AN ECONOMIC EVALUATION OF THE GENERAL MANAGEMENT PLAN FOR YOSEMITE NATIONAL PARK

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Richard G. Walsh

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ABSTRACT

This is an economic evaluation of the General Management Plan and Environmental Impact Statement for Yosemite National Park. The study describes and evaluates the planning process, and recommends improved planning procedures consistent with the guidelines of the agency and the department. Included are estimates of the present value of costs, benefits, and cost effectiveness of the alternative park plans. Results should help those who are interested identify alternative plans whose recreational and environmental effects are superior in relation to their costs.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

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SUMMARY AND CONCLUSIONS

The purpose of this report is to describe and evaluate the Yosemite planning process and to recommend improved procedures consistent with the guidelines of the agency and the department. In the various sections of this report, we attempt to explain the planning process including identifying alternatives, measuring their costs and effects, choosing the most preferred plan, and relating the proposal to budgets and programs. This study demonstrates how to estimate the present value of costs, benefits, and the cost effectiveness of park plans. It is based on information in published and unpublished documents, and interviews with park managers and planners.

The present Yosemite planning process was a culmination of work which began more than a dozen years ago, representing a total cost from 1967 to 1979 of about $2.5 million. Earlier plans were rejected because of vagueness, inaccuracy, and undue political influence by a large concessioner in the park.

The General Management Plan and Environmental Impact Statement [1978 and 1979] for Yosemite took about five years to prepare at a cost of nearly $1 million. It was the largest single planning effort in the history of the National Park Service.

At least one-half of the resources committed to Yosemite planning in the past five years were used to pay for an unexpectedly large public involvement program. Over 63,000 persons participated, 10 times more than expected, representing a level of public involvement unprecedented in the history of the agency.

The primary purpose of the public involvement program was to identify the alternatives preferred by a sufficient number of people to justify assessing the impact of their implementation. A list of every idea and suggestion was compiled with where it came from. Over 21,700 persons and 64 groups took 3-4 hours to complete a Yosemite Planning Workbook containing 700 questions.

All of the alternative plans were based on responses to the workbook. Cluster analysis of a 5,000 person subsample provided Alternatives 1 and 2. Alternative 3 was based on the concessioner's response to the workbook. Each alternative plan included public health and safety requirements with respect to employee housing, roads, and wastewater treatment.

Alternative 1 was a popular combination of the most frequently chosen actions in-between Alternative 2, environmental preservation, and Alternative 3, a commercial development objective. Alternative 4 was a continuation of the current level of management without new programs.

The proposed draft plan was designed by Park Service planners and managers to enhance the best features of each alternative; it was closest to Alternative 1. Its major goal was to improve the quality of visitor experience. It would begin to rectify an overzealous attempt to civilize the park, alleviate overcrowding, restore natural areas, and strengthen the interpretive program to enhance visitor enjoyment of the unique natural and cultural resources of the park.

The investment costs of the draft plan were reported as $78 ($72-$84.8) million, which was substantially less than the $116 million for Alternative 2, but more than the $67 million for Alternative 1 and $34 million for Alternative 3. Costs of operation and maintenance, not reported, were estimated on the basis of the number of O & M employees reported for each alternative.

The present value of total costs including investment and annual O & M costs was calculated for this report. The proposed plan has the highest present value of total costs at $64 million, compared to $58 million for Alternative 1, $10 million for Alternative 2, and $27 million for Alternative 3. The proposed plan would cost $2.71 per visitor day compared to $1.56 currently.

Although the proposed plan would have the highest present value of costs, its present value of benefits would offset the higher costs, resulting in a benefit cost ratio of 0.8 from reduced crowding and a ratio of 1.1 when benefits from improved air and water quality are included. The proposal is superior to Alternatives 1 and 3 in nearly every respect. It would reduce development and congestion in Yosemite Valley by 16 percent, while the park could continue to serve nearly 2.7 million visitors per year. It would also reduce current damages to environmental quality by an average of 26 percent.

Alternative 2 has the lowest present value of costs and the highest present value of benefits, resulting in a more favorable benefit cost ratio of 3.5. It is superior to the proposal and Alternatives 1 and 3 in nearly every respect. It would reduce development and congestion in Yosemite Valley by nearly 50 percent, however, the number of persons who could visit the park annually would decline by 20 percent to 2.2 million. It would reduce current damages to environmental quality by an average of 85 percent. It would create substantially more jobs and income in the regional economy than the other plans.

Changes from the draft plan to the final plan provided that autos would be less restricted, as would concessioner lodging and other facilities in Yosemite Valley. Utilities would be upgraded including the electrical and water systems. The largest change was with respect to cost.

The investment costs of the final plan were reported as $162 million in 1979, which was 2.1 times the costs of the proposed plan published in 1978. This was primarily the result of a correction of estimate rather than more elaborate facilities design. Estimates contained in the draft plan were developed by the Study Team which had little or no experience in cost estimating. Most of the costs in the final plan were developed by an engineer with the Branch of Estimating, Denver Service Center.

Present value of total costs were calculated as $202 million with the final plan compared to $87 million without, thus present value of incremental costs with the final plan would be $115 million. The final plan would cost $3.72 per visitor day compared to $1.56 per visitor day currently, an increase of $2.15 per visitor day.

The present value of benefits from the final plan would not offset the higher present value of costs. Its benefit cost ratio would be 0.5 from reduced crowding, rising to a ratio of 0.7 when benefits from improved air and water quality are included. This means that for every $1 of investment and O & M costs attributed to the final plan, benefits from improved quality of visitor experience would be about $0.70.

The final plan would reduce development and congestion in Yosemite Valley by 10 to 20 percent, while the park could continue to serve nearly 2.7 million visitors per year. Future use of the park would be dispersed by constructing new facilities outside of the Valley. The final plan would also reduce current damages to environmental quality. Water quality would be improved by more than 10 percent and air quality by nearly 30 percent. Consumptive use of land in Yosemite Valley would be reduced by about 16 percent, particularly the most scenic view sites where development would be reduced by nearly 46 percent.

The construction program would be phased over 11 years in order to complete all major projects in time for the centennial celebration of the founding of the park in 1990. Construction costs would be $5 million in 1980 and 1981, rise to $20 million in 1982 and 1983, and level off at $10 million per year from 1984 to 1990. By comparison, the annual construction budget for the 40 parks in the Western Region has averaged about $18 million per year, and the annual construction budget for all parks in the U.S. has averaged $80 million. In 1982 and 1983, the $20

million annual construction program for Yosemite would exceed the Western Region budget and would account for one-fourth of the U.S. parks construction budget. Delaying these park expenditures until the last two years of the construction program would reduce the present value of construction costs by $6 million.

It is recommended that the final plan be modified to achieve net benefits. This would involve changes which increase benefits or decrease costs or both. It is unfortunate that the planning process did not consider the costs and effects of reduced overnight lodging congestion in Yosemite Valley between the range of 15 percent in the final plan and the 75 percent of Alternative 2. For the final plan to have net benefits with costs of $2.15 per visitor day, the plan would need to be modified to reduce average crowding by nearly twice as much as indicated, or by approximately 25 to 30 percent. Another way to adjust the final plan to bring about net benefits would be to reduce its costs by nearly one-half.

Another important consideration is the dual nature of National Park Service management objectives: (1) recreation use, and (2) preservation of unique natural and historic resources. It may be possible to separate costs between the two functions, or to assume that a certain proportion of costs are reasonably attributed to each. If it could be determined that for Yosemite, the agency may reasonably allocate nearly one-half of the costs of the final plan to the preservation of resources, then the plan could be considered beneficial, with present value of benefits attributed to recreation use exceeding present value of costs. Moreover, recreation benefits equal to at least 20 percent of costs would result from resource preservation such as improved stream flow, water quality, air quality, forest quality, and scenic quality.

The most important recommendation of this report for improvement in National Park Service planning would be to adopt the benefit cost framework currently

recommended in the Water Resources Council planning guidelines [1979] for the entire parks planning process. The National Park Service Planning Process Guide [NPS-2, 1978] requires that an economic benefit cost analysis will be prepared in the development and evaluation of alternative strategies or plans (Chapter 6, Exhibit 1). But no guidelines are provided in NPS-2. The WRC Procedures for Evaluation provide an excellent guideline which has been approved by the U.S. Department of the Interior. Moreover, the National Park Service has adopted the WRC guidelines for Wild and Scenic River studies and other studies of new areas or proposed parks which involve substantial bodies of water. The WRC planning guidelines would introduce information on the present value of the costs of operation and maintenance which with investment costs, would allow a more accurate evaluation of changes in costs. In addition, it would introduce information on the present value of projected visitor use and benefits, which would facilitate more accurate comparison of the benefits and costs of alternative plans.

The Director of the National Park Service should appoint an Economic Advisory Committee to review whether the current level of resources committed to economic analysis is sufficient to implement Special Directive 78-6 and the revised NPS-2. Its membership should include professional economists who are sympathethic to the objectives and problems of the agency. Its purpose should be to review the role of economics in the planning and budgeting process. It would be charged with recommending how an economics unit might contribute to the preparation of general management plans for existing parks, new area studies, wild and scenic river studies, and provide economic input into budgets, programs and the choice of Final General Management Plans by the agency.

STATEMENT OF THE ISSUE

The purpose of this study is to describe and evaluate the results of the National Park Service master planning process as it pertains to Yosemite National Park, Draft General Management Plan, [1978], and to draw inferences if possible about the planning process itself. The general management plan (GMP) provides a guide to develop and manage recreation resources in the park for the next 15 years. It shows what developments there will be to provide for visitor use, and where they will be located.

The major goal of the plan, in brief, is to improve the quality of visitor experience. Chronic overcrowding and an "overzealous attempt to civilize the park" would be rectified. Automobile traffic will be reduced and eventually eliminated from Yosemite Valley and Mariposa Grove. Nonessential facilities will be removed from developed areas, and the natural scene restored whenever possible. Information and interpretive programs will be strengthened to enhance visitor enjoyment of the unique natural and cultural features of the park. This is consistent with the National Park Service Enabling Act of 1916 in which Congress defined its responsibility to manage the national parks and monuments: "...to conserve the scenery and natural and historic objects and the wildlife therein, and to provide for the enjoyment of same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

Yosemite is one of the largest National Parks in the U.S., serving approximately 2.5 million visitors per year with an operating budget of about $7 million. The 1,200 square mile park in east central California contains unique high waterfalls, cliffs, and giant redwood trees. Within its borders are 266 miles of paved road and 750 miles of trail. The park employs 385 persons and concessioners 1,585 persons during the peak summer season. The park charges an entrance fee of $3 per auto

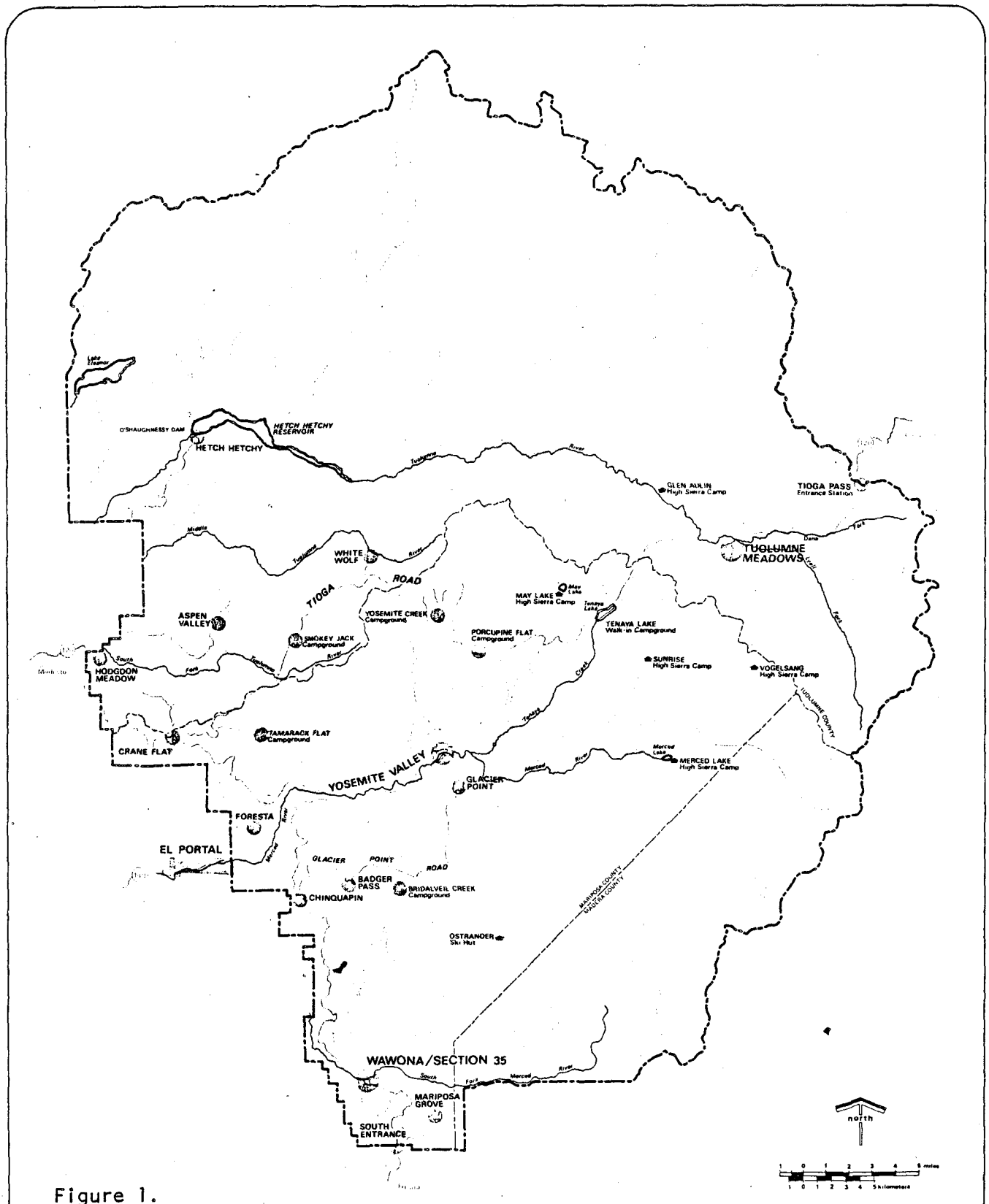

Figure 1.

Existing Developed Areas

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Yosemite National Park U.S. Department of the Interior National Park Service

and camping fees of $1-4 per site. Visitors spend about $30 million annually in the park, of which about 7 percent is collected by the Park Service through entrance and use fees and 87 percent by the primary concessioner, the Yosemite Park and Curry Company, the largest private organization in any national park.

The park contains a medium-sized town at the east end of Yosemite Valley with a population of approximately 20,000 people on a peak holiday weekend. The Valley has a summer resident population of 2,971 people including 313 park and 2,490 concessioner employees and their families. It contains three lodging complexes with a capacity to house 4,934 overnight visitors in 1,528 rooms. In addition, there are several Park Service campgrounds in the Valley with capacity of 4,132 people in 872 campsites. Also, there are sufficient parking spaces for 17,340 day visitors, although their number has not exceeded 7,300 in the heavily congested east end of the Valley. Consistent with this urban development, the Valley contains four restaurants, two cafeterias, five bars, three gift shops, three souvenir shops, two hamburger stands, two grocery stores, two gasoline stations, two sporting goods stores, a clothing store, bank, school, hospital, and dental office.

The major problem of overcrowding exists at the east end of the Valley where people stay in motels and developed campgrounds, eat in restaurants, browse in curio shops, and view the natural wonders out of their car windows. This has resulted in acres of pavement, traffic congestion, and the noise of a dense urban environment. Visitors to the park are clearly aware of crowding. About two-thirds of a sample of visitors in 1975 reported overcrowded conditions in the park. The Yosemite plan is designed to begin restoring the Valley to less crowded, less urbanized natural conditions.

The objectives of this study are to:

(1) Assess the costs and effects of the draft general management plan;

(2) Evaluate the success of the planning process in efficiently and effectively identifying and analyzing appropriate alternatives at the various stages of the planning process;

(3) Describe the process of how the alternatives were translated into the choice of the most preferred alternative and the preferred alternative into budgets and programs;

(4) Recommend procedures for strengthening the relationship between the general management planning process and the budgetary process;

(5) Recommend a method to improve the identification and assessment of alternatives with respect to costs and benefits;

(6) Recommend guidelines for implementation of NPS Special Directive 78-6 with regard to cost effectiveness of plans, giving particular emphasis to methods for evaluating cost effectiveness of different plans.

The description of the planning process (objectives 1, 2, and 3) is based on information in published and unpublished documents, and personal interviews with park specialists in Denver, Yosemite Park, San Francisco, and Washington, D.C. The evaluation of the planning process (objectives 4, 5, and 6) is based on planning guidelines of the National Park Service and the U.S. Department of the Interior.

The major issue with respect to costs and effects of the draft general management plan is whether it achieves reasonable results, both as to effect on the welfare of the park and its users, and effect on the budget. Is the general management plan the best attainable plan? As concerns the process, should there be changes in the procedures, concepts, or resources used by the National Park

Service in its general management planning? What further issues need to be clarified or resolved in future general management planning?

The major issue with respect to the alternatives is whether they have been conceptualized correctly, or whether any variations achieve similar results at less cost? Are the design assumptions incorporated in the alternatives reasonable? Do any components of the alternatives reflect rigid requirements as opposed to analysis?

The major issue with respect to the choice among alternatives is whether the cost estimates are realistic, whether attention has been paid to incremental analysis, and whether gains and losses have been balanced overall. With respect to budgets and programs, is the staging of the plan sensible or could better staging lead to a lower present value of costs while retaining the same beneficial effects? Who is expected to pay the costs both measured and unmeasured? Are implicit subsidies involved and who will be subsidized? Is the plan a fair one with regard to the balance between losers and gainers?

In this brief study we attempted to describe accurately what took place in the Yosemite planning process with respect to identifying and analyzing alternatives and developing successive changes in the proposed plan up to and including the final draft plan announced November 27, 1979. Our approach in this study is that of an economic analyst concerned with cost effectiveness and with benefit cost analysis. We find support in recent directives of the National Park Service (NPS-2) for the principles of cost effectiveness and benefit cost analysis. However, the Yosemite planning process was initiated before NPS-2 established the principles of National Park Service planning and was exempt from its requirement. Therefore, we do not fault the Yosemite plan for failure to comply fully with its economic provisions.

BACKGROUND

In December, 1974, the largest single planning effort in the history of the National Park Service began. Assistant Secretary of the Interior, Nathaniel P. Reed, ordered that a new General Management Plan and Environmental Impact Statement be prepared for Yosemite National Park. "The new planning process should get underway at once," he said, "with maximum public involvement." A study team was formed that same month and began holding public hearings in January, 1975.

The present planning effort for Yosemite actually began in 1967 [Reynolds, 1977]. In fact, a Master Plan was reviewed and tentatively approved in 1974. However, in late 1974, this document which set park management guidelines for the next ten years was stamped REJECTED. The plan was disapproved for two reasons.

First, Assistant Secretary Reed concluded that the plan was "far too vague and ambiguous . . . (so that) an accurate assessment of environmental impact was impossible." Congress had passed the National Environmental Policy Act while the plan was being formulated, and it was decided that the plan could not be approved officially until an environmental impact statement was also prepared and approved. This work was well underway and by late fall of 1974, the environmental impact statement was under review by the Department of the Interior, when the Master Plan was rejected and a new planning effort began.

The second and more important reason the plan was rejected was the public controversy concerning the nature of the plan and the planning process itself. It was alleged in the press, by many environmental organizations, and in over 4,300 letters to the National Park Service or congressmen that a large concessioner in the park had undue influence in the planning process, resulting in revision of the draft plan to include proposals the concessioner wanted that were not necessarily in the public interest. It was alleged that the concessioner had

influenced the plan prior to public review, which gave it an unfair advantage over other interested organizations and the public at large [Reynolds, 1977].

An example of this controversy is in the allegations brought by the Sierra Club [Sierra Club Bulletin, May 1977]. In 1973, the Yosemite Park and Curry Company, the primary concessioner (the largest in the NPS system with approximately 20 percent of all concessioner sales in the U.S.) was acquired by the Music Corporation of America (MCA), a Hollywood-based conglomerate, the 344th largest U.S. corporation. At the time, the NPS was nearing completion of a master plan for Yosemite. The Sierra Club considered it a well-conceived plan stressing natural preservation until the concessioner's influence became apparent.

