THE ENVIRONMENTAL QUALITY OBJECTIVE OF PRINCIPLES AND STANDARDS FOR PLANNING

by

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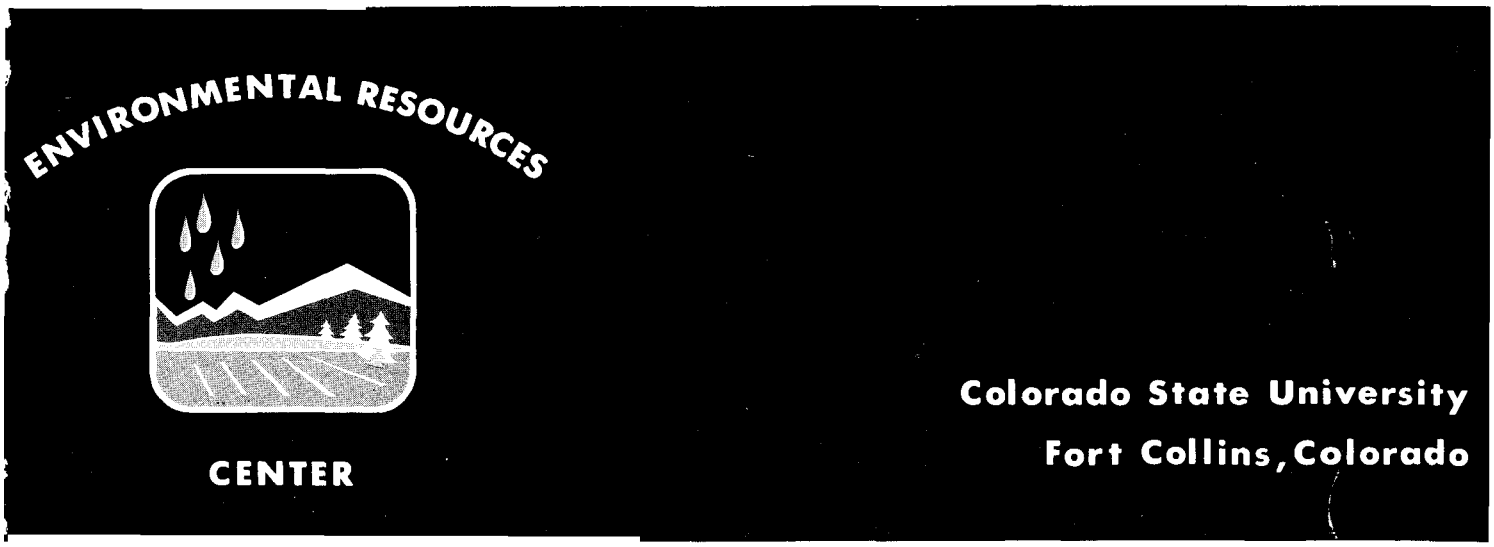

Information Series No. 19

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Submitted to the Water Resources Planning Fellowship Steering Committee, Colorado State University, in fulfillment of requirements for NR 795 Special Study in Planning

August 1975

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the cooperation and friendly participation of those people employed by the Bureau of Land Management, Bureau of Reclamation, National Park Service, U. S. Army Corps of Engineers, U. S. Fish and Wildlife Service and the U. S. Forest Service who gave of their time to convey the information contained in this report. We also appreciate the help of our graduate committee who have always been available for advice. The committee consists of Norman Evans, Director, Environmental Resources Center, Chairman of the Committee; Henry Caulfield, Professor of Political Science; R. Burnell Held, Professor of Outdoor Recreation; Kenneth Nobe, Chairman of the Department of Economics; and Everett Richardson, Professor of Civil Engineering.

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I. INTRODUCTION

A. Background

Planning for development of the nation's water resources has evolved over some 150 years. It has only been within the last few decades, however, that significant efforts have been undertaken to standardize the myriad of various water and related land use planning practices by the numerous Federal agencies involved.

During the early 1960's, President Kennedy proposed the Water Resources Planning Act and requested the four secretaries who would make up the Water Resources Council (WRC) under the proposed legislation to form an ad hoc council and undertake the outlining of planning standards, policies, and procedures to guide the federal agencies.[1] This was accomplished, and the President approved a new set of standards, Senate Document No. 97 (SD 97), on May 15, 1962. The planning policies enunciated in SD 97 were directed to four objectives, namely, national and regional economic development, preservation of the environment, and well-being of the people. However, agency practices responsive to Executive direction continued to adhere to previously established evaluation practices

[1]The Water Resources Planning Act became law in 1965.

emphasizing the concept of economic efficiency. In subsequent years, Congress enacted a substantial amount of additional conservation, environmental, and social legislation bearing on water resource planning and related policies affecting the scope and content of regional development, urban needs, water quality, natural beauty, outdoor recreation, and the quality of the environment. Among growing controversy concerning the applicability and operability of SD 97, a Special Task Force on Evaluation Procedures was created in November 1968. Operating under the auspices of the WRC, the Task Force worked for more than a year-and-a-half wrestling with the problems of defining objectives and clarifying evaluation practices required to design programs responsive to all objectives.[2] The Task Force report was released in an interagency report by WRC in July of 1970. After extensive study, review, field testing and public hearings, the WRC then published "Proposed Principles and Standards for Planning Water and Related Land Resources" (36 FR24144) along with a draft environmental statement, and invited public comment on the proposal. After careful consideration of the public response to its proposal and consultation with all concerned Federal agencies, the WRC forwarded its recommendations to the President. Pursuant to Sec. 103 of the Water Resources Planning Act (P.L. 89-80) the President approved the Principles and Standards (P & S) on September 5, 1973 (38 FR 24778).

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[2]William J. Donovan, The Genesis and Function of the Fourth Water Resources Council Account.

The P & S set forth two coequal objectives in water and related land resource planning, (1) enhancing National Economic Development (NED) "by increasing the value of the Nation's output of goods and services and improving national economic efficiency," and (2) enhancing Environmental Quality (EQ)" by the management, conservation, preservation, creation, restoration, or improvement of the quality of certain natural and cultural resources and ecological systems" (Principles, II, p. 6). These standards currently apply to the planning and evaluation of the effects of the following water and land programs, projects, and activities carried out by the Federal Government: Corps of Engineers civil functions; Bureau of Reclamation projects; Federally constructed watershed and water and land programs; National parks and recreation areas; Wild, scenic, recreational rivers and wilderness areas; Wetland and estuary projects and coastal zones; Federal waterfowl refuges; Tennessee Valley Authority; and Federal assistance to state and local government sponsored watershed and water and land resource programs (Standards, I, pp. 23, 24). Procedures for implementation of these standards are the responsibility of the administrator of each Federal program.

B. Purpose and Scope

The purpose of this paper is (1) to reveal the manner in which selected Federal agencies from the above listing have

developed guidelines to comply with the WRC directives for implementation of the Environmental Quality objective of the P & S, and (2) to highlight those areas where Federal agency guidelines for implementation of the Environmental Quality objective of the P & S differ from WRC guidelines.

The following agencies were contacted as representative of the Federal programs responsible for implementation of the P & S: Corps of Engineers, Bureau of Reclamation, U. S. Forest Service, Soil Conservation Service, National Park Service, Fish and Wildlife Service, Bureau of Land Management, and Bureau of Outdoor Recreation. Guidelines were furnished for analysis by all agencies contacted except the Bureau of Outdoor Recreation.[3] Only those guidelines published by the U. S. Department of Agriculture have been approved by the WRC. Guidelines received from other agencies were in the form of official drafts pending approval by the WRC. Analyses of the Federal agency guidelines are contained in Section III of this paper.

In addition to the above agencies, the Council on Environmental Quality, the Environmental Protection Agency, the Department of Transportation and the State of California were also contacted and guidelines requested. However, the

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[3]Guidelines for this agency will be published on 1 September, 1975.

guidelines provided by these agencies were prepared for compliance with the National Enivronmental Policy Act of 1969 and dealt specifically with the preparation of Environmental Impact Statements. Accordingly, these guidelines were omitted from the analyses of this paper.

II. ENVIRONMENTAL QUALITY

This section discusses environmental quality (EQ) as viewed from three parameters: the EQ objective and components, EQ projections, and EQ measurement methodologies. Excerpts regarding EQ are also taken from the "Manual for Training in the Application of Principles and Standards"[4] which is an unofficial guide to interpretation of P & S.

A. The EQ Objective and Components

The EQ objective and components as set forth by the P & S are as follows:

1. The Objective. The EQ objective is defined in the P & S as promoting the quality of life by reflecting society's preferences and:

> To enhance the quality of the environment by the management, conservation, preservation, creation, restoration, or improvement of the quality of certain natural and cultural resources and ecological systems (p. 6, P & S).

In addition to enhancing the quality of the environment the EQ objective is responsive to the needs of society and man by:

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[4]The manual was prepared by Colorado State University in cooperation with the U. S. Water Resources Council and the Office of Water Resources and Technology, U. S. Department of the Interior.

> reflecting society's concern and emphasis for the natural environment and its maintenance and enhancement as a source of present enjoyment and a heritage for future generations,
> and:
> reflecting man's abiding concern with the quality of the natural physical-biological system in which all life is sustained (p. 33, P & S).

In the objectives quoted above the P & S make reference to the "natural environment" and the "natural physical-biological systems." Mr. Zube[5] in his comments regarding the EQ objectives in the "Manual" makes note of the fact that the objectives should not be interpreted to exclude metropolitan areas from consideration. He states that:

> Natural environments, if we define them as environments consisting of primarily natural physical-biological systems rather than of cultural, socio-economic systems, can--should--and do exist in urban metropolitan centers. They are in fact--in minds of many people--essential ingredients of any quality environment, be it rural or urban (p. 56, Manual).

2. Components. The environment is all encompassing and interwoven with complex conditions that can only be best understood and evaluated as separable components or classes. The P & S has utilized four components within which beneficial and adverse effects of plans can be evaluated for the environmental objective. These components are listed below. Following each component is an overview provided by Mr. Zube as contained in the "Manual."

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[5]Mr. Ervin H. Zube is the Director, Institute for Man and Environment, University of Massachusetts, Amherst.

a. The first component contained in the P & S relates to:

Management, protection, enhancement or creation of areas of natural beauty and human enjoyment such as wild and scenic rivers, lakes, beaches, shores, mountain and wilderness areas, estuaries, or other areas of natural beauty (pp. 33,34, P & S).

Mr. Zube, in his overview of amenity values states:

> While some of these resources such as mountains and wilderness areas are unique to or can only be found in natural settings, open and green space, lakes, beaches and shores are not. The planning and management of these resources in metropolitan areas can contribute significantly to urban amenities. The structuring of open and green space, for example, around natural drainage ways, around rivers and streams, can provide linear parks which thread their way throughout urban areas; which can serve as visual and physical means of structuring urban growth; and which thereby create and enhance aesthetic values. They can define boundaries and identify neighborhoods or sectors of the city. In summary, amenity resources should be considered along the entire environmental continuum, from wildlands to the city (p. 56, Manual).

b. The second component includes:

> Management, preservation, or enhancement of especially valuable or outstanding archaeological, historical, biological (including fish and wildlife habitat), and geological resources and ecological systems (p. 34, P & S).

Mr. Zube looks upon this component as a component relating to cultural, educational and scientific values while stating that:

> This component recognizes the importance of protecting examples of relatively undisturbed naturally occurring ecosystems for educational purposes, for scientific study, for the maintenance of diversity in the environment and for use as benchmarks in assessing the impacts of man on similar ecosystems. This

component also recognizes the educational and cultural values society attaches to the buildings, structures, sites and other artifacts associated with the history and the prehistory of the land, the country and the culture. These buildings, structures, sites, and artifacts are tangible examples of the values and actions which represent where we have been as a nation and as individuals, and how we got to the present. They represent actions and artifacts of warfare as well as the accomplishments of community building. They provide insights to the evolution of its social and political institutions and its scientific and technical developments (p. 37, Manual).

c. The third component set forth by the P & S relate to:

Enhancement of quality aspects of water, land and air by control of pollution or prevention of erosion and restoration of eroded areas embracing the need to harmonize land use objectives in terms of productivity for economic use and development with conservation of the resources (p. 34, P & S).

Regarded as a component relating to resource quality, Mr. Zube has the following comments:

This component addresses a broad topic. It speaks, for example, to issue of non-point sources of pollution which are related to varying land uses and land use practices. It also speaks to the issue of relating use to resource capability. Considerations of steepness of slope, ground water level and soil quality for agricul-cultural production are factors to be considered, both in controlling non-point sources of pollution and in harmonizing land use objectives with conservation of the resource. It suggests the consideration of resource capability analysis as a step in the planning process as a means of identifying the parameters of harmonious land use and conservation objectives. It also suggests that related land use--a term which is not defined in the P & S--be defined, for example, as a watershed in the case of a river basin study (pp. 57, 58, Manual).

d. The fourth component contained in the P & S states:

Avoiding irreversible commitments of resources to future uses: While all forms of development and use affect and sometimes change the tenuous balance of

> fragile aquatic and terrestrial ecosystems, the implication of all possible effects and changes on such systems is imperfectly understood at the present time. In the absence of absolute measures or standards for reliably predicting ecological change, these planning standards emphasize the need for a cautionary approach in meeting development and use objectives in order to minimize or preclude the possibility of undesirable and possible irreversible changes in the natural environment (p. 34, P & S).

