United States
Department of
Agriculture

Forest Service

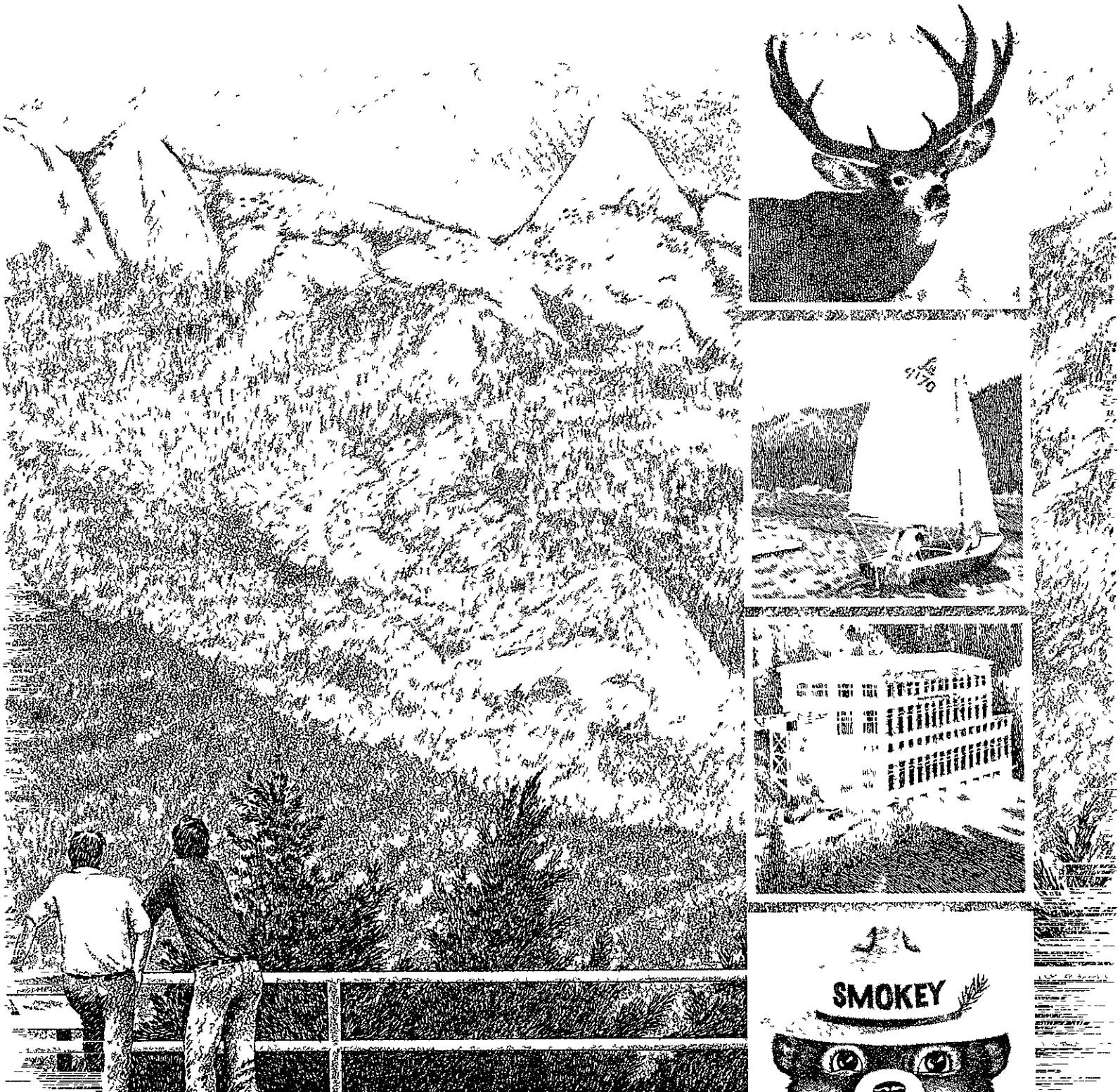
Pacific
Southwest
Region

1991

APPENDICES

Chapter 7.0 of the Final Environmental Impact Statement

Sierra National Forest



UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
SIERRA NATIONAL FOREST
1600 TOLLHOUSE ROAD
CLOVIS, CA 93612
(209) 487-5155

REPLY TO: 1920

DATE: April 3, 1992

Dear Interested Party:

Enclosed are copies of the Sierra National Forest Plan and Final Environmental Impact Statement (FEIS). The documents describe how National Forest Systems lands are allocated for various uses including recreation, wilderness, wildlife habitat, streamside needs, timber harvesting, reforestation, grazing, etc. It establishes standards and guidelines for future projects; provides general land allocation direction; and requires future monitoring of the Forest to ensure healthy, productive resources for the future.

Normally, the Forest Service prepares a Record of Decision to accompany the Plan and FEIS. However, before Regional Forester Ronald Stewart makes a decision on the Final Plan there will be a 60-day public comment period for you to review the documents.

The 60-day period is an informal review period. Six years have passed since the Draft Plan and Environmental Impact Statement (EIS) were released and there have been changes in the planning direction over that time. Because of this, we believe it is important to allow the public another opportunity to comment. We are particularly interested in any new or additional factual information you may have. After the public comment period ends, needed changes to the document will be addressed in the Regional Forester's Record of Decision.

We hope you will take the time during this 60-day comment period to review the plan and provide us with your comments. My staff and I are available to meet with you or to make presentations to your group about the Plan. Your comments must be received at the following address no later than June 4, 1992:

Sierra National Forest
ATTN: LMP
1600 Tollhouse Road
Clovis, CA 93612

If you have any questions please contact Merlin Hehnke at (209) 487-5985. Thank you for your continued interest in the Sierra National Forest.

Sincerely,

JAMES L. BOYNTON
Forest Supervisor

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APPENDIX A - ISSUES, CONCERNS, AND OPPORTUNITIES

A 1
THE SCOPING PROCESS

The central elements of the Forest planning process are key public issues, management concerns, and enhancement opportunities. A public issue is defined here as a Forest matter of widespread interest that was developed through public involvement. A management concern is a Forest problem or constraint that was developed by the Forest Service. Enhancement opportunities represent development potential for one or more national forest resources. The process of developing the key issues, concerns, and opportunities is called scoping.

The Forest Plan scoping process was formally initiated on March 25, 1979 when a Notice of Intent (to produce an environmental impact statement) was published in the Federal Register.

Public involvement in the scoping process started March 31, 1979, with the mailing of preliminary issues to 500 organizations, groups, and individuals for a 30-day comment period. These issues were developed by the Forest Management Team based on past public involvement in planning and the Team's perception of the current situation. Included with the issues was a list of screening criteria to be used in determining the final set of issues to address in the Plan

The following is a list of the screening criteria used to evaluate potential issues:

1. First Level

    a Is it an issue involving Sierra National Forest or within its zone of influence?

    b Can the issue be resolved at the Forest level?

    c. Is it a highly localized issue that can be resolved more effectively through existing administrative or management channels?

2. Second Level

    a. Scope - What land area(s) are involved?

    b Intensity - Does the issue have broad public concern?

    c Duration - How long is the issue likely to remain an issue?

    d Significance - How important is it?

During the 30-day review period, public meetings were held in Fresno on April 16 and 17, 1979. At these sessions participants were given an overview of the preliminary issues and the screening criteria They were also presented with an opportunity to ask questions, comment on the preliminary issue, or present additional issues and opportunities. More than 60 people attended the meetings and 20 oral and written statements were presented.

During the same period, a number of meetings were held with various organizations to identify issues, concerns, and opportunities, and to check for compatibility of management.

Meetings were held with the Planning Departments of Mariposa, Madera, and Fresno Counties, Yosemite and Sequoia/Kings Canyon National Parks, Bureau of Land Management, and the Fresno County Council of Government to review their concerns. Discussions were also held regarding their most recent plans and any compatibility problems that might exist between their plans and those of Sierra National Forest.

Discussions with the California Department of Fish and Game dealt with habitat for fish and wildlife. Primary attention was devoted to deer and the five deer herd plans.

Indian groups contacted included Big Sandy Rancheria, Sierra Mono Museum, American Indian Council of Mariposa County, Native American Heritage Commission, Fresno American Indian Council, Native American Advisory Council, and the Central Valley Indian Health Unit. Principle topics included religious freedom, access to Forest lands, collection of native material, use and development of hot springs, and collection of artifacts.

Owners of large parcels of land within the Forest, as well as the two major utility companies (PG&E and SCE), were also contacted to better understand their concerns and needs.

Responses of these organizations, as well as those of many other groups and individuals are available in the Forest Planning files.

In December 1979, the Forest Planning Team reviewed the public comments and prepared the final issues, concerns, and opportunities (collectively called the Forest Issues Document). The issues and related planning questions were distributed to over 500 individuals and groups Public distribution of the Forest Issues completed the initial Forest scoping process.

Meetings with many of the organizations, groups, and individuals contacted during initial scoping continued throughout the entire planning process

A 2
CONSULTATION WITH OTHERS CONCERNING THE ORIGINAL DEIS AND PLAN

The Forest Planning Team used the Forest Issues documentation as the cornerstone for developing management alternatives. The Team developed alternatives by selecting different solutions to the combined Forest Issues.

In May 1980, the Forest distributed a set of five preliminary alternatives to the public. More than 1,400 copies of the alternatives were distributed by mail and at 6 public meetings in Fresno and 4 mountain communities. Over 340 people attended the meetings. The Forest received 30 oral statements and 190 written comments on the five preliminary alternatives. These comments are available in the Forest Planning files.

All of the comments received concerning the preliminary alternatives were summarized by the Forest These comments were considered by the Planning Team during revision of the alternatives and during preparation of the Draft Environmental Impact Statement and Draft Forest Plan

The Draft Forest Plan and accompanying DEIS were distributed to the public during December 1981 through March 1982. Initially, about 600 copies of the draft documents were mailed to individuals, groups, and agencies on the Forest mailing list. Concurrently, District Rangers and Forest staff delivered about 100 copies to community leaders, organizations, and local government agencies. Approximately 900 copies were distributed in response to requests received through the mail.

Throughout the 90-day public review and comment period, Forest officials met with interested individuals, organizations, and government agencies to explain the draft planning documents and to answer questions. Many organizations asked members of the Forest staff to appear before their membership, Board of Directors, or conservation committees. Presentations ranged from general informative talks at service clubs to detailed presentations for special interest groups and professionals. More than 100 presentations were made to requesting organizations

In February 1982, 8 open houses were held at the 5 District offices and in Fresno and Madera. Subsequently, members of the Planning Team participated in meetings with Forest employees, Pacific Southwest Forest and Range Experiment Station in Fresno, and the California Department of Fish and Game. At all of these meetings, the DEIS and the Draft Plan were explained and participants had the opportunity to have their questions answered by the Planning Team and Forest staff

By the end of the 90-day public review period, 470 comment letters were received Responding individuals, groups, and agencies are included in Table A.01.

In general, recreation received the most attention in the responses to the DEIS and Plan. The following breakdown shows the approximate percentage of the total comments addressed to each major resource of Forest program.

Recreation	53%
Wilderness	12%
Timber	7%
Wildlife and Fish	4%
Hydroelectric	3%
Lands and Cultural Resources	3%
All Other (14 categories)	18%
	100%

Two new issues emerged during the review period. They were concern over hydroelectric development on mountain streams and rivers, and the associated Wild and Scenic River question.

The Forest Planning Team used the analysis of the comments on the Draft Forest Plan and DEIS in developing a final Forest Plan and EIS in October 1982. Before the FEIS and Plan were released to the public, the United States Court of Appeals for the Ninth Circuit upheld the State of California's 1979 challenge of the Forest Service's Roadless Area Review (RARE II) EIS The Forest was subsequently directed to re-evaluate management options in seven unroaded areas that had been allocated to nonwilderness or wilderness by RARE II

A 3
ADDITIONAL SCOPING

To accommodate the re-evaluation of unroaded areas, the Forest terminated efforts to distribute the final Forest Plan and began a new scoping program for the 7 unroaded areas in September 1983. The scoping process was completed by mailing maps of the seven areas, an accompanying explanation, and requests for comments to those on the Forest's mailing list. In addition, a public meeting was held in Fresno on September 27, 1983

The Forest received approximately 35 comment letters during the second scoping effort. The Forest Planning Team reviewed the comment letters and concluded that none identified new Forest Issues.

Since the additional scoping took place, passage of the California Wilderness Bill and Public Law 100-150 resolved the unroaded issue by adding 178,000 acres of new wilderness and designatingythe Kings River Special Management Area.

In November 1984 the DEIS and Forest Plan was submitted to the Pacific Southwest Region Office for review and approval This review led to a request to address the Wild and Scenic River issue presently under study by the Forest Service and to address other subjects

of concern In early 1985 extensive scoping and public review was undertaken on the wild and scenic river issue. This issue and other concerns were incorporated into the Land Management Plan. The revised DEIS and Forest Plan were submitted to the Pacific Southwest Regional Office in September 1985 for review and subsequent forwarding to the Forest Service in Washington D.C

The final set of selected issues and planning questions to be addressed in the revised DEIS are listed in Chapter 1 A comparison of how individual alternatives deal with the issues is presented in Table 2 31 of Chapter 2. The effects of the various Forest issues on PNV is also discussed in Chapter 2.

On September 5, 1986, Notice of Availability of the Draft Environmental Impact Statement and Plan was published in the Federal Register, establishing a public comment period ending December 20, 1986. This period was later extended to January 20, 1987

An initial mailing of 1,200 sets of the planning documents was made to individuals, organizations, agencies, elected officials, and others known to be interested. Approximately 500 additional sets were distributed Copies of the Plan were sent to local county, state and university libraries Copies were also available at the Forest Supervisor's headquarters and at the four Ranger District offices.

During the four-month public review period, eight public meetings and two formal public hearings were held

At the public meetings details of the environmental documents were explained and questions were answered by members of the Forest interdisciplinary team and Forest managers. At the public hearings a court reporter was provided to record the public testimony. At the request of a number of organizations, additional small-group presentations were given during the public comment period District rangers and Forest staff also made numerous contacts with individuals and cooperating agencies.

The distribution of the planning documents and the public involvement activities that followed led to 1,870 responses. These responses included approximately 6000 comments.

Five new issues emerged during the review period. They included concern over the ASQ, clearcutting, the economic impact of the ASQ on North Fork and other small communities, spotted owl habitat, and the Budget Conversely, neither the public nor the Forest Management Team found energy to be a resolvable issue. During our analysis of the energy issue described in the DEIS the following situation emerged·

1) Biomass conversion could not be estimated because of unknown variables such as the supply of energy, costs, and the declining demand for fuelwood;

2) Oil and gas sources within the Forest were unknown;

3) Geothermal energy was not likely to be developed,

4) The demand for bus service to the Forest had not materialized, and

5) The public did not perceive energy as an issue based on the Forest receiving only two comments pertaining to this subject

Energy saving efforts have become routine rather than part of long goals and policies Normal practices include the widespread use of smaller more fuel efficient vehicles, scheduled retrofitting of buildings for energy conservation, and designation of public fuelwood gathering areas. While these efforts help reduce energy consumption, they contribute little to the overall energy issue.

The Forest Supervisor concluded, therefore, that because energy was not an issue with the public and since energy cannot be resolved in this planning effort that the issue is unresolvable and should be dropped

The Forest planning team used the analysis of the comments on the Draft Plan and the DEIS in developing the final Forest Plan and EIS.

Meetings held and comments received during the entire planning process to date are documented in the Forest Planning files located in the Supervisor's Office. These comments played an important role in shaping the set of alternatives and the Standards and Guidelines presented in the FEIS.

A.4
COORDINATION WITH ADJACENT FORESTS

During the planning process several central National Forests with the Sierra Nevada Range, including the Sierra National Forest, have met periodically to discuss and standardize Management Practices, Management Direction, and FORPLAN modeling. Analysis of Further Planning Areas and inventoried rivers for possible inclusion in the National Wild and Scenic Rivers System, which crossed Forest boundaries, was done in conjunction with Stanislaus, Inyo, and Sequoia National Forests. Also, the management of Merced River and Kings River canyons has been coordinated between adjacent forests, as well as several shared wilderness areas.

TABLE A.01 - LISTING OF RESPONDENTS TO THE ORIGINAL DEIS

Federal Agencies

Office of Minority Affairs - Washington, DC
Department of Agriculture
Department of the Interior - San Francisco
Environmental Protection Agency - San Francisco
Federal Energy Regulatory Commission - San Francisco
Department of Health and Human Resources
Public Health Services - Atlanta

California State Agencies

Department of Forestry - Fresno
Resources Agency of California - Sacramento
Native American Heritage Commission - Sacramento

County Agencies

County of Fresno -
    Planning Department
    Resources Department
    Public Works Department
Madera County -
    Board of Supervisors
    Sheriff's Department
Mariposa County Planing Commission

Other Local Agencies

Big Creek Community Service District
Bid Creek School District
Big Sandy Rancheria
Council of Fresno County Government
Madera Irrigation Districts

Commercial Forest Permittees

Cedar Crest Resort
D & F Pack Station
Florence Lake Resort
Gold Arrow Camp
Huntington Lake Resort
Lost Valley Pack Station
Mammoth Pool Resort
Snow Summit Ski Corp.

Other Businesses and Permittees With Forest Interests

Akers, C. E
American Forest Products Co. - Fresno
E. B. Yancy Lumber Co. - Madera
Kottmeier Company, Inc. - Visalia
Lassotovich, F. R , G , & A.
Muir Trail Ranch
Pacific Gas and Electric Co. - San Francisco
Rock Creek Pack Station - Bishop
Southern California Edison Co. - Long Beach
Topping, Leonard & Jane
Wickes Forest Industries - Dinuba

Organizations

Boy Scouts of America
    Mount Whitney Area Council
    Stanford Area Council
    Southern Sierra Council
    Verdugo Hills Council
California Association of 4WD Clubs - Sacramento
California Native Plant Society - Berkeley
California Trout - San Francisco
Defenders of Wildlife - Sacramento
Earth National Park - Fresno
Ecology Center of Southern California - Los Angeles
Equestrian Tails, Inc. _ Mariposa
Fly Fisherman for Conservation - Fresno
FORMPOC (Forest Management Planning Overview Committee) - North Fork
Four Wheel Drive Club of Fresno
Fresno Audubon Society
Fresno County Sportsmens Club
Fresno Yacht Club
Friends of the River Foundation - San Francisco
Gilroy Fisherman (petition) - Gilroy
High Sierra Packers Assoc., Western Unit - Clovis
Home Camp Creek Tract
Huckleberry Water and Development Association
Huntington Lake Association
Kaweah Flyfishers - Visalia
Lower Deer Creek Water and Development Assoc.
Madera County Cattlemen's Association - Madera
Mariposa Trail Riders
Northern California Council of Fly Fishing Clubs
Northern Californians for Wilderness - Susanville
yorth Fork Chamber of Commerce
Outdoor Enterprises - Fremont
Private Property Rights Assoc. - Coarsegold
Resource Development - AuberrySan Joaquin
Wilderness Assoc - Fresno
Save Whiskey Creek Assoc - North Fork
Schusski Intramural Racing League - Los Angeles
Sierra Assoc. for Environment - Fresno
    Sierra Club
    N CA/Nevada Conservation Committee - Oakland
    Sierra Club- San Francisco
    Sierra Club, Tehipite Chapter - Fresno
Sierra Trail Bikers - Fresno
Society of American Foresters, High Sierra Chapter - Fresno
South Bay Ski Club - Manhattan Beach
Sportsmen's Council of Central California - Fresno
United States Ski Association - Washington, DC
Wildlife Management Institute - Washington, DC
Wildlife Society, San Joaquin Chapter - Fresno
Women in Timber, Central Valley Chapter - Fresno
Yosemite National History Assoc.

Individual Respondents

Alec, Lind

Allegado, George
Allen, M G.
Allen, Thelma
Alman, Don
Altwein, D. W.
Aqueda, Margaret
Atamian, Howard

Baker, Genevieve
Bakke, W.
Ball, Richard
Ball, Thomas
Ballard, Bob & Family
Ballsun, C.
Baraldi, Peter
Baranek, Paul
Barker, Arthur L. & Ruth A.
Barndollar, Nancy
Barnett, Lucinda
Bates, Donald & Marjorie
Batey, Carol
Battenberg, Thomas
Battylia, Alex
Bearden, George
Beck, Stephen L.
Belton, Jon
Bender, Marguerite
Berg, Allean
Berggreen, Barbara
Birnbaum, Alan
Bladen, Cindy
Block, Philip
Boardman, Howard
Bowker, Don
Box, Claudia & Bernice
Bradway, Don
Bridges, George
Brockway, Evelyn
Brough-Stevenson G.
Brown, Francis
Bryan, Sam
Buckner, Lloyd
Buford, Randy
Bull, William R
Bullemer, Robert
Bullock, Barbara
Bullock, Mark
Bunn, Maury
Burgess, Joseph B.
Burk, Pete & Joyce
Byron, Juan

Carlson, Leroy
Carson, Allan M
Cassel, T. R.
Chapel, Mike
Chasteen, A. J.
Chedester, Thomas
Christenson, Daniel
Clemo, Robert
Clinco, Robert A.
Colegrove, Charles
Colen, Marc
Coles, Kathy
Collins, Jeffrey
Copeland, Barbara
Copeland, Donald
Corsaro, Robert L.
Costello, Marlin
Coulter, W. Dixon
Coulter, Sandra
Cowin, Doug
Crill, Michael
Croker, Kenneth S.
Crumpley, Elsa

Dargan, Thomas
Davis, Aileen D. & Byron H.
Davis, Margaret
Dawson, Bronwyn
Day, Barbara
Deauville, Paul
Debono, Roberts
DeGarmo, Thomas
DeGraff, Jerome V.
De Jager, William
Dellavalle, Ann
De Roche, W. Tim, Jr
Dollar, Frances
Durham, Harry

Emmert, Patrick
Englund, Ward
Erberts, J. Gordon
Esquibel, George
Evans, Frances S
Evans, Kenneth R.