The Sierra Club alleged that Ron Walker, Director of the National Park Service, approved proposals by the concessioner to expand commercial operations in the park. The concessioner was criticized for: (1) filiming of the TV serial "Sierra" by Universal Studios, another subsidiary of MCA, inside the park, including the employment of 49 park rangers, closing of areas in the park to the public during filming, and painting rocks to improve filming; (2) publishing of a brochure which advertised Yosemite as "nature's eloquent answer to convention city" and showing hundreds of chairs set up in a Valley meadow, one of the most scenic sites in the park; (3) opposing proposals to reduce or place an upper limit on facilities and services in the park; (4) constructing new facilities and/or expanding existing facilities; (5) opposing Park Service proposals to relocate some of their administrative facilities and housing from the Valley to El Portal, just beyond the park's western boundary. The Sierra Club charged that the concessioner attempted to circumvent the NPS planning process by expanding facilities such as a warehouse before completion of the plan. The plan prompted Assistant Secretary of the Interior Reed to observe that it "appeared to be written by MCA" [Sierra Club Bulletin, May 1977].

YOSEMITE MANAGEMENT PLANNING PROCESS

The Yosemite management planning process is outlined on the following page of this report. It begins with the collection of information about problems, issues, and resources in the park. The interested public suggests alternative management plans, effects of which are assessed by the agency. A proposed plan is developed from the alternatives based on results of the impact analysis and management considerations. Subsequently, a draft general management plan and draft environmental impact statement are published for public review. Public comments are analyzed and the proposal reevaluated. A revised GMP and Environmental Statement are issued for public review during a 30-day period. Subsequently, a plan can be approved by the Director.

At least half of the resources committed to Yosemite planning were used to pay for an unexpectedly large public involvement program. The level of public involvement in the Yosemite planning process was unprecedented in the history of the National Park Service [Reynolds, 1977]. More than 63,000 individuals and groups participated in developing the proposed and alternative plans by attending workshops, completing the planning workbooks, and writing letters or signing petitions. This was more than ten times the number expected.

Costs of the public involvement program were substantial. Table 1 shows that the $366,000 costs attributed directly to the public involvement program accounted for 45 percent of the total Yosemite planning cost of $813,000 from January, 1975, to September, 1978. In addition, a substantial part of the $97,000 cost of printing the plan and impact statement resulted from the need to print more than 60,000 copies of a summary of these documents for distribution to the interested public. Thus, both direct and indirect costs of public involvement account for at least half of the total cost of the Yosemite management planning process. Costs

Public Involvement and Planning Process [1/]

Data Collection

The NPS collects information about problems, issues and resources.

The public identifies problems and issues and suggests ideas for Yosemite's future through public workshops, position papers, letters, and telephone calls.

Development of Alternatives

The NPS develops The Workbook, which is composed of ideas from the data collection phase.

Through The Workbook, people put together their individual plans for Yosemite.

Alternatives

An analysis of The Workbook responses produces alternatives.

Impact Assessment

The NPS assesses the potential effects of the alternatives in terms of

- Archeological Sites
- Historical Buildings and Districts
- Air Quality
- Scenic Quality
- Water Quality
- Natural Vegetation Patterns
- Diseases Vegetation
- Wildlife Habitats
- Soil Suitability
- Rockfall and Avalanche Zones
- Floodplains
- Operational Efficiency
- Cost
- Socioeconomic Situation
- Legislation
- NPS Policy
- Traditional Park Uses
- Visitor Expectations

Proposal

The NPS develops a proposal from the alternatives based on their potential impacts and planning and management considerations.

Draft General Management Plan and Draft Environmental Statement

The NPS publishes the proposal for Yosemite, the alternatives considered, and the full assessment of impacts.

The public reviews the draft GMP and gives the NPS their reactions through public meetings and letters.

Approved General Management Plan

The NPS analyzes the public comment and reevaluates the proposal. After including whatever changes are decided upon, a revised GMP and Environmental Statement are issued.

The public reviews the documents and comments on them during a 30-day review period.

At the close of the review period, the plan can be approved by the NPS Regional Director.

[1/] See Summary Draft Environmental Impact Statement, 1978.

Table 1. Cost of Management Planning, Yosemite National Park, National Park Service, January 1975 to September 1978.

Function	Cost
Public Involvement	
Workshops	$106,000
Workbook	120,000
Western Regional Office	110,000
Newsletters	30,000
Subtotal	366,000
Carrying Capacity Analysis	37,000
Assessment of Impacts on the Yosemite Park and Curry Company	135,000
Data Base	81,000
Archeological Inventories	30,000
Formulation of Proposals, Alternatives, and Impact Assessment	60,000
Cultural Resourcement Management Plan	7,000
Printing of Plan, Impact Statement & Summary	97,000
TOTAL COST	$813,000[a/]

[a]The Yosemite Planning Team captain estimated the total cost of the Yosemite planning process from 1967 to 1979 as $2.5 million.

of planning per se, including $135,000 for a certified public accounting firm to assess the impact of the alternative plans on a concessioner's operation total $350,000, not including normal printing charges.

The first phase of the Yosemite planning process began with a search for the range of opinions and ideas about the park. In February, 1975, 48 public workshops were held, 34 within California and 14 in seven major cities across the country. During these workshops, conducted by the planning team and park staff, more than 5,600 participants were urged to express all their ideas and suggestions about the park. The staff at Yosemite also held seven public workshops during the spring of 1975 especially for park visitors. As a result of workshop publicity, some 2,600 additional individuals, who were not able to attend a workshop wrote letters giving their views. By the end of this first planning phase, the workshop summaries, letters, records from telephone calls, and position papers received from organized groups had been compiled into a listing of every idea or suggestion and its source.

Before beginning the public workshops in 1975, members of the planning team had met or talked with representatives of the organizations that had been most active in the previous Yosemite planning effort to explain the purposes and format of the new planning process. These groups were American Alpine Club, Friends of the Earth, Friends of Yosemite (California), Natural Resources Defense Council, Sierra Club, and Yosemite Park and Curry Company. Other groups that would be interested in or affected by the planning at Yosemite were identified and notified by letter and news release of the public workshops and of the planning team's desire to hear from them. All groups were urged to submit a position paper outlining what they thought should be planned for Yosemite. These position papers became a part of the material used to develop a workbook for the next stage of the process.

In May, 1975, a selection of conservation and user groups and the Yosemite Park and Curry Company were asked to review the proposed visitor use survey for the purpose of eliminating any bias or poorly designed questions. In June, 1975, a number of organized groups inquired about the planning process. In response, three question-and-answer sessions were held on June 25, 1975, August 21, 1975, and September 1, 1976. Organized groups who were most active in the planning process, individuals representing various user groups, and park concessioners were invited to attend. The number of groups attending these sessions grew from 9 to 34 as the planning progressed.

The second phase of the planning process was to develop a long and detailed questionnaire entitled Yosemite Planning Workbook and send it to about 59,000 individuals and 460 organizations who had participated in the first phase of planning or who had written and asked for a copy before the deadline, January 5, 1976. Over 21,700 persons and 64 groups returned their response sheet which took 3-4 hours to complete. Because of cost considerations, a random sample of 5,000 individual responses and all organization responses were analyzed. Results will be discussed in following sections of this report.

The purpose of the Workbook was to identify the alternatives preferred by sufficient number of people to merit assessing the impact of their implementation. Four poster-sized worksheets identified the major alternative management plans on a continuum from total wilderness (A) to increased levels of commercial services and development (D). A booklet was enclosed containing a discussion of the purpose, history, and planning objectives of Yosemite, with a brief explanation of the major laws and regulations affecting park management. Respondents were urged to study all possible actions and choose those that best represented their views, drawing from the four alternatives (but not restricted to them) thus creating their own alternative.

In another attempt to hear from the public, the planning team conducted a visitor use survey in August, September, and October 1975. Some 3,487 out of about 7,000 randomly sampled visitors mailed back questionnaires reporting what they did in the park and what kinds of facilities and activities they thought should be in Yosemite. Socioeconomic questions were also included which provided an updated picture of the characteristics of Yosemite visitors. The visitor use survey provided a scientific means to assessing the degree to which alternative plans met recreational needs of visitors, as part of assessing the social and economic impacts of the alternative plans.

As planning progressed, periodic newsletters were issued to all individuals and groups on the Yosemite mailing list, which numbered about 63,000 persons. Cost was estimated at $6,000 per mailing for 6 or 7 mailings.

The Western Regional Advisory Committee (WRAC), a citizens' group appointed by the Secretary of the Interior to advise the Regional Director of the National Park Service Western Region, met with the planning team on May 16 and 17, 1975, August 23, 1975, December 6, 1975, and September 17 and 18, 1976, to review the status and future direction of the planning process. During these public meetings various groups and individuals made statements to the committee giving their views on the planning process itself and what they thought Yosemite should be like in the future. A subcommittee was formed to advise and counsel the Yosemite planning team.

In addition, the study team consulted with interested federal, state, and local agencies of government. The objectives were to identify those resources, events, processes, organizations, and activities beyond the park boundaries that either influenced or were influenced by Yosemite management and use. For example, the Tuolumne Wild and Scenic River Study was deemed compatible with the proposed

general management plan for Yosemite. Four meetings were held with managers of the Inyo, Toiyabe, Sierra, and Stanislaus National Forests to discuss campgrounds, wilderness areas, trail systems, regional transportation, and heavy recreation use in areas adjoining Yosemite National Park.

The Planning Team included a full-time public involvement coordinator, two landscape architects, a specialist in graphics, a natural scientist (Ph.D.), a sociologist (M.A.), a cultural resources specialist and an economist. The team drew upon the knowledge and experience of other National Park Service employees who provided assistance on a part-time basis, including a historian, economist, interpretive planner, writer-editor, and others. When expertise was not available within the Park Service, the study team relied on outside consultants.

A considerable amount of the planning work was contracted out as listed below:

Private Contract Work in the Yosemite Planning Process

1) Structural investigation of the Wawona Hotel complex;
2) Production of aerial view graphics for public workshops;
3) Review and critique of the visitor use survey for bias, organization, length, and clarity by an expert sociologist with experience in survey design and methodology;
4) Evaluation of the characteristics of the mapped soil units for Yosemite Valley to determine the corresponding soil series and rating for various types of uses;
5) Evaluation by a skilled statistician of the various techniques that could be used in the analysis of the workbook responses;
6) Evaluation by a computer expert of the various computer systems that would meet the needs of the National Park Service for storage and retrieval of resource information and mapping;
7) Description of the regional economic conditions and an analysis of how each alternative would affect the regional economy;
8) Evaluation by certified public accountants of the financial and operational effects of the proposal and the alternatives on the primary concession operations, analysis of various methods of mitigating any resulting adverse impacts in compliance with the provision of the Concessions Policy Act, and investigation of other means than existing government/business relationships to provide essential services to park visitors.

DESCRIPTION AND ANALYSIS OF ALTERNATIVES

The Draft Environmental Impact Statement [1978] reported that all of the alternative plans for management of the park were based on responses to the workbook during the second phase of the planning process. Cluster analysis of a 5,000 person subsample of the 20,000 public responses resulted in a combination of the more frequently chosen components into Alternative 1, a compromise between the environmental preservation and commercial development alternatives. Cluster analysis also provided a second combination of components, although much less frequently chosen, which became Alternative 2, an environmental preservation objective. Alternative 3, a commercial development alternative, included the components proposed in the concessioner's response to the workbook. Alternative 4 was a continuation of the current level of management without new programs. (See Table 2, pages 25-26).

Park Service planners reported that not all of the specific aspects of each alternative plan were based on responses to the workbook. From the basic list of items desired, planners also inferred other items users would consider complementary to those chosen. These necessary complementary services were added to the items included in the overall concept of each program. For example, minimum standard employee housing and requirements of EPA with respect to water and wastewater treatment were a common element in all plan formulation. Congressional authorization of El Portal as a site for park headquarters and warehouse facilities may have influenced the formulation of Alternatives 1 and 2 and the proposed plan, but not Alternative 3.

Alternative 1: Popular Compromise In-Between Environmental Preservation and Commercial Development

Alternative 1 is a popular combination of the more frequently chosen components in-between the environmental preservation and commercial development objectives. The present level of overnight lodging and camping near autos in the Valley would remain unchanged, and overnight use of the park would be dispersed by constructing new facilities outside the Valley.

Auto traffic would be reduced in the overcrowded east end of the Valley, and eliminated from Glacier Point, which would have bus access from Badger Pass. Overnight visitors to the Valley would continue to drive directly to their units and park until departing. Traveling in the Valley would be by shuttle bus. All day visitors would park their cars at a new facilities for 1,000 cars in the west end of the Valley and travel in the Valley by shuttle bus.

Nonessential services would be removed from developed areas and the natural scene restored wherever possible. Yosemite Lodge would be moved to a less visual obtrusive location in Yosemite Valley. Parkwide, all gift, clothing, and alcoholic beverage sales would be removed. In addition, the bank would be removed from the Valley, as would auto repair and rental, barber and beauty facilities, and Valley tours provided by the concessioner. The commercial golf courses and tennis courts in Yosemite Valley and at Wawona would be removed. Hang-gliding and snowmobiling would not be allowed inside the park. All other current visitor recreation activities would remain. Most existing restaurant, grocery, gas station, and equipment rental services would continue to operate throughout the park, and facilities at Badger Pass and Crane Flat would be kept open all year.

Nonessential park and concession operations would be removed from the Valley to El Portal, including maintenance and headquarter offices with associated employee

housing and community services. Offices and housing for employees assigned to park district operations in Yosemite Valley, Wawona, and Hodgdon Meadow would remain in those locations to prevent commuting, but all other housing would be in El Portal.

Alternative 2: Environmental Preservation

Alternative 2 is the environmental preservation objective. It would greatly reduce overnight lodging in the park and remove auto parking and commercial services from the unique natural features of the park. All autos would be parked near the four entrances to the park in new parking lots for 4,200 cars and travel within the park would be by bus. Most previously developed areas would be restored to their natural condition. For example, the Hetch Hetchy reservoir would be drained and the Valley restored to its natural condition. Badger Pass ski area would be converted from downhill to cross-country skiing. The exception is the Wawona Hotel near the south entrance to the park which would be winterized and expanded to 145 rooms under all alternatives. However, the golf course, tennis court, swimming pool, and gas station would be removed. The grocery store-gift shop, post office, and stable would remain.

In Yosemite Valley, all existing overnight lodging and auto camping facilities would be removed with the exception of the Ahwahnee Hotel which would be converted to an interpretive center. All commercial services such as restaurant, grocery, gift, and equipment rental in the east end of the Valley would be moved to the less environmentally sensitive west end of the Valley. These services and gas stations would also be provided at parking areas near the entrances to the park. The cafeteria at Curry Village would become a hostel, and 300 low-cost rooms would be constructed in the less environmentally sensitive west end of the Valley. A total of 320 walk-in campsites would be provided at five sites in the Valley.

Several recreation activities would be discontinued in the park: golf, tennis, ice-skating, swimming, downhill skiing, and snowmobiling. Sightseeing, picnicking, walking, hiking, biking, and cross-country skiing would be encouraged. A number of areas which provide auto camping would be converted to walk-in camping. Camping near auto would remain at sites close to the entrances to the park.

Housing for employees working in Yosemite Valley would be reduced to 310 (110 NPS and 200 concessioner). Elsewhere in the park, employees would continue to be housed where they work. All administrative employees of the park and concessioner would be moved to El Portal.

Alternative 3: Commercial Development

Alternative 3 is the commercial development objective which contains the plan proposed in the concessioner's workbook response. This alternative would increase overnight lodging and camping facilities, commercial services, and day use auto parking in the park. It would replace a substantial portion of existing low-priced overnight lodging units with medium-priced multi-story motel-type facilities.

In Yosemite Valley, the existing number of overnight lodging and auto camping facilities would be unchanged. All commercial services would be retained in their present location including restaurants, barber and beauty facilities, auto repairs and rental, grocery stores, gift shops, equipment rental facilities, and gas stations. All existing recreation facilities would be retained, including golf course, tennis courts, ice-skating rink, and swimming pools. All existing day parking would be retained except strip parking along Southside Drive. An additional 200-car parking area would be constructed adjacent to Yosemite Lodge. The existing shuttle bus service provided by the concessioner under contract with the Park Service would be continued. Day users would be encouraged (on a voluntary basis) to leave their cars in parking areas and ride the bus. Park and concessioner headquarters and employee

housing would remain in its present location. The concessioner garage would be removed. Park and concessioner maintenance facilities would be combined and remain in the Valley, while heavy maintenance would be moved to El Portal. Employee tent cabins in Yosemite Village would be replaced with seasonal dormitories with 250 units. A total of 257 low-priced overnight lodging units would be torn down and replaced with medium-priced multi-story motel-type units. The 872 Park Service campsites would remain but 116 would be relocated away from the river bank.

Future growth in overnight use of the park would be dispersed by constructing new facilities outside the Valley. The historic Wawona Hotel which is owned by the Park Service would be winterized and expanded to 145 rooms, and a new 200-site campground would be constructed nearby. All commercial services would be retained including the golf course, tennis courts, swimming pool, gas station, grocery store, post office, gift shop, and stable. As 381 individually owned inholding cabins in Section 35 are acquired, they would be used as overnight lodging rental units and housing for park employees. A 200-site campground would be constructed near El Portal. A 200-car parking lot would be developed at Crane Flat, near the northwest entrance to the park, and bus service provided to Yosemite Valley and along the Tioga Road.

SELECTION OF DRAFT PLAN

The proposed draft plan was designed by Park Service planners and managers to enhance the best features of each of the alternatives. It is closest to Alternative 1 which contains popular aspects in-between the environmental preservation and commercial development alternatives. The Draft General Management Plan [1978] stated that the major goal of the proposed plan is to improve the quality of visitor experience. Chronic overcrowding and an "overzealous attempt to civilize the park" would be rectified. Auto traffic would be reduced and eventually eliminated from Yosemite Valley and Mariposa Grove. Nonessential services would be removed from developed areas, and the natural scene restored whenever possible. Information and interpretive programs would be strengthened to enhance visitor enjoyment of the unique natural and cultural features of the park.

Although more people would like to stay in overnight lodging facilities than can be accommodated with existing facilities, no attempt would be made to satisfy total demand because to do so would require an unacceptable level of development. Table 2 shows that the capacity of overnight facilities including camping and lodging would increase by 1.3 percent to 15,615 people. Parkwide, overnight lodging facilities, all of which are concession operated, would be reduced by about 11 percent to 1,542 rental units capable of accommodating about 4,827 people. All of the reduction would be in low-cost lodging units because of their deteriorated physical condition and location on a flood plain or rock fall zone. In Yosemite Valley, the number of people who could be accommodated in overnight lodging facilities would be reduced by 940 or 19 percent to 4,234 people.

Campgrounds, all of which are operated by the Park Service, would be increased parkwide by about 200 sites which would increase the number of people who could camp by about 8 percent to 10,788 people. Campgrounds in Yosemite Valley and Tuolumne

Meadows would be reduced. In Yosemite Valley, the number of campsites would be reduced by 13 percent to 756, reducing erosion along the banks of the Merced River. At Tuolumne Meadows, camping facilities would be reduced by one-third to 400 larger and less congested sites. Thus, more people would be able to camp in the park, but they would be dispersed by constructing new facilities outside of Yosemite Valley. The maximum number of visitors who would be able to stay overnight in campgrounds and lodging facilities in Yosemite Valley will be reduced by 15.5 percent to 7,662.

Currently there is severe congestion in Valley facilities at peak periods. Auto traffic would be reduced in the overcrowded eastern two-thirds of Yosemite Valley, and eliminated from Mariposa Grove which would have bus access from the south entrance to the park. Eventually autos would be excluded from Yosemite Valley, when it becomes economically feasible and alternative methods of public transportation are acceptable. Meanwhile, all of the more than 1,900 day use parking spaces in the esatern two-thirds of the Valley would be removed. All day visitors would park in the proposed 700-car parking area and 571 existing pulloff spaces along roads in the western end of the Valley or in new parking lots at the El Portal and Crane Flat entrances to the park and ride buses into the eastern part of the Valley. Overnight visitors to the Valley would continue to drive directly to their reserved campground or lodging sites and park until departing. All travel in the Valley would be by shuttle bus. The physically handicapped would be given special passes to drive their cars. The overall effect would be to greatly reduce potential auto congestion in the Valley. This would not have reduced the actual number of Valley day use visitors in the past except for one day in 1976 when the number of day visitors to the east end of the Valley would have been restricted by about 8 percent to 6,675 people. Inexplicably the present day

use parking capacity in the Valley is sufficient for 13,000 persons at one time, far in excess of foreseeable need.

Nonessential commercial services would be removed from Yosemite Valley including beauty and barber service, major auto repair, car rental, banking, and sportswear sales which would be relocated at El Portal, 16 miles or 30 minutes away. The hospital would be converted to emergency service only, and the dentist would move to El Portal. Essential services remaining in the Valley would be: two staple grocery stores, one gas station, one recreation equipment shop, restaurants, and gift shops. Commercial recreation services with no relation to the unique natural resources of the Valley would be removed; including swimming pools, tennis courts, a golf course, and an ice-skating rink. Tennis, golf, and the swimming pool would remain as traditional activities at the Wawona Hotel near the south entrance to the park. Hang-gliding would continue and snowmobiling would be prohibited. The existing downhill ski area at Badger Pass would remain at its current size of three double-chair lifts. It was the first ski area in California beginning in 1935. The cross-park Tioga Road would continue to be closed in the winter months. No new backcountry camps would be constructed, and three areas formerly designated for expansion would become part of a Wilderness Area proposal.

