These items range from maintenance of stream temperature by limiting tree canopy removal (to retain proper habitat for fish) to limiting livestock use to specified areas where impacts on the riparian area can be minimized. Details are contained in the standards and guidelines in the Forest Plan.

e. Diversity

As a whole the Forest tends heavily to a forested boreal habitat. As such the Forest has less species diversity associated with open areas. Physical conditions limit the amount of wetlands and therefore the diversity associated with them. Due to the fire history on the Forest there are significant areas where there is no old growth suitable for the needs of old growth dependent species. Openings in the forest canopy progress through the various successional stages over time and can provide an increase in diversity by supplying some of the type of habitat which is currently in short supply.

There is little that can be done to significantly add wetland habitats, but management practices can be designed to eventually provide additional old growth.

The economics of clearcut harvest practices cause them to be selected often in the FORPLAN model. This type of harvest is one way to achieve the canopy openings mentioned above. The economics of timber harvest also causes virtually all old growth trees which would be suitable for dependent species to be cut. Furthermore rotations are shortened so that the current supply of old growth would not be replenished over time.

Diversity is enhanced by permitting clearcutting to provide openings while constraining the inventory and designating specific lands to develop old growth conditions. It was assumed that if about 8% of the forest's acres under 5500 feet in elevation were either in old growth conditions or moving toward those conditions over time, a sufficient amount of old growth habitat would exist to maintain old growth dependent species across the Forest. The 8% figure was derived from information in McClelland, 1977 and McClelland et al, 1977.

There are about 1,860,000 acres on the Forest which are below 5500 feet in elevation. Eight percent of this amounts to 149,000 acres. Due to pine beetle and other factors, the lodgepole pine working group can not be expected to supply old growth habitat. It is further assumed that at least 9000 acres of old growth exists in the Wilderness and other portions of the 350,000 acres that are modeled as non-commercial in FORPLAN. Thus, the FORPLAN model was constrained to provide at least 140,000 acres of old growth through a combination of regulated and unregulated acres located throughout the Forest. The model was constrained to provide this amount in MIXCON I and II working groups by decade 12 when a sufficient acreage of those groups reach age 250 years. Analysis areas which are modeled as 140 and 160 years old will supply the needed 250 year old stands by the 12th decade. They also satisfy present and future needs for old growth habitat prior to decade 12. To insure a wide distribution of old growth the WLDTIM prescription was assigned to about 95,000 acres distributed in watersheds across the Forest. This prescription contributes to the 140,000 acres and includes thinnings which help assure the development of the needed old growth characteristics (large diameter, decadent relatively open stands with large snags) along with extended rotations.

Modifications to the constraints discussed above were developed to explore the possibilities of providing additional old-growth, beyond the minimum management requirements, and removing all timber harvest activities from the WLDTIM prescription. This is discussed in section VI.B.4.a., below.

Further discussion of old growth is contained in Christensen and Kuennen, 1984.

f. Adequate Fish and Wildlife Habitat to Maintain Viable Populations

The minimum management requirements for soil and water conservation discussed above assure adequate water quantity and quality to provide the habitat needed to maintain viable fish populations. The diversity minimum management requirements coupled with the standards and guidelines for specific management

areas insure that viable populations of all species will be maintained. Maintenance of habitat for endangered species is discussed below.

g. Consistency with Multiple Use Laws

The Secretary of Agriculture under various laws is directed to administer National Forests for multiple uses such as outdoor recreation, range, timber, watershed, wildlife, fish, and minerals. The Secretary is also directed to develop and administer the renewable surface resources.

Forest planning and environmental analyses require that processes formerly used to make individual resource decisions must now be combined into integrated management decisions. The use of the FORPLAN model with its construction based upon land suitabilities and capabilities insures that the variety of multiple uses are considered and properly applied on the Forest.

The riparian zone, diversity, and fish and wildlife MMR's address how multiple use and sustained yield is achieved. The reforestation MMR and the soil and water MMR provide for maintenance of a sustained yield of timber without impairment to the productivity of the land.

h. Protecting Threatened and Endangered Species Habitat

Grizzly bear, Northern Bald Eagles and Grey wolves either occupy habitat year round, occur routinely as breeders and migrants or occur as transients from adjacent areas. Peregrine falcons pass through the area on migration flights, but only on a very infrequent basis. The eagles, wolves and falcons are protected by identifying essential habitat components and developing activities which may impact those habitats in such a way that the populations will not be disturbed. No special prescriptions were developed for these species because the application of other prescriptions can be adjusted to accommodate them in their essential habitat with very little change. Protecting nest sites, perch sites and roost sites for the birds can be accomplished within the context of each of the alternatives. Survival of the grey wolf depends upon the availability of prey which is linked to the MMR for wildlife species described above.

Management to protect grizzly bear habitat is much more complex. The MMR for grizzly habitat was built into the FORPLAN model in five steps. First, as described in section III of this appendix, the analysis areas (AA's) used in the formulation of the FORPLAN model were defined in part by the grizzly management situation of the area. Second, the GRIZTM prescription was made available to all Analysis Areas in grizzly habitat. Third, the option of selecting the TMBOPT prescription was removed in grizzly habitat. Fourth, the BGSRTM prescription was adjusted to remove thinning and extend the time frames for final harvests. Fifth, a scheduled output constraint was used to limit harvest in grizzly habitat to 8.3% of the area per decade. This percentage is based upon an empirical analysis of proportions of area needed to provide secure displacement habitat (Forest Planning Record: "Analysis of Spacial Restrictions for Grizzly Bear", Shadle and Christensen, March 19, 1984 - 1922.33). In combination these steps insure that all grizzly habitat is managed in ways that are felt to be compatible with the bear and harvest is

scheduled in such a way that sufficient secure areas should always be available.

i. Providing for Utility and Transportation Rights-of-Way and Corridors

Land disturbing activities such as timber harvest, land clearing, road construction, pipeline trenches and holes for power poles occur when providing rights-of-way. An analysis outside FORPLAN and prescriptions defined the kinds of land which should be excluded or avoided in permitting or constructing linear corridor facilities. Avoidance areas are areas where establishment and use of corridors conflict with land use or management objectives such as cultural or historic sites, wilderness areas, research natural areas and scenic areas. Potential corridors and existing rights-of-ways were identified in the Utility - Transportation Corridor Study for Montana mapped and considered in the alternatives and benchmarks.

j. Road Construction Standards

Access roads are necessary for efficient timber harvest, but road construction affects the soil, water, visual, and riparian resources. Safe road conditions for public and administrative use are necessary. Road standards vary depending upon the purpose of the road, the anticipated amount of use and the terrain traversed by the road.

The costs for local road construction used in FORPLAN assumes the following standards depending upon ELU grouping:

Depositional:	12 foot travel surface 10 MPH safe speed ditch spot rock surfacing
Erosional:	14 foot travel surface 10 MPH safe speed no ditch native surface
Breaklands:	14 foot travel surface 10 MPH safe speed no ditch native surface

Clearing widths vary by cross slope and the type and amount of rock crossed. Grades on this type of road are generally rolling and not steep.

The collector construction and reconstruction and the arterial reconstruction costs used in the analysis outside the FORPLAN model are linked to specific pieces of road and the road standards necessary to safely accommodate anticipated traffic flows. For details refer to planning record: "Capital Investment Needs Arterial/Collector Road System", Haugen, April 1981.

A management goal is to construct the minimum number of roads to permit the efficient removal of timber and mineral resources at the minimum standard necessary to meet the soil and water MMR and provide a safe facility. The standards and guidelines provide the necessary flexibility in design standards to accomplish this. The above noted standards are an estimate of the average that can be expected even though lower standards will be used where feasible.

k. Revegetating Temporary Roads

Short temporary roads are sometimes needed to efficiently transport logs; however, they can affect soil and water resources. The road density for the Forest's transportation system and log skid distances were designed to preclude the use of temporary roads in most cases. The minimum requirement is to re-establish forage or grass cover by seeding. Revegetation is included in the logging practices for prescriptions that harvest timber.

l. Maintaining Air Quality

This requirement was handled outside of FORPLAN. The Regional Guide directs the Forest to work through cooperative agreements with the states to manage smoke emissions. Scheduling the time and number of prescribed burns is done outside the FORPLAN model and in cooperation with states of Montana and Idaho.

m. Reforestation

Natural reforestation will occur on many acres. The costs in FORPLAN include planting on at least 20 percent of cutover acreage. Depending upon the management prescription applied and the ELU group this is stepped up to 30, 50 or 100 percent planting. Overall about a third of the cutover acres will be artificially regenerated. Planting occurs because of the long periods between cone crops, insect (spruce budworm) and disease (dwarf mistletoe) effects on seed sources and seedlings, grass competition or prevention of natural generation, and the need to close harvest openings to meet the hydrologic recovery rate established in the soil and water MMR.

n. Forty-Acre Clearcut Limit

Clearcutting is one silvicultural system used on the Forest for even-aged timber harvest. The Regional Guide establishes that the openings created by even-aged silviculture normally will be 40 acres or less. Costs and practices used are based on clearcuts of 40 acres or less and are included in the management prescriptions. The modeling efforts for the MMR's described above generally spread cut blocks sufficiently that they would be less than 40 acres. The exception to this is the lodgepole pine working group. A 20 decade harvest constraint was used to insure that the 40 acre limitation is satisfied across the Forest.

2. Timber Policy Requirements

a. Nondeclining Yield (NDY)

This is a constraint on timber outputs which limits the periodic harvests to levels greater than or equal to the preceding period level. This constraint was used to insure a constant even flow of timber harvest levels throughout the planning period.

b. Sequential Upper and Lower Bounds (Seq. U&L Bounds) - Harvest Floors

In lieu of the NDY constraint on timber outputs, Seq. U&L Bounds and harvest floors were used to constrain the harvest flows to reasonable levels in specific benchmark diagnoses. Floors were used to establish a parameter on timber harvests which would not invoke substantial change in local consumptive patterns. Floors were a lower limit which may be a necessary limit on harvests to offer a level of reasonablness in a benchmark.

A floor of 138 MMBF/year (34.5 MMCF/year) was used in run 114GG1 and found to be non-binding. None of the diagnoses approached this level which is 80% of the last 10 years average harvest. This was the level at which it was assumed that local economic impacts would become intolerable.

Sequential upper and lower bounds were applied in two different ways to explore two levels of economic stability in the local community. The first, and least constraining, set of bounds permitted harvest to increase or decrease 25% from the preceding decade (114GG1-M). The second set of bounds permitted increases of 20% and decreases of up to 15% in the decade to decade harvest levels (114V01-N). These levels were designed, based upon Regional Office direction, to prevent an overly rapid change in the local economy.

c. Rotation Based on CMAI

Timber rotation lengths based on the culmination of mean annual increment (CMAI) for existing and regenerated stands is required by 36CFR 219.16(2)(iii). The Forest Service is directed to analyze timber rotation lengths based on the time required for stands to reach the culmination of net growth. CMAI assures that all stands scheduled for harvest have reached this level. CMAI was used to constrain the FORPLAN model with regard to when timber harvests could actually occur.

d. Rotation Based on Utilization Standards

In order to evaluate the effects of timber rotation lengths constrained by CMAI, three FORPLAN diagnoses were executed which permitted harvest to occur up to two decades prior to culmination (114HH2, 114JJ2, 114II2). This permitted harvest scheduling based upon the proposed Regional utilization standards.

3. Maximum Resource Output Objectives

Maximum resource output constraints were used to determine the physical or biological potential of achieving specific resource outputs for the Forest, and the resulting impact on other resources or programs. The outputs chosen for this analysis were timber, wildlife and wilderness. The resource outputs were maximized by first assigning FORPLAN an objective function to maximize the particular output, locking in the resulting optimal land assignment, and rerunning FORPLAN with the objective function of maximizing PNV. In the case of wilderness, the maximum potential wilderness designations were known beforehand so it was not necessary to use an objective function that would have identified these lands.

4. Analysis in Response to Comments on the DEIS

The major points which required further analysis as a result of public input were the following:

1. Economic stability in the impact area
   a. future timber supply from all sources
   b. Forest Service opportunity to provide stability
2. Old Growth
   a. managing as unregulated
   b. maintenance of additional amounts
3. Timber Values
   a. alternative price projections
   b. alternative base values
4. Projected Budgets

The analysis of these concerns resulted in the development of the Final Forest Plan (Alternative JF). Since the public input was primarily focused upon alterations to the Proposed Forest Plan, the Final Plan was developed by modifying it. The result is a Final Plan that differs from the Proposed Plan in several key respects, but that is essentially the same in most areas.

It is the purpose of this section to describe the analysis efforts that led to the decisions to modify the Proposed Plan into the Final Plan. This section relates only to issues 2 through 4 listed above because the timber supply issue is described in section V.H. of this Appendix.

a. Old Growth

The Proposed Plan called for managing about 8% of the Forest land below 5,500 feet in elevation for old-growth timber characteristics (stands above 5,500 feet in elevation are not suitable for reproduction of most old-growth associated wildlife species). The proposed management scheme called for thinning to help hasten the development of important old-growth characteristics and an extended harvest rotation period to permit contribution of the old growth for a number of years prior to harvest.
The public questioned the notion of "managing" old growth and suggested that the old growth be removed from the regulated timber base. In addition it was pointed out that research indicates that a minimum of 8 to 10 percent old growth is needed to supply the needs of dependent wildlife species. Some

commentors suggested that 10 percent or more old growth would be more appropriate and less risky than 8 percent.

The current old growth inventory indicates that about 11 percent of the Forest acreage below 5,500 feet can currently be considered old growth (quality varies). Due to the fire history of the area, it is not likely that this acreage was ever more than 15 to 20 percent. Because of the current old-growth situation and several comments recommending use of the 10 percent level, the 10 percent level of old growth was explored. The idea of removing old growth from the regulated base was also explored.

b. Timber Values

Late in the process of developing the DEIS and Proposed Plan, new timber price projections were developed for the 1985 RPA analysis by Adams and Haynes. Some commentors suggested that these projections be used in the development of the Final Forest Plan. The DEIS and Plan had used projections developed by Adams and Haynes for the 1980 RPA process. Both sets of projections show prices increasing over a fifty-year time frame although the 1985 estimates increase at a slower rate than the 1980 figures.

The base timber prices used in the DEIS were linked to 44 sales on the Kootenai National Forest between 1974 and 1980. Some commentors suggested that this was a period of particularly high prices and was not an appropriate basis for developing future prices.

The sensitivity of the Final Plan to these estimates was tested at two points in the development process. The decisions with regard to the other questions being addressed here were based upon what will be referred to as the "old economics"; meaning those used in the DEIS. The set of "new economics" includes the following:

- base prices linked to transaction evidence sale data for the years 1975 through 1984
- price projections as used in the 1985 RPA process
- road costs adjusted for real cost decreases experienced since 1978

Overall the "new economics" represents an update of the same data used in the DEIS reflecting actual experience and revised assumptions since the original data was compiled. The "old" economics was used in order to retain comparability with the alternatives described in the DEIS. The effect of the various decisions being addressed here can thus be compared to the effects of the various constraints applied in the analyses of the DEIS.

c. Projected Budgets

Several commentors pointed out that the budget levels associated with the Proposed Action were quite high. In addition the reality of recent legislation aimed at balancing the Federal budget has raised concerns. FORPLAN was used to help explore ways to reduce budget requirements while still providing resource outputs aimed at resolving the issues and concerns. The method used was to examine the effects of essentially eliminating the Forest's commercial and pre-commercial thinning programs. In addition the policy of converting stagnated lodgepole pine stands early in the planning horizon was reexamined.

Although the elimination of commercial thinning decreases budgets, the initial impetus for this change came from within the Forest Service where past experience showed that selling commercial thins would probably not be possible. Thus removal of commercial thinning from the model makes the plan more implementable and the projections of future volumes more realistic as well as decreasing the needed budget.

C. Displayed Benchmarks (Includes constraint analysis FORPLAN diagnoses and development of the Final Plan)

1. Overview

Sixteen FORPLAN diagnoses were developed to define the production potentials and economic relationships of the Forest. The efficient schedule of management activities, resource outputs, environmental effects, economic consequences, and land designations to meet the purpose of each benchmark were estimated. This section describes the purpose of each benchmark. The major objectives and constraints are displayed in Table B-14:

Table B-14
Summary of Constraints Used in the Benchmark Analysis

RUNID - ALTERNATIVE	CONSTRAINT Ending Inventory	Rotation	Harvest Flow	Harvest Floor	MMR Constraints	Objective Function
114HH2	yes	utilization	±25%	yes	none	Max PNV
114A09	yes	CMAI	none	no	none	Max PNV
114U01	yes	CMAI	NDSY	no	none	Max PNV
114B06	yes	CMAI	none	no	Grizzly	Max PNV
114C04	yes	CMAI	none	no	Griz/soil/wat	Max PNV
114D04	yes	CMAI	none	no	Griz/soil/wat/div	Max PNV
114V01-N	yes	CMAI	+20/-15%	no	all	Max PNV
114F01-A	yes	CMAI	NDSY	no	all	Max PNV
114GG1-M	yes	CMAI	±25%	yes	all	Max PNV
114JJ2	yes	utilization	±25%	yes	all	Max PNV
114M01-H	yes	CMAI	NDSY	no	all	Max PNV
114II2	yes	utilization	NDSY	no	all	Max PNV
114W01-L	yes	CMAI	NDSY	no	all	Max PNV
114AA2-F	yes	CMAI	NDSY	no	all	Max PNV
114DD1	yes	CMAI	NDSY	no	all	Max PNV
114Y12-I	yes	CMAI	NDSY	no	all	Max PNV

As stated earlier, four types of benchmarks were developed for the Forest:

- Benchmarks that maximize present net value for the Forest and display the efficient levels of resource outputs.

- Resource benchmarks define the maximum potential for timber production, elk, and wilderness.

- The minimum level benchmark defines the minimum outputs associated with custodial management of the Forest and the unavoidable costs and benefits of public ownership.

- The current level benchmark defines the management most likely to be implemented in the future if current direction is followed.

Note, however, that additional benchmarks were run to analyze the costs of constraints (MMR's, timber policy requirements, etc.). These benchmarks are often variations of the first type.

The following procedures apply to all benchmarks (except as noted):

- Developed using FORPLAN.

- Developed using an objective function of maximizing PNV.

- Not constrained by budget levels. Except 114DD1 which was constrained to the minimum budget which was determined from a FORPLAN run that had an objective function of Minimize Costs for 20 decades. The "Minimize Cost" run was a stepping stone to the 114DD1 benchmark and is not considered a benchmark in itself.

- Comply with minimum management requirements, except those benchmarks designed to explore the effects of the MMR's (114HH2, 114A09, 114U01, 114B06, 114C04, 114D04).

- Are legally implementable. The only exceptions were Benchmarks 114HH2, 114A09, 114U01, 114B06, 114D04, 114JJ2, and 114II2 which were used to examine tradeoffs of legal constraints including those associated with MMR's.

- Timber management constraints were used to preclude harvest from 94,360 acres of existing wilderness.

- Regulated timber management was constrained to preclude it from all non-capable timberland.

- Timber harvest rotations were constrained to be greater or equal to CMAI except benchmarks 114HH2, 114JJ2, and 114II2 where earlier harvest was permitted in order to examine the effects of this constraint.

- A constraint was used so timber inventory in 200 years will equal or exceed the volume that would occur on a regulated Forest.

- Several variations of the present net value and resource benchmarks determined the opportunity cost and resource tradeoffs of meeting specific constraints, objectives, regulations, and policies.

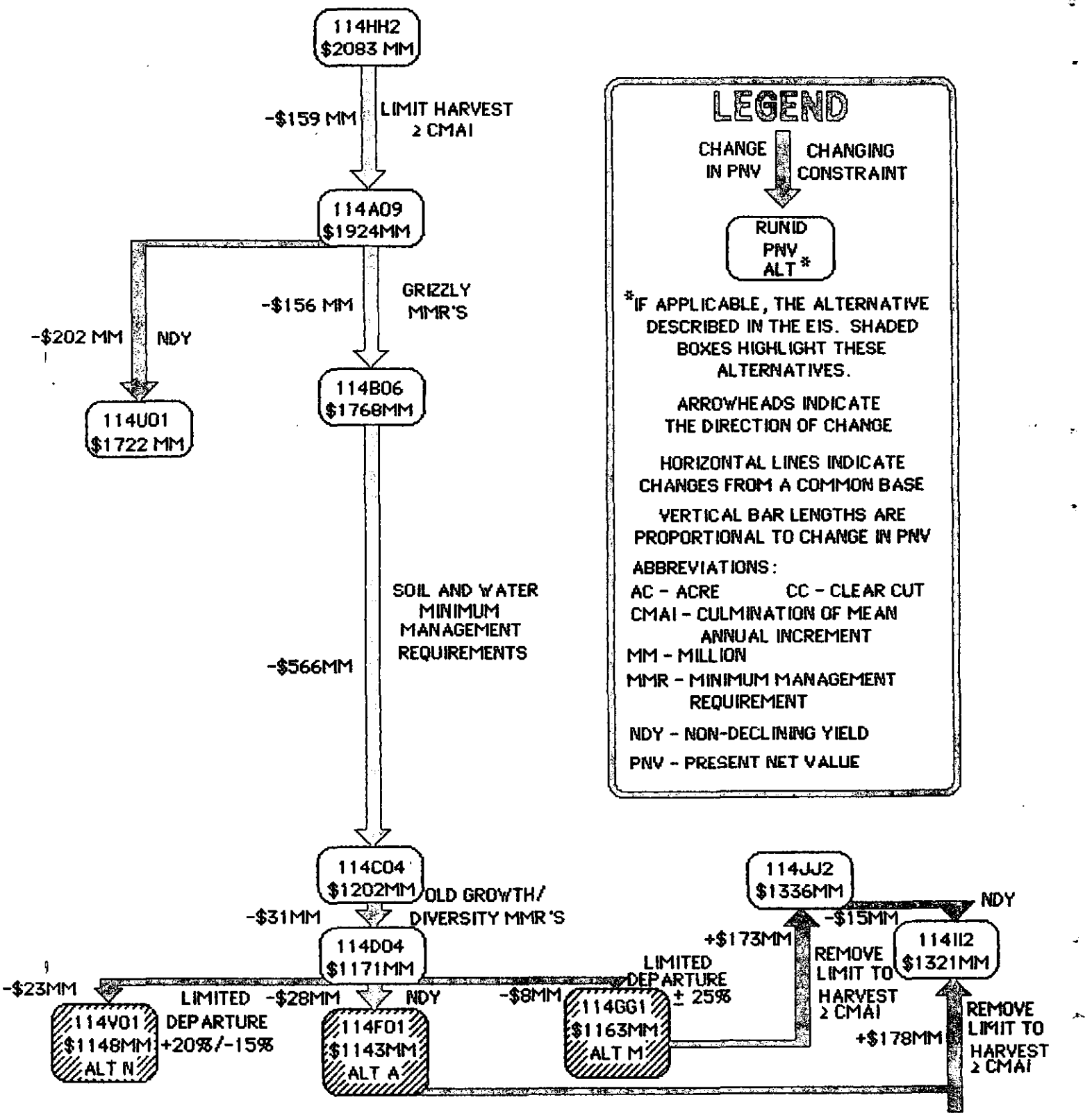
2. Displayed Benchmarks

The following figure is a graphic portrayal of the analysis described above. Details on the individual benchmarks follow the figure. The figure will be useful in following the discussion in this section as well as the section on Benchmark Analysis which follows.

The Table following after these figures briefly describes the outputs from each of the benchmarks, it is repeated at the end of this section for easy reference:

FOREGONE PNV OF THE MAJOR CONSTRAINTS EXPLORED IN THE ANALYSIS

(MMR'S AND LEGAL REQUIREMENTS)



FOREGONE PNV OF THE MAJOR CONSTRAINTS EXPLORED IN THE ANALYSIS

(MAXIMUM RESOURCE OUTPUTS, CURRENT DIRECTION AND MINIMUM LEVEL MANAGEMENT)

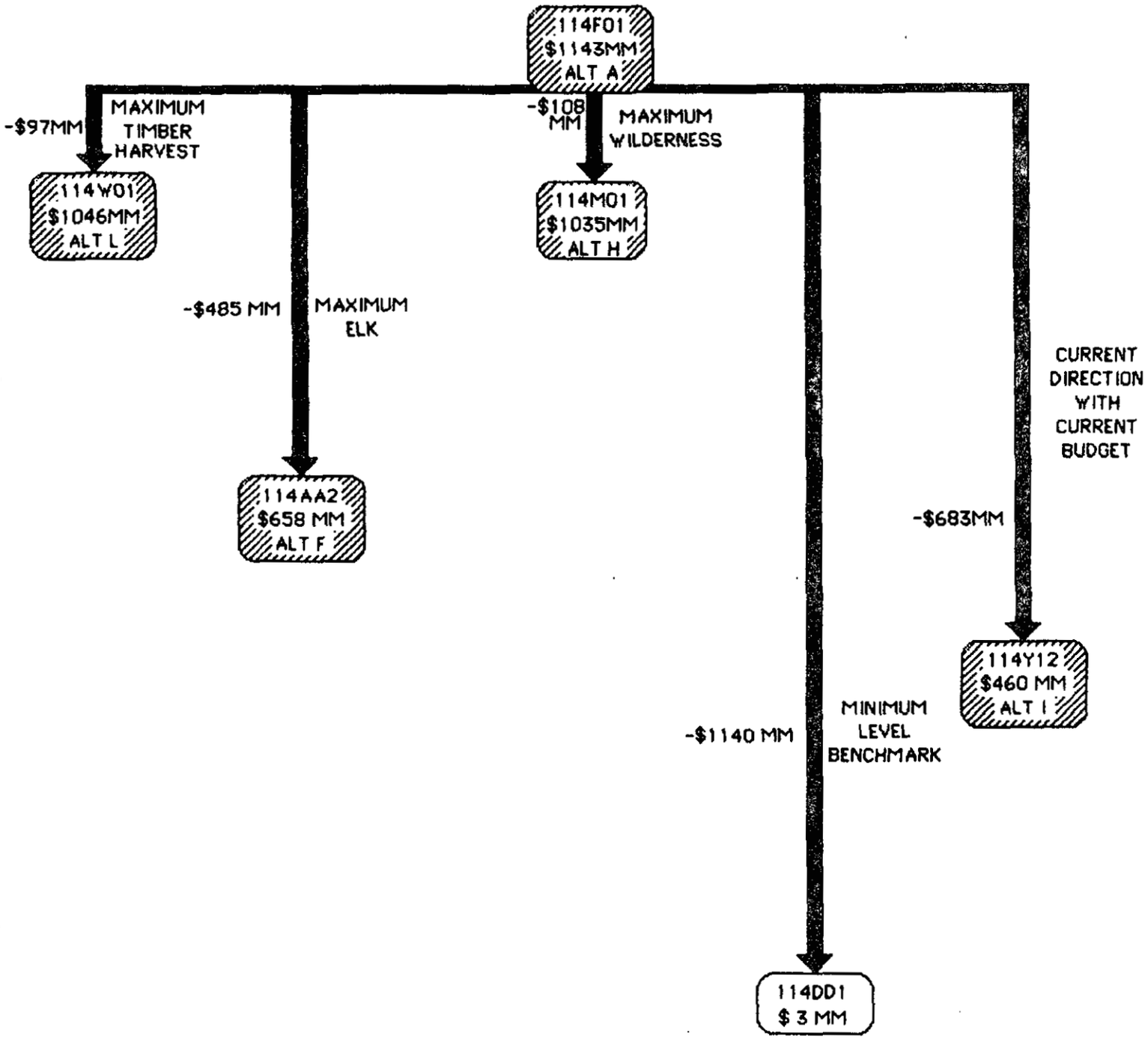


Table B-15
Resource Outputs of the Benchmarks

OUTPUT	UNIT of MEASURE	MAXIMUM PNV BENCHMARKS 114HH2	114A09	114U01	114B06	114C04	114D04	114V01-N	114F01-A	114GG1-M	114JJ2	114II2
WILDER & PWLDER	M Acre	94.4	94.4	94.4	94.4	94.4	94.4	94.4	94.4	94.4	94.4	94.4
Other Unroaded Mgmt	M Acre	219.4	218.8	249.3	241.8	285.1	295.3	283.1	283.4	295.3	296.6	274.8
Roaded & Other Mgmt	M Acre	1932.0	1932.6	1902.1	1909.6	1866.3	1856.1	1868.3	1863.0	1856.1	1854.8	1876.6
Suitable Timberland	M Acre	1786.6	1752.3	1793.1	1693.4	1457.2	1477.6	1496.7	1486.8	1484.1	1518.0	1534.6
Decade 3 Elk Pop.	M Elk	6.3	6.5	7.1	8.5	8.5	8.4	8.5	8.6	8.4	8.5	8.6
LTSY	MMBF/yr	484	316	490	260	228	231	339	348	334	350	350
Allowable Sale	MMBF/yr											
Decade 1		474	261	380	275	390	367	247	226	262	311	271
Decade 2		721	1218	467	884	173	185	240	253	224	253	282
Decade 3		486	1	468	198	187	175	283	249	274	309	321
Decade 4		595	365	404	381	433	409	322	314	326	335	349
Decade 5		449	399	443	287	388	403	329	336	437	368	366
Decade 6		325	989	474	937	423	409	340	349	362	364	364
Decade 7		240	92	438	152	250	218	319	334	251	417	324
Decade 8		264	74	441	130	220	185	296	313	245	339	322
Decade 9		310	440	389	308	455	487	317	326	322	300	337
Decade 10		386	374	392	233	145	127	282	290	238	254	313
Decade 11		486	32	457	125	191	205	287	295	306	316	327
Decade 12		650	519	488	507	739	743	345	348	393	328	330
Decade 13		698	2024	533	1371	335	308	406	396	502	378	329
Decade 14		574	47	555	324	288	267	395	391	371	497	329
Decade 15		342	524	590	362	372	405	381	382	336	344	362
Decade 16		337	179	551	272	405	375	370	369	436	294	363
Decade 17		386	1510	503	1247	671	646	378	373	445	223	346
Decade 18		523	88	541	133	291	277	377	371	346	270	365
Decade 19		531	74	573	214	256	251	385	378	262	295	337
Decade 20		451	448	490	406	465	454	339	345	278	350	347
Roads for Management	Miles	12567	12404	12612	12144	11397	11380	11267	11272	11226	11857	11464
PNV (4%)	$MM	2083	1924	1722	1768	1202	1171	1148	1143	1163	1336	1321

Table B-15 (Continued)
Resource Outputs of the Benchmarks

MAXIMUM RESOURCE, MINIMUM MANAGEMENT, AND CURRENT LEVEL BENCHMARKS						
OUTPUT	UNIT of MEASURE	114W01-L MAX TIM	114AA2-F MAX ELK	114M01-H MAX WILD	114DD1 MINLVL	114Y12-I CURRENT
WILDER & PWLDER	M Acre	94.4	94.4	498.1	94.4	157.3
Other Unroaded Mgmt	M Acre	220.6	273.0	54.0	378.4	250.2
Roaded & Other Mgmt	M Acre	1930.8	1878.4	1693.7	1773.0	1838.3
Suitable Timberland	M Acre	1788.4	1132.3	1361.1	169.4	1422.2
Decade 3 Elk Pop.	M Elk	8.5	9.9	8.6	7.4	7.3
LTSY	MMBF/yr	455	250	325	0	388
Allowable Sale	MMBF/yr					
Decade 1		255	164	208	2	150
Decade 2		245	191	222	2	152
Decade 3		264	190	223	2	157
Decade 4		316	185	273	4	143
Decade 5		345	198	295	4	162
Decade 6		339	197	310	4	172
Decade 7		360	193	300	4	163
Decade 8		327	181	270	7	180
Decade 9		385	264	348	28	164
Decade 10		341	224	290	28	194
Decade 11		375	242	291	28	162
Decade 12		410	244	323	27	172
Decade 13		458	241	357	27	169
Decade 14		427	256	359	27	164
Decade 15		427	228	337	27	172
Decade 16		449	261	333	26	177
Decade 17		432	236	349	26	188
Decade 18		426	239	350	27	201
Decade 19		464	243	339	26	207
Decade 20		455	241	318	27	215
Roads for Management	Miles	12363	9847	10591	6000	9837
PNV (4%)	$MM	1046	658	1035	3	460

a. **Benchmark 114HH2**

This benchmark was developed to explore the effects of upper and lower bounds, a harvest floor and CMAI with an otherwise unconstrained model. It also forms a base run for use in formulating and evaluating minimum management requirements. None of the minimum management requirements were included. Harvest was allowed to occur up to two decades prior to CMAI thus allowing the objective function (Maximize PNV) to drive the run to the most efficient schedule of timber harvest based upon the proposed Regional utilization standards. A sequential upper

limit of 25% and lower limit of 25% was applied to the timber harvest schedule from decade to decade to offer a level of reasonableness to the benchmark. In addition a floor of 80% of the last decade actual harvest (345 MMCF) was applied to all decades.