Mr. Zube's comment to this component follows:

> This component suggests that prudence be exercised in the allocation of resources when such actions approach the irreversible or make commitments that are irretrievable. It suggests, for example, that high groundwater yield and recharge areas, well sites, flood plains, prime agricultural land, wetlands, mineral deposits and pontential reservoir sites be preserved or limited in use such that those resource values are available to future generations even though their exploitation is not required to satisfy an existing demand.

B. EQ Projections

The Principles and Standards (P & S) recognize that in order to improve the quality of life relative to both natural and human environments, the future pattern and level of production and consumption activities must be compatible with capabilities of the natural environment, as well as with social preferences. The P & S require that future environmental conditions be appraised in the planning process; however, the P & S do not provide specific projections for environmental needs of the future as is offered for the National Economic Development account. Instead, the P & S states:

> Environmental needs of the future should be identified in terms of features of the natural environment of the area that will assure a continuance of sources with limitations alleviated or a healthful, scenic, and aesthetically satisfying experience to all citizens. For instance, unique archeological, historical, and biological features of the area that are desired for preservation for future generations should be identified. Desired environmental conditions for the future should be explicitly stated. These environmental component needs should reflect not only current preferences but should attempt to reflect the preferences likely to prevail in the future (p. 97, P & S).

The P & S also requires that planning take account of National and State environmental and social standards such as water quality, air quality, and minimum health standards. Standards are projected for these specific elements in various laws.

In the "Manual for Training in the Application of Principles and Standards," a chapter titled "Environmental Projections and Carrying Capacity Models" by A. Bruce Bishop, enlarges upon the P & S effort to project environmental conditions.

Mr. Bishop recognizes that ". . . the art and science of environmental projection, in contrast to economic projections, are still in early stages of development." He suggests four general areas of concern relating to environmental projections:

> 1. Where will we <u>likely</u> go from here? What are the probable environmental future(s) under "without" plan conditions?
> 2. Where do we <u>desire</u> to go from here? What are the goals and normative requirements for plans?
> 3. Where is it <u>possible</u> to go from here? What are the environmental futures obtained through the implementation of water resources plans (the with conditions)?
> 4. Where do we <u>expect</u> to go from here? What is feasible in terms of the most acceptable path given both what is possible and the targets or goals we desire to achieve (p. 110, Manual).

Mr. Bishop points out that the description of possible futures given by projections also enters importantly in the analysis by providing a perspective of the effects of immediate irreversible or irretrievable commitments of resources versus the preservation of future options.

One of the major problems confronting efforts to project environmental quality is the difficulty in producing a meaningful system of reporting environmental status and trends. Mr. Bishop states that the Council on Environmental Quality prefers an indices which aggregates and summarizes the available data on environmental factors much in the same way socio-economic indices, such as population, GNP, consumer price index, etc., provide economic trends and a basis for forecasts.

Further study and research is currently being undertaken to establish baseline conditions, monitoring programs, and models, operational rules and procedures for making forecasts of future environmental conditions. Mr. Bishop discusses several:

1. Matrix approach (Leopold et al.) which provides a framework for systematically exploring the effects of the aspects of proposed actions upon an exhaustive listing of environmental characteristics.

2. Network approach (Bishop) which begins with the basic components of proposed actions and derive a cause-effect network which leads to the identification and determination of the environmental impacts as a chain of consequences.

3. Simulation Modeling which is a process of abstracting physical or socio-economic aspects of a particular system to a set of relationships describing processes and functions occurring in the real system. Simulation involves the use of a model to carry out experiments designed to reveal and predict characteristics of the system.

Mr. Bishop summarizes his discussion in this manner:

> In developing water resources plans, planners and decision makers must continually assess and project the social and environmental implications of present trends and alternative proposals. Approaches to projections of regional activity and effects on environmental systems are developing, but much work is yet to be done in finding workable approaches in predicting the natural and human viability of proposals. Future efforts in the area should be directed toward augmenting planning processes with sound projection procedures that can be used to examine the character of environmental changes that will occur under different levels of social and economic activity, how changes in the physical environment relate to the social objectives and values for resource development and use, and how well various planning proposals achieve desired levels of environmental change (pp. 131,132, Manual).

C. EQ Measurement Methodologies.

While planning effects on EQ are characterized by their non-market and non-monetary nature, it is essential to provide other means of measurements of EQ effects when judging the value of proposed plans. The P & S provide guidance in determining the beneficial and adverse effects on EQ, recognizing that often an environmental impact of a plan cannot be easily labeled as being adverse or beneficial,

since that decision will vary with the perceptions of the individual concerned. To the extent possible, the P & S state that beneficial or adverse EQ effects will be displayed in terms of relevant physical and ecological criteria or dimensions, including the appropriate qualitative dimensions. Where significant physical effects are less perceived, it may be necessary to determine their extent through instrumentation or systematically by the presence or absence of commonly expected characteristics such as BOD or dissolved oxygen count. For certain environmental effects, the P & S recommends reference to qualitative dimensions--for instance, it may be necessary to use this approach to show the importance of a reduction in use of areas of natural beauty, archeological, or historical significance.

The P & S recognizes that it is not presently possible to anticipate or identify, much less measure, all environmental effects or change. Nor are there in existence evaluation standards that permit full and direct quantitative comparisons and rankings of the conditions of identifiable environmental effects that might be expected to result from a plan. Consequently, the P & S acknowledges that reasoned judgments by multidisciplinary teams will be required in many situations.

The four components of EQ (discussed earlier in this section) are evaluated separately by the P & S to measure environmental effects. A thorough outline is provided in the P & S to insure comprehensive coverage of each objective (see Exhibit 1).

The training manual[6] has a chapter entitled "Principles and Standards Requirement for the Measurement of Effects of Water and Related Land Resources Plans on Environmental Quality," written by Mr. Gary L. Hickman, which presents various measurement processes for some of the EQ objectives. A synopsis of the measurements follows:

1. Physical Land Resources - Hickman explains how erosion of soil can be measured using the Soil Conservation Services Universal Soil Loss equation such that various construction actions can be evaluated. Geological resources measurement includes a descriptive-qualitative interpretation of the effects to geology caused by a plan. Specific items that should be evaluated, if of geomorphic or geologic significance, are: caves, classic rock formations, classic stratigraphic rock sections and unique palaentological sites and unique geologic features such as natural bridges, etc.

2. Air and Water Quality. For the air quality measurement, Mr. Hickman merely restates the P & S information (pp. 73 and 74, P & S). For water quality, measurements are to be determined according to the Federal Water Pollution Control Act of 1972, which include such parameters as dissolved oxygen, temperature, total dissolved solids, etc.

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[6]Manual for Training in the Application of Principles and Standards, Water Resources Council.

3. Ecological Resources. To measure the ecological resources in a planning area, a terrestrial and aquatic ecosystem evaluation was developed to determine the habitat value for each type of terrain found in the area. In addition to the habitat unit evaluation, a narrative description is required on the expected effects of each plan on ecosystem relationships, including irreversible commitments of ecological resources and expected effects on plants and animals endangered with extinction. (For further information on ecological resource determination, see Exhibit 2.)

4. Culturally Significant Resources. This component contains archeological and historical resources as well as areas of natural beauty. To measure archeological and historical resources, Mr. Hickman uses the National Park Service evaluation parameters:

a. inventory
b. documentation
c. determine significance
d. determine effect of plan
e. recommend mitigation

For areas of natural beauty, Mr. Hickman states that specific probable effects of plans on unity, variety of natural ingredients, and vividness in a landscape should be identified and described.

III. FEDERAL AGENCIES RESPONSE

The purpose of this section is (1) to describe the methodologies developed by selected Federal agencies for measuring beneficial and adverse effects on environmental quality, (2) compare the described methodologies with those set forth in Section II of this paper, and (3) discuss the problems associated with implementation of the described methodologies.

A. Corps of Engineers

1. Methodology. The Corps of Engineers recently completed their regulations establishing guidance for conducting all level A, B, C, and continuing authority studies consistent with the planning requirements of the P & S and related policies. Although the regulation is yet to be published in the Federal Register (this is expected to occur in September or October 1975) the regulation is to be regarded as official.

The Corps regulation states that the EQ objectives in the P & S "should be interpreted as being the same as the definition of environmental quality contained in Section 102 (2)(C) of the National Environmental Policy Act of 1969. Thus, planning to achieve the EQ objective should address the broadest scope of concerns pertaining to the natural and

cultural environment."[7] EQ plans will include only those measures which are concerned with management of water and related land resources. In addition, the River and Harbor and Flood Control Act of 1970 (Section 122) specifies those impacts that, as a minimum, must be assessed for any proposed action.

For level A and B studies when the Corps is the lead agency and for level C and continuing authority studies conducted under the Corps auspices, the Corps will recognize the components of the EQ objective as:

> (a) Management, protection, enhancement, or creation of areas of natural beauty and human enjoyment.
> (b) Management, preservation, or enhancement of especially valuable or outstanding archeological, historical, biological, and geological resources and ecological systems.
> (c) Enhancement of quality aspects of water, land, and air by control of pollution or prevention of erosion and restoration of eroded areas.
> (d) Avoiding irreversible commitment of resources to future uses (p. A-18, Corps Er).

The Corps is also to recognize that

> Environmental quality has both natural and human manifestations and an EQ plan is to address the planning objectives in a way which emphasizes aesthetic, ecological, and cultural contributions. Beneficial EQ contributions are to be made by preserving, maintaining, restoring or enhancing significant cultural and natural environmental attributes of the study area.[8]

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[7]Excerpt from page 5 of Corps ER entitled "Planning Process: Multiobjective Planning Framework," May 1975.

[8]Page A-26 of Corps Er.

Determination of EQ benefits will involve

> Perceptual analysis, emphasizing the need for interdisciplinary planning with extensive public input, to place values on the environmental contributions of plans. Designating EQ plans will involve measuring the environmental changes related to different plans and selecting those which, based on public input, contributes to or are most harmonious with environmental objectives. This means that EQ plans are those which make the best contributions to one or more of the components of the EQ account.[9]

The Corps goes on to state that an EQ plan is often thought of as being synonymous with a non-structural plan, but this need not be the case. Also an EQ plan is not necessarily a "do nothing" plan or a plan to maintain existing conditions. But where a do nothing or a no development alternative is considered, it must be recognized that positive action is nonetheless required to assure that the no development concept can be realized and, further, that the particular environmental characteristics that it is desired to maintain or enhance through the no development alternative may change through time as a result of changing conditions within a planning setting.

During the Corps impace assessment activities the assessment team is directed to conduct an objective analysis to identify and measure environmental effects (as well as social and economics) of each alternative plan. Suggested guidelines for identifying, categorizing and tracing of each impact to determine all significant effects are included in

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[9] Ibid.

the assessment guidelines that cover the requirements set forth in Section 122 of the Rivers and Harbor and Flood Control Act of 1970 (P.L. 91-611) and the Corps Er 1105-2-105, dated 15 December 1972 and entitled "Guidelines for Assessment of Economic, Social and Environmental Effects of Civil Works Projects." When assembled, this assessment information could then be used for comparison with the base conditions to determine whether change in any of the base condition elements can be forecast as a consequence of the plan.

The Corps also states that when establishing the degree of net beneficial or adverse contribution it is not necessary to involve a numerical measure. When appropriate, numbers may be used in measuring contributions. However, many contributions may be expressed in ordinal differences such as high, medium or low or in terms of net effects such as beneficial or adverse.

2. Comparison Analysis. Although the Corps recognizes the components of the EQ objective set forth by the P & S they do not utilize the evaluation methods suggested and closely paralleled by the Bureau of Reclamation. Following evaluation procedures outlined above and utilizing the information contained in the above mentioned Section 122 Assessment Procedures and ER 1105-2-105, the Corps feels that the real challenge is one of providing an adequate comprehensible display. A suggested method is shown in Exhibit 3.

Here the components of the EQ account are not the focus of the display; rather the focus is on the values of the impacts.