Further steps would be taken toward implementating the 1958 Congressional authorization to move park and concessioner headquarters and employee housing to El Portal on the west side of the park, 16 miles from Yosemite Valley. El Portal population would increase from the present 458 to 1,722 people. The proposed plan states that district level administration and maintenance would have to be retained inside the park, along with employee housing, for reasons of operational efficiency. Without the relocation of about 206 administrative employees and their families to El Portal, as proposed in the plan, the amount of Valley housing for the remaining

2,338 employees and their families would be inadequate. Substandard housing would be rehabilitated or replaced and new dormitories constructed reducing the land devoted to housing somewhat. However, there would be little visible change in the employee residential community in Yosemite Valley under the proposed plan despite the reduction in number of employees and their families by 21 percent to 2,338 people. As a first step, a newly appointed Superintendent of the park took up residence in El Portal in July, 1979, and the Superintendent's house in Yosemite Valley is scheduled for demolition.

COST AND EFFECTS OF THE PROPOSED AND ALTERNATIVE PLANS

Table 2 compares the costs and several important tangible effects of the proposed and alternative plans, drawn from the Draft Environmental Impact Statement [1978]. This document discussed the proposal and each alternative plan separately with cumulative impacts of each plan compared to current conditions. Lacking was a discussion of the relationship of the cost of implementing each alternative to its benefits or to its effectiveness in achieving management objectives expressed in terms of qualitative and quantitative criteria. In addition, there was no comparison of the effects of the four plans or appraisal of their relative cost and effectiveness. The purpose of Table 2 is to facilitate comparison of costs, benefits, and other measurable effects of the proposed and alternative plans. For example, existing conditions with respect to environmental damage are assigned a value of 100 percent, and the value for each alternative calculated as a proportion of 100. Lower values indicated reduced environmental damage. The table is a summary of several more detailed backup tables which follow.

In summary, the proposed plan would have the highest present value of costs, however, its present value of benefits would nearly offset the higher costs, resulting in a benefit cost ratio of 0.8 from reduced crowding and a ratio of 1.1 when benefits from improved air and water quality are included (see page 85). The proposal is superior to Alternatives 1 and 3 in nearly every respect. It would reduce development and congestion in Yosemite Valley by 16 percent, while the park could continue to serve nearly 2.7 million visitors per year. It would also reduce current damages to environmental quality by an average of 26 percent. Alternative 2 has the lowest present value of costs and the highest present value of benefits, resulting in a more favorable benefit cost ratio of 3.5. It is superior to the proposal and Alternatives 1 and 3 in nearly every respect. It would reduce

Table 2. Comparison of the Cost and Effects of the Proposal and Alternatives, Draft General Management Plan and Environmental Impact Statement, Yosemite National Park, 1978.

Costs and Effects	Existing Conditions	Proposed Plan	Popular Plan Alt. 1	Environmental Preservation Alt. 2	Commercial Development Alt. 3
Costs (millions)					
Investment Costs	$ 0	$ 78	$ 67	$116	$ 34
Operation & Maintenance Costs [a] (per year)	$ 6.1	$ 7.3	$ 7.3	$ 1.9	$ 6.5
Present Value of Costs [b] (millions)					
Investment Costs	$ 0	$ 47	$ 41	$ 70	$ 21
Operation & Maintenance Costs	$ 87	$104	$104	$ 27	$ 93
Total Costs	$ 87	$151	$145	$ 97	$114
Per Visitor Day [c]	$ 1.56	$ 2.78	$ 2.60	$ 2.16	$ 2.05
Present Value of Benefits [d]					
Total (millions)	$278	$329	$289	$313	$157
Per Visitor Day	$ 5.00	$ 6.17	$ 5.20	$ 8.18	$ 2.78
Benefit Cost Ratio	3.2	2.2	2.0	3.2	1.4
Incremental Costs and Benefits					
Total Incremental Costs (millions)	$ 0	$ 64	$ 58	$ 10	$ 27
Incremental Costs Per Visitor Day	$ 0	$ 1.22	$ 1.04	$ 0.60	$ 0.49
Total Incremental Benefits (millions)	$ 0	$ 51	$ 11	$ 35	$117
Incremental Benefits Per Visitor Day	$ 0	$ 1.17	$ 0.20	$ 3.18	-$ 2.22
Incremental Benefit Cost Ratio		0.8	0.2	3.5	- 4.3
Effectiveness (ratio of 100)					
Number of Employees (peak season)					
Concessioner	1,585	100.0	118.7	118.6	31.6	107.1
Park Service	385	100.0	120.0	119.5	31.7	106.8
Total	1,970	100.0	119.0	118.8	31.6	107.1
Recreation Use [e] (millions per year)						
Visits	2.75	100.0	97.8	100.0	81.1	101.5
Visitor Days	3.89	100.0	97.7	100.0	80.7	101.5
Capacity, Visitor Use & Employee Housing (persons per day)						
Day Use Capacity						
Valley	17,300	100.0	60.7	68.8	49.1	105.8
East End Valley	13,475	100.0	49.5	59.5	63.0	107.0
Park Total	40,600	100.0	97.5	98.3	105.7	106.6
Adjusted Day Use Capacity [f]						
Valley	11,788	100.0	89.1	101.0	72.1	155.3
East End Valley	7,963	100.0	83.8	100.8	106.7	181.2
Park Total	34,400	100.0	115.1	116.0	124.8	125.8
Lodging Capacity						
Valley	4,934	100.0	80.9	100.0	20.9	101.7
Park Total	5,528	100.0	87.3	105.8	55.8	127.2
Camping Capacity						
Valley	4,132	100.0	88.8	100.0	31.0	100.0
Park Total	9,892	100.0	109.0	109.8	61.1	116.7
Visitor Overnight Capacity						
Valley	9,066	100.0	85.9	100.0	25.5	101.0
Park Total	15,420	100.0	103.4	108.4	59.2	120.5
Total Visitor Capacity						
Valley	26,366	100.0	68.9	79.5	41.0	104.5
Park Total	56,020	100.0	98.6	101.7	92.9	110.5
Adjusted Total Visitor Capacity [f]						
Valley	20,854	100.0	87.2	100.5	51.8	132.1
East End Valley	17,028	100.0	84.9	100.4	63.5	138.5
Park Total	50,683	100.0	109.0	112.4	102.7	122.1

Table 2. Comparison of the Cost and Effects of the Proposal and Alternatives (continued)

Costs and Effects		Existing Conditions	Proposed Plan	Popular Plan Alt. 1	Environmental Preservation Alt. 2	Commercial Development Alt. 3
Employee & Family Housing						
Valley	2,971	100.0	78.7	79.0	16.1	84.1
El Portal	458	100.0	386.9	384.7	54.6	218.3
Park Total	3,898	100.0	124.2	124.2	31.6	107.2
Total Capacity						
Valley	29,337	100.0	69.9	79.5	38.5	102.1
Park Total	59,918	100.0	100.2	102.6	88.9	110.2
Adjusted Total Capacity [f]						
Valley	23,825	100.0	86.1	97.9	47.4	125.7
East End Valley	20,000	100.0	84.0	97.2	56.4	130.4
Total Park	54,581	100.0	110.0	112.6	97.6	121.0
Regional Economic Impact						
Construction Jobs		0	3,841	3,855	6,615	1,446
Construction Income (millions)		0	$ 31.2	$ 29.1	$ 57.0	$ 12.1
Concessioner Expenses & Profits						
Total Sales		100.0	104.2	93.0	87.0	87.0
Net Income Before Capital Expenses		100.0	84.9	56.0	67.0	96.0
Total Capital Expenses		100.0	278.1	294.0	288.0	195.0
Net Income Before Taxes		100.0	- 7.4	- 56.0	- 39.0	61.0
Environmental Quality						
Developed Land (acres)						
Valley	340	100.0	84.2	102.9	32.7	98.3
Park Total	1,029	100.0	85.8	82.5	49.3	86.2
El Portal	121	100.0	218.2	175.2	187.6	124.8
Scenic Quality Damage to Valley (acres)						
A-Scenic	101.2	100.0	54.5	66.0	10.0	88.4
B-Scenic	206.2	100.0	91.1	88.5	18.8	102.3
C-Scenic	9.6	100.0	118.7	640.6	0	100.0
Water Supply and Wastewater Treatment (mil gpd)						
Valley	1.15	100.0	87.9	91.3	16.6	110.4
Park Total	2.36	100.0	88.2	89.0	58.1	102.5
Air Quality (tons/day)						
Valley						
Carbon Monoxide	5.35 [g]	100.0	71.1	80.2	0	100.0
Hydrocarbons	.49	100.0	71.4	79.8	0	100.0
Nitrogen Oxides	.27	100.0	70.4	81.5	0	103.7
Park Total						
Carbon Monoxide	25.46	100.0	105.2	103.0	45.6	107.9
Hydrocarbons	2.32	100.0	106.0	104.3	46.2	108.6
Nitrogen Oxides	1.32	100.0	103.0	102.3	45.5	107.6

a. Yosemite National Park operation and maintenance costs were reported as $6.1 million in 1978. For the proposal and alternatives, O & M costs were estimated based on number of O & M employees as a proportion of the number under existing conditions.

b. Present value of investment cost assumed equal annual expenditures over a 15-year implementation period with a 7 percent discount rate, approximately the current U.S. resource planning rate (factor = 9.1). Present value of O & M costs assumed perpetual annual expenditure of an equal amount and a 7 percent discount rate (O & M/.07).

c. Present value of cost divided by the result of annual visitor days of recreation use divided by a 7 percent discount rate (annual visitor days/.07).

d. Benefit per visitor day multiplied by the result of annual visitor days of recreation use divided by a 7 percent discount rate. This assumes reduced congestion is a perpetual benefit of the alternative plans.

e. Harris, Kerr, Forster, 1978.

f. Adjustment based on effective daily capacity of 20,000 people at one time in the east end of Yosemite Valley on a peak day in 1976, including an estimate 7,963 day users, 4,934 overnight lodgers, 4,132 campers, and 2,971 employees and their families living in the Valley.

g. Peak day, 1978.

development and congestion in Yosemite Valley by nearly 50 percent, however, the number of persons who could visit the park annually would decline by 20 percent to 2.2 million. It would reduce current damages to environmental quality by an average of 85 percent. It would create substantially more jobs and income in the regional economy than the other plans.

Costs

Tables 2 and 3 compare the investment costs of the proposed and alternative plans during the 15-year implementation period, uncorrected for inflation. The agency reported that the lowest cost, $34 million, plan would be Alternative 3, commercial development, because it would result in the least amount of change from existing conditions. By comparison, it was estimated in 1978 that the proposed plan would cost twice as much, ranging between $72.5 and $84.8 million with a midpoint of $78 million. Alternative 2, the environmental preservation plan, was the most expensive with total cost estimate as $116 million. Alternative 1, the popular plan in-between the commercial development and environmental preservation alternatives, would cost $67 million, only slightly less than the proposed plan. Table 4 shows that the transfer of administration, employee housing, and heavy maintenance facilities to El Portal would account for the largest share of total costs of all plans except Alternative 3.

Table 2 compares the estimated annual costs of park operation and maintenance with the proposed and alternative plans. Costs of O & M were reported as $6.1 million for Yosemite National Park in 1978. With the proposed plan, it is estimated that costs of O & M would increase to $7.3 million, or by 20 percent. Alternative 1 costs of O & M also would be $7.3 million. Alternative 2 O & M costs would decline to $1.9 million, or by more than two-thirds. Alternative 3 would have O & M costs of $6.5 million, about 11 percent less than the proposed

Table 3. Estimated Investment Costs of the Proposed and Alternative Plans, Draft General Management Plan, Yosemite National Park, 1978.

Cost Items	Cost in Millions of Dollars			
	Proposed Plan	Alternative 1	Alternative 2	Alternative 3
National Park Service				
Design and Construction	$29.0 to $34.0	NA	NA	NA
Ongoing acquision of private properties inside the park	$12.0 to $15.0	NA	NA	NA
Archeological investigations and salvage	$ 2.5 to $ 2.6	NA	NA	NA
Payments to the concession for removal and relocation of facilities	$ 2.0 to $ 3.2	NA	NA	NA
Subtotal (NPS costs would be in addition to the annual operating budget for Yosemite, which is now about $7 million a year)	$45.5 to $54.8	$31	$ 84	$15
Yosemite Park and Curry Company	$27.0 to $30.0	$36	$ 32	$19
(About 65% of these costs would be for employee housing)				
Total	$72.5 to $84.8	$67	$116	$34

NA = Not available.

Source: Summary, Draft General Management Plan [1978] and Harris, Kerr, Forester and Company [1978].

Table 4. Estimated Investment Costs of the Proposed and Alternative Managment Plans by Location, Yosemite National Park, National Park Service, February, 1979.

Location	Cost in Millions of Dollars			
	Proposal	Alternative 1	Alternative 2	Alternative 3
Yosemite Valley	$ 9.20	$17.40	$15.50	$10.60
El Portal	$25.70	$26.10	$42.20	$11.20
Wawona	$ 9.90	$17.50	$16.30	$17.40
Mariposa Grove	$ .40	$ .02	$ .40	$ .16
Tuolumne Meadows	$ 4.10	$ 1.70	$ 1.60	$ 2.20
Tioga Road	$ 1.60	$ 1.20	$ 3.30	$ 1.20
Glacier Point Road	$ .35	$ 1.50	$ 7.40	0
TOTAL	$51.20	$65.40	$87.60	$42.60

Source: Planning Team, "Cost Estimates for All Alternatives and The Proposal, Yosemite General Management Plan," Supersedes Cost Estimates of November, 1976. Denver Service Center, National Park Service, February 10, 1977.

plan. These costs were estimated based on the number of O & M employees as reported in the Draft Environmental Impact Statement [1978]. Current park employment was reported at 385 persons during peak season. This would increase to 462 or by 20 percent with the proposed plan and with Alternative 1. It would increase to 411 or by 6.8 percent with Alternative 3. It would decline to 122 employees with Alternative 2, or by over two-thirds. The latter figure was not reported in the draft EIS and was an estimate based on employee housing reported in the EIS. Employment is considered a reasonable proxy for cost comparison purposes. However, it should be noted that costs of operation and maintenance could vary among the alternatives depending on the nature of the services provided with no change in employment. For example, costs of fuel for the large number of shuttle buses with Alternative 2 may increase O & M cost estimates based on number of employees alone.

Table 2 compares the present value of costs of investment and O & M with the proposed and alternative plans. Present value provides a standard procedure to put investment and annual costs on a comparative basis. Present value of investment cost was based on equal annual expenditures over a 15-year implementation period and a 7 percent discount rate, approximately the current U.S. Water Resources Council rate (factor = 9.1). Present value of O & M cost was based on perpetual[1/] annual expenditures of an equal amount and a 7 percent discount rate (= O & M/.07).

The proposed plan would have the highest present value of cost. The proposal would cost $151 million, including investment costs of $47 million and O & M costs

[1/] The assumption of perpetual annual expenditures of an equal amount is preferable over the usual 50-year planning period because there is no reason to believe that major changes in O & M expenditures would occur in 50 years. The effect of choosing a perpetual time period compared to a 50-year time period is to increase the resulting value by only 3.5 percent.

of $104 million, based on cost reported in 1978. This would be somewhat more than the $145 million present value of costs for Alternative 1. Considering the present value of O & M costs has a dramatic effect on Alternative 2. It ranked as the highest investment cost plan. It ranks as the least present value of cost plan. Reduction in costs of O & M offset the higher investment costs, so that present value of costs fall to $97 million, one-third less than the proposed plan. The present value of costs would be $114 million with Alternative 3, $17 million more than the least cost plan.

Table 2 compares the present value of cost per visitor day with the proposed and alternative plans. The present value of cost was divided by annual visitor days of recreation use divided by the 7 percent discount rate. With present value of cost estimated at $2.78 per visitor day, the proposal would be higher cost than alternative plans, and $1.22 per visitor day higher than the $1.56 per visitor day under existing conditions. The least cost plan would be Alternative 2 with present value of cost estimated as $2.16 per visitor day, only $0.60 per visitor day more than the $1.56 currently. Alternative 3, would have total costs of $2.05 per visitor day, $0.49 per visitor day more than existing costs. Alternative 1 would cost $2.60 per visitor day, $0.18 less than the proposed plan.

Table 4 compares investment cost of the proposed and alternative plans at each major location in the park. While these costs were estimated by the Study Team in 1976 and updated to 1977, they form the basis for the cost estimates in Table 2 and contained in the Draft General Management Plan [1978] although they are not identical. In 1977, some costs such as draining Hetch Hetchy reservoir were inadvertently omitted and both park and concessioner costs are lumped together. Despite these limitations, the data reveal several interesting relationships. First, moving park and concessioner administrative facilities and employee housing

to El Portal accounts for the largest share of total cost of the proposed plan and of the alternatives except Alternative 3, in which a minimum transfer to El Portal would occur because the concessioner had opposed the move. The reconstruction and expansion of the U.S. owned Wawona Hotel and related development of wastewater treatment facilities is the second largest cost item for all alternatives. Yosemite Valley construction costs would be slightly less than for the Wawona area of the park. All other areas of the park would contribute a very small part of the total costs of the proposed and alternative plans.

Benefits and Costs

Table 2 compares the present value of recreation benefits of the proposed and alternative plans. Benefits are based on the economic results of the 1975 Yosemite Visitor Survey updated to 1979, summarized as an Appendix to this report. Average net benefits were estimated as about $5 per day under existing conditions. These benefits are expected to change by $0.073 per visitor day for each one percentage point change in crowding in the east end of Yosemite Valley, shown as Adjusted Total Capacity in Table 2.

The proposed plan would increase benefit per day to $6.17, about 19 percent more than present benefit of $5.00 per day. This results from an expected 16 percent reduction in congestion. Alternative 2 would have the highest benefit estimated as $8.18 per visitor day, owing to a 43.6 percent reduction in congestion. Alternative 3 would have the lowest benefit of $2.78 per visitor day, resulting from a 30.4 percent increase in congestion. Alternative 1 would have benefits of $5.20 per visitor day, slightly higher than under existing conditions, resulting from a 2.8 percent reduction in crowding.

The present value of benefits with the proposed plan were calculated as $329 million compared to $278 without, an increase of 18 percent. Benefits from

the alternative plans are expected to be perpetual, with a uniform average number of visitor days per year as shown in Table 2, and a 7 percent discount rate. Alternative 2 would have the highest present value of benefits estimated as $313 million. With Alternative 3, present value of benefits would fall to their lowest level, $157 million. Alternative 1 would have present value of benefits of $289 million, only slightly higher than under existing conditions.

The recreation use of Yosemite would have a benefit cost ratio of 2.2 with the proposed plan, compared to 3.2 under current conditions. This means that for every $1 of costs, recreation users would receive benefits of $2.20 with the proposed plan. Alternative 2 would have the most favorable benefit cost ratio estimated as 3.2. Alternative 3 would have the lowest benefit cost ratio of 1.4, which nonetheless remains a favorable B/C ratio. Alternative 1 would have a slightly less favorable benefit cost ratio than the proposed plan, with 2.0.

Table 2 also shows the incremental benefits and costs of the proposed and alternative plans. These are the net changes in costs and benefits compared to existing conditions. This incremental analysis reveals that the proposed plan would have a benefit cost ratio of 0.8. This means that for every $1 of added cost, recreation users would receive benefits of $0.80. Alternative 2 would have the most favorable incremental benefit cost ratio of 3.5, owing to a substantial reduction in overcrowding in the east end of Yosemite Valley. Reduced park visitation resulted in disbenefits valued at $5 per visitor day for the proposed plan and Alternative 2. Present value of disbenefits were estimated as $6.4 million for the proposed plan and $54.3 million for Alternative 2. These were subtracted from the present value of benefits for these plans. Increased park visitation with Alternative 3 resulted in a $4.2 million increase in present value of benefits.

Annual Visitation

Table 2 shows that there would be an estimated 2.69 million recreation visits to the park annually with the proposed plan, equal to 3.89 million visitor days [Draft Environmental Impact Statement, 1978]. This is nearly identical to current conditions defined as visitation of 2.75 million during the peak year of 1976. Recreation use of the park would remain nominally the same for Alternative 1. Recreation use would increase slightly with Alternative 3 to 2.79 million visits (equal to 3.95 million visitor days) and decline by about 19 percent with Alternative 2 to 2.23 million visits (equal to 3.14 million visitor days). The basis for these estimates of uniform annual recreation use with the proposed and alternative plans was Harris, Kerr, Forster [1978] which attributed them to the Denver Service Center, National Park Service. They are considered rough estimates as they are not based on predictive equation from a statistical regression analysis and projection of factors of demand.