The PNV was the highest of any of the benchmarks at $2,083,000,000 (4%). Timber volumes fluctuated within the ±25% limits. The 345 MMCF floor was never reached so it can be concluded that the opportunity cost of removing the floor is zero. The elk population is the lowest of all the benchmarks due to the amount of timber harvesting activity done without regard to elk habitat. This benchmark could not be legally implemented. The strongest argument for its illegality is its lack of the minimum management requirements necessary to satisfy the Endangered Species Act and provide for a viable population of grizzly bear.

b. Benchmark 114A09

The purpose of this benchmark was to provide a basis for calculating the opportunity costs of sequentially applying the minimum management requirements. No minimum management requirements were included, but harvest was constrained to occur at or after culmination of mean annual increment (CMAI). There were no timber harvest constraints so the harvested volumes fluctuated wildly (from 1 MMBF/year in decade 3 to 2024 MMBF/year in decade 13).

c. Benchmark 114U01

The purpose of this benchmark was to provide a basis for calculating the opportunity cost of non-declining sustained yield free from the influences of other constraints. The minimum management requirements were not included, but harvest was constrained based upon CMAI. Thus, in formulation, this benchmark is identical to 114A09 except for the NDSY constraint and the link to long term sustained yield. 36 CFR 219.12 (e)(1)(iii)(C)

d. Benchmark 114B06

This benchmark is similar to 114A09 except that it includes the minimum management requirements for grizzly bear recovery as discussed in Section IV of this Appendix. The purpose of the run is to estimate the opportunity cost of the grizzly bear minimum management requirements. This MMR was added first because it is associated with the legal requirements of the Endangered Species Act and these have been found to be critical in past modeling efforts.

e. Benchmark 114C04

This benchmark is similar to 114B06 except that the constraints associated with the minimum management requirements for soil and water conservation are added. This MMR was added second because it is associated with the legal requirements of the Water Quality Act. Its purpose is to provide a basis for estimating the opportunity cost of this MMR.

f. Benchmark 114D04

This benchmark is similar to 114C04 except that the constraints associated with supplying diversity are added. The purpose of this benchmark is to provide a basis for estimating the opportunity cost of the diversity MMR.

g. Benchmark 114V01-N

This benchmark is similar to 114D04 except that harvest flow constraints have been added along with the 40 acre clear cut limitations. The harvest flow constraints permit a maximum increase in harvest level of 20% (in cubic measure) from one decade to the next and a maximum decrease of 15% from one decade to the next. No floors or ceilings are used. The constraint to model 40 acre clearcut size limits is discussed above. This benchmark, when compared to 114D04 describes the opportunity cost of the upper and lower bounds combined with the the 40 acre clear cut limits. This benchmark is carried forward as a departure alternative (Alternative N).

h. Benchmark 114F01-A

This benchmark is similar to 114V01-N except that harvest is constrained to non-declining flow. This benchmark, when compared to the following other benchmarks is the basis for estimating the noted opportunity costs:

114D04 - opportunity cost of the NDSY constraint together with the 40 acre clearcut limitations.

114V01-N - incremental opportunity cost of constraining from a limited departure to NDSY

114GG1-M - incremental opportunity cost of constraining from a broader departure to NDSY and the estimates of the mix of resource uses combined with a schedule of outputs and costs which maximizes the PNV of those major outputs which have an established market price <u>and</u> those major outputs which have an established market price or an assigned monetary value given NDSY (36 CFR 219.12 (e)(1)(iii)(C)). See the planning record noted under 114GG1-M, below, for the analysis which demonstrated that there is insignificant change in results whether the non-market (assigned) values are used in the model or not.

114II2 - opportunity costs of rotations restricted to CMAI given the MMR's and NDSY along with the parameters common to all the benchmarks

114U01 - opportunity costs of all the MMR's combined given NDSY and the other parameters of both benchmarks

114JJ2 - opportunity costs of NDSY and rotations restricted to CMAI from a departure base

i. Benchmark 114GG1-M

This benchmark is similar to 114D04 except that the harvest flow is constrained with sequential upper and lower bounds of ±25% and a 20 decade floor of 345 MMCF per decade (the 345 MMCF floor was non-binding). This benchmark has two purposes. First, when compared to 114D04 it displays the opportunity cost of the sequential upper and lower bounds and the 40 acre clear cut limitations. Second, when compared to 114JJ2 it displays the opportunity cost of harvesting at or after CMAI. This benchmark is carried forward as alternative M because it produced the highest PNV of all when all MMR's were included and the harvest schedule was constrained to reasonable fluctuations. The opportunity costs of the alternatives are measured from this benchmark. This is the benchmark which describes the mix of outputs along with the schedule of outputs and costs which maximizes the PNV of those major outputs which have an established market price (36 CFR 219.12(e)(1)(iii)(A). An analysis demonstrated that the non-market values do not significantly alter the output mix or schedule (Planning Record: "Established Market Prices VS Assigned Monetary Values in the FORPLAN Model", Haugen, December 21, 1984). On this basis, this benchmark also estimates the mix and schedule which maximizes PNV of those major outputs which have an established market price or are assigned a monetary value (36 CFR 219.12(e)(1)(iii)(B)).

j. Benchmark 114JJ2

This benchmark is similar to 114GG1-M except that harvest is permitted up to two decades prior to CMAI. This benchmark, when compared to 114GG1-M, shows the opportunity cost of restricting harvest to CMAI given all the MMR's. It displays the effect of CMAI for both the market and non-market value situations described above (114GG1-M) in accordance with 36 CFR 219.12(e)(1)(iii)(C). In comparison with 114HH2, this benchmark displays the opportunity cost of the minimum management requirements with a limited departure from NDSY.

k. Benchmark 114II2

This benchmark is similar to 114JJ2 except that NDSY is added. It is also similar to 114F01-A except that harvest is permitted prior to CMAI. It includes all the MMR's and NDSY, but harvest is not constrained by CMAI. In comparison with 114JJ2, the opportunity cost of NDSY can be determined given that PNV is maximized without regard to harvest after CMAI. In comparison with 114F01-A, the opportunity cost of harvesting after CMAI can be determined given that all the MMR's and NDSY are in effect.

l. Benchmark 114W01-L

This benchmark is similar to 114F01-A except that FORPLAN is constrained to harvest the maximum possible amount of timber. The maximum timber volume constraint was based upon run 114T03 which had an objective function of Maximize Timber for 20 decades. In comparison with 114F01-A, this benchmark displays the opportunity cost of maximizing timber production (36 CFR 219.12(e)(1)(ii)).

m. Benchmark 114AA2-F

This benchmark is similar to 114F01-A except that FORPLAN is constrained to produce the maximum number of elk possible. The maximum production level of elk was based upon run 114Z01 which had an objective function of Maximize Elk for 20 decades. In comparison with 114F01-A, this benchmark displays the opportunity cost of maximizing elk production and, by association, other wildlife for which elk acts as an indicator species (36 CFR 219.12(e)(1)(ii)).

n. Benchmark 114M01-H

This benchmark is similar to 114F01-A except that FORPLAN is constrained so that all acres which are suitable for Wilderness designation are modeled as Proposed Wilderness. In comparison with 114F01-A, this benchmark displays the opportunity cost of designating all inventoried roadless areas as wilderness (36 CFR 219.12(e)(1)(ii)). In addition to this benchmark, several other FORPLAN diagnoses were used to analyze the incremental addition of roadless areas to designated Wilderness. Benchmark 114M01-H and four of these additional diagnoses are brought forward as alternatives to be discussed later: 114G02-B, 114H02-C, 114J01-E and 114L01-G.

o. Benchmark 114DD1

This benchmark is similar to 114F01-A except that Forest Service budget costs are constrained to the minimum levels. The cost constraints were based upon run 114P01 which had an objective function of Minimize Cost for 20 decades. This benchmark, when compared to 114F01-A, displays the opportunity cost of managing the Forest to maintain and protect it as a part of the National Forest System with essentially no production of controllable outputs while meeting the minimum management requirements (36 CFR 219.12(e)(1)(i)).

p. Benchmark 114Y12-I

This benchmark is similar to 114F01-A in that all the MMR's are satisfied. The major differences with 114F01-A involve constraining all land designations to match the Current Direction on the forest and applying constraints so that the budget is kept as close as possible to the current budget over the 20 decade time frame. The land designations are based upon the designations contained in the Unit Plans developed for the Forest over the last several years. These earlier designations were updated to account for new laws and knowledge relating to the minimum management requirements. In comparison with 114F01-A, this benchmark displays the opportunity cost of continuing management on the Forest as it has been in the past (36 CFR 219.12(e)(2)).

3. Development of the Final Plan

A series of FORPLAN diagnoses were used to help analyze the effects of various actions suggested by the public. These diagnoses are benchmarks in the sense that PNV is maximized and cost-efficient levels of output are developed. They differ somewhat from the benchmarks discussed earlier because the focus is upon changes to the proposed action rather than independent exploration of constraints as discussed above. The figure on the following page graphically portrays the relationships between the diagnoses described below and provides some key results. The analysis scheme can be more easily followed if you refer to the chart as you read the following narrative. More details are provided in section VI.D.6., below.

a. Run 11402B

The purpose of this run was to test the sensitivity of land suitabilities and other factors when the entire set of "new" economics are applied. This run is the Maximum PNV benchmark of the DEIS (114GG1) with the updated base timber prices, price trends and road costs. Constraints are identical to those described above for Benchmark 114GG1. When compared to Benchmark 114GG1, the maximum effect of the "new" economics can be seen. Diagnoses 11402B and 114GG1 were not modifications of the Proposed Plan and thus are not shown in Figure B-15. Run 114GG1 is displayed on Figure B-14, above.

b. Run 11412A

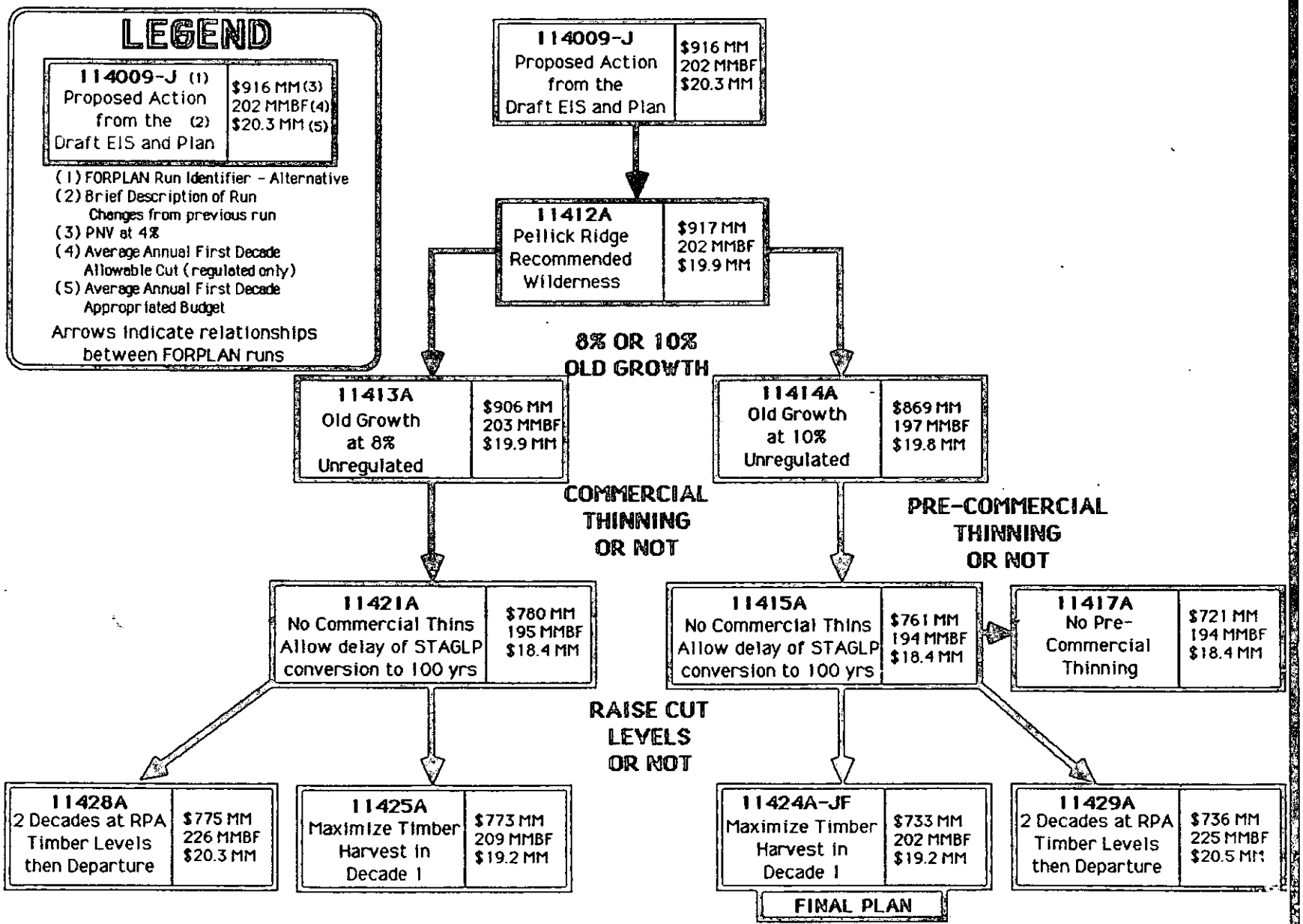
This run is essentially an update of the Proposed Plan model (114009) with the redesignation of Pelleck Ridge (Scotchman Peaks Roadless Area) to Recommended Wilderness. The update involved numerous minor adjustments to better model the Proposed Action. The redesignation of Pelleck Ridge involved 12,000 acres. Less than 500 of those acres had been designated for timber management in the Proposed Plan. Earlier recommendations for non-wilderness designation included consideration of potentially high mineral values. Recent field analyses in the vicinity have provided evidence that mineral values are not as great as earlier data would have suggested. In comparison to 114009, the Proposed Action, this run displays the effect of redesignating Pillick Ridge to Recommended Wilderness. The decision was made that this redesignation had no significant impact upon other resources while adding an important component to the National Wilderness System. For this reason the remaining diagnoses in the sequence leading to the Final Plan all retain the Pelleck Ridge proposal.

c. Run 11413A

This run displays the effects of removing the old growth (MA 13) from the regulated timber base when compared to run 11412A. About 5 percent of the Forest's acreage below 5500 feet in elevation was in MA 13 in this run with another 3 percent existing in other designations such as MA's 2, 7, 8 which do not include regulated timber harvest. This provided for a total of 8 percent of the Forest's lands below 5,500 feet in elevation with old-growth timber.

FIGURE B-15

FORPLAN RUNS LINKED TO DECISION POINTS DRAFT TO FINAL EIS



d. Run 11414A

This run increases the old growth acreage (MA 13) so that about 10 percent of the Forest's acreage below 5500 feet in elevation is in old-growth timber. In comparison to run 11412A it displays the effect of unregulating old growth at the 10 percent level. In comparison to run 11413A it displays the effect of increasing the unregulated old growth from 8 percent to 10 percent. This run and all other diagnoses depicting 10 percent unregulated old growth modeled the additional old growth as occurring on the most productive timber lands (Mixed Conifer I, Depositional). Thus, these diagnoses displayed the maximum impact of this change. The actual locations of old growth stands are shown on the Management Area Map as MA-13.

e. Run 11415A

This run was used to explore the effects of removing requirements for commercial thinning and delaying conversion of stagnated lodgepole pine for as long as 100 years into the future. The intent was to reduce budget expenditures and determine the associated impacts of those reductions. The removal of commercial thinning requirements reduced the acreage treated from 25,000 acres to 13,000 acres for a budget savings of $1.4 million annually. As originally modeled, commercial thinning generally improved PNV even though actual experience revealed that it is very difficult to sell commercial thinning sales. The reasons for this difficulty include a combination of complex factors (low volume per acre, small piece size, protection of the residual stand etc.) which make logging costs higher than originally estimated and lack of demand for the type of product produced at the prices necessary for successful sales. This run reveals that the products of commercial thinning can be replaced with the products of final harvest which are currently more in demand. Thus, even though this run reveals a reduction in PNV with the removal of commercial thins, it is more practical not to require them when actual implementation of the plan is considered in light of the current economic climate. The Final plan permits commercial thinning, but does not require it as did the Proposed Action. For more details on the topic of commercial thinning see "Commercial Thinning and the Issues - Budgets vs PNV", Haugen May 13, 1987, in the planning records and sections VI.B.4.c; VI.D.6.c; VIII.C.2.9(2)(a); and VIII.C.2.p(2)(b) of this Appendix. In comparison to run 11414A the modeled effect of these changes can be seen at the 10 percent old growth level. In comparison to run 11421A, described below, the difference between 8 and 10 percent old growth levels is seen.

f. Run 11416A

This run is identical to run 11415A except that the new economic data is used. The effect of the new economic data can be seen in comparison to 11415A. This run is not displayed on the above chart.

g. Run 11417A

This run explored the effects of eliminating the pre-commercial thinning program in addition to the commercial thinning program and delaying the conversion of stagnated lodgepole stands for up to 100 years. The effect of eliminating pre-commercial thinning can be seen in the comparison to run 11415A.

h. Run 11421A

This run explored the effects of eliminating the commercial thinning program and delaying the conversion of stagnated lodgepole pine while providing unregulated old growth at the 8 percent level. The comparison to run 11413A displays the effects of these changes. The comparison to run 11415A shows the difference in effects between the 8 and 10 percent old growth levels.

i. Run 11424A (Final Plan - Alternative JF)

This run was designed to determine the effects of maximizing timber production in the first decade under a non-declining harvest schedule. The intent was to help stabilize timber supplies at a level closer to the historic levels experienced in the area in order to reduce the potential for community disruption. This run shows the effects of maximizing timber in the first decade at the 10 percent old growth level when compared to run 11415A. The difference between the 8 percent and 10 percent old growth levels can be seen in the comparison to run 11425A, described below. Run 11424A represents the Final Plan (Alternative JF).

j. Run 11425A

This run, like 11424A, was designed to determine the effects of maximizing timber production in the first decade, but at 8 percent old growth rather than 10 percent. The difference between the effects at 8 and 10 percent old growth can be seen in the comparison to run 11424A. The effect of maximizing timber in the first decade at 8 percent old growth can be seen in the comparison to run 11421A.

k. Run 11428A

This run explores the effects of increasing harvest levels for two decades by allowing a departure from non-declining yield to occur after decade 2. The RPA timber goals are met in the first two decades. This run has old growth at the 8 percent level so this approach to increasing early timber harvests can be compared to run 11425A which maximized the first decade harvest under non-declining yield. The effect of the increased harvest levels can be seen in the comparison to run 11421A. The difference between the 8 and 10 percent old growth levels can be seen in the comparison to run 11429A, described below.

1. Run 11429A

Like run 11428A, this run explores the effects of increasing harvest levels for two decades by allowing a departure from non-declining yield to occur after decade 2. This run has old growth at the 10 percent level so it can be compared to 11415A which had no increased harvest levels. It can also be compared to run 11424A which used the approach of increasing volumes by maximizing timber in the first decade under non-declining yield. The difference between the 8 and 10 percent old growth levels can be seen in the comparison to run 11428A.

D. Benchmark Analysis - Summary of Opportunity Costs Associated With Modeling Constraints

The monetary tradeoffs of the management opportunities explored during the analysis of the management situation (AMS) and the development of the Final Plan can be determined by comparing the benchmarks or diagnoses described in Section C. Monetary tradeoffs are limited to priced benefits. In this section, the tradeoffs of timber harvest floors and ceilings, minimum management requirements, timber policy constraints, market vs. assigned values, additional timber modeling constraints, providing maximum resource outputs, current direction, and the minimum level are discussed. Note that the "opportunity cost" reference points vary in the benchmark discussion. Alternative comparisons will use benchmark 114GG1 (Alternative M) as a common reference point.

1. Opportunity Cost of Timber Harvest Floors and Ceilings

A comparison of benchmarks was performed to portray the opportunity cost of limiting timber harvest to reasonable levels, given that all minimum management requirements are satisfied in FORPLAN. Benchmark 114GG1-M revealed that a floor of 80% of the last decade's timber cut (345 MMCF) was non-binding and thus had an opportunity cost of zero. The comparison of 114GG1-M to 114D04 reveals that constraining harvest fluctuations to ±25% from one decade to the next has an opportunity cost of about $8 million. This is about a 1% decrease in PNV. Comparing 114V01-N to 114D04 reveals a decline in PNV of about $23 million (2%) when harvest levels can fluctuate upward by 20% a decade and downward by 15% per decade maximum. The latter case has a larger decrease in PNV simply because the limits are more constraining. In both cases the effect of constraining the harvest schedule is quite small because the satisfaction of the minimum management requirements already go a long way toward regulating the harvest schedule to a reasonable level. The decreases in PNV are caused by deferring some harvest from the first decade to later decades and by harvesting more in some decades and less in other decades than the amount which would maximize PNV without the constraints.

Run Comparison:

114D04	PNV = $1171 million	no scheduling constraint
114GG1	PNV = $1163 million	345 MMCF floor and ±25%/decade
114V01	PNV = $1148 million	+20% to -15% per decade

Opportunity Cost:

345 MMCF floor	= $0 (0% reduction)
±25% per decade	= $8 million (1% reduction)
+20 to -15% per decade	=$23 million (2% reduction)

2. Opportunity Cost of Minimum Management Requirements (MMRs)

The tradeoffs associated with MMRs were analyzed by comparing the opportunity costs of the following pairs of benchmarks: 114A09 vs 114B06 (grizzly), 114B06 vs 114C04 (soil and water), 114C04 vs 114D04 (diversity) and 114D04 vs 114GG1-M (40 acre clearcuts). These incremental comparisons were developed under the timber policy constraint of harvest at or after culmination of mean annual increment (CMAI). The total opportunity cost of the whole package of MMR's was developed on the same basis.

a. Endangered Species Act - Grizzly Bear

Benchmarks compared:	114A09	PNV = $1924 Million
	114B06	PNV = $1768 Million

Opportunity cost:
$156 Million (8 percent reduction, 114A09 base)

PNV is reduced 8 percent by the substitution of GRIZTM prescriptions for TMBOPT prescriptions, no thinning in the BGSRTM prescription and a limit on harvest to a maximum of 8.3 percent of the area in each grizzly situation per decade. The substitution of prescriptions which return a lower PNV was one cause of the decline in PNV, but the largest impact was a result of the harvest area constraint. This constraint reduced the fluctuations in timber harvest a great deal (see Table B-12) thus removing the options to harvest large amounts of timber early when PNV could be higher.

b. Soil and Water Protection

Benchmarks compared:	114B06	PNV = $1768 Million
	114C04	PNV = $1202 Million

Opportunity cost:
$566 Million (29 percent reduction, 114A09 base)

PNV is reduced another 29 percent by the addition of a set of scheduled output constraints which limit cutting on a watershed by watershed basis so that runoff will not cause damage to stream channels. The constraints take into account the current condition of the forest canopy and the fact that regrowth after cutting will reduce runoff over time thus allowing further cutting in the watershed. The major cause of the reduced PNV is the fact that the constraints force the harvest to be spread out over time thus reducing early harvest of large trees. This is particularly evident in decade 2 where harvest is reduced from 884 MMBF per year to 173 MMBF per year. The constraint is applied over 20 decades so these early reductions in harvest level can only gradually be picked up later.

c. Diversity

Benchmarks Compared: 114C04 PNV = $1202 Million
114D04 PNV = $1171 Million

Opportunity cost:
$31 Million (2 percent reduction, 114A09 base)

PNV is reduced by an additional 2 percent when specific lands are set aside for old growth management and a total of 140,000 acres of land are constrained to supply trees older than 250 years by decade 13. This reduction is, again, a function of altered harvest schedules and substitution of prescriptions which do not return as high a PNV as others.

d. Forty-Acre Clearcut Limits

Benchmarks Compared: 114D04 PNV = $1171 Million
114GG1-M PNV = $1163 Million

Opportunity cost:
$0 (0 percent reduction, 114A09 base)

PNV is not affected when a constraint limiting harvest outside of grizzly habitat to 25 percent of the area per decade is applied. The forty acre clearcut limits were applied along with upper and lower harvest bounds in benchmark 114GG1-M, however the constraint designed to model 40 acre clearcut limits was not binding in any decade. This constraint was also not binding in benchmarks 114V01-N and 114F01-A. This demonstrates that the other minimum management requirements disallow cutting units larger than 40 acres. The two constraints which accomplish this are those that limit harvest in grizzly habitat to 8.3 percent or less per decade and those that limit cutting to prevent stream channel damage.

e. All Minimum Management Requirements

The complete package of MMR's was evaluated in three ways described below.

(1) Rotations Based Upon CMAI - No Harvest Schedule Constraint

Benchmarks Compared: 114A09 PNV = $1924 Million
114D04 PNV = $1171 Million

Opportunity Cost:
$753 Million (39 percent reduction, 114A09 base)

PNV is reduced by 39 percent when all the minimum management requirements are applied under the assumption that harvest will occur at or later than CMAI and the harvest schedule is not otherwise constrained.

(2) Rotations Based Upon CMAI With NDY/LTSY Link

Benchmarks Compared: 114U01 PNV = $1722 Million
114F01-A PNV = $1143 Million

Opportunity Cost:
$579 Million (34 percent reduction, 114U01 base)

PNV is reduced by 34 percent when all the MMR's are applied under the assumption that harvest will occur at or later than CMAI and the harvest schedule is constrained to non-declining yield with a link to long term sustained yield.

(3) Rotations Based Upon Utilization Standards With Sequential Upper and Lower Bounds

Benchmarks Compared: 114HH2 PNV = $2083 Million
114JJ2 PNV = $1336 Million

Opportunity Cost:
$747 Million (36 percent reduction, 114HH2 base)

PNV is reduced by 36 percent when all the MMR's are applied under the assumption that rotations are based upon utilization standards rather than CMAI and sequential upper and lower bounds limit harvest to reasonable levels.

3. *Opportunity Cost of Timber Policy Constraints*

The timber policy constraints were analyzed to determine their impact on PNV. Two constraints, NDY/LTSY link and rotations based on CMAI, were applied to the FORPLAN model separately to determine their opportunity cost and then as a set to determine the net effect.

a. Rotations Based Upon CMAI

Benchmarks Compared: 114JJ2 PNV = $1336 Million
114GG1-M PNV = $1163 Million

Opportunity Costs:
$173 Million (13 percent reduction, 114JJ2 base)

PNV declines 13 percent when rotations are constrained to occur at or after CMAI given that harvest fluctuations are kept to reasonable limits by sequential upper and lower bounds and all MMR's are in effect.

b. NDY/LTSY Link

The opportunity cost of this constraint varies depending upon where in the analysis process it is applied. This difference results from the complementary relationship between the application of the MMR's and NDY. As more MMR's are applied the harvest schedule tends to flatten out over time until it becomes nearly non-declining. The following three comparisons display the situation:

(1) No MMR's, Rotations Based Upon CMAI, No Bounds

Benchmarks Compared: 114A09 PNV = $1924 Million
114U01 PNV = $1722 Million

Opportunity Cost:
$202 Million (10 percent reduction, 114A09 base)

PNV declines 10 percent when the NDY/LTSY link constraint is applied when rotations are defined by CMAI, no MMR's are in effect and harvest is not otherwise constrained initially. The decline of PNV between this pair of benchmarks ($202 MM) can be compared to the decline in PNV between the following pair ($28 MM) to indicate that the application of the MMR's go a long way toward achieving non-declining yield independently of the constraint.

(2) All MMR's, Rotations Based Upon CMAI, No Bounds

Benchmarks Compared: 114D04 PNV = $1171 Million
114F01-A PNV = $1143 Million

Opportunity Cost:
$28 Million (2 percent reduction, 114D04 base)

PNV declines 2 percent when the NDY/LTSY link constraint is applied when rotations are defined by CMAI, all MMR's are in effect and harvest is not otherwise constrained initially.

(3) All MMR's, Rotations Based Upon Utilization Standards, U & L Bounds

Benchmarks Compared: 114JJ2 PNV = $1336 Million
114II2 PNV = $1321 Million

Opportunity Costs:
$15 Million (1 percent reduction, 114JJ2 base)

PNV declines 1 percent when the NDY/LTSY link constraint is applied when rotations are defined by utilization standards, harvest fluctuations are kept to reasonable limits by sequential upper and lower bounds and all MMR's are in effect.

c. Rotations Based Upon CMAI and NDY/LTSY Link

Benchmarks Compared: 114JJ2 PNV = $1336 Million
114F01-A PNV = $1143 Million

Opportunity Cost:
$193 Million (14 percent reduction, 114JJ2 base)

PNV declines 14 percent when the two constraints are applied together given that all MMR's are in effect and harvest fluctuations are constrained by sequential upper and lower bounds prior to their application.

d. Utilization Standards

Although not considered benchmarks for the purposes of this discussion, two pairs of FORPLAN diagnoses were used to explore the the effect of the proposed regional utilization standards.

(1) Timber Volume Effect

Run Comparison: 114X01 (first decade volume 1002 MMCF)
114EE1 (first decade volume 933 MMCF)

Opportunity Cost: 69 MMCF (7 percent reduction)

The objective function for both diagnoses was "Maximize Timber for 1 decade". Both have the NDY/LTSY link constraint and include no MMR's. Because the objective function is not "Maximize PNV" they are not comparable to the benchmarks on monetary terms. Run 114EE1 used timber yield tables which depicted the current utilization standards while 114X01 depicts the proposed regional utilization standards. There is a seven percent reduction in volume when the current utilizations standards are applied in lieu of the proposed regional standards.

(2) Opportunity Cost

Run Comparison: 114009-J PNV = $916 Million
114KK2 PNV = $840 Million

Opportunity Cost: $76 Million (8 percent reduction)

These two diagnoses were generated as part of the alternative development process, but they do represent an opportunity cost of the timber policy constraint related to utilization standards and will be discussed here. Run 114009-J is the proposed alternative using the proposed regional utilization standards. Run 114KK2 is identical except that the current utilization standards are used. PNV is decreased 8 percent when the current utilization standards are used in lieu of the proposed regional standards. Both diagnoses include all MMR's and the NDY/LTSY link constraint.

4. Opportunity Costs of Valuing Market Values Only

All the FORPLAN diagnosess used in this analysis included all costs, but only the values associated with market commodities (timber and grazing). The non-market values were added to the FORPLAN economics outside of the model to generate the PNV's used.

There are basically two ways to increase the amounts of non-market outputs in an optimal FORPLAN solution. First, the costs and values associated with these outputs can be built into the model. If prescriptions which include more non-market outputs generate a larger contribution to PNV than do prescriptions with lower non-market outputs, more non-market outputs will show up in the solution. Second, constraints can be applied to the model. These constraints can either directly force more non-market outputs into the solution or they can indirectly force added non-market outputs by limiting market outputs. As a simple example, a limit on the amount of clearcut acreage will effectively remove harvest options from certain Analysis Areas thus opening the way for other prescriptions which may contribute less to PNV, but which will likely contribute more non-market outputs. The analysis described below showed that the addition of non-market values was not sufficient to make a significant change in the relative contribution of each prescription to PNV. Thus, to get significant non-market outputs, it would be necessary to apply constraints anyway.

The analysis was performed using the set of prescriptions which were the input for benchmark 114A09. Benchmark 114A09 was designed with very few limitations as to the types of prescriptions available so a wide range of opportunities can be explored if this run is used as the basis for analyzing the effects of valuing non-market outputs. A special FORPLAN option was used which generates a list of the contribution which every possible prescription and timing choice can have to the total PNV. This option simply calculates these contributions based upon the economic information supplied to it. In this case the same economic information was included as for all the other diagnoses: all costs, but only market values.

The maximum contribution to PNV from non-market (assigned) values was manually calculated for each prescription. The prescription which contributed most to PNV for each Analysis Area was determined with and without the non-market values included. In almost all cases the same prescription would be selected to maximize PNV whether or not the non-market values were included. Recall that the FORPLAN model included 389 Analysis Areas and 2,246,000 acres. The prescription which contributed most to PNV changed when the non-market values were added on 28 occasions. This involved 28 Analysis Areas and 29,920 acres. The **maximum** contribution due to non-market outputs was used so this is a maximum possible effect. The change in PNV amounted to $4.6 million out of $1924 million, again a maximum effect.

Thus the conclusions were that, at most, the inclusion of the non-market values would raise PNV about $4.6 million or 0.2 percent. The opportunity cost of not including those values ($4.6 MM) was determined to be insignificant relative to the opportunity costs of all the other factors explored. Furthermore, the inclusion of non-market values would not have supplied enough non-market outputs to effectively model the various alternatives, constraints are necessary anyway. The FORPLAN model was not restructured to attempt to include these

values, instead they were added to PNV after an optimal solution was found for each benchmark and alternative. For details on the complete analysis see Planning Record: "Established Market Prices vs Assigned Monetary Values in the FORPLAN Model", Haugen, December 21, 1984.

5. Opportunity Costs of Maximum Resource Output, Minimum Level, and Current Direction Benchmarks

An analysis of maximum resource outputs was conducted to define the opportunity costs of these resources, and to determine maximum resource potentials. These diagnoses were compared using common constraints of: rotation based on CMAI, NDY/LTSY link, and MMR's.