Fairless, Larry & Jeanie
Fairweather, Mr. & Mrs. J.
Farnnam, Mrs. W. E , Jr.
Farris, Lloyd & Linda
Farris, Margorie & Ragene A
Flemming, Robert K.
Finkelstein, Hy
Foreman, Robert & Jeanne
Fowler, Lynn M.
Frazer, Tim
Freeman, Barbara
Futlick, Shirley

Gailey, Mark
Garner, Jack
Gerstung, Eric
Gibbons, Henry
Gilgun, Michael
Gillis, G.
Gitchel, Sam
Goldsmith, Ken
Gordon, Charles H. & Carolyn M.
Gowing, D. R
Gradle, Bruch

Gray, Mark
Griffin, Robert E.
Guenther, Ron

Halls, Dorothy
Hammerburg, Ken & Alice
Hampson, Lee G.
Hansen, William
Hardin, Dennis
Hardy, Kathy
Harmon, David
Harmon, Donald
Harmon, Raymond & Jean
Harpain, Elmer J.
Harris, Richard L
Harrison, Keith
Harsh, Mr. & Mrs J R.
Hart, William
Harter, O Clyde
Harwell, Doug
Haslam, Gerald
Haslett, Roy
Heberle, Irvin W.
Henning, Albert
Hennings, Barry A. & Patricia F.
Hiestand, Kathryn
Holt, Donald
Horn, Charles
Horvath, Peter J
Hoskinson, David
Huckins, John
Huffman, Frances
Hull, Charles G.
Hull, Robert F.
Hutchings, Alison
Hutchinson, Rick

Ingram, John P., Jr.
Inman, Jack

Jackson, Leon & Jane
Jakovina, Robert A. & Harriet E
Janson, Frans
Johnson, H M
Johnson, R. Blaine
Johnson, Vernon W.
Joseph, Myron
Junell, Robert

Kangas, Richard
Kanne, Robert
Karrer, H. Edward & Pearl
Kawakami, Alan T.
Kearney, Robert
Kelkenberg, R. & S.
Kessler, Robert & Rosalind
Kidd, John C. & Judith K.
Kientz, Marvin
Kilbourn, Keith
Killian, Martin
Kline, John
Klock, Brian
Koodlock, Marion
Koon, Mildred E.
Kovac, Thomas W.
Krase, Robert
Kratz, Sharon H.
Krukow, Walter
Kruse, Scott M.
Kutcher, Celia

Larson, Jeff
Law, James
LaZier, Cathie
Leach, Cecelia
Lejse, Cosette
Levin, Lee
Leitan, Patricia
Lewis, Sherman
Liles, Jerry
Lindeman, Annette
Lindemann, Theodore
Lindley, Phyllis
Linneman, James
Lobree, Floyd
Longtin, Gilbert J.
Lucrezi, Ted
Lyle, Philip

Majalca, Christine
Markus, Stephen J. & Sharley M.
Marshall, Irene
Martin, Frances
Martin, Jim
Mason, Lynette
McCandless, Richard
McCann, Laurie
McCloskey-Dozier, Eileen
McClymonds, J D. & H. P.
McCormick, Meredith
McGowan, Mel
McLaughlin, Lucy
McLaughlin, Robert J.
McLean, Rita
Mead, Mary
Meagher, Kathleen
Miller, Joaquin
Miller, John
Miller, Neal
Miyashire, Rand
Moffitt, Kathy
Mohan, Carol
Molarsky, Margaret
Morgan, J. R
Morinini, Julian
Morrow, Margaret
Moticha, Joseph
Muller, Bud
Murchie, Tom
Murray, Alison
Muttersbach, C

Nash, Annelies
Nelson, H K.
Nichols, Larry
Nichols, Robert
Nichols, Nancy
Noble, Bruce & Karen
Norris, Frank

O'Connell, Thomas
Ogle, Vicki
Ohman, Susan
Olson, John A.
O'Rear, Paul
O'Rourke, Joseph P.
Owens, Gary

Palamari, Demetra
Patterson, Christine
Paulovich, Mike
Peck, Leslie
Peterlin, Frank
Petersen, S. R.
Petry, Austin G.
Phelps, Pearl A & A C.
Phillips, Alfred
Piirto, Doug
Pitzer, R. H.
Pratt, Dave
Price, William
Price, Viola
Prichard, Shari
Puckett, Bruce & Christina
Romano-Puckett
Ralph, Bill
Rand, Deirdre & Randy
Randolph, Bob
Reden, Vernon
Reeves, M.
Regan, John J.
Remus, Andrew
Replogle, Cliff
Reynolds, Charles R.
Richberger, Wanda
Richy, Donald B.
Riecher, Bonnie
Roberts, Clarence & Anita
Robertson, Becky
Robins, Barbara
Roediger, Edward
Roessler, Bernhard
Rogers, Priscilla
Rose, Gene
Rowe, Jemina
Rownd, Stewart
Rumjahn, Theresa
Russell, Fern B.
Rybicki, Dave

Sanders, Ellen
Sattler, W. & G
Sauer, Keith
Shovest, Dr. & Mrs. Gary
Schroeder, Arthur E.
Shadduck, Louise
Shea, Joanna
Shepard, Teena
Shields, Brian
Shuford, Clyde
Silliman, Bill
Simon, Horst
Sinay, Margaret
Sipes, Kenneth
Skovran, William
Smith, Euell & Barbara
Smith, Genny
Stashak, George
Stokes, Tim
Stork, Ron
Storms, Larry
Stover, Jerry
Stracham, Barbara
Stromsness, Chris
Stull, Judson & Marcella
Sturm, Grant & Gladys
Summers, Zoe & Jeff
Sutton, Francis
Swanson, John R.
Syverson, Michael

Taliaferro, Mitch
Tarbet-Knowlton, Angela
Thaker, Malay
Thomsen, Christopher
Thorp, Glenda
Tillia, Cheryl
Tillia, John L.
Tracy, Karen

Uphold, William B
Underwood, James R

Van Atta, Lester C.
Van Bossuyt, Daniel & Melinda
Lee-Van Bossuyt
Van Ginkel, Winifred
Van Santen, Robert
Vorum, Dore

Ward, John
Waters, Gary
Watkins, H. M. S.
Wattenberger, William
Weatherson, Jerry
Weaver, John & Phyllis
Weidert, Carl
Welch, Robert
Welker, Francia M.
Welton, Laurie
White, Francis J.
White, Richard
White, Robert K.
Whitman, Lew

Whitmore, George
Whitmore, Nancy
Wiebusch, Susan & John
Wilkinson, Dorothea & W. D.
Willard, Dwight M.
Williams, Shelley
Wilson, Curtis & Ellen
Winn, David & Mathers L.
Womack, Rhoda H. & J. Printise
Wong, Gary
Wrinkle, Sharon

Yee, Donna
Yocum, Donna

Zalky, Marcus
Zane, Bryan
Zane, Burke
Ziemer, Don & Ann

B.0
APPENDIX B - THE MODELING AND ANALYSIS PROCESS

B.1
ORIENTATION

The purpose of this appendix is to present a technical discussion of the analysis process and models used. Basic assumptions, model components and inputs, modeling rules and methods, and modeling constraints imposed, along with their rationale and impacts, are described in this appendix. Information presented in this appendix supplements the broader and less technical descriptions that are included in the body of the FEIS. See Chapter 2, Section 2.2.2 for a description of the overall process, Chapter 2, Section 2.3 for the result of the benchmark analysis, and Chapter 2, Section 2.7 for additional discussion of the alternatives

FORPLAN [1] is the primary modeling tool used to assure that land allocations and outputs schedules for alternatives and benchmarks are made in a way that meets all constraints in the most cost efficient manner possible. In addition to being used to formulate alternatives and benchmarks that are both feasible and cost effective, FORPLAN is also used to perform detailed accounting work and to generate summary reports of information needed to construct the display tables in the EIS. Additional models are used to generate input data for use in FORPLAN and to interpret output data from FORPLAN. RAMPREP [2] is the growth and harvest model used to make timber yield estimates for use in FORPLAN. The FIREPLAN system was used to estimate the fire organization, activity levels, and fire management costs required to efficiently achieve the program direction for each alternative. An income and employment model was developed, using the RIM [3] system to estimate income and employment effects from changes in Forest outputs. The Effective Alteration approach employed perspective plot computer simulations to correlate levels of timber harvesting with Visual Quality Objectives. A more detailed description of each of these models is included in this appendix.

B.2
THE FOREST PLANNING MODEL

B 2.1
Overview

FORPLAN is a specialized matrix generator and report writer for a standard linear programming algorithm called "Functional Mathematical Programming System" (FMPS) [1]. Linear programming is a standard mathematical technique for solving simultaneous linear equations subject to a certain set of constraints and a particular objective function.

In the FORPLAN formulation, the linear equations (rows) represent resource production functions, costs, acreage, or other types of constraints. For example, row 1 might represent timber production; row 2 might represent total cost; row m might represent acres burned by wildfire. The columns j = l, n) represent the different activities (prescriptions) which can occur over time on specific units of land called analysis areas (represented by x_j). The a_j's in the matrix are the production, cost, or resource coefficients associated with each prescription/analysis area combination. The b_j's are the right-hand-side constraints representing exact amounts (=) or upper (<) or lower (>) constraint levels that must be met.

In the example above, if row 1 represents timber production, the interpretation of the constraint --

$$a_{11} x_1 + a_{12} x_2 + a_{13} x_3 \ldots a_{1n} x_n \; b_1$$

would be the "total amount of timber produced from all prescriptions and anlysis areas must be greater than or equal to the amount b_1."

The FORPLAN model was built by representing the production functions, costs, values and resource supplies for the Forest in the mathematical format described above. For the Forest, the resulting model contained approximately 36,000 columns and 2,800 rows. Once the model was formulated, a number of test runs were made to check the model for reasonableness and to make additional calibrations. Land allocations, activity and output schedules, costs, benefits, and present net value were developed by altering the objective function and constraint set to meet the theme of each alternative and benchmark, and then running the model.

Unique constraint sets were developed to represent minimum management requirements, minimum implementation requirements, Forest discretionary

[1] See Johnson, K. Norman, Daniel B. Jones, and Brian M. Kent, Forest Planning Model (FORPLAN) User's Guide and Operations Manual, USDA Forest Service, May 1980.

[2] See R-5 Inventory Process, July 1981, USDA Forest Service, Pacific Southwest Region for a more detailed discussion of RAMPREP.

[3] See Industry--Specific Gross Output Multipliers for BEA Economics Areas, Regional Economic Analysis Division, Bureau of Economic Analysis, U.S. Department of Commerce, January 1977.

constraints common to all alternatives, and specific land allocations and output schedules needed for individual alternatives.

An interactive process was used to formulate these constraint sets prior to making final FORPLAN runs for the alternatives and benchmarks (see sections G, H, and I of this appendix).

FORPLAN was used to determine the most cost effective mix of goods and services that could be produced from the Forest, given the objectives and constraints of each alternative. Tradeoffs made among alternatives were examined and the costs and benefits associated with each objective or constraint measured. This analysis provided a way of indirectly evaluating the nonpriced benefits by measuring the amount of present net value (PNV) foregone The final criterion used to evaluate alternatives was net public benefits (NPB), which is the PNV plus consideration of nonquantifiable Forest resource benefits.

Management activities modeled in FORPLAN were determined by the interdisciplinary team. This pre-FORPLAN analysis included identifying

1. Activities that could be applied to National Forest system land.

2. Activities that could be modeled in FORPLAN.

3 Kinds of land to which each activity could be applied.

4. Costs, outputs, and benefits which would result from the application of each activity to a specific type of land.

5 Compatibility of activities when applied to the same land area

This provided the basis for a matrix of all possible management activities, which could be modeled, and their associated costs, outputs, and benefits.

Activities which were desired, but not modeled as one of the above FORPLAN inputs, required the use of additional constraints.

The post-FORPLAN analysis took two forms. First, activities that could not be modeled, such as watershed improvement, were analyzed and added to the prescriptions if they increased net public benefits. Second, the alternatives were ground checked to insure their implementability

B.2.2
Land Units

A capability area is the smallest unit of land (or water) for which data is collected in forest planning. They are classified according to physical (soil), biological (vegetation) and slope factor. All land within a capability area is alike in its ability to produce resource outputs and in its production limitations The Forest has 25,000 capability areas.

The linear programing technique is expressed mathematically as:

Maximize. $Z = c_1 x_1 + c_2 x_2 + \ldots c_n x_n$ (Objective function)

Subject to: $a_{11} x_1 + a_{12} x_2 + \ldots a_{1n} x_n \leq b_1$ (Constraint set)

$a_{21} x_1 + a_{22} x_2 + \ldots a_{2n} Xm \leq b_2$

$a_{m1} x_1 + a_{m2} x_2 + \ldots a_{mn} x_n \leq b_m$

$xi \geq 0$

These mathematical expressions can also be shown in the following matrix:

	Column j=1	Column j=2	Column j=3	Column j=n	Constraint Type	Right Hand Constraint
Objective function	$c_1 x_1$	c_2 Xa	$c_3 x_3$	$c_n x_n$		Maximize
Row i = 1 (Timber)	$a_{11} x_1$	$a_{12} x_2$	$a_{13} x_3$	$a + l_n x_n$		$\geq b_1$
Row i = 2 (Land)	$a_{21} x_1$	$a_{22} x_2$	$a_{23} x_3$	$a_{2n} x_n$	$\leq$	b_2
Row i = m	$a_{m1} x_1$	$a_{m2} x_2$	$a_{m3} x_3$	$a_{mn} x_n$	=	b_m
				x_1	$\geq$	0

[1] This is the linear programming code used with FORPLAN on the UNIVAC 1100 at Fort Collins, Colorado, a major Federal Communication Center for automatic data processing.

Capability areas were developed by overlaying existing map information. Capability area lines were drawn on maps, with new areas created whenever a significant change in physical, biological or administrative features occurred. The Forest decided what information was needed, for each capability area, to assess resource opportunities and public issues and then collected information about each new area

There are 35 different attributes determined for each capability area and stored in computer files to form the Forest Data Base. The Forest used the Intel System 2000 data base management system (S2K). Once entered into the system, information or capability areas could be retrieved, sorted, aggregated, and analyzed

Because of their large number, individual capability areas could not be used in FORPLAN. Use of such a large number of land units would be cumbersome, expensive, and would have exceeded the matrix size limits that can be handled in FORPLAN Analysis areas were created to handle this problem. An analysis area is a group of capability areas that respond in a uniform way to management prescriptions.

The delineation of the analysis areas required several steps First, each interdisciplinary team resource specialist decided which physical or biological attribute in the data base were necessary to determine their resource yields The selection of which resource outputs to monitor in FORPLAN was guided by the problems identified by the Forest issues, concerns, and opportunities.

Next, the analysis areas were defined using each attribute proposed by the resource specialists as a level of stratification, or level identifier in FORPLAN Because FORPLAN could accommodate only six level identifiers, the number of attributes initially selected by the resource specialists were greater than could be used. This forced the Interdisciplinary Team (ID Team) to select the most critical attributes necessary to address the planning problems and to consider the reliability of the data for making yield and cost estimates

The level identifiers chosen to determine analysis areas were geographic location, resource emphasis, program emphasis, vegetation type, land slope class, and vegetation condition class. Each level identifier had two or more labels associated with it, except for land slope class. Land slope class was limited to one label early on in the modeling process because the model was still too large to be run in FORPLAN. Land slope class was chosen as the level identifier to limit because its effects could be modeled with the use of averages. Each forest analysis area was defined by a unique combination of the labels under each level identifier Sierra National Forest developed 200 analysis areas for use in FORPLAN.

B.2.3
Prescriptions

A prescription is a set of management practices and schedule for their application on a specific area to achieve desired objectives. For a given analysis area, the range of prescriptions describe the possible actions in that analysis area FORPLAN is used to determine what should be done, given the constraints and objective function for an alternative.

Prescriptions were developed by the ID Team to represent the range of management opportunities and to respond to issues Prescriptions were developed to represent five general condition levels of management intensity minimum level of management, management below current levels, current level of management, management at greater intensity than current management, and management at the maximum intensity level that is legal and implementable. Prescriptions were formulated to use the most cost efficient mix of practices to achieve the objectives at each level of management intensity.

Prescriptions were quantified in terms of the outputs, costs, and benefits that would occur when the prescription is applied to a given analysis area or land unit This quantification process produced the output, cost, and benefit coefficients that are used in the FORPLAN yield and economic tables.

The Forest distinguishes between FORPLAN prescriptions and management prescriptions. FORPLAN prescriptions are sets of activities which could occur on the analysis area that can be modeled in FORPLAN. They are "pure" activities in that they are written without imposition of the standards and guidelines needed to fit activities to site specific conditions. Management prescriptions are written as a result of allocating FORPLAN prescriptions to specific land areas and imposing standards and guidelines. The management prescription includes the FORPLAN prescription as one of its parts, but also includes additional practices needed to meet standards and guidelines at specific sites An example of these practices is structures for watershed improvement.

FORPLAN prescriptions were developed to allow consideration of a full range of management activities on the analysis areas A minimum level prescription was created, for each analysis area, to allow a choice between selecting a possible intensive practice or selecting no active management practice. The choice of prescriptions identified for each analysis area was constrained only by technical feasibility. Limiting the number of prescriptions available to choose from in a given analysis process is a type constraint used to formulate an alternative or benchmark. FORPLAN prescriptions analyzed are described below. Additional information on the prescriptions and the prescription development process is

included in Chapter 2 of the EIS and in the planning records.

B 2.3.1
Prescriptions Unique to Analysis Areas

Min-Level - Applies minimum custodial direction, for all resources, to all analysis areas. For the most part, only background outputs occur. There are no associated developed recreation, range, timber or watershed treatment outputs. The fire program is at a level necessary to protect other land (other ownership) from fires originating on National Forest land

No Timber Harvest - A no-activity prescription allows CAS land not to be harvested. No costs above background are applied, but can count towards spotted owl habitat.

Regulation Class I - Timber - Timber is harvested with even-aged management to produce high yields.

Regulation Class II - Timber Harvest for Spotted Owl Management - Timber is harvested with both uneven-aged and even-aged management with a longer rotation to produce spotted owl habitat.

Regulation Class II - Timber Harvest for Visual Quality - Timber is harvested with even-aged management with longer rotations, to provide larger trees and less observable disturbance for visual quality, to meet Partial Retention Visual Quality objectives.

Regulation Class III - Timber Harvest for Visual Quality - Timber is harvested with uneven-aged management with rotation ages greater than Regulation Class II to meet Retention Visual Quality objectives

Clearcut Without Thinning - Removal of all merchantable commercial trees within a stand in one operation with the objective of establishing a new, fully-stocked stand. The harvest is followed by slash disposal, site preparation and reforestation.

Clearcut With Thinning - Periodic removal of trees, prior to final clearcut, to reduce stocking and improve the quality and growth of the stand.

Shelterwood Without Thinning - Timber harvest used to obtain natural regeneration. Most of the stand is removed, allowing room for new trees to grow beneath the remaining older trees, which provide seeds and protect the young trees from sun and wind damage. After new trees are established, the remaining older trees are harvested in a seed tree or removal step.

Shelterwood With Thinning - Periodic removal of trees, prior to initiation of shelterwood cut, to reduce stocking and improve the quality and growth of the stand.

Intermediate Salvage - Timber harvest is conducted in stands to capture current and predicted mortality that will occur prior to the next scheduled cutting cycle.

Uneven-aged Management - Timber harvest of small groups of trees (wo acres). The objective is to establish a new fully stocked stand. Succeeding harvest of adjacent timber over time will create a mossaic of small groups of trees, of different age classes, which in aggregate make up an uneven-aged stand of timber extending over many acres.

Reforestation - A reforestation prescription applied to non-stocked areas due to past harvesting or fire

Timber Harvesting on Highly Erosive Soil - Timber harvest that produces low yields from highly erosive, unstable soils This is a shelterwood prescription that includes a thinning before final harvest.

Timber Harvesting in Streamside Management Zones - Timber harvest with uneven-aged management and a long rotation age to protect riparian values.

Min-Level Grazing - A no-activity prescription that will not allow grazing on established grazing lands. No costs or outputs are associated with this prescription.

Current Grazing - Applies the current level of grazing on established grazing lands. Current outputs and costs are associated with this prescription.

Early Grazing - Allows earlier grazing in the season than current practice and achieves higher output at no higher cost

Grazing With Fertilization - Fertilizes specified rangelands for increased forage production. Both outputs and costs will increase.

Grazing With Fencing, Water Development and Fertilization - Fertilizes, fences and provides more water sources to increase outputs. Costs will also increase.

Prescribed Burns - Includes repeated prescribed burns, on a ten year interval, of specific chaparral areas to increase AUM outputs, water yield and WFUDs.

Type Conversion - Includes permanent removal of existing vegetation and planting of grasses to increase the volume of useable water yield and available livestock forage.

Wilderness Management - Includes maintenance of existing trails and trailheads and the construction of new trail and trailheads.

Developed Recreation Areas Maintained by the Forest Service - Represents recreation areas developed, managed and maintained by the Forest Service.

Developed Recreation Areas Maintained by Permittees - Represents recreation areas developed, managed and maintained by permittees

Min-Level Recreation - Management that applies custodial care for recreation without outputs for wilderness and developed recreation Dispersed recreation includes only a background amount.

Recreation at Low Standard - Management that provides fewer facilities and services, but still meets health, safety, and other visitor needs.

Recreation at Full Standard - Management that provides health and safety of the visitor, protection of natural resources, facility protection and visitor satisfaction

B.2.3.2
Forestwide Prescriptions

Reduced Wildlife Program - Wildlife program is managed to only meet MMR activities.

Current Wildlife Program - Wildlife program is managed at current levels

Increased Wildlife Program - Increases wildlife program as well as increases costs.

Dispersed Recreation - Applies a level of management to dispersed recreation areas.

Current Fire Program at Current Funding - Represents existing percentage combination of suppression, detection, prevention and fuels personnel in the fire program with current funding levels.

Current Fire Program Minus 20 Percent Funding - Represents existing percentage combination of suppression, detection, prevention and fuels personnel in the fire program with a 20 percent across-the-board reduction in funding.

Current Fire Program Plus 20 Percent Funding - Represents existing percentage combination of suppression, detection, prevention and fuels personnel in the fire program with a 20 percent across-the-board increase in funding.