The number of recreation visits to Yosemite without the proposed plan has been relatively stable during the past decade, with no definite trend. In 1978, there were about 2.6 million recreation visits. During the 30 years from 1938 to 1968, the number of recreation visits to the park nearly doubled each decade. The agency prepared a linear trend projection of recreation visits from 1956 to 1977 which predicted 1981 visits of 3.25 million. This seems unlikely to occur because the number of recreation visits has leveled off during the past decade, with no definite trend evident.

Yosemite National Park
Recreation Visits in Thousands

1938	467	1975	2,537
1948	796	1976	2,682
1958	1,139	1977	2,393
1968	2,281	1978	2,569

The study team selected 1976 as a normal year without the proposed plan when recreation visits were 2,682,000. Visitor statistics collected by the National Park Service are equivalent to number of trips. Number of days per trip varies widely at a park such as Yosemite where some visitors are on vacation and others a weekend or single day visit. The Statistical Section reports number of overnight stays which is equivalent to visitor days. Overnight stays in Yosemite were reported as 1,809,200 in 1976 which divided by an average of approximately three nights per person in camping and lodging facilities equals 603,067 visits by persons who stayed overnight in the park. Subtracting this 603,067 from total park visits of 2,685,400 equals 2,082,333 visits by day users. Summing the 2,082,333 day users and the 1,809,200 overnight stays equals a total of 3,891,533 visitor days at Yosemite in 1976. Visitor surveys suggest that about 80 percent visit Yosemite Valley, or approximately 3 million visitor days annually.

Carrying Capacity

Table 5 compares the number of people who can be accommodated at one time in overnight lodging and camping facilities under the proposed and alternative plans. Alternative 3 would provide overnight lodging facilities to accommodate 7,034 persons, an increase of 27 percent above the present capacity of 5,528 persons. Alternative 2 would provide lodging capacity of 3,087 persons, a 44 percent reduction. The proposed plan would provide overnight lodging capacity of 4,827 people, a 12.7 percent reduction. Alternative 1 would provide lodging capacity of 5,851 persons, a 5.8 percent increase.

In Yosemite Valley, the proposal would reduce overnight lodging capacity to 3,994 persons, which would be 19.1 percent less than the present capacity. Valley lodging capacity would remain the same under Alternative 1. Valley lodging capacity would be 5,018 with Alternative 3, 1.7 percent more than present capacity.

Table 5. Number of People Who Can Be Accommodated at One Time in Overnight Lodging and Camping Facilities, Proposed and Alternative Plans, Yosemite National Park, 1978.

Developed Area	Number of Visitors Accommodated				
	Existing Alt. 4	Proposal	Alt. 1	Alt. 2	Alt. 3
Yosemite Valley					
Yosemite Lodge					
Cabin w/bath	269	0	269	0	269
Cabin w/o bath	291	0	291	0	0
Rooms w/bath	870	1,062	870	0	870
Rooms w/o bath	51	0	51	0	0
Spartan motel type	0	0	0	0	342
Total	1,481	1,062	1,481	0	1,481
Curry Village					
Cabin w/bath	378	378	378	0	378
Cabin w/o bath	288	288	288	0	288
Tent Cabin	1,254	1,005	1,254	0	858
Housekeeping	1,200	928	1,200	0	1,200
Spartan motel type	0	0	0	0	480
Hostel	0	0	0	100	0
Total	3,120	2,599	3,120	100	3,204
Ahwahnee Hotel					
Hotel Rooms	267	267	267	0	267
Luxury Cabin	66	66	66	0	66
Curry 2					
Tent Cabins	0	0	0	450	0
Cabins w/bath	0	0	0	480	0
Total Valley	4,934	3,994	4,934	1,030	5,018
Valley Campgrounds					
Auto Camp	3,200	2,736	3,200	0	3,200
Walk-in	232	232	232	1,280	232
Group	700	700	700	0	700
Total	4,132	3,668	4,132	1,280	4,132
El Portal					
Motel	0	0	0	1,200	0
Auto Camp	0	0	0	800	0
Badger Pass					
Hostel	0	0	0	40	0
Motel	0	0	120	0	0
Bridalveil Campground					
Auto Camp	440	440	440	0	440
Horse Group Camp	0	50	50	0	50
Walk-in Camp	0	0	0	200	0

Table 5. Number of People Who Can be Accommodated (continued)

Developed Area	Number of Visitors Accommodated				
	Existing Alt. 4	Proposal	Alt. 1	Alt. 2	Alt. 3
Wawona					
Auto Camp	400	1,200	1,200	400	1,200
Group Camp	30	30	30	30	30
Hotel	170	392	392	392	392
Section 35					
Cabins w/bath	19	0	0	0	1,219
Tuolumne Meadows					
Auto Camp	2,400	1,600	2,400	0	2,400
Walk-in Camp	200	200	200	800	200
Horse Group Camp	0	50	0	0	0
Tent Cabins	198	198	198	198	198
Hostel	0	0	0	20	0
White Wolf					
Tent Cabins	39	75	39	39	39
Auto Camp	344	600	344	0	344
Walk-in Camp	0	0	0	344	0
Crane Flat					
Auto Camp	656	800	656	656	656
Tioga Road Campground					
Auto Camp	620	1,000	620	0	620
Walk-in Camp	200	200	200	820	200
Hodgdon Meadow					
Auto Camp	440	800	440	440	440
Foresta					
Walk-in Camp	0	0	0	120	0
Group Camp	30	30	30	30	30
High Sierra Camps					
Tent Cabins	168	168	168	168	168
Hetch Hetchy					
Walk-in Camp	0	120	120	120	0
Total, Accommodations	5,528	4,827	5,851	3,087	7,034
Total, Camp Areas	9,892	10,788	10,862	6,040	11,542
Near Auto	8,500	9,176	9,300	2,296	10,100
Walk-in	632	752	752	3,684	632
Group	760	860	810	60	810
Total	15,420	15,615	16,713	9,127	18,576

Alternative 2 would provide lodging capacity for only 1,030 persons in the Valley, a 79.1 percent reduction.

The proposed changes in lodging capacity would have distributional effects. For example, the Draft General Management Plan [1978] shows that the proposed plan would reduce the number of lodging units in Yosemite Valley disproportionately in the low-cost category which would decline by 28 percent.

Overnight Lodging Units	Existing	Proposed	Unit Change	Percent Change
Luxury ($36-$46/night)	121	121	0	0
High ($29-$35/night)	274	274	0	0
Moderate ($18-$28/night)	218	198	-20	-9.2%
Low ($7-$17/night)	915	657	-253	-28.0%
Total	1,528	1,250	-278	-18.2%

The proportion of low-cost lodging units in the Valley would decline from 60 percent under existing conditions to about 53 percent with the proposed plan. Still, 57 percent of the units parkwide would be low-cost units with the proposed plan, a decline from 65 percent now. In addition, campgrounds provide the opportunity for low-cost overnight stays in the park.

Capacity of campgrounds in the park would be increased with all of the plans considered except Alternative 2, in which case capacity would be 6,040 persons, a decrease of 39 percent from present capacity of 9,892 persons. Table 5 shows that the proposed plan would provide campground capacity for 10,788 persons, a 9 percent increase. Alternative 1 would increase campground capacity by nearly 10 percent and Alternative 3 would increase it by 16.7 percent.

The proposed plan would reduce campground capacity in the Valley to 3,668 persons, 11.2 percent less than the present capacity of 4,132 persons. Valley campground capacity would remain the same as at present with Alternative 1 and Alternative 3. With Alternative 2, Valley campground capacity would be reduced

to 1,280 persons, a 74.5 percent reduction. Moreover, all Valley campgrounds would be converted from auto camping to walk-in camping.

Table 5 shows that the proposed plan would provide a balanced increase in campground capacity in the park among the three types of facilities: auto, walk-in, and group campgrounds. The same would be true for Alternative 1 and Alternative 3, except that the capacity of walk-in campground facilities would remain the same as at present. With Alternative 2, all of the reduction in capacity would be among auto and group campgrounds, while walk-in camping capacity would increase to 3,684 persons, or 5.8 times present walk-in camping capacity. All management plans provide for a considerable amount of backpacking to primitive camp sites in the wilderness areas of the park.

Table 6 compares visitor day use capacity of the proposed and alternative plans. This is based on the number of parking spaces and average daily turnover plus existing bus access estimated at 7 percent. The most day use capacity would occur under Alternative 3, and the least with the proposed plan, however, not appreciably below the present capacity level of 40,584, which is substantially above current use, and far in excess of foreseeable need. There is no limit to bus access, thus day use capacity is even larger than this. All plans except Alternative 3 would remove a substantial amount of day use parking capacity from the Valley and provide more parking elsewhere in the park.

The proposed plan would decrease the current 13,475 visitor day use capacity in the congested east end of Yosemite Valley by 50 percent. However, parking capacity accommodating only 7,963 day users has ever been occupied at one time. This was during a peak day in 1976 when 20,000 total visitors were in the east end of the Valley. Adjusted for effective capacity, the proposed plan would decrease visitor day use capacity in the east end of the Valley by only 16.2 percent.

Table 6. Visitor Day Use Capacity of the Proposed and Alternative Plans, Yosemite National Park, 1978

Location	Visitor Day Use Capacity (persons)				
	Existing Alt. 4	Proposal	Alt. 1	Alt. 2	Alt. 3
Yosemite Valley District					
Yosemite Valley					
East End	13,485	6,675	8,025	8,505	14,430
West End	3,855	3,855	3,855	--	3,855
Cascades	90	90	90	0	90
Arch Rock	270	270	270	0	270
El Portal	540	765	540	2,700	540
Wawona District					
Chinquapin	810	810	810	2,700	810
Badger Pass	3,300	3,300	6,600	0	3,300
Summit Meadow/ Bridalveil	0	360	360	0	360
Glacier Point	7,650	7,650	6,600	1,026	7,650
Wawona	1,689	1,689	1,689	1,689	1,689
Mariposa Grove	3,450	3,850	4,200	2,700	3,450
South Entrance	540	4,525	1,080	2,700	1,080
Mather District					
Tioga Pass	540	540	540	6,750	540
Tuolumne Meadows	1,260	1,485	1,440	5,400	1,440
White Wolf	45	45	45	0	45
Tenaya Lake Area	720	720	720	0	720
Crane Flat	225	900	900	6,750	900
Hodgdon Meadow	540	540	540	540	540
Foresta	90	90	90	0	90
Hetch Hetchy	1,080	1,080	1,080	1,080	1,080
Merced Grove	405	405	405	405	405
Total	40,584	39,644	39,879	42,945	43,284

Table 2 shows the effect of this adjustment for effective capacity on total park capacity estimates.

Regional Effects

Table 7 compares regional economic and socioeconomic effects of the proposed and alternative plans. This is based solely on uniform average annual construction costs by both the Park Service and concessioner beginning in the year 3 of a 15-year period. Effects are shown for Mariposa County and for a five-county Yosemite region. Construction expenditures with Alternative 2 would generate the most jobs and income for the region, nearly double the amount from the proposed plan and Alternative 1, which are nearly identical with respect to regional impact. Alternative 3 would generate the fewest jobs and income for the region, less than half the amount of the proposed plan. Including changes in costs of park operation and maintenance, and doubling the construction costs of the proposed plan from 1978 to 1979 would significantly change these regional economic impacts. Moreover, changes in number of park visitors and expenditure patterns associated with each of the alternative plans would have regional economic impacts, which were not estimated. As a result, the reader should be cautioned not to rely on the regional economic estimates shown in Table 7, except as rough indications of differences between the plans.

Effect on Concessioner

Table 8 compares the estimated effect of the proposed and alternative plans on concessioner expenses and profits. The information is presented in percentage change from adjusted 1975-76 results rather than actual dollars to avoid disclosure of legally protected discretionary information. Rate of profit before taxes of 10.5 percent on sales of $24 million in 1975 was assumed the minimum level acceptable. A certified public accounting firm conducted the contract study. The basic underlying data are unavailable so its reliability cannot be tested. The results

Table 7. Regional Economic Impacts and Socioeconomic Effects of the Draft General Management Plan and Alternatives, Yosemite National Park, 1978.

Variable	Proposed Plan	Alternative 1	Alternative 2	Alternative 3
		Yosemite Region[a]		
Employment	3,841 man-years	3,855 man-years	6,615 man-years	1,446 man-years
Income	$31,186,900	$29,104,825	$56,971,500	$12,221,200
Annual Employment	320 man-years	321 man-years	551 man-years	121 man-years
Annual Income	$ 2,598,900	$ 2,425,400	$ 4,848,725	$ 1,018,430
Population Increase	0.5%	0.5%	0.9%	0.2%
Demand for Housing	0.7%	0.7%	1.0%	0.2%
Demand for Health Care	0.5%	0.5%	0.9%	0.2%
Increase in School-Aged Children	0.7%	0.7%	1.0%	0.3%
		Mariposa County		
Employment	1,676 man-years	1,984 man-years	2,632 man-years	710 man-years
Income	$ 6,218,200	$ 6,279,940	$10,042,660	$ 2,715,250
Annual Employment	139 man-years	165 man-years	219 man-years	59 man-years
Annual Income	$ 518,180	$ 523,330	$ 836,890	$ 226,270
Population Increase	7.0%	8.0%	10.0%	3.0%
Demand for Housing	9.0%	10.0%	14.0%	4.0%
Demand for Health Care	7.0%	8.0%	11.0%	3.0%
Increase in School-Aged Children	11.0%	13.0%	17.0%	5.0%

[a] Includes Madera, Mariposa, Merced, Mono, and Tuolumne Counties.

Table 8. Effects of Proposed and Alternative Plans on Concessioner Expenses and Profits, Yosemite National Park, 1978.

Variable	Percent Change from Adjusted 1975-76 Results			
	Proposal	Alt. 1	Alt. 2	Alt. 3
Total sales and income	+ 4.2	- 7	- 13	+ 13
Direct operating expenses	+ 3.7	- 4	- 18	+ 11
Departmental profits	+ 4.9	0	- 5	+ 15
Deductions from income	+ 19.5	+ 33	+ 38	+ 41
House profits	- 0.1	- 18	- 19	+ 7
Overhead expenses	+ 16.3	+ 9	- 5	+ 10
Operating profits	- 12.9	- 39	- 31	+ 5
Other deductions	+ 5.4	- 6	- 10	+ 12
Net income before capital expenses	- 15.1	- 43	- 33	+ 4
Total capital expenses	+178.1	+194	+188	+ 95
Net income before taxes	-107.4	-156	-139	- 39
Return on equity investment	-105.7	-120	-114	- 68
Required equity investment	+156.5	+158	+130	+105

Source: Harris, Kerr, Forester and Co. [1977 and 1978].

suggest that investment levels, primarily employee housing and the move of administration to El Portal, would be increased substantially with resulting decreases in profits at current price levels. Costs would exceed revenues and losses would be incurred with the proposed plan and all alternatives except Alternative 3, in which case estimated profit on equity investment would decline about two-thirds.

Consumptive Land Use

Table 9 compares the amount of disturbed park land caused by the proposed and alternative plans. The least consumptive use of park land for development would occur with Alternative 2. With this alternative, only about 507 acres of land parkwide would be used for development, less than one-half current conditions. In Yosemite Valley only 111 acres would be used for development, less than one-third current conditions. The most amount of land disturbance would occur under Alternative 3 about equal to the amount of land disturbance by the proposed plan. Still this would be about 15 percent less land use than the 1,029 acres under existing conditions. In Yosemite Valley, no significant change in land use would occur under either Alternative 3 or Alternative 1. The proposed plan would result in a modest 53.6 acres or about 16 percent reduction in the 339.7 acres of existing land disturbed in the Valley.

Scenic Quality

Table 10 compares the residual damages to scenic quality in Yosemite Valley associated with the proposed and alternative plans. The least effect on scenic quality would occur under Alternative 2, environmental preservation, less than one-tenth the current 101.2 acres of A-Scenic, the most significant view areas. All of the alternative plans would reduce scenic damage to the highest quality areas in the Valley. The proposed plan reduces the number of acres affected by

Table 9. Effects on Amount of Disturbed Park Land by the Proposed Alternative Plans, Yosemite National Park, 1978.

Developed Area	Predominate Vegetation Type	Disturbed Park Land (Acres)				
		Existing Conditions	Proposal	Alternative 1	Alternative 2	Alternative 3
Yosemite Valley						
Yosemite Lodge	Mixed Conifer	38.9	28.0	38.9	0.0	42.4
Yosemite Village	Mixed Conifer	60.4	36.9	54.7	0.0	52.4
Curry Village	Mixed Conifer	63.1	45.0	58.1	3.4	63.3
Ahwahnee Hotel	Mixed Conifer	10.4	6.3	6.3	4.1	10.4
Campgrounds	Mixed Conifer	123.9	108.9	123.9	64.0	123.9
Other Valley Areas	Mixed Conifer	43.1	61.0	67.6	39.5	41.7
Total, Valley Areas		339.7	286.1	349.5	111.0	334.1
Cascades/Arch Rock	Mixed Conifer	9.5	9.5	5.0	5.0	9.5
Chinquapin	Red Fir	1.0	2.0	1.8	7.0	2.0
Badger Pass	Red Fir	76.8	76.8	78.1	1.5	77.1
Bridalveil Campground/Summit Meadow	Red Fir	28.9	33.1	33.1	17.0	33.1
Glacier Point	Red Fir	10.0	10.0	7.9	4.8	10.4
Wawona	Mixed Conifer	282.4	118.2	94.5	78.1	148.2
South Entrance Station	Mixed Conifer	1.5	8.5	1.7	5.5	1.7
Mariposa Grove	Sequoia	11.2	8.1	7.6	2.0	10.7
Tioga Pass Ent. Station	Subalpine Meadow	0.8	0.8	0.8	10.8	0.8
Tuolumne Meadows	Lodgepole Pine/ Subalpine Meadow	71.4	69.1	70.9	56.8	72.2
White Wolf	Mixed Conifer	26.6	36.1	26.6	27.1	26.6
Crane Flat	Mixed Conifer	36.9	51.4	43.9	49.9	40.4
Tioga Road Campgrounds	Red Fir	76.7	106.7	76.7	76.7	76.7
Hodgdon Meadow	Mixed Conifer	26.7	40.4	29.4	27.9	29.4
Foresta	Mixed Conifer	19.5	11.6	11.0	16.5	11.0
Hetch Hetchy	Chaparral	1.5[a]	7.5[a]	7.5[a]	7.5	1.5[a]
Aspen Valley	Lodgepole Pine/ Red Fir	6.0	0.0	0.0	0.0	0.0
Mather Station	Mixed Conifer	1.5	1.5	1.5	1.5	1.5
Park Totals		1,028.7	877.4	847.5	506.6	886.9
El Portal[b]	Chaparral	121.0	263.7	211.6	227.1	150.5

[a]Excluding 552.4 acres of San Francisco lands associated with Hetch Hetchy Reservoir.

[b]Excluded from park totals because of status as an administrative site.

Table 10. Effect on Scenic Quality of the Proposed and Alternative Plans, Yosemite Valley, Yosemite National Park, 1978.

Developed Area and Scenic Classification[a/]	Damage to Scenic Quality (in acres)				
	Existing	Proposal	Alt. 1	Alt. 2	Alt. 3
Yosemite Lodge					
A - Scenic	26.6	14.2	0	0	26.6
B - Scenic	12.3	13.8	0	0	15.8
C - Scenic	0	0	38.9	0	0
Yosemite Village					
A - Scenic	13.1	0	13.1	0	4.1
B - Scenic	45.3	33.1	39.6	0	46.3
C - Scenic	2.0	3.8	2.0	0	2.0
Curry Village					
A - Scenic	2.7	0	0	0	2.7
B - Scenic	60.4	45.0	58.1	3.4	60.6
C - Scenic	0	0	0	0	0
Ahwahnee Hotel					
A - Scenic	9.6	5.5	5.5	3.3	9.6
B - Scenic	0.8	0.8	0.8	0.8	0.8
C - Scenic	0	0	0	0	0
Other Valley Areas and Campgrounds					
A - Scenic	49.2	35.4	48.1	3.0	46.4
B - Scenic	87.4	95.1	83.9	34.5	87.4
C - Scenic	7.6	7.6	22.6	0	7.6
Mixed	22.8	31.8	36.9	66.0	24.2
Total Valley					
A - Scenic	101.2	55.1	66.7	9.7	89.4
B - Scenic	206.2	187.8	182.4	38.7	210.9
C - Scenic	9.6	11.4	61.5	0	9.6

[a/] Definitions:

A - Scenic areas are the most significant scenic views that exist today. They are the most frequently used viewing areas, and were commonly chosen by eminent early photographers and painters.

B - Scenic areas are the less significant, less frequently used viewing areas, and were less commonly chosen by historic photographers and painters.