The Maximum Timber benchmark showed that, by maximizing timber harvest under NDY, PNV would be reduced from $1163 million (114GG1-M) to $1046 million (114W01-L) on the Forest. The reason for this relationship is the fact that maximization of timber requires that all lands with the potential for producing timber do so even if it is more costly to manage the land for timber production than can be returned from the values associated with that management. This is particularly evident in the stagnated lodgepole pine stands which are very costly to return to production, but which can make a significant long term contribution to timber harvest.

The Minimum Level benchmark defines the costs and benefits which can be attributed to operating the Forest in the absence of producing controllable outputs such as timber, range, etc. Management under this benchmark reduces PNV by 99+ percent ($1160 MM from a base of $1163 MM, 114GG1-M), and essentially terminates all market outputs. The discounted cost of this run, $196 MM, represents the cost of maintaining the Forest in public ownership for 200 years.

The Maximum Wildlife benchmark (114AA2-F) is linked to elk populations as an indicator species. It reduced PNV by 43 percent ($505 MM from a base of $1163 MM, 114GG1-M). This reduction occurs even though timber harvest contributes to the forage supply because less economical harvest regimes are necessary to provide security to the elk along with increased forage. The Max wildlife benchmark produces 9900 elk in the third decade. This represents an 80 percent increase above current levels. The continuation of current direction (114Y12-I) would increase the elk population to 7300 by the third decade so the Max wildlife benchmark represents a 36 percent increase from this base.

The opportunity cost of maximizing wilderness on the Forest was analyzed to determine the impacts of this management scenario. Under this benchmark (114M01-H), 498,100 acres of current roadless areas were allocated to wilderness management, which effectively reduces the suitable timber acres by 14 percent (245,000 acres). The results of this run show that PNV is reduced $128 MM (11 percent, 114GG1-M base). The 200 year timber harvest total is reduced 8 percent from benchmark 114GG1-M. The LTSY level declines by 3 percent from benchmark 114GG1-M.

The current direction benchmark illustrates the tradeoffs which occur by continuing management under current land use plans and direction, with a budget and associated harvest level similar to the present situation. The PNV of this run is $460 Million. Another FORPLAN run, not called a benchmark, was made to determine the effect of permitting any budget. This run, 114Y08, had a PNV of $909 million.

a. Maximum Timber

Benchmarks Compared: 114GG1-M PNV = $1163 Million
114W01-L PNV = $1046 Million

Opportunity Cost: $117 Million (10 percent reduction)

PNV is reduced 10 percent when 200 year timber production is maximized.

b. Minimum Level

Benchmarks Compared: 114GG1-M PNV = $1163 Million
114DD1 PNV = $ 3 Million

Opportunity Cost: $1160 Million (99+ percent reduction)

PNV is reduced more than 99 percent when all controllable outputs on the Forest are terminated.

c. Maximum Wildlife (Elk)

Benchmarks Compared: 114GG1-M PNV = $1163 Million
114AA2-F PNV = $ 658 Million

Opportunity Cost: $505 Million (43 percent reduction)

PNV is reduced 43 percent when wildlife resources (elk) are maximized in the objective function.

d. Maximum Wilderness

Benchmarks Compared: 114GG1-M PNV = $1163 Million
114M01-H PNV = $1035 Million

Opportunity Cost: $128 Million (11 percent reduction)

PNV is reduced 11 percent when all existing roadless areas are allocated to wilderness use.

e. Current Management

Run Comparison:

Benchmark	114GG1-H	PNV = $1163 Million
Benchmark:	114Y12-I	PNV = $ 460 Million
Run:	114Y08	PNV = $ 909 Million

Opportunity Costs:
$703 Million (60 percent reduction with current budget)
$254 Million (22 percent reduction with higher budget)

PNV is reduced 60 percent if lands are assigned to uses described in present management plans and direction when harvest levels and associated budgets are held constant at present levels.

PNV is reduced 22 percent when lands are assigned to the uses described in present management plans and direction, but budgets are not limiting.

6. Development of the Final Plan

The monetary tradeoffs of the management approaches explored during the development of the Final Plan can be determined by examining the FORPLAN diagnoses described in section C.3. above. In this section the tradeoffs associated with the various approaches to management are discussed. The opportunity cost reference points used in this discussion will vary depending upon the action being examined. The same economic values used above will be used in these comparisons.

a. Opportunity Cost of Redesignation of Pillick Ridge to Recommended Wilderness

Redesignation of Pillick Ridge to Recommended Wilderness was done in concert with a number of model adjustments designed to better portray the Proposed Action. The effect was an estimated opportunity cost of negative one million dollars. In other words, the opportunity cost of keeping the designations as they were in the Proposed Plan was one million dollars.

Run Comparison:
114009 PNV = $916 million (Proposed Action - Alt. J)
11412A PNV = $917 million

Opportunity Cost: $1 million (0 percent change)

b. Opportunity Cost of Unregulating Old Growth

The Proposed Action managed about 8 percent of the Forest acres below 5,500 feet as old growth. The MA 13 portion of this was in the regulated timber base. Removing MA 13 from the regulated base so that no scheduled timber management activities would occur resulted in an opportunity cost of $11 million. Enlarging the size of MA 13, so that about 10 percent of the Forest below 5,500 feet is managed for old growth, and removing MA 13 from the regulated base resulted in an opportunity cost of $48 million. The difference between 8 percent and 10 percent old growth was an opportunity cost of $37 million.

Run Comparison:
11412A PNV = $917 million
11413A PNV = $906 million
11414A PNV = $869 million

Opportunity Cost:
8% Unregulated = $11 million (1% reduction in PNV)
10% Unregulated = $48 million (5% reduction in PNV)
8% to 10% Unregulated = $37 million (4% reduction in PNV)

c. Opportunity Cost of No Commercial Thinning and Delayed Conversion of Stagnated Lodgepole Pine

Removing the requirement to commercially thin timber stands and allowing delays in the conversion of stagnated lodgepole pine stands of up to 100 years had an opportunity cost of from $108 million to $126 million. With 8 percent old growth, the opportunity cost was $126 million. With the smaller regulated base associated with 10 percent old growth, the opportunity cost was $108 million.

Run Comparison:
11413A PNV = $906 million
11421A PNV = $780 million

11414A PNV = $869 million
11415A PNV = $761 million

Opportunity Cost:
No Com Thin 8% Old Growth = $126 million (14% reduction)
No Com Thin 10% Old Growth = $108 million (12% reduction)

d. Opportunity Cost of No Pre-Commercial Thinning

When the opportunity to pre-commercially thin stands is removed, the PNV drops by about $40 million.

Run Comparison:
11415A PNV = $761 million
11417A PNV = $721 million

Opportunity Cost: $40 million (5% reduction in PNV)

e. Opportunity Cost of Maximizing Timber Production in Decade 1 With Non-Declining Yield

In an effort to help bolster timber supply in the area, timber production was maximized in the first decade subject to non-declining yield. This approach dropped the PNV from $7 million to $28 million depending upon the size of the regulated base.

Run Comparison:
11421A PNV = $780 million
11425A PNV = $773 million

11415A PNV = $761 million
11424A PNV = $733 million

Opportunity Cost:
8% Old Growth: $7 million (1% reduction in PNV)
10% Old Growth: $28 million (4% reduction in PNV)

f. Opportunity Cost of RPA Timber Goals for 2 Decades Followed By Departure

Another approach to bolstering timber supply in the area was explored: timber volume was set to equal the RPA volumes for the first two decades followed by a permitted departure in decades 3 and 4 (± 25%) and a return to non-declining yield thereafter. The opportunity cost of this approach was $5 million at the 8% old growth level and $25 million at the 10% old growth level.

Run Comparison:
11421A PNV = $780 million
11428A PNV = $775 million

11415A PNV = $761 million
11429A PNV = $736 million

Opportunity Cost:
8% Old Growth: $5 million (1% reduction in PNV)
10% Old Growth: $25 million (3% reduction in PNV)

g. Effects of Alternative Base Timber Values, Price Projections and Road Costs

In response to public comment, the effects of using a new set of economic data were determined. The new economic data included:

- base prices linked to transaction evidence sale data for the years 1975 through 1984
- price projections as used in the 1985 RPA process
- road costs adjusted for real cost decreases experienced since 1978

These effects were determined at two different levels in the analysis process. First, the maximum PNV benchmark of the DEIS (114GG1 - Alt M) was rerun using the new set of economic data. This run has the opportunity to choose land designations based upon maximizing PNV in a departure (±25%) mode. The model was relatively unconstrained except for the minimum management requirements. Second, a heavily constrained run, 11415A, was rerun with the new data. This run is similar to the Final Plan run except that first decade harvest is not forced upward. All land designations are fixed, thus the only opportunity for change under the new set of economic data is in the area of harvest flow scheduling. The Final Plan run (11424A) was not used because the first decade harvest constraint limits the opportunity for scheduling changes.

Some key effects of changing the economic data in the PNV benchmark run are displayed below:

Table B-16
EFFECTS OF "NEW" ECONOMICS ON THE PNV BENCHMARK

RunID	Description	Suitable Acres	PNV ($MM)	1st Decade Timber (MMBF)
114GG1	Max PNV - Old Econ	1,484,000	$1163	262
11402B	Max PNV - New Econ	1,337,000	$ 222	240
	Change from 114GG1	-147,000	-941	22
	% Change from 114GG1	-9.9%	-81%	-8.4%

The PNV drops a great deal under the new set of economic data, but the suitable acreage and the first decade harvest level drops a smaller amount. From the change in PNV it can be seen that the relationship between costs and prices changes significantly. From the change in suitable base, it can be seen that the changes in price and cost relationships are not sufficient enough to move a proportionate amount of land out of the regulated base. While some land becomes uneconomical to harvest, most of the land base remains economical to harvest, but at considerably lower net returns.

The effect of changing the economic data in run 11415A is displayed in the following table:

Table B-17

EFFECTS OF "NEW" ECONOMICS ON A HEAVILY CONSTRAINED RUN

RunID	Description	Suitable Acres	PNV ($MM)	1st Decade Timber (MMBF)
11415A	Old Econ	1,263,000	$761	194
11416A	New Econ	1,263,000	$162	185
	Change from 11415A	0	$599	-9
	% Change from 11415A	0.0%	-79%	-4.6%

This shows that the PNV changes at about the same proportion as in a relatively unconstrained run while the first decade timber harvest is affected somewhat less. The suitable acres remain constant because each analysis area is constrained to specified designations. This constancy in suitable acres reduces the latitude of the model to vary timber harvest scheduling by almost half.

The effect of changing the economic data in run 11424A is displayed in the following table:

Table B-18

EFFECTS OF "NEW" ECONOMICS ON THE FINAL PLAN

RunID	Description	Suitable Acres	PNV ($MM)	1st Decade Timber (MMBF)
11424A	Final Plan-Old Econ	1,263,000	$733	202
11430A	Final plan-New Econ	1,263,000	$122	202
	Change from 11424A	0	-$611	0
	% Change from 11415A	0.0%	-83%	0.0%

The Final Plan is heavily constrained. In addition to the acreage constraints mentioned above, the first decade volume is maximized and thus can not change with changing economic parameters. The only effect is a decline in PNV because of the values used in its calculation.

A paper entitled "The Effects of Updated Economics on the Suitable Timber Land Base and A Comparison of the Final Forest Plan to Suitabilities When PNV is Maximized" (Haugen, June 10, 1986) provides details on the types of lands that become unsuitable and how the designations in the Final Plan compare to those in run 114GG1.

In summary: When the updated economic values are used, more land becomes unsuitable for timber production. The affected lands tend to be those which are less productive and on steeper slopes. The Final Plan has more unsuitable land than when harvest flow constraints are relatively relaxed. Since the Final Plan land designations were established then installed in the model, the reasons for the increased unsuitable acreages are fairly obvious. The Final Plan reflects refinements in non-capable lands, the decision to manage old growth outside the regulated base, the decision to preserve certain roadless areas and decisions to provide several types of management for specific purposes even though the lands involved may contribute more financially if managed for timber production (viewing, semi-primitive non-motorized recreation, big game winter range and special interest areas).

h. Utilization Standards

Unless noted otherwise, all of the timber volumes presented in this Appendix are based upon the desired Regional Utilization Standards. A document entitled "Analysis of Proposed Vs Current Timber Utilization Standards" (Haugen and Johnson, February 1985) and a document entitled "Utilization Standards Analysis - Volume of Projected Harvest by Species" (Haugen, September 27, 1985) are in the planning records. These documents describe the analysis developed for the Proposed Plan. The following Tables display the two standards and the results of the analysis as adjusted to the volumes of the Final Plan (Alternative JF):

Table B-19
CURRENT VS PROPOSED UTILIZATION STANDARDS

	MINIMUM D.B.H.		MINIMUM TOP D.I.B.	MINIMUM LENGTH
Standard	Lodgepole Pine	All Other Species	All Species	All Species
Current	7 inches	8 inches	5.6 inches	8 feet
Reg Guide	6 inches	7 inches	4.6 inches	8 feet

The general effect of shifting from the current to the Regional utilization standards is an increase in harvest volumes. Harvest from a given acre will be larger simply because smaller trees and higher tops are counted in the harvest volumes.

Table B-20

Comparison of Volume by Tree Species and Tree Diameters
Current Vs Regional Guide Utilization Standards
Final Plan

SPECIES:	DF	LA	CE	ES	LP	GF	AF	HE	PP	WP	TOTAL
Current Stds											
1st Decade											
MMBF	39.4	30.5	9.1	8.5	66.4	6.6	13.2	6.7	6.5	1.0	188
MMCF	9.3	7.2	2.2	2.0	15.3	1.5	3.1	1.6	1.5	.2	44
5th Decade											
MMBF	44.6	39.6	14.5	12.3	68.7	9.1	12.7	10.1	7.0	1.6	220
MMCF	9.0	7.9	2.9	2.4	13.6	1.8	2.6	2.0	1.4	.3	44
Regional Guide Stds											
1st Decade											
MMBF	35.2	34.0	10.4	9.2	81.3	6.9	11.0	7.7	4.9	1.1	202
MMCF	8.4	8.3	2.5	2.2	19.9	1.7	2.6	1.9	1.1	.3	49
5th Decade											
MMBF	46.5	42.1	15.1	12.8	75.4	9.5	13.2	10.6	7.3	1.7	234
MMCF	9.9	8.8	3.2	2.7	15.6	2.0	2.8	2.2	1.6	.3	49

DIAMETER CLASS (inches DBH)	6.0 to 6.9	7.0 to 7.9	8.0 to 9.9	10.0 to 11.9	12.0 to 13.9	14.0 to 15.9	16.0 and more
Current Stds							
1st Decade							
MMBF	0	4	5	46	0	38	95
MMCF	0	1	1	11	0	10	22
5th Decade							
MMBF	0	0	2	32	69	0	117
MMCF	0	0	0	6	15	0	23
Regional Guide Stds							
1st Decade							
MMBF	7	0	6	63	0	15	111
MMCF	2	0	2	14	0	4	27
5th Decade							
MMBF	3	1	2	38	73	0	117
MMCF	1	0	0	8	15	0	25

Volumes by species may decline in some cases when the Regional Guide standards are used because a different species mix may be chosen to maximize PNV under those standards.

The detailed analysis in the planning records concluded that the major impact associated with the Regional utilization standards is that the cut volume in the larger size classes increases. There is no large increased cut of the smallest size classes or of the minimum sized lodgepole pine. The increased volumes

obtained from the larger size classes are due to the lower minimum top diameter. In general larger harvested volumes produce higher PNV's so the Regional standards contribute to raising the PNV. Changes in land designations tend to be insignificant when analyzed using the maximum PNV benchmark (114GG1).

E. Resource Relationships

1. Timber Harvest/Roadless and Wilderness Management

Timber harvest levels and roadless/wilderness management are generally inversely related. The mix of resources which maximizes PNV manages much of the inventoried roadless area for timber production although some areas which are very expensive to manage for timber do become designated for roadless uses. As the roadless/wilderness acreage is increased above the minimum, the efficient level of harvest over 200 years decreases. When roadless/wilderness acreage is maximized (498,100 acres), the efficient level of timber output is 81 percent of the maximum 200 year total harvest determined by the Maximum Timber benchmark. To the extent that non-commercial areas are put into roadless/wilderness timber harvest is not affected.

2. Timber Harvest/Livestock Forage

All livestock forage on the Forest is modeled as coming from transitory range. Thus as acres harvested increases acres of available transitory range increases as does available forage. When elk is maximized through the application of prescriptions which maximize elk forage production, livestock forage is also maximized at about 78 MAUM's in the first decade (114AA2-F). Since useful livestock forage is limited by the lack of overwintering facilities, the remoteness of available range, and the expense of providing adequate water and range developments, increased timber harvest acreages tend only to supply additional unused AUM's.

3. Timber Harvest/Elk Forage

Creating elk forage with timber harvest could increase elk habitat potential from 5500 elk at the present to 9900 elk by decade 3. The mix of timber harvest and elk forage which maximizes PNV is 88 percent of the 200 year timber harvest potential and 85 percent of the third decade elk potential. Maximizing elk forage reduces the amount of efficient timber harvest to 59 percent of the 200 year potential.

4. Livestock Forage/Elk Forage

Both livestock forage and elk winter range forage are increased with certain timber harvest prescriptions. However, both forage outputs cannot be maximized at the same time because of competition between livestock and elk for forage. The demand for livestock forage on this Forest is constant at about 13,000 AUM's and no significant competition with wildlife is expected at this level (Dillion, 1982).

5. Livestock Forage/Roadless and Wilderness Management

Producing high levels of roadless areas and livestock forage is not possible because roadless management precludes creating transitory forage with timber harvest.

6. Elk Forage/Roadless Area and Wilderness Management

Elk forage production is decreased when roadless management is maximized because of the decrease in acres of timber harvest which create forage. The mix of resources which maximizes PNV is 84 percent of the elk forage potential and no additional wilderness.

7. Grizzly Habitat/Timber Harvest

Grizzly habitat is decreased when short term timber harvest is increased. Long term harvest will be somewhat decreased when grizzly habitat is maintained or enhanced. In the long run (200 years) timber harvest totals can be relatively high and grizzly habitat can be maintained by spreading the harvest out over time and space. Timber harvests are decreased somewhat by eliminating commercial thinning which would otherwise impact the grizzly population. Potential grizzly populations were not tracked in the analysis and grizzly were valued only in terms of the opportunity cost of the grizzly MMR's.

F. Production Potential

The benchmarks provide information about production and economic potential of the Forest. This section discusses the potential and efficient mix of resource outputs to meet the potential.

1. Economic Potential of Maximum PNV (114GG1-M)

The maximum PNV of the Forest is defined in the Max PNV benchmark (114GG1-M) with the following constraints: sequential upper and lower bounds of 25 percent, rotations based on the culmination of mean annual increment, and minimum management requirements (MMRs). The PNV of this benchmark is $1163 MM. Other benchmarks analyzed had higher PNVs, but did not meet the timber policy and legal requirements to be considered in this analysis. Timber management is cost efficient on 83 percent of the tentatively suitable lands, or 1,484,100 acres. Timber harvests are 262 MMBF per year in the first decade.

2. Fixed Costs of Public Land Ownership (114DD1)

The cost of maintaining the Forest in public ownership, protecting existing facilities, and providing for uncontrollable outputs is $5.5 MM in the first decade. The major activities include:

- Facilities maintenance is reduced to levels which protect the incidental user.
- Fire suppression would be limited to preventing safety hazards and protecting adjacent landowners.
- Timber harvest, road construction, and livestock grazing activities are limited to completing current contracts.

The present value of the costs is $196 MM and the distribution is:

General Administration/other	75 percent
Recreation/Wildlife	23 percent
Range	0 percent
Timber	1 percent
Roads	1 percent

Outputs which are incidental to management include timber and livestock grazing under contracts, recreation use, and elk forage. Recreation use would be restricted as trails, roads, and facilities are closed. The present value of the outputs is $199 MM, mostly recreation related.

3. Timber Potential (114W01-L)

The Forest has the ability to produce more timber than it is currently producing, but maximizing timber production would have a opportunity cost of $117 MM. The Max timber benchmark was modeled to address the capability of harvesting maximum yields of timber. This benchmark was constrained to produce the maximum volumes of timber possible. Run 114T03 with an objective function of maximize timber for 20 decades was used to define these constraints. Associated constraints included NDY/LTSY link, rotations based upon CMAI, volume based upon proposed regional utilization standards, and all MMR's. The first decade timber harvest is 255 MMBF per year and the long term sustained yield is about 455 MMBF per year. Timber management is applied to all the tentatively suitable timberlands, although in comparison to the Maximum PNV benchmark (114GG1-M), about 304,000 acres would not be cost efficient. Elk forage is at 86 percent of maximum and no added wilderness is proposed.

4. Elk Summer Range Forage Potential (114AA2-F)

The Max Elk Benchmark was modeled to show the capability of producing elk habitat on the Forest. This benchmark had constraints for managing for maximum elk habitat production, NDY/LTSY link, rotations based on CMAI, and all MMRs. This benchmark produces the highest levels of elk habitat, capable of supporting 9900 elk in the third period. The first decade timber harvest is 164 MMBF per year, and the LTSY is 250 MMBF per year. Timber management is cost-efficient on 1,132,300 acres, or 63 percent of the tentatively suitable lands. The PNV is $658 MM.

5. Wilderness Potential (114M01-H)

The roadless resource of the Kootenai National Forest consists of 498,100 acres in 32 separate areas. All of the Forest's roadless areas are presently by definition eligible candidates for inclusion in the National Wilderness Preservation System. When all of these areas are modeled as Proposed Wilderness, the first decade regulated timber yield averages 208 MMBF per year. This is 82 percent of the first decade harvest when timber is maximized. The LTSY is 325 MMBF, and 1,361,100 acres were designated for timber management, 76 percent of the tentatively suitable lands. This benchmark produces 87 percent of the maximum elk population. The PNV is $1035 MM

6. Dispersed Recreation Potential

Although not addressed specifically in this analysis, dispersed recreation opportunities are expected to shift in emphasis among benchmarks. The type of recreation opportunities will shift from semiprimitive to roaded natural in proportion to the roading of present roadless areas. In the same proportion, outfitter operations will decrease and users preferring primitive experiences will be limited to wilderness use. There will be a decreased need for trail maintenance in present roadless areas and an increased need for trail maintenance in classified areas. This pattern will be most obvious in alternatives which show an emphasis in timber development. In general, the higher the timber harvest levels, the more motorized dispersed recreation and the less non-motorized recreation will be produced.

7. Resource and Economic Potential Under Current Management (114Y12-I)

Continuing current management on the Forest with or without a budget constraint provides for a moderate level of roadless, wilderness, livestock forage, and elk winter range forage. Timber harvest starts at 150 MMBF/year for the first decade, then increases to 162 MMBF/year by decade 5 when current budgets are maintained. About 80 percent of the tentatively suitable timberland is defined as suitable for timber management. The PNV is $460 million, reflecting the $703 million opportunity cost of operating at the current level.

Where budget is not limiting (run 114Y08), timber harvest starts at 204 MMBF/year and climbs to 260 MMBF/year by decade 5. The same amount of land is suitable for timber harvest although less harvest is deferred until after the planning horizon (200 years). The PNV is $909 MM, thus reducing the opportunity cost to $254 MM.

Tables B-15, B-21, and B-22 summarize the outputs and effects of the benchmark analysis.

Table B-15
Resource Outputs of the Benchmarks

OUTPUT	UNIT of MEASURE	MAXIMUM PNV BENCHMARKS 114HH2	114A09	114U01	114B06	114C04	114D04	114V01-N	114F01-A	114GG1-M	114JJ2	114II2
WILDER & PWLDER	M Acre	94.4	94.4	94.4	94.4	94.4	94.4	94.4	94.4	94.4	94.4	94.4
Other Unroaded Mgmt	M Acre	219.4	218.8	249.3	241.8	285.1	295.3	283.1	283.4	295.3	296.6	274.8
Roaded & Other Mgmt	M Acre	1932.0	1932.6	1902.1	1909.6	1866.3	1856.1	1868.3	1863.0	1856.1	1854.8	1876.6
Suitable Timberland	M Acre	1786.6	1752.3	1793.1	1693.4	1457.2	1477.6	1496.7	1486.8	1484.1	1518.0	1534.6
Decade 3 Elk Pop.	M Elk	6.3	6.5	7.1	8.5	8.5	8.4	8.5	8.6	8.4	8.5	8.6
LTSY	MMBF/yr	484	316	490	260	228	231	339	348	334	350	350
Allowable Sale	MMBF/yr											
Decade 1		474	261	380	275	390	367	247	226	262	311	271
Decade 2		721	1218	467	884	173	185	240	253	224	253	282
Decade 3		486	1	468	198	187	175	283	249	274	309	321
Decade 4		595	385	404	381	433	409	322	314	326	335	349
Decade 5		449	399	443	287	388	403	329	336	437	368	366
Decade 6		325	989	474	937	423	409	340	349	362	364	364
Decade 7		240	92	438	152	250	218	319	334	251	417	324
Decade 8		264	74	441	130	220	185	296	313	245	339	322
Decade 9		310	440	389	308	455	487	317	326	322	300	337
Decade 10		386	374	392	233	145	127	282	290	238	254	313
Decade 11		486	32	457	125	191	205	287	295	306	316	327
Decade 12		650	519	488	507	739	743	345	348	393	328	338
Decade 13		698	2024	533	1371	335	308	406	396	502	378	329
Decade 14		574	47	555	324	288	267	395	391	371	497	329
Decade 15		342	524	590	362	372	405	361	382	336	344	362
Decade 16		337	179	551	272	405	375	370	369	436	294	363
Decade 17		386	1510	503	1247	671	646	378	373	445	223	346
Decade 18		523	88	541	133	291	277	377	371	346	270	365
Decade 19		531	74	573	214	256	251	385	378	262	295	337
Decade 20		451	448	490	406	465	454	339	345	278	350	347
Roads for Management	Miles	12567	12404	12612	12144	11397	11380	11267	11272	11226	11857	11464
PNV (4%)	$MM	2083	1924	1722	1768	1202	1171	1148	1143	1163	1336	1321

Table B-15 (Continued)
Resource Outputs of the Benchmarks

MAXIMUM RESOURCE, MINIMUM MANAGEMENT, AND CURRENT LEVEL BENCHMARKS

OUTPUT	UNIT of MEASURE	114W01-L MAX TIM	114AA2-F MAX ELK	114M01-H MAX WILD	114DD1 MINLVL	114Y12-I CURRENT
WILDER & PWLDER	M Acre	94.4	94.4	498.1	94.4	157.3
Other Unroaded Mgmt	M Acre	220.6	273.0	54.0	378.4	250.2
Roaded & Other Mgmt	M Acre	1930.8	1878.4	1693.7	1773.0	1838.3
Suitable Timberland	M Acre	1788.4	1132.3	1361.1	169.4	1422.2
Decade 3 Elk Pop.	M Elk	8.5	9.9	8.6	7.4	7.3
LTSY	MMBF/yr	455	250	325	0	388
Allowable Sale	MMBF/yr					
Decade 1		255	164	208	2	150
Decade 2		245	191	222	2	152
Decade 3		264	190	223	2	157
Decade 4		316	185	273	4	143
Decade 5		345	198	295	4	162
Decade 6		339	197	310	4	172
Decade 7		360	193	300	4	163
Decade 8		327	181	270	7	180
Decade 9		385	264	348	28	164
Decade 10		341	224	290	28	194
Decade 11		375	242	291	28	162
Decade 12		410	244	323	27	172
Decade 13		458	241	357	27	169
Decade 14		427	256	359	27	164
Decade 15		427	228	337	27	172
Decade 16		449	261	333	26	177
Decade 17		432	236	349	26	188
Decade 18		426	239	350	27	201
Decade 19		464	243	339	26	207
Decade 20		455	241	318	27	215
Roads for Management	Miles	12363	9847	10591	6000	9837
PNV (4%)	$MM	1046	658	1035	3	460

Table B-21
Present Value Benefits and Costs for Resource Groups by Benchmark (4%)
(Millions 1978$)[1]

Benchmark	Present Net Value	Present Value Benefits: Timber	Range	Recreation/ Wildlife	Present Value Costs: Timber	Roads	Range	Recreation/ Wildlife	Other
114HH2	2083	2945	3	215	497	344	2	79	158
114A09	1924	2671	3	212	440	291	2	78	151
114U01	1722	2476	3	219	394	337	2	79	164
114B06	1768	2374	3	230	373	234	2	82	148
114C04	1202	1732	3	228	277	234	2	80	168
114D04	1171	1687	3	227	268	229	2	80	167
114V01-N	1148	1604	3	231	245	200	2	81	162
114F01-A	1143	1588	3	228	236	195	2	81	162
114GG1-M	1163	1631	3	227	251	204	2	80	161
114JJ2	1336	1863	3	227	293	222	2	80	160
114II2	1321	1839	3	229	284	219	2	81	164
114W01-L	1046	1590	3	229	300	227	2	81	166
114AA2-F	658	962	3	234	151	149	2	80	159
114M01-H	1035	1440	3	219	215	175	2	76	159
114DD1	3	26	1	172	2	2	0	45	147
114Y12-I	460	776	3	227	169	125	2	82	168

1/ The direct comparison of individual resource benefits and costs is misleading because not all costs are allocated to each resource, ie. the "other" cost category contains inseparable joint costs associated with several resources.

NOTE: Timber benefit in the FORPLAN model is evaluated as lumber value and costs include logging, haul and production costs so that land designation and scheduling can take these cost factors into account. The above table shows only the timber costs of the Kootenai National Forest and does not include purchaser costs; timber benefits as shown here are based upon stumpage value.

Table B-22
Present Value Benefits and Costs for Resource Groups by Benchmark (4%)
(Millions 1978$)[1]

Benchmark	Present Net Value	Present Value Benefits: Timber	Range	Recreation/ Wildlife	Present Value Costs: Timber	Roads	Range	Recreation/ Wildlife	Other
114HH2	2083	2945	3	215	497	344	2	79	158
114A09	1924	2671	3	212	440	291	2	78	151
114U01	1722	2476	3	219	394	337	2	79	164
114B06	1768	2374	3	230	373	234	2	82	148
114C04	1202	1732	3	228	277	234	2	80	168
114D04	1171	1687	3	227	268	229	2	80	167
114V01-N	1148	1604	3	231	245	200	2	81	162
114F01-A	1143	1588	3	228	236	195	2	81	162
114GG1-M	1163	1631	3	227	251	204	2	80	161
114JJ2	1336	1863	3	227	293	222	2	80	160
114II2	1321	1839	3	229	284	219	2	81	164
114W01-L	1046	1590	3	229	300	227	2	81	166
114AA2-F	658	962	3	234	151	149	2	80	159
114M01-H	1035	1440	3	219	215	175	2	76	159
114DD1	3	26	1	172	2	2	0	45	147
114Y12-I	460	776	3	227	169	125	2	82	168

1/ The direct comparison of individual resource benefits and costs is misleading because not all costs are allocated to each resource, ie. the "other" cost category contains inseparable joint costs associated with several resources.

NOTE: Timber benefit in the FORPLAN model is evaluated as lumber value and costs include logging, haul and production costs so that land designation and scheduling can take these cost factors into account. The above table shows only the timber costs of the Kootenai National Forest and does not include purchaser costs; timber benefits as shown here are based upon stumpage value.

VII. Formulation of Alternatives

Significant Changes from Draft to Final EIS

A discussion of Alternative JF (11424A), the Final Plan, has been added to the end of this section.

A. Introduction

A Forest planning alternative is a mix of management prescriptions applied in specific amounts and locations to achieve a desired management emphasis as expressed in goals and objectives. To be viable (NFMA - 36 CFR 219.12f), the alternative must:

1. Exist between maximum and minimum resource potential of the Forest;
2. Facilitate analysis of opportunity costs and of resource use and environmental tradeoffs among alternatives;
3. Facilitate evaluation of present net value, benefits, and costs of achieving various outputs as well as values that are not assigned monetary values;
4. Show a different way to address and respond to major public issues, management concerns, and resource opportunities (ICO's);
5. Represent the most cost-efficient combination of management prescriptions that can meet the objectives of the alternative;
6. State the condition and uses that will result from implementation;
7. State what goods and services will be produced including timing and flow of outputs and the costs and benefits generated;
8. State the resource management standards and guidelines used;
9. State the purpose of the management direction used.

Formulating alternatives was planning action number five in the Forest planning process following the analysis of the management situation (AMS). During the analysis of the management situation a determination was made of the ability of the Forest to supply goods and services. Maximum and minimum output levels were established. These levels form the range within which the alternatives were developed. Two specific alternatives are required. One alternative must be developed which responds to and incorporates the Resource Planning Act (RPA) program tentative resource objective. Another alternative was developed to reflect the current and expected level of goods and services produced should current management be continued (the "no-action" alternative). The process for formulating alternatives can best be explained in a series of steps.

Step 1: Major public issues and concerns were identified through public involvement. (This process is further explained in Appendix A). These issues and concerns were reviewed by an interdisciplinary team and consolidated into a set of planning questions to be answered.

Step 2: A comprehensive multi-resource data base was formed based on the identified issues and concerns and stored in a computer retrieval system.