Current Fire Program Minus 40 Percent Funding - Represents existing percentage combination of suppression, detection, prevention and fuels personnel in the fire program with a 40 percent across-the-board decrease in funding

Current Fire Program Plus 40 Percent Funding - Represents existing percentage combination of suppression, detection, prevention and fuels personnel in the fire program with a 40 percent across-the-board increase in funding

Fire Program With Emphasis on Initial Attack and Fire Prevention - Represents a fire management strategy that emphasizes prevention and initial attack

Fire Program With Emphasis on Air Attack - Represents a fire management strategy that emphasizes air attack

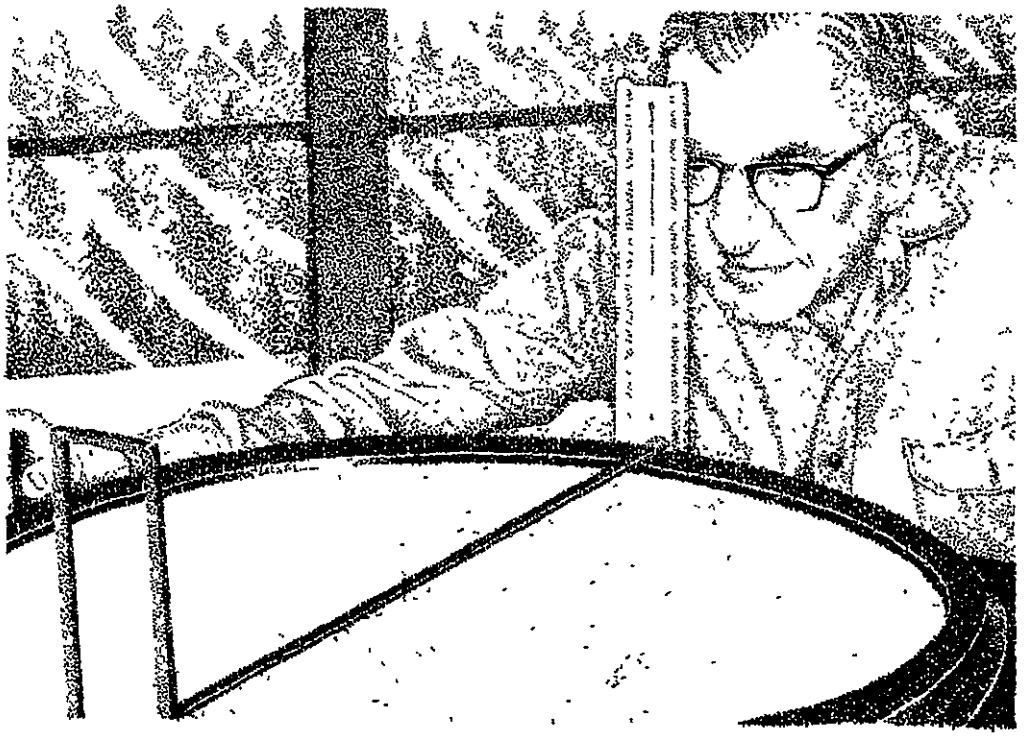


TABLE B.01 - PRESCRIPTION COMPARISONS

FORPLAN PRESCRIPTION	MANAGEMENT PRESCRIPTIONS *														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
BCKGRD / MINLVL Min-Level			X					X	X	X	X	X	X	X	X
WLDFSH / MINLVL Reduced Wildlife Program	X		X	X	X	X			X	X	X	X			X
WLDFSH / CURENT Current Wildlife Program	X			X	X	X			X	X	X	X			X
WLDFSH / ENHANC Increased Wildlife Program	X			X	X	X			X	X	X	X			X
MULUSE / MINLVL No Timber Harvest			X	X	X	X									
RC1TIM / Regulation Class I Timber						X									
RC2OWL / Spotted Owl Management Regulation Class II					X										
RC2*PR / Visual Quality Regulation Class II					X										
RC3GEO / Highly Erosive Soil				X											
RC3RIP / STREAM Streamside Management Zones				X											
RC3RET / RETENT Visual Quality Regulation Class III				X											
GRAZNG / Grazing	X		X	X	X	X					X			X	X
WLDREC / Wilderness	X														
DISREC / Dispersed Recreation			X	X	X	X	X							X	X
FS-DEV / Developed Recreation Areas Forest Service							X								
PERDEV / Developed Recreation Areas Permittees							X								
RC2GS / Uneven-aged Management					X										

* See Chapter 2 for full description. Management Prescriptions are:

1 Wilderness
2 Wild and Scenic River
3 Minimum-Level Mngmt.
4 Limited-Timber Yield
5 Modified-Timber Yield
6 Full-Timber Yield
7 Developed Recreation
8 Administrative Sites
9 Special Areas
10 Special Management Area (Kings River)
11 Experimental Forest
12 Experimental Range
13 RNA
14 Land Exchange
15 Dispersed Recreation
16 Front Country

B.3
TIME PERIODS

To assure that the allowable sale quantity can be achieved and maintained, a 16-decade planning horizon is used in FORPLAN. The first decade of the planning horizon is the period 1991-2000 A total of 16 time periods, each with a duration of 10 years, is used in the modeling process. However, to reduce the complexity of data displayed in the EIS, 5 decades are used in all EIS display tables.

B 4
OUTPUTS

There are two types of outputs that can be tracked in our analysis process They are scheduled and non-scheduled outputs Scheduled outputs depend both on the prescription chosen for an analysis area and the timing of its application. Nonscheduled outputs depend on the prescription chosen for an analysis area, but not the timing of its application The following table displays the types of outputs used to analyze benchmarks and alternatives.

Outputs are estimated with the use of yield coefficients For outputs modeled in FORPLAN, these coefficients are built into the yield tables and are used to estimate outputs for all prescription/analysis area combinations For outputs accounted for outside FORPLAN, yield coefficients are applied to factors that are accounted for both inside and outside the FORPLAN model. The process used by the ID Team to develop the yield coefficients used for each output is summarized below.

B 4 1
Outputs Tracked Inside FORPLAN

A summary of these outputs is shown in Table B.02, followed by an explanation of how each was derived.

TABLE B.02 - SUMMARY OF SCHEDULED AND NONSCHEDULED OUTPUTS TRACKED INSIDE FORPLAN

OUTPUTS	UNITS
SCHEDULED	
Timber (TIMBER)	cubic feet
Effective alteration (EFFALT)	acres
Livestock forage - utilizable (LIVFOR)	AUM
Spotted owl habitat (OWLHAB)	acre
Wildlife and fish user days (WFUDs-)	RVD
Water yield (H2OYLD)	acre-feet
Burned acres of mature forest (BURNAC)	acres
Dispersed recreation (DISREC) [1]	RVD
Developed recreation (DEVREC) [1]	RVD
Burned acres of plantation (BURNPL)	acres [2]
Diversity	acres
Recreation Opportunity Spectrum (ROS)	acres
UNSCHEDULED OUTPUTS	
Maximum long-term sustained yield (LTSY)	cubic feet
Maximum ending inventory (MAXINV)	cubic feet
Minimum ending inventory (MININV)	cubic feet
[1] Outside of FORPLAN in Amenity Alternative only. [2] Acre counter used for modeling acres	

B 4 1 1
Scheduled Outputs

Timber

A sampling procedure developed by Langley (1968, 1970) was used to collect volume, growth, and other data for each timber stratum Sampling was done according to a multi-stage design employing variable probability sampling, with replacement from a list of the sub-population elements at each stage. In this scheme, preliminary relative cubic volume estimates were made on standard aerial photographs This was followed by several allocation stages with increasingly better estimates involving the use of larger-scale color photos Finally, 94 plots, approximately 0.4 acre in size, were installed and tree measurements were made with an optical dendrometer. Once sampling to obtain the necessary ground truth was completed, measurement data were expanded, using the probability of selection at each stage, to obtain estimates for the entire Forest This method has been shown to yield unbiased estimates, with the sampling error dependent only on the accuracy of estimation at each stage, rather than on population variability

Effective Alteration

This output is expressed in acres effectively altered by vegetational changes Coefficients were developed to indicate the visual impact of timber harvests and other vegetation changes. Various vegetation removal practices were rated by landscape architects for their effective alteration of the visual landscape Estimates were made on the offsetting effects of regrowth over time. The regrowth was different for different tree species and soil productivity classes. The final coefficients used on the Forest were based on professional judgement, experience, field checking timber harvest areas in different stages of regrowth and consultation with landscape architects from Stanislaus and Sequoia

National Forests. These tables were put in the FORPLAN matrix so the report writer could calculate, by decade, the number of acres impacted.

Livestock Forage

These coefficients measure the potential usable Animal Unit Months (AUMs) per acre per decade for permanent and transitory range Coefficients were also estimated for increased usable AUMs resulting from various timber management activities, prescribed burns, and vegetation treatments. The yields were developed from the Range Analysis Field Guide and adjusted to allow adequate forage for wildlife and litter for soil and water protection. These yields were reduced to reflect usable forage, based on professional judgement.

Spotted Owl Habitat

To evaluate the availability of suitable spotted owl habitat over time, coefficient tables were developed to assign a suitability value to each possible combination of forest type and seral stage Coefficient values ranged from 0 0 to 1 0 in increments of 0.1 Each coefficient represented the relative value of the land type/seral stage combination as suitable spotted owl habitat. The 0.0 value was given to all stands that were unsuitable for spotted owls. These stands included all stands younger than 70 years and older sites with open canopies. The 1 0 value was given to optimum owl habitats. Optimum habitats are mature to over-mature stands (130 years) with dense crown closure.

The remaining values were assigned to stands that present habitat quality in the range between unsuitable and optimum. The suitability of spotted owl habitat was evaluated for all time periods for all alternatives and benchmarks.

Wildlife and Fish User Days

Although WFUDs are included in the RIM system, and are a subset of dispersed recreation, they are modeled and valued separately from RVDs in Forest planning To reduce complexity, the various types of WFUDs were modeled and valued as a composite, rather than tracked individually in the analysis. The value assigned to a composite was a weighted average of the included WFUD use types, based on historical use patterns WFUD outputs were used to proxy wildlife and fish recreational demands and the associated costs and benefits. Demand cutoffs were established to limit WFUD production at levels parallel to dispersed recreational demand.

Water Yield

Basic computations were derived from the use of a regression equation developed for Sierra National Forest watersheds. The major variable in the equation is the average percent of area completely covered by trees or brush (18% of the Forest in wilderness has 35% cover and 82% of the Forest has 80% cover). Using a weighted average technique, the Forest average was determined to be 72%. The calculated background flow value was compared to actual flow records and was within 5% Cover factors resulting from silvicultural cutting practices were determined from discussions with the Forest silviculturalist. On chaparral, type conversion recovery was determined to be complete for water yield purposes after 5 years of growth. Vegetation converted and maintained produced an additional water yield of 3.9 ac-ft/acre/decade. If chaparral was allowed to grow back and treated every 5 years, the average yield was 0.6 ac-ft/acre/decade.

Cumulative Watershed

Cumulative watershed effects is addressed in the Forest Plan through the use of a proxy, clearcut acres. This is due to insufficient data to establish thresholds of concern and related variables for employing the Regional methodology on a forestwide basis. Project level analyses of cumulative watershed effects is establishing coefficients and some related variables on selected parts of the Forest governed by scheduled activities However, these analyses depend heavily on professional judgement in rendering conclusions on the likelihood of incurring a cumulative watershed effect rather than an established threshold of concern value. One watershed was judged likely to incur a cumulative watershed effect based on field observations of past management. An equivalent roaded acreage value of 12 percent was associated with this watershed. The value was nearly double previous ERA values and, therefore, was consistent with field observations.

The difference between application of cumulative watershed analyses at the planning and project level raises the issue of whether the project level analysis may constrain timber outputs to a greater degree than represented in the Forest Plan. To examine this issue, a series of coefficients were developed based on those currently used in project level analysis. This allowed FORPLAN modeling of equivalent roaded acres, representing the way project level analysis is being done, with ERA levels applied in other areas of the Region. A threshold level of 15% was used. The Forest coefficients were not found to be constraining on future timber harvest at that level. Therefore, it is concluded the approximation used in the Forest Plan to address cumulative watershed effects should yield results which will not be constrained by project level analysis based on the Regional methodology. Project level analyses completed by the end of the next planning cycle should develop a sufficient data representative of the entire Forest. This will allow cumulative watershed effects to be addressed in the next Plan using the Regional methodology

Burned Acres of Mature Forest

Burned acres, costs and net value change for each fire program/option were based on output from the Initial Attack Assessment Model, version 2 These outputs and values were integrated into FORPLAN and became active outputs in the allocation and scheduling decisions.

Dispersed Recreation

Dispersed recreation was based on the current level of dispersed use for various activities by each ROS class area of the Forest, as shown in recreation inventory data and projections

Dispersed recreational capacity was based on a review of past and potential additional use, such as new roads, trails, and reservoirs. PAOT (persons-at-one-time) capacities and RVD capacities by ROS class were then developed (see Appendix G: Tables G.01, G 02, G 03). Dispersed use is only valued up to demand capacity in FORPLAN.

Wilderness use was based on historic use by ROS class of the existing wilderness in the Forest, as shown in recreation inventory data and projections of this use.

Wilderness capacity was based on a review of past use and potential for additional use, such as a change in user density/acre allowed, new roads, and additional designated wilderness areas nearby PAOT capacities and RVD capacities by ROS class were then developed (see Appendix G: Tables G 01, G.02, G.03). Wilderness use is only valued up to demand in FORPLAN.

Suitable acreage for wilderness includes the acreage within the boundaries of existing Wilderness and those areas in Further Planning status, such as Kings River. Wilderness acreages vary by alternative, based on allocation or nonallocation of the Kings River Area to Wilderness status.

Developed Recreation

Developed recreation capacity was based on types of existing and potential developed sites in different ROS class areas as shown in current recreation inventory data and projections of this use.

Campground use, capacity, and projections of this were used as indicators for other developed site uses on the Forest (see Appendix F), since it is the primary developed site use. RVD yields based on existing POAT capacity and use was used to predict potential use. Developed recreation RVDs are only valued up to demand capacity in FORPLAN.

Burned Acres of Plantation

Estimates of burned plantation were made from probability factors (from historical records) multiplied by the number of regenerated acres. The percent of plantations burned over the past decade on the Forest is about 1%. A population increase factor was also included to simulate the increased use of the Forest by the public. The Fire Programs created negative acres to simulate acres saved because of the Fire Program. Those acres created, but not saved, were charged a cost for burning, and a loss of growth

Acre Counter Used for Modeling

This output was used to help model various parts in FORPLAN Its value is meaningless on its own.

Diversity

Changes in forest diversity were evaluated by developing a second set of output tables in FORPLAN. The output tables replaced the Scheduled Output Tables and were termed the "Second Deck." The Second Deck outputs were produced from coefficient tables that linked the land classification data base in FORPLAN with appropriate habitat type and stage labels.

Second Deck tables were developed for forested habitats only. The habitat types tracked were: ponderosa pine, mixed conifer, red fir, and subalpine. The habitat stages evaluated are listed below.

Stage 1 - Grass/forb stage. Consisting primarily of perennial grasses, annual grass, and forbs but may include scattered small trees and brush

Stage 2 - Shrub/seedling/sapling stage. Consisting of pure or mixed stands of brush and young trees up to 20 feet.

Stage 3A - Open pole/medium tree stage. Stands with trees 20-50 feet in height and canopy closures of 0-39%, commonly found with considerable stands of brush or grass in the understory.

Stage 3B/C - Closed pole/medium tree stage. Stands with trees 20-50 feet in height and canopy closures exceeding 40%. Understory characteristics are variable.

Stage 4A - Open, large tree stage. Mature forests with most trees over 50 feet in height and canopy closures less than 40% Substantial shrub or herbaceous understories are common.

Stage 4B/C - Closed, large tree stage Mature forests with canopy closures exceeding 40%. Understory vegetation is typically reduced.

Stage 4C+ - Late Seral stage. Mature to over-mature forest stands with obvious decadence. Canopy closures exceed 70%.

Coefficient tables were developed for each habitat type/stage combination. The tables reflected succession changes in habitat stages that resulted with harvesting and without harvesting Coefficient values were either 0.0 or 1.0, with 1.0 value representing the counter for a particular type stage combination

For example, a typical clearcut ponderosa pine stand will undergo the following succession sequence: Stage 1 for one decade, Stage 2 for two decades. Stage 3B/C for three decades, Stage 4B/C for seven decades, and Stage 4C+ for all subsequent decades. The coefficient table for Stage 1 will therefore have a 1.0 value for the first decade and 0 0's for all remaining time periods, the Stage 2 table will have 1 0 values for the second and third decades only, and so on.

As FORPLAN treats the land base in each alternative, the Second Deck tracks structural changes in habitat across the forest. The output tables report the number of acres in each habitat type/stage combination over time and reflect the changes resulting from different harvesting intensities and methods. The Second Deck output tables are monitored in all alternatives to ensure that each of the seven seral stages comprises at least 5% of all habitat types

Recreation Opportunity Spectrum (ROS)

ROS was modeled by moving the acres of the Primitive class from Regulation Class I to Regulation Class III. The acres of Semi primitive Motorized and Semiprimitive Non motorized classes were moved from Regulation Class I to Regulation Class II, in the FORPLAN analysis Changing the regulation class, which causes a change in the amount of acres accessed, meets the modeling needs of the ROS system.

B.4.1.2
Unscheduled Outputs

Optimal Long-Term

The optimal Long-term Sustained Yield (LTSY) is computed by FORPLAN using the CAS acres multiplied by the prescriptions which produces the highest annual yield. The actual prescriptions used in the FORPLAN solution is sometimes other than the optimum yield prescription.

Ending Inventory

This is the merchantable volume of all the standing timber that will exist at the end of the planning period. Coefficients for predicting growth and yields are in FORPLAN, expressed in cubic feet.

B.4.2
Outputs Tracked Outside FORPLAN

These outputs are not calculated by FORPLAN. The outputs are calculated in a number of different ways. A summary of these outputs is shown in Table B.03, followed by a brief explanation of how each was derived.

TABLE B.03 - OUTPUTS TRACKED OUTSIDE OF FORPLAN

OUTPUT	UNIT
Roads and Trails with Seasonal OHV Closure	miles
Roads and Trails Open to OHV	miles
Roads and Trails Closed to OHV	miles
Recreation Opportunity Spectrum Class	acres
Visual Quality Index	numbers
Bald Eagles	numbers
Peregrine Falcons	number of pairs
Lahontan and Paiute Cutthroat Trout	number of populations
Spotted Owls	number of pairs
Goshawks	number of pairs
Mule Deer	number of animals
Resident Fish	pounds
Acres/Structures of Direct Habitat Improvement	acres (for wildlife) and acres/structures (for fish)
Fuelwood	cords
Biomass	MMCF
Water Quality Meeting Standard	acre feet
Watershed Improvement	acres
Minerals Operating Plans	number of plans
Land Adjustments	acres
Human Resources	enrollees
Fuel Treatment (activity)	acres
Fuel Reduction (other)	acres
Dams and Reservoirs	number of dams
Administrative Sites	number of sites
Road Construction / Reconstruction	miles
Road Maintenance	miles
Dispersed Recreation [1]	RVDs
Developed Recreation [1]	
[1] For Amenity Alternative only	

Off Road Vehicle Trails

There were no coefficients for this output. Based on the total number of dispersed RVDs, miles of road and trail, and the alternative theme, the ID Team developed the

outputs for miles of open, closed, and seasonal OHV roads and trails.

Recreation Opportunity Spectrum (ROS)

Acres of ROS class over time were based on the existing physical setting, scheduled recreational development, timber harvesting, and road construction. USDA Forest Service "ROS User's Guide" and Forest Service Manual 2331 47 and 2353.4, Regional Supplements No. 122, 10/80 were used as reference.

Visual Quality Index

Levels of visual resource outputs for each of the alternatives have been compared by applying a numerical weight to the quantity (in acres) of each Visual Quality Objective by variety class. By simple multiplication and addition, a single index was developed for each alternative. The procedure is found in Forest Service Manual 2383.4, Region Supplement No. 143, 5/83. The index for each alternative was determined from the allocated management prescriptions and their acres of Visual Quality Objectives by variety class The index for the current situation is based on review of the actual visual condition of the landscape by variety class.

Bald Eagles

All benchmarks and alternatives were assumed to maintain the current wintering population of 5-10 birds. The assumption was based on knowledge that 1) the Forest's management practices may have very little effect on current eagle populations, and 2) opportunities for increasing Forest populations are very limited. Alternative E was assumed to provide a habitat improvement program that results in an increased wintering population of 2 birds.

Peregrine Falcons

All benchmarks and alternatives were assumed to provide a program that satisfies the current recovery plan for the peregrine falcon. Meeting the target of three breeding pairs was assumed for all runs, except Alternative E. Alternative E was assumed to manage breeding pairs at each of the Forest's six identified nest sites by the end of the first decade.

Lahontan and Paiute Cutthroat Trout

All alternatives and benchmarks were assumed to maintain the current number of populations of these threatened species.

Spotted Owls

An estimate of the number of spotted owl pairs was determined in decades 1-5 for all benchmarks and alternatives. The estimates were made with the assumption that owl pair densities will change proportionately with the acres of suitable habitat. In addition, a wilderness owl populations of 10 pairs was assumed for all alternatives and benchmarks.

Owl population estimates were made with the formula given below. The formula does not account for the spatial distribution of suitable spotted owl habitat; but it is believed to produce trends in owl densities that are consistent with the theme of the alternatives and benchmarks.

Number of pairs = (TS acres - SOHA Acres)/1,000 acres + 650 replacement + SOHAs + 10

When TS acres = estimates of the total suitable acreage of spotted owl habitat (see discussion of Spotted Owl Habitat in the Scheduled Output Section).

SOHA Acres = suitable habitat set aside in owl habitat areas.

SOHAs = number of spotted owl habitat areas in the alternative or benchmark.

1,000 acres + 650 replacement = number of acres of suitable habitat/owl pair under current conditions.

10 = owl population in wilderness.

Goshawks

All alternatives provide suitable conditions over time for the minimum required number of 50 breeding pairs. No alternative was planned to exceed the MMR level because the Forest is believed to support a naturally-occurring population of about 50 breeding pairs of goshawks

Mule Deer

Mule deer population estimates were made by developing habitat-suitability coefficients and multiplying the coefficients with a base line habitat-capacity estimate for 1982. Mule deer populations were estimated for 5 decades in all alternatives and benchmarks.

Each habitat-suitability coefficient was developed by multiplying values for expected impacts of timber, range, and habitat management on deer habitat quality. Impacts from timber management were represented in the suitability coefficient by a value that related the timber volume produced by the alternative or benchmark with the output in 1982. Similarly, values for range and habitat impacts were factored into the suitability coefficient with values that related the alternative or benchmark's annual production (in AUMs) and habitat improvement acres to the 1982 condition. Since the Forest's deer population in 1982 is thought to have been well below carrying capacity, the estimated populations for local herds in 1972 was chosen as a more reliable estimate of habitat capacity.

Results of estimating deer habitat capacity trends for the alternatives and benchmark are available in the Forest planning files.

Resident Fish

Trout biomass estimates for individual alternatives were developed from assessments of impacts of the alternatives on the trout fishery. The assessment included considerations for water quality, grazing intensity, roads constructed, acres/numbers of habitat improvement projects, and recreational usage associated with each alternative. A baseline biomass estimate was calculated from Forest wide fish densities, typical size ranges, and the estimated miles of streams known to contain trout. Quantitative population data is lacking to define either the numbers or total biomass of trout species within the Forest However, a baseline biomass estimate was calculated from Forest-wide fish densities, typical size ranges, and the estimated miles of streams known to contain trout. Using electro-shocking data and professional judgement, assume 10-15 fish (greater than 3 inches long)/100 linear feet of stream, with an average of 13 fish/100 feet. This converts to 685 fish/mile. The Forest has 1,800 miles of streams, of which 1,530 miles contain fish Hence, 1,530 x 685 fish = 1,048,000 fish. Assuming a typical trout is 5 to 7 inches in length, then according to CDFG's Trout and Salmon Culture Manual, typical trout will weigh 0.9 to 2.1 ounces. Thus, 1,048,000 x 0 9 ounces = 58,950 pounds and 1,048,000 x 2 1 ounces = 137,560 pounds of biomass Alternatives were then ranked for their overall potential for impacting the fishery resource. The biomass estimates were assigned by adjusting the baseline condition (1982) with coefficients that reflect this ranking.

Acres/Structures of Wildlife and Fish Habitat Improvement

The programs for wildlife and fish habitat improvement were developed by comparing the 1982 (base year) program, the current program (1989/1990), and the theme of the alternatives.

Fuelwood and Biomass

All of these were calculated based on predicted demand, amounts of wood products allocated and scheduled for regulated harvest by FORPLAN, and past trends.

Water Yield Meeting Water Quality Standards

There were no coefficients for these yields An estimated 2% of the water yield will not meet quality objective for all alternatives due to peak storm runoff. Reasonable application of BMPs will prevent reducing water quality below water quality objectives

Watershed Improvement

There were no coefficients for this output. Outputs were based on alternative theme and existing situations' potential for improvement projects.