C - Scenic areas are of minor significance, as they are seldom used viewing areas, and can accept development without detracting from either primary or secondary vistas.

about 45 percent. Damage to B-Scenic areas, the less significant and less frequently chosen viewing areas, would be reduced by all of the alternative plans except Alternative 3 which would increase the number of acres damaged by 2 percent to 210.9 acres. Damage to areas classified as Mixed would increase under all of the alternatives considered. Very little of the existing and proposed alternative development in the Valley would be located in areas classified as C-Scenic, of minor significance as they are seldom used for viewing and can accept development without detracting from either primary or secondary vistas.

Archeological Effects

Table 11 compares the number of new archeological sites disturbed by the proposed and alternative plans. Under existing conditions, 193 sites have been disturbed directly or indirectly, leaving only 71 wholly undisturbed sites. Alternative 3 would disturb fewer archeological sites than other alternatives because fewer changes would be made in current development. Alternative 2 would result in the most disturbance of archeological sites, because the greatest changes would be made in current development. Facilities and roadways would be removed from Yosemite Valley which would disturb archeological sites somewhat. Indians lived in Yosemite for 2,000 to 4,000 years and while 264 sites have been catalogued, very little is known about their relative importance.

Water and Air Quality

Table 12 compares water supply and wastewater treatment under the proposed and alternative plans. Alternative 2 would consume the least amount of water and require the least amount of wastewater treatment capacity. Diversion of water from the North Fork of the Merced River in Yosemite Valley would decrease from about 34 percent of low flow volumes currently to about 5 percent, significantly increasing aquatic habitat. The proposed plan would decrease low flow volume

Table 11. Effect on Archeological Sites of the Proposed and Alternative Plans, Yosemite National Park, 1978.

Developed Area	Archeological Sites Disturbed Under Existing Conditions			Number of New Archeological Sites Disturbed							
				Proposal		Alternative 1		Alternative 2		Alternative 3	
	No Impact	Direct	Indirect	Direct	Indirect	Direct	Indirect	Direct	Indirect	Direct	Indirect
Yosemite Valley	8	56	34	5	0	8	0	41	34	3	2
Cascades	0	3	0	0	0	0	0	0	0	0	0
El Portal	0	5	2	9	0	9	0	10	0	9	0
Wawona Area	16	8	23	2	3	1	3	2	3	1	3
Tuolumne	22	23	12	9	0	8	0	9	0	8	0
Hodgdon Meadow	4	3	1	1	0	1	0	0	0	1	0
Tioga Road Corridor	9	4	2	1	2	1	1	2	1	0	1
Hetch Hetchy	0	1	0	0	1	0	1	0	1	0	0
Foresta	11	4	5	0	0	0	0	0	0	0	0
Aspen Valley	0	0	0	0	5	0	5	0	5	0	5
Backcountry	1	3	4	0	0	0	0	0	0	0	0
TOTAL	71	110	83	27	11	28	10	64	44	22	11

Table 12. Effects on Water Supply and Wastewater Treatment of the Proposed and Alternative Plans, Yosemite National Park, 1978.

Location	Consumption (gallons per day)				
	Existing Alt. 4	Proposal	Alt. 1	Alt. 2	Alt. 3
Yosemite Valley	1,150,000[a]	1,007,000[a]	1,050,000[a]	175,000	1,270,000[a]
Cascades	1,600	1,600	1,600	0	1,600
Arch Rock	1,700	1,700	1,700	0	1,700
El Portal	300,000[a]	555,000[a]	550,000[a]	400,000[a]	560,000[a]
Chinquapin	4,300	4,300	4,300	67,500[d]	4,300
Bridalveil Creek	11,0000	13,400	13,400	5,000	13,400
Summit Meadow		700	700	0	700
Badger Pass	13,500	13,500	13,500	3,000	13,500
Glacier Point	4,825	3,825[b]	3,500	500	4,800
Wawona	647,000[a]	244,000[a]	244,000[a]	216,000[a]	330,000[a]
South Entrance	2,000	4,000[c]	1,100	2,700	1,400
Mariposa Grove	13,500	1,800[b]	2,100	1,400	1,700
Tioga Pass	2,900	2,900	2,900	170,000[d]	2,900
Tuolumne Meadows	110,000	90,000	113,000	63,000	115,000
White Wolf	12,000	24,000	12,000	21,000[d]	12,000
Crane Flat	18,000	22,000	18,000	185,000[d]	18,000
Hodgdon Meadow	17,000	25,000	17,000	17,000	17,000
Tioga Road Cmpgs	24,000	39,000	24,000	20,500	24,000
Hetch Hetchy	1,800	4,800	4,800	4,800	4,800
Foresta	4,000	1,200	1,200	0	1,200
High Sierra Camps	18,000	18,000	18,000	18,000	18,000
Merced Grove	2,000	2,000	2,000	2,000	2,000
Total	2,359,125	2,079,825	2,098,800	1,372,400	2,418,000
Watershed Totals					
North Fork-Merced River	1,532,900	1,663,200	1,681,900	856,500	1,913,200
South Fork-Merced River	662,500	249,900	247,200	220,100	333,100
South Fork-Tuolumne River	163,700	166,700	169,700	295,800	171,700

[a] 40% of the consumption rate is irrigation water that would not be part of the wastewater load.

[b] Based on use of oil-recirculating toilets, which decrease water usage to one-half gpd per visitor.

[c] Based on use of low-flow fixtures, which decrease water usage to 1 gpd per visitor.

[d] Based on 25 gpd per visitor for food service.

diverted to about 30 percent. Construction of a new wastewater treatment plant at Wawona is included in the proposed plan and all alternatives, as is improvement of individual wastewater treatment systems at campgrounds, correction of the overflow problem at the El Portal plant, and upgrading of the collection system.

Table 13 compares air quality under the proposed and alternative plans. The data show the effects on projected tons per day of exhaust emissions from visitor and employee levels at various locations in the park. Alternative 2 would result in the lowest levels of carbon monoxide, hydrocarbons, and nitrogen oxide emissions. Alternative 3 would result in the highest, particularly in Yosemite Valley. The proposed plan would result in a substantial (29 percent) reduction in auto traffic and thus in emissions in Yosemite Valley, but parkwide emissions would be increased somewhat.

Air quality studies were conducted in Yosemite Valley in 1973. California standards for oxidants were exceeded two days in August, and the Federal Primary Air Quality Standard was exceeded once. Ozone levels average 0.08 ppm per hour and ranged from 0.08 to 0.20 ppm over an eight-hour period. This level of concentration could injure ponderosa pine and other plant species. Increasing concentrations of pollutants represent potential threats to continued use and visitor appreciation of Yosemite Valley.

Insufficient information was presented in the planning documents to do a complete cost effectiveness analysis of the proposal and alternative plans. However, it is possible to illustrate their relative cost effectiveness with respect to environmental quality (see Nez and Walsh, 1979, for methodology). Assign equal weights to the reduction in environmental damage scores presented in Table 2 for the land, water, air, and scenic quality variables. Subtract each of the combined scores from 100 to obtain equally weighted effectiveness

Table 13. Comparison of Effects on Projected Tons Per Day of Exhaust Emissions Based on Visitor and Employee Levels of Proposed and Alternative Plans, Yosemite National Park, 1978.

Proposed

Location	Estimated Percentage Change in Use Levels (from Proposal)	Expected Maximum Emissions (Tons per Day) Carbon Monoxide	Hydro-carbons	Nitrogen Oxides
Yosemite Valley	-29%	3.80	.35	.19
Yosemite Valley-Arch Rock	- 5%	1.72	.16	.10
Glacier Point Corridor	+12%	2.15	.20	.11
Yosemite Valley-Wawona	- 5%	3.92	.37	.19
South Entrance-Wawona	+54%	1.31	.12	.07
Mariposa Grove	100%	-	-	-
Yosemite Valley-Crane Flat	+37%	4.22	.39	.22
Big Oak Flat-Crane Flat	+39%	1.84	.16	.08
Crane Flat-Tioga Pass	+24%	7.83	.71	.40
Total		26.79	2.46	1.36

Alternative 1

Location	Estimated Percentage Change in Use Levels (from Proposal)	Expected Maximum Emissions (Tons per Day) Carbon Monoxide	Hydro-carbons	Nitrogen Oxides
Yosemite Valley	+13	4.29	.39	.22
Yosemite Valley-Arch Rock	0	1.72	.16	.10
Glacier-Point Corridor	-06	2.02	.19	.10
Yosemite Valley-Wawona	0	3.92	.37	.19
Wawona-South Entrance	-17	1.09	.10	.06
Mariposa Grove	+[a]	.70	.07	.04
Yosemite Valley-Crane Flat	-18	3.46	.32	.18
Big Oak Flat-Crane Flat	-31	1.27	.11	.06
Crane Flat-Tioga Pass	-01	7.75	.71	.40
Total Parkwide		26.22	2.42	1.35

[a]Increase from 0.

Alternative 2

Location	Estimated Percentage Change in Use Levels (from Proposal)	Expected Maximum Emissions (Tons per Day) Carbon Monoxide	Hydro-carbons	Nitrogen Oxides
Yosemite Valley	-100	.00	.00	.00
Yosemite Valley-Arch Rock	- 75	.43	.04	.03
Glacier Point Corridor	- 84	.34	.03	.01
Yosemite Valley-Wawona[a]	0	3.92	.37	.19
Wawona-South Entrance	- 22	1.03	.09	.06
Mariposa Grove	0	.00	.00	.00
Yosemite Valley-Crane Flat	- 75	1.06	.10	.06
Big Oak Flat-Crane Flat	- 50	.92	.08	.04
Crane Flat-Tioga Pass	- 50	3.91	.36	.21
Total Parkwide		11.61	1.07	.60

[a]Estimated 75% reduction between Chinquapin and Yosemite Valley.

Alternative 3

Location	Estimated Percentage Change in Use Levels (from Proposal)	Expected Maximum Emissions (Tons per Day) Carbon Monoxide	Hydro-carbon	Nitrogen Oxides
Yosemite Valley	+ 41	5.35	.49	.28
Yosemite Valley-Arch Rock	+ 22	2.10	.19	.12
Glacier Point Corridor	0	2.15	.20	.10
Yosemite Valley-Wawona	0	3.92	.37	.19
Wawona-South Entrance	- 22	1.03	.09	.06
Mariposa Grove	0	.00	.00	.00
Yosemite Valley-Crane Flat	- 8	3.89	.36	.21
Big Oak Flat-Crane Flat	- 34	1.21	.11	.06
Crane Flat-Tioga Pass	0	7.83	.71	.40
Total		27.48	2.52	1.42

scores for each plan. Divide these scores by the present value of costs for each plan. The result is an environmental effectiveness score of 0.17 per million dollars of cost for the proposed plan, 0.10 for Alternative 1, 0.88 for Alternative 2, and 0.01 for Alternative 3. Taking the ratios of the alternative plans to the proposed plan, we may conclude that Alternative 2 is 60 percent as cost effective as the proposed plan, and Alternative 3 is 6 percent as cost effective. Alternative 2 is 5.2 times more cost effective than the proposed plan with respect to environmental quality.

FROM DRAFT TO FINAL PLAN

Review of the Draft General Management Plan and Draft Environmental Impact Statement began in September, 1978. Over 63,000 copies of a summary were distributed to individuals and organizations on the Yosemite mailing list. Organized groups and government agencies also received the complete Draft General Management Plan and Draft Environmental Impact Statement. The agency invited written comments and conducted 10 public meetings at Yosemite Village, Fresno, Bishop, Sacramento, San Francisco, Oakland, Anaheim, Woodland Hills, San Diego, California, and Washington, D.C. The public review period ended January 15, 1979.

About two-thirds of those responding expressed approval of the proposed plan, although overall response rate was less than 10 percent. However, 557 of the 3,499 people who wrote 2,563 individual letters preferred one of the alternative plans, rather than the proposed plan. Other responses included: 242 statements at public meetings where 1,412 persons attended; 6 petitions with 552 signatures; 51 official letters or position papers from organized groups; and 26 official responses from government agencies. Comments from public agencies were generally supportive. Negative comments included opposition to removal of low-cost lodging facilities and other visitor support facilities such as swimming pools from Yosemite Valley.

Subsequently, the Draft General Management Plan and Draft Environmental Impact Statement were revised. On April 2, 1979, a briefing session was held for the Director of the National Park Service in Washington, D.C. There it was proposed that the long-term goal of eliminating private vehicles from Yosemite Valley be modified to provide that limitations on day use vehicles be tested prior to a final decision to require parking at a newly constructed Taft Toe parking area in the west end of the Valley. It was recommended that the net reduction in overnight

lodging in the Valley be changed from 940 to 756 persons, 184 fewer. Low-cost lodging would be reduced from 57 percent to 49 percent of total available lodging. The proposal to eliminate the bank from the Valley was modified to provide limited banking services. The proposed Indian Cultural Center would be located in the east end of the Valley near Yosemite Lodge rather than in the less congested western end of the Valley. The plan also was modified to provide employee recreational facilities in the Valley.

By August, 1979, the final plan provided that day users may continue to drive autos into the congested east end of the Valley so long as parking spaces are available. The 1978 summary of the draft plan had stated: "Only visitors with reservations for accommodations or campsites will drive beyond Taft Toe to parking areas at their overnight destinations." With this change, the schedule of removal of parking spaces becomes critical to reduction of congestion. The final plan would establish and enforce a carrying capacity of visitor use and autos in Yosemite Valley. In addition, it would implement a visitor information and control system from entrance stations.

The final plan provides for 50 additional low to medium cost overnight lodging facilities, 16 at Yosemite Lodge, and 34 at Curry Village. These would be cabin type housekeeping units. While this change is contrary to the goal of reducing overnight lodging facilities in the Valley, it provides more units with cooking facilities which contribute to an economical visit to the park. Other overnight lodging facilities at Yosemite Lodge scheduled to be replaced with 80 moderate cost units were changed from "moderate" to "low to moderate" cost units.

Changes from the draft to final plan also provide for preservation of additional historical structures. Previously scheduled for removal, these buildings now would be preserved for adaptive use: Pohono Studio, CCC Visitor Center,

Soda Springs enclosure, and McCauley cabin. In addition, the dental office would be retained in the Valley rather than relocated to El Portal. An emergency jail would remain in the Valley. The 200-acre Carl Inn area would be retained within the boundary of the park rather than deleted. The 790 Baseline Camp area would be designated as potential wilderness rather than as wilderness. Water system capacity would be increased by 50 percent. The electric system would be upgraded. Additional picnicking areas would be provided. The draft plan was corrected to include existing camping facilities for 25 people at Wawona and 150 people at Tuolumne Meadows. A small number of camping facilities were added and the proposed walk-in campground for 120 people at Hetch Hetchy was moved to Mather Station.

Table 14 shows several important measured changes from draft to final general management plan. The most significant was to adjust the estimated investment cost required to implement the plan. Total investment cost increased from $78 million in the draft plan to $162 million in the final plan, a rise of about $84 million or 106 percent. For the most part, this was a correction of estimates contained in the draft plan rather than additional cost of changes in the final plan. This is clearly the case for estimated concessioner investment costs which were reduced 20 percent to $25 million despite the addition of 50 overnight lodging units to the final plan. Estimated costs of archeological investigations and salvage also were reduced by 23 percent to $2 million. The final plan included $40 million for government facilities that remain and are rehabilitated, a category which had been subsumed in new construction in the draft plan. The largest change from draft to final plan was in the estimated costs of government facilities that are new or relocated. Estimated cost of new construction by the government increased from $31.5 million in 1978 to $78 million in 1979, a rise of $46.5 million or 148

Table 14. Measured Changes From Draft to Final General Management Plan, Yosemite National Park, 1978 to 1979.

Cost and Effect	Draft Plan	Final Plan	Change	Percent Change
Investment Costs (millions)				
Concessioner facilities that new or relocated a/	$31.1	$ 25.0	-$ 6.1	- 19.6%
Government facilities that are new or relocated	$31.5	$ 78.0	$46.5	147.6%
Government facilities that remain and are rehabilitated		$ 40.0	$86.5	274.6%
Ongoing acquisition of private properties inside the park	$13.5	$ 17.0	$ 3.5	25.9%
Archeological investigations and salvage	$ 2.6	$ 2.0	-$ 0.6	- 23.1%
Total investment costs	$78.7	$162.0	$83.4	105.8%
Capacity, Visitor Use (persons)				
Campgrounds, park total	10,788	10,988	200	1.9%
Lodging overnight				
Valley	3,944	4,178	184	4.6%
Park total	4,827	5,011	184	3.8%
Environmental Quality				
Developed land (acres)				
Valley	286			
Park total	883	888	5	0.6%

[a]Subject to contract negotiation of the specific costs to be assumed by the government and by private concessioner with an appropriate assignment of possessory interest.

percent. This was a correction of estimates contained in the draft plan which were developed by members of the Study Team, who had little or no experience or training in cost estimating. Most of the costs of the final plan were developed by an engineer with the Branch of Estimating, Denver Service Center. These are Class C cost estimates based on cost experience in other parks, as distinguished from Class B estimates which would be based on specifications, and Class A estimates based on working drawings.

Table 15 shows a summary of the worksheet costs of the proposed plan by function and location in the park. These are worksheet costs developed by an engineer with the Branch of Estimating, Denver Service Center, during a March, 1979 on-site visit. It should be noted that the $127.5 million total construction cost shown in Table 15 is $16 million less than the $143 million total cost of government and concessioner construction contained in the final plan (Table 14). Perhaps the difference in cost estimates reflects the difference between net and gross construction costs. The final plan states that the $143 million estimate is gross construction costs which includes the approximate costs of design, construction, supervision, and furnishings. The engineer providing the estimates considers the $127.5 million costs of rehabilitation of existing facilities and constructing facilities that are new or relocated as net construction costs only. The traditional practice in the agency has been to add 46 percent, including 15 percent project design and planning, 15 percent supervision of construction, and 16 percent contingency for overruns. Apparently, costs of $25 million for new or relocated concessioner facilities include 46 percent for design, supervision, and contingency.

Despite limitations, the cost data reveal several interesting relationships. For example, total combined concessioner and agency costs in Yosemite Valley were

Table 15. Worksheet Costs of General Management Plan, Yosemite National Park, National Park Service, Denver Service Center, March 1979.

Site	Costs in Thousands of Dollars										
	Construction of Employee Housing		Other Construction	Utilities							
	Permanent	Seasonal		Power	Sewer	Water	Roads	Trails	Removal	Other	Total
Yosemite Lodge Area		$ 234	$ 1,920	$ 4,000	$ 3,000	$ 3,000	$1,500	$ 500	$ 546	$ 153	$ 14,853
Village Area	$ 200	3,465							785	6,915	11,365
Curry Village	6,900	6,900	100						103	448	7,551
Ahwahnee Hotel									35	97	132
Campgrounds									12	164	176
Other Valley Areas			1,350	4,000	3,000	2,500		480	380	1,420	13,130
Cascade	10			2,000						4	2,014
Arch Rock	90									210	300
El Portal	24,330	1,375	8,626		2,000	4,000				2,500	42,831
Chinquapin	100		60	60		60*				30	310
Badger Pass			25			50				345	420
Bridalveil Campground/Summit Meadow			390	67*	67*	67*	2			72	664
Glacier Point	3	120	140	50	100*	100*		60	55	260	888
Wawona	2,000	3,375	2,303		4,000	3,000				804	15,482
South Entrance	2		505		400		250			0	1,157
Mariposa Grove			96	100*	300	100		40	50	32	718
Tuolumne Meadows	3,000		1,915	150		650			156	1,460	7,331
Tioga Road			217						3	2	222
White Wolf		440	360	1,000	50	100				37	1,987
Crane Flat	5		521	400	2,000	100				60	3,086
Hodgdon Meadow	190	420	730		400	100				75	1,915
Hetch Hetchy						100		10		13	123
Mather Station			81	33*	33*	33*				23	204
Aspen Valley									50	0	50
Foresta/Big Meadows						30	**		500	30	560
Total	$29,930	$16,329	$19,339	$11,860	$15,350	$13,990	$1,752	$1,090	$ 2,675	$15,154	$127,469

*General utility costs reported were divided amoung appropriate utility categories.
**Cost of rehabilitation of roads parkwide was reported as $7 million.

estimated as $9.2 million for the proposed plan compared to $47 million for the final plan, or five times the original estimate. This and other changes in cost estimates from the proposed to final plan are summarized below:

	Millions	
Location	Proposed	Final
Yosemite Valley	$ 9.2	$47.0
El Portal	$25.7	$42.8
Wawona	$ 9.9	$15.4
Tuolumne Meadows	$ 4.0	$ 7.2
Glacier Point	$ 0.3	$ 0.9

It is possible to assess the costs of the final plan for Yosemite Valley separately from other park costs. The appropriate sum of Valley and El Portal, contained in the cost worksheets summarized as Table 15, equals $90 million, of which employee housing accounts for $43 million and utilities $25.5 million (including power, sewer, and water). In addition, the cost worksheets omit $16 million of the $143 million total estimated construction and rehabilitation costs of the plan and an unknown part of this would be in Yosemite Valley and El Portal.