Step 3: Land analysis areas with similar physical and biological attributes were identified and mapped as analysis areas. The capability, suitability, and management opportunities of specific areas of the Forest were considered in this step.

Step 4: A set of management prescriptions was prepared to represent a variety of possible ways and intensities to manage the Forest.

Step 5: The 389 analysis areas identified in Step 3 were assigned management prescriptions. Some analysis areas were assigned only one prescription while others were assigned a variety of prescriptions that could be applied depending upon the capability, suitability and management opportunities of the analysis area. Single prescription assignments, which are applied because of limited capabilities of the land, limit the model's land designation choices.

Step 6: Resource outputs and the associated costs and dollar values that would result when a prescription was implemented were calculated and entered into the computer model FORPLAN.

Step 7: Demand was estimated for the resources involved in the planning questions.

Step 8: Supply potentials were determined using the FORPLAN computer model. Various assumptions, constraints, and objectives were used to establish benchmarks for supply potentials of each resource. Benchmarks were established for the minimum, maximum, and constraint resource levels and maximum present net value. Existing resource supply and projected demand were compared to supply potentials of each benchmark. Opportunities to resolve issues and concerns were identified for each resource by comparing existing and projected demand to potential production levels. These potentials, when compared to the Current Direction, indicate opportunities and/or need for change. This step concluded the analysis of the management situation - benchmark analysis.

Step 9: Alternative objectives were established to provide a broad range of options for future management of the Forest. Selected benchmarks were used to define upper and lower limits for the production of each resource. These upper and lower limits outlined the decision space boundaries for the resources involved. The interdisciplinary team considered expected use, supply, potential (upper and lower limits), and evaluated public input to establish the range of alternatives within the decision spaces.

Step 10: The FORPLAN model was again used to estimate the outputs and costs for each alternative by reflecting the objective of the alternative through a given set of constraints.

Step 11: The results of the FORPLAN analysis for each alternative were evaluated to assure conformance with laws, policies, and guidelines. Refinements were made to insure that each alternative could be achieved.

Further information on the FORPLAN model is presented in Section III of this Appendix.

The interdisciplinary team incorporated cost-efficiency into the planning process. First, objectives, standards, and guidelines were established for each prescription by resource element. Second, given the objective of the prescription, costs were estimated for resource elements to meet the standards and guidelines of the prescription. Third, costs of producing the outputs that would result from implementing the prescription were developed and compared to the benefit values produced. Prescriptions were carried forward if they were cost efficient in achieving prescription goals. These prescriptions were applied to suitable analysis areas and were combined with the necessary constraints and incorporated into FORPLAN to form different alternatives. Each alternative produces a different combination of priced and nonpriced outputs. The technical feasibility of each alternative is analyzed with FORPLAN. All constraints must be satisfied or an infeasibility will result. The methodology used to account for both priced and non-priced outputs in alternative formulation and evaluation is discussed in Section IV of this Appendix.

B. Common Constraints

The constraints used in the Max PNV (114GG1) benchmark formed the basis for constraints applied to all alternatives except current management (Alternative I). Common benchmark constraints were developed, examined, and tested to see how well they addressed their stated purpose. They also represent the most cost-efficient approach to meeting the intended purpose. These constraints were previously analyzed in Section VI, "Analysis Prior to Development of Alternatives." The benchmark constraints common to all alternatives were as follows:

1. Constraint: All alternatives except departures (114GG1-M, 114V01-N) require nondeclining yield for timber harvests (NDY).

   Purpose: Providing a sustained yield of timber harvests generally results in positive social effects by providing an economy with consistent and relatively stable growth potential.

   Rationale: Assumes a constant supply or upward trend in timber supply.

   Tradeoff: Small reduction in PNV and base timber harvest schedule (see Section VI).

2. Constraint: Insure an appropriate level of timber inventory at the end of the planning horizon (long-term sustained yield link - LTSYC).

   Purpose: To assume that harvestable timber will be available in the decades immediately following the end of the planning horizon.

Rationale: Assure a future sustained yield of timber harvest.

Tradeoff: Small reduction in PNV and timber harvest schedule (see Section VI).

3. Constraint: Timber rotations are based on the culmination of mean annual increment (CMAI) for existing and regenerated stands. This constraint is applied by limiting potential harvest periods in every harvest prescription to times at or after CMAI for the particular type of stand.

Purpose: Assure that timber is harvested at or beyond its maximum mean annual growth rate.

Rationale: Provide rotation ages that maintain high productivity and abide by Forest Service Manual direction.

Tradeoff: $173 Million reduction in PNV and an associated reduction in timber yield.

4. Constraint: Limit amount of harvest on MIXCON I and MIXCON II analysis areas of greater than 1000 acres over the entire 200 year planning horizon. This constraint is applied in the form of over 100 individual constraints on the CCE scheduled output.

Purpose: Assure that basic soil, water quality, water yield, fisheries objectives, and legal size of opening requirements are maintained.

Rationale: Soil, water, and fisheries resources must be maintained at legally defined levels.

Tradeoff: $566 Million reduction in PNV and an associated reduction in timber yield.

5. Constraint: Disallow thinning in grizzly habitat to maintain adequate secure displacement habitat when timber management activities do occur. This constraint is applied in two parts. First, every timber harvest prescription inside of grizzly habitat is designed so no thinning occurs. Second, a series of several constraints are applied which limit the acres harvested in the various grizzly management situations to 8.3 percent of the land area or less in any decade.

Purpose: Assist in the recovery of the grizzly bear population in accordance with the Endangered Species Act. This constraint, by limiting thinning, limits repetitive entries into a stand and, by preserving displacement habitat, gives the bears a place to go when activities do occur.

Rationale: The Endangered Species Act can not be violated.

Tradeoff: $156 Million reduction in PNV and an associated reduction in timber yield.

6. Constraint: A minimum of 8 percent old growth is maintained on the land base under 5500 feet in elevation. This constraint is applied by first forcing a minimum amount of oldgrowth timber to be managed under the WLDTIM (extended rotation) prescription then forcing the inventory to include a minimum acreage of old trees after the twelfth decade when there are sufficient trees to meet the constraint.

Purpose: Help maintain viable wildlife populations of all species and provide a more diverse range of habitats.

Rationale: Old growth would not be maintained on the more productive timber sites without a constraint.

Tradeoff: $31 MM reduction in PNV and an associated reduction in timber yield.

C. Development of Alternatives

1. Alternative A (114F01)

a. Goal

The goal of Alternative A is to provide the most cost effective land base for timber management without the addition of any new wildernesses.

b. Criteria and Assumptions

The criteria and assumptions underlying the development of this alternative are:

- Designation of land uses will be constrained only by the minimum management requirements (MMR's), by non-declining yield and by the long term sustained yield link.

c. Constraints

The constraints used to meet the criteria and assumptions are:

- Timber policy constraints (see Common Constraints)
- MMR's (see Section VI)

d. Rationale

Alternative A is designed to develop the maximum PNV and other outputs that can be supplied in a legal and implementable alternative which is constrained to NDY. For this reason additional constraints are carefully omitted.

2. Alternative B (114G02)

a. Goal

The goal of this alternative is to display an historical perspective to the wilderness issue by providing wilderness proposals as recommended by the administration following the RARE II process (April 1979).

b. Criteria and Assumptions

The criteria and assumptions underlying this alternative are:

- Production of market outputs from areas outside of the Wilderness areas would be based upon cost efficiency.
- This alternative proposes an additional 63,900 acres of Wilderness in Scotchman Peaks and the Cabinet Additions. This is 16% of the total inventoried roadless area on the Forest (excluding Ten Lakes).

c. Constraints

The constraints used to meet the criteria and assumptions are:

- Timber policy constraints (see Common Constraints)
- MMR's (see Section VI)
- Assign 63,900 acres of the following roadless areas, as noted, to Proposed Wilderness prescriptions:

Scotchman Peaks	48,300 acres
Cabinet Face West	8,100 acres
Cabinet Face East	400 acres
McKay	6,700 acres
Chippewa	400 acres

d. Rationale

The RARE II process was a Nationwide effort to develop a set of Wilderness recommendations for action by Congress. Those areas specifically recommended for Wilderness on the Kootenai National Forest are carried forward as Proposed Wilderness in this alternative. The specific analysis areas and portions of analysis areas within the boundaries of each RARE II wilderness proposal were constrained to the Proposed Wilderness prescription in order to properly model this situation.

3. Alternative C (114H02)

a. Goal

The goal of this alternative is to display a wilderness recommendation similar to the Montana Wilderness Bill of June 1984 (which was not acted upon) while managing areas outside of the wilderness areas in a cost efficient manner.

b. Criteria and Assumptions

The criteria and assumptions underlying this alternative are:

- Production of market outputs from areas outside of the Wilderness areas would be based upon cost efficiency.

- This alternative proposes an additional 81,300 acres of Wilderness in Scotchman Peaks, the Ten Lakes Contiguous Area, Trout Creek and the Cabinet Additions. This is 20% of the total inventoried roadless area on the Forest (excluding Ten Lakes).

c. Constraints

The constraints used to meet the criteria and assumptions are:

- Timber policy constraints (see Common Constraints)

- MMR's (see Section VI)

- Assign 81,300 acres of the following roadless areas, as noted, to Proposed Wilderness prescriptions:

Scotchman Peaks	28,900 acres
Ten Lakes Contiguous	7,100 acres
Trout Creek	13,100 acres
Cabinet Face West	6,700 acres
Cabinet Face East	17,900 acres
McKay	5,000 acres
Chippewa	400 acres
Tuchuck	2,200 acres

d. Rationale

The Montana Wilderness Bill of June 1984 was developed as a compromise between various constituencies and is a valid proposal. This alternative was developed so that a level of analysis comparable to the analyses for the other alternatives could be prepared. In order to be on a comparable base, the set of constraints were the same as for the other alternatives in this series (i.e. alternatives B, C, E, G and H) except for the particular areas forced into the Proposed Wilderness designation.

4. Alternative D (114CC5) - RPA Alternative

a. Goal

The goal of this alternative is to respond to and incorporate the RPA program tentative resource objectives as displayed in the Regional Guide (36 CFR 219.12(f)(6)) and the RARE II Wilderness recommendations.

b. Criteria and Assumptions

The criteria and assumptions underlying this alternative are:

- Production of market outputs from areas outside of the Wilderness areas would be based upon cost efficiency.

- This alternative proposes an additional 63,900 acres of Wilderness in Scotchman Peaks and the Cabinet Additions to match the RARE II recommendations. This is 16% of the total inventoried roadless area on the Forest (excluding Ten Lakes).

- Departure from non-declining yield is limited to occur between decades 5 and 10 only and will not change more than 25% from one decade to the next or fall below a floor equal to historic ten year harvest levels.

- Elk population goals can be satisfied without additional constraints.

c. Constraints

The constraints used to meet the criteria and assumptions are:

- Timber policy constraints (see Common Constraints) except as noted below.

- MMR's (see Section VI)

- Assign 63,900 acres of the following roadless areas, as noted, to Proposed Wilderness prescriptions:

Scotchman Peaks	48,300 acres
Cabinet Face West	8,100 acres
Cabinet Face East	400 acres
McKay	6,700 acres
Chippewa	400 acres

- Force harvest volumes in the first five decades to match the RPA goals

- Apply sequential upper and lower bounds of ±25% and a 345 MMCF floor to decades 6 through 10.

- Apply NDY to decades 11 through 20.

d. Rationale

This alternative is developed as required in 36 CFR 219.12(f)(6). The RPA timber goals were originally developed from different data and presumed a base harvest schedule (NDY). The data used here is aggregated differently and the MMR and other constraints applied in this analysis differ from those used in any previous analysis. On this basis it was determined that the RPA goals for timber could not be achieved without departure from a base harvest schedule. Thus, this alternative was constrained as closely as possible to NDY while attaining those harvest levels. The constraints to designate specific areas as Proposed Wilderness match those of Alternative B and are the RARE II proposals which were incorporated into the RPA program.

5. Alternative E (114J01)

a. Goal

The goal of this alternative is to exceed the RARE II and Montana Wilderness proposals by recommending some large blocks of land as Wilderness and Wilderness additions, while still providing as much opportunity for timber harvest as possible.

b. Criteria and Assumptions

The criteria and assumptions underlying this alternative are:

- Production of market outputs from areas outside of the Wilderness areas would be based upon cost efficiency.

- This alternative proposes an additional 186,600 acres of Wilderness in Scotchman Peaks, Trout Creek, the Cabinet Additions, Roderick, Galena and Cataract. This is 46% of the total inventoried roadless area on the Forest (excluding Ten Lakes).

c. Constraints

The constraints used to meet the criteria and assumptions are:

- Timber policy constraints (see Common Constraints)
- MMR's (see Section VI)
- Assign 186,600 acres of the following roadless areas, as noted, to Proposed Wilderness prescriptions:

Scotchman Peaks	49,300 acres
Trout Creek	24,100 acres
Cabinet Face West	9,800 acres
Cabinet Face East	46,700 acres
McKay	10,500 acres
Chippewa	400 acres
Roderick	19,700 acres
Galena	12,700 acres
Cataract	12,300 acres
Government Mountain	1,100 acres

d. Rationale

This alternative is another in a series of alternatives developed to explore the effects of a range of Wilderness proposals. In order to be comparable to others in the series it was modeled identically except for the constraints which force specific areas into the Proposed Wilderness designation.

6. Alternative F (114AA2)

a. Goal

The goal of this alternative is to provide significant big game (elk) habitat management opportunities.

b. Criteria and Assumptions

The criteria and assumptions underlying this alternative are:

- Production of market outputs is secondary to management of Elk habitat.
- Areas not suitable for elk habitat will be managed for cost efficiency

c. Constraints

The constraints used to meet the criteria and assumptions are:

- Timber policy constraints (see Common Constraints)
- MMR's (see Section VI)

- The maximum elk population will be produced (this is based upon the maximum generated by run 114Z01 which had maximize elk as its objective function and was otherwise the same as Alternative F).

d. Rationale

This alternative was designed to emphasize, to the extreme, management for big game species using elk as an indicator species. Base elk population numbers are calculated within the Kootenai FORPLAN model as a non-scheduled output. This means that the output depends only upon the way in which the land is designated. The population generated in this way is the population which can be supported when the various land designations are being managed as described in the Forest Plan. This population is adjusted somewhat outside of the FORPLAN model to account for a period of adjustment of the herd as the designations are implemented and for impacts of specific management activities over time. Because the model is constructed in this way, a special intermediate FORPLAN run was made with Maximize Elk as the objective function. This run defined the highest level of the elk base population which could be achieved. In order to make a comparable alternative under the rules of 36 CFR 219, the model was restructured with Maximize Present Net Value as the objective function and the maximum elk population as a constraint.

7. Alternative G (114L01)

a. Goal

The goal of this alternative is to recommend significant amounts of additional Wilderness while managing the areas outside of Wilderness for cost efficiency.

b. Criteria and Assumptions

The criteria and assumptions underlying this alternative are:

- Production of market outputs from areas outside of the Wilderness areas would be based upon cost efficiency.

- This alternative proposes an additional 304,900 acres of Wilderness in many roadless areas across the Forest. This is 76% of the total inventoried roadless area on the Forest (excluding Ten Lakes).

c. Constraints

The constraints used to meet the criteria and assumptions are:

- Timber policy constraints (see Common Constraints)

- MMR's (see Section VI)

- Assign 304,900 acres of the following roadless areas, as noted, to Proposed Wilderness prescriptions:

Scotchman Peaks	51,900 acres
Trout Creek	30,300 acres
Cabinet Face West	10,400 acres
Cabinet Face East	50,200 acres
Government Mountain	6,200 acres
McKay	13,500 acres
Chippewa	2,300 acres
Rock Creek	400 acres
Roderick	24,700 acres
Galena	15,500 acres
Cataract	17,700 acres
Buckhorn	22,000 acres
Northwest Peaks	13,200 acres
West Fork Elk Creek	4,800 acres
Gold Hill	10,700 acres
Gold Hill West	10,200 acres
Berray Mountain	8,000 acres
East Fork Elk Creek	4,900 acres
Thompson-Seton	5,700 acres
Tuchuck	2,300 acres

d. Rationale

This is another alternative in a series with incrementally more Proposed Wilderness developed to explore the range of potential resolutions to the Wilderness issue. The constraints used are necessarily the same as those used in the other alternatives in this series except for the actual areas constrained to Proposed Wilderness. This is the only way to make the analysis results directly comparable between the various alternatives in the series.

8. Alternative H (114M01) - Maximum Wilderness

a. Goal

The goal of this alternative is to recommend the maximum amount of wilderness while managing areas outside of the wilderness areas for cost efficiency.

b. Criteria and Assumptions

The criteria and assumptions underlying this alternative are:

- Production of market outputs from areas outside of the Wilderness areas would be based upon cost efficiency.

- This alternative proposes an additional 403,700 acres of Wilderness in all the inventoried roadless areas on the Forest (except Ten Lakes). This is 100% of the total inventoried roadless area on the Forest (excluding Ten Lakes).

c. Constraints

The constraints used to meet the criteria and assumptions are:

- Timber policy constraints (see Common Constraints)

- MMR's (see Section VI)

- Assign 403,700 acres of the following roadless areas, as noted, to Proposed Wilderness prescriptions:

Scotchman Peaks	51,900 acres
Ten Lakes Contiguous	7,100 acres
Trout Creek	31,400 acres
Cabinet Face West	10,900 acres
Cabinet Face East	50,400 acres
Government Mountain	8,600 acres
McKay	13,500 acres
Chippewa	2,300 acres
Rock Creek	400 acres
Roderick	24,800 acres
Galena	15,500 acres
Cataract	17,700 acres
Buckhorn	22,000 acres
Northwest Peaks	13,400 acres
West Fork Elk Creek	4,800 acres
Gold Hill	10,700 acres
Gold Hill West	10,200 acres
Berray Mountain	8,300 acres
East Fork Elk Creek	5,000 acres
Lone Cliff-Smeads	6,600 acres
McNeeley	7,700 acres
Flagstaff	9,500 acres
Roberts Mountain	8,000 acres
Grizzly Peak	6,000 acres
Zulu	6,400 acres
Marston	6,000 acres
Willard Lake - Estelle	18,500 acres
Cube-Iron	1,200 acres
Thompson-Seton	20,100 acres
Tuchuck	2,300 acres
Maple Peak	1,400 acres
Le Beau	700 acres

d. Rationale

This alternative is the last in the series of incrementally increasing Wilderness proposals and has the maximum amount of Wilderness. The determinations of Wilderness suitability are the same as those used for the latest roadless area review so all of the areas defined as roadless on the current inventory are constrained to Proposed Wilderness in this alternative. The other constraints are the same as for the other alternatives in this series in order to keep the alternative comparable.

9. Alternative I (114Y12) - Current Direction

a. Goal

The goal of this alternative is to display the direction that the Kootenai National Forest is currently following. The current direction is a composite of 25 separate land use plans completed over a six year period. (36 CFR 219.12(f)(7))

b. Criteria and Assumptions

The criteria and assumptions underlying this alternative are:

- All land designations are as established in the unit plans except as updated to satisfy new laws and regulations as embodied in the MMR's, thus only activity scheduling can be used to maximize PNV.

- This alternative proposes an additional 62,900 acres of Wilderness in Scotchman Peaks, and the Cabinet Additions. This is 16% of the total inventoried roadless area on the Forest (excluding Ten Lakes).

- Budgets and resource outputs over the 200 year horizon approximate current levels.

c. Constraints

The constraints used to meet the criteria and assumptions are:

- Timber policy constraints (see Common Constraints) except as noted below.

- MMR's (see Section VI)

- Assign 62,900 acres of the following roadless areas, as noted, to Proposed Wilderness prescriptions:

Scotchman Peaks	47,600 acres
Cabinet Face West	8,200 acres
Cabinet Face East	400 acres
McKay	6,300 acres
Chippewa	400 acres

- Limit budgets to current levels by constraining timber volumes to current levels over the 200 year horizon.

- Assign all acres to prescriptions which match the Unit Plans except as necessary to meet the MMR's.

d. Rationale

This alternative is one of the most heavily constrained since every land designation is forced into solution. The *NFMA regulations*, 36 CFR 219.12(f)(7), require an alternative which reflects "the current level of goods and services provided by the unit and the most likely amount of goods and services expected to be provided in the future if current management direction continues". The Unit Plans for the Forest have a set of designated land uses that are reproduced in this alternative with some alterations to reflect recent policy changes which would be carried into the future. The Unit Plans do not involve the same detail in scheduling activities as does the analysis process described in this appendix. Thus, it was necessary to devise a set of constraints which would force a schedule of activities to match what could be expected in the future if current management were continued. Current direction seems to be toward very contained budgets so this philosophy was carried into this alternative. The budget could be directly constrained except that the several adjustments, discussed earlier, which are made after the run is complete make it difficult to develop an appropriate constraint level. Timber harvest and budget are directly related so the constraint was applied to harvest levels to force them to match, as closely as possible, the current cut levels out into the future. As a consequence of the relationship between timber harvest and budget, the resulting budget was close to the current level. Recreation and wildlife outputs are generally a function of the way in which the land is designated so by matching the Unit Plan designations this alternative matches those current direction outputs.

10. Alternative J (114009) - Proposed Action

a. Goal

The goal of this alternative is to provide a combination of Wilderness, roadless and timber management designations that provide both for stability and future options. Wildlife and fish production are emphasized to provide a more balanced multiple resource program.

b. Criteria and Assumptions

The criteria and assumptions underlying this alternative are:

- Roadless designations are applied where timber management is environmentally unsound or not cost effective.

- This alternative proposes an additional 66,500 acres of Wilderness in Scotchman Peaks, the Ten Lakes Contiguous Area, and the Cabinet Additions. This is 16% of the total inventoried roadless area on the Forest (excluding Ten Lakes).

- Land designations are based upon suitabilities and cost efficiency with added emphasis for the retention of future options and enhancement of the wildlife and fish resources.

c. Constraints

The constraints used to meet the criteria and assumptions are:

- Timber policy constraints (see Common Constraints)

- MMR's (see Section VI)

- Assign 66,500 acres of the following roadless areas, as noted, to Proposed Wilderness prescriptions:

Scotchman Peaks	24,200 acres
Ten Lakes Contiguous	6,800 acres
Cabinet Face West	8,000 acres
Cabinet Face East	20,400 acres
McKay	6,700 acres
Chippewa	400 acres

- Prescriptions assigned on the basis of suitability with deference given to maintaining future options.

d. Rationale

The goal of retaining future options does not lend itself to modeling with the use of broad constraints because it involves subjective rather than mathematical decisions. Thus, this alternative was developed by constraining individual areas to designations which were subjectively determined to retain the various options (for timber, for roadless recreation etc.). Together, this set of designations was also subjectively determined to meet the goal. The NDY constraint was applied to help attain the stability goal in the form of a constant or steadily increasing timber harvest schedule. The emphasis on wildlife and fish was made jointly with the subjective emphasis on the retention of options so it is embedded in the set of designation constraints. Since the goals of the alternative were met by constraining the designations of the land, the schedule was optimized from a cost efficiency standpoint like the other alternatives.

11. Alternative K (114FF5) - Departure on the Proposed Action

a. Goal

The goal of this alternative is to provide for an increase in timber harvest levels for the first two decades to more closely approach the RPA timber goals while providing a combination of Wilderness, roadless and timber management designations that provide for both stability and future options.

b. Criteria and Assumptions

The criteria and assumptions underlying this alternative are:

- Roadless designations are applied where timber management is environmentally unsound or not cost efficient.

- This alternative proposes an additional 66,500 acres of Wilderness in Scotchman Peaks, the Ten Lakes Contiguous Area, and the Cabinet Additions. This is 16% of the total inventoried roadless area on the Forest (excluding Ten Lakes).

- Land designations are based upon suitabilities and cost efficiency with added emphasis for the retention of future options and enhancement of the wildlife and fish resources.

- RPA timber goals are achieved in the first two decades by allowing departure to NDY after decade 2.

c. Constraints

The constraints used to meet the criteria and assumptions are:

- Timber policy constraints (see Common Constraints) except as noted below.

- MMR's (see Section VI)

- Assign 66,500 acres of the following roadless areas, as noted, to Proposed Wilderness prescriptions:

Scotchman Peaks	24,200 acres
Ten Lakes Contiguous	6,800 acres
Cabinet Face West	8,000 acres
Cabinet Face East	20,400 acres
McKay	6,700 acres
Chippewa	400 acres

- Prescriptions assigned on the basis of suitability with deference given to maintaining future options.

- Decade 1 and 2 harvest levels are set in cubic measure so as to approximate RPA goals which are expressed in board foot measure. The harvest schedule is forced back to NDY after decade 4.

d. Rationale

This alternative has the same goals as the Proposed Action except that it aims to harvest timber at the RPA levels in decades one and two. The goals are met in the same way as for Alternative J - by constraining each area to specific designations which were subjectively determined. Since Alternative J had the same set of designations and did not achieve the RPA harvest goals under the NDY constraint, it was necessary to force the harvest volumes upward in decades one and two to meet the increased timber harvest goal of this alternative. In addition, it was necessary to permit a departure from NDY to make these higher harvest levels feasible. Permitting continued fluctuations in harvest levels would detract from the stability goal so the harvest schedule was forced back into NDY as soon as this was feasible (decade 4).

12. Alternative L (114W01) - Maximum Timber Benchmark

a. Goal

The goal of this alternative is to supply the highest possible timber yields.

b. Criteria and Assumptions

The criteria and assumptions underlying this alternative are:

- Production of outputs from areas outside of the Wilderness would be based upon maximizing timber outputs.
- This alternative proposes no additional acres of Wilderness.

c. Constraints

The constraints used to meet the criteria and assumptions are:

- Timber policy constraints (see Common Constraints)
- MMR's (see Section VI)
- Timber volume for each decade constrained to match the maximum levels as determined by run 114T03.

d. Rationale

Since the goal of this alternative is to maximize the production of timber over the 200 year time horizon of the model, it was necessary to determine the levels of harvest which would need to be applied to accomplish this. An intermediate model was run with an objective function of Maximize Timber for 20 decades. The harvest levels from this run were then used as constraints in the model of this alternative which had an objective function of Maximize PNV. The MMR constraints were included to keep the solution legally implementable and the timber harvest schedule constraints (NDY) were included to keep this alternative comparable to the others (except those which explored departure opportunities).

13. Alternative M (114GG1) - Maximum PNV Benchmark

a. Goal

The goal of this alternative is to provide the highest possible present net value while fluctuations in timber outputs over time are kept within reasonable limits.

b. Criteria and Assumptions

The criteria and assumptions underlying this alternative are:

- Production of market outputs from areas outside of the Wilderness would be based upon cost efficiency.

- This alternative proposes no additional acres of Wilderness.

- Harvest levels can increase or decrease by up to 25 percent from one decade to the next without causing unacceptable impacts on dependent communities.

c. Constraints

The constraints used to meet the criteria and assumptions are:

- Timber policy constraints (see Common Constraints) except as noted below.

- MMR's (see Section VI)

- Timber harvest scheduling is constrained by sequential upper and lower bounds so that a change in harvest level does not exceed 25 percent from one decade to the next. NDY is not a constraint.

d. Rationale

Timber harvest levels are closely linked to PNV so restrictions on harvest schedules or levels tends to decrease PNV, as determined in the benchmark analysis. Thus, in the development of this alternative, it was recognized that releasing the NDY constraint would permit a higher PNV. From a social impact viewpoint, however, large fluctuations in timber harvest activities are linked to large fluctuations in local economic activity. To keep these fluctuations within reasonable limits the ± 25 % sequential upper and lower bound constraint was applied.

14. Alternative N (114V01)

a. Goal

The goal of this alternative is to provide higher first decade timber harvest levels by allowing a limited departure from non-declining yield while providing more stable support of the local economy than Alternative M.

b. Criteria and Assumptions

The criteria and assumptions underlying this alternative are:

- Production of outputs from areas outside of the Wilderness would be based upon cost efficiency.

- This alternative proposes no additional acres of Wilderness.

c. Constraints

The constraints used to meet the criteria and assumptions are:

- Timber policy constraints (see Common Constraints) except as noted below.

- MMR's (see Section VI)

- Timber harvest is allowed to decline by up to 15 percent or rise by up to 20 percent from one decade to the next for the first five decades then returns to NDY.

d. Rationale

The goal of this alternative, to provide higher first decade timber volumes, is broad. The added stability consideration limits the ways in which the goal can be achieved. Rather than constraining to harvest the maximum possible timber in the first decade, which would have required large harvest fluctuations later, another approach was used. The approach is similar to that for Alternative M, except that the departure options are limited somewhat. Thus, this alternative becomes a variation on Alternative G which provides added stability in the local economy by limiting fluctuations in harvest levels.

15. Alternative O (114S07)

a. Goal

The goal of this alternative is to provide significant protection to roadless areas (both as proposed Wilderness and as other designations) and visual quality. Areas outside of the protected roadless areas are managed for cost efficiency subject to emphasizing the visual resource.

b. Criteria and Assumptions

The criteria and assumptions underlying this alternative are:

- This alternative proposes an additional 81,300 acres of Wilderness in Scotchman Peaks, the Ten Lakes Contiguous Area, Trout Creek and the Cabinet Additions. This is 20% of the total inventoried roadless area on the Forest (excluding Ten Lakes).

- Emphasis is given to non-motorized recreation and visual quality.

c. Constraints

The constraints used to meet the criteria and assumptions are:

- Timber policy constraints (see Common Constraints)

- MMR's (see Section VI)

- Assign 81,300 acres of the following roadless areas, as noted, to Proposed Wilderness prescriptions:

Scotchman Peaks	28,900 acres
Ten Lakes Contiguous	7,100 acres
Trout Creek	13,100 acres
Cabinet Face West	6,700 acres
Cabinet Face East	17,900 acres
McKay	5,000 acres
Chippewa	400 acres
Tuchuck	2,200 acres

- *Timber harvest prescriptions are limited as follows:*

  Where an analysis area is not in grizzly habitat, not lodgepole pine and not in the breaklands land class and where the recommended visual quality objective is retention or partial retention timber harvest may occur only under the VIEWTM prescription (partial retention). Where the recommended visual quality objective is modification, harvest may occur only under the TMVIEW prescription (modification).

  Where an analysis area is not in grizzly habitat and is lodgepole pine or is in the breaklands land class, only the TMVIEW harvest prescription (modification) is allowed. In these areas it is very difficult to meet the partial retention objective.

  In the above analysis areas, options for the MINLVL prescription are retained and the WLDTIM prescription may compete where the appropriate suitabilities exist.

d. Rationale

The goal for this alternative is very similar to that for Alternative C except that additional emphasis is given to visual quality and non-motorized recreation. The Proposed Wilderness is the same as for Alternative C. The visual quality constraints noted above are designed to limit degradation of visual quality where that can be accomplished without violating the MMR's. The visual quality limitations are not applied in grizzly habitat because shelterwood cuts require additional periodic entries in a stand which are disruptive to grizzly use of the habitat. A visual quality objective (VQO) of "modification" is allowed on steep slopes and in lodgepole pine stands because of the physical difficulty in managing for a more stringent VQO. These constraints involve removing BGSRTM and TMBOPT prescriptions from consideration in most of the area outside of grizzly habitat (the TMBOPT designation is removed from consideration in grizzly habitat by the MMR's). In these areas the non-motorized recreation designations are now competing on a cost efficiency basis with designations which tend to be more costly than TMBOPT or BGSRTM. This situation allows those non-motorized recreation and other non-harvest designations to be selected more often.

16. Alternative JF (11424A - Final Plan)

a. Goal

The intent of this alternative is to provide a combination of wildlife, wilderness, roadless and timber management designations that provide for balance, economic stability and future options. Roadless designations are provided where timber management appears to be environmentally less desirable or not cost efficient. Other wildlife, especially old growth timber dependent species, receive more emphasis to provide for a balanced multiple resource program. Increased emphasis is also placed on the protection of fish habitat and water quality. Visual quality protection is provided in sensitive areas such as along major travel routes and around communities and recreation sites. The recommended wilderness proposal is a combination of parts of the RARE II Final EIS and the June, 1984, Montana Wilderness Bill.

b. Criteria and Assumptions

The criteria and assumptions underlying the Final Plan are:

- Roadless designations are generally applied where timber management is environmentally unsound or not cost effective.

- The Final Plan proposes a total of 79,000 acres of Wilderness in Scotchman Peaks, the Ten Lakes Contiguous area and the Cabinet Additions. This is 20% of the total inventoried roadless area on the Forest (excluding The Ten Lakes Montana Wilderness Study Act Area).

- Land designations are based upon suitabilities and cost efficiency with added emphasis for the retention of future options and enhancement of the wildlife and fish resources.

c. Constraints

The constraints used to meet the criteria and assumptions are:

- Timber policy constraints as described in the "Common Constraints" section above, plus:
  maximize timber in the first decade

- MMR's (see Section VI)

- Assign 78,500 acres of the following roadless areas, as noted, to Recommended Wilderness prescriptions:

Scotchman Peaks	36,200
Ten Lakes Contiguous	6,800
Cabinet Face West	8,000
Cabinet Face East	20,400
McKay	6,700
Chippewa	400

- Prescriptions assigned on the basis of suitability with deference given to maintaining future options.

d. Rationale

The goal of retaining future options does not lend itself to modeling with the use of broad constraints because it involves subjective rather than mathematical decisions. Thus, the Final Plan was developed by constraining individual areas to designations which were subjectively determined to meet the goal.