The EQ account will be prepared by

> An interdisciplinary planning team, reflecting public inputs and expert judgement will indicate whether EQ is enhanced, degraded or destroyed. Where there is no impact or where evaluation indicates that the impact is neutral or otherwise insignificant, no entry is made for the sake of brevity. However, in certain situations where there is no impact, the report will note the lack thereof. The judgement of the interdisciplinary team will be based upon with and without analysis and the following definitions.
>
> (1) EQ enhanced. The environment is enhanced if a greater quantity or improved quality of environmental outputs is obtained with a plan than without it. Often, so called preservation measures are actually an enhancement because without the plan the environment would be degraded or destroyed over time. Frequently, the same plan may cause both beneficial and adverse outputs. Beneficial outputs will be displayed under EQ enhanced; adverse impacts will be displayed under EQ degraded or destroyed. However, EQ enhanced should be limited, where appropriate, by some motion of an optimum quantity of the EQ output. For example, the amount of open space needed by a certain population size is the limit on the extent of EQ achieved by additional open space.
>
> (2) EQ degraded. The environment is degraded if a lesser quantity or reduced quality of environmental output is obtained with a plan than without it. Nevertheless, the environmental loss could be made up by actions outside the plan or by natural processes over a period of time.
>
> (3) EQ destroyed. In this case, environmental quality is reduced to the extent that it cannot be regenerated. Loss of a species of wildlife in a given area is an example. Pollution to the point where a river becomes anaerobic is another. While the line between degradation and destruction is rarely clear and precise, the distinction is crucial and an effort to exercise judgement is integral to the overall planning process (p. B-13 & B-14, Corps Er).

Irreversible commitments of resources to future uses will be a sub-category of the above EQ destroyed category.

Additional evaluation features relating to timing, uncertainty, exclusivity and actuality are noted in Exhibit 4 which further clarify data presented in Exhibit 3. Specified evaluation criteria is contained in Exhibit 5.

These evaluation features and criteria are utilized by the Corps as measurement methodologies for all four accounts (NED, EQ, RD, SWB); not exclusively for the EQ account.

3. The Objective. The Corps basic policies regarding objectives is to guide planning for the conservation, development, and management of water and related land resources which is basic to the objectives of the P & S. But the Corps also states (as mentioned earlier) that the EQ objective in the P & S should be interpreted as being the same as the definition of environmental quality contained in the National Environmental Policy Act of 1969. Thus planning to achieve the EQ objective should address the broadest scope of concerns pertaining to the natural and cultural environment.

In essence the Corps recognizes the same basic objectives set forth by the P & S while emphasizing the National Environmental Policy Act as a policy directive.

4. Projections. The Corps also recognizes the projection requirements of the P & S and states that in order to accommodate these requirements it will be necessary "to examine expressed opinions and assumptions about the future of the study area and to designate what is considered to be the most probable future."[10]

Continuing, the Corps also states that a number of reasonable alternative future conditions should be projected by

> drawing on the public concerns regarding existing and future problems and opportunities in the study area, including a thorough analysis of the base conditions. A range of these conditions which reflect alternative assumptions about the future will be presented to the public. From this range of alternative futures, the one that best reflects the public's desires and aspirations, consistent with the constraints imposed by the economic, environmental, social, and political systems, will serve as the basis for projecting future conditions and will represent the most favorable future (p. 9, ER).

5. Problems. A basic question the Corps raises and may be considered a problem area is directed toward the extent to which planners should trade-off economic benefits and incur additional economic costs to avoid adverse impacts on environmental quality or to provide environmental quality benefits.

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[10]Excerpt from page A-15 of Corps ER entitled "Planning Process: Multiobjective Planning Framework," May 1975.

This is a difficult problem because the Corps feels that environmental quality values are subjective and cannot be valued in explicit monetary terms. Yet when dollar costs or benefits are traded off for environmental considerations an implicit evaluation is made that the net benefits are worth the dollar cost to obtain them.

There will also be uncertainty as to what the public concensus may be regarding trade-offs and decisions cannot be reached until the range of trade-offs is shown to the public. So the Corps' feeling is that a variety of alternative plans will have to be developed which appear to represent the preferences of the various publics. These plans will then have to be refined and those which lack significant public support would be eliminated, resulting in time consuming planning procedures.

B. Bureau of Reclamation

1. Methodology. Recognizing the need for consideration of environmental values, the Bureau of Reclamation examined existing evaluation methods which were being employed to meet water planning needs. Following an evaluation period the Bureau prepared a method in which environmental values could be quantified while using the advice and services of a multi-agency multidisciplinary staff.[11]

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[11] EQ evaluation methods are contained in the Bureau of Reclamation's "Guidelines for Implementing Principles and Standards for Multiobjective Planning of Water Resources," December 1972 and their "Addendum" to the above, November 1973.

The P & S for Planning Water and Related Land Resources prepared by the WRC were the basis for the Bureau's environmental evaluation system. The procedures the multi-agency team assembled (which became the Bureau's methodologies) utilized component groups and evaluation categories that generally corresponded to the classes of environmental effects defined in the P & S. These component groups and evaluation categories are as follows:

Component Group	Evaluation Category
Areas of Natural Beauty and Human Enjoyment	Open Space and Greenbelts Streams and Stream Systems Lakes and Reservoirs Beaches and Shores Wilderness, Primitive, and Natural Areas Estuarine and Wetland Areas Other Areas of Natural Beauty
Archeological, Historical and Cultural	Archeological Resources Historical Resources Cultural Resources
Biological, Geological and Ecological	Biological Resources Flora Fauna Geological Resources Ecological Systems
Quality	Water Quality Air Quality Land Quality Sound Quality Visual Quality
(Considerations related to all component groups)	Uniqueness Considerations Irreversibility Considerations

In evaluating the environment under this system, the same resource--such as land area--may be considered several times. Each consideration, however, is necessary to permit coverage of the various ways that environmental quality depends on that resource.

Within the Bureau's evaluation system, the criteria, used to describe and evaluate the beneficial and adverse conditions are termed evaluation factors. Each water resource plan or program alternative is evaluated in relation to the environmental evaluation factors for each component unless that component is clearly unrelated to the planning setting.

The evaluation factors are generally grouped as follows: (The evaluation factors are listed on pages 4-4 through 4-6 of the Bureau's implementing guidelines.)

Evaluation Factors

(1) Quantity. To the extent practicable, the specific environmental features that are evaluated within each category are to be measured and displayed in terms of accepted water and land measurements such as acres, miles, volumes, and/or numbers of animals or places. After such measurements have been made, they may be summarized but should not be further translated into other terms.

(2) Quality. Except for the categories of Uniqueness and Irreversibility, a subjective judgment is to be made on those criteria that contribute to the quality of the quantity factors, e.g., how environmentally desirable

is a particular 10-mile stretch of a certain stream. This evaluation can be made regardless of the numbers of people using the area or the amount of use involved. The quality of the resources considered are to be subjectively described by assigning numbers on a 0 to 10 scale to evaluation factors by comparing known or projected conditions with conditions that occur at other locations. The scale for describing quality conditions is:

0 - worst known
1-2 - very low
3-4 - moderately low
5 - average
6-7 - moderately high
8-9 - very high
10 - best known

(3) Human Influence. Except for the categories of Uniqueness and Irreversibility, a subjective judgment is to be made of the relationship of the quantity criteria to people. These factors are subjectively evaluated to indicate the degree that people use or would use the resource identified, the degree that it is available for continued use, the degree that it is protected for use, the degree that it might be degraded by use, and the degree that it contributes to education, scientific knowledge, and human enjoyment. Human influence factors are described on a 0 to 10 scale where numbers are subjectively assigned to describe relevant conditions as compared to conditions at other locations. The scale is:

0 - worst known
1-2 - very low
3-4 - moderately low
5 - average
6-7 - moderately high
8-9 - very high
10 - best known

(4) Uniqueness. In the uniqueness category, the degree of uniqueness of a specific resource is subjectively indicated by comparing its occurrence within the planning setting with its occurrence elsewhere. This is described by subjectively assigning numbers on a 1 to 10 scale that relates the frequency of occurrence of a resource within the planning setting, the region, and the nation. The scale is shown along with the specific discussion of the uniqueness category in Exhibit 6.

(5) Magnitude. In the uniqueness category, the degree of effect on a unique resource is measured by determining the degree that each specific resource is destroyed or degraded. This is described by subjectively assigning numbers on a 0 to 10 scale where 0 indicates complete destruction and 10 indicates no measureable effect. The scale is shown as part of the specific discussion of uniqueness considerations Exhibit 6.

(6) Significance. In the category "Irreversibility Considerations" the significance of each anticipated change adversely affecting an environmental resource is determined by considering factors related to the nature of occurrence of each resource, the interrelationships of supply, reversibility relationship with other

resources, and mitigatory actions. The significance of an irreversible change is described by subjectively assigning numbers on a 1 to 10 scale as described in Exhibit 6.

On the basis of information available and the judgment of an evaluation team, numbers indicated above are assigned to evaluation factors in each environmental category. These numbers indicate the relative degree that the proposed plan or program reduces or increases the quantity and quality of the resource category evaluated, the degree of human influence on the resource, and the magnitude and significance of proposed actions. The numbers would not indicate the desirability of increasing or decreasing either the quality or supply of a resource; although the rating implies that more of a higher quality is good and loss of a poor quality is bad. The intent was to provide a comprehensive array of beneficial and adverse effects to assist the decisionmaker in making an informed appraisal of future conditions with and without proposed water resource oriented alternatives.

A more detailed evaluation procedure which utilizes the above listed evaluation factors in relation to evaluation categories and components is displayed in Exhibit 6. This exhibit also contains a definition of each category, a standard for use in assigning a number to each factor, a short description of certain evaluation factors in cases

where definitions apprea necessary, and suggestions for determining the geographic area to be evaluated for each category.

2. Comparison Analysis. As previously stated, the P & S served as a basis for the Bureau's environmental evaluation system. While implementing the P & s to the greatest extent possible, the Bureau did modify some definitions to fit their own evaluation system.

Basically, the Bureau recognized the four classes or components of environmental effects set forth in the P & S but deviated slightly in establishing the component groups and evaluation categories. (The evaluation categories could be termed sub-components in the P & S.) (See page 25 for Bureau's evaluation structure.) For example, the P & S's second component includes archeological, historical, biological and geological resources and ecological systems. The Bureau broke this component group into two component groups. One group is more or less scientifically oriented while the other is basically culturally oriented. They also added cultural resources[12] as a category within their evaluation system. This cites one example, further distinction can be found by comparing the Bureau's system (page 25 and Exhibit 6), with the P & S guidelines contained in Section II and Exhibit 1.

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[12]The Bureau's "Addendum to Guidelines for Implementing Principles and Standards. . ." recommends that the evaluation of cultural resources and opportunities should be displayed in the social well-being account instead of in the EQ account as shown in the 1972 guidelines.

In addition, the Bureau established evaluation factors which when utilized by individuals having expertise in the categories that are to be evaluated will help in subjectively or objectively describing or evaluating the beneficial or adverse effects of a plan. The evaluation factors were itemized and described on pages 25 through 28.

The Bureau also added three other categories that were excluded from the P & S. These are sound quality, visual quality, and uniqueness considerations. These categories respectively cover the beneficial and adverse effects of sound as it relates to the quality of the environment, assess the benefits from visually attractive landscapes as well as the adverse effects of features that destroy, disrupt or intrude on pleasant settings and make note of the fact that some environmental resources are of particular significance in that they are rare, unusual or extraordinary in the Nation or in the region. (Additional details on these categories are contained in Exhibit 6.)

Concluding, this paper makes note of the fact that the Bureau made an effort to establish a means of recognizing and evaluating the irreversibility component set forth by the P & S (the P & S does not present evaluation guidelines for determining irreversibility). Using evaluation factors such as (1) nature of occurrence, (2) interrelationships of supply, (3) reversibility, (4) effect on remaining resources and (5) mitigatory actions the Bureau identifies and evaluates

each natural, physical and cultural resource affected by a proposed project or program. Additional information considering this component is available in Exhibit 6.

3. The Objective. The objectives of the Bureau regarding the EQ account parallel those of the P & S so closely that a comparison analysis is not necessary.

4. Projections. The Bureau's projection for EQ are more definitive than those of the P & S but do not contain near the detail Mr. Bishop suggested in the "Manual." The Bureau's projections are stated as follows:

> The existing status of the resources in each category is the base for projections. There may be changes in the resources during the planning period and these would be evaluated in terms of the status anticipated without any plan at the midterm of the period that the project or program is expected to be in operation. Separate evaluations of environmental resources should be made for each alternative plan. These evaluations compare the resource projected into the future without a plan to the conditions that would exist with each alternative plan assumed to be in operation (p. 4-7, Bureau's Guidelines).

5. Problems. As previously mentioned, the Bureau of Reclamation utilized the guidelines contained in the P & S for implementing the environmental quality objective to the greatest extent possible, but some deviation was necessary in order to create guidelines the Bureau felt were viable and definitive. The main problem with trying to utilize the buidelines of the P & S, according to the Bureai, was the limited guidance given in quantifying and estimating technical material. There was not system of rating impacts upon the

environment, no way of evaluating the impact of one alternative with another on a certain environmental component.

Qualitative interpretations were to be made regarding some environmental resources but problems emerged in association with the fact that no guidelines were given explaining what quality was. How does one measure or evaluate quality? What does quality consist of? Even though the P & S state that "it is not presently possible to anticipate or identify, much less measure, all environmental effects or change," the Bureau felt that more definitive measures were necessary if viable evaluation procedures were to be made. Thus the formation of their evaluation factors.