Other park construction would account for the difference between the $143 total construction cost of the plan and the $90 million for the Valley development and move of Valley facilities to El Portal. With the final plan, costs of construction in other areas of the park are estimated as at least $37 million. Of this amount, $15.5 million would be spent for expansion of the U.S. owned Wawona Hotel by 130 percent to accommodate 392 people, and related development of employee housing, water supply, and wastewater treatment facilities. The Tuolumne Meadows area development would cost $7.3 million with the largest part for employee housing. All other areas of the park would contribute a very small part of the total costs of the proposed plan.

WITH AND WITHOUT ANALYSIS OF FINAL PLAN

Table 16 compares costs and benefits with and without the Final General Management Plan [1979]. Investment costs were estimated as $162 million with the proposed plan. Annual costs of park operation and maintenance of $6.1 million in 1978 would rise to $7.3 million with the proposed plan, an increase of $1.2 million or 20 percent. This estimate is based on a 20 percent increase in park employment reported in the Draft Environmental Impact Statement [1978].

Present value of investment costs were estimated as $98 million based on equal annual expenditures of $10.8 million over a 15-year implementation period and a 7 percent discount rate, approximately the current U.S. resource planning rate (factor = 9.1). Present value of operation and maintenance costs were estimated as $104 million with the proposed plan compared to $87 million without, for added O & M costs of $17 million with the proposed plan. Calculation of the present value of O & M costs was based on perpetual annual expenditure of an equal amount and a 7 percent discount rate (O & M/.07). Thus, present value of total costs would increase by $115 million to $202 million with the proposed plan, which is 132.2 percent more than the $87 million present value of park costs without the plan.

Present value of costs with the proposed plan would equal $3.72 per visitor day, which is $2.15 or about 137 percent higher than costs of $1.57 per visitor day without. The present value of total costs with the proposed plan were divided by the annual visitor days of recreation use with the proposed plan divided by a 7 percent discount rate. The Draft Environmental Impact Statement [1978] estimated that with the proposed plan there would be 2.69 million recreation visits to the park annually, equal to 3.89 visitor days. This is nearly identical to visitation without the proposed plan reported as 2.75 million during the peak year of 1976.

Table 16. Comparison of Costs and Benefits With and Without the Final General Managment Plan, Yosemite National Park, 1979.

Costs and Effects	Without Final Plan (Existing Conditions)	With Final Plan	Incremental Change	Percent Change
Costs (millions)				
Investment Costs	0	$162.0	$162.0	
Operation & Maintenance Costs (per year)[a/]	$ 6.1	$ 7.3	$ 1.2	20.0%
Present Value of Costs[b/] (millions)				
Investment Costs	$ 0	$ 98.0	$ 98.0	
Operation & Maintenance Costs	$ 87.0	$104.0	$ 17.0	19.5%
Total Costs	$ 87.0	$202.0	$115.0	132.2%
Present Value of Costs per Visitor Day[c/]				
Investment Costs	$ 0	$ 1.8	$ 1.8	
Operation & Maintenance Costs	$ 1.57	$ 1.92	$ 0.35	22.3%
Total Costs	$ 1.57	$ 3.72	$ 2.15	136.9%
Present Value of Benefits[d/]				
Total (millions)	$278.0	$339.0	$ 55.0	22.0%
Per Visitor Day	$ 5.00	$ 6.10	$ 1.10	22.0%
Benefit Cost Ratio	3.2	1.7	0.5	
Number of Employees (peak season)				
Park Service	385	462	77	20.0%
Concessioner	1,585	1,882	297	18.7%
Total	1,970	2,344	374	19.0%
Recreation Use (millions per year)				
Visits	2.75	2.69	- 0.06	- 2.2%
Visitor Days	3.89	3.80	- 0.09	- 2.3%
Capacity, Visitor Use & Employee Housing (persons per day)				
Day Use Capacity				
Valley	17,300	10,500	-6,800	-39.3%
East End Valley	13,475	6,675	-6,800	-50.5%
Park Total	40,600	39,600	-1,000	- 2.5%
Adjusted Day Use Capacity[e/]				
Valley	11,788	10,500	-1,288	-10.9%
East End Valley	7,963	6,675	-1,288	-16.2%
Park Total	34,400	39,600	5,200	15.1%
Lodging Capacity				
Valley	4,934	4,178	- 756	-15.3%
Park Total	5,528	5,011	- 517	- 9.4%
Camping Capacity				
Valley	4,132	3,668	- 464	-11.2%
Park Total	10,067	10,988	921	9.1%
Visitor Overnight Capacity				
Valley	9,066	7,846	-1,220	-13.5%
Park Total	15,595	15,999	404	2.6%
Total Visitor Capacity				
Valley	26,366	18,346	-8,020	-30.4%
Park Total	56,195	55,599	- 714	- 1.3%
Adjusted Total Visitor Capacity[e/]				
Valley	20,854	18,346	-2,508	-12.0%
East End Valley	17,028	14,521	-2,507	-14.7%
Park Total	50,683	55,599	4,916	9.7%
Employee & Family Housing				
Valley	2,971	2,338	- 633	-21.3%
El Portal	458	1,772	1,314	286.9%
Park Total	3,898	4,842	944	24.2%
Total Capacity				
Valley	29,337	20,625	-8,712	-29.7%
Park Total	60,093	60,382	289	0.5%

Table 16. Comparison of Costs and Benefits With and Without the Final General Management Plan (continued)

Costs and Effects	Without Final Plan (Existing Conditions)	With Final Plan	Incremental Change	Percent Change
Adjusted Total Capacity[e]				
Valley	23,825	20,625	-3,200	-13.4%
East End Valley	20,000	17,549	-2,451	-12.3%
Park Total	54,581	60,382	5,801	10.6%
Distributional Equity				
Valley Lodging (Units)	1,528	1,300	- 228	-14.9%
Luxury ($36-$46/night)	121	121	0	0
High ($29-$35/night)	274	274	0	0
Moderate ($18-$28/night)	218	268	50	22.9%
Low ($7-$17/night)	915	637	- 278	-30.4%
Environmental Quality				
Developed Land (acres)				
Valley	340	286	- 54	-15.8%
Park	1,029	888	- 141	-13.7%
El Portal	121	264	143	118.2%
Scenic Quality Damage to Valley (acres)				
A-Scenic	101.2	55.1	- 46.1	-45.5%
B-Scenic	206.2	187.8	- 18.3	- 8.9%
C-Scenic	9.6	11.4	1.8	18.7%
Water Supply & Wastewater Treatment (mil gpd)				
Valley	1.15	1.01	- 0.14	-12.1%
Park	2.36	2.08	- 0.28	-11.8%
Air Quality (tons/day)				
Valley				
Carbon Monoxide	5.35[f]	3.80	- 1.55	-28.9%
Hydrocarbons	.49	.35	- 0.14	-28.6%
Nitrogen Oxides	.27	.19	- 0.08	-29.6%
Park				
Carbon Monoxide	25.46	26.79	1.33	5.2%
Hydrocarbons	2.32	2.46	0.14	6.0%
Nitrogen Oxides	1.32	1.36	0.04	3.0%

a. Yosemite National Park operation and maintenance costs were reported as $6.1 million in 1978, without the proposed plan. The O & M costs of the final plan were estimated based on a 20 percent increase in the number of O & M employees reported in the Draft Environmental Impact Statement [1978].

b. Present value of investment cost assumed equal annual expenditures over a 15-year implementation period with a 7 percent discount rate, approximately the current U.S. resource planning rate (factor = 9.1). Present value of O & M costs assumed perpetual annual expenditure of an equal amount and a 7 percent discount rate (O & M/.07).

c. Present value of cost divided by the result of annual visitor days of recreation use divided by a 7 percent discount rate (annual visitor days/.07).

d. Benefit per visitor day multiplied by the result of annual visitor days of recreation use divided by a 7 percent discount rate (annual visitor days/.07). This assumes reduced congestion is a perpetual benefit of the final plan. With 90,000 fewer visitor days per year with benefits of $5 per day, the present value of benefits with the final plan is reduced from $61 million to $55 million.

e. Adjustment based on effective daily capacity of 20,000 people at one time in the east end of Yosemite Valley on a peak day in 1976, including an estimated 7,963 day users, 4,934 overnight lodgers, 4,132 campers, and 2,971 employees and their families living in the Valley.

f. Peak day, 1978.

The proposed plan would serve an estimated 60,000 or 2.2 percent fewer visitors per year.

The value of benefits with the proposed plan would rise to approximately $6.10 per visitor day, which is about 22 percent higher than benefits of $5.00 per visitor day without. The current average price or direct cost to recreation users is estimated as slightly more than $14.50 per visitor day, as shown in Figure 2. Without the proposed plan, average net benefits defined as consumer surplus above price or direct cost are about $5 per visitor day. This study suggests that these net benefits would increase by an average of $0.073 per visitor day for each one percentage point reduction in crowding from current levels. (See Appendix for methodology). The proposed plan would reduce overcrowding in the park by 10 to 20 percent. Taking the midpoint, a 15 percent reduction in crowding would be expected to result in a $1.10 increase in net benefits per visitor day (= $0.073 x 15).

Present value of benefits with the proposed plan was calculated as $339 million compared to $278 million without, thus added benefits equal $55 million. Benefits with the proposed plan are expected to be perpetual, with a uniform average of 3.8 million visitor days per year and a 7 percent discount rate (= 3.8 mil./.07 x $6.10).

The recreation use of Yosemite National Park has an estimated benefit cost ratio of 3.2 to 1.0 without the proposed plan. This means that for every $1 of park operation and maintenance costs, recreation users receive benefits of $3.20. Past investments in the park are considered sunk costs and are omitted in B/C analysis. With the proposed plan, the benefit cost ratio for recreation use of the park declines to 1.7 which remains a favorable B/C ratio. However, the benefit cost ratio of the <u>added</u> cost and benefit with the proposed plan falls to 0.5 from 1.0. This means that for every $1 of investment and operating costs directly

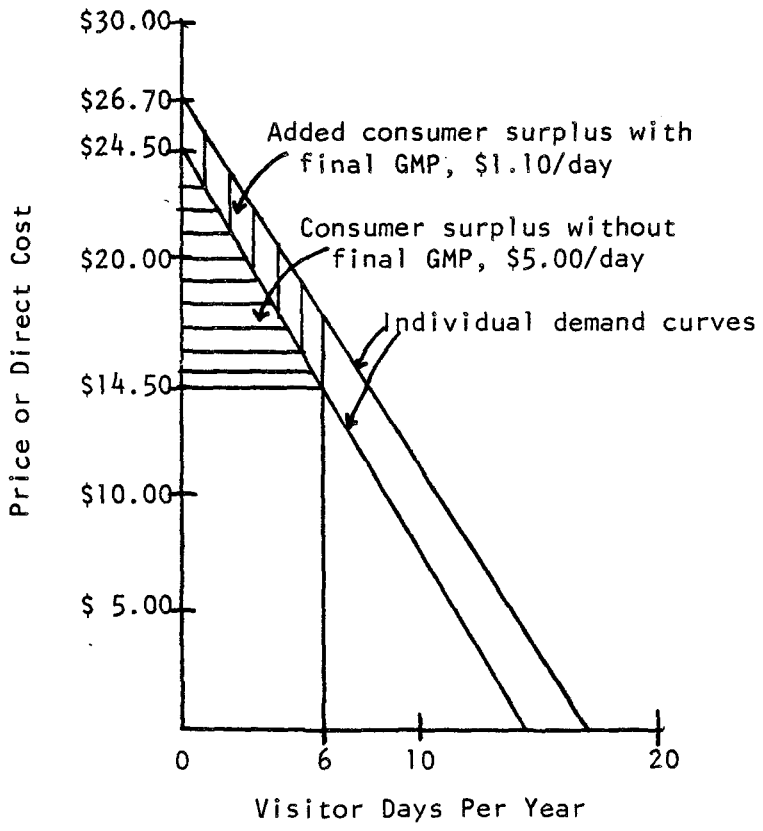


Figure 2. Shift in Demand for Recreation Use of Yosemite National Park, 1979.

attributed to the final plan, benefits to recreation users of the park would be $0.50 or half of costs.

Table 16 also shows a comparison of several measures of effectivenss with and without the proposed general management plan. The major goal of the plan is to improve the quality of visitor experience primarily by reducing overcrowding. In Yosemite Valley, a medium-sized town of 20,000 people on a peak weekend, congestion would be reduced by moving park and concessioner administration facilities to El Portal, removing nonessential services, restricting the use of private autos, and reducing the number of overnight lodging and camping facilities. With the final plan, potential congestion in the Valley on a peak day would decline by 12.3 percent to 17,549 people (Table 16). This includes reducing the number of people accommodated in overnight lodging facilities by 15.3 percent to 4,178 people. All of the reduction would be in low-cost lodging units because of their deteriorated physical condition and location on a flood plain or rock fall zone. The capacity of campsites in the Valley would be reduced by 11.2 percent to 3,668 people. The number of employees and their families housed in the Valley would be reduced by 21 percent to 2,338 people. The number of day use visitors in the congested east end of the Valley would be restricted below peak use of 1976 by about 16 percent to 6,675 people.

Nonessential commercial services would be removed from the Valley including beauty and barber service, major auto repair, car rental, and sportswear sales. The grade school would be moved to El Portal and the hospital converted to emergency service only. Essential services remaining in the Valley would be: two staple grocery stores, one gas station, one recreation equipment shop, restaurants, gift shops, dental service, minimum service banking, post office, and jail. Commercial recreation services with no relation to the unique natural resources of

the Valley would be removed including swimming pools, tennis courts, a golf course, and an ice-skating rink.

Improved environmental quality would result from the 12.3 percent reduction in the number of people visiting the Valley. The consumptive use of land for development would be reduced by 16 percent to about 286 acres. Most of the reduction in land use would occur on A-Scenic land, the most significant areas. Development of A-Scenic land would be reduced by about 46 percent to a total of about 55 acres. B-Scenic land development, the less significant and less frequently chosen viewing areas, would be reduced by about 9 percent to a total of about 188 acres. Very little land development in the Valley would be located in areas classified as C-Scenic of minor significance as they are seldom used for viewing and can accept development without detracting from either primary or secondary vistas. Land development of C-Scenic areas would increase by 1.8 acres to a total of 11.4 acres.

Air quality would be improved as reduced number of vehicles and increased use of public transit would result in a nearly 29 percent reduction in vehicle traffic and exhaust emissions of carbon monoxide, hydrocarbons, and nitrogen oxides. Instream flow and water quality would be improved as necessary water supply and wastewater treatment would be reduced by 12.2 percent to about 1.01 million gpd.

Future visitor use of the park would be dispersed by constructing new facilities outside of the Valley. Parking facilities for day use outside of the Valley would be expanded by 25 percent to 29,100 spaces. Capacity of overnight lodging facilities outside of the Valley would be expanded by 40 percent to 833 people. Capacity of campgrounds outside the Valley would be expanded by 23 percent to 7,320 people. The number of employees and their families living outside the Valley

would be increased by 1.7 times to 2,504 people.

Overall, potential visitor use of the park as a whole could be 10 percent greater with the final plan than without. The capacity of overnight visitor facilities in the park including both camping and lodging would increase by 2.6 percent to nearly 16,000 people at one time. This includes the capacity of concession operated overnight lodging facilities which would be reduced by 9.4 percent to 5,011. Capacity of campgrounds would be increased by 9 percent to 10,988 people. The National Park Service EIS reported that parking capacity for day users would be reduced by 2.5 percent to 39,600 people, however, adjusted effective capacity would increase by 15 percent because all of the reduction in parking spaces would occur in Yosemite Valley where they have never been used to capacity, while parking outside the Valley would be substantially increased.

PHASING OF THE CONSTRUCTION PROGRAM

The Superintendent of Yosemite submitted a report on implementation of the General Management Plan to the Director of the National Park Service in September, 1979. He proposed to phase the program over 11 years from 1980 to 1990 in order to complete all major GMP projects in time for the centennial celebration of the founding of Yosemite National Park in 1990. The total cost of the construction program was estimated as $120 million. This includes both construction of new facilities and rehabilitation of facilities which remain in place, and is identical to costs estimated in the final plan for these purposes. Excluded from the phasing plan were the estimated costs to the concessioner of $25 million, acquisition of private inholding lands of $17 million, and archeological investigations of $2 million.

The following tabulation shows the proposed phasing of the construction program. Construction costs would be $5 million in 1980 and 1981, rise to $20 million in 1982 and 1983, and level off at $10 million per year from 1984 through 1990.

Construction Program, Yosemite National Park, 1980 - 1990.
(millions)

1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	Total
$5	$5	$20	$20	$10	$10	$10	$10	$10	$10	$10	$120

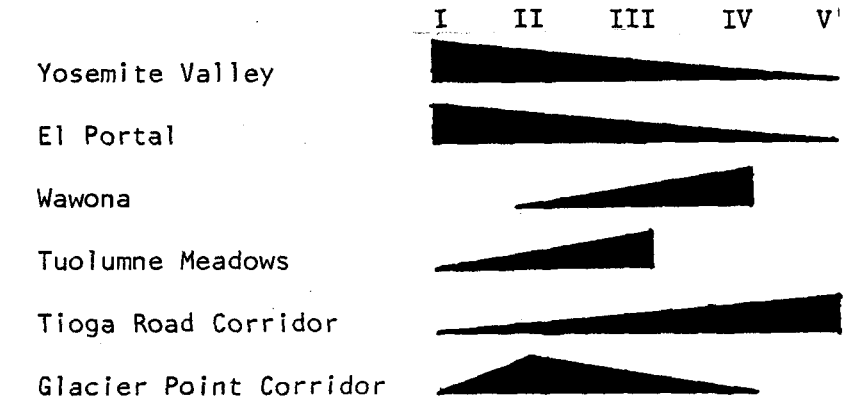
By comparison, the annual construction budget for the 40 parks in the Western Region has averaged about $18 million per year, and the annual construction budget for all parks in the U.S. has averaged $80 million. Even with the size of Yosemite's annual visitation and operation budget, a reasonable allocation of the NPS construction budget may be substantially less than the construction program of $10 to $20 million per year proposed for 1982 to 1990. In 1982 and 1983, the proposed $20

million annual construction program for Yosemite would account for 25 percent of the U.S. parks construction budget (both in 1979 dollars).

An important question with respect to budgets and programs is whether alternative staging of the plan could lead to lower present value of costs? The present value of the construction program outlined above was calculated as $81.7 million with a 7 percent discount rate. This was nearly identical to equal annual expenditure of the $120 million construction budget over the 11 year period from 1980 to 1990, which had a present value of $81.8 million. What if the largest annual expenditures of $20 million budgeted for 1982 and 1983 were delayed until the last two years of the program, 1989 and 1990, and the $10 million budgeted for the latter two years were budgeted for the earlier years? The present value of this alternative construction program would be $75.7 million or $6 million less than the final plan.

The following chart illustrates the five general phases of the construction program. Phase I and II would primarily reduce crowding in Yosemite Valley, and move nonessential services to El Portal. Reconstruction of Glacier Point Road would be funded primarily in Phase II. The Tuolumne Meadows program to reduce congestion would be funded primarily in Phase III, and the Wawona Hotel and campground expansion in Phase IV. The Tioga Road campground and trail access development would be funded primarily in Phase V, the last years of the plan.

Phasing Schedule, Yosemite National Park, 1980 - 1990.



In order of priority, the 1980 to 1990 construction schedule would include: (1) Wawona sewage treatment plant; (2) Glacier Point rehabilitation; (3) El Portal office building, commercial complex, maintenance facility; (4) Wawona water system and fire suppression system; (5) Yosemite Valley water supply system; (6) Rebuild hydroelectric power plant, aqueduct, and penstock; (7) Yosemite Valley comfort stations, picnic areas, and parking areas for staging; (8) Cascade bridges and picnic areas; and (9) Wawona campground.

An Immediate Construction Program of high priority projects requiring little or no detailed advance planning would be funded with $5.5 million reprogrammed construction funds in 1980. These funds were programmed for emergency improvements in the El Portal wastewater treatment plant. The problem was solved with less investment than programmed. Whether these funds will be available for reprogramming within Yosemite park or reprogrammed for worthy investment projects in other parks is unknown at this time. Actions which are contemplated include: advanced planning, removal of asphalt from the Village Mall and abandoned park roads, use the asphalt to build bike trails in Yosemite Valley, rebuild Glacier Point Road, provide trail-head parking lots, improve shuttle bus stops, build storage buildings at El Portal, improve water and sewer systems, and build residential housing and trailer sites at El Portal.