The non-declining yield constraint was applied because anticipated declines in timber supplies available from all sources in the area could not be offset with a departure. In addition, eventual declines in Kootenai National Forest harvest levels under a departure sequence would likely be necessary before supplies on other ownerships could be increased to offset National Forest declines. In essence a departure would bolster the short-term timber supply to some degree while increasing social disruption in the future when declines would be necessary. Timber harvest is maximized in the first decade (to 202 MMBF regulated) to bolster short-term supplies as much as possible without increasing instability in the local economy in the future (see section V.H. above).

The emphasis on wildlife (particularly big game, grizzly bear and old-growth timber dependent species) and fish was made jointly with the subjective emphasis on the retention of options so it is embedded in the set of designation constraints. Since the goals of the Final Plan were met by constraining the designations of the land, the schedule was optimized from a cost efficiency standpoint like the alternatives described in the DEIS.

VIII. Summary of Tradeoffs Within Selected Benchmarks, and Alternatives

Significant Changes from Draft to Final EIS

A discussion of Alternative JF (Final Plan) has been added to the end of this section. See also Chapter IX for details related to the timber resource and suitable timber land.

A. Overview

The purpose of estimating and displaying tradeoffs is to compare priced and nonpriced outputs in a way that helps decisionmakers select which alternative maximizes Net Public Benefits. This comparative analysis is the basis for evaluating alternatives and selecting a preferred action (planning steps 7 and 8). This section focuses on the overall effects of alternatives and benchmarks. The constraints are discussed in detail in Appendix B, Section VII, and social and environmental effects are discussed in Chapters II and IV. Section 17 in Chapter II summarizes the tradeoff discussion details presented here.

B. Process for Evaluating Significant Constraints

Management objectives of benchmarks and alternatives were achieved by constraining FORPLAN as described in Section VII. The efficiency tradeoffs of individual objectives can be determined by comparing the PNV of a FORPLAN solution which meets the objective and one which does not. The change in PNV is the efficiency tradeoff of achieving a specific objective if both solutions have efficient prescriptions, both solutions maximize PNV, and the constraints are cost-efficient. The efficiency tradeoff was not determined for individual alternative objectives because of the prohibitive costs of analyzing every constraint used to develop alternatives. But by comparing alternatives, the economic tradeoffs of the groups of objectives which have the most significant impact on PNV can be determined. These efficiency tradeoffs can then be compared to environmental, social consequences and other nonpriced outputs produced to help decisionmakers identify the alternative which maximizes net public benefits.

A major factor in the tradeoff analysis is the order in which the objectives are analyzed. For example, the economic tradeoff of meeting management objectives A and B can be determined by comparing FORPLAN solutions with various combinations of the two objectives. The change in PNV due to meeting only A may be $5 MM, and the change due to meeting only B may be $11 MM. However, the change due to meeting both A and B will probably be less than $16 MM. In addition, the cost of meeting objective A in one alternative will not necessarily be the same as meeting the same objective in another alternative. Therefore, the economic tradeoffs discussed in this section are only relevant to the actual alternative where the objectives were analyzed.

C. Tradeoffs Among Alternatives

This discussion focuses on how alternatives respond to the various issues and concerns and the various tradeoffs (both priced and nonpriced) that occur.

Resource outputs and socioeconomic effects are displayed in Chapter II, and environmental effects are discussed in Chapters II and IV.

1. Response to Issues and Concerns

Alternatives were designed to address the major issues, management concerns and opportunities. A single alternative cannot fully resolve all issues because of the conflicts among issues. Nor can most issues be resolved to the satisfaction of all interested parties simply because of differences of opinions and viewpoints of the participants. Table B-23 compares the response of each alternative to the major issues and concerns. A detailed discussion of issues is in Appendix A.

Table B-23, Part 1

COMPARISON OF ALTERNATIVES FOR RESPONSE TO THE MAJOR ISSUES, CONCERNS, AND OPPORTUNITIES

No.	Indicator of Issues, Concerns, & Opportunities	RPA Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F	Alt. G	Alt. H	CD Alt. I	PA Alt. J	FP Alt. JF	Dep. Alt. K	Alt. L	PNV Alt. M	Alt. N	Alt. O
1.	Decade 1 regulated (live green) tmbr. harv.(mmbf/yr)	226	223	225	227	218	164	213	208	150	202	202	230	255	262	247	215
	& % change from last 10-yr. average regulated harvest	+53	+51	+52	+53	+47	+11	+44	+40	0	+36	+36	+55	+72	+77	+67	+45
2.	Suitable tmbrland managed(MAcres) &	1470	1464	1466	1595	1425	1132	1386	1361	1422	1386	1263	1386	1788	1484	1481	1389
	% of total available	82	82	82	89	80	63	78	76	80	78	71	78	100	83	83	78
3.	New road const. needed by Decade 5 (miles) and %	5270	5200	5150	5690	4950	3850	4750	4590	3840	4690	4050	4720	6360	5230	5270	4680
	change from exist. miles on 1/1/84	+88	+87	+86	+95	+83	+64	+79	+77	+64	+78	+68	+79	+106	+87	+88	+78
4.	Miles of new road const. needed in 1st decade	2690	2660	2680	2670	2630	2020	2510	2480	1850	2440	2370	2760	3100	3150	2890	2560
5.	Total road system eventually required (mi.)	11270	11200	11150	11690	10950	9850	10750	10590	9840	10690	10050	10720	12360	11230	11270	10680
6.	Rec. wilderness (MAcres) & number	None	64	81	64	187	None	305	404	64	66	78	66	None	None	None	81
	of locations	0	2	5	2	6	0	15	27	2	3	3	3	0	0	0	5
7.	Designated rdless acres in invent. rdless areas	211	164	151	155	99	209	53	0	174	202	192	202	159	200	205	322
	(M Acres) & % of total	52	41	37	38	25	52	13	0	43	50	48	50	39	50	51	80
8.	Inventoried rdless acres developed in Decade 1 (MAcres)	46	50	45	39	45	49	17	0	34	10	10	10	57	55	42	0
9.	Inventoried rdless acres remain.after 1st decade (MAcres)	358	289	278	301	172	355	81	0	307	327	315	327	347	349	362	322
	& % of total	89	72	69	75	43	88	20	0	76	81	78	81	86	86	90	80
10.	Total roadless rec. opportunities provided (MAcres)	399	428	419	410	476	401	534	583	441	518	521	518	349	389	393	574
	and % of the total Forest	18	19	19	18	21	18	24	26	20	23	23	23	16	17	18	26
11.	Elk population by 3rd decade	8400	8500	8500	8000	8400	9900	8500	8600	7300	8000	8000	8000	8500	8300	8400	8500
12.	Additional road restrictions needed by 5th decade(mi.)	3510	3510	3520	3170	3280	3360	3180	3130	2990	4480	4130	4480	4090	3500	3520	2700
13.	Migratory fish (smolts) prod. in Decade 1 (MM fish/	191	192	191	190	192	194	193	193	199	192	192	192	188	192	189	190
	yr.) & % change	-7	-6	-7	-7	-6	-5	-6	-6	-3	-6	-6	-6	-8	-6	-8	-7
14.	Old growth timber (160+ yr.) after Decade 10 (MAcres)	204	203	204	186	206	344	218	230	537	255	311	255	168	191	196	232

Table B-23, Part 2

COMPARISON OF ALTERNATIVES FOR RESPONSE TO THE MAJOR ISSUES, CONCERNS AND OPPORTUNITIES

No.	Indicator of Issues, Concerns, & Opportunities	Alt. A	Alt. B	Alt. C	RPA Alt. D	Alt. E	Alt. F	Alt. G	Alt. H	CD Alt. I	PA Alt. J	FP Alt. JF	Dep. Alt. K	Alt. L	PNV Alt. M	Alt. N	Alt. O
15.	Grizzly habitat design. for limited or no development (M Acres)	425	434	439	469	475	339	514	545	551	589	609	589	354	434	424	444
	& % of total habitat	42	42	42	45	46	33	50	53	53	57	59	57	34	42	41	43
16.	Visual quality protection(preservation,retention, & partial retent. VOQs) (MAcres)	1108	1114	1120	1046	1137	1465	1157	1199	1240	1311	1311	1311	976	1092	1102	1382
17.	Decade I lodgepole pine harvest (MMBF/yr)	69	70	72	67	64	56	59	51	77	75	78	79	42	93	85	75
	& % change from last 5 yrs.	+38	+40	+44	+34	+28	+12	+18	+2	+54	+50	+56	+58	-16	+86	+70	+50
18.	Stagnated lodgepole pine stands covert. by Decade 5(MAcres)	2	2	1	45	1	44	1	1	69	70	32	70	93	1	1	5
19.	Projected withdrawals from oil & gas exploration(MAcres)	148	212	228	212	335	148	453	540	212	215	227	215	148	148	148	228
20.	Projected withdrawals from locatable mineral explor.(M Acres)	185	249	265	249	371	185	484	579	249	252	264	252	185	185	185	265
21.	Forest-related employmt.(jobs) in Decade I in private sector	2460	2440	2450	2460	2390	2010	2340	2240	1930	2300	2300	2490	2730	2710	2610	2400
	& % change from 1980	+47	+46	+47	+47	+44	+20	+41	+34	+16	+38	+38	+50	+64	+62	+57	+44
22.	Decade I total aver. ann. budget needed (million dollars)	27.2	27.0	27.1	26.9	26.4	20.7	25.7	25.1	19.6	25.2	24.0	27.5	34.2	30.4	29.1	26.9
23.	Average annual capital investmt. road const. funding needed in Decade I (million dollars)	4.3	4.2	4.3	4.3	4.1	3.4	3.9	3.8	2.4	3.7	3.6	4.2	5.2	5.1	4.6	3.9
24.	Decade I appropriated budget needed:capital investments + operation & maint. (million dollars)	21.7	21.6	21.8	21.5	21.1	16.8	20.6	20.0	16.6	20.3	19.2	22.0	28.1	24.1	23.2	21.8
25.	Landownership Adjustment	All alternatives treated landownership adjustment similarly - Dispose of approximately 69,000 acres and acquire approximately 91,000 acres to meet grizzly recovery goal, recreation and wildlife needs, solve trespass, etc.															

2. Tradeoffs

This discussion identifies the consequences of implementing the alternatives by comparing each alternative to Benchmark 114GG1 (Alternative M) and to at least three other alternatives: the next cheapest alternative in terms of discounted costs, the next cheapest alternative in terms of PNV, and the current management alternative I. In some cases, alternatives with similar objectives are also compared. In addition each alternative is compared to the non-priced benefits of other alternatives in terms of how the alternative ranks compared to the others. The comparisons form the basis for balancing economic tradeoffs with nonpriced resource outputs in selecting the preferred action.

One measure of the cost of an alternative is the discounted cost which represents the equivalent payment required by the government to implement an alternative. The minimum cost (discounted over 200 years at 4%) for federal ownership is defined by Benchmark 114DD1 as $196 million. Table B-24 displays the discounted costs, discounted benefits, and PNV in order of increasing costs for the alternatives. In general, the costs of alternatives increase with the size of the timber and road construction programs. These costs range from $541 million for Alternative F to $776 million for Alternative L. By comparing the benefits and costs of an alternative with the next cheapest alternative, the economic consequences of the additional expenditure can be compared to the additional nonpriced benefit values.

Another measure of the cost of an alternative is the change in PNV between alternatives. The maximum net value of the Forest is defined by Benchmark 114GG1 (Alternative M) as $1163 million. The difference between $1163 million and the PNV of an alternative represents the foregone investment opportunity to the government for implementing that alternative. Table B-25 displays the discounted costs and benefits by resource and the PNV in order of decreasing PNV. In general, the PNV of alternatives increases with the size of the timber program. Changes in the timber program are caused by constraints which preclude regulated timber harvest, disperse timber harvest over the landscape, set a timber harvest objective in certain decades or constrain harvest schedules. By comparing each alternative with the alternative having the next highest PNV, the incremental economic tradeoffs can be compared to the incremental nonpriced benefits. (see Table B-26)

The economic consequences of changing from the current land designation, output schedule, and budget are defined by comparing the PNV of the alternatives with the PNV of Alternative I. All alternatives allow for a more efficient land designation and output schedule than the current direction when the current direction is constrained to current budgets. When the budget for the current direction alternative is not constrained (FORPLAN run 114Y08) the PNV rises to $909 Million which is higher than alternative F.

The non-priced consequences of one alternative in comparison to any other is described by the outputs listed in Table B-26 and by the rank of the alternative under discussion in relation to the other alternatives. The quantifiable elements of each issue, concern and opportunity are ranked from the highest (1) to the lowest (15) by output level.

The discussion of each alternative will focus upon the items which differ between alternatives. Demand projections for the transitory range which the Kootenai can supply are far below supply levels of all the alternatives. Thus, the value of the available forage is considered to be constant for all alternatives (see Table B-25) and will not be further addressed in this discussion.

Table B-24
Alternatives in Order of Increasing Discounted Costs
(Discount Rate = 4%, Millions of 1978 dollars)

	Present Value Costs		Present Value Benefits		Present Net Value	
ALT	$MM	Change From Max PNV %	$MM	Change From Max PNV %	$MM	Change From Max PNV %
F	541	-22	1199	-36	658	-43
I-CD	546	-22	1006	-46	460	-60
JF-FP	611	-12	1344	-28	733	-37
H	627	-10	1662	-11	1035	-11
G	647	- 7	1720	- 8	1073	- 8
J-PA	647	- 7	1563	-16	916	-21
E	659	- 5	1772	- 5	1113	- 4
K-DEP	662	- 5	1573	-15	911	-22
B	673	- 3	1809	- 3	1136	- 2
C	674	- 3	1802	- 3	1128	- 3
A	676	- 3	1819	- 2	1143	- 2
O	689	- 1	1753	- 6	1064	- 9
N	689	- 1	1837	- 1	1148	- 1
M-PNV	697	0	1860	0	1163	0
D	718	+ 3	1782	- 4	1064	- 9
L	776	+11	1822	- 2	1046	-10

Table B-25

Present Net Value, Present Value Benefits, and Present Value Costs
By Alternative

		PRESENT VALUE BENEFITS			PRESENT VALUE COSTS				
ALT	PNV $MM	TIMBER $MM	RANGE $MM	REC AND WILDLIFE $MM	TIMBER $MM	ROADS $MM	RANGE $MM	REC AND WILDLIFE $MM	OTHER $MM
M-PNV	1163	1631	3	227	251	204	2	80	161
N	1148	1603	3	231	245	200	2	81	161
A	1143	1588	3	228	237	195	2	81	161
B	1136	1575	3	231	236	194	2	81	160
C	1128	1568	3	231	236	194	2	81	161
E	1113	1538	3	231	229	186	2	81	161
G	1073	1490	3	227	222	183	2	80	160
D-RPA	1064	1552	3	227	267	205	2	81	163
O	1064	1514	3	236	263	178	2	83	163
L	1046	1590	3	229	300	227	2	81	166
H	1034	1441	3	219	218	175	2	76	158
J-PA	916	1328	3	232	224	175	2	82	164
K-DEP	911	1338	3	232	231	183	2	82	164
JF-FP	733	1109	3	233	196	163	2	82	167
F	658	962	3	233	151	149	2	80	158
I-CD	460	776	3	227	169	124	2	82	169

NOTE: The direct comparison of individual resource benefits and costs is misleading because not all costs are allocated to each resource. The "Other" cost category includes unseparable joint costs associated with several resources.

Summary of Net Public Benefits

Alternatives (In Order of Descending PNV)	PNV M	N	A	B	C	E	G	RPA D	O	L	H	PA J	DEP K	FP JF	F	CD I
PRICED BENEFITS																
PNV ($MM)	1163	1148	1143	1136	1129	1113	1073	1064	1064	1046	1035	916	911	733	658	460
Opportunity Cost ($MM)	0	15	20	27	34	50	90	99	99	117	128	247	252	430	505	703
% Change from Alt. M	0	-1	-2	-2	-3	-4	-8	-9	-9	-10	-11	-21	-22	-27	-43	-60
Numerical Rank*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	14	15
Present Value Benefits	1860	1837	1819	1809	1803	1772	1720	1782	1753	1823	1662	1563	1573	1345	1198	1006
% Change From Alt. M	0	-1	-2	-3	-3	-5	-8	-4	-6	-2	-11	-16	-15	-28	-36	-46
Numerical Rank*	1	2	4	5	6	8	10	7	9	3	11	13	12	14	14	15
Present Value Costs	697	689	676	674	674	658	647	718	689	776	627	647	662	611	541	547
% Change from Alt. M.	0	-1	-3	-3	-3	-6	-7	+3	-1	+11	-10	-7	-5	-12	-22	-22
Numerical Rank*	3	4	5	6	6	8	9	-2	4	1	10	9	7	11	12	11
1st Decade Regulated (live green)																
Timber Harvest-mmbf/yr	262	247	226	223	225	218	213	227	215	255	208	202	230	202	164	150
% Change over last 10 yr. Ave. Regulated Timber Harvest	+77	+67	+53	+51	+52	+47	+44	+53	+45	+72	+40	+36	+55	+36	+11	0
Numerical Rank*	1	3	6	8	7	9	11	5	10	2	12	13	4	13	14	15
NONPRICED BENEFITS																
Jobs and Community Stability																
Decade 1 Forest-related Private Sector Jobs	2710	2610	2460	2440	2450	2390	2340	2460	2400	2730	2240	2300	2490	2300	2010	1930
% Change from Alt. I	+40	+35	+27	+26	+27	+24	+21	+27	+24	+41	+16	+19	+29	+19	+4	0
Numeric Rank*	2	3	5	7	6	9	10	5	8	1	12	11	4	11	13	14
Potential Population Change from 1980	2310	2020	1570	1500	1540	1370	1230	1570	1400	2370	910	1100	1670	1100	220	0
% Change in Population	+13	+11	+9	+8	+9	+8	+7	+9	+8	+13	+5	+6	+9	+6	+1	0
Numerical Rank*	2	3	5	7	6	9	10	5	8	1	12	11	4	11	13	14

*Numerical rank is from the highest quantity (1) to the lowest quantity (15).

Alternatives (In Order of Descending PNV)	PNV M	N	A	B	C	E	G	RPA D	O	L	H	PA J	DEP K	FP JF	CD F	I
NONPRICED BENEFITS (CONT.)																
Visual Quality Protection In Sensitive Areas																
M Acres of Preservation Retention and Partial Retention VQO	1092	1102	1108	1114	1120	1137	1157	1046	1382	976	1199	1311	1311	1311	1465	1240
% Change from Alt. I	-12	-11	-11	-10	-10	-8	-7	-16	+11	-21	-3	+6	+6	+6	+18	0
Numerical Rank*	12	11	10	9	8	7	6	13	2	14	5	3	3	3	1	4
Wilderness and Roadless Quality																
Total Roadless Rec Opportunities (M Acres)	389	393	399	428	419	476	534	410	574	349	583	518	518	521	401	441
% of Total Forest	17	18	18	19	19	21	24	18	26	16	26	23	23	23	18	20
% Change from Alt. I	-12	-11	-10	-3	-5	+8	+21	-7	+30	-21	+32	+17	+17	+17	-9	0
Numerical Rank*	13	12	11	7	8	5	3	9	2	14	1	4	4	4	10	6
Accessibility for Minerals Oil & Gas Exploration																
M Acres Withdrawn from Oil and Gas Exploration	148	148	148	212	228	335	453	212	228	148	540	215	215	227	148	212
% Change from Alt. I	-30	-30	-30	0	+8	+58	+114	0	+8	-30	+155	+1	+1	+8	-30	0
Numerical Rank*	7	7	7	6	4	3	2	6	4	7	1	5	5	4	7	6
M Acres withdrawn from locatable mineral exploration	185	185	185	249	265	371	484	249	265	185	579	252	252	264	185	249
% Change from Alt. I	-26	-26	-26	0	+6	+49	+94	0	+6	-26	+133	+1	+1	+6	-26	0
Numerical Rank*	7	7	7	6	4	3	2	6	4	7	1	5	5	4	7	6

*Numerical rank is from the highest quantity (1) to the lowest quantity (15).

Summary of Net Public Benefits (continued)

Alternatives (In Order of Descending PNV)	PNV M	N	A	B	C	E	G	RPA D	O	L	H	PA J	DEP K	FP JP	F	CD I
Grizzly Recovery																
M Acres of Grizzly Habitat with Little or no Development	434	424	425	434	439	475	514	469	444	354	545	589	589	609	339	551
% of Total Habitat	42	41	42	42	42	46	50	45	43	34	53	57	57	59	46	53
% change from Alt. 1	-21	-23	-23	-21	-20	-14	-7	-15	-19	-36	-1	+7	+7	+11	-38	0
Numerical Rank*	10	12	11	10	9	6	5	7	8	13	4	2	2	1	14	3
Lodgepole Pine Risk Management																
MMBF/yr Lodgepole Pine Harvest Decade 1	93	85	69	70	72	64	59	67	75	42	51	75	79	78	56	77
% Change from Last 5 yr. Average	+86	+70	+38	+40	+44	+28	+18	+34	+50	-16	+2	+50	+58	+58	+12	+54
Numerical Rank*	1	2	8	7	6	10	11	9	5	14	13	5	3	3	12	4
M Acres of Stagnated Lodgepole Pine Converted by Decade 5	1	1	2	2	1	1	1	45	5	93	1	70	70	32	44	69
% Change from Alt. I	-99	-99	-97	-97	-99	-99	-99	-35	-93	+35	-99	+1	+1	-54	-36	0
Numerical Rank*	9	9	8	8	9	9	9	4	7	1	9	2	2	6	5	3
Miles of Road (Access)																
New Road Construction needed by Decade 5, as of 1/1/84 (miles)	5230	5270	5270	5200	5150	4950	4750	5690	4680	6360	4590	4690	4720	4050	3850	3840
% Change from Existing Miles on 1/1/84	+87	+88	+88	+87	+86	+83	+79	+95	+78	+106	+77	+78	+79	+68	+64	+64
Numerical Rank*	4	3	3	5	6	7	8	2	11	1	12	10	9	13	14	15

*Numerical rank is from the highest quantity (1) to the lowest quantity (15).

Summary of Net Public Benefits (continued)

Alternatives (In Order of Descending PNV)	PNV M	N	A	B	C	E	G	RPA D	O	L	H	PA J	DEP K	FP JP	P	CD I
First Decade Appropriated Budget																
Million $ per year	24.1	23.2	21.7	21.6	21.8	21.1	20.6	21.5	21.8	28.1	20.0	20.3	22.0	19.0	16.8	16.6
% Change from 1980-82 Average (Alt. I)	+45	+40	+31	+30	+31	+27	+24	+30	+31	+69	+20	+22	+33	+16	+1	0
Numerical Rank*	2	3	6	7	5	9	10	8	5	1	12	11	4	13	14	15
Old-growth timber management																
Percent of Total Forest Land below 5,500 feet elevation	8	8	8	8	8	8	8	8	8	8	8	8	8	10	8	8
% Change from Alt. I	0	0	0	0	0	0	0	0	0	0	0	0	0	+25	0	0
Numerical Rank*	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2

*Numerical rank is from the highest quantity (1) to the lowest quantity (15).

a. Alternative A

(1) Quantified Comparisons

Quantity	Value	Rank From Highest	Change From Alt I - CD
Present Net Value	$1143 Million	3	+148 %
Opportunity Cost	$ 20 Million	12	- 97 %
Present Value Costs	$ 676 Million	5	+ 24 %
Present Value Benefits	$1819 Million	4	+ 81 %
Jobs & Community Stability	2457 Jobs	5	+ 27 %
Visual Quality Protection	1108 M Acres	10	- 11 %
Wilderness/Roadless Quality	399 M Acres	11	- 10 %
Oil & Gas Withdrawals	148 M Acres	7	- 30 %
Locatable Mineral Withdrawals	185 M Acres	7	- 26 %
Undeveloped Grizzly Habitat	425 M Acres	10	- 23 %
Total Decade 1 Timber Harvest	226 MMBF/Year	6	+ 51 %
Decade 1 Lodgepole Pine Harvest	69 MMBF/Year	8	- 10 %
Stagnated LPP Converted - Dec 5	2 M Acres	7	- 97 %
New Road Access by Decade 5	5270 Miles	3	+ 37 %
First Decade Budget (approp)	$21.7 MM/Year	6	+ 31 %

Note: A higher numeric rank may or may not equate to "best" or "worst" depending upon the reader's value system.

(2) Discussion

Alternative A was modeled so that all tentatively suitable timberland would be available for designation to timber management prescriptions. It stresses timber management on the most cost efficient land base (sixth highest first decade timber harvest) while giving little consideration to non-market outputs (tenth highest visual quality and eleventh highest wilderness/roadless quality). This alternative has the highest first decade timber harvest of all the alternatives which do not deviate from non-declining yield and which do not have special harvest constraints. The opportunity cost of $20 million is the result of applying the NDY constraint, thus, the only way to raise the PNV of this alternative would be to permit some type of departure harvest schedule.

(a) Cost Comparison

The present value of costs for Alternation A is $676 Million which is the fifth highest of all the alternatives. Alternative A has slightly higher timber and road costs than Alternative C (sixth highest) because alternative A has more timberland designated for management and harvests more timber than Alternative A.

(b) PNV Comparison

The PNV for Alternative A is $1143 Million. Only alternatives M and N have higher PNV's and these alternatives achieve the increase by departing from non-declining yield harvest schedules.

(c) Comparison to Current Direction

Alternative A has the third highest PNV and Alternative I (Current Direction) has the lowest PNV because Alternative A has no constraint on timber harvest or budgets and it has 48,000 more acres in the suitable timber base. The additional timber management emphasis of Alternative A causes much higher timber and road costs than the current direction, but these added costs are more than offset by the much higher timber benefits. The recreation and wildlife costs and benefits are essentially the same between the two alternatives, but Alternative A has slightly more roaded recreation and slightly less wilderness recreation, as a percentage of recreation/wildlife benefits, than does the current direction.

The number of private sector Forest related jobs supported by Alternative A is 27 percent higher than for the Current Direction. While Alternative A has fewer recreation related jobs the added timber related jobs far offset the losses in recreation.

In order to produce the high levels of timber, Alternative A trades off 132,000 acres of protected visual quality that the current direction would retain. Alternative A does not use the costly TMVIEW and VIEWTM prescriptions which accommodate improved visual quality and which were forced into the Current Direction solution. Alternative A is one of the lowest (tenth) and the Current Direction is one of the highest (fourth) in acres of protected visual quality.

Alternative A has 10 percent fewer acres designated for wilderness or roadless uses than does the current direction. The only lands that fall into the wilderness/roadless designation in Alternative A are those that do not generate a positive return under timber management or those that can not be harvested due to the minimum management requirements. The current direction forced additional lands into these categories to satisfy public demands.

Withdrawals of land from oil,gas and mineral exploration are associated with Wilderness and Proposed Wilderness land designations. Since Alternative A has no Wilderness Proposals it is among the five alternatives that minimize withdrawals. Alternative A has 26 percent fewer acres of locatable mineral withdrawals and 30 percent fewer withdrawals from oil and gas exploration than the Current Direction.

The risk of failing to recover the grizzly population is decreased as more grizzly habitat is left undisturbed. Alternative A has the tenth highest amount of undisturbed grizzly habitat because of the high timber harvest emphasis. Alternative A leaves 23 percent fewer undisturbed acres than does the current direction.

In order to manage the risk associated with the lodgepole pine beetle and the fire hazards associated with dead and dying lodgepole stands it is necessary to have these stands in the suitable timber base. The costs of converting stagnated stands are high and returns come far in the future so Alternative A which is focusing upon cost efficient land management converts only a minimal amount of stagnated lodgepole. Alternative A converts 97 percent less stagnated lodgepole pine than does the current direction. High risk lodgepole stands do return a positive cash flow so they often appear in the suitable

timber base. In order to manage the current risk of insect and fire damage these stands must be cut in the first decade. This becomes a question of scheduling. In order to get these stands into the first decade harvest schedule they must provide a higher return in the first decade than other stands because overriding constraints such as non-declining yield and the minimum management requirements prevent all stands with a positive return from being cut in the first decade. Alternatively, harvest of these stands can be forced into solution with special constraints. Alternative A has the NDY constraint and does not force these stands to be harvested early so has the eighth highest first decade LPP harvest among the alternatives. It cuts 10 percent less than the current direction.

Alternative A harvests 51 percent more timber in decade one than does the current direction. This is partly due to the additional land in the suitable timber base, but it is primarily due to the constraint on timber volumes in the Current Direction model which was necessary to keep budgets at the current level. When the Current Direction model is run without the harvest constraints (114Y08), the first decade harvest rises to 204 MMBF/year. Without the harvest constraint in the Current Direction model, Alternative A would cut only 11 percent more timber than the Current Direction.

Alternative A requires 37 percent more new road construction by the end of decade five than does the current direction. This is due to the added suitable timber base and the relatively rapid harvest schedule in comparison to the current direction.

This alternative requires a relatively high budget (sixth highest) in the first decade to finance the activities associated with the high timber harvest levels. Alternative A has a first decade budget that is 31 percent higher than the current direction which has the lowest budget of all the alternatives.

b. Alternative B

(1) Quantified Comparisons

Quantity	Value	Rank From Highest	Change From Alt I - CD
Present Net Value	$1136 Million	4	+147 %
Opportunity Cost	$ 27 Million	11	- 96 %
Present Value Costs	$ 673 Million	7	+ 23 %
Present Value Benefits	$1809 Million	5	+ 80 %
Jobs & Community Stability	2436 Jobs	7	+ 26 %
Visual Quality Protection	1114 M Acres	9	- 10 %
Wilderness/Roadless Quality	428 M Acres	7	- 3 %
Oil & Gas Withdrawals	212 M Acres	6	0 %
Locatable Mineral Withdrawals	249 M Acres	6	0 %
Undeveloped Grizzly Habitat	439 M Acres	9	- 20 %
Total Decade 1 Timber Harvest	223 MMBF/Year	8	+ 49 %
Decade 1 Lodgepole Pine Harvest	70 MMBF/Year	7	- 10 %
Stagnated LPP Converted - Dec 5	2 M Acres	7	- 97 %
New Road Access by Decade 5	5200 Miles	5	+ 35 %
First Decade Budget (Approp.)	$21.6 MM/Year	7	+ 30 %

(2) Discussion

Alternative B was modeled similarly to Alternative A except that 63,900 acres were designated, by constraint, as Proposed Wilderness. Of this acreage 30,400 were tentatively suitable, but only about 6,000 acres of this total were selected in Alternative A as being cost efficient and available under the minimum management requirements. Thus, the suitable timber base under Alternative B is 6000 acres less than for Alternative A. Since the general thrust of the alternative is toward cost efficient timber management except for the 6000 acres, the range of outputs are quite similar to Alternative A. The opportunity cost of $27 Million is due to the combination of the NDY constraint and the specially constrained Proposed Wilderness designation. Alternative A displayed an opportunity cost of $20 Million for the NDY constraint so the added opportunity cost of $7 Million (<1% of Maximum PNV) can be attributed to the 63,900 acres of proposed wilderness. This added opportunity cost is quite small because most of the acreage which was constrained to Proposed Wilderness was already in non-developmental designations due to economics and the minimum management requirements.

(a) Cost Comparison

The next cheapest alternative in terms of the present value of costs is Alternative K ($662 MM). This is due to the higher timber and road costs of Alternative B. Even though Alternative K has higher timber outputs in decade one, Alternative B has higher outputs in all other decades so the 200 year discounted costs are two percent higher for "B" than for "K". Alternative K was constrained to produce the higher first decade volume and allowed to depart from non-declining yield for two decades to make that higher cut feasible.

(b) PNV Comparison

The PNV for Alternative B is $1136 Million. This is the fourth highest PNV of all the alternatives. Alternative B has a slightly lower PNV than Alternative A ($1143 MM) simply because 6000 acres of cost efficient timber management land are included in the Proposed Wilderness designation of Alternative B. Alternative M and N achieve even higher PNV's by departing from non-declining yield.

(c) Comparison to Current Direction

Alternative B has a much higher PNV than the current direction ($1136 MM vs $460 MM) primarily because the harvest in the Current Direction model is constrained downward to current levels to keep the budget down. Without the volume constraints the Current Direction would have a PNV of $909 MM. The additional difference is due to an added 42,000 acres in the suitable timber base of Alternative B and a different mix of land designations between the alternatives. As with Alternative A, the major difference is in the timber program. Timber costs are much higher for Alternative B over the Current Direction but these higher costs are offset by higher timber benefits to produce a higher net value.

With a higher timber harvest level comes more jobs in the timber industry. Alternative B has 26 percent more jobs than does the Current Direction. If the

Current Direction model were not constrained by current levels of timber and associated budgets, Alternative B would still provide 5 percent more jobs.