Other problems exist with implementing the environmental quality evaluation procedures that do not specifically pertain to the P & S but may be of interest and value to the reader. These problems are associated with the Bureau's implementation of their own procedures. It appears as though planning offices across the country are having difficulties interpreting and utilizing the evaluation procedures. Most of the problem seems to revolve around the use of their scale or weighting system. It is difficult to attach a true and meaningful value to an object or use when values can differ from region to region. These are interpretation problems that only time and experience can help alleviate.

The Bureau has also taken its evaluation system to public meetings and requested the public's input for evaluating

environmental impacts. This has proven to be a cumbersome and time consuming process. The Bureau has found that small groups containing professionals with expertise in pertinent areas of environmental concern produced more rewarding and useful results than did the general public groups.

C. U. S. Forest Service and the Soil Conservation Service

1. Methodology. The Forest Service and Soil Conservation Service use procedures developed by the United States Department of Agriculture to comply with the Principles and Standards. The guidelines[13] state how USDA agencies will implement the conceptual basis embodied in the P & S in planning water and related land projects.

Until the Water Resources Council publishes the government-wide procedures, the USDA procedures provide methods for carrying out the various levels of planning activities, including the selection of objectives, the formulation of alternative plans, the evaluation and measurement of beneficial and adverse effects, the comparison of alternative plans, and the selection of a recommended plan.

2. Components. The components of USDA's environmental quality objectives are identical to those recognized by the

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[13]USDA Procedures for Planning Water and Related Land Resources, USDA, March 1974.

P & S. When discussing the beneficial and adverse effects on environmental quality, USDA generalizes the categories given by P & S, and consequently leaves more responsibility to the planner to recognize and adequately evaluate the environmental effects.

3. Projections. The USDA guideline points out that P & S does not contain projections of environmental requirements, other than clean air and water standards. For USDA projects it is necessary to identify those specific features of the environment that will assure achievement of environmental surroundings which the general public considers acceptable. These environmental component needs are to reflect not only current preferences but should attempt to reflect preferences likely to prevail in the future.

4. Plan Formulation. USDA's guidelines closely parallel P & S in plan formulation elements, stressing participation from the public in all planning phases. One minor difference occurs here: The P & S recommends making available all plans, reports, data analysis interpretations, and other information for public inspection. USDA qualifies this statement further by adding the phrase, "not of a confidential nature."

5. Problems. One of the P & S implementation problems surfaced by the Forest Service involves utilization of existing agency laws and regulations. Such laws as the

Multiple Use Sustained Yield Act, may have conflicting purposes and evaluation determinants to those of the P & S. The planner must try to satisfy both requirements, leading to confusion and uncertainty in the planning process. And in relation to this same problem, the series of planning steps set forth by P & S does not include a step or checkpoint in the planning process to include an agency's implementation of its own requirements and duties ascribed by law.

D. National Park Service.

1. Methodology. Because the National Park Service is occasionally required to prepare plans for new area proposals in accordance with the Principles and Standards, guidelines[14] were developed to assist NPS planners in applying the P & S process. This is done by relating them to the NPS and its park masterplanning program and by further explaining and interpreting them.

Section I, B, 2 of the Standards indicate that the P & S apply to the planning and evaluation of the effects of Federal assisted programs and projects including national parks. The National Park Service will apply the planning process outlined in P & S only to areas proposed for addition

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[14]National Park Service, Draft Guidelines for Application of the Water Resources Council's Principles and Standards for Water and Related Land Resources, April, 1975.

to the National Park System when these proposals conflict with possibilities for development of water resource projects of probable national importance. National importance would be attributed to a program or project if it would have the potential of increasing the value of the nation's output of goods and services and of improving national economic efficiency. The P & S need not be applied in cases involving a conflict between a new NPS proposal and a potential water resource development of region,a but not national, significance. The NPS Regional Directors, in consultation with their counterparts in the Bureau of Reclamation and the U. S. Army Corps of Engineers, will determine which new area studies are to be conducted in accordance with the P & S.

2. Levels of Planning. The P & S apply to all three levels of Federal water resource planning. In Level A--Framework Studies and Assessments--the NPS contributes but does not have a leadership role. In Level B--Regional or River Basin Plans--the NPS role usually involves assessment of cultural and visual resources. Level C--Implementation Studies--would include planning for a National Park System new area proposal.

3. Environmental Quality Objective (EQ). The NPS recognizes that the EQ objective recently has become a major concern in water resource planning, primarily because of changing values and demands of the public and an apparent

unwillingness by society to accept further environmental deterioration in exchange for additional goods and services. Environmental Quality is enhanced by the management, conservation, preservation, creation, restoration, or improvement of the quality of certain natural and cultural resources and ecological systems in the area under study and elsewhere in the Nation. The NPS has specific expertise in the analysis of environmental quality components and should be able to further develop existing skills toward the realization of a leadership role in environmental quality determinations.

4. Plan Formulations. The NPS guidelines emphasize the EQ objective in the plan formulation process. During the evaluation of resource capability, the NPS states that the analysis should include the geographic availability of the particular resource, its unique qualities, spatial distribution, and relative importance. It is further stated that the evaluation provides the opportunity for the NPS planner to point out the need for providing protection, improved management, and possible rehabilitation of threatened or scarce resources.

The guidelines go on to discuss the formulation of alternative plans including tradeoffs between the NED and EQ objectives and selection of a recommended plan. This discussion closely follows the process described in the P & S. Where a "no development" plan is selected, the NPS recognizes

that positive action and cooperative planning is nonetheless required to assure realization of desired future conditions. Agencies and bureaus such as the NPS will be intensely concerned with the production of a plan maximizing EQ objectives. While the selected plan should have national economic development benefits, a plan with less than unity benefit-cost balance can be chosen as long as the net deficit does not exceed the benefits foregone and the additional cost incurred from the EQ objective (see pages 106-107 of the P & S).

5. Period of Analysis. The period of analysis or planning time frame suggested by NPS for the EQ objective would be to achieve a level of environmental quality during or at the end of the NED period of analysis and to maintain this level into the indefinite future. Appropriate qualitative and quantitative considerations of long term environmental factors which would extend beyond the period of analysis would be listed in the accounting process.

6. Components. The NPS discussion of this segment is reproduced here:

> The environmental objective is enhanced by the management, conservation, preservation, creation, restoration, or improvement of the quality of certain natural and cultural resources in the immediate area of analysis and throughout the Nation. The P & S recognizes the explicit need for diverting an increasing portion of the Nation's resources from production of conventional market-oriented goods and services to accomplishment of environmental objectives. The environmental objective reflects man's awareness of the spiritual, psychological, recreational, and material needs of man, and his concern with the quality of the natural-biological system which sustains all life. Components of the environmental objective are:

1. Management, protection, enhancement, or creation of areas of natural beauty and human enjoyment such as open and green space, wild and scenic rivers, lakes, beaches, shores, mountains and wilderness areas.
2. Management, preservation, or enhancement of especially valuable or outstanding archoelogical, historical, biological, and geological resources and ecological systems.
3. Enhancement of quality aspects of water, land, and air by control of pollution and prevention of erosion.
4. Avoiding irreversible commitments of resources to future uses.
5. Additional components should be explicitly identified and given proper accommodations in the planning process. Given the broad and pervasive nature of environmental quality, it is not practical to specify here all possible components of the objective.

Information for the determination of beneficial and adverse effects of alternative plans on the components which have been chosen for a specific planning activity can be partially derived from the NPS Resource Basic Inventory (RBI). An RBI should be compiled for the proposed new area which would include sufficient data to complete the display accounts of the P & S. Significant additions to the RBI framework would be necessary in the economic and social categories. The inventory of physical, biological, and environmental quality characteristics probably will provide sufficient information for the environmental quality accounting process with the exception of natural beauty and landscape aesthetics (see NPS Handbook, RBI, May 1974). Methods of identifying, quantifying and evaluating landscapes (natural beauty) are being developed by the NPS for use in Level B studies, and by other agencies and private concerns. Acceptable methods need to be established by the NPS and included in the RBI to be used as a basic planning tool.

7. Projections. The NPS does not incorporate any guidelines for interpretation of EQ projections; however, it is stated in the NPS guideline draft that planners must be familiar with the P & S and should refer to them directly.

8. Problems. Since the P & S were prepared to guide Federal water resources planning activities, the National

Parks Service planning does not always come under the P & S jurisdiction. The NPS considers proposed national parks and recreation areas; and wild, scenic, recreational river areas to be water resources related only when establishment of such areas would significantly affect the amount and availability of water which could serve other uses, resulting in National Economic Development values foregone. Thus far, NPS has not applied the P & S planning process to any of its projects.

There is also a strong doubt whether the NPS has the capability or orientation for determining the optimal NED plan. The status quo is not the optimal NED plan. The market value of land is only one of the elements of production which must be included in developing the greatest economic level of production. NPS does not have the expertise for determining the optimal level or use for economic production nor for determining those elements and their costs, other than land which must be included.

E. U. S. Fish and Wildlife Service

1. Methodology. Few of man's activities affect the quality and quantity of fish and wildlife resources as significantly as Federal water resources development and management. Therefore, it is essential that all species of fish and wildlife be given adequate consideration in Federal water and related land development.

Numerous laws, policies, and regulations have been developed over the years for the purpose of protecting fish and wildlife resources. In 1973, the Principles and Standards for Planning Water and Realted Land Resources (P & S), adopted by the Water Resources Council, established a "full environmental partnership" in planning water related land resource development. An essential ingredient is the assurance that fish and wildlife and their related habitats receive adequate consideration in plan formulation and evaluation.

2. Comparison Analysis. The U. S. Fish and Wildlife Service is called upon by various Federal agencies to determine what effect government projects have on fish and wildlife resources, but are not usually involved in NED and other EQ objectives of P & S.

Consequently, the Fish and Wildlife guidelines for P & S implementation deal primarily with ecological resource evaluation rather than environmental quality objectives in general.

Basically, the process of evaluating the ecological resources is very similar to that put forth by Mr. Gary Hickman, who at the time of writing the techniques in the P & S training manual was employed by the Fish and Wildlife Service (synopsis provided in Exhibit 2 of this paper).

3. Objectives. The Fish and Wildlife Service presents some introductory statements in their Ecological Planning and Evaluation Procedures which help set the stage for ecological evaluation in the planning process.

The objectives of resource planning is discussed as follows:

> A basic objective of water and related land resources planning is that fish and wildlife habitat losses will be prevented, mitigated or compensated by the lead agency. Historically, water development projects have resulted in fish and wildlife habitat destruction with varying effects on fish and wildlife populations. The only meaningful way to mitigate (lessen) such project losses is to increase the habitat carrying capacity of other lands to a level sufficient to offset habitat losses affected by the project. This can be achieved only by intensive management of like habitat-types or ecosystems. Fish and wildlife habitat losses will be calculated in habitat units and should be replaced in kind. Under the NED or MOP process, EQ features will not be considered to be enhancement until all other adverse effects of the plan are adequately mitigated or compensated for. In keeping with the policy of mitigating habitat losses in kind whenever possible, habitat unit losses in one planning segment may not be compensated by providing another planning segment containing different habitat-types, unless it is infeasible to do otherwise.
>
> An underlying assumption of these guidelines is that almost all land and water has some habitat value - with or without water resource development. Habitat values can be determined on a relative numerical scale of 1 to 10 by fish and wildlife biologists familiar with the ecosystems present in the area. Furthermore, an empirical approach, using non-parametric measures, is considered valid for numerically expressing mitigation or compensation requirements when measured as the difference between existing or projected habitat carrying-capacity and that attainable by implementing appropriate fish and wildlife habitat management practices.

4. Other Pertinent Discussion.[15]

a. Public and Interagency Participation is discussed as follows:

When a new planning effort starts, the public and interested governmental agencies (State and Federal) should be notified immediately by the lead planning agency in order that an early coordinated Introductory Public Meeting date can be set. The advance time required will vary from project to project because of variabilities in the complexity and size of the proposed planning area. The lead time should be negotiated using a general planning network approach. The lead time may range from 1 to 12 months.

At a minimum, participants representing each major component area of the two national planning objectives should be strongly encouraged to present a paper or statement which sets out their views and needs in a clear and logical manner. The authors should be instructed to focus on the component needs of the planning area from their interest viewpoint with the aid of a preliminary with-and-without analysis. The component needs should be briefly substantiated with background data and stated concisely in terms of outputs needed.

Interested governmental agencies, including the major planning agency, should also present papers at the Introductory Public Meeting.

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[15]This material is included for general background information.

The major planning agency should publish and widely distribute the proceedings of the Introductory Public Meeting.

A citizens advisory committee should be selected, with representatives from each of the principal interest groups at the Introductory Public Meeting. The representatives on the citizens' advisory committee should be equally divided between the two national planning objectives (NED and EQ). The citizens advisory committee should be asked to assist in arranging the complementary component needs in formulating first cut NED and EQ plans.

After the first cut NED-EQ plans are formulated AND evaluated in the four accounts, outlines of alternative plans should be developed with the help of the citizens advisory group.

This package--including the NED and EQ plans and four evaluation accounts and the outlines of any other alternative plans which may be "shaded" in between--should be puslished and widely distributed and a second public meeting entitled "Alternative Review" should be scheduled to address outlines of multi-objective plans to narrow the field and to get some consensus on priorities.