Minerals

The projected number of operating plans for each alternative was obtained by considering the emphasis of each alternative and the anticipated effect upon mineral development and mining The base number of operating plans was obtained by taking the average number of operating plans issued during the past 5-year period, 1979-1983.

Land Acquisition

Land area affected by management prescription 11 are modeled in FORPLAN as available for timber harvest, range, water production and wildlife outputs until such time as the parcels are exchanged. With the exception of short-term commitments, these land areas will not be encumbered with use permits, easements and contracts. No major improvements such as campgrounds, trails, or range improvements are permitted. Investment for access and resource management activities are limited to the level actually needed to conduct management activities safely and without damage to the resources. Upon the transfer of ownership through exchange, the land management plan will be amended to reflect the changes in output

Human Resources

There were no coefficients for this output. Numbers were estimated using historical data and expected budget levels for each alternative.

Fuels Treatment

Activity fuel treatments were predicted based on anticipated harvest and sale area betterment. Natural fuel treatments were based on anticipated needs for fire hazard reduction, wildlife, and range needs

Fuel Models

Each Zone had to be assigned one fuel model as the predominant fuel. As in the Area Program, where percentages of several fuel models could be input, the fuel models for the base 1982 levels were determined by examining the Forest's fuels inventory maps. For 2030 projections, the Forest Fire Management Officer examined input from Timber, Resource, and Recreation functions and also the fuels management emphasis for each budget option. From this, the fuel model was projected for the year 2030.

Acres Burned by Intensity Level

The acres shown in this output are the proportions (by level intensities and size class) from the specific IAA-2 model chosen by FORPLAN and multiplied by the predicted acres from FORPLAN.

Trails

Trail miles were calculated based on current trail system, areas allocated to wilderness, and the total dispersed RVDs. The cost of trail maintenance and construction was linked to dispersed RVDs and inventoried unroaded area in FORPLAN

Dams and Reservoirs

Existing inventory is shown all through each alternative. The Forest has no plans to build reservoirs and there is no reliable method to predict how many and when any reservoirs will be built.

Administrative Sites

There were no coefficients for this output. Estimates were based on the budget and theme of the alternative.

Road Construction

No new arterials will be required. The miles of collector roads needed to access individual analysis areas were calculated by locating the roads necessary for initial entry to unroaded areas Miles of local roads necessary for timber management were calculated from the total area in timber harvest and scheduled as per the rate of treatment during the first five decades.

Road reconstruction was based on a decay factor. It was assumed that there could be three entries on a road before it needed to be reconstructed. Also, high production alternatives were assumed to have more money available for reconstruction.

Maintenance

The miles of road maintenance was assumed to be the average miles of road per year each decade.

B 5
ECONOMICS IN FORPLAN

B.5.1
Economic Efficiency and Demand Analysis

Economics is discussed in the alternative development process in Chapter 2 of the EIS, displayed in various tables in Chapter 3, in the economic environment section, in Chapter 4, in the economic consequences section and Appendix D, which outlines how economics are used in the entire document. Demand analysis is presented in Chapter 3. Demand cutoffs are used for both Dispersed and Developed RVDs.

Most of the economic efficiency analysis was conducted with the use of the FORPLAN model Economic data and assumptions incorporated into FORPLAN are described below.

All dollar values are expressed in 1982 dollars. The following factors, based on the implicit price deflator for Gross National Product (GNP), were used to adjust values for other years to 1982.

Year	Factor
1978-82	1 39
1979-82	1.28
1980-82	1.18
1981-82	1.08

An interest rate of 4.0% was used to determine the present value of future benefits and costs. This rate approximates the long-term cost of capital in the private sector, as measured by the return on AAA corporate bonds after adjustment for inflation [1]. For sensitivity testing, a discount rate of 7.125% was used. This is the rate used for water resource evaluation by the U.S. Water Resources Council in 1980 and also adopted for use in the 1980 RPA. Use of the 7.125% discount rate decreases PNV from that obtained with a 4% discount rate Data on PNV for each alternative using the 7.125% discount rate is available in the planing records.

Real cost and price trends used for timber are shown in Table B 04 below

TABLE B.04 - ESTIMATED FUTURE ANNUAL CHANGE IN TIMBER PRICE AND COSTS (in percent / year)

	DECADE				
	1	2	3	4	5
Price	4.8	1.1	2.1	1.6	1.8
Cost	3.1	2.4	2.0	1.6	1.6

[1] For a complete discussion of the rationale for the discount rate, see Row, Clark, H. Fred Kaiser, and John Sessions, "Discount Rate for Long-term Forest Service Investments," Journal of Forestry, June 1981.

These timber price trends are projections from an econometric model of National and Regional timber markets [1]. The timber cost trends are based on projections of per capita disposable personal income because timber management cost increases have historically been highly correlated with increases in per capita disposable income [2].

Cost and prices for all other resources were held constant since FORPLAN version 1, Model 2, release 13 cannot utilize cost and price trends for both timber and nontimber resources.

B.5.2
Costs

All costs used in the analysis are estimates based on accounting records and the experience of project managers. Costs for applying the different multiple resource prescriptions were estimated and built into the economic tables in FORPLAN. Costs were checked for reasonableness by comparing the first decade costs for the current alternative developed with the use of FORPLAN against the actual expenditures for FY 1982.

The following resource activities had costs associated with them:

Wildlife and Fish
- Operation and Maintenance (O&M) at current level
- Wildlife Enhancement Projects
- K-V funds from timber activities

Recreation (Standard)
- Developed Recreation O&M
- Dispersed Recreation O&M
- Wilderness Recreation O&M

Recreation (Low Standard)
- Developed Recreation O&M
- Dispersed Recreation O&M
- Wilderness Recreation O&M

Range
- Operation and Maintenance
- Early Grazing
- Fertilization
- Fertilization, Fence and Water
- Type Conversion - Low Intensity with Fire
- Type Conversion - High Intensity with Mechanical/Chemical

Costs also were developed for logging, road construction, slash disposal, and reforestation. These costs varied by analysis area to account for average slope, mix of species, and silvicultural systems For further information, see Timber Cost Data in the Planning Files.

The only true fixed costs are minimal level costs. These costs are $3,074,728/year and represent 17% of the current budget

B.5.3
Benefits

The dollar values for outputs used to calculate PNV are the prices that consumers will be willing to pay for forest outputs, whether or not such prices are actually collected by the Federal Government. At present it is national policy to provide most Forest outputs either at no charge to consumers or at a charge less than the willingness to pay the price. This is shown in the tabulations in Table B 05.

Timber

Each Level 1 geographic area with CAS land has a unique average value for all timber within the area The value is weighted, based on the amount of each working group within the area (forest type). The value assigned to each working group was determine as follows:

1. Average value received for timber harvested between 1979 through 1982. The value was $728/MCF or $115 66/MBF. This includes the value of constructed roads.

2 Timber sales harvested during this period were classified as to predominate forest type and Level 1 identifier (all sales were located in part A, General Forest). An average current contract rate for each forest type was estimated for these sales.

3. Values derived from step 2 were tested against the all-species average derived from step 1 by calculating a weighted average value based upon the working group acres in part A, General Forest The following values for each working group, when weighted by acres of each working group, yields an average value of $115/MBF for all timber in part A, General Forest

Mixed Conifer type	$150/MBF
Ponderosa Pine type	$150/MBF
Red Fir type	$ 60/MBF
Subalpine type	$ 25/MBF

4. Weighted average value for existing timber was calculated using the above values in each Level 1 geographic area with CAS land.

[1] Haynes, Richard W., Kent P. Connaughton, and Darius M. Adams, "Stumpage Price Projections for Selected Western Species," USDA Forest Service Research Note PNW-367, November 1980.
[2] USDA Forest Service, "An Assessment of the Forest and Range Land Situation in the United States," January 1980

5. Because the average species and forest type value represents value after subtraction of operating cost, except for road construction, there is a specific amount of operating cost amortized. Major operating cost variables are logging systems used and log transportation. No Level 1 area has the same mix of logging system and transportation cost as those represented in the sales from which the value was derived. Therefore, adjustment to the weighted average value for each Level 1 area was made based upon amounts of logging systems acres in the area and difference in average haul distances. The method for determining the adjustment is documented in the Forest planning records. The adjustment has been entered into FORPLAN as a logging cost. Timber values shown in Table B.04 are those adjusted for weighted logging systems in each Level 1 area.

6. Values determined in step 3 were used to estimate value of regenerated timber by diameter class by forest type. Regenerated timber values and costs were, however, aggregated into two economic tables. One table was for low site and subalpine type regenerated timber. In each table, the average value is weighted by forest type Costs are weighted averages for Level 1 area GENFOA

   For outputs used off-site, benefits are based on the value of the outputs as they leave the land or production site For outputs used on-site, benefits are valued when use takes place. However, in cases where it is easier to derive values after the output leaves the production site, costs incurred and profits earned after the output leaves the site were deducted from the values at later production stages.

Range

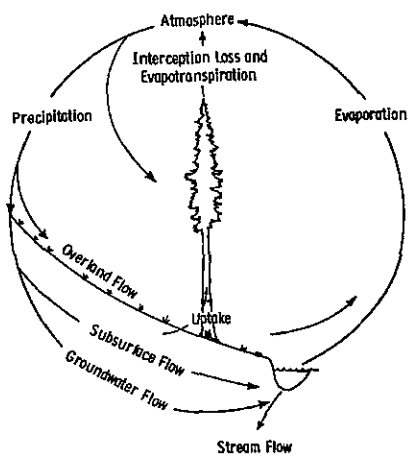
Range values are the average amount that Forest permittees are willing to pay for grazing on the forest, as estimated from ranch livestock budgets developed by the USDA Economic Research Service.

Recreation

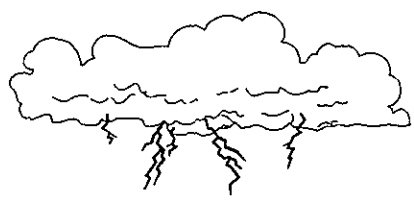
Recreation and wildlife and fish user day values are the estimated average amounts that recreationists are willing to pay at the site. WFUD value is a weighted average of several wildlife activities and species These values are based on a national survey of travel cost and contingent value recreation studies conducted by the Forest Service for the Draft 1985 Resource Planning Act (RPA) evaluation [1]. Revisions made for the final 1985 RPA were relatively minor and will not significantly affect allocations if they had been incorporated in the analysis.

Water

Water values are estimated amounts that water users are willing to pay for water at the point of use, less storage and delivery costs incurred to get the water from National Forest streams and rivers to the user. Values are based on the marginal value of water in irrigation use, the primary water used in California, determined from studies by the Forest Service for the 1985 RPA. Water values for 1985 do not reflect the hydroelectric value of water from the Forest because hydroelectric values will differ between individual watersheds, based on the capacity of installed hydroelectric facilities to generate power from incremental increases in water yield. Conducting a survey of facility and watershed by watershed evaluation, to establish hydroelectric values, was beyond the scope of the analysis that could be accomplished in this round of Forest planning.



Hydrologic Cycle



[1] Draft Environmental Impact Statement 1985-2030 Resources Planning Act Program, Appendix F, Forest Service, U. S Department of Agriculture, January 1984.

TABLE B.05 - BENEFITS USED IN THE ANALYSIS

OUTPUT	UNIT	Average Actual Cash Receipts / Unit of Output	Average Willingness to Pay Value Used in Analysis
TIMBER (Level 1 identifier)			
1. FERRDG	MCF	251	251
2. DGULCH	MCF	343	343
3. MT.RAY	MCF	64	64
4. SANJBA	MCF	558	558
9. SHTEYE	MCF	398	398
11. DINKPA	MCF	141	141
14. KRCFPA	MCF	298	298
18. KRIVB	MCF	243	243
19. SYCSPG	MCF	577	577
20. DEVREC	MCF	568	568
21. FRONTC	MCF	642	642
22 GENFOA	MCF	638	638
23 GENFOB	MCF	608	608
24. GENFOC	MCF	802	802
RANGE			
Livestock grazing	AUM	1 86	6 07
RECREATION			
Dispersed			
standard	RVD	0	11.30
low standard	RVD	0	5.99
Developed			
standard	RVD	0.25	11.20
low standard	RVD	0	5.94
Wilderness			
standard	RVD	0	13.75
low standard	RVD	0	7.24
WILDLIFE AND FISH			
Recreational use	WFUD	0	18.24
WATER			
	Ac-Ft	0	59.00

Benefit values are applied only where there is a demand for the output by Forest users. Outputs that exceed demand are given a zero benefit value, while those produced at or below are assigned the benefit value described in the previous section. This is handled with the use of a demand cutoff. Most of the outputs from the Forest are consumed in national and regional markets, where the quantity demanded is many times larger than the productive capacity of the Forest. (See Chapter 3 for a resource by resource description of the demand situation.) For this reason demand cutoffs were needed only for RVDs and WFUDs. For these resource outputs, demand is more localized and less than the productive capacity of the Forest in early time periods.

TABLE B.06 - DISPERSED AND DEVELOPED RECREATIONAL DEMAND CUTOFFS

	DECADE				
	1	2	3	4	5
Dispersed and Wilderness Cutoff (M RVD)					
Non-WFUD	25,586	29,030	32,200	35,538	39,478
WFUD	4,865	5,292	5,720	6,149	6,577
TOTAL	30,451	34,322	37,920	41,687	46,055
Developed Cutoff (M RVD)					
Supplied By USFS	7,817	4,071	4,416	4,784	5,198
Supplied By Permittee	9,233	11,674	15,934	17,366	18,902
TOTAL	17,050	18,750	20,350	22,150	24,100

These cutoff values are based on projected population growth in the local market area, and were derived from a regression analysis. For further details regarding recreation demands, costs, and benefits, see the June 1, 1984, Forest's planning files document, "RVD Documentation "

B 6
CONSTRAINTS

Each of the resources discussed in 36 CFR 219.13 through 219 26 must be addressed by standards and guidelines, management prescriptions, or other management direction in the Forest Plan. Regional resource direction, which Forests are expected to follow, is in the Regional Planning Direction Some management requirements can be translated into modeling constraints and can be simulated or proxied in FORPLAN.

Constraints are quantifiable limits placed on the linear computer program model to ensure minimum or maximum acres or dollars are used, or specific minimum or maximum amounts of outputs are produced. Constraints override the objective in linear programming analysis. Thus, where a predetermined level of output, minimum physical condition, or allocation is entered as a constraint, it is always achieved (or no feasible solution is found). Output levels and other desired effects entered as constraints assumably contribute more to public benefits than their cost of production plus the foregone public benefits of any outputs or other effects they replace.

Constraints may have a significant effect on outputs or PNV where they:

1. Limit the quantity of land available for a given prescription,

2. Limit the time period a prescription is available,

3 Limit amount of timing of external resources (budget) necessary to produce the output,

4 Specify the amount of an output or condition.

Because constraints can have significant effects on PNV and outputs, the ID team tried to formulate constraints that met objectives with least cost and least effect on commodity outputs. In most cases, this required the formulation and testing of several alternative sets of constraints to determine the most cost effective set (in terms of PNV) that would meet the objectives Cost of constraints were measured by their effect on PNV. The cost to PNV were determined by a reiterative subtraction process. In this process a FORPLAN solution is obtained for a set of constraints and then one constraint and then another is subtracted. The difference in the PNV with and without each constraint is the cost of the subtracted constraint For detailed explanations and results, see Chapter 2 of the EIS.

B.7
CONSTRAINTS COMMON TO ALL ALTERNATIVES

For Forest planning purposes, constraints can be divided into five general categories:

1. Technological Constraints,

2 Minimum Management Requirements,

3 Timber Policy constraints (part of MMRs, but separated for purposes of discussion),

4. Minimum Implementation Requirements, and

5. Forest constraints.

The constraints are discussed in the next section. Table B.08 is a guide to identifying constraints used in each benchmark and alternative. Type of benchmark and alternative are listed across the top and constraints down the right hand side. By reading vertically, alternative constraints can be identified Reading horizontally, differences in a specific constraint between alternatives can be identified A brief description of benchmark and

alternative themes can be found in Sections 2 8 and 2 9 in this appendix.

1. Technological Constraints

The only technological constraint applied was a limit of 2,000 acres of clearcutting in the true fir working group, in each decade. This was necessary because the Forest cannot successfully regenerate more than 200 acres of clearcut in the true fir type each year.

2. Minimum Management Requirements

MMRs are taken from 36 CFR 219.27 and generally represent requirements that are outside of Forest Service authority to change. They are based on statutes and regulations in contrast to Forest Service Manual direction or agency policy. By definition, these requirements represent "absolute minimum" constraints and are needed for consistency of analyses between Forests.

a. Capable, Available, and Suitable (CAS) Land: Land tentatively suitable for timber management was placed in analysis areas and given a range of appropriate prescriptions. Land not suitable for timber management was placed in other analysis areas, where timber prescriptions were not an option. A detailed discussion of the timber suitability criteria is contained in the Land Management Plan Appendix C.

The suitability for timber management of the Forest red fir type is limited by the ability to successfully establish regeneration following final harvest. While there is demonstrated evidence the steps necessary to successfully regenerate stands after harvest are known and have been successfully carried out, there is insufficient evidence this success can be achieved on a large scale. Therefore, the amount of clearcutting is limited to 2,000 acres per decade until such time there is a demonstrated ability to successfully regenerate red fir harvest areas on a large scale.

The effect of limiting the land base to only those acres that are now available, and have a reasonable chance of successful reforestation, defines the acres that are available for the scheduling of harvesting, reforestation, and thinning. This is the maximum land base available to sustained yields of timber. There are 393,700 acres of capable, available, and tentatively suitable land in the Forest.

b. Threatened and Endangered Species: The Forest currently provides suitable habitat for the endangered bald eagle and peregrine falcon as well as the threatened Lahontan and Paiute Cutthroat Trout. Since critical habitat for these species can be maintained as specified in their recovery plans by following established Forest Service direction and proposed standards and guidelines, they were not included as modeling constraints

c. Viable Populations: Goshawks - Current planning direction for Region 5 mandates that Forests establish a network of suitable goshawk nesting habitat. Planning direction also specifies that the network provides at least one nesting area for each 18 square miles of suitable habitat. In the Forest, this direction yields a network of about 50 nesting areas. Goshawks were not modeled as individual constraints in FORPLAN because it was felt most nest sites would be found in areas with other "protection" designations and exceptions would not account for significant acreage. The 50 nesting areas will be protected, through recent changes in the S&Gs, with 50 acres of habitat surrounding each nest, thus providing suitable conditions for the nest stand and an alternate nest stand.

Spotted Owls - Three prescriptions are available to manage the SOHA network in the Forest. They are: 1) no scheduled timber harvest prescription, which includes 1,000 acres of currently suitable habitat plus 650 acres of replacement habitat; 2) an even-aged timber management prescription, which includes 1,000 acres of currently suitable habitat plus 1,650 acres of replacement habitat; and 3) an uneven-aged timber harvest prescription, which includes 1,000 acres of currently suitable habitat plus 1,000 of replacement habitat. The objective of the MMR spotted owl constraint is to proxy maintenance of this species at the required minimum level in Region 5 of the Forest Service The MMR is intended to maintain a viable population of owls region-wide and will provide 21 owl habitat areas in the commercial forest zone and 5 in Wilderness. The total acres constrained to account for owl habitat is 21,000 acres. SOHAs are managed on an even-aged prescription. The trade-off for protection of spotted owls in MMR is approximately 8.5 MMBF per year. Alternatives B, C and H manage owls using this prescription. Alternatives A, D and H exceed MMR.

d. Diversity: Diversity of wildlife habitat was not treated as a constraint in the FORPLAN model. However, the Second Deck output table was reviewed to ensure that each major vegetation type, including hardwoods,

comprised at least 5% of seven important seral stages (see Diversity discussion in the scheduled output section, B 4.1 1).

Diversity on regeneration harvest areas is achieved by maintaining the specified levels of mast producing hardwood and planting or providing a seed source for species harvested. This is measured by timber compartment or planning area. Verticle diversity is achieved through saving, to the extent possible, advanced regeneration while leaving specified levels of trees destined to become wildlife trees over the rotation life of the new timber stand.

e. Riparian Areas: The aquatic, riparian, and terrestrial habitats associated with riparian areas is important to a large variety of wildlife species. The riparian wildlife corridor is defined as streams and adjacent vegetative communities which are predominantly influenced by, or associated with, water. This was modeled in FORPLAN by allowing only uneven-aged (REGCL3) timber management within 100 feet on either side of perennial streams. This affected approximately 12 percent of CAS timber land acres. Acreage of riparian on CAS varies by alternative because alternatives vary by acreage of CAS. The MMR in the DEIS was 11,000 acres (on CAS). It was based on miles of stream outlined in blue on United States Geological Survey (USGS) maps. Field reviews and an analysis of more detailed maps resulted in a revised riparian area of approximately 12 percent. Acreage in riparian varied from 27M acres in Alternative D and 44M acres in Alternative C. (See description of alternatives for more information on how each alternative was affected by riparian.)

f. Soil and Water Productivity: Adverse impacts to soil and water productivity are limited by restricting harvest on 4% of the CAS land base to FORPLAN Rx REGCL3. Mass movement potential is limited, but always present, on this unstable land by restricting the harvest so that it does not exceed the standards of a modified shelterwood prescription. These standards insure that sufficient stabilizing roots are retained to prevent mass movement. An additional 2% of the tentative CAS land base was determined to be physically unsuited for management without incurring irreversible damage to soil productivity. This unstable land was removed from the CAS land base for this cycle of planning These limitations, coupled with normal dispersion of regeneration areas, proxy MMR practices.

3. Timber Policy Constraints (TPC)

Constraints needed to ensure that timber harvest meets sustained yield within and beyond the planning horizon are: harvest regenerated stands at or beyond the period when at least 95% of CMAI has been reached and dispersion of even-aged regeneration units across the Forest.

a. Sustained Yield Requirements: The objective of this constraint is to prepare a timber harvest schedule for the first 16 decades that produces at or near the LTSY for the prescriptions selected by FORPLAN, and have sufficient inventory and growth rate capable of continuing to produce at the LTSY rate after 16 decades. The constraint has three parts:

1) Harvests in the 15th and 16th decades are limited to 90% of maximum LTSY. Other constraints can only be met by FORPLAN selecting some prescriptions which will produce below the maximum LTSY.

2) Growth rates in the 15th and 16th decades are required to equal 10% and 15% of the timber inventory in those two decades, respectively.

3) Timber inventory in the 15th and 16th decades must be composed of the following age class proportions:

a) REGCL1: 12 5% of the inventory must be 40 to 80 years old

b) REGCL2 : 8% of the inventory must be 120 to 140 years old.

b Harvest Flow Requirements: Timber output after the first decade will not be allowed to fluctuate more than 17% from the previous decade. The value of 17% represents the percentage of volume from the 1982 harvest level needed to maintain the average mill in this area This constraint prevents wide fluctuations from one decade to the next. This is used only in alternatives that depart from nondeclining, even-flow policy.

c. Dispersion: The objective of this constraint is to model the limitation that must be imposed on the rate of harvest to: 1) generally keep even-aged regeneration cutting areas to less than 40 acres, and 2) delay harvest of adjacent timber until trees in harvested area are over 4.5 feet tall. There are two parts to this constraint·

1) The amount of harvest per decade in certain high PNV AAs is limited. Those would otherwise be liquidated in the first or second decade because of their high contribution to PNV.