In order to produce high volumes of timber on its suitable timberland, Alternative B trades off 126,000 acres of visual quality compared to the Current Direction. This is 6,000 acres less of a tradeoff than Alternative A because those 6,000 acres moved from timber harvest prescriptions in Alternative A to Proposed Wilderness in Alternative B where the visual quality is protected. Even though the suitable timberland in Alternative B is only 42,000 acres larger than the Current Direction, the visual quality tradeoff is 126,000 acres. This is because the Current Direction uses the VIEWTM and TMVIEW prescriptions to protect visual quality while generating a regulated flow of timber whereas Alternative B does not. The VIEWTM and TMVIEW prescriptions are costly and would not be consistent with the aim of Alternative B to manage timber in the most cost efficient manner.

Alternative B has three percent less acreage dedicated to Wilderness and roadless recreation than the Current Direction. Alternative B picks up the additional Proposed Wilderness discussed above along with other acres that did not fall into timber harvest prescriptions as discussed for Alternative A. The shift in this category from Alternative A to Alternative B does not equal the Proposed Wilderness acreage because some of those acres were already in roadless recreation designations in Alternative A.

Because they have the same Wilderness proposal, Alternative B and the Current Direction have the same withdrawals from oil, gas, and locatable mineral exploration.

Alternative B has 20 percent less undeveloped grizzly habitat than the Current Direction. This is due to the high timber emphasis outside of the Proposed Wilderness.

Alternative B, like Alternative A, is focusing on cost efficient timber management thus only a minimal amount of stagnated lodgepole pine is converted in the first five decades (2000 acres). This is 97 percent less than the Current Direction. For the same reasons discussed for Alternative A, Alternative B has a relatively low first decade lodgepole pine harvest (seventh highest). This is 10 percent less than the Current Direction and about the same as Alternative A.

Alternative B harvests 49 percent more timber in the first decade than does the Current Direction. This is primarily due to the constraint on volumes which was applied to the Current Direction to get output levels and budgets close to the current level. Without these limits on the Current Direction, Alternative B would only harvest 9 percent more timber in the first decade than the Current Direction.

In order to access the timber lands in the suitable base with the harvest schedule of Alternative B it would be necessary to build 5200 new miles of road by decade 5. This is 35 percent more than the Current Direction alternative. This difference is due to the higher harvest levels of Alternative B.

Alternative B requires the seventh highest budget to carry out the various programs. Its budget is 30 percent higher than the Current Direction.

c. Alternative C

(1) Quantified Comparisons

Quantity	Value	Rank From Highest	Change From Alt I - CD
Present Net Value	$1129 Million	5	+145 %
Opportunity Cost	$ 34 Million	10	- 95 %
Present Value Costs	$ 674 Million	6	+ 23 %
Present Value Benefits	$1802 Million	6	+ 79 %
Jobs & Community Stability	2447 Jobs	6	+ 27 %
Visual Quality Protection	1120 M Acres	8	- 10 %
Wilderness/Roadless Quality	419 M Acres	8	- 5 %
Oil & Gas Withdrawals	228 M Acres	4	+ 8 %
Locatable Mineral Withdrawals	265 M Acres	4	+ 6 %
Undeveloped Grizzly Habitat	439 M Acres	8	- 20 %
Total Decade 1 Timber Harvest	225 MMBF/Year	7	+ 50 %
Decade 1 Lodgepole Pine Harvest	72 MMBF/Year	6	- 6 %
Stagnated LPP Converted - Dec 5	1 M Acres	8	- 99 %
New Road Access by Decade 5	5150 Miles	6	+ 34 %
First Decade Budget (Approp.)	$21.8 MM/Year	5	+ 31 %

(2) Discussion

Alternative C was modeled in much the same way as Alternatives A and B except that the wilderness proposal of Alternative C has 17,400 more acres in it than does that for Alternative B. The Proposed Wilderness constraints also apply to different acres, in some cases, from Alternative B. The Wilderness Proposals in this alternative match those in the Montana Wilderness Bill of June 1984. About 38,700 acres of the 81,300 acres in the Proposed Wilderness are tentatively suitable, but only about 18,700 acres were selected for timber management under Alternative A. All of the tentatively suitable timberland could not be managed for timber production because some is not cost efficient and other acres can not be managed for timber due to the constraints needed to satisfy the minimum management requirements and harvest flow needs (NDY). The reduction of 18,700 acres of suitable timberland which is placed into PWLDER is offset by 14,700 acres which were outside the Proposed Wilderness and which moved into timber management prescriptions. The number of acres in timber management prescriptions changed because the wilderness proposal removed the opportunity to select some lands from various age classes for timber management. This change in the lands available for timber management caused a different set of prescriptions and a different schedule to be selected as maximizing PNV under the constraints described in Section VII of this Appendix.

The additional opportunity cost in moving from Alternative A (no PWLDER) to Alternative C (81,300 acres of PWLDER) amounts to about $14 Million. This added opportunity cost is associated with the wilderness proposal. Outside of the Proposed Wilderness, this alternative manages for cost efficiency and thus produces a relatively high volume of timber (seventh highest in the first decade).

(a) Cost Comparison

The next cheapest alternative in terms of the present value of costs is Alternative B which has essentially the same present value of costs ($1 MM less). Alternative C harvests slightly more timber in the first 3 decades but after that alternative B harvests more. The effect of discounting balances out the costs of the different schedules. The alteration in the harvest schedule and the associated costs is caused by the age class differences between the suitable timber lands of the two alternatives. The cost difference is in the "other" category. It is not possible to break the cost out specifically to timber activities, but the amount of all costs is related to the timber harvest activity on the Forest. Thus the costs difference is described here based upon timber harvest differences.

(b) PNV Comparison

The PNV for Alternative C is $1128 Million. This is the fifth highest PNV of all the alternatives. Alternative C has a slightly lower PNV than Alternative B ($1136 MM) because about 12,700 additional acres of cost efficient timber lands are placed into Proposed Wilderness.

(c) Comparison to Current Direction

Alternative C has a much higher PNV than the Current Direction ($1128 MM vs $460 MM) primarily because of the harvest constraints on the Current Direction which were applied to bring budgets down to current levels. Without the volume constraints the PNV for Alternative C would be 24 percent higher than the Current Direction rather than 145 percent higher as it is when those constraints are applied to form the Current Direction. In addition to the harvest constraints, the PNV of Alternative C is higher because it manages 44,000 additional acres of cost efficient timber lands and has a different mix of land designations. Those added timber management acres cost $116 MM more over 200 years (4%, timber and roads) to manage, but return $771 MM in timber benefits (4%).

Alternative C has a higher timber harvest level in the first decade thus it has 27% more private sector jobs related to Forest Service programs. If the Current level were not constrained by current levels of timber harvest and budget, Alternative C would provide only 5 percent more jobs than the Current Direction.

In order to produce high volumes of timber on its suitable timberland, Alternative C trades off 120,000 acres of visual quality compared to the Current Direction. This is 12,000 acres less of a tradeoff than Alternative A because those 12,000 acres moved from timber harvest prescriptions in Alternative A to Proposed Wilderness and other non-harvest prescriptions in Alternative C where the visual quality is protected. Even though the suitable timberland in Alternative C is only 44,000 acres larger than the Current Direction, the visual quality tradeoff is 120,000 acres. This is because the Current Direction uses the VIEWTM and TMVIEW prescriptions to protect visual quality while generating a regulated flow of timber whereas Alternative C does not. The VIEWTM and TMVIEW prescriptions are costly and would not be consistent with the aim of Alternative C to manage timber in the most cost efficient manner.

Alternative C has seven percent less acreage dedicated to Wilderness and roadless recreation than the Current Direction. Alternative C picks up the additional Proposed Wilderness discussed above along with other acres that did not fall into timber harvest prescriptions as discussed for Alternative A. The shift in this category from Alternative A to Alternative C does not equal the Proposed Wilderness acreage because some of those acres were already in roadless recreation designations in Alternative A.

Alternative C has more acreage proposed for wilderness than the Current Direction thus it has more withdrawals from oil, gas, and locatable mineral exploration.

Alternative C has 20 percent less undeveloped grizzly habitat than the Current Direction. This is due to the high timber emphasis outside of the Proposed Wilderness.

Alternative C, like Alternatives A and B, is focusing on cost efficient timber management thus only a minimal amount of stagnated lodgepole pine is converted in the first five decades (1000 acres). This is 99 percent less than the Current Direction. For the same reasons discussed for Alternative A, Alternative C has a relatively low first decade lodgepole pine harvest (sixth highest). This is 6 percent less than the Current Direction.

Alternative C harvests 51 percent more timber in the first decade than does the Current Direction. This is primarily due to the constraint on volumes which was applied to the Current Direction to get output levels and budgets close to the current level. Without these limits on the Current Direction, Alternative C would only harvest 10 percent more timber in the first decade than the Current Direction.

In order to access the timber lands in the suitable base with the harvest schedule of Alternative C it would be necessary to build 5150 new miles of road by decade 5. This is 34 percent more than the Current Direction alternative. This difference is due to the higher harvest levels of Alternative C.

Alternative C requires the seventh highest budget to carry out the various programs. Its budget is 31 percent higher than the Current Direction.

d. Alternative D - RPA (with departure from NDY)

(1) Quantified Comparisons

Quantity	Value	Rank From Highest	Change From Alt I - CD
Present Net Value	$1064 Million	8	+125 %
Opportunity Cost	$ 99 Million	7	- 86 %
Present Value Costs	$ 718 Million	2	+ 32 %
Present Value Benefits	$1782 Million	7	+ 77 %
Jobs & Community Stability	2457 Jobs	5	• 27 %
Visual Quality Protection	1046 M Acres	13	- 16 %
Wilderness/Roadless Quality	410 M Acres	9	- 7 %
Oil & Gas Withdrawals	212 M Acres	6	0 %
Locatable Mineral Withdrawals	249 M Acres	6	0 %
Undeveloped Grizzly Habitat	469 M Acres	6	- 15 %
Total Decade 1 Timber Harvest	227 MMBF/Year	5	+ 51 %
Decade 1 Lodgepole Pine Harvest	67 MMBF/Year	9	- 13 %
Stagnated LPP Converted - Dec 5	45 M Acres	4	- 35 %
New Road Access by Decade 5	5690 Miles	2	+ 48 %
First Decade Budget (Approp.)	$21.5 MM/Year	8	+ 30 %

(2) Discussion

This alternative begins to deviate more from Alternative A than do Alternatives B and C. The primary reason is that timber volumes are constrained in decades one through five to approximate the RPA program tentative resource goals for timber. The wilderness proposal was constrained to match the RARE II proposal upon which the RPA goals are based. The wilderness proposal is identical to that of Alternative B. In order to generate a feasible solution it was necessary to allow a departure from non-declining yield. The departure schedule was constrained to allow departure for decades 6 through 10 and then return to NDY. The solution, however, only declined in decades 6, 7, and 8 before starting to increase the timber harvest volume. It should be noted here that the NDY constraint and the various departure schedules are based upon cubic foot measure. The RPA goals are in board foot measure. Since the ratio between board feet and cubic feet varies by the type and size of tree harvested, it was necessary to approximate the RPA volumes in cubic measure in order to constrain the model. This results in a board foot harvest schedule which differs slightly from the RPA goals. The results were as follows:

DECADE	RPA GOAL MMBF/yr	ALT D MMBF/yr
1	228	227
2	248	248
3	292	285
4	315	320
5	345	344

Permitting a departure from NDY is a release of a constraint and will cause PNV to rise (unless NDY was not binding on the solution). In Alternative D, the constraints to reach the higher RPA goals for five decades cost more in terms

of PNV than could be offset by relaxation of the NDY constraint. Alternative D is like Alternative B except for the timber harvest schedule constraints, so the change in PNV from $1136 MM for Alternative B to $1064 MM for Alternative D ($72 MM) can be attributed to the effort to achieve RPA timber goals. The total opportunity cost of $99 MM is associated with the combination of timber harvest and proposed wilderness constraints.

(a) Cost Comparison

The next cheapest alternative in terms of the present value of costs is Alternative M (maximum PNV benchmark). Alternative D has higher timber costs because the volumes were forced to climb relatively rapidly in the first five decades and the departure schedule was so limited that it was not possible to lower later costs sufficiently via a departure. Alternative M had a more open departure schedule (±25% for 20 decades) so that harvest could be scheduled more freely. In this way those stands with large timber volumes and lower costs could be harvested first and those stands which were more costly to harvest and which produced less volume could be deferred. The result is that Alternative M harvests about 66.2 Billion BF over the 200 year period and Alternative D harvests about 66.9 Billion BF over the same period. The larger harvest from Alternative D costs more.

(b) PNV Comparison

The PNV of Alternative D is $1064 Million. This is the eighth highest PNV of all the alternatives. Alternative G has the next higher PNV and Alternative O has the same PNV. Alternative O achieves the same PNV by proposing more wilderness acres (81,300 acres) and stressing the visual and recreation resources under a NDY harvest schedule. Alternative G achieves a slightly higher PNV ($1073 MM) by proposing wilderness designation on 304,900 acres and managing for cost efficiency outside the proposed wilderness under a NDY harvest schedule. On the basis of PNV alone, the selection between Alternative O (which stresses wilderness, recreation and viewing) and Alternative D (which stresses meeting the RPA goals for timber and wilderness) would be a toss up.

(c) Comparison to Current Direction

Alternative D has a higher PNV than the current direction ($1064 MM vs $460 MM) primarily because the harvest in the Current Direction model is constrained downward to current levels to keep the budget down. Without the volume constraints the Current Direction would have a PNV of $909 MM. The additional difference is due to an added 173,000 acres in the suitable timber base of Alternative D, a different mix of land designations between the alternatives, the departure from NDY in Alternative D and the high timber volume constraints in Alternative D. As with Alternatives A, B and C, the major difference is in the timber program. Timber costs are much higher for Alternative D over the Current Direction but these higher costs are offset by higher timber benefits to produce a higher net value.

With a higher timber harvest level comes more jobs in the timber industry. Alternative D has 27 percent more jobs than does the Current Direction. If the Current Direction model were not constrained by current levels of timber and associated budgets, Alternative D would still provide 5 percent more jobs.

In order to produce high volumes of timber on its suitable timberland, Alternative D trades off 194,000 acres of visual quality compared to the Current Direction. This is the thirteenth highest amount of visual quality protection and is 68,000 acres more of a tradeoff than Alternative B, which had the same Proposed Wilderness. Here those 68,000 acres moved from non-timber harvest prescriptions in Alternative B to harvest prescriptions in Alternative D where the visual quality is not protected. Even though the suitable timberland in Alternative D is 173,000 acres more than the Current Direction, the visual quality tradeoff is 194,000 acres. This is because the Current Direction uses the VIEWTM and TMVIEW prescriptions to protect visual quality while generating a regulated flow of timber whereas Alternative D does not. The VIEWTM and TMVIEW prescriptions are costly and would not be consistent with the aim of Alternative D to manage timber in the most cost efficient manner while still achieving the RPA goals.

Alternative D has seven percent less acreage dedicated to Wilderness and roadless recreation than the Current Direction. Alternative D picks up the additional Proposed Wilderness discussed above along with other acres that did not fall into timber harvest prescriptions as discussed for Alternative A. The shift in this category from Alternative B to Alternative D is the result of the RPA timber goals which required that additional suitable timberland be used even though it would not be cost efficient on an acre by acre basis.

Because they have the same Wilderness proposal, Alternative D and the Current Direction have the same withdrawals from oil, gas, and locatable mineral exploration.

Alternative D has 15 percent less undeveloped grizzly habitat than the Current Direction. This is due to the high timber emphasis.

Alternative D, like Alternative A, is focusing on cost efficient timber management, but in order to achieve the RPA harvest goals and meet NDY after decade 10 it is necessary to convert 45,000 acres of stagnated lodgepole pine in the first five decades. This is 35 percent less than the Current Direction. For the same reasons discussed for Alternative A, Alternative D has a relatively low first decade lodgepole pine harvest (ninth highest). This is 13 percent less than the Current Direction and is similar to Alternative A.

Alternative D harvests 51 percent more timber in the first decade than does the Current Direction. This is primarily due to the constraint on volumes which was applied to the Current Direction to get output levels and budgets close to the current level. Without these limits on the Current Direction, Alternative D would only harvest 11 percent more timber in the first decade than the Current Direction. Another factor is that the first decade volume of Alternative D is constrained to the RPA goal level.

In order to access the timber lands in the suitable base with the harvest schedule of Alternative D it would be necessary to build 5690 new miles of road by decade 5. This is 48 percent more than the Current Direction alternative and also higher than the other alternatives discussed so far. This difference is due to the higher harvest levels and larger suitable timber land base of Alternative D.

Alternative D requires the eighth highest budget to carry out the various programs. Its budget is 30 percent higher than the Current Direction.

e. Alternative E

(1) Quantified Comparisons

Quantity	Value	Rank From Highest	Change From Alt I - CD
Present Net Value	$1113 Million	6	+142 %
Opportunity Cost	$ 50 Million	9	- 93 %
Present Value Costs	$ 659 Million	9	+ 21 %
Present Value Benefits	$1772 Million	8	+ 76 %
Jobs & Community Stability	2391 Jobs	9	+ 24 %
Visual Quality Protection	1137 M Acres	7	- 8 %
Wilderness/Roadless Quality	476 M Acres	5	+ 8 %
Oil & Gas Withdrawals	335 M Acres	3	+ 58 %
Locatable Mineral Withdrawals	371 M Acres	3	+ 49 %
Undeveloped Grizzly Habitat	475 M Acres	5	- 14 %
Total Decade 1 Timber Harvest	218 MMBF/Year	9	+ 45 %
Decade 1 Lodgepole Pine Harvest	64 MMBF/Year	10	- 17 %
Stagnated LPP Converted - Dec 5	1 M Acres	8	- 99 %
New Road Access by Decade 5	4950 Miles	7	+ 29 %
First Decade Budget (Approp.)	$21.1 MM/Year	9	+ 27 %

(2) Discussion

Alternative E was modeled similarly to Alternative A except that 186,600 acres were designated as Proposed Wilderness by constraint. Of this acreage, 106,700 acres were tentatively suitable for timber harvest, but much of this acreage can not be managed for timber in a cost efficient manner or was not accessible in Alternative A given the MMR's and harvest schedule constraints. Alternative A displayed the opportunity cost of the NDY constraint as being $20 MM so the additional opportunity cost of $30 MM can be attributed to the wilderness proposal.

(a) Cost Comparison

The next cheapest alternative in terms of the present value of costs is Alternative J, the Proposed Action ($647 MM). The timber and road costs are lower for Alternative J because it harvests less timber from a smaller suitable timber base.

(b) PNV Comparison

The PNV for Alternative E is $1113 Million. This is the sixth highest PNV of all the alternatives. Alternative E has a slightly lower PNV than Alternative C ($1128 MM) simply because additional acres of cost efficient timber management land are included in the Proposed Wilderness designation of Alternative E.

(c) Comparison to Current Direction

Alternative E has a higher PNV than the current direction ($1113 MM vs $460 MM) primarily because the harvest in the Current Direction model is constrained downward to current levels to keep the budget down. Without the volume constraints the Current Direction would have a PNV of $909 MM. The additional difference is due to an added 3,000 acres in the suitable timber base of Alternative E and a different mix of land designations between the alternatives. As with the other Alternatives, the major difference is in the timber program. Timber costs are much higher for Alternative E over the Current Direction, but these higher costs are offset by higher timber benefits to produce a higher net value.

With a higher timber harvest level comes more jobs in the timber industry. Alternative E has 24 percent more jobs than does the Current Direction. If the Current Direction model were not constrained by current levels of timber and associated budgets, Alternative E would still provide 3 percent more jobs.

In order to produce high volumes of timber on its suitable timberland, Alternative E trades off 103,000 acres of visual quality compared to the Current Direction. Even though the suitable timberland in Alternative E is only 3,000 acres larger than the Current Direction, the visual quality tradeoff is 103,000 acres. This is because the Current Direction uses the VIEWTM and TMVIEW prescriptions to protect visual quality while generating a regulated flow of timber whereas Alternative E does not. The VIEWTM and TMVIEW prescriptions are costly and would not be consistent with the aim of Alternative E to manage timber in the most cost efficient manner.

Alternative E has 8 percent more acreage dedicated to Wilderness and roadless recreation than the Current Direction. Alternative E picks up the additional Proposed Wilderness discussed above along with other acres that did not fall into timber harvest prescriptions as discussed for Alternative A. The shift in this category from Alternative A to Alternative E does not equal the Proposed Wilderness acreage because some of those acres were already in roadless recreation designations in Alternative A.

Alternative E has 58 percent more acres withdrawn from oil and gas exploration and 49 percent more acres withdrawn from locatable mineral exploration than does the Current Direction. This is due to the larger wilderness proposal of Alternative E.

Alternative E has 14 percent less undeveloped grizzly habitat than the Current Direction. This is due to the high timber emphasis outside of the Proposed Wilderness.

Alternative E is focusing on cost efficient timber management thus only a minimal amount of stagnated lodgepole pine is converted in the first five decades (1000 acres). This is 99 percent less than the Current Direction. For the same reasons discussed for Alternative A, Alternative E has a relatively low first decade lodgepole pine harvest (tenth highest). This is 17 percent less than the Current Direction.

Alternative E harvests 45 percent more timber in the first decade than does the Current Direction. This is primarily due to the constraint on volumes which

was applied to the Current Direction to get output levels and budgets close to the current level. Without these limits on the Current Direction, Alternative E would only harvest 7 percent more timber in the first decade than the Current Direction.

In order to access the timber lands in the suitable base with the harvest schedule of Alternative E it would be necessary to build 4950 new miles of road by decade 5. This is 29 percent more than the Current Direction alternative. This difference is due to the higher harvest levels of Alternative E.

Alternative E requires the ninth highest budget to carry out the various programs. Its budget is 27 percent higher than the Current Direction.

f. Alternative F (Maximum Elk Benchmark)

(1) Quantified Comparisons

Quantity	Value	Rank From Highest	Change From Alt I - CD
Present Net Value	$ 658 Million	13	+ 43 %
Opportunity Cost	$ 505 Million	2	- 28 %
Present Value Costs	$ 541 Million	13	- 1 %
Present Value Benefits	$1199 Million	14	+ 19 %
Jobs & Community Stability	2006 Jobs	13	+ 4 %
Visual Quality Protection	1465 M Acres	1	+ 18 %
Wilderness/Roadless Quality	401 M Acres	10	+ 4 %
Oil & Gas Withdrawals	148 M Acres	7	- 30 %
Locatable Mineral Withdrawals	185 M Acres	7	- 26 %
Undeveloped Grizzly Habitat	339 M Acres	13	- 38 %
Total Decade 1 Timber Harvest	164 MMBF/Year	14	+ 9 %
Decade 1 Lodgepole Pine Harvest	56 MMBF/Year	12	- 27 %
Stagnated LPP Converted - Dec 5	44 M Acres	5	- 36 %
New Road Access by Decade 5	3850 Miles	13	0 %
First Decade Budget (Approp.)	$16.8 MM/Year	13	+ 1 %

(2) Discussion

Alternative F is like Alternative A except that a special constraint is applied so that the selection of prescriptions is made on the basis of their ability to provide elk habitat before maximizing PNV. "ELK" is a non-scheduled output in the FORPLAN model and the yield tables are set up so that the number of elk produced varies by AA (potential habitat quality) and by prescription (capability to manage elk habitat). Thus, the designation of land is driven by the elk constraint, but the schedule of activities is driven by the objective function of maximizing PNV. In general the BGSRTM prescription provides the highest elk outputs so it is selected more often than in Alternative A (698,000 acres vs 522,100 acres). Outside of suitable elk summer range the land is managed for cost efficiency subject to the NDY and MMR constraints. The opportunity cost of $505 MM is made up of a combination of the NDY constraint and the constraint to supply high elk numbers. The additional opportunity cost beyond that for Alternative A is $485 MM and can be associated with the effort to produce those high elk numbers.

(a) Cost Comparison

The present value of costs for Alternative F is $541 MM. This is the lowest cost of all the alternatives. The low cost is associated with low timber harvest volumes and a lack of either commercial or precommercial thinning on the summer range acres. Repetitive entries into summer range to manage timber tends to displace elk so to maximize elk these entries (including thinnings) are minimized. Final harvests are used to manage cover/forage ratios and produce a regulated flow of timber while doing so.

(b) PNV Comparison

The PNV for Alternative F is $658 Million. Only the Current Direction Alternative with its constrained timber harvest and associated budget produces a lower PNV. The next higher PNV is produced by Alternative K. Alternative F has a lower PNV primarily because it has 254,000 acres less suitable timberland than Alternative K. Alternative K is a departure on the Proposed Action and has a different mix of prescriptions constrained into the solution which also helped produce the higher PNV but generated lower elk populations (8070 elk vs 10,100 elk).

(c) Comparison to Current Direction

Alternative F has a higher PNV than the current direction ($658 MM vs $460 MM) primarily because the harvest in the Current Direction model is constrained downward to current levels to keep the budget down. Without the volume constraints the Current Direction would have a PNV of $909 MM which exceeds the PNV from Alternative F by $251 MM. The difference is due to a suitable timber base which is 290,000 acres smaller than the Current Direction and a different mix of land designations between the alternatives. As with the other alternatives, the major difference is in the timber program. Timber costs are higher for the Current Direction because more commercial and precommercial thinning and conversion of stagnated lodgepole pine is scheduled. The roading program for Alternative F is more costly than for the Current Direction even though the suitable timber base is 290,000 acres smaller because much of the Current Direction road building was unnecessary, within the 200 year time horizon, to produce the low volumes of timber. Timber benefits are higher for Alternative F because it harvests more timber.

With a higher timber harvest level comes more jobs in the timber industry. Alternative F has 4 percent more jobs than does the Current Direction. If the Current Direction model were not constrained by current levels of timber and associated budgets, Alternative F would provide 14 percent <u>fewer</u> jobs.

Managing for elk habitat tends to be compatible with visual quality enhancement. Alternative F has 18 percent more visual quality protection than does the Current Direction.

Alternative F has four percent more acreage dedicated to Wilderness and roadless recreation than the Current Direction. All of this acreage is in unroaded, non-wilderness designations which contribute a great deal to elk habitat.

Since Alternative F has no Wilderness proposed, it has 30 percent fewer withdrawals from oil and gas exploration and 26% fewer withdrawals from locatable mineral exploration.

Alternative F has 38 percent less undeveloped grizzly habitat than the Current Direction. This is due to the heavy use of the BGSRTM prescription on elk summer range and the fact that elk summer range is frequently within grizzly habitat.

Alternative F is attempting to improve elk habitat at all costs so when stagnated lodgepole pine stands occur within elk summer range, they are converted and managed for elk habitat. Alternative F converts 44,000 acres of stagnated lodgepole which is 36% less than the Current Direction but much more than those alternatives which maximize PNV without the constraint to supply elk. For the same reasons discussed for Alternative A, Alternative F has a relatively low first decade lodgepole pine harvest (twelfth highest). This is 27 percent less than the Current Direction.

Alternative F harvests 9 percent more timber in the first decade than does the Current Direction. This is primarily due to the constraint on volumes which was applied to the Current Direction to get output levels and budgets close to the current level. Without these limits on the Current Direction, Alternative F would harvest 20 percent less timber in the first decade than the Current Direction. The long run sustained yield harvest level for Alternative F is the lowest of all the alternatives because high long range yields are associated with intensive management in the form of precommercial and commercial thinnings and these are not compatible with elk habitat management. Compounding this, Alternative F has the smallest suitable timber base of all the alternatives.

In order to access the timber lands in the suitable base with the harvest schedule of Alternative F it would be necessary to build 3850 new miles of road by decade 5. This is essential the same as the Current Direction alternative. The reason for this similarity given the big differences in suitable timber lands is described above in the first paragraph of this section.

Alternative F requires a budget which is the second lowest of all the alternatives. The Current Direction requires the lowest budget. Alternative F is budgeted at a level one percent higher than the Current Direction.

g. Alternative G

(1) Quantified Comparisons

Quantity	Value	Rank From Highest	Change From Alt I - CD
Present Net Value	$1073 Million	7	+133 %
Opportunity Cost	$ 90 Million	8	- 87 %
Present Value Costs	$ 647 Million	10	+ 18 %
Present Value Benefits	$1720 Million	10	+ 71 %
Jobs & Community Stability	2343 Jobs	10	+ 21 %
Visual Quality Protection	1157 M Acres	6	- 7 %
Wilderness/Roadless Quality	534 M Acres	3	+ 21 %
Oil & Gas Withdrawals	453 M Acres	2	+144 %
Locatable Mineral Withdrawals	484 M Acres	2	+ 94 %
Undeveloped Grizzly Habitat	514 M Acres	4	- 7 %
Total Decade 1 Timber Harvest	213 MMBF/Year	11	+ 42 %
Decade 1 Lodgepole Pine Harvest	59 MMBF/Year	11	- 23 %
Stagnated LPP Converted - Dec 5	1 M Acres	8	- 99 %
New Road Access by Decade 5	4750 Miles	8	+ 24 %
First Decade Budget (Approp.)	$20.6 MM/Year	10	+ 24 %

(2) Discussion

This alternative is modeled like alternatives A, B, C, and E except that the wilderness proposal is different. In this case there are 304,900 acres constrained to the Proposed Wilderness prescription in twenty roadless areas. About 172,700 acres of this Proposed Wilderness is tentatively suitable timberland, but much of this acreage can not be managed for timber in a cost efficient manner or was not accessible in Alternative A given the MMR's and NDY constraints. The land outside of the Proposed Wilderness is managed for cost efficiency. Alternative A displayed an opportunity cost of $20 Million for the NDY constraint so the additional opportunity cost of $70 Million can be attributed to the Wilderness proposal.

(a) Cost Comparison

The next cheapest alternative in terms of the present value of costs is Alternative H, the maximum Wilderness benchmark. Alternative H has lower timber and road costs because it harvests less timber from a smaller suitable timber base. It also has lower recreation related costs because some recreationists who prefer the less rustic semi-primitive non-motorized recreation experience do not continue to use the area if it is managed for Wilderness thus fewer overall recreationists use the Forest and the cost of managing them is less. This is based upon the assumptions that current use patterns by recreation type can be used to project future demand and that future recreation management will not cause shifts in demand between the different types of recreation. Management for elk and other big game hunting recreation is higher for Alternative H, but this is offset by the lower costs for semi-primitive non-motorized recreation. Note that in this analysis the elk and big game hunting recreation projections are independent of the other

recreation types and that hunting can occur in areas suitable for either roaded or non-roaded recreation.

(b) PNV Comparison

The PNV for Alternative G is $1073 Million. This is the seventh highest PNV of all the alternatives. Alternative G has a slightly lower PNV than Alternative E ($1113 MM) simply because additional acres of cost efficient timberland are included in the wilderness proposal of Alternative G.

(c) Comparison to Current Direction

Alternative G has a higher PNV than the current direction ($1073 MM vs $460 MM) primarily because the harvest in the Current Direction model is constrained downward to current levels to keep the budget down. Without the volume constraints the Current Direction would have a PNV of $909 MM. The additional difference is due to a different mix of land designations between the alternatives. As with the other Alternatives, the major difference is in the timber program. Timber and road costs are higher for Alternative G over the Current Direction, but these higher costs are offset by higher timber benefits to produce a higher net value.

With a higher timber harvest level comes more jobs in the timber industry. Alternative G has 21 percent more jobs than does the Current Direction. If the Current Direction model were not constrained by current levels of timber and associated budgets, Alternative G would provide less than one percent more jobs.

In order to produce high volumes of timber on its suitable timberland, Alternative G trades off 83,000 acres of visual quality compared to the Current Direction. Even though the suitable timberland in Alternative G is less than the Current Direction, the visual quality tradeoff is 83,000 acres. This is because the Current Direction uses the VIEWTM and TMVIEW prescriptions to protect visual quality while generating a regulated flow of timber whereas Alternative G does not. The VIEWTM and TMVIEW prescriptions are costly and would not be consistent with the aim of Alternative G to manage timber in the most cost efficient manner.

Alternative G has 21 percent more acreage dedicated to Wilderness and roadless recreation than the Current Direction. Alternative G picks up the additional Proposed Wilderness discussed above along with other acres that did not fall into timber harvest prescriptions as discussed for Alternative A. The shift in this category from Alternative A to Alternative G does not equal the Proposed Wilderness acreage because some of those acres were already in roadless recreation designations in Alternative A.

Alternative G has 144 percent more acres withdrawn from oil and gas exploration and 94 percent more acres withdrawn from locatable mineral exploration than does the Current Direction. This is due to the larger wilderness proposal of Alternative G.

Alternative G has 7 percent less undeveloped grizzly habitat than the Current Direction. This is due to the high timber emphasis outside of the Proposed Wilderness.

Alternative G is focusing on cost efficient timber management thus only a minimal amount of stagnated lodgepole pine is converted in the first five decades (1000 acres). This is 99 percent less than the Current Direction. For the same reasons discussed for Alternative A, Alternative G has a relatively low first decade lodgepole pine harvest (eleventh highest). This is 23 percent less than the Current Direction.