The proceedings of the Alternative Review Public Meeting will be published along with the priorities identified for multi-objective planning. This should be distributed widely among the public and to interested organizations and

agencies with a 60-day public review and comment period. The planners, with the consultation of the citizens' advisory group, should then formulate and evaluate a multi-objective plan or plans.

Once the point is reached where the tentative recommended solution can be proposed, the Draft EIS will be prepared. A draft report documenting the tentative recommendations and alternative plans will be published. Both documents will be available for review and comment at least 30 days prior to the holding of a Final Review Public Meeting. At this meeting planners will present their plans to the public and answer questions.

All special groups, citizens, State and Federal agencies will have 30 days following the Final Review Public Meeting to submit formal comments on the Draft EIS and the Draft Project Report. Based on these comments the final EIS will be prepared and filed with the Council on Environmental Quality (CEQ) and the Project Report with the final recommended plan will be completed. Public comments should be summarized, analyzed, and published along with the EIS and the Project Report. The EIS and Project Report, with comments, will be furnished Congress for its use in considering authorization or other disposition.

b. Ecological Resources Evaluation and Planning Sub-Team Composition is discussed as follows:

As determined by the activities scheduled by a Federal water resource development agency (BR, COE, or SCS) the State

fish and wildlife agency and the U. S. Fish and Wildlife Service will, within available funding and manposer limitations, assign personnel to the sub-team on Ecological Resources Planning and Evaluation. The team will evaluate proposed water and related land resource planning areas and develop and coordinate appropriate ecological resources plans.

As a minimu, the team should be composed of a biologist each from the State fish and wildlife agency and the U. S. Fish and Wildlife Service. From a practical standpoint, a fish and wildlife biologist from both agencies ideally should be involved in the evaluation and planning process.

c. Establishing Planning Area Boundaries is discussed as follows:

The Environmental Quality team will tentatively establish geographic boundaries for the EQ planning area which should usually coincide with those of the National Economic Development (NED) planning area. However, the EQ planning area boundaries may differ in order to adequately cover EQ planning and evaluation needs.

Tentative boundaries are necessary since resources in the EQ planning area have yet to be inventoried or evaluated. Depending on the resources identified and their interrelationships, the final EQ evaluation and/or planning area boundary may be adjusted later to encompass interdependent portions of the ecosystems involved.

d. Basic Responsibilities of the Construction Agency to EQ Planning and Evaluation Team is discussed as follows: The construction agency should provide:

1. Current planning area maps and aerial photo mosaics as necessary for evaluation and planning purposes. The scale of the aerial photo mosaic must be equal to or greater than 4" to the mile. Aerial photo mosaics are also necessary for areas affected directly and indirectly and for lands potentially to be considered for mitigation or compensation of adverse effects. To evaluate the effects of economic plans on ecological resources, discrete planning segments such as conservation pool, flood pool, takeline, etc. should be delineated or overlaid on the aerial mosaic as soon as possible.

2. Realistic land-use, economic and population information and projections "without-a-project" based on reliable identified studies.

In the event the EQ team finds the projections unacceptable and the differences cannot be resolved, the EQ team, utilizing its professional knowledge of existing or future conditions, may find it necessary to modify or adjust the projections.

3. Data showing expected project-caused or induced changes in land and water use for the project area affected (including external types) over the full planning period by selected target years.

5. Problems. The U. S. Fish and Wildlife Service has a problem with having to utilize the different guidelines of agencies for whom they are working. Once the uniform guidelines are compiled by the Water Resources Council and participating Federal agencies, that problem should be alleviated. Fish and Wildlife employees have expressed concern over compromises on EQ objectives, and doubt whether consensus can be reached between their agency and construction agencies. At best, uniform guidelines are not expected before 1977.

Another problem involves the interpretation of where to place a specific resource--whether in the NED account or the EQ account. For instance, the production of deer belong in the EQ account until such time the deer are harvested by hunters, moving it into the recreational benefits, and therefore, into the NED account.

Some modification to Mr. Hickman's original habitat unit evaluation has evolved and will probably continue to change as experience is gained in its use of determining ecological resources.

F. Bureau of Land Management

1. Methodology. The Bureau of Land Management (BLM) foresees minimal involvement with the P & S because the agency's primary duty is management of areas rather than planning new projects. The guidelines that BLM has prepared

for implementation of P & S contain the following criteria and activities which necessitate P & S compliance:

Criteria

a. The action requires an Environmental Impact Statement because of the water aspects:
   (1) significant effects on water use;
   (2) significant effects on water quality.

b. Exceed estimated development costs of $500,000, including costs for planning, survey, design, and construction.

c. Would have a significant effect on National Economic Development objective:
   (1) Preliminary estimates would be required using appropriate accounts (NED, Reg'l Dev., Social Well-Being, or EQ).
   (2) BLM planning system documents and activity plan use of P & S concepts would provide basis for preliminary estimates of NED effects.

d. Is a defined critical community watershed

Bureau Activities Involved. Subject to any two of the criteria above.

a. Watershed.

b. Recreation
   (1) water oriented recreation, and
   (2) wilderness classification.

c. Wildlife - water oriented habitat development, including wetland and estuary projects.

d. Other activities to be determined.

The BLM states that the Bureau's Planning System (BPS), including revisions which are currently being implemented, describe a planning process similar to the one described by the Principles and Standards. Their BPS will, when fully implemented, meet the intent of the P & S while improving upon handling environmental components which, upon the final analysis, should dovetail better with existing environmental procedures.

The improvement statement stems from the fact that their Ecological profile approach to planning (BLM's counterpart to the EQ objective) described and analyzes

> the total resource in the planning area by examining the ecosystem components as they function in interwoven cycles within geographic settings whereas the Principles and Standards calls for a look at only those environmental components that are significantly related to the use and management of the resources.[16]

2. Comparison Analysis. Because of the BLM's uncertainty as to what the future holds as far as P & S involvement is concerned a concerted effort was not made to compare the BLM's Ecological Profile with the entire range of components set forth by the P & S for evaluating the EQ objective. The ecological profile satisfies at this point in time their immediate involvement with implementation procedures.

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[16]Excerpt from "BLM Implementation of the Water Resources Council Principles and Standards for Planning of Water and Related Land Resources."

But a brief comparison shows that the BPS, including revisions currently being implemented, describes a planning process with some similarities to the WRC process.

Each system includes an identification of needs and problems. Alternatives are also recommended in each system for evaluating their contribution to objectives. Both are concerned with the improvement of the quality of life through contributions to NED and EQ.

The major differences are methodology. The P & S require a plan for optimum contribution to NED and an alternative plan to emphasize EQ. The BPS does neither of these. The BPS provides a range of alternatives from each activity that are in one plan. Recommendations from each of the seven resource activities respond to National Policy and Guidance. Policy statements are responseive to both NED and EQ.

While the BLM is still in the process of finalizing procedures to implement P & S (if implementation is necessary given the above criteria) they have attempted to utilize the guidelines contained in the P & S on one project. With no qualifying directives given their district office, a test of the application of the P & S was conducted. The results of this test case for the EQ account is enclosed as Exhibit 7.

3. The Objective. The objective of the P & S was described in Section II. The objective of the BLM's Unit Resources Analysis System in which their Ecological Profile is contained is as follows:

> Provide a comprehensive analysis of inventory data, resource problems, conditions, uses, production, quality, capabilities, and management potential for use in preparing Management Framework Plans. Provide summarized resource information pertinent to making land-use decisions as a unit, in one place, and for use in all other phases of resource management, including public contact. Provide a means of achieving continuity in resource data retention and maintenance.[17]

4. Projections. EQ projections were not made by the BLM.

5. Problems. Basically, the Bureau of Land Management is concerned with the meaning of the P & S and its effect on the Bureau. They feel that the P & S is a document better geared for those agencies involved in water resource planning and not a management agency such as the BLM.

Although the BLM takes the position that the Bureau Planning System, when fully implemented, meets the intent of the P & S for most purposes. They feel it is clear that those BLM activities which are primarily water oriented require additional analysis. In this context, "water oriented" activities are those for which the main objective is the protection, enhancement, or maintenance of water quantity or quality. Being a management agency with minimal water oriented planning tasks the BLM anticipates little involvement with implementing the P & S.

Furthermore, the BLM is operating under management laws which sometimes conflict with P & S objectives. This conflict hinders any planning work toward implementing the P & S.

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[17]Excerpt from "United States Department of the Interior, Bureau of Land Management, 1605 - Unit Resource Analysis," 4/17/75 .02 Objectives.

IV. SUMMARY AND CONCLUSIONS

A. Comparison Analysis

As a basis for comparison, this paper has presented a specific interpretation of the guidelines for implementation of the EQ objective of the P & S for Planning Water and Related Land Resources as set forth in the Federal Register by the Water Resources Council (WRC) and supplemented by portions of the Manual for Training in the Application of the Principles and Standards of the WRC. Among the seven different agency directives reviewed for compliance with this interpretation of WRC guidelines, three closely followed P & S in the evaluation of all EQ objectives--those of the Bureau of Reclamation, U. S. Forest Service, and the Soil Conservation Service. The National Park Service, the Fish and Wildlife Service and the Bureau of Land Management felt that only partial compliance was necessary, mainly because of conflicts between P & S requirements and the requirements of the authorizing legislation of the agencies involved.

The remaining agency, the Corps of Engineers, was in between these two groups in compliance procedures. The Corps worked toward compliance of the P & S and like the Bureau of Reclamation, Forest Service and SCS, the Corps recognized the four components utilized for evaluating the EQ objective.

But unlike these agencies the Corps developed evaluation criteria around procedures previously or recently developed for environmental assessment plus new methods for displaying the EQ account.

The above information contains a synopsal account of how the various agencies complied with the directives set forth in the P & S. A more detailed comparison can be gained by comparing the material in the Exhibits with the agencies reviewed.

B. General Problems

Before leaving the subject of environmental quality a discussion of some of the more general problems associated with measuring beneficial and adverse effects on EQ is needed. Although these problems were not specifically discussed under any of the individual agencies in Section III they are relevant to agency guidelines.

1. Irreversibility. Of all the methodologies set forth by the Principles and Standards for measuring beneficial and adverse effects on environmental quality, the component which requires consideration of the irreversible commitment of natural resources has received the least attention in agency guidelines.

The standards require the evaluation of "effects resulting from the preservation of freedom of choice to future resource users by actions that minimize or avoid irreversible

or irretrievable effect." They also "emphasize the need for a cautionary approach in meeting development and use objectives in order to minimize or preclude the possibility of undesirable and possible irreversible changes in the natural environment." The Manual for Training in the Application of Principles and Standards "suggests that prudence be exercised in the allocation of resources when such actions approach the irreversible." However, neither directive contains a discussion of the methodologies for measuring the effect of irreversibility. This inadequacy has alos been mirrored in agency guidelines as shown by their lack of consideration of this component.

Admittedly, the problem of irreversibility is more often implicit than explicit in environmental analysis, and therefore, is hard to express in quantitative measures. How then can an evaluator determine whether an action will result in an irreversible commitment? There are two dimensions to the problem--time and cost--which can be partially substituted for one another. Some actions, such as polluting air and water (though not necessarily the damages resulting from the pollution) can be reversed relatively quickly but at significant costs. Others, such as the regeneration of a forest, require a lot of time but not great amounts of money. Still, others, such as strip mine reclamation, require both money and time. On the other hand, the death of a person or species is absolute and cannot be reversed. Other actions--

urban sprawl, the filling of wetlands--often called irreversible, can be reversed by spending great amounts of both time and money. Buildings can be razed, the land returned to its original contours, and an acceptable, if not the original, pattern of vegetation reestablished. In a sense, almost every action or activity is at least partially irreversible. There is some cost involved in any reversal. And at an extreme, it is usually impossible to reproduce in exact detail every condition existing prior to an activity. However, as the item is commonly used, an irreversible situation may be defined as one in which the time or cost of satisfactory reversal is so high that it will probably not be undertaken. Another problem is that some day we may wish that the resource had remained in its natural state. The point is that we do not know all the ramifications of our actions, nor do we know the value that future generations would place on a natural resource that no longer exists.

An important practical consideration is whether there are other like-resources available to substitute for the resource being irreversibly committed. For instance the irreversible committment of a trout stream in Colorado is likely to be less serious than the commitment of a similar stream in Iowa. The former has many substitutes, the latter few. Similarly, commitment of an acre of open space in the Great Plains is surely less serious than commitment of an acre of open space in the middle of a city park.

Before making decisions which result in an irreversible commitment of resources, one must analyze the availability of substitutes, the cumulative effects of many small irreversible commitments, and the future value to society of resource preservation. In addition, one should favor those alternatives which retain the greatest latitudes for further action. Reversibility of action should be counted as a major benefit and irreversibility as a major cost. The future is critical to current decisions especially when they have irreversible consequences--consequences that cannot be undone except at great cost over long time periods. A logical selective approach would involve ranking alternative courses of action according to their reversibility. Reversible actions should be taken first during which time research could be focused on a careful study of the more irreversible options. Highly irreversible decisions should be avoided insofar as possible, but since such commitments are often required, they should be delayed as long as possible to provide time for research and analysis. When a choice must be made among highly irreversible options, then the one that contains the broadest set of satisfactory outcomes should be selected.