2) The total amount of REGCL1 CAS land in each decade that can be in regenerated timber less than 20 years old or in an equivalent revegetative condition is limited to 30%. Constraints on other classes of land result in lower rates of harvest on those lands, therefore, the REGCL1 constraint is not needed on that land.

4 Minimum implementation requirements

These apply to alternatives considered and ensure they are at least minimally acceptable for implementing on the ground.

The ones applicable to the Forest are scenic highways and technical operational feasibility, and sensitive plant management.

a. Scenic Highways - Requirements were placed on lands viewed from officially designated State and County Highways and routes on the 1970 State Highway Master Plan, so that scenery was managed along heavily traveled scenic highways. These roads were State Highways 41, 49, 140 and 168. Present management and public expectations of the foreground are that no activities are visually evident. This was achieved by assigning highway foreground and middleground to a visual quality of retention and partial retention. For these corridors, the public expects near-natural appearance, the Fresno County Plan calls for near-natural appearances on some, and three corridors are primary access to national parks. The area was delineated on the Forest data base and the acres identified by analysis area.

b. Operational Constraint - Because of the dispersion constraint, there was no need for the Operational Constraint.

c. Manage sensitive plants to ensure that species do not become threatened or endangered because of Forest Service actions

5. Forest constraints

These are constraints needed to ensure implementation at the local level. They are based on Forest rather than Regional conditions, and are in addition to MMRs These constraints are not applied to all benchmarks, but are applied to all alternatives except the Constrained Economically Efficient Alternative (CEE). There are three Forest constraints. 1) The Forest ID Team felt most reservoirs (Bass Lake, Mammoth Pool, Edison Lake, Florence Lake, Courtright Reservoir and Wishon Reservoir) should manage foreground views to Partial Retention. 2) Under the even-age timber prescription, 20% of the mixed conifer type must use the shelterwood regeneration system. The primary reason for this Forest constraint is to assure regeneration of white fir in those mixed conifer stands having a high proportion of white fir. 3) The suitability for timber management of the Forest red fir type is limited by the ability to successfully establish regeneration following final harvest. While there is demonstrated evidence steps necessary to successfully regenerate stands after harvest are known and have been successfully carried out, there is insufficient evidence success can be achieved on a large scale. Therefore, clearcutting is limited to 2000 acres per decade until there is a demonstrated ability to successfully regenerate red fir harvest areas on a large scale.

B.8
BENCHMARKS

FORPLAN modeling rules for each benchmark and alternative are presented in detail as follows:

(MLV) Minimum Level Management

A. Description and Purpose:

Estimate outputs and cost of the backgrounds or residuals Minimum level should be thought of as an accounting analysis to determine the background outputs and fixed costs associated with maintaining the Forest. It will be used as a base to compare other alternatives, not stewardship or custodial management. Because it is only an accounting analysis, the needed phase-in period, if minimum level was actually implemented, should be ignored.

B. Specifications·

1. Objective function: Minimize cost for the planning horizon.

2. Output constriants:

a. Only background or incidental outputs are allowed.

b. Timber, range, and developed recreational outputs are set at zero.

C Other Assumptions:

1. Vegetation will follow natural succession. Habitat capability for management indicator species, requiring late seral stage habitat, will decrease over

time. Habitat capability for indicator species, requiring early seral stage habitat, will increase over time. However, wildfire is assumed to provide considerable benefits for many early and mid-successional species such as deer.

2. Only maintain those facilities that are needed to support basic ownership activities. Allow all other facilities to deteriorate

   a State and County roads will remain open, but most Forest roads will be closed.

   b. Close all public and private sector recreational facilities on Forest land, with no provisions for maintaining such assets.

3. The fire organization will be greatly reduced. Forests will assume costs for only P03 (detection) and P04 (initial attack); no other fire management and/or cooperator resources are to be considered.

4. Recreational use will consist of noninduced, dispersed recreation that cannot be controlled or discouraged.

   a. The management of such use will be limited control of excessive soil and water damage.

   b. The overall recreational use should not exceed 45% of the 1982 level.

   c. Winter sports will consist of cross-country skiing at current levels.

   d. Assume an operation and maintenance cost of $.03/RVD.

   e. No developed or wilderness RVD outputs or costs will be shown Wilderness RVD outputs will be included with dispersed recreation.

5. A minimum amount of time will be allotted to FERC coordination.

6 Cultural resource management will be a minimum, primarily for protection (especially in conjunction with minerals management or unauthorized recreational activities).

<u>(FLW) Unconstrained MAX PNV Assigned with FLOW/LTSY Constraints</u>

A. Description and Purpose:

1. Evaluate the appropriateness of harvest flow constraints

2 Provide the economically efficient level of valued resources with fewest constraints.

3 Forms a base run to be used in evaluating MMRs.

4. Test to see if other floor or sequential bounds are needed. If first period harvest is equal to floor, rerun without floor as a constraint.

B. Specifications:

1. Objective function: MAX PNV for 12 periods

2. Timber policies: See item H-3 (Constraints Common to all Alternatives) for details.

   a. Minimum rotation: merchantability.

   b. Sustained-yield requirements.

   c. Harvest flow requirements.

   d No dispersion.

3. Land base: All tentatively suitable land.

4. Economic assumptions: Use assigned values with trends from timber and demand cutoffs for RVDs and WFUDs.

<u>(MMR) MAX PNV Assigned with MMR-NDY-CMAI</u>

A. Description and Purpose:

1. Defines and evaluates MMRs as directed in Regional Direction (see item H-2 above).

2. Shows the opportunity cost of MMRs taken collectively

3. Forms the basis for evaluating constraints.

4. Estimate the mix of resource uses and a schedule of outputs and costs which will maximize the present net value of those outputs that are assigned a monetary value. Dollar values are to be based on actual or simulated market prices (willingness to pay) for timber, recreation, range, water, wildlife and fish, as appropriate for the Forest.

B. Specifications.

1. Objective function: MAX PNV for 12 periods.

2. Timber policies:

   a. Minimum rotation: Use the full set of rotation ages greater than or equal to 95% CMAI

   b. Sustained-yield requirement.

   c. Nondeclining-yield requirement.

   d. Dispersion

3. Land base: All tentatively suitable land.

4. Economic assumptions: Use assigned values with trends from timber and demand cutoffs for RVDs and WFUDs.

5. All regionally-defined MMRs apply.

(MKV) MAX PNV - Market Values Only - with MMR-NDY-CMAI

A. Description and Purpose:

1. Estimates the mix of resource uses and a schedule of outputs and costs which will maximize PNV of those outputs that have an established market price. Dollar values are to be based on actual or simulated market prices (willingness to pay) for timber, range, and developed recreation. Use the same dollar values as are in the other runs.

2. Outputs are compared to ##MMR-run to provide proportional differences in PNV and outputs. Proportions will be used to estimate the differences between assigned and market values in subsequent runs.

B. Specifications:

1. Same as for ##MMR-run except use market values only for timber, range, and developed recreation.

2. Run the solution through the FORPLAN report writer to price out all assigned values Use the PNV-COST values from the second report to make comparisons.

(TBR) MAX Timber for One Period with MMR-NDY-CMAI

A. Description and Purpose

Define the maximum timber output possible for the first decade under current policy and MMRs.

B. Specifications:

1 Objective function: Maximize timber for one period

2 Timber policies:

a. Minimum rotation Use the full set of rotation ages greater than or equal to 95% CMAI.

b. Sustained-yield requirement.

c. Nondeclining-yield requirement.

d. Dispersion.

3 Land base: All tentatively suitable land

4. Economic assumptions: Use assigned values with trends from timber and demand cutoffs for RVDs and WFUDs.

5. All regionally-defined MMRs apply.

6. Rollover is required to determine the most economically efficient allocation and schedule which corresponds to the harvest levels for each of the 5 periods defined in the maximum timber (##TBR) run The specifications for this rollover are the following

a. Objective function: Maximize PNV for 12 periods.

b. Timber policies: Same as above.

c. Land base· Same as above.

d. Economic assumptions: Same as above.

e. All regionally-defined MMRs apply as above.

f. Output Constraint· Meet timber outputs from each of the 5 periods as defined by the ##TBR run.

(TBC) Max Timber for 1 Period with NDY & MMRs - Remove 95% CMAI

Constraint. Use Merchantability

The harvests are being constrained by LTSY and no gains would be made by lowering the minimum rotational age of red fir (for mixed conifer and pine, 95% CMAI and merchantability are the same age). This is illustrated in the MMR run where the youngest red fir cut is 110 years old. Since that was the only purpose for the TBC benchmark, it was not necessary to run it on FORPLAN

(WLN) MAX PNV with Maximum Wilderness

A Description and Purpose

Evaluate the impacts of maximum wilderness allocations.

B Specification:

1. Objective function· Maximize PNV for 12 periods or the planning horizon, whichever is smaller.

2. All regionally-defined MMRs apply.

3. Land base.

a. All tentatively suitable land.

b. All unroaded and wilderness study areas allocated to wilderness prescription. Boundary adjustments are not allowed; use all unroaded areas.

4. Economic assumptions: Use assigned value with trends from timber and demand cut-off for RVDs and WFUDs.

(RGN) Maximum Livestock-Grazing for 5 Periods

A. Description and Purpose:

Define maximum capability of the Forest to provide commercial livestock grazing over the RPA planning horizon, subject to MMRs

B. Specification:

1. Objective function: Maximize livestock forage for 5 periods.

2 All regionally-defined MMRs apply.

3. Land base: All tentatively suitable land.

4. Economic assumptions: Use assigned values with trends from timber and demand cutoffs for RVDs and WFUDs.

5. Activity constraints: The range activities may provide for:

   a. Brush treatment of land not capable of growing 20 CF/acre/year.

   b. Full development of water and fencing to permit full utilization of available forage.

   c. Nonrelease of timber stands to provide additional forage.

   d. Grazing in wilderness.

   e. Intensive harvesting of timber land to provide high levels of transitory range.

6. Rollover is required to determine the most economically efficient allocation and schedule which corresponds to the forage production level for each of the 5 RANGE (##RGN) run.

The specifications for this rollover are:

   a. Objective function: Maximize PNV for 12 periods or the planning horizon.

   b. Timber policies: Same as above.

   c. Land base Same as above.

   d. Economic assumptions: Same as above.

   e. All regionally-defined MMRs apply as above.

   f. Output constraints Meet the forage outputs for each of the 5 periods as defined by the ##RGN run.

   g. Activity constraints: Same as above.

(H20) Max Water Yield for 5 Periods

A. Description and Purpose:

Define maximum capability of the Forest to provide water over the RPA planning horizon subject to MMRs.

B. Specifications·

1. Objective function: Maximize water yield for 5 periods

2. All regionally-defined MMRs apply.

3. Land base: All tentatively suitable land

4. Economic assumptions: Use assigned values with trends from timber and demand cutoffs for RVDs and WFUDs.

5. Activity constraints. Water yield activities may provide for:

   a Type conversion of timber land not capable of growing 20 CF/acre/year.

   b. Intensive harvesting of timber land to provide high levels of water yield.

   c Vegetative treatments in noncommercial vegetative types.

6. Rollover is required to determine the most economically efficient allocation and schedule, which corresponds to the water yield levels for each of the 5 periods as defined in the MAX WATER (##WTR) run.

The specifications for this rollover:

   a. Objective function: Maximize PNV for 12 periods or the planning horizon, whichever is smaller.

   b. Timber policies: Same as above.

   c. Land base: Same as above.

   d. Economic assumptions: Same as above.

   e All regionally-defined MMRs apply as above.

f. Output constraints: Meet the water yield outputs for each of the 5 periods as defined by the ##H20 run.

g. Activity constraints: Same as above.

B.9
ALTERNATIVES

Refer to Chapter 2 of the EIS for a more complete discussion and display of alternatives and their results. This section lists only those constraints that were modeled in FORPLAN and describes how they are modeled

B.9.1
(PRF) Preferred Alternative

1. Theme: The Plan represents a balanced management program with a decrease in some market resources over present levels. Dispersed recreational and wilderness uses are stressed, with opportunities for quality wilderness experiences enhanced. Timber benefits will be commensurate with costs, while recognizing essential balance with other uses and resource capabilities. Fish and wildlife habitats will be maintained near current levels.

2. Objective function Maximize timber production in period one. Rollover is the solution used to determine the most cost effective timber harvest schedule. Objective function of the rollover is to maximize PNV for 12 periods.

3. Timber policies: Rotation length at 95% of CMAI, LTSY, Nondeclining Harvest Flow, Dispersion for Regulation Classes I and II Timber.

4 Fixed pre-FORPLAN AAS/RX distribution:

   a. Mt. Raymond, Ferguson Ridge, Devils Gulch and Dinkey Lakes are assigned to Semiprimitive, Nonmotorized Recreation.

   b. Kings River "B" Further Planning Area is assigned to Kings River Special Management Area designation.

   c. Twenty-four SOHAs on CAS land are assigned to the "no scheduled timber harvest" prescription.

   d. Portions of the Developed Recreation AA around Courtright and Wishon Reservoirs and the area between the Ansel Adams and Dinkey Lakes Wildernesses leading to Edison and Florence Lakes are assigned to no scheduled timber harvest.

5. Minimum Management Requirements: All MMRs applied.

6. Minimum Implementation Requirements: All MIRs applied.

7. Forest constraints common to all alternatives: All common constraints applied.

8. Constraints unique to this alternative:

   a. One-third of the poorly stocked, mixed conifer and pine stands will be regenerated in each of the first 3 periods. These are stands created by past management activities which would not otherwise be selected by FORPLAN because of PNV. Objective is to get these stands to full production. This was modeled through scheduled output constraints.

   b. Minimum acres (35,000 acres) assigned to uneven-aged management.

   c. Approximately 3.5% of the future regenerated stands will be unavailable for harvesting. This is to proxy the effects of hardwoods on future regenerated timber stands. This was modeled through scheduled output constraints.

   d. Minimum annual average (9-10 MMBF) yield from Salvage/Intermediate is scheduled in each of the first five periods.

   e No scheduled timber harvest is specified for SOHAs.

   f. Limited-Timber Yield Prescriptions are assigned to all furbearer habitat areas and corridors. Yields from furbearer habitat areas are estimated similarly to yields from riparian areas (see #7). An estimated 38,600 acres of the available 66,000 acres of furbearer habitat acreage on CAS land, tracked outside of FORPLAN, is now available for Limited - Timber Yield harvest. Annually, approximately 3 MMBF will be harvested.

   g. Riparian acres are estimated to be 33,000. Yields will total 1 5 MMBF per year and will only include harvest to improve the riparian ecosystem or incidental removal for roads and skyline corridors. If Regulation Class III management were applied, approximately 3 3 MMBF per year would be harvested

   h. A total of 18,700 acres are included in deer population centers and holding areas where increased emphasis is given to deer habitat management. This was modeled by changing half the desired amount of deer acres from Regulation Class I to Regulation Class II in the specific analysis area's aggregate emphasis package.

i. The ROS class of some specific analysis areas was increased. This was done to show what the ID Team thought the mix of ROS acres should be to meet the theme of this alternative. This was modeled by changing the additional acres of SPM and SPNM from Class I to Class II Regulation. Additional acres of Preservation were changed from Class I to Class III Regulation. These Regulation Class changes achieved the ROS objectives.

j An additional 5% of the mixed conifer stands were required to use shelterwood as the regeneration harvest method. This was done to show timber stands in sensitive areas where clearcutting would be controversial This was modeled through a scheduled output constraint.

k Approximately 3% of existing and regenerated stand volume reserved from harvest to provide dead trees to meet snag standards and guidelines in future decades.

l Errors in the recreation use trend section of the January 1990 PRF run prevented its use for some recreation related costs and benefits Data from the older run for this program area was used instead.

m. FORPLAN data was adjusted to reflect additional program costs for wildlife, fish and T & E that was not completely modeled.

n. FORPLAN data was adjusted to GA to reflect additional program costs in watershed improvements.

B 9.2
(CUR) Current Alternative

1. Theme. This alternative represents no change; continuation of the Forest's current programs and activities into the future Emphasis will be to maintain a moderate level of timber production and forage utilization and an equal program of developed and dispersed recreational opportunities. Efforts to make optimum use of the Forest's land will continue. Adverse environmental impacts will be minimized, and the Forest's resources protected and conserved Any deteriorated resources will be planned for rehabilitation. The budget is restricted to 1982 levels with adjustments for inflation.

2. Objective function: Maximize PNV for 12 periods

3. Timber policies: Rotation length at 95% of CMAI, LTSY, Nondeclining Harvest Flow, Dispersion for Regulation Classes I and II Timber.

4. Fixed pre-FORPLAN AAs/Rx distribution: Kings River Special Management Area and Mt. Raymond are assigned to Semiprimitive, Nonmotorized Recreation. This was modeled by assigning timber prescriptions to Min-Level.

5. Minimum Management Requirements· All MMRs applied.

6. Minimum Implementation Requirements: All MIRs applied.

7. Forest constraints common to all alternatives. All common constraints applied.

8. Constraints unique to this alternative:

   a. Intermediate harvest on 12,000 acres would take place for the first 5 periods, with final regeneration harvest in the sixth period. This was done to show second growth stands that are planned to be thinned. This was modeled by creating a new analysis area and two prescriptions; Min-Level and Intermediate Harvest

   b. A total of 11,400 acres are included in deer population centers and holding areas where increased emphasis is given to deer habitat management. This was modeled by changing half the desired amount of deer acres from Regulation Class I to Regulation Class II in the specific analysis area's aggregate emphasis package.

   c. The ROS class of some specific analysis areas were increased. This was done to show what the ID Team thought the mix of ROS acres should be to meet the theme of this alternative.

   d. The Fire Budget was set to the current level as a minimum This was done to show current Fire Budget in this alternative.

   e. The amount of standard and low standard services for developed and dispersed RVDs was set to equal 1982 levels The amount of developed and dispersed RVDs is estimated to increase 5.8 percent per decade.

   f. Riparian areas are estimated to be 35,000 acres and are managed for timber as Regulation Class III.

   g. As a consequence of increased riparian acres in Management Area 4, 23,500 acres of Min-Level were moved to Limited-Timber Yield.

B.9.3
(RPA) 1980 RPA Program Alternative

1. Theme· This alternative represents the role the Forest will have to play in order to best meet the 1980 RPA program. It emphasizes timber and range production, where benefits are commensurate with costs, and maintains the environment, including wildlife habitat, on all Forest land. Dispersed recreational opportunities will be stressed. Developed recreational opportunities will be maintained and new development opportunities for private capital investments on Forest encouraged. Wilderness management will be directed toward increasing opportunities for a high-quality wilderness experience.

2 Objective function: Maximize PNV for 12 periods.

3. Timber policies: Rotation length at 95% of CMAI, LTSY, Nondeclining Harvest Flow, Dispersion for Regulation Classes I and II Timber.

4. Fixed pre-FORPLAN AAs/Rx distributions. No pre-allocations were made.

5. Minimum Management Requirements: All MMRs applied.

6. Minimum Implementation Requirements: All MIRs applied

7. Forest constraints common to all alternatives· All common constraints applied.

8. Constraints unique to this alternative:

   a A total of 11,400 acres are included in deer population centers and holding areas where increased emphasis is given to deer habitat management. This was modeled by changing half the desired amount of deer acres from Regulation Class I to Regulation Class II in the specific analysis area's aggregate emphasis package.

   b The ROS class of some specific analysis areas was increased. This was done to show what the ID Team thought the mix of ROS acres should be to meet the theme of this alternative.

   c. Harvest levels for the first period and the fifth period were set to be equal to or greater than the RPA targets. The target levels are 238.1 MMCF for the first period and 261.5 MMCF for the fifth period. This was modeled by scheduled output constraints.

   d. Riparian areas are estimated to be 44,000 acres and are managed for timber as Regulation Class III.

   e. The volume was reduced from Draft to account for increased riparian acres. This was accomplished by multiplying riparian acreage increase (32,500 acres) by average yield from Regulation Classes I and II

B.9.4
(LBU) Low Budget Alternative

1. Theme: This alternative represents a basic or low budget level of activities. It is near the minimum of activities and production prescribed by laws, regulations, and Forest Service management direction. It responds to the basic responsibilities of control, protection, and use of the Forest's air, land, and water resources. Production will be concentrated on existing roaded land base and activities will be dispersed as widely as practicable. Actions will be implemented primarily to protect and conserve resources and to rehabilitate resources where deterioration has occurred

2. Objective function: Maximize PNV for 12 periods.

3. Timber policies Rotation length at 95% CMAI, LTSY, Nondeclining Harvest Flow, Dispersion for Regulation Classes I and II Timber.

4. Fixed pre-FORPLAN AAs/Rx distributions· Ferguson Ridge, Devil's Gulch, Mt. Raymond, Dinkey Lakes, and Kings River "B" Further Planning Area are assigned to Semiprimitive, Nonmotorized Recreation. This was modeled by assigning timber prescriptions to Min-Level.

5. Minimum Management Requirements: All MMRs applied.

6. Minimum Implementation Requirements· All MIRs applied.

7. Forest constraints common to all alternatives: All common constraints applied

8. Constraints unique to this alternative:

   a. A total of 18,700 acres are included in deer population centers and holding areas where increased emphasis is given to deer habitat management. This was modeled by changing half the desired amount of deer acres from Regulation Class I to Regulation Class II in the specific analysis area's aggregate emphasis package.

   b An additional 5% of the mixed conifer stands were required to use shelterwood as the regeneration harvest method. This was done to show timber stands in sensitive areas where clearcutting would be more expensive than the theme would consider to be prudent. This was

modeled through a scheduled output constraint.

c. A constraint was put on the Fire Budget so it would not drop below 75% of the 1982 budget level. This was done because FORPLAN would like to lower the Fire Budget more than was acceptable. This was modeled through a scheduled output constraint.

d. Spotted owl habitat was increased 1.4 times the MMR acreage to proxy an increase from 21 SOHAs (MMR on CAS land) to 29 SOHAs. This was modeled through an increase in the percentages assigned in the aggregate emphasis package and an increase in the spotted owl habitat scheduled output constraint. The 29 SOHAs are managed with an even-aged prescription

e. The amount of standard Forest Service - developed RVDs was set at zero. This caused this output to produce at Low Standard. All other recreational outputs were allowed to float between Standard and Low Standard.

f. Riparian areas are estimated to be 27,000 acres and are managed for timber as Regulation Class III.

g As a consequence of increased riparian acreage in Management Area 4, 15,500 acres of Min-Level were moved to Limited-Timber Yield.

B 9.5
(AMN) Amenity Alternative

1. Theme: Management in this alternative will emphasize nonmarket (amenity) values such as dispersed recreation, wilderness, wildlife and fish habitat, and environmental quality, with fish and wildlife and wilderness having the primary emphasis. Timber harvest volumes will be reduced from current levels. An uneven-aged harvest system will be implemented on all tractor ground. Commodity resources will be managed to avoid conflicts with or enhance amenity values such as visual resources, wildlife, and fish. Developed recreation will remain near present levels.