Alternative G harvests 42 percent more timber in the first decade than does the Current Direction. This is primarily due to the constraint on volumes which was applied to the Current Direction to get output levels and budgets close to the current level. Without these limits on the Current Direction, Alternative G would only harvest 4 percent more timber in the first decade than the Current Direction.

In order to access the timber lands in the suitable base with the harvest schedule of Alternative G it would be necessary to build 4750 new miles of road by decade 5. This is 24 percent more than the Current Direction alternative. This difference is partly due to the higher harvest levels of Alternative G. Even though the current direction has more suitable timber land than Alternative G fewer roads are needed in the time horizon of this analysis (200 years) because some of the suitable timberland is never managed in that time period thus the roads are not needed.

Alternative G requires the tenth highest budget to carry out the various programs. Its budget is 24 percent higher than the Current Direction.

h. Alternative H (Maximum Wilderness)

(1) Quantified Comparisons

Quantity	Value	Rank From Highest	Change From Alt I - CD
Present Net Value	$1035 Million	10	+125 %
Opportunity Cost	$ 128 Million	5	- 82 %
Present Value Costs	$ 627 Million	11	+ 15 %
Present Value Benefits	$1662 Million	11	+ 65 %
Jobs & Community Stability	2237 Jobs	12	+ 16 %
Visual Quality Protection	1199 M Acres	5	- 3 %
Wilderness/Roadless Quality	583 M Acres	1	+ 32 %
Oil & Gas Withdrawals	540 M Acres	1	+155 %
Locatable Mineral Withdrawals	579 M Acres	1	+133 %
Undeveloped Grizzly Habitat	545 M Acres	3	- 1 %
Total Decade 1 Timber Harvest	208 MMBF/Year	12	+ 39 %
Decade 1 Lodgepole Pine Harvest	51 MMBF/Year	13	- 34 %
Stagnated LPP Converted - Dec 5	1 M Acres	8	- 99 %
New Road Access by Decade 5	4590 Miles	12	+ 20 %
First Decade Budget (Approp.)	$20.0 MM/Year	12	+ 20 %

(2) Discussion

Alternative H was modeled similarly to Alternatives A, B, C, E and G except that in this alternative all inventoried roadless areas are designated for Proposed Wilderness by constraint. Of the 403,700 acres of Proposed Wilderness 245,100 acres are tentatively suitable timber lands. About 206,400 acres of the inventoried roadless areas were not in the suitable timber base of Alternative A because they were either non-commercial forest lands, were not cost efficient to manage for timber production or could not be managed for timber without violating the MMR's. Of the 245,100 acres in the tentatively suitable lands, about 23,200 acres were not designated for timber management in Alternative A because they either could not increase PNV or could not be accessed due to the MMR's and NDY constraints. Alternative A displayed the opportunity cost of the NDY constraint as being $20 Million so the additional opportunity cost of $108 Million can be attributed to the wilderness proposal.

(a) Cost Comparison

The next cheapest alternative in terms of the present value of costs is Alternative I, the Current Direction ($546 MM). Alternative H has higher timber and road costs which offset its lower recreation costs. The higher road and timber costs are due to the higher timber harvest levels and the fact that the Current Direction defers some of these activities until even after the 200 year planning horizon. The lower recreation costs are related to the shift of some lands from semi-primitive non-motorized (SPNMRC) designations which serve the demands of a segment of the recreationist population to wilderness designations which serve a different segment. It is assumed that demand for wilderness recreation will not change due to this shift. Alternative G, which has the next lowest amount of Proposed Wilderness already supplies more wilderness recreation than will be demanded until late in the planning horizon (decade 16). Thus, the added wilderness of Alternative H brings neither increased costs or benefits, but the lost SPNMRC users do take with them both costs and benefits when they no longer use the Forest.

(b) PNV Comparison

The PNV for Alternative H is $1035 million. This is the tenth highest PNV of all the alternatives. Alternative H has a slightly lower PNV than Alternative L ($1046 MM). This is due to a combination of factors. First, Alternative L has no Proposed Wilderness so this would be expected to raise its PNV considerably. Second, Alternative L has the largest suitable timber base of all the alternatives (100 percent of the tentatively suitable base) which may also be expected to raise the PNV. Third, Alternative L is constrained to produce the maximum amount of timber in 200 years under the NDY constraint and the MMR's. In fact forcing all the tentatively suitable timberland into timber management is very costly, particularly when stagnated lodgepole pine stands are considered. The raise in PNV of Alternative L due to its lack of wilderness is almost offset by the increased costs of managing all the tentatively suitable timberlands in a way which will maximize timber outputs. The result is that Alternative L has only a slightly higher PNV than Alternative H.

(c) Comparison to Current Direction

Alternative H has a higher PNV than the current direction ($1035 MM vs $460 MM) primarily because the harvest in the Current Direction model is constrained downward to current levels to keep the budget down. Without the volume constraints the Current Direction would have a PNV of $909 MM. The additional difference is due to a different mix of land designations between the alternatives. As with the other Alternatives, the major difference is in the timber program. Timber and road costs are higher for Alternative H over the Current Direction, but these higher costs are offset by higher timber benefits to produce a higher net value.

With a higher timber harvest level comes more jobs in the timber industry. Alternative H has 16 percent more jobs than does the Current Direction. If the Current Direction model were not constrained by current levels of timber harvest and associated budgets, Alternative H would provide 4 percent fewer jobs.

In order to produce high volumes of timber on its suitable timberland, Alternative H trades off 41,000 acres of visual quality compared to the Current Direction. Even though the suitable timberland in Alternative H is less than the Current Direction, the visual quality tradeoff is 41,000 acres. This is because the Current Direction uses the VIEWTM and TMVIEW prescriptions to protect visual quality while generating a regulated flow of timber whereas Alternative G does not. The VIEWTM and TMVIEW prescriptions are costly and would not be consistent with the aim of Alternative H to manage timber in the most cost efficient manner.

Alternative H has 32 percent more acreage dedicated to Wilderness and roadless recreation than the Current Direction. Alternative H picks up the additional Proposed Wilderness discussed above along with other acres that did not fall into timber harvest prescriptions as discussed for Alternative A. The shift in this category from Alternative A to Alternative H does not equal the Proposed Wilderness acreage because some of those acres were already in roadless recreation designations in Alternative A.

Alternative H has 155 percent more acres withdrawn from oil and gas exploration and 133 percent more acres withdrawn from locatable mineral exploration than does the Current Direction. This is due to the larger wilderness proposal of Alternative H.

Alternative H has 1 percent less undeveloped grizzly habitat than the Current Direction. This is due to the high timber emphasis outside of the Proposed Wilderness.

Alternative H is focusing on cost efficient timber management thus only a minimal amount of stagnated lodgepole pine is converted in the first five decades (1000 acres). This is 99 percent less than the Current Direction. For the same reasons discussed for Alternative A plus the fact of its lower suitable timber land acreage, Alternative H has a relatively low first decade lodgepole pine harvest (thirteenth highest). This is 34 percent less than the Current Direction.

Alternative H harvests 39 percent more timber in the first decade than does the Current Direction. This is primarily due to the constraint on volumes which was applied to the Current Direction to get output levels and budgets close to the current level. Without these limits on the Current Direction, Alternative H would only harvest 2 percent more timber in the first decade than the Current Direction.

In order to access the timber lands in the suitable base with the harvest schedule of Alternative H it would be necessary to build 4590 new miles of road by decade 5. This is 20 percent more than the Current Direction alternative. This difference is partly due to the higher harvest levels of Alternative H. Even though the current direction has more suitable timber land than Alternative H fewer roads are needed in the time horizon of this analysis (200 years) because some of the suitable timberland in the Current Direction alternative is never managed in that time period thus the roads are not needed.

Alternative H requires the twelfth highest budget to carry out the various programs. Its budget is 20 percent higher than the Current Direction.

i. Alternative I (Current Direction)

(1) Quantified Comparisons

Quantity	Value	Rank From Highest	Change From Alt I - CD
Present Net Value	$ 460 Million	14	0 %
Opportunity Cost	$ 703 Million	1	0 %
Present Value Costs	$ 546 Million	12	0 %
Present Value Benefits	$1006 Million	15	0 %
Jobs & Community Stability	1931 Jobs	14	0 %
Visual Quality Protection	1240 M Acres	4	0 %
Wilderness/Roadless Quality	441 M Acres	6	0 %
Oil & Gas Withdrawals	212 M Acres	6	0 %
Locatable Mineral Withdrawals	249 M Acres	6	0 %
Undeveloped Grizzly Habitat	551 M Acres	2	0 %
Total Decade 1 Timber Harvest	150 MMBF/Year	15	0 %
Decade 1 Lodgepole Pine Harvest	77 MMBF/Year	4	0 %
Stagnated LPP Converted - Dec 5	69 M Acres	3	0 %
New Road Access by Decade 5	3840 Miles	14	0 %
First Decade Budget (Approp.)	$16.6 MM/Year	14	0 %

(2) Discussion

This alternative differs from all the others because the land designations are constrained to match the designations currently in effect on the Forest. The designations were originally developed in a series of Unit Plans developed in accordance with the Multiple Use Sustained Yield Act and the National Environmental Policy Act. The development of these plans considered costs, benefits and schedule implications to a much lesser extent than the process described in this Appendix. As a result the Current Direction generates a rather low PNV ($909 MM when not operating under a limited budget or $460 MM

when the outputs and budget are similar to current experience). The opportunity cost of this alternative (with current outputs) is $703 million. This is due to the specified set of land designations including forced management of stagnated lodgepole pine stands (69,000 acres) and use of the TMVIEW and VIEWTM designations which are costly, but permit regulated timber flows while maintaining visual quality. The constraint on timber volumes which was designed to keep timber outputs and budgets at the current level through the entire 200 year horizon also detracted a great deal from the PNV of this alternative (-$449 MM).

(a) Cost Comparison

The next cheapest alternative in terms of the present value of costs is Alternative F, the maximum elk benchmark ($541 MM). Alternative F harvests more timber, but converts 36 percent less stagnated lodgepole pine, does less thinning and focuses on clearcuts rather than shelterwood cuts (at the expense of 7 percent of visual quality) so that total timber costs are lower. Road costs are higher even though the suitable acreage is lower because the Current Direction defers some access beyond the end of the 200 year horizon. The overall effect is that Alternative I has a higher present value of costs.

(b) PNV Comparison

The PNV for the Current Direction is $460 Million. This is the lowest PNV of all the alternatives and is due in large part to the output levels which are constrained to match current levels. Without these output constraints the Current Direction would generate a PNV of $909 million which is slightly less than Alternative K (departure on the Proposed Action) and more than Alternative F (maximum elk benchmark).

j. Alternative J (Proposed Action)

(1) Quantified Comparisons

Quantity	Value	Rank From Highest	Change From Alt I - CD
Present Net Value	$ 916 Million	11	+ 99 %
Opportunity Cost	$ 247 Million	4	- 65 %
Present Value Costs	$ 647 Million	10	+ 18 %
Present Value Benefits	$1563 Million	13	+ 55 %
Jobs & Community Stability	2299 Jobs	11	+ 19 %
Visual Quality Protection	1311 M Acres	3	+ 6 %
Wilderness/Roadless Quality	518 M Acres	4	+ 17 %
Oil & Gas Withdrawals	215 M Acres	5	+ 1 %
Locatable Mineral Withdrawals	252 M Acres	5	+ 1 %
Undeveloped Grizzly Habitat	589 M Acres	1	+ 7 %
Total Decade 1 Timber Harvest	202 MMBF/Year	13	+ 35 %
Decade 1 Lodgepole Pine Harvest	75 MMBF/Year	5	- 3 %
Stagnated LPP Converted - Dec 5	70 M Acres	2	+ 1 %
New Road Access by Decade 5	4690 Miles	10	+ 22 %
First Decade Budget (Approp.)	$20.3 MM/Year	11	+ 22 %

(2) Discussion

This alternative differs from those already discussed in several ways. First, as previously noted, the VIEWTM and TMVIEW designations are used in specific locations to manage the view of particularly sensitive areas while still producing a regulated flow of timber. Second, there are 66,500 acres of Proposed Wilderness. Third, designations are constrained in such a way that future options are retained. This last difference resulted in this alternative having one of the higher acreages dedicated to roadless recreation, but one of the lowest acreages in Proposed Wilderness. The goals of this alternative could not be attained in the FORPLAN model using the general constraints applied to most of the other alternatives so each land designation was individually constrained in the model. The opportunity cost of this alternative is $247 million. This cost is associated with the NDY constraint plus the individual land designation constraints which were established, in part, on the basis of non-priced values.

(a) Cost Comparison

Alternative G has the same present value of costs as the Proposed Action. Alternative G produces more timber than the Proposed Action and has higher road costs, but lower timber costs than the Proposed Action. The suitable timber base of Alternative G is the same size as that of the Proposed Action, but it is in different locations. Thus, Alternative G requires more road miles to access its timber base and the costs are higher. The timber costs in the Proposed Action are higher because of the added stagnated lodgepole pine conversions and the special visual management prescriptions (which involve shelterwood cuts). Recreation costs are lower in Alternative G because, under the assumptions used in this analysis, its high Proposed Wilderness acreage caused the total number of recreationists to decline. This is discussed in more detail under the discussion for Alternative G (above). The net effect of these differences is that Alternative G and the Proposed Action have the same present value of costs.

(b) PNV Comparison

The PNV for the Proposed Action is $916 million. This is the eleventh highest PNV of all the alternatives. The Proposed Action has the next lower PNV than Alternative H, the maximum wilderness benchmark ($1034 MM). The PNV is lower for the Proposed Action because harvest volumes are lower, producing lower timber benefits and timber and recreation costs are higher. Timber costs are higher even though volumes are lower because more costly prescriptions are used to manage visual quality and more stagnated lodgepole is converted. Recreation costs are higher because, under the assumptions used to develop recreation use projections, the Proposed Action will provide a greater diversity of recreation experiences and thus attract more recreation. This added cost of managing recreation is more than offset by the added benefits derived from recreation, but the added recreation benefits are not sufficient to offset the higher timber costs.

(c) Comparison to Current Direction

The Proposed Action has a higher PNV than the current direction ($916 MM vs $460 MM) primarily because the harvest in the Current Direction model is constrained downward to current levels to keep the budget down. Without the volume constraints the Current Direction would have a PNV of $909 MM. The additional difference is due to a different mix of land designations between the alternatives. As with the other Alternatives, the major difference is in the timber program. Timber and road costs are higher for the Proposed Action over the Current Direction, but these higher costs are offset by higher timber benefits to produce a higher net value.

With a higher timber harvest level comes more jobs in the timber industry. The Proposed Action has 19 percent more jobs than does the Current Direction. If the Current Direction model were not constrained by current levels of timber harvest and associated budgets, the Proposed Action would provide 1 percent fewer jobs.

Due to the stress on visual quality through the use of the TMVIEW and VIEWTM designations and through special application of other designations, which tend to preserve future options, the Proposed Action provides 6 percent more visual quality protection than does the Current Direction.

The Proposed Action has 17 percent more acreage dedicated to Wilderness and roadless recreation than the Current Direction. The Proposed Action has 2,000 acres of additional Proposed Wilderness along with a heavier emphasis on retaining options which has the effect of providing more acreage useful for unroaded sorts of recreation.

The Proposed Action has 1 percent more acres withdrawn from oil and gas exploration and 1 percent more acres withdrawn from locatable mineral exploration than does the Current Direction. This is due to the slightly larger wilderness proposal of the Proposed Action.

The Proposed Action has 7 percent more undeveloped grizzly habitat than the Current Direction. This is the highest protection afforded to grizzly in any of the alternatives and reflects the stress on retaining options, including those affecting the grizzly bear.

The Proposed Action is focusing on preserving options thus a relatively high amount of stagnated lodgepole pine is converted in the first five decades (70,000 acres). This is 1 percent more than the Current Direction. This conversion preserves, or enhances opportunities for timber management while reducing the risk of fire and insect damage to other parts of the Forest. Such damage could remove or at least delay the acquisition of many of the benefits discussed in this document. Harvest of lodgepole pine in the first decade is 3 percent less than that for the Current Direction. This reflects a tradeoff in the preservation of options by leaving areas unroaded and the preservation of options by managing high risk lodgepole pine. The Proposed action puts 15,800 acres more mature lodgepole pine stands into non-harvest designations than does the Current Direction. Thus the Proposed Action accepts more insect and fire risk (with the potential loss of options) and preserves more options in terms of leaving areas undeveloped.

The Proposed Action harvests 35 percent more timber in the first decade than does the Current Direction. This is primarily due to the constraint on volumes which was applied to the Current Direction to get output levels and budgets close to the current level. Without these limits on the Current Direction, the Proposed Action would harvest 1 percent less timber in the first decade than the Current Direction.

In order to access the timber lands in the suitable base with the harvest schedule of the Proposed Action it would be necessary to build 4690 new miles of road by decade 5. This is 22 percent more than the Current Direction alternative. This difference is partly due to the higher harvest levels of the Proposed Action. Even though the current direction has more suitable timber land than the Proposed Action fewer roads are needed in the time horizon of this analysis (200 years) because some of the suitable timberland in the Current Direction alternative is never accessed.

The Proposed Action requires the eleventh highest budget to carry out the various programs. Its budget is 22 percent higher than the Current Direction.

(d) Sustained Yield by Administrative Forest

Section 13(a) of the National Forest Management Act of 1976 discusses the calculation of sustained yield on individual proclaimed National Forests. This analysis was performed for the Proposed Action and the details of this analysis are available in the Forest planning records. Table B-27 and B-28 and Figure B-16 display long term sustained yield, suitable acres and allowable sale quantity for the proclaimed Kootenai National Forest and that portion of the Kaniksu National Forest administered by the Kootenai National Forest.

TABLE B-27

Proclaimed N.F and Administrative N.F.
Long Term Sustained Yield (LTSY) AND Suitable Acres
(Thousands of Acres and Millions of Cubic Feet per decade)

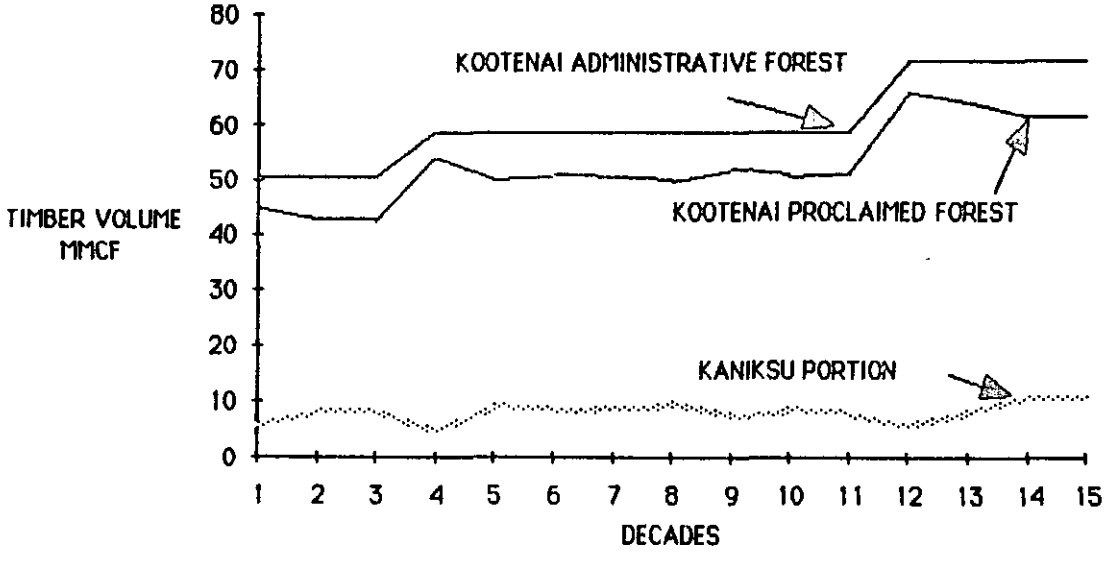
Proclaimed Forest	Administrative Forest	Suitable Acres (MAC)	LTSY (MMCF/dec)
Kootenai	Kootenai	1195.3	624.9
Kaniksu	Kootenai	182.6	93.8

TABLE B-28
Proclaimed National Forest and Administrative National Forest
Allowable Sale Quantity (MMCF/Decade)

Decade	Kootenai Proclaimed National Forest	Kaniksu Proclaimed Administered by the Kootenai	Kootenai Administrative Forest Total Allowable Sale Quantity
1	447.0	57.0	504.0
2	424.8	80.2	504.0
3	422.8	82.2	504.0
4	537.2	48.9	586.1
5	498.7	87.4	586.1
6	507.2	78.9	586.1
7	501.1	85.0	586.1
8	493.8	92.3	586.1
9	516.5	69.6	586.1
10	502.6	83.5	586.1
11	509.1	77.0	586.1
12	656.2	57.6	713.8
13	634.2	79.6	713.8
14	610.5	103.3	713.8
15	612.1	101.7	713.8

FIGURE B-16

KOOTENAI PROCLAIMED NATIONAL FOREST AND ADMINISTRATIVE NATIONAL FOREST
ALLOWABLE SALE QUANTITY - PROPOSED ALTERNATIVE
(AVERAGE ANNUAL VOLUMES)



The figures displayed for the Kootenai proclaimed Forest and the Kaniksu portion of the administrative Kootenai National Forest appear as departures. This happens because they were separated from the sum of the allowable sale quantity of the Kootenai administrative Forest. The suitable acres on the Kootenai proclaimed Forest and the Kaniksu portion of the administrative Kootenai were included in only the FORPLAN models developed by the Kootenai National Forest. The administrative Kootenai allowable sale quantity was done on an administrative forest-wide basis and does not depart from a base sale schedule.

The allowable sale quantity and LTSY for the proclaimed Kaniksu National Forest can be found in the Idaho Panhandle Forest Plan EIS.

k. Alternative K (Departure on the Proposed Action)

(1) Quantified Comparisons

Quantity	Value	Rank From Highest	Change From Alt I - CD
Present Net Value	$ 911 Million	12	+ 98 %
Opportunity Cost	$ 252 Million	3	- 64 %
Present Value Costs	$ 662 Million	8	+ 21 %
Present Value Benefits	$1573 Million	12	+ 56 %
Jobs & Community Stability	2492 Jobs	4	+ 29 %
Visual Quality Protection	1311 M Acres	3	+ 6 %
Wilderness/Roadless Quality	518 M Acres	4	+ 17 %
Oil & Gas Withdrawals	215 M Acres	5	+ 1 %
Locatable Mineral Withdrawals	252 M Acres	5	+ 1 %
Undeveloped Grizzly Habitat	589 M Acres	1	+ 7 %
Total Decade 1 Timber Harvest	230 MMBF/Year	4	+ 53 %
Decade 1 Lodgepole Pine Harvest	79 MMBF/Year	3	+ 3 %
Stagnated LPP Converted - Dec 5	70 M Acres	2	+ 1 %
New Road Access by Decade 5	4720 Miles	9	+ 23 %
First Decade Budget (Approp.)	$22.0 MM/Year	4	+ 33 %

(2) Discussion

Alternative K is much like the Proposed Action except that additional emphasis is given to raising short term timber harvest levels. This is accomplished by constraining timber harvest in the first two decades so than the RPA goals are reached. In order to make this harvest schedule feasible it was necessary to permit departure from NDY in decades three and four. Due to the size of trees being harvested the BF/CF ratios change over time so in order to constrain FORPLAN in cubic feet while the RPA goals are provided in board feet it was necessary to force a decline from decade 1 to decade 2 in cubic measure. The timber harvest schedule in the first five decades is as follows:

Decade	RPA Goal MMBF/yr	Alternative K MMBF/yr	MMCF/yr
1	228	230	57
2	248	241	53
3	292	216	48
4	315	251	57
5	345	271	57

The first two decades of Alternative K's harvest volume are only approximately equal to the RPA goals because it is nearly impossible to predict precisely the BF/CF ratio that the optimal solution will provide before the model is run.

The opportunity cost of Alternative K is $252 Million. This is due to the same factors outlined for Alternative J plus the schedule to reach the RPA volume goals. The difference in PNV between Alternative J and Alternative K is $5 Million. This difference can be attributed to the effort to raise the early harvest volumes.

(a) Cost Comparison

The next cheapest alternative in terms of the present value of costs is Alternative E which is $3 Million cheaper. The timber costs of Alternative K are $3 Million higher and the road costs are $3 Million lower than Alternative E. Timber costs are higher even though volume is lower in the long run because Alternative K uses the TMVIEW and VIEWTM designations, which are more costly, and converts more stagnated lodgepole pine. The road costs are lower because the suitable timber base for Alternative K is smaller than for Alternative E. Recreation and wildlife costs are slightly lower for Alternative E due to the mix of recreation opportunity provided. The "other" costs of Alternative E are also lower than for Alternative K due to the mix of activities that are being managed.

(b) PNV Comparison

The PNV for Alternative K is $911 Million. This is the twelfth highest PNV of all the alternatives. Alternative K has a slightly ($5 MM) lower PNV than Alternative J, the Proposed Action. The increase in PNV attained by relaxing the NDY constraint is offset by the decrease in PNV resulting from forcing the higher timber volumes in the first two decades.

(c) Comparison to Current Direction

Alternative K has a higher PNV than the current direction ($911 MM vs $460 MM) primarily because the harvest in the Current Direction model is constrained downward to current levels to keep the budget down. Without the volume constraints the Current Direction would have a PNV of $909 MM. The additional difference is due to a different mix of land designations between the alternatives. As with the other Alternatives, the major difference is in the timber program. Timber and road costs are higher for Alternative K than for the Current Direction, but these higher costs are offset by higher timber benefits to produce a higher net value.

With a higher timber harvest level comes more jobs in the timber industry. Alternative K has 29 percent more jobs than does the Current Direction. If the

Current Direction model were not constrained by current levels of timber harvest and associated budgets, Alternative K would provide 7 percent more jobs in the first decade. There would however be a decline in the number of jobs in the third decade when the harvest volume declines.

Alternative K, like the Proposed Action is managing toward retaining future options. As such it provides 6 percent more visual quality compared to the Current Direction. The Current Direction, the Proposed Action and Alternative K all use the TMVIEW and VIEWTM designations so that a regulated yield can be achieved while managing for visual quality.

Alternative K has 17 percent more acreage dedicated to Wilderness and roadless recreation than the Current Direction. Alternative K picks up 2000 acres of Proposed Wilderness over the Current Direction. The other acres in roadless management designations come from individual constraints designed to retain options for the future.

Alternative K has 1 percent more acres withdrawn from oil and gas exploration and 1 percent more acres withdrawn from locatable mineral exploration than does the Current Direction. This is due to the slightly larger wilderness proposal of Alternative K.

Alternative K has 7 percent less undeveloped grizzly habitat than the Current Direction. This is due to the effort to retain options as described under Alternative J.

Alternative K is focusing on the preservation of options thus slightly more stagnated lodgepole pine is converted in the first five decades (1 % more). The rationale is explained above, under Alternative J. For the same reasons discussed for Alternative J, Alternative K has a relatively high first decade lodgepole pine harvest (third highest). This is 3 percent more than the Current Direction.

Alternative K harvests 53 percent more timber in the first decade than does the Current Direction. This is primarily due to the constraint on volumes which was applied to the Current Direction to get output levels and budgets close to the current level. Without these limits on the Current Direction, Alternative K would only harvest 13 percent more timber in the first decade than the Current Direction. The constraint to reach the RPA timber volume goal in the first decade also contributes to this difference.

In order to access the timber lands in the suitable base with the harvest schedule of Alternative K it would be necessary to build 4720 new miles of road by decade 5. This is 23 percent more than the Current Direction alternative. This difference is partly due to the higher harvest levels of Alternative K. Even though the current direction has more suitable timber land than Alternative K fewer roads are needed in the time horizon of this analysis (200 years) because some of the suitable timberland in the Current Direction alternative is never managed in that time.

Alternative K requires the fourth highest budget to carry out the various programs. Its budget is 33 percent higher than the Current Direction.

1. Alternative L (Maximum Timber Benchmark)

(1) Quantified Comparisons

Quantity	Value	Rank From Highest	Change From Alt I - CD
Present Net Value	$1046 Million	9	+127 %
Opportunity Cost	$ 117 Million	6	- 83 %
Present Value Costs	$ 776 Million	1	+ 42 %
Present Value Benefits	$1822 Million	3	+ 81 %
Jobs & Community Stability	2727 Jobs	1	+ 41 %
Visual Quality Protection	976 M Acres	14	- 21 %
Wilderness/Roadless Quality	349 M Acres	14	- 21 %
Oil & Gas Withdrawals	148 M Acres	7	- 30 %
Locatable Mineral Withdrawals	185 M Acres	7	- 26 %
Undeveloped Grizzly Habitat	354 M Acres	12	- 36 %
Total Decade 1 Timber Harvest	255 MMBF/Year	2	+ 70 %
Decade 1 Lodgepole Pine Harvest	42 MMBF/Year	14	- 45 %
Stagnated LPP Converted - Dec 5	93 M Acres	1	+ 35 %
New Road Access by Decade 5	6360 Miles	1	+ 66 %
First Decade Budget (Approp.)	$28.1 MM/Year	1	+ 69 %

(2) Discussion

Alternative L is like Alternative A except that timber volume outputs are specially constrained to the levels which will produce the maximum amount of timber in the 20 decade time horizon. In order to determine where these harvest level constraints should be set, the data set for Alternative A was run with an objective function of maximizing timber for 20 decades. In this alternative all of the tentatively suitable timber land is in the suitable base even though the MMR, NDY and timber constraints may not permit harvesting in the 20 decade time horizon. The opportunity cost of NDY as determined by Alternative A is $20 Million. The additional opportunity cost of $97 Million can be associated with maximizing the production of timber.

(a) Cost Comparison

The next cheaper alternative in terms of the present value of costs is Alternative D ($718 MM). Alternative L is the most costly of all the alternatives due to the high timber harvest levels and the necessity of managing all possible acres including stagnated lodgepole pine to maximize the output of timber. Recreation and wildlife costs do not change between Alternative D and Alternative L, but the mix of recreation opportunities supplied changes. Alternative L provides more roaded recreation and less wilderness and semi-primitive non-motorized recreation than does Alternative D. Due to the added forage for elk provided by cutting activities, more elk hunter recreation can be expected. The decreases balance out the increases in terms of discounted costs so both alternatives have the same present value of recreation and wildlife costs.

(b) PNV Comparison

The PNV for Alternative L is $1046 Million. This is the ninth highest PNV of all the alternatives. Alternative H has a slightly lower PNV ($1034 MM). Constraining to produce the maximum amount of wilderness (Alternative H) generates a lower PNV than constraining to provide the maximum amount of timber (Alternative L). The timber and road costs for Alternative L are much higher than those for Alternative H, but the associated timber benefits outweigh this cost. The recreation costs are lower for Alternative H because, under the assumptions of the analysis, the mix of recreation opportunities do not supply the needs of as many recreationists so management costs are less. For the same reason recreation benefits are less for Alternative H.

(c) Comparison to Current Direction

Alternative L has a higher PNV than the current direction ($1046 MM vs $460 MM) primarily because the harvest in the Current Direction model is constrained downward to current levels to keep the budget down. Without the volume constraints the Current Direction would have a PNV of $909 MM. The additional difference is due to a different mix of land designations between the alternatives. As with the other Alternatives, the major difference is in the timber program. Timber and road costs are higher for Alternative L over the Current Direction, but these higher costs are offset by higher timber benefits to produce a higher net value.

With a higher timber harvest level comes more jobs in the timber industry. Alternative L has 41 percent more jobs than does the Current Direction. If the Current Direction model were not constrained by current levels of timber and associated budgets, Alternative L would still provide 17 percent more jobs. Alternative L provides the second highest first decade timber volume but the highest number of jobs due to the recreation activity generated and the Forest Service budget spent to generate all the outputs. These expenditures are linked to local economic activity and the number of jobs. The addition of this many jobs in the local economy is not expected to be particularly disruptive to the social fabric of the community. At 2.98 people per job, the 796 additional people beyond those currently associated with Forest activities would be a 13.4 percent increase in Lincoln County population. During the decade of 1960 to 1970 the county population increased by 5,526 people for a 44 percent increase. This was a result of the initiation of construction on the Libby Dam and was socially disruptive in many ways. The 13.4 percent maximum increase due to Forest activities not only is much less than has been experienced previously, but only affects sectors of the economy that are already in place and functioning.

In order to produce high volumes of timber on all suitable timberland, Alternative L trades off 264,000 acres of visual quality compared to the Current Direction. The TMVIEW and VIEWTM designations are not used in Alternative L because they are inconsistent with efforts to maximize timber production.

Alternative L has 21 percent less acreage dedicated to Wilderness and roadless recreation than the Current Direction. Alternative L manages all the tentatively suitable timber land for timber production thus only those acres

which are not suitable for timber production are available for unroaded recreation uses.

Alternative L has 30 percent fewer acres withdrawn from oil and gas exploration and 26 percent fewer acres withdrawn from locatable mineral exploration than does the Current Direction. This is due to the wilderness proposal of the Current Direction.

Alternative L has 36 percent less undeveloped grizzly habitat than the Current Direction. This is due to the high timber emphasis.