2. Environmental Projections. The P & S are somewhat lacking in providing projections of EQ as is provided for the National Economic Development objective (except for air and water standards as prescribed by law). Along with the absence of projections, there are no value guidelines for EQ.

Consequently the planner and decision maker is left with their own interpretations on whether enough EQ commodity is attained and whether future needs in EQ will be satisfied.

In addition to the information provided by Mr. Bishop in the "Manual for Training in the Application of Principles and Standards" as set forth in Section II of this paper, the following contains some questions which should be answered:

a. How much open and green space should be provided in a given acreage of development, and how much can adequately be maintained?

b. What are some of the useful limitations of lakes, beaches, estuaries, rivers, and other areas of natural beauty for various human experiences and wildlife habitat?

c. What constiutes significant or valuable archeological, historical, biological and geological resources?

d. From an economic and biological sense, are all species equally significant?

e. In relation to land use planning, what social, political, and physical limits should dictate or take precedence in plan formulation?

Value standards of an EQ nature must be general and flexible, but guidance of this kind is necessary to obtain a common denominator in evaluating alternative plans.

3. Objectives. In closing, a final question must be asked--How many objectives?

Considering the growing national and international concern of the potential environmental deterioration from population growth and increased pressures for exploiting natural resources, a strong case can be made that it is superior to explicitly plan water resources to attain at least the two objectives of NED and EQ than to emphasize only NED. Where important conflicts in use occur, it is important that before a course of action is selected alternative plans emphasizing each of the two objectives be available for scrutiny. The complexities of formulating separate plans to emphasize each of four objectives including RD and SWB, which in themselves are admittedly difficult to measure, would tend to compound the perplexities of the planning process. Yet, experience suggests that water planning settings are sufficiently different that competitive objectives may involve more than NED or EQ.

There are certain planning areas, such as sparsely settled areas in the plains of central and northwestern United States, where EQ may not be as important a national issue as serving components of RD or SWB or elements of both. If water developments are justified at all in such areas, the choice may be between a very limited development meeting the rather restrictive monetary benefit-cost criteria of the NED objective or a broader plan with portions of the costs

justified by the RD and/or SWB benefits. These kinds of conditions speak for a compromise which would permit the combining of components under the objectives discussed initially as RD and SWB to provide a third objective. To avoid some of the hangups already associated with the term "RD" perhaps this third objective could be labeled "social equity," "balanced development," or somethings else.

A number of factors and precedents can be cited as possible support for a three-objective approach. For example, there are several social programs in the United States involving assistance to depressed economies, sparsely populated rural areas, and areas of persistently low incomes. In some instances, water resource developments may prove as important catalysts in improving living conditions. Often available resources in sparsely settled areas are limited to water and land, and public investment to combine the two into useful production may be the only logical avenue for development. Outstanding examples are water projects in the United States under construction or recently authorized to serve objectives other than NED or EQ in order to alleviate conditions in economically depressed areas with persistently low income. Some of these are located on American Indian Reservations.

In less developed countries there are often significant areas that are in need of social programs to enhance standards of living which would also warrant the consideration of a third objective. Social well being and regional

development could very well be viewed as significantly more important than environmental quality. Once the basic needs of life and experience are met, greater attention may be given to environmental concerns. Costly measures to serve environmental objectives in water planning may be thought of as luxuries of more affluent societies.

Growing world crises in energy and food production suggest that exclusive reliance on monetary benefits related to simulated market prices or the willingness-to-pay concepts under the NED criteria may not recognize broader national goals and international considerations. The role of water projects in establishing adequate levels of food and fiber, contributing to world food reserves, and assisting in maintaining healthy trade balances has yet to be defined. In light of these current developments, some additional flexibility other than that offered by a two-objective NED-EQ approach, may prove prudent in formulating water resource plans.

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EXHIBITS

EXHIBIT 1

CLASSES OF ENVIRONMENTAL EFFECTS

COMPONENT #1

Beneficial effects resulting from the protection, enhancement, or creation of open and green space, wild and scenic rivers, lakes, beaches, shores, mountain and wilderness areas, estuaries, or other areas of natural beauty.

With regard to these kinds of resources, beneficial effects on this component of the environmental quality objective are evaluated on the basis of data such as follows, though these are not all inclusive:

1. Open and green space. These are essentiall undeveloped, visually attractive natural areas strategically located where most needed to ameliorate intensifying urbanization patterns.

a. Size and measure:

(1) Total acreage (woods, fields, meadows, etc.);

(2) Pattern and distribution;

(3) Juxtaposition to community and urban areas (effect on urban sprawl).

b. A descriptive-qualitative interpretation, including an evaluation of the effects of a plan on the designated or affected open and green space.

c. Improvements:

(1) Accessibility (mileage of public roads or trails provided; easements):

(2) Public amenities (provision for limited facilities, if any);

(3) Other (specify or describe).

d. Protection and preservation:

(1) Physical (fire, bioenvironmental, etc.);

(2) Legal (dedication, easements, institutional, etc.);

(3) Special.

2. Wild and scenic rivers. These are free-flowing streams, with shorelines or watershed essentially or largely undeveloped, which possess outstandingly remarkable scenic, recreational, geological, fish and wildlife, historic, cultural, and other features.

a. Size and measure, including characterization of adjacent primitive or near natural setting:

(1) Total mileage;

(2) White water mileage;

(3) Water quality;

(4) Character and extent or acreage of streamside land;

(5) Juxtaposition to community.

b. A descriptive-qualitative interpretation, including an evaluation of the effects of a plan on the designated or affected wild or scenic river.

c. Improvements:

(1) Accessibility (trails, infrequent roads, or other minimum public access provided; easements);

(2) Public amenities (provision for limited facilities, as boat launching, picnic areas, if any);

(3) Other (specify or describe).

d. Protection and preservation:

(1) Physical (bioenvironmental);

(2) Legal (dedication or withdrawal, institutional, water quality standards, etc.);

(3) Special.

3. Lakes. Where their clarity, color, scenic setting, or other characteristics are of special interest, aesthetically pleasing lakes contribute to the quality of human experience.

a. Size and measure:

(1) Surface acreage;

(2) Shoreline mileage;

(3) Depths;

(4) Water quality.

b. A descriptive-qualitative interpretation, including an evaluation of the effects of a plan on the designated or affected lake or lakes.

c. Improvements:

(1) Accessibility (public roads and trails; easements);

(2) Drainage;

(3) Cleaning;

(4) Shoreline management, including public amenities;

(5) Other (specify or describe).

d. Protection and preservation:

(1) Physical (bioenvironmental);

(2) Legal (institutional, pollution standards, etc.);

(3) Special.

4. Beaches and shores. The juxtaposition of attractive beaches, distinctive scenic shorelines, and adjacent areas of clean offshore water provides positive public aesthetic values and recreational enjoyment.

a. Size and measure:

(1) Mileage;

(2) Acreage;

(3) Marshland acreage;

(4) Embayments.

b. A descriptive-qualitative interpretation, including an evaluation of the effects of a plan on designated or affected beaches and shores.

c. Improvements:

(1) Accessibility (public roads and trails; easements);

(2) Public amenities;

(3) Nourishment;

(4) Other (specify or describe).

d. Protection and preservation:

(1) Physical (jettys, bulkheads, etc.);

(2) Legal (dedication, institutional, etc.);

(3) Special.

5. Mountains and wilderness areas. Generally occurring at higher altitudes, these pristine areas of natural splendor and scientific interest embrace a very special category of land use. Such areas are designated for the purpose of preserving primeval conditions, as nearly as possible, for aesthetic enjoyment and for limited forms of recreation and other scientific uses.

a. Size and measure:

(1) Acreage;

(2) Biological diversity;

(3) Pattern and distribution;

b. A descriptive-qualitative interpretation, including an evaluation of the effects of a plan on the designated or affected mountain and wilderness area.

c. Improvements:

(1) Accessibility (limited public roads and trails);

(2) Public amenities (limited facilities provided, if any);

(3) Other (specify or describe).

d. Protection and preservation:

(1) Physical (fire, bioenvironmental, etc.);

(2) Legal (dedication, institutional, etc.);

(3) Special.

6. Estuaries. Beyond their critical importance in man's harvest of economically useful living marine resources, many estuaries, coves, and bays merit special consideration as visually attractive settings that support diverse life forms of aesthetic value and as marine ecosystems of special interest.

a. Size or measure:

(1) Surface acreage;

(2) Shoreline mileage;

(3) Marshland acreage and shoreline mileage.

(4) Water quality.

b. Biological significance as a nursery, breeding, and feeding ground (name species involved).

c. A descriptive-qualitative interpretation, including an evaluation of the effects of a plan on the designated or affected estuary.

d. Improvements:

(1) Accessibility;

(2) Public amenities (facilities provided, if any);

(3) Other (specify or describe).

e. Protection and preservation:

(1) Physical;

(2) Legal;

(3) Special.

7. Other areas of natural beauty. These include any other examples of nature's visual magnificence and scenic grandeur, not accommodated in the above-specified classes, which have special appeal to the aesthetic faculties of man.

a. Size or measure:

(1) Acreage;

(2) Mileage.

b. A descriptive-qualitative interpretation, including an evaluation of the effects of a plan on designated or affected areas of natural beauty.

c. Improvements:

(1) Accessibility (public roads and trails; easements);

(2) Screening;

(3) Plantings (seedlings, grassed cover, etc.);

(4) Public amenities (scenic overlooks, if any);

(5) Other (specify or describe).

d. Protection and preservation:

(1) Physical (fire, bioenvironmental, etc.);

(2) Legal;

(3) Special.

Conversely, and in a generally parallel manner, adverse effects of a plan result from the inundation, adverse alteration, or decreases in the availability, use, and aesthetic quality of these resources.

COMPONENT #2

Beneficial effects resulting from the preservation or enhancement of especially valuable archeological, historical, biological, and geological resources and selected ecological systems.

Excluding ecological systems which are separately evaluated below, beneficial effects on this component of the environmental objective are evaluated on the basis of data such as follows, though these are not all inclusive:

1. Archeological resources. Preservation of these resources provides a continuing opportunity for studying the development of human settlements and understanding man's cultural heritage.

   a. Size or measure:

      (1) Acreage;

      (2) Square footage;

      (3) Height or depth from ground level.

   b. A descriptive-qualitative interpretation including an evaluation of the effects of a plan on the designated or affected archeological resource areas.

   c. Educational:

      (1) General education;

      (2) Special and scientific.

   d. Improvements:

      (1) Accessibility (public roads and trails, easements);

(2) Interpretation and monumentation;

(3) Other (specify or describe).

e. Protection and preservation:

(1) Physical;

(2) Legal (dedication, other);

(3) Special.

2. Historical resources. Preservation of these resources provides for the study, understanding, and appreciation of the Nation's origins and the evolution of its institutions as well as its scientific and technical progress.

a. Size and measure:

(1) Acreage;

(2) Number of units (of whatever kind).

b. A descriptive-qualitative interpretation, including an evaluation of the effects of a plan on the designated or affected historical resource area.

c. Educational values:

(1) General education;

(2) Specialist.

d. Improvements:

(1) Accessibility (public roads and trails; easements);

(2) Availability (as appropriate to particular site or materials preserved);

(3) Interpretation and monumentation;

(4) Other (specify or describe).

e. Protection and preservation:

(1) Physical;

(2) Legal (dedication, other);

(3) Special.

3. Biological resources. The opportunity to observe and study biological resources - - terrestrial and aquatic - - leads to an enlarged understanding and appreciation of the natural world as the habitat of man.

a. Size and measure (wide variation depending on characteristics of particular animal or plant):

(1) Total land and surface acreage and shoreline mileage;

(a) Land acreage (forest, woodland, grassland, etc.);

(b) Water surface acreage and shoreline mileage;

(c) Marshland acreage and shoreline mileage.

(2) Population estimates and characteristics of fish and wildlife to include as nearly as possible:

(a) Age and size classes;

(b) Sex ratios;

(c) Distribution (density).

b. A descriptive-qualitative interpretation, including an evaluation of the effects of a plan on the designated or affected biological resource or resources.

c. Educational:

(1) General;

(2) Special and scientific.

d. Improvements:

(1) Accessibility (public roads and trails; easements;

(2) Habitat enhancement or site improvement:

(a) Sanitation;

(b) Stabilization;

(c) Increasing edges;

(d) Harvesting (to maintain balance with environmental food supply);

(e) Cover planting (species, including number or acreage);

(f) Stocking:

(i) Wildlife (species and number);

(ii) Fish (species and number);

(3) Other (specify or describe);

e. Protection and preservation:

(1) Physical;

(2) Legal (dedication, other);

(3) Special.