2. Objective function: Maximize PNV for 12 periods.

3. Timber policies: Rotation length at 95% CMAI, LTSY, Nondeclining Harvest Flow, Dispersion for Regulation Classes I and II Timber.

4. Fixed pre-FORPLAN AAs/RX distributions:

a. Mt. Raymond, Ferguson Ridge, Devils Gulch and Dinkey Lakes are assigned to Semiprimitive, Non-motorized Recreation.

b. Kings River "B" Further Planning Area is assigned to Kings River Special Management Area.

c. Twenty-four SOHAs on CAS land are assigned to the "no scheduled timber harvest" prescription.

d. Portions of the Developed Recreation Management Area around Courtright and Wishon Reservoirs and the areas between Ansel Adams and Dinkey Lakes Wildernesses leading to Edison and Florence Lakes are assigned to Min-Level.

5. Minimum Management Requirements· All MMRs applied.

6. Minimum Implementation Requirements: All MIRs applied.

7. Forest constraints common to all alternatives all common constraints applied.

8 Constraints unique to this alternative.

a. Approximately 3.5% of future regenerated stands will be unavailable for harvesting. This proxies the effects of oaks on future regenerated timber stands. This was modeled through the scheduled output constraints.

b. Riparian acres were increased, to more accurately reflect RMA acres, from 14,500 acres in the Draft Plan to 33,000 acres in the Final Plan. Yields will total 1.5 MMBF per year and will only include harvest of incidental amounts of timber for roads and skyline corridors or to improve the riparian ecosystem.

c. A total of 26,700 acres are included in deer population centers and holding areas where increased emphasis is given to deer habitat management. This was modeled by increasing the amount of acres assigned to group selection

d. Minimum-Level Management and Limited-Timber Yield Prescriptions are assigned to all furbearer habitat areas and corridors respectively. All furbearer areas, an estimated 77,600 acres, tracked outside of FORPLAN, are dedicated to Minimum - Level Management.

e. The ROS classes of some specific analysis areas were increased. This was done to show what the ID Team thought the mix of ROS acres should be to meet the theme of this alternative.

f. An additional 5% of the mixed conifer stands were required to use shelterwood as the regeneration harvest method This was done to show some timber stands in sensitive areas where clearcutting would be controversial. This was modeled through a scheduled output constraint.

g All dispersed and wilderness recreation will be at full standard. This is done to model the theme of this alternative. This was modeled through a scheduled output constraint.

h The total amount of harvest (both regeneration, intermediate, and uneven - aged) will be no greater than 55,000 acres/decade, and the total amount of regeneration harvest will be no greater than 21,000 acres/decade This was done to limit the amount of disturbed ground necessary to meet the theme of this alternative. This was modeled through a scheduled output constraint.

i. Minimum acres (147,000 acres) assigned to uneven-aged management using group selection.

j. Approximately 3% of existing and regenerated stand volume reserved from harvest to provide dead trees to meet snag standards and guidelines in future decade

B.9.6
(CEF) Constrained Economic Efficiency with Forest Constraints Alternative

1. Theme: This alternative provides resource outputs using the most economically-efficient land areas and prescriptions, while providing adequate protection to soils, water, wildlife, and scenery Developed recreation will be emphasized in existing high use areas with dispersed recreation stressed elsewhere in the the Forest. Developmental opportunities for private capital investments on Forest land will be encouraged. Wilderness will be managed at low intensity.

2. Objective function: maximize PNV for 12 periods.

3 Timber policies: Rotation length at 95% of CMAI, LTSY, Nondeclining Harvest Flow, Dispersion for Regulation Classes I and II Timber.

4. Fixed pre-FORPLAN AAs/Rx distributions No pre-assigned allocations were made.

5. Minimum Management Requirements: All MMRs applied.

6. Minimum Implementation Requirements: All MIRs applied.

7. Forest constraints common to all alternatives: All common forest constraints applied.

8. Constraints unique to this alternative: No other constraints were applied to this alternative.

B.9.7
(WLI) Wilderness Emphasis with Capital Investment Alternative

1. Theme: This alternative was developed to evaluate the potential for maintaining or increasing commodity outputs on the non-wilderness portion of the Forest, through intensified management, while recommending all eligible further planning areas for wilderness. The remainder of the Forest was then managed with the objective of minimizing timber production. Investments included pre-roading, scheduled precommercial thinning and sanitation.

2. Objective function. Maximize PNV for 12 periods

3. Timber policies. Rotation length at 95% CMAI, LTSY, Nondeclining Harvest Flow, Dispersion for Regulation Classes I and II Timber.

4. Fixed pre-FORPLAN AAs/Rx distributions: Mt. Raymond was assigned to semiprimitive, nonmotorized recreation. This was modeled by assigning the timber prescription to Min-Level. Kings River "B" Further Planning Area was assigned to Wilderness This was modeled by assigning the timber prescriptions to Min-Level, and the recreational prescriptions to Wilderness.

5. Minimum Management Requirements: All MMRs applied.

6. Minimum Implementation Requirements: All MIRs applied.

7 Forest constraints common to all alternatives· All common constraints applied.

8. Constraints unique to this alternative:

   a. A total of 2,100 acres are included in deer population centers and holding areas where increased emphasis is given to deer habitat management This was modeled by changing half the desired amount of deer acres from Regulation Class I to Regulation II in the specific analysis area's aggregate emphasis package.

b. The spotted owl habitat acres were increased 1.6 times the MMR acreages. This was done to show an increase in spotted owl management. This was modeled through an increase in the percentages assigned in the aggregate emphasis package and an increase in the spotted owl habitat scheduled output constraint. The 34 SOHAs on CAS land are managed with an even-aged prescription.

B 9 8
(MKT) Market Emphasis Alternative

1. Theme: This alternative will more fully utilize the Forest's productive capacity. It was formulated to portray market opportunities. Though production will be emphasized, environmental quality will be a major concern Timber, range, mineral resources, and developed recreation will be emphasized. Nonmarket resources will be managed at economically efficient levels.

2 Objective function: Maximize PNV for 12 periods.

3. Timber policies: Rotation length at 95% CMAI, LTSY, Nondeclining Harvest Flow, Dispersion for Regulation Classes I and II Timber.

4 Fixed pre-FORPLAN AAs/Rx distributions: No pre-assigned allocations were made.

5. Minimum Management Requirements· All MMRs applied.

6. Minimum Implementation Requirements: All MIRs applied

7. Forest constraints common to all alternatives· All common constraints applied.

8. Constraints unique to this alternative:

   a. Developed Recreation will be met at full standard. This was done to show the theme of the alternative as it relates to recreation. This was modeled through a scheduled output constraint.

   b. The harvest levels for the first and fifthperiods were set to be equal to or greater than minimum levels set by the Region. The level for the first period is 232 MMCF and for the fifth period is 256 MMCF. This was modeled through a scheduled output constraint

   c. The range outputs were set to meet or exceed the fifth period target of 50 M AUMs This was modeled through a scheduled output constraint.

   d. Riparian areas are estimated to include 42,000 acres and are managed as Regulation Class III.

   e. The volume was reduced from DEIS as a result of increased riparian area. This was accomplished by multiplying riparian acreage increase (30,500 acres) by average yield from Regulation Classes I and II land.

B.9.9
(PRO) High Production Alternative

1. Theme: This alternative is intended to meet the 1980 RPA High Productivity timber targets. All suitable timber land, except those in existing classified wilderness, experimental forests, and special interest areas will be managed for timber production. Range, developed recreation, and minerals resources will be managed and utilized above current levels. All other resources will be managed at minimum legal levels. Includes management direction common to all alternatives.

2. Objective function: Maximize PNV for 12 periods

3. Timber policies. Rotation length at 95% CMAI, LTSY, Nondeclining Harvest Flow only after the sixth period, Dispersion for Regulation Classes I and II Timber.

4. Fixed pre-FORPLAN AAs/Rx distributions: No pre-assigned allocations were made.

5. Minimum Management Requirements: All MMRs applied.

6. Minimum Implementation Requirements: All MIRs applied

7 Forest constraints common to all alternatives: All common constraints applied.

8 Constraints unique to this alternative: The harvest levels for the first thru fifth periods were set to be equal to or greater than minimum levels set by the Region The levels set are 224, 256, 304, 296, and 288 MMCF for the first through fifth periods. This was modeled through a scheduled output constraint

B.9.10
(CEE) Constrained Economic Efficiency Alternative

1. Theme: This alternative is intended to achieve the most economically efficient distribution and schedule for meeting MMRs and MIRs. While not carried forward as an alternative, it is used in several tables in the EIS for comparison of discounted costs and benefits and PNV among the other alternative

2. Objective function: Maximize PNV for 12 periods.

3. Timber policies: Rotation length at 95% CMAI, LTSY, Nondeclining Harvest Flow only after the sixth period, Dispersion for Regulation Classes I and II Timber.

4 Fixed pre-FORPLAN AAs/Rx distributions: No pre-assigned allocations were made.

5. Minimum Management Requirements: All MMRs applied

6. Minimum Implementation Requirements: All MIRs applied.

7. Forest constraints common to all alternatives No constraints applied.

8. Constraints unique to this alternative: No constraints

B.9 11
(UNE) Uneven-aged Management Alternative

1. Theme. This alternative is the same as Alternative A except that timber production is to be achieved to the maximum extent physically possible through uneven-aged management, utilizing the group selection method to achieve regeneration.

2 Objective function: Same as Alternative A.

3. Timber policies· Same as Alternative A.

4. Fixed pre-FORPLAN AA/Rx distribution: Same as Alternative A.

5. Minimum Management Requirements: All MMRs applied.

6. Minimum Implementation Requirements: All MIRs applied.

7 Forest constraints common to all alternatives. All common constraints applied.

8. Constraints unique to this alternative: Same as Alternative A except that a minimum of 148,000 acres are assigned to uneven-aged management, using the group selection method to achieve regeneration.

B.9.12
(CON) Conservation Alternative

1. Theme· Management in this alternative will emphasize nonmarket (amenity) values such as dispersed recreation, wilderness and habitat for wildlife and fish. Extended harvest rotations will promote late seral stage and eliminate the need for clearcutting and herbicide. Commodity resources will be managed to enhance amenity values such as visual resources, wildlife and fish. An additional 48,668 acres will be added to wilderness. Developed recreation will remain near present levels. Costs in this alternative will be moderate.

2. Objective function: Maximize PNV for 12 periods.

3. Timber policies: All of timber base is in Regulation Class III

4 Fixed pre-FORPLAN AA/Rx distributions·

   a. Mt. Raymond, Ferguson Ridge, Devils Gulch are assigned Semiprimitive, Non-motorized Recreation.

   b. Kings River "B" Further Planning Area is assigned Wilderness even though it is within the Kings River Special Management Area.

   c. Twenty-four SOHAs on CAS land are assigned to the "no scheduled timber harvest" prescription.

   d. Portions of the Developed Recreation Area around Courtright and Wishon Reservoirs and the area between the Ansel Adams and Dinkey Lakes Wildernesses leading to Edison and Florence Lakes are assigned to Min-Level.

5. Minimum Management Requirements: All MMRs applied.

6 Minimum Implementation Requirements: All MIRs applied.

7. Forest constraints common to all alternatives: All common constraints applied.

8. Constraints unique to this alternative·

   a. All dispersed and wilderness recreation will be at full standard. This is done to model the theme of this alternative. This was modeled through a scheduled output constraint.

   b Timber management will occur on 313,200 acres. All of this area will be managed to Regulation Class III.

   c A total of 147,000 acres will be assigned uneven-aged management using group selection.

   d. No herbicide will be applied

   e. Riparian areas total 33,000 acres. No timber is scheduled to be harvested in these areas.

B 9 13
(TIM) Timber Association of California Alternative

1. Theme: This alternative emphasizes timber and range production and maintains the environment including wildlife habitat on all Forest land. The volume in this alternative maintains the four sawmills dependent on timber from the Forest. Demand for dispersed recreation will be met through a broad range of opportunities. Development of new facilities will be accomplished primarily through recreation licensees. Management of wilderness will improve through rehabilitation of existing facilities and increased visibility of forest personnel. Costs used in this alternative will be moderate.

2 Objective function: Maximize PNV for 12 periods.

3. Timber policies Rotation length at 95% of CMAI, LTSY, Nondeclining Harvest Flow, Dispersion for Regulation Classes I and II Timber.

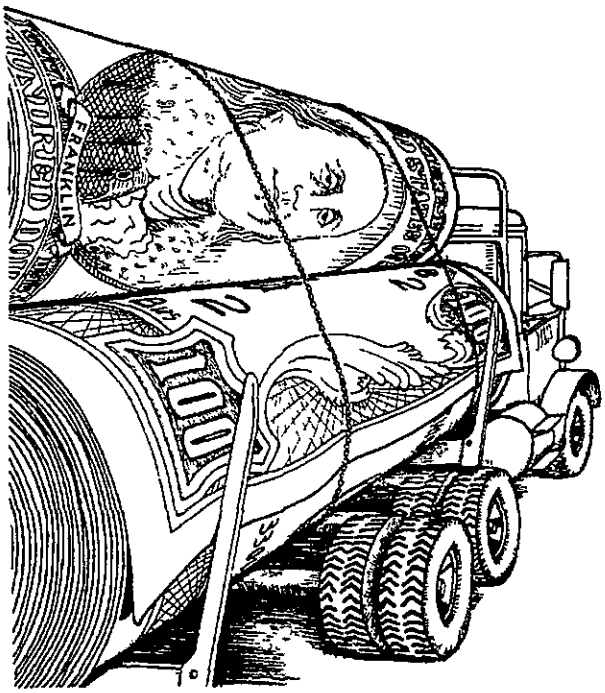
4. Fixed pre-FORPLAN AA/Rx distribution: Used 13.9 M acres in Regulation Class IV (Minimum yield)

5. Minimum Management Requirements: All MMRs applied.

6. Minimum Implementation Requirements: All MIRs applied.

7. Forest constraints common to all alternatives: All common constraints applied.

8. Constraints unique to this alternative: 1) Steeper, more sensitive ground will be managed to provide multi-storied stands and maintain a continuous forest cover by leaving 20% of the stands. 2) Riparian areas are estimated to include 38,000 acres and are managed as Regulation Class III. 3) The volume was reduced from original proposed to account for increase in riparian acres. This was accomplished by multiplying increased riparian acreage by 410 BF/AC (average growth of Regulation Classes I and II land.



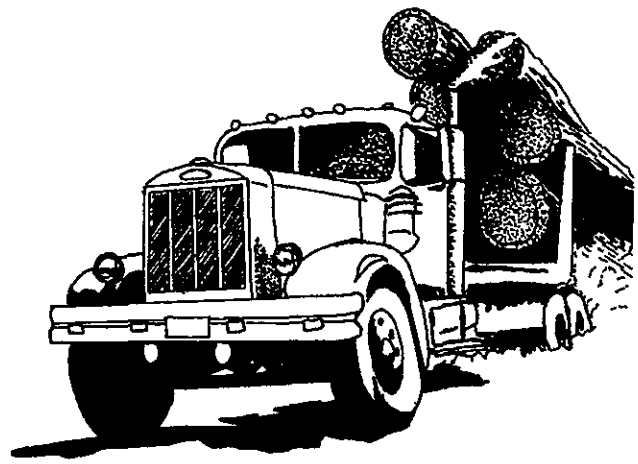


TABLE B.07 - BENCHMARK AND ALTERNATIVE CONSTRAINTS

	MLV	FLW	MMR	MKV	TBR	TBD	WLN	RGN	H20	PRF	CUR	RPA	LBU	AMN	CEF	WLI	MKT	PRO	CEE	UNE	CON	TIM
OBJECTIVE FUNCTIONS																						
Minimize Cost	Y																					
Maximize PNV All Resources		Y	Y				Y															
MAximize PNV Market Only				Y							Y	Y	Y	Y	Y	Y	Y	Y	Y			
Maximize Specific Output with rollover to maximize PNV)					Y	Y		Y	Y	Y				Y						Y	Y	Y
CONSTRAINTS																						
1. Technological Constraints		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2. MMRs			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
3. Timber Policies																						
LTSY		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Rotation		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Nondeclining			Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y
Dispersion			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
4 MIRs										Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
5 Forest Constraints																						
Visual Standards & Guidelines										Y	Y	Y	Y	Y	Y	Y	Y	Y		Y		Y
Shelterwood Mixed										Y	Y	Y	Y	Y	Y	Y	Y	Y		Y		Y
6. Scheduled Outputs																						
Recreation																						
Developed Recreation		U	U	U	U	U	U	U	U	U	E	U	U	U	U	U	U	U	U	U	U	U
Dispersed Recreation		U	U	U	U	U	U	U	U	U	E	U	U	U	U	U	U	U	U	U	U	U
Wilderness Recreation		U	U	U	U	U	U	U	U	U	E	U	U	U	U	U	U	U	U	U	U	U
WFUDs		U	U	U	U	U	U	U	U	U	E	U	U	U	U	U	U	U	U	U	U	U
Range AUMs								L	L	U	E	U	U	U	U	U	U	U		U		U
Early Grazing										U	U	U	U	U		U	U			U		U
Vegetation Treatment								U		U	U	U	U	U		U	U	U		U		U
Retardation										L	U	L	U	L		L	L	L		U		U
Timber											L	L					L	L				
Fire Program																	L		L			
Budget Limitation																	U		U			
7. Alternative Constraints																						
Poorly Stocked Stands Regenerated										Y										Y		Y
Regeneration Period										Y				Y						Y		
Intermediate Harvest										Y	Y			Y						Y		Y
No Harvest in SOHAs										Y				Y						Y	Y	
Oak Retention										Y				Y						Y	Y	
Added Riparian										Y				Y						Y	Y	
Level 1 Area Assigned							Y			Y	Y		Y	Y		Y				Y		
Added Spotted Owl										Y			Y	Y								
Added Deer Habitat										Y	Y	Y	Y	Y		Y				Y	Y	
ROS Class										Y	Y	Y		Y								
Additional Shelterwood Cutting										Y			Y	Y						Y		Y
Minimum Uneven-aged Group Selection										Y				Y						Y	Y	
Inventory Reduction for Snags										Y				Y								

Y Constraint On;
E "Equal To" Limit;
U "Upper" Limit;
L "Lower" Limit

B.10
OTHER MODELS

B 10.1
RAMPREP

The Fort Collins Computer Center program, CIA - RAMPREP, produces tables of yields corresponding to RAM volume tables and special activities for a set of specified rotations Also produced is a table of basal area and volume values per acre for growing stock, sanitation, and their total. Output values are for sampling strata, which are defined to be RAM activity classes. Tables showing numbers of trees by DBH and age class contained in sample can be produced A final option creates the RAM special activity and volume data files.

B.10.1.1
Fire Management Analysis Process (FIREPLAN)

The fire management analysis process is comprised of four levels of analysis and a series of eight computer programs. Of the four levels of analysis only the two described below are used in the Forest planning process These two levels affect implementation and evaluation. The eight computer programs are simulators and report writers used to define the historical and current fire management situations and to evaluate candidate fire management fuels, prevention, detection, and suppression programs.

Fire Management Analysis Level 1 is basically an analysis of the historical and current fire management situation using fire and weather information, records of fire occurrences, and fire behavior (number of fires, acres burned by fire size and intensity). Some uses of Level 1 analysis are:

1. Display the general effectiveness and cost, including FFF, of the current fire management program. This program cost may be used as a basis for estimating expected future costs, where the fire program is relatively stable and will not vary significantly between prescriptions on a Forest-wide basis.

2 As a tool to aid the formulation and development of organizations in response to Forest plan alterations and prescriptions. Level 1 analysis identifies areas which can be further analyzed in the areas of prevention, suppression, and fuel management

Fire Management Analysis Level II is an analysis of various fire management program options (a suppression mix versus prevention), budget levels (costs), and their effectiveness. This analysis is based upon the simulation of representative fires using varying models, differing suppression resources, historical occurrence patterns, and by changing occurrence patterns based upon prevention efficiency. Some uses of Level II analysis are to:

1. Evaluate fire program options appropriate for the principal Forest plan alternatives identified by FORPLAN to provide detailed resource output, net value change, and program cost data for selection of the most efficient program level, where the fire program cost and effectiveness will affect the choice between these alternatives.

2. Evaluate the efficiency of fire program options for a number of alternative management prescriptions or Forest plan alternatives that provide general estimates of fire program costs and consequences for FORPLAN.

3. Evaluate the effectiveness of fire program options for a single Forest plan alternative within a constrained budget to establish the most cost effective program mix where the budget level is fixed.

From Fire Management Analysis Levels I and II, inputs by alternative to FORPLAN are:

1. Probability of acres burned,

2. Various program costs reflecting different fire management organizations, and

3 Suppression costs reflecting fire management organizational efficiency.

Then FORPLAN provides results by alternative in:

1. Acres burned,

2 Suppression costs,

3. Net value change resources, and

4 Optimum organization and budget level by period.

B.10 1 2
Regional Industrial Multiplier System (RIMS)

The U.S. Department of Commerce's Regional Industrial Multiplier System [1] (RIMS) was used to develop impact multiplier, employment and income estimates for the alternatives analyzed in the EIS This system provides input-output model multipliers for 56 industrial sectors for Bureau of Economic Analysis (BEA) Economic Area 166. Most of the economic activity associated with the Forest takes place within BEA Economic Area 166. BEA Economic Area 166 includes Fresno and Madera Counties.

[1] Industry - Specific Gross Output Multipliers for BEA Economic Areas, Regional Economic Analysis Division, Bureau of Economic Analysis, U S. Department of Commerce, January 1977.

A number of assumptions used in the input-output modeling technique are kept in mind when interpreting the resulting income and employment estimates

1. Historical transaction patterns associated with Forest outputs and purchases are assumed to hold in the future.

2. Transaction patterns (production functions) for industries in the local economy are assumed to be similar to those in the national economy and are assumed to hold in the future.

3. Income and employment impacts are assumed to occur in the same time period as the underlying changes in Forest outputs and purchases (no lagged effects are assumed).

As a result of these basic assumptions, employment and income effects estimated for the alternatives have relatively low reliability in absolute terms in future time periods However, income and employment estimates are reasonably accurate indicators of relative changes between the alternatives in the first decade.

C.0
APPENDIX C - KINGS RIVER FURTHER PLANNING AREA (B5-198)

C 1
INTRODUCTION

Forest Service Manual 2320 specifies the factors to be considered when evaluating wilderness resources as need, suitability, availability, and manageability. Direction concerning wilderness evaluations may be reviewed in Forest Service Manual 2320 and the Pacific Southwest Region's "Land Management Planning Direction."

As a result of the 1984 California Wilderness Act all roadless areas were either released for multiple use management, created or added to existing wilderness, or placed into a "Further Planning" category. The Kings River Roadless Area was the only area in the Forest to become a Further Planning area. This area includes 24,368 acres in the Sierra National Forest and 24,300 acres in the Sequoia National Forest. In November 1987, through "special" legislation, [1] the Kings River Special Management Area (KRSMA) was created thus, restricting future development of the area (See Management Area 12 in Forest Plan). This legislation restricted many management activities, however, it did not remove the area from further planning and future wilderness consideration via the 1984 California Wilderness Act. This appendix documents the trade-offs relating to wilderness vs. non-wilderness designation in addition to KRSMA designation.