Alternative L is focusing on timber production over 200 years so all the stagnated lodgepole pine is converted in the first five decades (93,000 acres). This is 35 percent more than the Current Direction. Alternative L eventually harvests all the lodgepole pine, but gets 45 percent less than the Current Direction in the first decade. In effect Alternative L is ignoring the risk of fire and insect damage related to leaving these stands and harvests those other stands (MIXCON I and II) that can contribute to faster growth over the 200 year time frame and higher harvests later.

Alternative L harvests 70 percent more timber in the first decade than does the Current Direction. This is primarily due to the constraint on volumes which was applied to the Current Direction to get output levels and budgets close to the current level and the efforts of Alternative L to maximize timber production. Without the limits on the Current Direction, Alternative L would only harvest 25 percent more timber in the first decade than the Current Direction.

In order to access the timber lands in the suitable base with the harvest schedule of Alternative L it would be necessary to build 6360 new miles of road by decade 5. This is 66 percent more than the Current Direction alternative. This difference is due to the higher suitable timber base in Alternative L and is the highest amount of road construction needed by any alternative.

Alternative L requires the highest budget of any alternative to carry out the various programs. Its budget is 69 percent higher than the Current Direction.

m. Alternative M (Maximum PNV Benchmark with departure from NDY)

(1) Quantified Comparisons

Quantity	Value	Rank From Highest	Change From Alt I - CD
Present Net Value	$1163 Million	1	+153 %
Opportunity Cost	$ 0 Million	14	-100 %
Present Value Costs	$ 697 Million	3	+ 28 %
Present Value Benefits	$1860 Million	1	+ 85 %
Jobs & Community Stability	2706 Jobs	2	+ 40 %
Visual Quality Protection	1092 M Acres	12	- 12 %
Wilderness/Roadless Quality	389 M Acres	13	- 12 %
Oil & Gas Withdrawals	148 M Acres	7	- 30 %
Locatable Mineral Withdrawals	185 M Acres	7	- 26 %
Undeveloped Grizzly Habitat	434 M Acres	9	- 21 %
Total Decade 1 Timber Harvest	262 MMBF/Year	1	+ 75 %
Decade 1 Lodgepole Pine Harvest	93 MMBF/Year	1	+ 21 %
Stagnated LPP Converted - Dec 5	1 M Acres	8	- 99 %
New Road Access by Decade 5	5230 Miles	4	+ 36 %
First Decade Budget (Approp.)	$24.1 MM/Year	2	+ 45 %

(2) Discussion

Alternative M is much like Alternative A except that fluctuations (25 percent in volume from one decade to the next) in timber harvest are permitted over the entire 200 year time frame modeled. The fluctuations are limited to the maximum amount that would seem to be feasible without causing excessive distabilization of the community over time. The application of the timber harvest constraint used in this run reduced PNV by $8 Million over a benchmark which had no harvest limitations at all. Refer to Section VI of this appendix for further discussion on this point. Since this alternative is the most lightly constrained of all the alternatives, it produces the highest PNV and is used as the maximum PNV benchmark for determining opportunity costs of the other alternatives.

(a) Cost Comparison

The next cheapest alternative in terms of the present value of costs is Alternative N which is $8 Million cheaper. Alternative N also departs from NDY, but not as much as Alternative M (+20 to -15% from one decade to the next with a return to NDY after decade 5). Since both Alternatives are headed in the same direction as far as management of the Forest, but Alternative N is constrained from going quite as far as Alternative M, it is not surprising to note that Alternative M has higher overall timber harvest volumes and suitable timber base along with higher road and timber costs.

(b) PNV Comparison

The PNV for Alternative M is $1163 Million, the highest of all the alternatives. The next lower PNV is $1148 for Alternative N. The ability of Alternative M to generate a higher PNV is related to the fact that its timber harvest is not as tightly constrained.

(c) Comparison to Current Direction

Alternative M has the highest PNV and the Current Direction has the lowest PNV of all the alternatives ($1163 MM vs $460 MM). The difference between the two alternatives is primarily because the harvest in the Current Direction model is constrained downward to current levels to keep the budget down and Alternative M has more latitude in harvest scheduling and in the assignment of land designations. Without the volume constraints the Current Direction would have a PNV of $909 MM. The additional difference is due to a different mix of land designations between the alternatives and the less tight scheduling constraints of Alternative M. As with the other Alternatives, the major difference is in the timber program. Timber and road costs are higher for Alternative M over the Current Direction, but these higher costs are offset by higher timber benefits to produce a higher net value.

With a higher timber harvest level comes more jobs in the timber industry. Alternative M has 40 percent more jobs than does the Current Direction. If the Current Direction model were not constrained by current levels of timber and associated budgets, Alternative M would provide 16 percent more jobs.

In order to produce high volumes of timber on its suitable timberland, Alternative M trades off 48,000 acres of visual quality compared to the Current Direction. The Current Direction uses the VIEWTM and TMVIEW designations to protect visual quality while generating a regulated flow of timber whereas Alternative M does not. The VIEWTM and TMVIEW prescriptions are costly and would not be consistent with the aim of Alternative M to manage timber in the most cost efficient manner.

Alternative M has 12 percent less acreage dedicated to Wilderness and roadless recreation than the Current Direction. This is related to the aim of the alternative to maximize PNV and the general situation wherein timber harvest produces higher PNV's than do recreation activities. It has 3 percent less acreage in this category than does Alternative A because the additional flexibility to schedule timber activities to meet the MMR's permits Alternative M to schedule additional acres for timber harvest.

Alternative M has 30 percent fewer acres withdrawn from oil and gas exploration and 26 percent fewer acres withdrawn from locatable mineral exploration than does the Current Direction. This is due to the larger wilderness proposal of the Current Direction.

Alternative M has 21 percent less undeveloped grizzly habitat than the Current Direction. This is due to the high timber emphasis.

Alternative M is focusing on cost efficient timber management thus only a minimal amount of stagnated lodgepole pine is converted in the first five decades (1000 acres). This is 99 percent less than the Current Direction.

Alternative M harvests 21 percent more lodgepole pine in the first decade than does the Current Direction. This is the highest of all the alternatives. This is due to a combination of a larger suitable land base, higher overall timber harvest levels and an increased ability to schedule more harvest while meeting the MMR's.

Alternative M harvests 75 percent more timber in the first decade than does the Current Direction. This is primarily due to the constraint on volumes which was applied to the Current Direction to get output levels and budgets close to the current level. Without these limits on the Current Direction, Alternative M would only harvest 22 percent more timber in the first decade than the Current Direction. The remaining difference is due to the latitude which Alternative M has to depart from NDY, assign land designations and schedule harvest.

In order to access the timber lands in the suitable base with the harvest schedule of Alternative M it would be necessary to build 5230 new miles of road by decade 5. This is 36 percent more than the Current Direction alternative. This difference is partly due to the higher harvest levels and suitable timber base of Alternative M. The additional difference is due to the fact that the limited harvest of the Current Direction and the time horizon of this analysis (200 years) allow some of the suitable timberland to escape management in the time period thus the roads are not needed.

Alternative M requires the second highest budget to carry out the various programs. Its budget is 45 percent higher than the Current Direction.

n. Alternative N

(1) Quantified Comparisons

Quantity	Value	Rank From Highest	Change From Alt I - CD
Present Net Value	$1148 Million	2	+150 %
Opportunity Cost	$ 15 Million	13	- 98 %
Present Value Costs	$ 689 Million	4	+ 26 %
Present Value Benefits	$1837 Million	2	+ 83 %
Jobs & Community Stability	2608 Jobs	3	+ 35 %
Visual Quality Protection	1102 M Acres	11	- 11 %
Wilderness/Roadless Quality	393 M Acres	12	- 11 %
Oil & Gas Withdrawals	148 M Acres	7	- 30 %
Locatable Mineral Withdrawals	185 M Acres	7	- 26 %
Undeveloped Grizzly Habitat	424 M Acres	11	- 23 %
Total Decade 1 Timber Harvest	247 MMBF/Year	3	+ 65 %
Decade 1 Lodgepole Pine Harvest	85 MMBF/Year	2	+ 10 %
Stagnated LPP Converted - Dec 5	1 M Acres	8	- 99 %
New Road Access by Decade 5	5270 Miles	3	+ 37 %
First Decade Budget (Approp.)	$23.2 MM/Year	3	+ 40 %

(2) Discussion

Alternative N is similar to both Alternatives M and A. It permits a departure from the NDY constraint of Alternative A, but that departure is more limited than the departure for Alternative M. Alternative N is permitted to depart only for the first five decades and, in that period, harvest can not decline more than 15 percent or rise more than 20 percent from one decade to the next (in cubic measure). This close relationship leads to the 1, 2, 3 ranking of the alternatives by PNV in the order of M, N, A with Alternative M having the highest PNV. The opportunity cost of $15 Million for Alternative N is associated with the more restrictive departure schedule than that permitted for the Maximum PNV benchmark (Alternative M).

(a) Cost Comparison

Alternative O achieves the same present value of costs as Alternative N. The next cheaper alternative is Alternative A. The discounted costs for Alternative N are somewhat higher than for Alternative A because the departure option permits more harvest in the early decades and a larger suitable timber base. Thus, the discounted timber and road costs are higher for Alternative N.

(b) PNV Comparison

The PNV of Alternative N is $1148 Million. This is the second highest PNV of all the Alternatives. Alternative M has a higher PNV because its harvest schedule has fewer constraints. Alternative A has a lower PNV because its harvest schedule (NDY) is more constraining.

(c) Comparison to Current Direction

Alternative N has the second highest PNV and the Current Direction has the lowest PNV of all the alternatives ($1148 MM vs $460 MM). The difference between the two alternatives is primarily because the harvest in the Current Direction model is constrained downward to current levels to keep the budget down and Alternative N has more latitude in harvest scheduling and in the assignment of land designations. Without the volume constraints the Current Direction would have a PNV of $909 MM. The additional difference is due to a different mix of land designations between the alternatives and the less tight scheduling constraints of Alternative N. As with the other Alternatives, the major difference is in the timber program. Timber and road costs are higher for Alternative N over the Current Direction, but these higher costs are offset by higher timber benefits to produce a higher net value.

With a higher timber harvest level comes more jobs in the timber industry. Alternative N has 35 percent more jobs than does the Current Direction. If the Current Direction model were not constrained by current levels of timber and associated budgets, Alternative N would provide 12 percent more jobs.

In order to produce high volumes of timber on its suitable timberland, Alternative N trades off 138,000 acres of visual quality compared to the Current Direction. The Current Direction uses the VIEWTM and TMVIEW designations to protect visual quality while generating a regulated flow of timber whereas Alternative N does not. The VIEWTM and TMVIEW prescriptions are

costly and would not be consistent with the aim of Alternative N to manage timber in the most cost efficient manner.

Alternative N has 11 percent less acreage dedicated to Wilderness and roadless recreation than the Current Direction. This is related to the aim of the alternative to maximize PNV and the general situation wherein timber harvest produces higher PNV's than do recreation activities. It has 1 percent less acreage in this category than does Alternative A because the additional flexibility to schedule timber activities to meet the MMR's permits Alternative N to schedule additional acres for timber harvest.

Alternative N has 30 percent fewer acres withdrawn from oil and gas exploration and 26 percent fewer acres withdrawn from locatable mineral exploration than does the Current Direction. This is due to the larger wilderness proposal of the Current Direction.

Alternative N has 23 percent less undeveloped grizzly habitat than the Current Direction. This is due to the high timber emphasis.

Alternative N is focusing on cost efficient timber management thus only a minimal amount of stagnated lodgepole pine is converted in the first five decades (1000 acres). This is 99 percent less than the Current Direction. Alternative N harvests 10 percent more lodgepole pine in the first decade than does the Current Direction. This is the second highest of all the alternatives. This is due to a combination of a larger suitable timber base, higher overall timber harvest levels and an increased ability to schedule more harvest while meeting the MMR's.

Alternative N harvests 65 percent more timber in the first decade than does the Current Direction. This is primarily due to the constraint on volumes which was applied to the Current Direction to get output levels and budgets close to the current level. Without these limits on the Current Direction, Alternative N would only harvest 21 percent more timber in the first decade than the Current Direction. The remaining difference is due to the extra latitude which Alternative N has to depart from NDY, assign land designations and schedule harvest.

In order to access the timber lands in the suitable base with the harvest schedule of Alternative N it would be necessary to build 5270 new miles of road by decade 5. This is 37 percent more than the Current Direction alternative. This difference is partly due to the higher harvest levels and suitable timber base of Alternative N. The additional difference is due to the fact that the limited harvest of the Current Direction and the time horizon of this analysis (200 years) allow some of the suitable timberland to escape management in the time period thus the roads are not needed.

Alternative N requires the third highest budget to carry out the various programs. Its budget is 40 percent higher than the Current Direction.

o. Alternative O

(1) Quantified Comparisons

Quantity	Value	Rank From Highest	Change From Alt I - CD
Present Net Value	$1064 Million	9	+131 %
Opportunity Cost	$ 99 Million	7	- 86 %
Present Value Costs	$ 689 Million	4	+ 26 %
Present Value Benefits	$1753 Million	9	+ 74 %
Jobs & Community Stability	2401 Jobs	8	+ 24 %
Visual Quality Protection	1382 M Acres	2	+ 11 %
Wilderness/Roadless Quality	574 M Acres	2	+ 30 %
Oil & Gas Withdrawals	228 M Acres	4	+ 8 %
Locatable Mineral Withdrawals	265 M Acres	4	+ 6 %
Undeveloped Grizzly Habitat	444 M Acres	7	- 19 %
Total Decade 1 Timber Harvest	215 MMBF/Year	10	+ 43 %
Decade 1 Lodgepole Pine Harvest	75 MMBF/Year	5	- 3 %
Stagnated LPP Converted - Dec 5	5 M Acres	6	- 93 %
New Road Access by Decade 5	4680 Miles	11	+ 22 %
First Decade Budget (approp)	$21.8 MM/Year	5	+ 31 %

(2) Discussion

Alternative O is similar to Alternative C except that added emphasis is given to the visual and non-motorized recreation resources. This is done by constraining the model to select either TMVIEW or VIEWTM, depending upon the visual quality objective for an area, or some non-developmental prescription rather than the TMBOPT or BGSRTM prescriptions. This is only done outside of grizzly habitat because the various entries associated with the VIEWTM and TMVIEW prescriptions detract from the quality of the habitat and would violate the MMR's. This alternative has the same 81,300 acre wilderness proposal as Alternative C. The opportunity cost of the NDY constraint has been estimated at $20 Million based upon the PNV of Alternative A. The additional opportunity cost of the wilderness proposal has been estimated at $14 Million based upon Alternative C. The additional opportunity cost of $65 Million can be associated with the added emphasis on the visual and recreation resources mentioned above.

(a) Cost Comparison

The next cheaper alternative in terms of the present value of costs is Alternative A. Alternative N has the same present value of costs. Alternative O has higher timber costs than Alternative A even though Alternative A harvests more volume because of the higher costs associated with the VIEWTM and TMVIEW prescriptions and the slightly higher acreage of stagnated lodgepole pine that is converted in Alternative O. Alternative O has lower road costs than Alternative A because it has a smaller suitable timber base. Recreation and wildlife costs are also a bit higher for Alternative O.

(b) PNV Comparison

The PNV for this alternative is $1064 Million. This is the ninth highest of all the alternatives. Alternative O has the same PNV as Alternative D. The tradeoffs between the resources supplied by these two alternatives is such that the opportunity costs of reaching the RPA goals for timber and Wilderness are equal to the opportunity costs for emphasizing the visual and recreation resources more heavily. Alternative O has lower timber and road costs and slightly higher recreation and wildlife costs than does Alternative D. To balance this off, Alternative O has higher recreation and wildlife benefits and lower timber benefits than Alternative D. The largest difference is in the road costs where Alternative D is $27 Million higher. This is primarily due to the additional 206,000 acres of suitable timber land in Alternative D.

(c) Comparison to Current Direction

Alternative O has a higher PNV than the current direction ($1064 MM vs $460 MM) primarily because the harvest in the Current Direction model is constrained downward to current levels to keep the budget down. Without the volume constraints the Current Direction would have a PNV of $909 MM. The additional difference is due to a different mix of land designations between the alternatives. As with the other Alternatives, the major difference is in the timber program. Timber and road costs are higher for Alternative O over the Current Direction, but these higher costs are offset by higher timber benefits to produce a higher net value.

With a higher timber harvest level comes more jobs in the timber industry. Alternative O has 24 percent more jobs than does the Current Direction. If the Current Direction model were not constrained by current levels of timber and associated budgets, Alternative O would provide three percent more jobs.

Due to the high emphasis on the visual and recreation resources, Alternative O has 142,000 acres more visual quality protection than does the Current Direction. Both Alternative O and the Current Direction use the VIEWTM and TMVIEW prescriptions to achieve visual quality objectives on suitable timber land. Alternative O has a smaller suitable land base due to the emphasis on roadless recreation. Thus Alternative O has almost 60 percent of its suitable timber land managed for visual quality where as the Current Direction has about 9 percent managed for visual quality.

Alternative O has 30 percent more acreage dedicated to Wilderness and roadless recreation than the Current Direction. Alternative O picks up the additional Proposed Wilderness discussed above along with other acres that did not fall into timber harvest prescriptions as discussed for Alternative A. Additional roadless designations arose when the economics associated with those designations were competing with the costly VIEWTM and TMVIEW designations rather than the cheaper TMBOPT and BGSRTM designations.

Alternative O has 8 percent more acres withdrawn from oil and gas exploration and 6 percent more acres withdrawn from locatable mineral exploration than does the Current Direction. This is due to the larger wilderness proposal of Alternative O.

Alternative 0 has 19 percent less undeveloped grizzly habitat than the Current Direction. This is due to the high timber emphasis outside of the Proposed Wilderness and inside grizzly habitat. Note that the constraints that were used to push more visual and recreation consideration into the model were applied only outside of grizzly habitat. As mentioned above this is because the added entries required to manage for visual quality detract from grizzly habitat usefulness.

Alternative 0 is focusing on cost efficient timber management subject to the constraints in the model thus only a minimal amount of stagnated lodgepole pine is converted in the first five decades (5000 acres). This is 93 percent less than the Current Direction. Alternative 0 has the fifth highest first decade lodgepole pine harvest of all the alternatives. This is fairly high because of the scheduling limitations associated with the constraints that were used to enhance the visual and recreation emphasis.

Alternative 0 harvests 43 percent more timber in the first decade than does the Current Direction. This is primarily due to the constraint on volumes which was applied to the Current Direction to get output levels and budgets close to the current level. Without these limits on the Current Direction, Alternative 0 would only harvest 5 percent more timber in the first decade than the Current Direction.

In order to access the timber lands in the suitable base with the harvest schedule of Alternative 0 it would be necessary to build 4680 new miles of road by decade 5. This is 31 percent more than the Current Direction alternative. This difference is partly due to the higher harvest levels of Alternative 0. Even though the current direction has more suitable timber land than Alternative 0 fewer roads are needed in the time horizon of this analysis (200 years) because some of the suitable timberland is never managed in that time period.

Alternative 0 requires the fifth highest budget to carry out the various programs. Its budget is 31 percent higher than the Current Direction.

p. Alternative JF (Final Plan)

(1) Quantified Comparisons

Quantity	Value	Rank from Highest	Change from Alt I -CD
Present Net Value	$ 733 Million	14	+ 59%
Opportunity Cost	$ 430 Million	3	- 39%
Present Value Costs	$ 611 Million	14	+ 12%
Present Value Benefits	$1344 Million	14	+ 34%
Jobs & Community Stability	2299 jobs	11	+ 19%
Visual Quality Protection	1311 M acres	3	+ 6%
Wilderness/Roadless Quality	518 M acres	4	+ 18%
Oil & Gas Withdrawals	227 M acres	5	+ 7%
Locatable Mineral Withdrawals	264 M acres	5	+ 6%
Undeveloped Grizzly Habitat	589 M acres	1	+ 7%
Total Decade 1 Timber Harvest (reg)	202 MMBF/Year	13	+ 35%
Decade 1 Lodgepole Pine Harvest	78 MMBF/Year	4	+ 1%
Stagnated LLP Converted - Dec 5	32 M acres	6	- 54%
New Road Access by Decade 5	3850 miles	13	0%
First Decade Budget (Approp.)	$19.2 MM/Year	13	+ 16%

(2) Discussion

Alternative JF is similar to the Proposed Action (Alternative J) except that (1) the Pillick Ridge Area is recommended for Wilderness designation, (2) additional old-growth will be retained and it will be outside the regulated timber base, (3) commercial thinning will not occur very often and (4) stagnated lodgepole pine stands will not be converted during the life of the plan.

(a) Cost Comparison

Timber costs are 13 percent lower than for the Proposed Plan primarily because commercial thinning is removed and stagnated lodgepole pine conversion is delayed. Commercial thinning contributed to increased PNV in the model, but commercial thins have proven very difficult to sell in the past. Thus, it was considered impractical to expect that the increased PNV could actually be achieved. In addition, removal of commercial thinning (and delaying stagnated Lodgepole pine conversions) results in lower budget needs. Because there are conditions where commercial thinnings can be sold and contribute to increased PNV, their elimination from the model is not intended to imply that they will never occur. Instead, it is expected that there will be some commercial thins occurring in the future as budgets permit. They are removed from the model so that values derived in the future are more realistic.

(b) PNV Comparison

The PNV for the Final Plan is $733 Million. This is fourteenth highest of the PNV's developed for the alternatives in the DEIS. It is a 20% decrease from the Proposed Action of the DEIS. The PNV is lower than that for Alternative K and higher than that for Alternative F. Alternative F was aimed at maximizing elk production while Alternative K sought to attain higher timber harvests in the first two decades through a departure schedule. On the cost side,

discounted road and timber costs are less for the Final Plan than for the Proposed Plan because of the smaller regulated timber base of the Final Plan. The smaller timber base is a result of increasing the acreage of MA 13 (old-growth timber) and removing it from the regulated base. In addition, the elimination of commercial thinning costs and delays in the costs of stagnated lodgepole pine conversion result in lower discounted timber costs. Discounted timber benefits are also lower due to the smaller regulated base and lower timber volumes in the future decades. While the costs dropped $26 Million, the benefits dropped $219 Million thus accounting for almost all of the change in PNV.

(c) Comparison to Current Direction

The Final Plan has a higher PNV than the Current Direction ($733 MM vs $460 MM) primarily because harvest in the Current Direction model is constrained downward to current levels to keep the budget similar to current levels. Without the volume constraints, the Current Direction would have a PNV of $909 MM and this would be higher than the PNV of the Final Plan. This $176 MM difference can be primarily attributed to the decrease in regulated timber base and the constraint to produce higher timber volumes in the first decade. Timber and road costs are higher than the current direction, but these higher costs are associated with higher timber benefits which offset the costs to produce a PNV higher than the Current Direction.

The Final Plan has higher timber harvest levels than the Current Direction and is estimated to contribute 19% more jobs. If the current direction were not constrained by current levels of timber harvest and associated budgets, the Final Plan would contribute 1 percent fewer jobs than the "unconstrained" current direction.

Due to the emphasis on visual quality through the use of MA-16 and MA-17 designations and through special applications of other designations which tend to preserve future options, the Final Plan provides 6% more visual quality protection than does the Current Direction.

The Final Plan has 18 percent more acreage dedicated to Wilderness and roadless recreation than the Current Direction. The Final Plan has 14,000 acres of additional Recommended Wilderness along with heavier emphasis on retaining options which has the effect of providing more acreage useful for unroaded sorts of recreation.

The Final Plan has 7 percent more acres withdrawn from oil and gas exploration and 6 percent more acres withdrawn from locatable mineral exploration than does the current direction. This is due to the larger Wilderness proposal of the Final Plan.

The Final Plan has 7 percent more undeveloped grizzly habitat than the Current Direction. This is the highest protection afforded to grizzly in any of the alternatives and reflects the emphasis on retaining options, including those affecting the grizzly bear.

The Final Plan emphasizes preserving options so 2 percent more of the lands below 5500 feet in elevation are designated for old growth timber retention.

The amount of stagnated lodgepole pine to be converted by the fifth decade is 54 percent less than envisioned in the Current Direction. This is contrary to the general goal of maintaining options because this land will not be immediately placed back into production and the risk of fire will remain high in these stands. This tradeoff is seen as necessary in the face of declining budgets and the high costs of conversion.

The Final Plan harvests 35 percent more timber in the first decade than does the Current Direction. This is primarily due to the constraint on volumes which was applied to the Current Direction to get outputs and budgets close to the current level. Without these limits on the Current Direction, the Final Plan would harvest 1 percent less timber in the first decade than the Current Direction.

In order to access the timber lands in the suitable base with the harvest schedule of the Final Plan it would be necessary to build 3850 new miles of road by decade 5. This is essentially the same as Current Direction. The harvest levels of the Final Plan are higher than those of the Current Direction, but the regulated timber base is smaller. The schedule of harvest for the Current Direction would not fully road the regulated base by the end of the 200 year analysis horizon because some of the suitable base is never accessed. The amount of land eventually roaded under the Current Direction is greater than that roaded under the Final Plan.

The Final Plan requires the 13th highest budget of the alternatives to carry out the various programs. Its budget is 16% higher than the Current Direction.

The Final Plan is very similar to the Proposed Plan as can be seen by those quantified items in the following Table which have not significantly changed. The decrease in PNV and increase in opportunity cost of the Final Plan is due to the combination of the following changes from the Proposed Plan:

- Old-growth timber designation increased to 10% of the Forest acreage below 5500 feet in elevation
- Old-growth timber designation removed from the regulated base
- Commercial thinning removed from the model
- Conversion of Stagnated Lodgepole pine stands delayed
- Timber harvest maximized in the first decade
- Redesignation of Pillick Ridge to Recommended Wilderness

These changes, either individually or in combination, also affected the other outputs which differ from the Proposed Plan.

Oil and gas and locatable mineral withdrawals increase by 12,000 acres with the increased size of the Proposed Scotchman Peaks Wilderness. The increased wilderness acreage is due to high public interest in Pillick Ridge as a quality Wilderness addition. Coupled with this is recent evidence that the potential for mineral resources in the area is less than previously estimated.

The first decade lodgepole pine harvest is 4% greater than the Proposed Plan. This is a result of reducing the regulated base and maximizing timber harvest in the first decade (subject to non-declining yield). The increased harvest level for lodgepole pine will provide enhanced opportunities to capture this volume before the trees are killed by the Mountain Pine Beetle.

(d) Comparison to the Proposed Action

The following table compares the Final Plan to the Proposed Action:

Table B-29

Kootenai National Forest

Comparison of Final Plan to Proposed Plan for Response to the Major Issues, Concerns, and Opportunities

Issue No.	Key Indicator of Issue, Concern and Opportunity	Proposed Plan (Alt J)	Final Plan (Alt JF)
2.	Suitable timberland managed (thous. acres) &	1,386	1,263
	% of total available	78	71
3.	New road construction needed by decade 5 (miles) and %	4,490	3,850
	change from existing in 1986	72	62
4.	Miles of new road construction needed in the first decade	2,440	2,370
5.	Total road system eventually required (miles)	10,690	10,050
6.	Recommended wilderness (thous. acres) and the number of	66	79
	locations	3	3
7.	Designated roadless acres in inventoried roadless areas (thousand acres)	202	192
9.	Inventoried roadless acres remaining after first decade	327	315
	(thous. acres) and % of total	81	78
10.	Total roadless recreation opportunity provided (thous.	518	521
	acres) and % of total Forest	23	23

Table B-29 (continued)

Kootenai National Forest

Comparison of Final Plan to Proposed Plan for Response to the Major Issues, Concerns, and Opportunities

Issue No.	Key Indicator of Issue, Concern and Opportunity	Proposed Plan (Alt. J)	Final Plan (Alt. JF)
12.	Additional road restrictions needed by fifth decade (miles)	4,480	4,130
14.	Old-growth timber (160 + yrs.) after 10 decades (thous. acres)	255	311
17.	First decade lodgepole pine harvest (mmbf/yr)	75	78
	and % change from last 5 years	+50	+56
18.	Stagnated lodgepole pine stands converted by the fifth decade (thousand acres)	70	32
19.	Projected withdrawals from oil and gas exploration (thous acres)	215	227
20.	Projected withdrawals from locatable mineral exploration (thousand acres)	252	264
22.	First decade total average annual budget needed (million $)	25.2	24.0
23.	First decade average annual Capital Investment road constr. funding needed (million $)	3.7	3.6
24.	First decade Appropriated Budget needed -- Capital Invest. plus Operation & Maintenance. (million $)	20.3	19.2

The model was provided with the option of delaying the conversion of stagnated lodgepole pine stands for as long as 100 years. Due to the high cost of this operation and the long time before returns are developed, the model delayed significantly more acres beyond decade 5. The effect is a reduction of 54% in the acres of stagnated lodgepole pine converted by the fifth decade.

New road access needed by the fifth decade (essentially all the new roads that will be ever needed) is 14% less than the Proposed Plan because of the smaller regulated timber base.

The first decade average budget is reduced by 5% due to the elimination of commercial thinning and reduced roading needs.

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APPENDIX B - INDEX

ALTERNATIVES	145, 149
A	149, 179
B	150, 182
C	151, 184
D	152, 187
E	153, 191
F	154, 193
G	155, 195
H	156, 198
I	157, 201
J	159, 202
K	160, 207
L	161, 209
M	162, 212
N	163, 215
O	164, 217
ANALYSIS AREAS	4, 12, 146
ANALYSIS OF THE MANAGEMENT SITUATION	94
ASPECT	3
ASSIGNED VALUES	127
BENCHMARKS	94, 107, 106
BENEFITS	37
Priced	44
BIG GAME	33
BUDGET	60
CAPABILITY AREAS	3
CLEARCUT	102, 123
CMAI	103, 112, 115
COEFFICIENTS	4, 27
COMMERCIAL THINNING	119, 131
COMMUNITY STABILITY	51
CONSTRAINTS	96, 147, 168
CORRIDORS	101
COST	37, 38
Budget	44
Capital Investment Roads	44
Efficiency	22, 36, 118
Fixed	33, 38, 139
Logging	39
Operation & Maintenance	44
Other Resources	39, 42
Production	39
Purchaser Credit Roads	44
Variable	38
CURRENT DIRECTION	116, 129, 140

CUSTODIAL PRESCRIPTIONS 21

DATA SOURCES 8
DISCOUNT RATES 36
DISPERSED RECREATION 140
DIVERSITY 98, 114, 123

EAGLES 100
ECOLOGICAL LAND UNITS 4
ECONOMIC IMPACT 61
ELEVATION 3
ELK 29, 33, 139
And Livestock 137
And Timber 137
And Wilderness 138
ENDANGERED SPECIES 100
ENERGY 34

FISH 31, 99
FIXED COSTS 34, 139
FORPLAN 10, 146

GAS 55
GRIZZLY BEAR 56, 100, 113, 122
And Timber 138

HABITAT TYPE 3

I/O MODEL 62
IMPLAN 62
IMPLEMENTATION 8

JOBS 51

LAND TYPE 3
LAWS 100
LIVESTOCK 29, 34
And Elk 137
And Timber 137
And Wilderness 138
LODGEPOLE PINE 57

MANAGEMENT REQUIREMENTS 96
MARKET VALUES 127
MAXIMUM OUTPUT LEVELS
Elk 116
Timber 116, 128
Wilderness 116, 128
Wildlife 128
MINERALS 55

MINIMUM
Budget 116
Management 128
Management Requirements 96, 122, 123
MONITORING 7
NET PUBLIC BENEFIT 35
NET SUBJECTIVE VALUE 50
NON-DECLINING YIELD 103, 113, 114
NON-PRICED OUTPUTS 51

OIL 55
OPPORTUNITY COSTS 49, 95, 121

PESTS 98
POPULATION 71
POTENTIALS
Dispersed Recreation 140
Economic 138
Elk 139
Timber 139
Wilderness 140
PRESCRIPTIONS 16, 22
RANGE BENEFITS 47
RANGE COSTS 41
RECREATION
Benefits 48
Costs 41
Developed 32
Prescriptions 21
Yield Tables 28
REFORESTATION 102
RETURNS TO THE TREASURY 50, 66
RIPARIAN AREAS 98
ROADS 30, 33, 59, 101
Costs 40
Temporary 102

SEDIMENT 31
SLOPE 3
SOCIAL IMPACT 61, 67
SOILS 97, 113, 122
SPECIAL AREA PRESCRIPTIONS 21

THREATENED SPECIES 100

TIMBER	139
Benefits	45
Capability	4
Condition Class	15
Costs	40
Demand	36
And Elk	137
And Grizzly Bear	138
Harvest Intensities	26
And Livestock	137
Prescriptions	20
Suitability	5, 15
Yield Tables	27
TRADEOFFS	168
UTILIZATION	103
Standards	126
VIEWING	
Prescriptions	20
Quality	52
Sensitivity	4
WATER	30, 97, 113, 122
WILDERNESS	53, 140
And Elk	138
And Livestock	138
And Timber	137
WILDLIFE	99
Benefits	48
Costs	41
Prescriptions	20
Use	4
WOLVES	100
WORK FORCE	67
YIELD TABLES	27