4. Geological resources. When of outstanding geologic or geomorphologic significance, preservation of these resources contributes to man's knowledge and appreciation of his physical environment.

a. Size and measure:

(1) Surface acreage;

(2) Subsurface acreage (estimated);

(3) Quantity (estimated in appropriate units).

b. A descriptive-qualitative interpretation, including an evaluation of the effects of a plan on the designated or affected geological resources.

c. Educational:

(1) General education;

(2) Special and scientific.

d. Improvements:

(1) Accessibility (public roads and trails, easements);

(2) Interpretation and monumentation;

(3) Other (specify and describe);

e. Protection and preservation:

(1) Physical;

(2) Legal (dedication, other);

(3) Special.

Conversely, and in a generally parallel manner, adverse effects result from the inundation, deterioration, or disruption of

like kinds of resources.

5. Ecological systems. Apart from the contributions which use of the natural resource base makes to man's basic needs for food, shelter, clothing, and employment opportunities, covered elsewhere, the environmental objective embraces the concept and appreciation of the values inherent in preservation of ecological systems per se.

Each natural area, such as a watershed, a vegetation and soil type, a tidal salt marsh, a swamp, a lake, or a stream complex, represents an ecosystem, an interdependent physical and biotic environment that functions as a continuing dynamic unit, possessing not only intrinsic values but also contributing to the enrichment of the general quality of life in a variety of subtle ways. Conversely, when such natural areas are lost or otherwise diminished in size or quality, there are corresponding adverse environmental effects borne by society.

Beneficial effects resulting from preservation of ecological systems include:

a. The maintenance of a natural environment in a state of equilibrium as an intrinsic value to society;

b. The provision of the purest form of aesthetic contact with nature;

c. Contributions to the development, appreciation, and integration of a "land ethic" or environmental conscience as a part of man's culture; and

d. Scientific understanding derived from the preserv
tion and study of natural ecological systems whic
contributes to the conservation of natural resour
in general, the most important practical applicat
of ecology.

Conversely, adverse effects are the reduction or loss of

portunity to society as a result of a plan.

COMPONENT #3

Beneficial effects resulting from the enhancement of selected quality aspects of water, land, and air by control of pollution.

1. Water quality. The beneficial effects of water quality improvements will be reflected in increased value to water users and will be recorded under the national economic development or regional development objective. For example, increases in the value of the Nation's output of goods and services from improvements in water quality will be accommodated under the national economic development objective. A great deal of improvement is needed in the methods of measuring these values.

There will be other water quality beneficial effects, however, that cannot be measured in monetary terms but are nonetheless of value to the Nation. Examples of such benefits are usually in the aesthetic and ecological areas so important to mankind. Beneficial effects from these kinds of improvements are contributions to the environmental quality account and are identified, measured, and described in nonmonetary terms.

Beneficial effects to the environmental quality account from water quality control may be defined in relation to the

State standards or goals established under the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). Reservoir storage and flow regulation for water quality may be utilized where it is the least-cost way of meeting these standards or goals.

Consistent with water quality standards or goals established for the affected planning area, water quality control beneficial effects are identified, measured, and described by methods and terms such as:

a. Physical and chemical tests including but not limited to:

(1) Dissolved oxygen;

(2) Dissolved solids;

(3) Temperature;

(4) Acidity/alkalinity;

(5) Nutrients.

b. Biological indicators including but not limited to:

(1) Coliform;

(2) Macro and micro organisms;

(3) Algae.

c. Description: By a descriptive-qualitative interpretation, including an evaluation of the effects of a plan on the aquatic community as a whole.

Conversely, adverse effects will be reflected as departures from the established water quality standards, including related

damages, as a result of a plan.

2. Air quality. Air pollution is primarily a regional problem stemming principally from urban centers containing concentrations of people, industry, and transportation. In addition to its diverse social impacts, air pollution causes direct injury to natural environments, including ground cover, trees, and wildlife. In its purely physical dimensions, air pollution is accommodated within the environmental objective.

Beneficial effects to the environmental objective from air quality control may be defined in relation to regional air quality standards established under the Clean Air Act of 1970.

Consistent with air quality standards established for the affected planning area, air quality control beneficial effects are identified, measured, and described by:

a. The amount and use of open space between sources of air pollution and concentrations of people to assist in the process of atmospheric dispersion and dilution.

b. Reductions in the use of fossil fuels.

c. Reductions in damages to:

(1) Wildlife:

(a) Species;

(b) Number or density;

(c) Distribution;

(d) A descriptive-qualitative interpretation and evaluation of effects as appropriate.

(2) Ground cover:

(a) Species;

(b) Acreage and density;

(c) Distribution;

(d) A descriptive-qualitative interpretation and evaluation of effects as appropriate.

(3) Forests:

(a) Species or types;

(b) Acreage:

(c) Growth rates;

(d) Distribution;

(e) A descriptive-qualitative interpretation and evaluation of effects as appropriate.

(d) Enhancement of possibilities for visual enjoyment and aesthetic appeal of natural settings and scenic landscapes.

Conversely, adverse effects will be reflected as departures from established air quality standards, including related damages, as a result of a plan.

3. Land quality. Where erosion is prevalent or spreading - largely because of inadequate land use planning and management -

it, among other things, seriously detracts from the general use, appreciation, and enjoyment of terrestrial and aquatic environments.

As encompassed in the environmental quality objective soil is valued as a basic national resource rather than for its traditional role as a primary production factor contributing to increases in national output.

Beneficial erosion control effects improving the visual attractiveness of the natural landscape include:

a. Reductions in sediment on beaches and public recreation areas;

b. Reductions in turbidity and sediment pollution of water in rivers, streams and lakes;

c. Restoration of cull banks from strip mines and other eroded sites;

d. Bank stabilization on mainline and secondary roads.

Conversely, adverse effects will reflect any increases in sedimentation, bank sloughing, or other kinds of erosion resulting from a plan.

EXHIBIT 2

ECOLOGICAL RESOURCES EVALUATION

Contained in the Water Resource Council's "Manual for Training in the Application of Principles and Standards" is an evaluation method for determining an area's terrestrial and aquatic ecosystem value.

A common denominator referred to as Habitat Units (HV) is used to reflect the value of each habitat type in supporting all fish and wildlife of the planning area. The analysis calculates the effects of future land-use changes, human activities and plant community successions on habitat values over the period of analysis without the project. The manual states that it must be recognized that positive action is nonetheless required to assure that the "no development" concept can be realized and, further, that the particular environmental characteristics which are to be maintained or enhanced through the "no development" alternative may change through time as a result of changing conditions within the planning setting. Positive action, such as zoning or public land acquisition, may be necessary to accomplish the "no development" condition. With this "without plan" data base, the effects of any proposed action can be evaluated in terms of habitat units lost or gained.

In addition to the display of HU lost or gained, a narrative treatment is made on special ecosystem relationships

and irreversible commitments of ecological resources, and species of animals or plants threatened with extinction.

The planning process requires review and summarization of the existing documentation on flora and fauna including the life cycle requirements and ecosystem dynamics within the planning area.

The next step in the planning process is to inventory existing ecological resources without consideration of any plans for the area under study. The inventory begins by determining the carrying capacity of each habitat-type, (forest, prairie, cropland, etc.) in terms of food and cover value. The resultant value assigned--habitat units--means that whenever a specific habitat-type occurs in the planning area, its value for supporting life can be estimated.

The acreage and total habitat unit value for each habitat component of the planning area is determined, thereby establishing the status of ecological resources.

The "without plan" evaluation would include any future change over the period of analysis in land use or human activities which would effect the ecological resources which must be discussed. The existing status of the total ecosystem dynamics should be narratively documented--such as the stages of plant community succession and aquatic ecosystem trophic levels, and so forth. Also, note should be made of any species occurring or affected by the planning area which would be considered threatened or in danger of extinction.

HABITAT EVALUATION WITH ALTERNATE PLANS

The development and display of the EQ evaluation account for each alternative plan is a mandatory requirement of the Principles and Standards. The training manual shows how to calculate for each alternative plan the habitat units (HU) lost or gained for each habitat component by planning segment.

The various planning features of a project, such as the flood pool, conservation pool, and recreation areas are all evaluated according to their individual influence upon the HU. For example, the HU value in the flood pool of a reservoir would depend upon the frequency that water would be stored within the limits of that pool. With regard to the conservation pool, 100% of the terrestrial habitat is lost, while a gain occurs in the aquatic reservoir habitat type. The loss and gain of HU will differ with porjects and areas.

A gift value ranging from zero to one HU per acre may be credited to each acre of habitat component in a planning segment when acquired in fee title from private ownership, presuming a beneficial result to the ecosystem.

A display is then presented which shows the algebraic sum of the losses and gains of HU in each habitat component in the planning area for each alternative plan.

EXHIBIT 3 - CORPS OF ENGINEERS TABLES

Table 1 - Summary Comparison of Alternative Plans

	Plan A	Plan B	Plan N
A. Plan Description			
B. Significant Impacts 1/ (The significant economic, social, and environmental effects of each plan are to be listed.)			
C. Plan Evaluation			
1. Contributions to Planning Objectives (The beneficial & adverse contributions of each plan to the planning objectives are to be listed.)			
2. Relationship to Four (4) National Accounts (The beneficial & adverse contributions to each of the four P&S accounts are to be listed.)			
NED			
EQ			
SWB			
RD			
3. Plan Response to Associated Evaluation Criteria 2/			
D. Implementation Responsibility (Federal, including both Corps & Non-Corps requirements, State, local, & private actions necessary to implement each plan are to be listed.)			

FOOTNOTES: 1/ Significant impacts specified in Section 122 of PL 91-611 & ER 1105-2-105 will be noted with an *.

2/ Each plans' acceptability, certainty, completeness, effectiveness, efficiency, equity, geographic scope, NED benefit/cost ratio, reversibility, and stability should be noted if crucial to plan selection.

Table 2 - System of Accounts

Accounts	Plan A Plan Description Location of Impacts Within the immediate planning area	Plan A Plan Description Location of Impacts Within the rest of the study area	Plan A Plan Description Location of Impacts Within a larger area affected by the plan	Plan A Plan Description Location of Impacts Within the rest of the nation	Plan B Plan Description Location of Impacts	Plan N Plan Description Location of Impacts
1. National Economic Development						
a. Beneficial impacts (specify separate benefits and source, if possible.)						
(1) Value of increased outputs of goods and services.						
(2) Value of output resulting from external economies.						
(3) Value of output from use of unemployed or underemployed resources in construction or installation.						
(4) Total NED benefits.						
b. Adverse impacts (specify separate costs and source, if possible.)						
(1) Project costs.						
(2) Loses resulting from external diseconomies.						
(3) Total NED costs.						
c. Net NED benefits.						

Index of footnotes:

Timing

1. Impact is expected to occur prior to or during implementation of the plan.
2. Impact is expected within 15 years following plan implementation.
3. Impact is expected in a longer time frame (15 or more years following implementation.)

Uncertainty

4. The uncertainty associated with the impact is 50% or more.
5. The uncertainty is between 10% and 50%.
6. The uncertainty is less than 10%.

Exclusivity

7. Overlapping entry; fully monetized in NED account.
8. Overlapping entry; not fully monetized in NED account.

Actuality

9. Impact will occur with implementation.
10. Impact will occur only when specific additional actions are carried out during implementation.
11. Impact will not occur because necessary additional actions are lacking.

Section 122

*. Items specifically required in Section 122 and ER 1105-2-105.

Table 2 - System of Accounts
Continued

	Plan A				Plan B	Plan N
	Plan Description				Plan Description	Plan Description
	Location of Impacts				Location of Impacts	Location of Impacts
	Within the immediate planning area	Within the rest of the study area	Within a larger area affected by the plan	Within the rest of the nation		
2. Environmental Quality						
a. Environmental quality enhanced (specify resources impacted and quantify as possible.)						
b. Environmental quality degraded (specify resources impacted and quantify as possible.)						
c. Environmental quality destroyed (specify resources impacted and quantify as possible.)						
3. Social Well-Being						
a. Beneficial impacts (specify and quantify as possible.) (1) Enhancement of health, safety, and community well being. (2) Increases in the equity of distribution of real income. (3) Educational, cultural, and recreation opportunities.						

Index of footnotes:

Timing

1. Impact is expected to occur prior to or during implementation of the plan.
2. Impact is expected within 15 years following plan implementation.
3. Impact is expected in a longer time frame (15 or more years following implementation.)

Uncertainty

4. The uncertainty associated with the impact is 50% or more.
5. The uncertainty is between 10% and 50%.
6. The uncertainty is less than 10%.

Exclusivity

7. Overlapping entry; fully monetized in NED account.
8. Overlapping entry; not fully monetized in NED account.

Actuality

9. Impact will occur with implementation.
10. Impact will occur only when specific additional actions are carried out during implementation.
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Section 122

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Table 2 - System of Accounts
Continued

	Plan A				Plan B	Plan N
	Plan Description				Plan Description	Plan Description
	Location of Impacts				Location of Impacts	Location of Impacts
	Within the immediate planning area	Within the rest of the study area	Within a larger area affected by the plan	Within the rest of the nation		
b. Adverse impacts (specify and quantify as possible.) (1) Decreases in the equity of real income. (2) Deterioration in quality of life, health, & safety. (3) Degraded educational, cultural, & recreational opportunities.* (4) Injurious displacement of people & community disruption.						
4. Regional Development						
a. Beneficial impacts (specify separate benefits & source if possible.) (1) Value of increased income. (2) Quantity of increased employment. (3) Desirable population distribution. (4) Increased stability of regional economic growth.						
b. Adverse impacts (specify separate costs & source.) (1) Value of income lost. (2) Quantity of jobs lost. (3) Undesirable growth.						