An Immediate Operational Program would be funded from 1980 park operating and maintenance funds at a level in excess of $200,000. Included are a large number of small inexpensive actions which would have immediate effects on the quality of visitor experiences. Included are: removal of some residences, removal of tennis courts and a golf course, removal of portions of paving at the Village Mall, remove a gas station, remove some parking, remove exotic plants from meadows and restore historic vistas, removal of campsites, nonaesthetic

curbing, signs, benches, etc., and build interim El Portal offices. In addition, detailed planning would get underway to carry out the GMP. For example, a plan for land acquisition, a market study of public transit access, the availability of private development sites outside park boundaries, a housing report, a subdivision plan for El Portal, a plan for school relocation, and a plan for the Indian Culture Center.

RECOMMENDATIONS

The purpose of this final section of the report is to (1) evaluate the Yosemite planning process based on planning guidelines of the National Park Service and the U.S. Department of the Interior, and (2) recommend guidelines for implementation of NPS Special Directive 78-6 with regard to cost effectiveness, and the identification and assessment of alternatives with respect to costs and benefits. The objective is to strengthen the relationship between the general management planning process and the budgetary process.

These are important questions, particularly so for the Yosemite planning process, because the plan is likely to become a model for planning elsewhere in the park system. It is to a large degree true that Yosemite serves as a catalyst to the rest of the system. Unfortunately, the Yosemite planning effort began in December, 1974, before the present planning guidelines were issued and was exempt from compliance with them. For example, planning starts beginning before January, 1977, were specifically exempted from compliance with Special Directive 76-17. The Yosemite planning effort was also exempt from compliance with the more recent Special Directive 78-6 and the revised NPS-2. Therefore, the following remarks should not be interpreted as criticism of the Yosemite planning process itself, which may conform with the planning guidelines in force at the time the planning effort began in December, 1974. Rather, the Yosemite plan is evaluated to illustrate how the future planning process elsewhere in the system could include compliance with the current guidelines of the National Park Service.

The most significant change required by recent guidelines is to introduce cost effectiveness analysis into the planning process. The final plan for Yosemite was chosen without considering whether it was cost effective or the least cost way to achieve management objectives. When an ideal plan cannot be implemented within

the budget, it is a case of over-planning which wastes limited planning resources and misleads the public which considers park plans as blueprints of action. The planning process should consider a series of alternative less elaborate and less costly ways of achieving management objectives.

Special Directive 78-6 [1978] requires that all planning proposals be cost effective and reflect servicewide budget goals and constraints. "Budgetary constraints and the mood of the country make it imperative that we prepare cost effective plans," the Director said. Planning should "be carefully and accurately tied to programming. . .budgetary matters." The ". . .cost of development in relation to visitation is (an) important consideration in planning that has been overlooked in some plans."

Special Directive 76-17 [1976] established procedures for evaluating the cost effectiveness of each major program, service, and development considered in the general management planning process. It requires that accurate estimates be prepared for investment costs, operating costs, and nonmonetary costs such as environmental damage.

The Planning Process Guideline [NPS-2, 1978] of the agency require that an economic benefit cost analysis will be prepared in the development and evaluation of alternative strategies or plans (Chapter 6, Exhibit 1). Unfortunately, no guidelines are provided for implementation of this requirement. A proposal to remedy the lack of guidelines for benefit cost analysis is presented in this section of the report.

The question of whether these National Park Service guidelines constitute an appropriate set of procedures and organization arrangements for recreation resources planning and management goes well beyond the scope of this study. But what this study does suggest is that the National Park Service consider establishing

a different set of capabilities than it now has so that certain kinds of economic information required by its planning guidelines receive professional consideration. This could result in substantial changes in procedures and concepts used by the Park Service in its general management planning in the past. It could lead to the addition of resources or reallocation of existing resources committed to the planning process. The high level of professional discipline now committed to architectural design, environmental design, mapping, and preservation of historic and natural resources also could be allocated to recreation economics.

Develop Accurate Cost Estimates and Use to Evaluate Alternatives

The Yosemite planning process was deficient in that estimates of costs were inaccurate and were not a factor in evaluating alternatives. The study team developed a very rough estimate of the costs of the proposed and alternative plans. Costs of the proposal reported in the final plan were 2.1 times costs of the proposal reported in the draft plan. Study team members observed that the inaccurate cost estimates were unimportant to the Yosemite planning process, as they were not a factor in evaluating alternatives or in choosing the final plan. The National Park Service, Planning Process Guideline [NPS-2, 1978] seems to sanction this practice by stating that: "In developing planning alternatives, rough estimates of the cost of implementation should be provided, except in cases where cost is not a factor in evaluating the alternatives." This guideline should be clarified as applicable only to alternatives which have no costs such as a costless change in park regulations. Moreover, the word "accurate" should replace the word "rough" when referring to cost estimates. This interpretation is clearly implied in the paragraph following the one above which requires cost effectiveness evaluation of alternatives. Meaningful comparison of the costs and effects of alternatives would be impossible without accurate cost estimates. The planning guide states:

"In addition, the cost effectiveness of alternatives in meeting park management objectives will be included as an important decision making factor, although it is recognized that considerable work may need to be done to develop useful methods for measuring this factor." (emphasis added)

Indications are that an unforeseen large public involvement expenditure in the case of Yosemite planning resulted in the curtailment of other important aspects of the planning process. A public involvement program is an essential part of the general management planning process of the agency, and is a substantial improvement over planning prior to the National Environmental Policy Act of 1969, which provided the impetus [Winge, 1978]. However, a public preference study or a show of hands should not be the primary basis for either choosing or evaluating alternatives. The costs of a public involvement program should be limited to a reasonable level as specified in a planning budget. It should not be allowed to substitute for other important phases of the planning process such as comparison of costs and effectiveness of alternatives. In the case of the Yosemite planning process, there was too great a reliance on the public involvement program and too little comparative analysis of alternatives.

Work was curtailed in at least three important areas: economic carrying capacity, economic benefits to visitors, and employee housing alternatives. First, a multi-disciplinary Carrying Capacity Study team was appointed and formulated a plan of work which was cut short when resources were transferred to the public involvement program. One member was Dr. John Krutilla, Resources for the Future, who is noted for the economic analysis of optimum carrying capacity of recreation resources. Second, a study of the economic benefits of visitors was planned and questions were included in the 1975 Visitor Use Survey. Analysis of the results was terminated and resources transferred to the public involvement program. The

economic study would have provided information similar to that presented in Table 2 and the Appendix of this report. Third, a study of employee housing preferences was planned, a questionnaire was prepared, but the survey was not taken. It would have provided information on the relative desirability of moving residents of Yosemite Valley to Wawona and El Portal.

An important aspect of cost effectiveness analysis which received too little attention in the Yosemite planning process is the question of the scale or size of each major program, service, and development [Special Directive 76-17, 1976]. In the past, many decisions were made on the basis of the belief that bigger is better. However, we are finding that many recreation facilities were overbuilt in the past and are too large in size to be cost effective today. We are finding, in short that small is beautiful, at least that it is often more cost effective. Several examples could be given. The Yosemite Superintendent is exploring the idea that small buses may be superior to the current large ones as they result in less congestion. The optimum size of a campground is less than 100 campsites rather than from 200 to 400 campsites as was once thought. The optimum size of an overnight lodging complex is much smaller than the Yosemite Lodge with 1,481 persons accommodated at one time or Curry Village with 3,120 persons [Walsh, 1972]. Excess size leads to inefficient operations, higher costs, and overcrowding. The fragile ecosystems of mountain valleys cannot support towns the size of Yosemite Valley's 20,000 people. The optimum size of a wastewater treatment plant is much smaller in mountain areas than elsewhere in the U.S. [Walsh, Soper and Prato, 1978]. Indications are that the capacity of the El Portal wastewater treatment plant may exceed foreseeable needs. Application of cost effectiveness analysis to the question of scale would not lead to a reduction in visitor services but they would be provided in smaller size units reducing costs of operation and congestion.

Provision should be made for continuity of planning during implementation if efficient alternatives are to receive serious consideration as new technology becomes available. Planners were constrained to take a very conservative view of available technology. For example, the study team concluded that the only transportation alternative to the private automobile was the gasoline or propane powered bus. This was based on outdated pre-energy crisis data from a contract study [VTN, 1973]. However, in Switzerland, the Transit Authority has provided the only access to the Matterhorn recreation and ski area with a virtually silent and pollution-free electric train. Yosemite National Park generates low-cost hydroelectric power now, and plant capacity will be doubled. Electric powered mass transit may provide the most cost-effective access to Yosemite Valley.

Include Present Value Analysis of Investment and Operating Costs

The current practice in National Park Service planning to list the total investment costs of proposed and alternative plans, even if accurate, is not a sufficient treatment of costs because it leads to false conclusions. Costs of operation and maintenance also should be estimated and displayed for the proposed and alternative plans. Both investment and O & M costs should be discounted to present value, and total present value of proposed and alternative plans also should be displayed.

Public review of the draft EIS for Yosemite was based on inaccurate total investment costs which is a serious deficiency in itself. But an even more serious shortcoming was the false conclusion in the draft EIS that the investment cost of the proposed plan at $78 million was in-between the range of costs for the most expensive and least expensive alternatives while present value analysis of investment and operating costs shows that at $64 million it was the most expensive by far. Moreover, the public review of the draft EIS was based on the showing that

Alternative 2, environmental preservation, was the most expensive plan with investment costs of $116 million, while present value analysis shows it would have the least expensive investment and operating costs estimated as $10 million.

Moreover, the disbenefits of the proposed and alternative plans were not presented for public review. Alternative 2 was the only plan expected to substantially reduce total park visitation. Average annual recreation use of the park was predicted to decline by 19 percent to 3.14 million visitor days. If current benefits are $5 per visitor day, Alternative 2 would reduce recreation benefits from $19.5 million annually to $15.7 million or by $3.8 million. Dividing $3.8 million by the 7 percent discount rate results in an estimated loss of $54.3 million present value of benefits. Thus, the present value of benefits to the 3.14 million visitor days which would occur annually with Alternative 2 would have to exceed $64 million rather than the $10 million present value costs to the National Park Service. Disbenefits were subtracted from benefit estimates in Tables 2 and 16.

It is not clear that all of the items included in construction costs would be required to achieve each of the alternative plans. For example, a considerable amount of Park Service and concessioner seasonal housing is dilapidated and would need to be replaced in the next 15 years with any GMP. The Yosemite planning documents should have shown the investment costs required without the final plan, to continue the current management program. The difference in investment costs with and without the final plan would be the correct cost to attribute to the final plan. It would be the incremental cost.

The consultant's report on the effects of the proposal and alternative plans with respect to the profitability of the large concessioner should have shown the effects of investment cost required in the next 15 years to continue the

current level of services, a without analysis. In addition, the consultant's report on the effects of the proposal and alternative plans with respect to regional economic impact on the surrounding counties should have shown effects of visitor expenditures and investment costs required in the next 15 years to continue the current level of services, a without analysis. Moreover, the report should have shown the extent to which otherwise unemployed resources in the surrounding counties would have been utilized by the proposed and alternative plans. They would have been counted as National Economic Development benefits.

Introduce Cost Effectiveness
Early in the Planning Process

Many of the shortcomings of the Yosemite planning process result from the sequence in which planners proceeded. There should be some preplanning before the public involvement program. This preplanning would be an initial reconnaissance of the range of alternatives for solving the recreation-related problems of a park. Surely in almost any park today there are enough old plans and studies available to make possible an initial approximation of the recreation resource problems of the park. Nothing in this reconnaissance should be taken for granted, neither institutional or legal barriers, not technology, nor the demand for recreation resource services. In other words, it should be of the broadest scope imaginable.

Enough information could come from this reconnaissance on the nature of the problem, the range of solutions, the costs and effects of alternatives to make possible more direction in the initial discussions with citizens, interest groups, and political bodies. The quality of the information feedback from public hearings in particular, would seem to be greatly increased by presenting citizens with both costs and effects. Cursory examination of the Yosemite hearing summaries reveals substantial room for improving this two-way flow of information. Pre-planning

assessment of the problem, alternative solutions, and appraisal of their costs and effectiveness would be a vast improvement over the Yosemite Workbook which presented over 700 alternative choices or options without any information on their costs or effects.

If cost effectiveness had been applied to the development of alternatives stage, the Yosemite planning process might have considered a more realistic range of alternatives. Cost effectiveness may have led the study team to consider an additional alternative, in-between the proposed plan and Alternative 2, environmental preservation. This would have allowed decision makers to consider the costs and effects of a more accelerated program of reduced crowding and resource protection over the next 15 years than the final plan provides, yet not as extreme a departure from current operations as provided in Alternative 2. The final plan would reduce crowding in Yosemite Valley by 10 to 20 percent compared to nearly 50 percent with Alternative 2.

The Draft Environmental Impact Statement [1978] reported that all of the alternatives were developed directly from 20,000 respondent preferences among over 700 alternative actions contained in the Workbook. This preference survey was overly elaborate and the results were not based on a representative sample of either the park user public or the general public. Even more important, the results did not provide a realistic range of alternative plans. Cluster analysis of the most popular actions provided Alternative 1, which was close to the proposed plan. Cluster analysis also provided Alternative 2, an extreme environmental preservation plan. Usually, Alternative 3, commercial development, would contain more actions which contribute to National Economic Development rather than being based primarily on preferred commercial development of a single large company as expressed in its response to the Workbook. This is analogous to a Regional Economic

Development objective and is an inappropriate basis for choice of alternative plans. An appropriate NED plan would contain more actions which enhance visitor benefits. In addition, Alternative 3 was overly close to the present situation of no action.

Usually, several tests should be applied to the actions contained in each possible alternative before an alternative is selected for study, including the following: (1) can it be done; is it technically feasible? (2) is the proposal lawful; is it legally feasible? (3) could the proposal be sustained; is it politically feasible? Once these questions are answered in the affirmative, the assessment of possible alternatives can begin. For the most part, the alternatives selected for study appear to meet these tests of workability. However, both the environmental preservation and the commercial development alternatives appear to contain one or more elements which may not meet these tests. With respect to the environmental preservation alternative, it seems a remote possibility that draining Hetch Hetchy would prove politically feasible. Built in 1935, it provides a substantial part of the water supply for San Francisco, and surrounding communities also own water rights there. The technical feasibility of draining the reservoir and restoring the valley to its natural condition within the next century may be remote. In addition, the commercial development alternative may not prove politically feasible because of the history of controversy and distrust during the 1973-1975 period.

There appear to be limitations imposed on the alternatives considered based on the institutional constraints of the National Park Service, and traditional practice within the agency. For example, the possibility that individual park employees could buy or rent housing from the private sector of the economy is

not considered. The related possibility that a local unit of government in El Portal could finance community services such as sewer, water, electricity, and roads is not considered. Moreover, commercial services such as grocery stores, restaurants, and shops could be provided by competitive bid or private initiative at the village of El Portal. Perhaps the requirement that provisions be made for employees to live where they work could be relaxed in some instances with favorable effects on the natural environment and the quality of visitor experience in the park. These alternatives would have distributional effects on employees which should be studied, along with the question of relative social costs.

Display Distributional Effects, Who Will Pay and Who Will Be Subsidized

The Yosemite planning process was deficient in that it did not treat the question of who will pay the costs of the proposed and alternative plans, and where implicit subsidies are involved, who will be subsidized. When costs are reimburseable in part at least, an inadequate treatment of who pays and who is subsidized leads the public and Congress to the false conclusion that all costs are borne by the U.S. Treasury.

In addition, there are a substantial number of investment decisions by the National Park Service where a rather straightforward application of economic analysis is appropriate and is recommended to bring the agency into compliance with its planning guidelines. Costs of developed campgrounds should be compared to the revenues collected as camping fees; costs of employee housing compared to rental revenues; costs of utilities such as water, sewer, power, telephone, and garbage collection apportioned and compared to rates based on cost recovery or comparable market rates; costs of the Wawona Hotel compared to concessioner rental fees generated over the useful life of the reconstructed and expanded facility;

and the costs of the commercial facilities such as in El Portal compared to concessioner rental fees.

Modify the Final Plan to Achieve Net Benefits

For the final plan to become cost effective, with costs of $2.15 per visitor day, the plan would need to be modified to reduce average crowding by more than twice as much as indicated, or by approximately 30 percent in order to increase benefits from recreation use by about $2.20 per visitor day. At this level of effectiveness, the $115 million present value of added costs would about equal the present value of added benefits to park visitors. Thus, for every $1 of investment and operating costs directly attributed to the final plan, benefits to recreation users of the park would be $1.02 which is a breakeven position. It is unfortunate that the planning process did not consider the costs and effects of reduced overnight lodging capacity in Yosemite Valley between the range of 15 percent in the final plan and the 75 percent of Alternative 2. With improved management practices during the next 15 years, a 30 percent reduction in crowding could be achieved within cost constraints of the agency by dispersing opportunities for recreation activities throughout the park, while total annual recreation use could remain the same or even increase. As concessioner facilities in Yosemite Valley depreciate out during the next 15 years, they would be closed and reconstructed elsewhere in the park out of the accumulated depreciation account, as suggested by Dr. John Krutilla, Resources of the Future.

Another way to adjust the final plan to bring about cost effectiveness with benefits of $1.10 per visitor day from reduction in crowding of about 15 percent would be to reduce its costs by one-half to a present value of $1.08 per visitor day. At this level of effectiveness, the $58 million present value of added

costs would about equal the present value of added benefits to park visitors. For example, some park employees could buy housing from the private sector of the economy and realize substantial capital gains. A local unit of government could finance community services such as water, sewer, electricity, garbage removal, and roads in the village of El Portal and Section 35. Commercial services such as grocery stores, restaurants, and shops could be provided by competitive bid or private initiative. Electric buses and small electric shuttles could be fueled by cheap hydroelectric power currently generated by the park. These are but a few examples of the cost reducing alternatives which were being considered by the park Superintendent, the Regional Director, and the Director of the National Park Service. An important question with respect to each alternative is whether it would reduce real costs or merely transfer costs.

Another important consideration is the dual nature of National Park Service management objectives: (1) recreation use, and (2) preservation of unique natural and historic resources. It may be possible to separate costs between the two functions, or to assume that a certain proportion of costs are reasonably attributed to each. If it could be determined that for Yosemite, the agency may reasonably allocate as much as one-half of the costs of the final plan to the preservation of resources, then the plan could be considered cost effective, with present value of cost attributed to recreation use about equal to present value of benefits from a 15 percent reduction in crowding. Moreover, additional recreation benefits [Freeman, 1979] would result from resource preservation: improved in-stream flow [Daubert and Young, 1979], improved water quality [Walsh, Greenley, Young, Prato and McKean, 1978; Walsh, Ericson, McKean and Young, 1978], improved air quality [Randall, Ives and Eastman, 1974; Brookshire, Ives and Schultze, 1976], improved forest quality [Michaelson, 1975; Lueschner and Young, 1978], and from improved scenic quality [Driver and Brown, 1975 and 1978; Daniel, 1976].

For example, a one percentage point improvement in water quality in Rocky Mountain National Park resulted in a $0.0166 increase in benefits per visitor day [Walsh, Ericson, McKean and Young, 1978]. Thus, a 10 percentage point increase in water quality in Yosemite, a similar national park, is expected to increase benefits by $0.166 per visitor day, or by $645,740 per year with a present value of $9.2 million. An air quality study at Glen Canyon National Recreation Area reported that a one percentage point improvement in air quality resulted in a $0.011 increase in benefits per visitor day [Brookshire, Ives and Schultze, 1976]. Thus, a 30 percentage point increase in air quality in Yosemite Valley with 80 percent of park visitors is expected to increase benefits by $0.26 per visitor day, or by $1.0 million per year with a present value of $14.3 million. These are preliminary estimates, which may change as further research becomes available. With the improvements in water and air quality, the present value of benefits would increase from $55 million to $78.5 million, and the benefit cost ratio for the final plan would increase from 0.5 to 0.7.

Apply WRC Guidelines to Benefit Cost Analysis

The National Park Service Planning Process Guide [NPS-2, 1978] requires that an economic benefit cost analysis will be prepared in the development and evaluation of alternative strategies or plans (Chapter 6, Exhibit 1). But no guidelines are provided in NPS-2. An excellent guideline is available and it has been approved by the U.S. Department of the Interior. It is the U.S. Water Resources Council principles of benefit costs analysis for water and related-land use planning [1973 and 1979]. Moreover, the National Park Service has adopted the WRC guidelines for Wild and Scenic River studies and other studies of new areas or proposed parks which involve substantial bodies of water.

The most important recommendation of this report for improvement in National Park Service planning would be to adopt the benefit cost framework currently recommended in the WRC planning guidelines [1979] for the entire parks planning process. This would introduce information on the present value of the costs of operation and maintenance with alternative plans as well as on investment costs, which would allow a more accurate evaluation of changes in costs. In addition, it would introduce information on the present value of projected visitor use and benefits, which would facilitate more accurate comparison of the benefits and costs of alternative plans.