C.2
FACTORS CONSIDERED WHEN EVALUATING WILDERNESS

C.2 1
Description

The major part of the further planning area is characterized by steep slopes covered with dense brush interspersed with rock outcrops and grassy openings of shallow soils Vegetation has poor age class and mosaic distribution Occasional stands of timber occur at higher elevations, particularly on north-facing slopes. Elevations range from 1,000 feet to the west to 10,000 feet at Spanish Mountain in the northeast. Views of the area are largely into areas where activities of man are evident.

The area is bisected by Kings River and penetrated by about 10 miles of a west-to-east road built on the north side of the river to reach mines in Fox Canyon. The roaded area is popular, with considerable recreational activity in spring and early summer occurring along the road and river. Campgrounds adjoin the unit at Mill Flat and Garnet Dike. The nearest paved county road access is to the west of Kirch Flat and to the east at Yucca Point. The major activities occurring in the KRSMA are hunting, hiking, fishing and whitewater rafting. Some 50 miles of trails provide access to and along portions of the river. Topography, vegetation, and difficult access restrict recreational opportunities.

The more noteworthy attractions, aside from the river, are Garlic Falls and several groves of giant Sequoia, including the Boole Tree. OHV use occurs in the vicinity of the Boole Tree, between Yucca Point and the river at Bear Wallow, Garlic Meadow, Lousy Spring, and Rodgers Ridge.

The North Kings Deer Herd utilize much of the area for winter and intermediate range. This herd has been the subject of intensive study and habitat improvement efforts by California Department of Fish and Game, Fresno County Sportsmens Club, California State University at Fresno, and Forest Service.

C.2.2
Suitability

Factors affecting the suitability of the Kings River Further Planning Area for wilderness are discussed in this section.

The area is generally undisturbed by man and, other than small areas near the perimeter, the natural integrity and apparent naturalness of the area is obvious. Interplay between biotic species has proceeded, generally in a free and natural manner.

Kings River Canyon offers self-reliance to the user. Steep slopes, ledges, and dense brush render the canyon nearly impassible. However, due to these same factors, there is very little diversity of opportunity within the canyon. Primary features are the river and small waterfalls on the side channels.

The area has considerable opportunity for solitude. Dense brush affords screening and, with the very low recreational use, the visitor is assured of a great deal of solitude.

C.2.3
Manageability and Boundary

Kings River Further Planning Area may be difficult to manage as wilderness, because of its boundaries Many miles of boundary are located adjacent to obvious resource management and development Impacts on wilderness experience will occur from uses and activities outside wilderness Similarly, activities outside wilderness will be precluded by the proposed boundary.

Boundaries may be adjusted to more manageable locations, thus minimizing conflicts inside and outside wilderness. The most manageable area will place the boundaries west at Garlic Spur and south at Kings River.

[1] Public Law 100-150 designated these areas into one

C 2.4
Availability

Opportunities exist to improve trail access along Kings River. This action will increase fishing and hiking by only a minor amount because there is an absence of significant attractions.

There is an estimated 50,000 RVD use in this area each year. Hunting, hiking, fishing and whitewater rafting are the most popular activities. Limited OHV use occurs, but is minor compared to fishing and hunting.

The further planning area is very important to the North Kings Deer Herd. There are some opportunities to improve habitat conditions, which may or may not increase population of the herd. With the exception of one peregrine falcon nest site in the canyon, the variety and abundance of wildlife populations is not particularly noteworthy. Kings River above Pine Flat Reservoir possesses excellent fisheries and has been designated a Wild Trout Stream

Little is known of the cultural resources of this area because Forest Service activities, which require cultural resource inventories, have not been performed. Archival and literature research however indicates some significant cultural properties. It is assumed these resources have maintained a high level of preservation because of isolation. Without field studies and professional evaluation, their potential and significance cannot be assessed.

The area contains a great deal of extremely heavy fuels. The prevalent burning conditions occurring in the canyon are rated as extreme. The combination of conditions comprises one of the most extreme fire situations known to occur in the United States and there is a high potential for a major conflagration; a very real management concern Sequoia National Forest, in particular, has concern for protecting high-value commercial forest, recreational facilities, and residential developments upslope of the further planning area.

About 4,000 AUMs of forage (3,160 AUMs on Sierra) are utilized each year. There are opportunities for wildlife burn projects on Rodgers Ridge to produce additional livestock forage, reduce fire hazard, and improve deer habitat.

Mineralization occurs along Kings River. Although several mines have produced from proven reserves, none are currently active Mineral potential in the canyon rates among the more attractive mineral areas in the Forest. The possibility of mineral occurrences is rated as proven, probable, and possible, with about a third of the area under each rating. Mining is limited to development of existing claims regardless of whether the area is managed as a SMA or wilderness

Power withdrawals encumber about 8,600 acres. A potential hydroelectric reservior is on record for the junction of the middle and south forks and a water storage-hydroelectric project was actively considered at Rodgers Crossing. However, the KRSMA Act specified that this project cannot be developed without specific authority of Congress. (Wilderness designation will require approval by Congress and the President.)

Application of visual resource analysis techniques resulted in rating the main canyon's landscape as common. The terrain varies moderately, with few dominant or distinctive features. Vegetation is quite uniform, with few changes to offer visual relief. The river, the area's major feature, offers moderate variations in waterforms. Air currents moving from the Central Valley introduce a noticeable haze. Visibility from the few vantage points available is often impaired. The area cannot attain Class I air quality standards because of its location.

Both Kings and South Fork Kings Rivers have been designated Wild and Scenic Rivers. Based on the Wild and Scenic River classification and analysis process, the two river segments within the Kings River Further Planning Area vary from Wild classification on the Kings River to Recreation on the South Fork Kings River.

There are 240 acres of private land within the Further Planning Area boundaries that are mostly undeveloped and unencumbered. Private land is considered nonconforming to wilderness designation and management, unless it can be acquired in the undeveloped condition KRSMA regulations are not applicable to private land, and private inholdings are subject to use and development within applicable state laws and county ordinances. Further, the owners of private land within a National Forest wilderness have a statutory right of ingress and egress to their property. The existence of private land therefore creates a situation where nonconforming uses and activities might occur in KRSMA. Improvements present an anomaly in the midst of KRSMA.

C.2.5
Need

Public comment during the RARE II process and drafts of the Sierra Land Management Plan and EIS showed a split between persons or groups favoring Wilderness and Non-wilderness designation Basic conflict between classification hinges on range, wildlife, fire, and water development interests. Range and wildlife issues relate to the ability to maintain and enhance forage conditions by vegetative manipulation projects, which will usually require mechanized equipment Installation of minor facilities, such as water development to enhance animal use and distribution, will also be necessary. Fire protection, management, and suppression activities in this highly flammable area will be more difficult, with most activities sharply curtailed by Wilderness designation.

The KRSMA Act resulted from a compromise between Rodgers Crossing dam construction proponents and those who opposed the project. The Act only grants Congress authority to approve the dam It also doesn't preclude the Kings River Conservation District from conducting studies Wilderness proponents may feel the KRSMA legislation is satisfactory. Prior to the legislation they proposed wilderness because of the free-flowing river, the scenic qualities of the area, low elevation and year-round access.

Concerning the need for wilderness, the Forest Service Manual states: "When considering the need for additional wilderness within a given area, it is necessary to place the wilderness resource in perspective. There should be an indication of current or future public need." This is considered in light of the amount of wilderness resource available within 150 miles of the Forest. Within that radius, there are approximately 7.25 million acres of established and proposed wilderness Based on a wilderness permit analysis (Region 5 - USDA Forest Service, 1975), the National Forest Wilderness within that same 150-mile radius contain some of the most heavily-used and some of the most lightly-used wilderness in California National Forest. Users reside primarily in the San Francisco-Sacramento and the Los Angeles-San Diego areas. The highest proportion of visitors to the southern units are from Southern California and the highest proportion of visitors to the northern units are from Central California. Wilderness enthusiasts from these areas also have access to considerably more wilderness than the 7.25 million acres within the 150-mile radius of the Forest.

C.3
ENVIRONMENTAL CONSEQUENCES

C.3.1
Alternative A, B, C, H

Designation:	Nonwilderness/SMA
24368 ac.	Sierra
24300 ac	Sequoia

Prescription. Special Management Area - emphasizing recreation; protection of the area's natural, archaeological, and scenic resources; and management for fish and wildlife.

Emphasis is placed on using fire to maintain or enhance wildlife resources by vegetative manipulation. Wilderness attributes will be affected little, except for short-term impacts on natural appearance, as a result of enhancement of wildlife habitat. Solitude will not change appreciably.

Prescribed fire will play a major role in vegetation and habitat management.

Wildlife habitat will be improved through treatment; vegetative and animal diversity will increase. Vegetative treatment will also benefit range as well as reduce fuels. The current range management program may increase slightly, although grazing will be subservient to wildlife needs. Improvements to facilitate more intensive grazing in the lower part of the area may be developed

There may be a slight increase in hunting because of increased wildlife populations, although the area is steep and not easy to use. Recreation is primarily water/fishing-oriented and will remain low because of poor access, steep terrain, and dense vegetation Access to the unit and throughout the area will limit visitors' ability to get around, although foot and horse trails may be developed and/or improved to facilitate access.

Air quality will remain the same, given proximity to the San Joaquin Valley. Periods when prescribed fire occurs will add smoke to the airshed. Cultural resources will be protected. Activities with potential for impacting cultural properties will require inventory, evaluation, and appropriate mitigation. Water quality will slightly decrease temporarily following projects.

Economic and social benefits will increase slightly due to increased use. A slight increase in water quantity will occur. There will be increases in range opportunities. Some social consequences will result from a loss of natural environment and loss of formal Wilderness designation. Fire suppression costs will remain high because of limited access.

C 3.2
Alternative D

Designation:	Wilderness
24368 ac.	Sierra
24300 ac.	Sequoia

Prescription: Wilderness - emphasizing, long-term diversity through fire management, maintenance of water quality, and wilderness recreational opportunities. The wilderness attributes of the area will be maintained Recreation, primarily water, fishing, and hiking, will remain low even if access is improved There will be a slight decline in RVDs from prohibition of OHV travel to reach hunting and fishing areas.

Because of proximity to the San Joaquin Valley, low visibility will occur during periods of inversion in the valley. Class I air quality will not be attainable

Fire will be used to maintain or enhance vegetative diversity. Vegetative diversity will produce visual diversity and increase the variety of wildlife in the area Grazing will continue, but opportunities to increase range

capacity and/or accomplish fuel reduction programs will be foregone. Losses of these resources will occur over time.

Stream channels are relatively stable and water quality and sedimentation will not change. Manageability and enforcement of wilderness regulations will be difficult and costly due to limited access and remoteness. Fire prevention and suppression costs will be greater than under nonwilderness management. Application of prescribed fire will be costly and limited.

Social and economic dependencies on the area are livestock grazing with 4,000 AUM capacity. Wilderness designation is not expected to adversely affect maintenance of current improvements or forage production. Management of allotments will continue, but be more restrictive, with constraints on further grazing improvements. No large resource trade-offs require mitigation.

Wilderness designation will preclude or restrict most, but not all, resource uses and management opportunities. Prohibitions or restrictions will apply to activities or actions requiring use of mechanized equipment. The evaluation of opportunities foregone involves many intangibles, so considerations are made in subjective terms. The opportunities foregone include:

Wilderness designation will preclude OHV uses, but some encroachment may occur on some lower elevation trails in the unit. Upslope fire protection of resources and developments through fuels management and firebreak development will be foregone. Most deer habitat improvement project opportunities will be foregone. Some minor projects, which can be accomplished by handwork might be accomplished. Hydroelectric development will be foregone at Rodgers Crossing unless the project is approved by Congress and the President.

Table C.01 summarizes Alternative D Wilderness / Nonwilderness trade-offs.

C.3.3
Alternative E

Designation:	Nonwilderness/SMA in lower area.
14,448 ac.	Sierra
19,700 ac.	Sequoia

Prescription: Sierra and Sequoia National Forests lower area: Special Management Area - emphasizing recreation; protection of the area's natural archaeological, and scenic resources; and management for fish and wildlife.

Except for reduced range management opportunities, environmental consequences are the same as in Alternative A, B, C, and H. The current range management program will not increase under this prescription and will remain subservient to wildlife needs.

Designation:	Wilderness in upper area
9890 ac.	Sierra
4600 ac.	Sequoia

Prescription: Wilderness - emphasizing wildlife and wilderness recreation.

Table C.02 summarizes Alternative E Wilderness/Nonwilderness trade-offs if only the upper portions of the area goes to Wilderness. Environmental consequences are the same as Alternative D.

C.4
SUMMARY OF DISTRIBUTION AMONG ALTERNATIVES

Table C.03 displays the distribution of Kings River Further Planning Area according to the emphasized management activity of each alternative.

TABLE C.01 - KINGS RIVER FURTHER PLANNING AREA - ESTIMATED WILDERNESS / NONWILDERNESS TRADE-OFFS IF TOTAL AREA GOES TO WILDERNESS IN ALTERNATIVE D

PARAMETER	UNIT	SPECIAL MANAGEMENT AREA/NONWILDERNESS		SPECIAL MANAGEMENT AREA/WILDERNESS	
		Sierra	Sequoia	Sierra	Sequoia
Dispersed Recreation	M RVD/year	3.4	2.0	0.0	0.0
Wilderness	M RVD/year	0 0	0.0	3.2	1.8
Hunting and Fishing	M WFUD/year	1.8	0.8	1.6	0.7
Grazing	M AUM/year	3.2	0.8	3.2	0 8
Habitat Improvement	Opportunity	Moderate		Very Low	
Hydroelectric Power Generation	Opportunity	Very Low		Very Low	
Road Construction	Opportunity	Moderate		Foregone	
Recreation Development	Opportunity	Moderate		Foregone	
Structures	Opportunity	Moderate		Foregone	
OHV Use	Opportunity	High		Foregone	
The economic model used to forecast changes in the local economy is not applicable to Sequoia National Forest. Economic changes cannot be estimated for the Kings River area					

TABLE C.02 - KINGS RIVER FURTHER PLANNING AREA - ESTIMATED WILDERNESS / NONWILDERNESS TRADE-OFFS IF ONLY UPPER AREA GOES TO WILDERNESS IN ALTERNATIVE E

PARAMETER	UNIT	SPECIAL MANAGEMENT AREA/NONWILDERNESS		SPECIAL MANAGEMENT AREA/WILDERNESS	
		Sierra	Sequoia	Sierra	Sequoia
Dispersed Recreation	M MBF/year	1.5	0 8	0.0	0.0
Wilderness	M RVD/year	0.0	0 0	1.5	0.8
Hunting and Fishing	M WFUD/year	0.2	0 2	0.2	0.2
Grazing	M AUM/year	0.8	0.0	0 8	0.0
Habitat Improvement	Opportunity	Moderate		Very Low	
Hydroelectric Power Generation	Opportunity	Very Low		Very Low	
Road Construction	Opportunity	Low		Foregone	
Recreation Development	Opportunity	Low		Foregone	
Structures	Opportunity	Low		Foregone	
OHV Use	Opportunity	Low		Foregone	
The economic model used to forecast changes in the local economy is not applicable to Sequoia National Forest. Economic changes cannot be estimated for the Kings River area					

TABLE C.03 - DISTRIBUTION OF KINGS RIVER FURTHER PLANNING AREA BY MANAGEMENT EMPHASIS (in acres)

MANAGEMENT EMPHASIS PRESCRIPTION	ALTERNATIVE					
	A	B	C	D	E	H
Wilderness						
a. Sierra NF				24,368	9,890	
b Sequoia NF				24,300*	4,600	
Total				48,668 (100%)	**14,490** *(29.8%)*	
Special Management Area**						
a. Emphasis: Recreation; Protection of Areas Natural, Cultural, Wildlife and Scenic Resources	24,368	24,368	24,368		14,478	24,368
	24,300	24,300	24,300		19,700	24,300
Total	**48,668** (100%)	**48,668** (100%)	**48,668** (100%)		**34,178** (70.2%)	**48,668** (100%)

* Includes 400 acres of private land

** Acreages and percentages shown for Special Management Area emphasis are for Sierra and Sequoia National Forests

D.0
APPENDIX D - ECONOMIC EFFICIENCY ANALYSIS

D.1
CONCEPTUAL BACKGROUND

Present net value (PNV) is the criterion used to maximize net benefits in planning benchmarks and alternatives for the Forest For each alternative, PNV is the difference between the discounted value of all priced outputs and all Forest Service management and investment costs over the analysis period. The priced outputs are those that are, or can be, exchanged in the market place. They include value of forage; stumpage value of timber; value of commercial fish in the stream, fur animals, and other harvested miscellaneous products; value of any increased water flow quantities; in-the-ground value of minerals, and all recreation visitor days, including those for wildlife, fishing, and wilderness experiences.

The alternatives are designed to achieve the specified nonpriced outputs and to meet constraints at the least cost. Thus, the PNV of each alternative estimates the value of the maximum attainable benefits of priced outputs. It is the value of priced outputs and nonpriced outputs and meeting management constraints PNV, therefore, is an estimate of the market value of the current forest resources after all costs of producing outputs and meeting constraints have been subtracted from the value of the expected flow of priced outputs.

Net public benefit is defined as the overall value to the Nation of all outputs and positive effects (benefits) less all the associated Forest Service inputs and negative effects (costs) for producing those primary benefits, whether they can be quantitatively valued or not. Thus, conceptually, net public benefits are the sum of PNV plus the full value of nonpriced outputs. Full value of nonpriced benefits is used because their cost of production has been accounted for in PNV. The nonpriced benefits here included are outputs such as threatened and endangered species maintenance or enhancement, natural and scientific areas; cultural site reservations such as Indian religious, historical, or anthropological sites; visual quality in excess of ROS Class needs; diversity objectives; or air quality in excess of MMRs MMRs in this context are standards that must be met in the production of any or all outputs from the Forest. The minimum level, therefore, is a cost of production in the multiple-use context.

There are secondary level benefits or effects that are also the concern of National Forest policy and management. These include local income and job effects on economic development of communities, net cost impacts on taxpayers; price effects on consumers of forest products and other producers of those products; payments to communities in lieu of taxes; and benefits to specific users of National Forest products who pay no fees, or fees less than the price of the valued outputs. All these are distributive welfare effects of National Forest production. All the foregoing distributive effects and impacts have been the object of national policy issues and discussions in both the Administration and Congress. Because they are distributive effects, they are essentially questions of equity, rather than efficiency, and they involve questions of who should get benefits and who pays the costs. They cannot be assessed in the context of the efficiency criteria associated with the PNV and the net public benefit concepts.

D.2
EIS PRESENTATION

The methodology, background, and results of the economic efficiency analysis conducted during the planning process are presented throughout the EIS. As a result, all of the major sections of the EIS, including those listed in Table D.01 below, must be read to obtain a complete picture of the analysis conducted for the EIS and Forest Plan.

TABLE D.01 - CONCERNS ABOUT ECONOMIC EFFICIENCY

CONTEXT	REFERENCE
Discussion of how economic efficiency analysis was used in the process of developing alternatives.	Chapter 2, Section 2.2.2
Outputs, total cost, and PNV for each benchmark	Chapter 2, Table 2 26
Results of the constraint analysis and a comparison of the alternatives in terms of PNV. This is the most comprehensive summary of the analysis results in the EIS.	Chapter 2, Table 2.27
Background information on economic conditions and the resource supply-demand situation for the Forest.	Chapter 3, Section 3.4
How and why PNV of the alternatives differ.	Chapter 4, Section 4.3
Technical details of the modeling and analysis process, including a description of basic estimates and assumptions on benefits, costs, and interest rates.	Appendix B

E.0
APPENDIX E - WILD & SCENIC RIVERS STUDY, DESCRIPTION, AND EVALUATION

E.1
INTRODUCTION

E.1.1
Background

The Nationwide Rivers Inventory (NRI) of January 1982 identified rivers that may be suitable for inclusion in the National Wild and Scenic Rivers System. The objective was to supply information to the Administration, Congress, and other agencies for their use in making decisions of eligibility and suitability. The NRI intended to:

1. Provide baseline data on the condition and extent of the Nation's free flowing and natural river resources that can be monitored over time.

2. Respond to Congress' mandate in Section 5 (d) of the Wild and Scenic Rivers Act to consider potential wild, scenic, and recreational river areas in land planning by providing a list of rivers.

3. Respond to President Carter's commitment to completing the Inventory as stated in his 1977 Environmental Message.

4. Provide a basis for recommending and insuring that the best rivers are considered for inclusion within the National System.

5. Identify potential water use conflicts prior to heavy commitments of private or public funds, thus reducing the possibility of costly confrontations.

6. Assist state, local, and private actions to conserve rivers

The wild and scenic river analysis for each of the inventoried rivers, not yet designated, will be included in this appendix. A map for each of the rivers is included with this appendix. The primary objective of the analysis is to identify "outstandingly remarkable" resource values, as indicated by the Wild and Scenic Rivers Act.

Rivers partly or completely within Sierra National Forest's land base that have been identified in the NRI for additional study are· Merced, San Joaquin, Middle Fork San Joaquin, North Fork San Joaquin and South Fork San Joaquin. Merced River is being jointly studied by Bureau of Land Management (BLM) and Sierra National Forest. The BLM, as a cooperating agency, will make final recommendations pertaining to river segments on land they administer. San Joaquin and North Fork San Joaquin Rivers are the complete responsibility of the Sierra National Forest. Middle Fork San Joaquin River is being jointly studied by Inyo and Sierra National Forests and Devils Postpile Natural Monument. South Fork San Joaquin River is being jointly studied by Sequoia-Kings Canyon National Park and Sierra National Forest.

E.1.2
Eligibility

Eligible river segments will be classified according to the extent of evidence of activity as one of the following:

1. "Wild river areas--those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America "

2. "Scenic river areas--those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads."

3. "Recreational river areas--those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past " (16 U.S C. Sec. 1273 (b))

Eligibility of rivers for inclusion into the Wild and Scenic River System will be determined using: "Guidelines for Evaluating Wild, Scenic, and Recreational River Areas Proposed for Inclusion in the National Wild and Scenic Rivers System Under Section 2, Public Law 90-542" and the National Wild and Scenic Rivers: Final (Revised) Guidelines, Federal Register 9/7/82. In order to be eligible for inclusion in the National System a river must:

1. Be "free-flowing," i.e., "existing or flowing in natural condition without impoundment, diversion, straightening, riprapping, or other modification of the waterway. The existence, however, of low dams or rivers proposed for inclusion in the National Wild and Scenic River System shall not automatically bar its consideration for such inclusion. Provided that this shall not be construed to authorize, intend, or encourage future construction of such structures within components of National Wild and Scenic River System." (16 U.S.C Sec. 1286)

2. Possess "outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values." (16 U.S.C. Sec. 1271)

The interpretation of "outstandingly remarkable" is important. Webster's dictionary defines "Outstanding" as "a standing out from a group, i.e., conspicuous; marked by eminence and distinction," and "Remarkable" as "worthy of being or likely to be noticed, especially as being

uncommon or extraordinary." So an outstanding remarkable value is a distinctive, conspicuous item that is noticeable. It is a conspicuous example of a value from among a population of similar values that are themselves extraordinary.