This would be a timely occasion for the Director to re-evaluate the proper role of the WRC guidelines in the National Park Service planning process. The recreation section of the WRC guidelines has been substantially expanded and improved in the 1979 revision. For example, the economic estimate of visitor benefits recommended by the WRC has been improved so that now recreation visitor valuation surveys can be readily applied in the national parks as well as to general public valuation of preservation of the quality of the unique historic and natural resources administered by the agency [WRC, 1979]. Previously [WRC, 1973] the travel cost approach to estimate visitor benefits was not well suited to the national parks because of the multi-purpose nature of trips which prevented accurate measurement by this approach.

Environmental Impact Statements prepared by the National Park Service currently include the three other types of information proposed in the WRC planning guidelines: environmental impacts, regional economic impacts, and social cultural effects. Adding the fourth type of information, a benefit cost analysis, would be a logical progressive step to improve the National Park Service planning process.

Review the Level of Resources Committed to Economic Analysis

This would be a timely occasion for the Director of the National Park Service to review whether the current level of resources committed to economic analysis is sufficient to implement Special Directive 78-6 and revised NPS-2. An Economic Advisory Committee of first-rate professional economists who are sympathetic to the objectives and problems of the agency should review the role of economics in the planning and budgeting process. The advisory committee would be charged with recommending how an economics unit might contribute to the preparation of programs and budgets, general management plans for existing parks, new area studies, wild and scenic river studies, etc.

In size and function, the economics unit might be similar to an economic group located in the U.S. Fish and Wildlife Service, a much smaller agency. It probably would be headed by a GS 14/15 professional (Ph.D.) economist trained in benefit cost analysis of recreation resources. In addition, the section likely would include two GS 13/14 professional (Ph.D.) economists and two GS 11/12 economists (M.S.) also trained in benefit cost analysis of recreation resources. Part of the staff of economists could be detailed as needed to the Office of the Director in Washington, D.C. This would provide economic input into budgets, programs, and choice of Final General Management Plans of the agency.

There has been a small economic analysis office in the Science Branch of the Denver Service Center for at least six years. It was staffed with about 1.5 man-years of professional time. At present, a full-time economist position (M.S.) at the GS 12/13 professional level is vacant, and has been converted to an 80 percent part-time position, which downgrades economic analysis in the National Park Service to an unacceptable level. A temporary half-time position (GS 12) which had been filled during the past five years by a professional (Ph.D.) economist trained in

benefit cost analysis of recreation resources is also vacant at this time. In addition, each of the four regional study teams has included an economist position, usually with a B.A. degree although occasionally an M.S. At least two of these positions are vacant at the present time.

It has been considered important that the Office of Economic Analysis be located in the Science Branch beside the Office of Visitor Statistics. Its visitor survey form used for special studies of the recreation activities of park visitors provides the opportunity to include questions on expenditures (price) and willingness to pay (benefits) per visitor day. Moreover, close proximity provides the opportunity to develop forecasts of visitor use based on predictive equations from statistical regression analysis and projection of factors of demand, as recommended by the WRC principles of benefit cost analysis.

POSTSCRIPT

This report was based on Yosemite planning documents issued prior to and including the Final General Management Plan dated August, 1979. Subsequently, a revised General Management Plan was announced by the Director on November 27, 1979, and published in early 1980. This new plan was outside the scope of this study. It was shortened and written in more general terms. Still, sufficient detail was provided so that it is possible to compare the two plans with respect to a number of important features.

The major change would be to move nearly 2,000 summer residents, Park Service and concessioner employees and their families, out of Yosemite Valley and to relocate them on the edge of the park. This would reduce congestion in Yosemite Valley by nearly 10 percent on a peak holiday weekend. The former plan would have moved only about one-third as many (633) summer residents out of the Valley and would have reduced Valley congestion by only 3.2 percent.

A related change would be to move the administrative headquarters of the park and the concessioner out of Yosemite Valley 28 miles south to Wawona, near the south entrance to the park. The former plan would have moved these administration facilities to El Portal where establishment of a temporary park headquarters was announced in the fall of 1979. The new plan would move maintenance and warehouse facilities from the Valley to El Portal, as would the previous plan. The effect of the change is that approximately one-half of the facilities and personnel moved out of Yosemite Valley will go to Wawona and one-half to El Portal. Wawona is characterized now as a "sleepy mountain village" and is designated as a historic interpretive site. It would become a bustling administrative and urban center under the new plan.

Another change would be to increase the concession operated lodging facilities in the park by 1.3 percent. The former plan would have reduced them by 9.4 percent. In the congested east end of Yosemite Valley, the new plan would reduce visitor lodging facilities by 4.7 percent and relocated them to Wawona. The former plan would have reduced them by 15.3 percent, or by over three times. With new motel-type facilities providing greater opportunities for year-round use, the number of visitors staying overnight annually in concessioner facilities in the Valley will not decrease. When the new plan was announced, the Director said that the concessioner could look forward to continued profitability in coming years with nearly all its facilities intact [Jones, 1979]. The previous plan would have reduced the number of motels, cabins, restaurants, and stores operated by the concessioner. A financial analysis suggested that this would have reduced its profits [Harris, Kerr, Forster, 1978].

Campground capacity would be increased by 9.1 percent parkwide and reduced by 11.2 percent in Yosemite Valley under both plans. Thus, the new plan would decrease overnight visitor (campground and lodging) use of Yosemite Valley by 8.3 percent, while the previous plan would decrease it by 13.5 percent. Capacity to serve day users would be increased by 15.1 percent parkwide and reduced by 16.2 percent in the east end of Yosemite Valley under both plans.

The net result is that the new plan would not change the previous plan with respect to parkwide visitor capacity of 55,600 persons per day, nearly a 10 percent increase over current levels. However, the new plan would decrease congestion in the east end of Yosemite Valley by 16.6 percent, which is one-third more than the previous plan which would have reduced congestion by 12.3 percent. This would increase benefits of the new plan by $0.31 per visitor day (= $0.073 x 4.3) to $1.41 which represents an increase of 28 percent. This is equivalent to a

$9 million increase in the present value of benefits to $70 million with the new plan. Present value of costs would be $97 million with the new plan, a decrease of $1 million. Thus, the benefit cost ratio of the incremental change in costs and benefits would increase from 0.5 previously to 0.6 with the new plan.

The investment cost reported for the new plan was nominally the same as the previous plan, $160 million compared to $162 million previously. The Director announced that to carry out the transportation phase of the previous plan could have cost an unacceptable $100 million. It is not clear whether this was included in the previous plan's estimate of $162 million total cost or whether it would be an additional cost. If it was included in the previous plan and eliminated from the new plan, then apparently $100 million of the new plan would represent the cost of moving approximately 1,300 more summer residents from Yosemite Valley to Wawona. The Director announced that a non-profit organization, the Yosemite Institute, would borrow from the private money markets to build the new facilities and housing for employees on the periphery of the park. The institute would lease the facilities to the Park Service and sell equity in the housing to park employees, under lease-purchase agreements. This would represent a major change in Park Service policy as historically parks were created and maintained with funds appropriated by Congress.

Other features of the new plan include a provision for a two-year study of transportation alternatives in Yosemite Valley by the U.S. Department of Transportation. The swimming pools would remain in the Valley under the new plan, while they would have been removed under the previous plan. This provision had received the largest negative public comment during the review process. The phasing of the construction process over the next 15 years was changed with respect to Wawona

and Tuolumne Meadows. All other construction programs would remain the same as in the previous plan. Wawona and Tuolumne Meadows would begin with Phase II in about 1983. Both would start large and tail off until about 1992. This would have the effect of scheduling more of the construction expenditure during the near-term, and less during the later years of the 15-year planning period. This would increase the present value of total construction costs.

APPENDIX

Benefits and Costs of Recreation Households Visiting Yosemite National Park*

The following procedure was used to estimate recreation benefits of the alternative and proposed plans. It is based on the Yosemite Visitor Survey of 1975 which asked a representative sample of 1,500 households to report expenditures in the Park and for travel, willingness to pay under certain conditions, and willingness to pay with reduced crowding. These data were adjusted for a 35.8 percent increase in the Consumer Price Index to July, 1979. Household values were divided by an average of 2.8 persons per vehicle. The result was multiplied by 68 percent because that proportion of the sample reported the quality of their recreation experience was adversely affected by crowding.

Household Willingness to Pay Without Improved Management ($40.51)	-	Household Price or Direct Cost ($30.40)	=	Household Net Benefits Without Improved Management ($10.11)
Household Willingness to Pay With 50 Percent Reduction in Congestion ($51.49)	-	Household Price or Direct Cost ($30.40)	=	Household Net Benefits with 50 Percent Reduction in Congestion ($21.09)

Household Net Benefits with 50 Percent Reduction in Congestion ($21.09)	-	Household Net Benefits Without Improved Management ($10.11)	÷ 50	=	Household Net Benefits Per 1 Percentage Point Change in Congestion ($0.22)	
Household Net Benefits Per 1 Percentage Point Change in Congestion ($0.22)	÷	Persons Per Household (2.8)	x 1 + Change in CPI Index, 1975-79 (1.358)	x	Proportion of Park Visitors Reporting Adverse Effects of Congestion (.68)	=

Net Benefits Per Visitor Day From 1 Percentage Point Change in Congestion ($0.073)

*This appendix was prepared by R. G. Walsh and J. R. McKean, Department of Economics, Colorado State University, Fort Collins, with the assistance of Kenneth Hornback, National Park Service, Denver.

The economic value of a recreation visit to Yosemite National Park has two parts: (1) price, and (2) willingness to pay. Price is the average daily cost incurred to visit the Park. Included are: entrance fees, lodging or camping fees, restaurant meals and groceries above those at home, gas, oil, and other transportation expenses to and from the Park, souvenirs, gifts, and other expenses such as entertainment, horseback riding, and the like. Economists measure willingness to pay along a demand curve. Net benefit is consumer surplus defined as the difference between the price paid and the highest price a visitor would be willing to pay for the experience of visiting the Park. Net benefits or consumer surplus is shown in the following graphs as the cross-hatched triangle areas. It is the best available economic estimate of visitor benefits from a day in the Park. A sample of park visitors in the summer of 1975 reported their willingness to pay for a visit to the Park. Visitors were asked to:

> "answer in terms of the maximum daily expenses for your party, above which you would decide not to visit the Park. No one is going to set prices for services in the Park on the basis of this questionnaire. We want to find out how strongly you feel about your visit to Yosemite. Since visiting the Park costs you money, we would like to get a dollar estimate of how much it was worth to you."

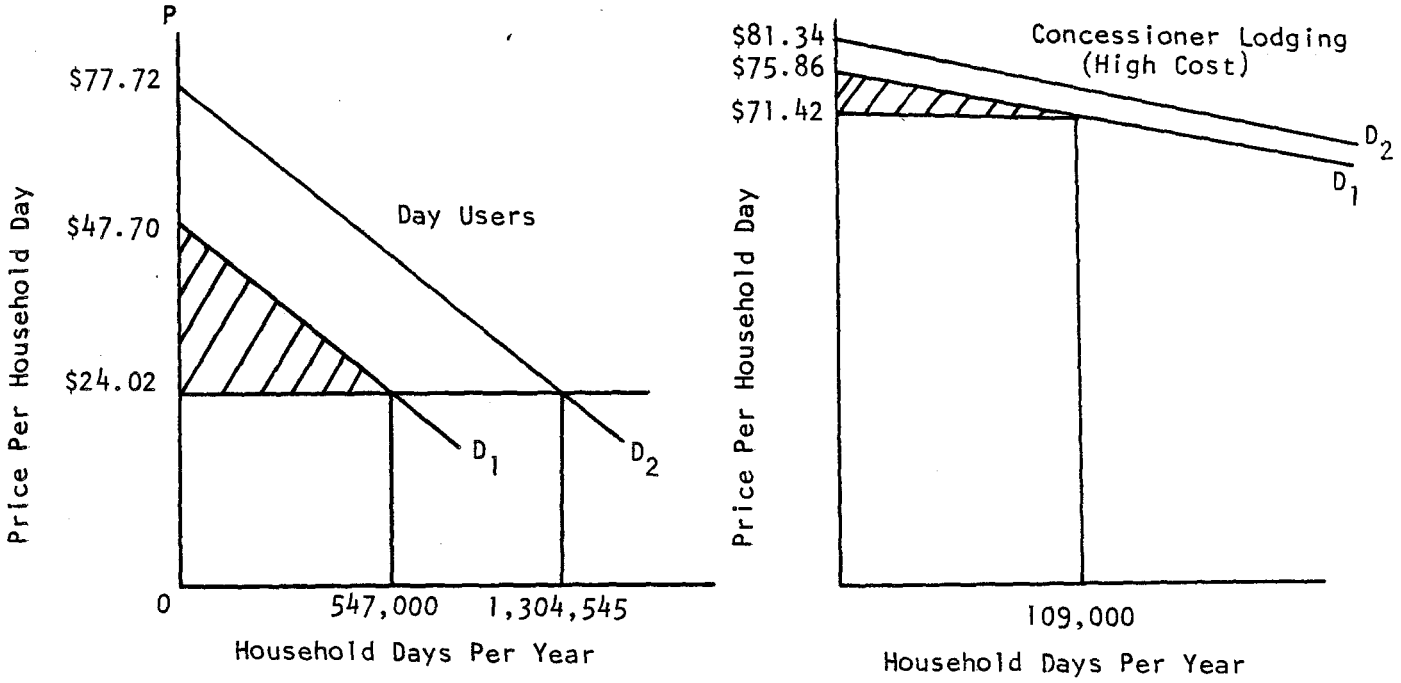


Figure 3. Demand for Day Use and Concessioner Lodging, Yosemite National Park, 1975

Table 17 shows visitor benefits in money terms as revealed by willingness to pay, and costs in terms of what visitors must pay for the recreation experience. This comparison is the benefit-cost ratio for household groups of park visitors.

Table 18 illustrates the effect of the availability of substitutes on visitor benefits from alternative use of park resources. When services, such as overnight lodges and campgrounds in the Valley, have relatively close substitutes nearby, consumers tend not to be willing to pay much more than their market price. Thus, the visitor benefits relative to costs of overnight facilities in the Valley are small. This is especially true for the higher-cost concessioner lodging with a B/C ratio of 1.03. Apparently, the prices of lodging capture most of the consumer surplus. On the other hand, the opposite is expected if the product or service has fewer close substitutes. An increase in opportunities for day use such as scenic touring and hiking to experience the unique view from the Valley floor of Yosemite Falls or Half Dome result in a significant gain in visitor benefits relative to costs. Day users have a B/C ratio of 1.49. This means that day users receive $1.49 in benefits for every $1.00 in costs they pay.

Another hypothesis tested was the effect of crowding on the value of a visit to the Park. This is important as nearly two-thirds of Park visitors reported awareness of congestion and crowding during August, 1975. Visitors were asked:

> "Suppose Park visitors spread themselves out and are less visible to you, while the total number of visitors in the Park remains the same. How much would your visit have been worth if you had encountered one-half as many visitors?"

This has the effect of shifting the demand curve to the right and thus to higher values per day of use. This was shown as D_2 in the preceding graphs. With improved management resulting in fewer encounters and reduced crowding, visitor values increase. It would be possible to compare effects of alternative management

Table 17. Average Daily Expenses Reported by Recreation Household Groups Visiting Yosemite National Park, 1975.

Daily Household Expenses	Day Users	Back Country Users	Campers	Low-Cost Accommodation Users	High-Cost Accommodation Users	Total
Number Reporting ( )	(530)	(83)	(440)	(254)	(229)	(1,536)
Entrance Fee	$ 2.55	$ 2.11	$ 2.22	$ 2.05	$ 2.18	$ 2.34
Lodging or Camping	--	1.61	2.78	12.16	28.43	5.38
Restaurant Meals	4.00	2.87	2.55	11.89	23.20	6.81
Groceries	2.06	4.19	7.14	4.78	3.06	3.75
Gas and Oil	5.88	3.99	5.81	4.45	2.22	5.20
Other Transportation	.22	.46	.76	1.01	6.73	1.08
Souvenirs, Gifts	3.46	.77	3.08	5.25	4.95	3.72
Other Expenses a/	.90	.25	1.66	2.94	1.58	1.44
Total Expenses in Park	$19.07	$16.25	$26.00	$44.53	$72.35	$29.72
Adjusted for Food Costs at Home b/	13.01	9.17	16.31	28.94	54.19	19.16
Average Distance from Visitors' Home, Miles	629	588	586	741	1,426	712.2
Average Length of Trip, Days	7.5	9.5	8.4	9.4	9.9	8.32
Travel Costs Per Day c/	$18.40	$13.84	$15.84	$17.64	$32.05	$18.83
Adjusted Daily Expense	$ 6.91	$ 4.72	$ 9.74	$23.48	$45.24	$12.88
Total Costs Per Day	$25.31	$18.56	$25.58	$41.12	$77.29	$31.71
Percent Business	5.1%	1.2%	4.4%	5.0%	7.6%	4.9%
Adjusted Total Cost	$24.02	$18.34	$24.45	$39.06	$71.42	$30.40

a/ Other expenses included entertainment, horseback riding, etc.

b/ The relevant food costs are the additional expenditures in the Park above daily food costs at home. The Bureau of Labor Statistics reported the results of a two-year survey of spending and earnings of American families. In regression analysis of daily food costs, size of family proved to be insignificant. The equation for at-home daily food costs is: $F = 1.73\ I^{.4396}$ where F is daily food cost and I is income in thousands of dollars. R^2 was .99 at a 90 percent confidence level. Applying this equation to visitors who stayed in higher-cost concessioner lodging facilities, average income was $23,974 so $23.975 x .4396 x 173 = $18.16 at-home daily food costs. They reported Yosemite food costs as $26.26 per day or $8.10 per day more. The $8.10 rather than $26.26 was included in the estimate of price per day to visit the Park. Source: Bureau of Labor Statistics, "BLS Releases Partial Results from Two-Year Survey of Consumer Expenditures," News, U.S. Department of Labor, April 16, 1975.

c/ Average distance from visitors' home times two for roundtrip mileage times ten cents per mile divided by the number of days on trip less one day for non-sightseeing travel.

d/ Average daily expenses less gas, oil, and other transportation costs in the Park.

Table 18. Benefit Cost Ratios Reported by Recreation Household Visitors With and Without Improved Management Practices, Yosemite National Park, 1975.

Alternative Land Use	Household Days Per Year	Consumer Benefit Cost Ratios	
		Without Improved Management Practices	With 50 Percent Less Congestion
All Recreation Household Visitors	1,174,000	$\frac{\$40.51}{\$30.40} = 1.33$	$\frac{\$51.49}{\$30.40} = 1.69$
Day Users	574,000	$\frac{\$35.86}{\$24.02} = 1.49$	$\frac{\$50.87}{\$24.02} = 2.12$
Back Country Campers	47,000	$\frac{\$27.04}{\$18.34} = 1.47$	$\frac{\$46.60}{\$18.34} = 2.54$
Developed NPS Campground Users	242,000	$\frac{\$30.08}{\$24.45} = 1.23$	$\frac{\$38.57}{\$24.45} = 1.58$
Low-Cost Concessioner Lodging Users	202,000	$\frac{\$51.35}{\$39.06} = 1.32$	$\frac{\$56.38}{\$39.06} = 1.44$
High-Cost Concessioner Lodging Users	109,000	$\frac{\$73.64}{\$71.42} = 1.03$	$\frac{\$76.38}{\$71.42} = 1.07$

plans for future development of the Park. Benefits rise proportionately more from an increase in day users, for example, than they fall from a decline in the number of overnight users. This is apparent from the benefit/cost ratios of these alternative land uses with improved management. Day users benefit/cost ratio rises to 2.12 with improved management practices, and back country campers report benefits of 2.54 relative to the costs they pay. Benefit/cost ratios of other overnight users also rise with improved management, but to a lesser extent. Users of the developed National Park Service campgrounds report a B/C ratio of 1.58, users of low-cost concessioner lodging a B/C of 1.44, and users of high-cost concessioner lodging a B/C ratio of 1.07 with benefits barely exceeding costs. Apparently, there are fewer substitutes available for Park Service campgrounds and low-cost tent-cabins and unimproved log cabins than for high-cost resort hotel and motel-type facilities, which could be removed from the Park with very little loss of value to visitors.

To summarize, information on the economic value of a visit to the Park is useful to estimate the effects of management decisions concerning recreation land use development. Values of alternative uses such as sightseeing and overnight accommodations vary, depending on the degree of substitution for these services. Sightseeing values of Yosemite National Park are higher because the scenery is unique and there is no place else to find it, while overnight accommodations have ready substitutes near the Park. Also, the effect on recreation values of improved management to reduce crowding reflect similar patterns. Reduced congestion of day users on scenic tours and those engaged in back country camping and hiking is expected to increase user values more than reduced congestion of overnight accommodations.

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