E 1.3
Scoping Issues

The scoping phase of the Forest Planning Process indicates that there were some specific questions that should be answered for the Wild and Scenic River studies.

The main issue is how the managers of the Forest Service (Sierra National Forest, Stanislaus National Forest, Inyo National Forest), Sequoia-Kings Canyon National Park, Devils Postpile National Monument), and the Bureau of Land Management should manage the five rivers (15 segments and 75 miles) that were inventoried for possible inclusion into the Wild and Scenic River System?

Specific planning questions address: What river segments should be recommended for wild, scenic, or recreation classifications? What river segments should not be recommended for classification? What river segments should be deferred for further study?

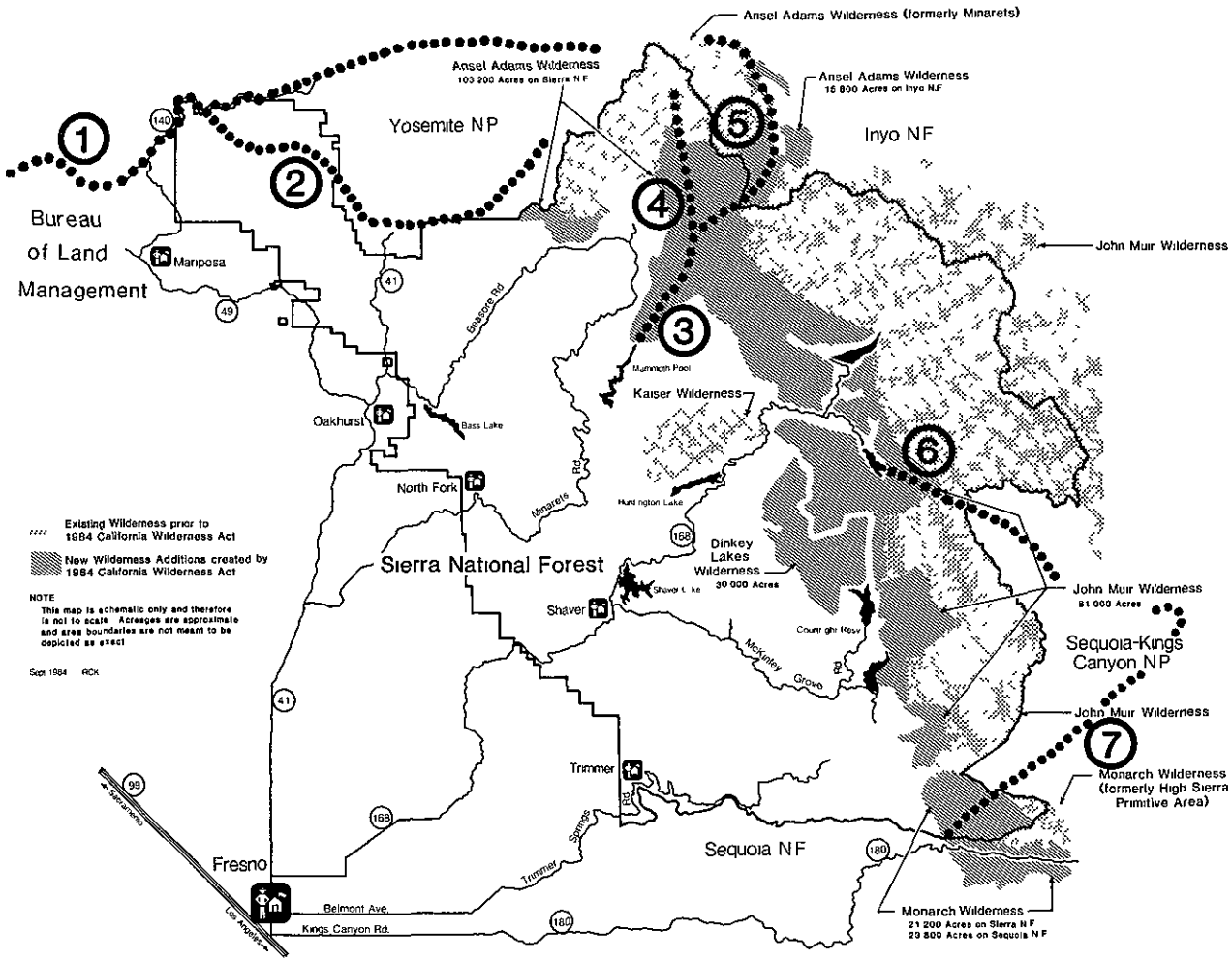
A major issue occurred between potential hydroelectric development on rivers within National Forest or BLM lands, and wild rivers since hydroelectric projects are incompatible uses of rivers under Wild River designation.

E 1 4
Regional Setting

The majority of these rivers are located in steep-walled canyons where little or no management activity takes place. Several areas traversed by these rivers are designated Wilderness areas Inclusion of these rivers in the Wild and Scenic River system will have little effect on National Forest or National Park management Much of the river system is difficult to reach and has few, if any, physical facilities or amenities for outdoor recreationist. Most river recreationists originate in the large Southern California and San Francisco Bay urban areas. Travel time of 5-7 hours from these urban areas to the Forest is sufficiently short to serve as an incentive for summer and weekend river recreation

FIGURE E1 – AREA LOCATION MAP OF WILD AND SCENIC RIVERS

Larger scale maps for individual rivers are contained with the set of maps accompanying the Final Environmental Impact Statement.



Legend

1. Merced River *
2. South Fork Merced River *
3. San Joaquin River
4. North Fork San Joaquin River
5. Middle Fork San Joaquin River
6. South Fork San Joaquin River
7. Middle Fork Kings River *

Approximate River Course

* Designated November 1987

E.2
DESCRIPTION OF RIVERS

In November 1987, all segments of the Merced except the section from near Briceberg to Lake McClure (a portion of segment 9 and all of segment 10), South Fork Merced and Middle Fork Kings River were designated Wild and Scenic. Segments 9 and 10 of Merced, still being considered for designation, are retained in this document. The other remaining inventoried rivers still being considered for designation include the San Joaquin, North Fork San Joaquin, Middle Fork San Joaquin and South Fork San Joaquin.

E 2 1
Merced River (All but portion of segment 9 and segment 10 were designated in November 1987.)

Study area·	From point at maximum flood control storage of Lake McClure to source on the south side of Mt. Lyell
Length	79 miles
Physiographic section·	Cascade-Sierra Nevada
State:	California
Counties	Mariposa and Madera
Congressional Districts.	15 and 18
Source:	South side of Mt. Lyell, including Red Peak, Merced Peak, and Triple Peak Forks in Madera County

Physical Description

Merced River flows from its sources at an elevation of 13,000 feet, including tributaries of the Lyell, Triple Peak, Merced Peak, and Red Peak Forks, through a glacially-carved canyon and rugged mountain and foothill country in a series of rapids and waterfalls to the high water line of Lake McClure at an elevation of 850 feet Most of the river segments are free-flowing. Man-made intrusions are noticeable in the Yosemite Valley and El Portal areas where a low diversion weir crosses the river. Elsewhere, the river corridor is relatively primitive.

Geology and Soils

Merced River winds along the bottom of a narrow, steep-sided valley. Below El Portal, this valley cuts through metasedimentary rocks that are geologically significant. The slopes along the river are sparsely vegetated. This reveals a variety of rock types along the river including limestone blocks forming prominent escarpments

Above El Portal the river occupies a valley cut in granite. The cliffs and domes of Yosemite Valley are unique and include the most spectacular glacially-scoured valleys in the world. The granite walls and cliffs of Yosemite Valley are reknowned for their size, steepness, and beauty.

The river runs through low-producing soils throughout the stretch from the El Portal area in T. 2 S., R 20 E., section 19 to the edge of Sierra National Forest The soils are shallow to moderately deep and have a very high erosion hazard potential throughout this area

Vegetation

Near the source of the river, vegetation includes lodgepole pine, Jeffrey pine, and red and white fir From the headwaters area to El Portal, the vegetation is mainly mixed conifer forest. Between El Portal and Briceburg the vegetation is mostly pine-oak savannah. There is a very narrow strip of riparian vegetation with a background of chaparral and/or annual grasses. The canyon below Briceburg, adjacent to BLM land, potentially contain invaluable chaparral and riparian habitat. The riparian community includes alder, willow, and ponderosa pine.

Between El Portal and Briceburg there are four State-listed rare plants growing adjacent to the river. These are Allium yosemitense Eastw.,Clarkia lingulata Lewis and Lewis, Eriophyllum congdonii Bdg., and Lewisia Congdonii (Rydb.) J T Howell. Clarkia lingulata is also a candidate species for federal listing status. Inside the Park above Yosemite Valley are two other State-listed species: Eriophyllum nubigenum Greene and Lewisia disepala Rydb. Especially noteworthy is the concentration of rare and endemic plants growing on metamorphic outcrops in the El Portal area. Clarkia lingulata is the rarest plant in Sierra National Forest and is found along Merced River Canyon, near South Fork bridge in Mariposa County

A total of 209 plant species within the digger pine-oak and 138 plant species within the chaparral associations are reported to be present along the river. Among the chaparral types the predominant species include buckbrush (Ceanothus cuneatus), chamise (Adenostoma fasciculatum), coffee berry (Rhamnus californicus), deer brush (C. integerrimus), manzanita (Arctostaphylos mariposa), and mountain mahogany (Cercocarpus betuloides).

Wildlife

Below El Portal riparian-dependent wildlife includes the limestone salamander, which is a State-listed rare species. Other important wildlife include mule deer, valley quail, bobcat, mountain lion, coyote, cottontail, brush rabbit, jackrabbit, bandtail pigeon, beaver and muskrat

A reported 177 riparian species find suitable habitat at the lower elevations. Above El Portal, river otter is the primary riparian mammal. Mountain lions, California mule deer, black bear, and mountain coyote are also found in the river canyon. Bald eagles have been reported above Lake McClure, but no nesting sites are known. One of two known nest sites in the Sierra Nevada for the endangered peregrine falcon occurs adjacent to the river in Yosemite Valley. There are other potential habitat sites along the river for this falcon. There are many birds, like the dipper and heron, which also depend on this river as their home.

Preserving these riparian values are important because the Department of Fish and Game reports that close to 90% of the Central Valley's historic low elevation riparian habitat has been lost to human activities. Existing habitat values along the lower portions of Merced River can therefore be rated quite high because of their rarity.

Fisheries

Above El Portal the river is classed as a resident, cold-water, trout fishery. It is self-sustaining, but receives some artificial recruitment from two or three lakes stocked each year. Rainbow trout are native up through Yosemite Valley, but were introduced above that point.

Below El Portal, the following fish are present, in order of relative abundance: sculpin, (species unknown), Sacramento sucker, rainbow trout, Sacramento squawfish, brown trout, California roach, and smallmouth bass. Occasionally, coho salmon are known to migrate from McClure Reservoir into Merced River within BLM and Forest Service boundaries. Coho salmon excepted, other fish are self-sustaining. During the summer months, Merced River is stocked regularly with catchable-size trout by Calif Dept. of Fish and Game . Stocking is limited to areas near campgrounds.

Water Quality and Water Resources

There are two sets of flow information for Merced River. The information for Merced River at Pohono Bridge gives an indication of the river's flow in Yosemite Valley. Valley flow, however, does not give a good indication of the river's flow downstream between El Portal and Lake McClure. Due to a lack of gages, flow information is limited to one water year (1969), which was slightly wetter than normal Flow below Yosemite Valley is much higher than Yosemite Valley flow throughout the year. Peak flows in both cases are during the late-spring to early-summer snowmelt. However, the downstream gage shows a minor peak in January from rainfall.

Flow data:	Merced River at Pohono Bridge, Yosemite Valley (USGS Gage)
Average annual flow:	622 cfs
Maximum recorded flow:	23,400 cfs (12/23/55)
Minimum recorded flow:	3.3 cfs (9/29/24 and 10/1/24)
Drainage area above gage.	321 square miles
Seasonal mean flow (cfs).	Oct. 62 Nov. 70 Dec: 65 Jan. 162 Feb. 190 Mar: 344 Apr: 1180 May: 2410 Jun: 2020 Jul. 547 Aug· 104 Sep: 34

Flow data:	Merced River at Bagby at highway bridge (1922-1950· 29 years)
Average annual flow·	1,155 cfs
Maximum recorded flow.	59,000 cfs (12/11/37)
Minimum recorded flow:	13 cfs (10/05/25)
Drainage area above gage:	912 square miles

Flow data:	Merced River near Briceburg (9 years)
Average annual flow:	1,222 cfs
Maximum recorded flow:	21,500 cfs (12/6/66)
Minimum recorded flow	N/A
Drainage area above gage	691 square miles
Seasonal mean flow (cfs):	Oct: 48, Nov· 3886, Dec: 395, Jan: 2833, Feb. 1699, Mar: 1683, Apr: 3587, May. 8860, Jun 6571, July· 2289, Aug. 416, Sep 139.

Water quality is suitable for full body contact such as swimming, except at very low water levels Below the sewage treatment plant at El Portal, there is the chance of an accidental discharge of sewage or unchlorinated, treated effluent Any effect would last only for a few miles downstream.

Land Ownership and Use

Yosemite National Park: 72% or about 57 miles; Sierra/Stanislaus National Forests: 11% or about 9 miles; Bureau of Land Management (Folsom District): 11% or about 9 miles, Private: 4% or about 3 miles; State of California 1% or about 1 mile

Above El Portal, the river corridor is managed for the preservation of the natural environment in Yosemite National Park Below El Portal, land use presently includes some small-scale mining activities. These mining activities on the river are primarily part-time or recreational in nature Suction dredging for placer gold on many streams and rivers throughout the Mother Lode area of California is a popular pastime and income source The California Dept. of Fish and Game regulates and permits suction dredging from June 1 to September 15. Within the Forest, there are an estimated 95 mining

claims near the river Each 1/4 section along the river has at least one claim, with most having three or four. There are private land parcels that are patented mining claims. BLM reports an estimated 150 unpatented mining claims. A recent resurgence of unpatented mining claims around BLM land increased 128% in the years between 1975 and 1980.

There are seven utility company power line easements dating from 1930 that include 1-90 acres. There are also Federal Power Act withdrawals extending for most of Sierra National Forest's and BLM's river corridor lands, which are from previous hydroelectric power proposals. These withdrawals are now being reviewed to see if they are still necessary BLM has the responsibility to recommend to Congress by 1991 if these withdrawals will be removed There are also 33 private land owners within the Forest's sections

BLM leases 29,879 acres of public land to 8 local ranches for grazing, providing 2,743 AUMs of forage within Merced River Planning Area. There are numerous private land owners along the BLM's portion of the river corridor Mariposa County is concerned about protecting their interests in withdrawing water from any portion of the Merced. However, the County has not yet applied for water rights from the California Water Resourcces Control Board nor does it have any water rights at this time.

Access below El Portal is by the parallel, all-year State Highway 140. There are also several river crossings and 7 miles of vehicular access from Briceburg to Hall's Gulch on BLM land Above El Portal road access is good throughout Yosemite Valley. Access above Yosemite Valley is by one major foot and stock trail that parallels the river to near its source, and by numerous side trails joining the main trail. Above Yosemite Valley 7 footbridges cross the river. No commercial timber is available for harvesting within the corridor.

Recreation

Below El Portal the river is used by rafters and a few kayakers in the late spring and early summer. This segment has a difficulty class of III/IV as listed by the River Information Digest, a guide prepared by the Interagency Whitewater Committee. It has been reported that there is a zone near El Portal that, because of the significant challenge, should be rated Class V+, the most difficult. The section from El Portal to Redbud Picnic Site is seldom used by rafters, however, use is likely to increase in the future, especially by skilled rafters. Whitewater boating is outstanding from EL Portal to Bagby along with wading and water play Most rafters go in at Redbud Picnic site on Forest land or at Cranberry in the vicinity of El Portal and float down to Bagby at the top of McClure Reservoir, which is on BLM land. This river trip is about 28 miles.

Since Yosemite National Park is one of the Nation's premier recreation spots, river recreation is heavy. About 2 million people a year have been reported either picnicking, camping, fishing, swimming, or floating in or near this famous river corridor. Rafting, innertubing, kayaking, and hiking are extremely popular along most of the river. Vistas of the most spectacular glaciated canyons in the world is a major attraction

Camping and picnicking opportunities within Sierra/Stanislaus National Forests and Bureau of Land Management lands below El Portal are limited and restricted by high summer temperatures. However, camping exceeds capacity in the Forest Service campgrounds during late spring, summer, and early autumn. The BLM manages 3 semi-improved campgrounds along this river section and reports popular use during weekends. An increasing number of local campers make Merced Canyon from McClure Reservoir to El Portal their destination rather than Yosemite National Park. Activities below El Portal include fishing, swimming, off-road vehicle use close to the river, camping, nature study, viewing scenery, and kayaking In fact, the segment from El Portal to Redbud is increasingly utilized by kayakers and rafting enthusiasts. In 1983, commercial rafting companies carried 6,326 passengers and individuals accounted for about 1,500 additional rafters

Visual Resources

Above El Portal and within Yosemite National Park, Merced River flows through the Sierra Nevada mountain landscape, which has some of the most spectacular glaciated canyons in the world. Numerous peaks up to 13,000 feet rise above the river. Two major waterfalls, which eventually flow into Yosemite Valley, are near the river The visual resources are outstanding or distinctive as rated by any value system in the world.

Below El Portal, the river flows through the Sierra chaparral foothill and Great Valley savannah landscape, which has some very rugged mountains and foothill country next to the corridor There are many rapids along this section The river runs adjacent to land within Sierra and Stanislaus National Forests that is rated as having a variety Class B in accordance with the National Forest Landscape Management System This means that the canyon's landscape is common compared to many other California landscapes

The BLM has inventoried and given visual quality management classes to their portion of the river The Merced Canyon has been given a VRM (Visual Resource Management) Class 2. These areas are generally viewed as foreground or middleground from the highways and access roads The river in this portion is bordered by a main highway on one side and an abandoned railroad grade on the north side. This highway is adjacent to the whitewater river for about 27 miles all the way to Briceburg

The highway provides excellent views of rafters Spectators have few other easily accessible opportunities to view rivers rafters. In fact this section is enjoyed by more people than any other river in the Sierra Nevada or California simply because it is on the way to one of the most popular National Parks in the world.

There is no other trans-Sierra road system that travels through as steep and deep a scenic canyon. Many utility lines, resorts, campgrounds, dwellings, mines, millsites, concrete embankments, private homes, and bridges are also visually evident in varying densities along this river segment. To some vacationists and recreationists, these cultural features may detract from scenic values. However, many of the homes and bridges are old and contribute to the historic value of the area.

Socio-Economic Conditions

Domestic water use in Yosemite Valley diverts up to 56 1 million gallons/year, with a peak diversion of 3 1 cfs The diversion dam with water intake structure for the Cascades Powerhouse spans the river at the junction of Big Oak Flat Road and Highway 140 About 115 cfs was diverted for about 2 miles for the Cascades Powerhouse. However, in 1986 the powerhouse closed.

There are many mining claims along Sierra/Stanislaus National Forests and Bureau of Land Management river portions that are presently affecting the river corridor. Some are active and may be commercially feasible.

Presently 11 commercial outfitters provide 1-2 days whitewater boating trips down various segments of Merced River according to the "River Information Digest." Even if the runnable season only extends to spring with levels of III/IV difficulty, this recreational activity seems to be a popular trend. Some of these commercial outfitters are reporting that Merced River offers one of the finest stretches of whitewater in California. In a 1984 Planning and Conservation League analysis of California whitewater rafting, it was reported that an estimated 14,386 visitor days of rafting on Merced River in 1982 generated an estimated $5,294,000 and 90 jobs in the State's economy. Rafting has increased since then.

An important portion of Mariposa County's income is derived from trade associated with Yosemite National Park and Highway 140 traffic, which makes the river accessible to a large population in less than a half day's drive from the Los Angeles and San Francisco areas. Some social and economic benefits may result from future development of water resources by Mariposa County.

All social and income groups visit Yosemite National Park, one of the most popular national parks in the world. The river corridor helps make this park experience valuable Highway 140 provides numerous opportunities to appreciate and understand the values of Merced River. The river is ecologically, spiritually, historically, and aesthetically contiguous with Yosemite National Park's values.

Many residents at Briceburg, El Portal, and Yosemite Valley focus on the river for recreation. The General Management Plan for Yosemite National Park, proposes large increases in population of the El Portal area. This group is very conscious of the river environment and economic benefits related to the river.

Cultural and Historical Resources

Several historic sites are located along Merced River, such as the old Yosemite railroad grade and a number of trestles. The inclines at Trumbull were built by Yosemite Lumber Co. during the winter of 1923-24, used until 1927, reconditioned in 1935 by Yosemite Sugar Pine Co., and closed with the last trainload of logs to Merced Falls Mill in late 1942

Savages Trading Post, claimed to be the site of a trading post established by Col James Savage of Mariposa Battalion fame, is located at the confluence of the Main and South Forks. The trading post is a California Historical Landmark.

Some major turn-of-the-century mining sites and the trails built to reach them, occur near the river. The remains of features, such as stamp mills and powerhouses, are still visible. Several old mine and millsites from around the 1890's are still present El Portal was recently acquired by the National Park Service. It began as an Indian winter settlement. In the 1850s was used as a mining settlement, became an orchard and garden in 1873 and was used by the railroad during the 1920s.

Mining activity has been in progress since 1849 in Merced River Canyon. Pine Tree Mine operated from 1849 to 1944 with output of $3,000,000. Upstream, at Clearing House Mine, gold and silver were mined from 1860 to 1937. Quartz mining represents the predominate extractive strategy for gold mining. At least 25 mines below El Portal were opened in the 1870s. These activities declined to almost nothing in the middle years of this century.

Ethnographic sources ascribe aboriginal habitation of the Merced River drainage to the Southern Sierra Miwok. Indian sites can be expected to be found along the River, which was a travel route for the Miwok.

Many sites have been damaged by mining and other activities. Placer mining, evident in many places in the canyon, was particularly damaging to archaeological sites. The railroad had a major impact on ethnographic Indian villages and archaeological sites. Several such sites were destroyed or damaged during railway construction, including the Soo'-wut-oo-lah' site at El Portal Many of

the sites near the river are inundated and scoured by high water runoff in the spring.

Ethnographic sources indicate that the Miwok pursued a strategy of annual burning of woodland, grassland, and chaparral. The intent of burning was to insure abundant seed harvests and improve wildlife forage and hunting.

Archaeological surveys have been conducted along several segments of the river (43 sites were recorded in the eastern upstream section, 98 sites in Yosemite Valley, and 21 sites around El Portal). BLM has recorded 43 cultural properties, with 33 occurring immediately adjacent to Merced River. Prehistoric and historic sites are represented. Historic sites are generally associated with mineral exploitation