Index of footnotes:

Timing

1. Impact is expected to occur prior to or during implementation of the plan.
2. Impact is expected within 15 years following plan implementation.
3. Impact is expected in a longer time frame (15 or more years following implementation.)

Uncertainty

4. The uncertainty associated with the impact is 50% or more.
5. The uncertainty is between 10% and 50%.
6. The uncertainty is less than 10%.

Exclusivity

7. Overlapping entry; fully monetized in NED account.
8. Overlapping entry; not fully monetized in NED account.

Actuality

9. Impact will occur with implementation.
10. Impact will occur only when specific additional actions are carried out during implementation.
11. Impact will not occur because necessary additional actions are lacking.

Section 122

*. Items specifically required in Section 122 and ER 1105-2-105.

EXHIBIT 4

CLARIFYING DATA TO EXPLAIN TIMING, UNCERTAINTY, EXCLUSIVITY AND ACTUALITY NOTED IN EXHIBIT 3

1. Timing. The timing of an effect is a critical variable in plan formulation. Therefore, the S of A provides for the following notations:

a. A "1" will be used to designate impacts expected to occur prior to or during plan implementation.

b. A "2" will be used to designate impacts expected in the short time frame. Over the life of the plan, these will generally be impacts estimated to occur in 15 years or less.

c. A "3" will be used to designate impacts expected in the long time frame. Over the life of the plan, these will generally be impacts estimated to occur later than 15 years.

2. Uncertainty. The concept of uncertainty is a broad one. It encompasses two of the specified evaluation criteria, certainty and stability, discussed in Exhibit 3. A rigorous statistical analysis to establish certainty or stability is not required. As used in this guidance, the concept represents a judgmental balancing of the following factors: the sensitivity of the impact on plan recommendation; the data limitations inherent in either the assessment or evaluation of the impact; and limitations inherent in the

theoretical framework or methodology. Based upon the above factors, the following notations will be made recognizing that the percent designations are suggestive and are not intended to imply statistical rigor.

a. A "4" will be used to designate that the level of uncertainty associated with an impact in the judgment of the analyst is greater than 50%. Many components of the regional account, second, and third order effects, and external economies and diseconomies will often fall into this notation.

b. A "5" will be used to designate an uncertainty range of 10%-50%.

c. A "6" will be used to designate an uncertainty range of 0-10%, thus suggesting that the impact is virtually certain.

3. Exclusivity. The components of accounts are not mutually exclusive. There are two major areas where such non-exclusivity may distort the display of accounts.

a. Regional Development. Regional components of the NED, EQ, and SWB accounts must sum to the national totals. This will avoid double counting of effects geographically.

b. Double Classification of Monetary and Non-Monetary Effects. Some contributions are dollar quantifiable but deserve special handling as non-monetary contributions as well. For example, while elimination of land scour due to flood flows can be quantified in dollars and counted as an

NED benefit, it should also be included as a positive contribution to the environmental account since it improves the quality of land resources. Therefore, the S of A provides for the following notations;

(1) The designation "7" will be used when the SWB, EQ, or RD contribution has been fully monetized and counted as an HED beneficial or adverse contribution.

(2) The designation "8" will be used when the SWB, EQ, or RD contribution has been partially monetized.

4. Actuality. Many of the contributions of plans depends upon the actions of others. The S of A will include notatations indicating the proximity of cause between a plan and an impact. The following notation will be used in Table 2.

a. A "9" will be used to designate that the contribution will likely occur without any action by any entity other than the proposed implementing agency, normally the Corps, or the required action is extremely likely to occur through the economic or natural physical systems.

b. A "10" will be used to designate that the achievement of the beneficial contribution requires positive governmental action, other than cost sharing, by another agency. The adverse contribution associated with this action can and likely will be prevented by government action. This situation can be specified only when coordination indicates that the necessary action will be taken.

c. An "11" will be used when coordination indicates that the action required by other agencies will not be forthcoming.

EXHIBIT 5

SPECIFIED EVALUATION CRITERIA

The following evaluation criteria will be applied to alternative plans to test their responsiveness. These criteria embrace considerations of acceptability, certainty, completeness, effectiveness, efficiency, geographic scope, NED benefit-cost ratio, reversibility, and stability and are explained as follows:

(1) Acceptability of a plan is determined by analyzing its acceptance by concerned publics. A plan is acceptable if it is or will likely be supported by some significant segment of the public. However, during reiteration every attempt should be made to climinate, to the extent possible, unacceptability to any significant segment of the public.

(2) The certainty of a plan is determined by analyzing in general terms the likelihood that if the plan is implemented the planning objectives and the contributions to the NED and EQ accounts will be attained.

(3) The completeness of a plan is determined by analyzing whether all necessary investments or other actions necessary to assure full attainment of the plan have been incorporated.

(4) The effectiveness of a plan is determined by analyzing the technical performance of a plan and its contributions to the planning objectives and to the System of Accounts.

(5) The efficiency of a plan is determined by analyzing its ability to achieve the planning objectives and NED and EQ outputs in the least-cost way.

(6) The geographic scope is determined by analyzing the relevancy of the geographic area encompassed by the plan; it must be large enough to encompass a full understanding of the problems and focused enough to make the proposed solutions effective.

(7) The NED benefit-cost ratio of a plan is determined by analyzing the economic benefits in relationship to the economic costs.

(8) The reversibility of a plan is determined by analyzing the capability, as public needs and values change or should unusual future circumstances so warrant, of restoring the partially or fully implemented plan to approximate the without condition; "non-structural plans" may rate higher in this regard.

(9) The stability of a plan is determined by analyzing the range of alternative futures, data and/or assumptions which can be meaningfully accommodated within the recommended plan or minor modifications thereof. Greater stability generally indicates a more desirable plan.

EXHIBIT 6

CATEGORIES OF ENVIRONMENTAL EFFECTS

The categories under which evaluations are to be made and the evaluation factors related to each category are listed subsequently. A definition of each category and a suggested standard for use in assigning a number of each factor is provided. A short description of certain evaluation factors is given in cases where definition appeared necessary. Suggestions for determining the geographic area to be evaluated for each category is also provided.

1. Open Space and Greenbelts

A landscape used to maximize natural and spatial values in a condition in which nature predominates. It should be conceived of in the same framework as any other land use which performs economically and socially desirable functions. These functions are basically:

1. Resource production
2. Preservation of natural and human resources
3. Health, welfare and well-being
4. Public safety
5. Transportation corridors
6. Urban and rural development
7. Recreation opportunity

Area of influence should be the area that would be visually impacted by project development. Also consideration should be given to alternative opportunities to plan and designate land areas to provide the above functions.

(A) Quantity Factors: (Acreages will not necessarily be mutually exclusive and may total more than 100 percent).

1. Acres designated as urban parks - recreation, scenic, historic
2. Acres designated as nonurban parks - recreation, scenic, historic
3. Acres serving distinctive sildlife uses, i.e., habitat, nature trails, etc.
4. Agricultural lands - uncultivated acres
5. Agricultural lands - cultivated acres
6. Rangeland - includ natural grasslands and prairies
7. Forestland - acres
8. Desert land - acres
9. State administered lands - acres
10. Federally administered lands - acres
11. Private lands - acres
12. Surface acres of water
13. Surface acres of wetlands, marshes, estuaries
14. Total area serving function of open space and/or greenbelts.

(B) Quality Factors:

1. Land features - the degree that land can and does provide open space and/or greenbelts

2. Water features - the degree that water can and does provide open space

3. Diversity - the degree of variety in the landscape

4. Distribution pattern - the degree that distribution of open space elements present a pleasing setting.

(C) Human Influence Factors. Human influence is conditioned in a large measure by the social and economic values of the natural resource to human use or adaptation. The

following existing and future uses and demands of the resources should be considered.

1. Relationship to the population. The degree that the area can or does receive use. Consider time and distance factors relative to origin of users and location of resource.

2. Public access. The degree or extent of area open to public use, considering existing or proposed transportation systems.

3. Public amenities. The degree to which public use facilities are developed in the area. Consider picnicking, camping, fishing, hiking, riding areas, overlooks, scenic viewpoints, golf courses, etc.

4. Legal and/or administrative protection. The degree to which the area is reserved from encroachment by industrial or residential developments.

5. Legal and/or administrative restrictions to public use. Consider both positive and negative effects. (i.e., overuse may be detrimental to the resources, whereas too many restrictions may preclude satisfaction of recreation demands.)

6. Physical protection. The degree of change expected to occur as a result of natural processes, considering the amount of land management practices expected.

7. The ability of the area to accommodate the anticipated use, or its durability, without degradation of natural values. Use in this situation would refer to human impact, including recreation, urban or industrial development, etc.

8. Effect of climate on public use of area.

2. Streams and Stream-Systems

This category refers to any natural course of water, whether flowing year-round or on an intermittent basis. Include reaches of stream between water development projects. Area of influence should consider upstream impacts on project area and impacts of project area use and development on downstream areas.

(A) Quantity Factors:

1. Total miles of stream with sustained flows.

2. Total miles of stream with intermittent flows.

3. Miles of undeveloped stream that have wild, scenic, and/or recreational potential (refer to Wild and Scenic River Act, Public Law 91-542, for definition of criteria for wild, scenic and recreation classification).

4. Stream dimensions. Width, length and depth.

5. Amount of fluctuations in streamflow. Seasonal (climatic) - upstream releases (power, irrigation, etc.).

6. Acres adjacent to shoreline with scenic quality characteristics. Judgment should be exercised in determining access to or line of sight from river or stream area.

(B) Quality Factors: (Consider quality from viewpoint of an observer in or on the stream).

1. Water quality. Turbidity, debris, chemicals, odor, algae, temperature

2. Capability of supporting aquatic life

3. Type of flow. Placid, turbulent, riffles, rapids, falls, or no flow (intermittent)

4. Characteristics of stream bottom. Muddy, gravel, rocks, etc.

5. Outstanding water features. Scenic, biotic, geologic

6. Specific uses of stream. River boat trips, fisheries, boat races, etc.

7. Land features along stream. Land forms such as steep cliffs, deltas, beaches, etc.

8. Biotic features along or in stream. Riparian vegetation, special wildlife habitat, fisheries, etc.

(C) Human Influence Factors. Human influence is conditioned in a large measure by the social and economic values of

the natural resource to human use or adaptation. The following existing and future uses and demands on the resources should be considered.

1. Relationship to population. The degree that the area can or does receive use. Consider time and distance factors relative to origin of users and location of resource.

2. Public access. The degree or extent of area open to public use considering existing or proposed transportation systems.

3. Public amenities. The degree to which public use facilities are developed and maintained in the area. Consider picnicking, camping, fishing, hiking, riding areas, overlooks, scenic viewpoints, golf courses, etc.

4. Legal and/or administrative protection. The degree to which the area is reserved from encroachment by industrial or residential developments.

5. Legal and/or administrative restrictions to public use. Consider both positive and negative effects. (i.e., overuse may be detrimental to the resources, whereas too many restrictions may preclude satisfaction of recreation demands.)

6. Physical protection. The degree of change expected to occur as a result of natural processes, considering the amount of land management practices expected.

7. Ability of stream and adjacent land to accommodate expected public use without degradation of natural resource values, with consideration of characterization of the stream such as wild, scenic or recreation values.

3. Lakes and Reservoirs

This includes both natural and manmade lakes and reservoirs and other areas of standing water (except those areas classed as wetlands or estuaries). Any water impounded behind a dam or other structure where the quantity of water is materially increased should be included. The minimum size

of lakes and reservoirs to be included in this analysis should be determined for each specific study. Area of influence should consider recreation potential and satisfaction, plus fisheries and wildlife habitat relative to porject area.

(A) Quantity Factors:

1. Total maximum surface areas of natural lakes

2. Total maximum surface areas of manmade lakes and reservoirs

3. Total number of natural and manmade lakes

4. Average surface area of natural and manmade lakes during the prime recreation season (June - September)

(B) Quality Factors:

1. Water quality. Turbidity, debris, chemical components, odor, algae, temperature

2. Scenic setting. Narrative description

3. Related land features

4. Faunal and floral desirability. Presence of insects, nettles, poison oak, algae, aquatic plants (these may be detriments to swimming or boating, but enhance wildlife or fisheries)

5. Productivity. Degree lake or reservoir sustains desirable faunal or floral communities

6. Fluctuation. Impact on reservoirs and adjacent land

7. Depth. Adequacy for sustaining year-round fish populations

(C) Human Influence Factors. Human influence is conditioned in a large measure by the social and economic

values of the natural resource to human use or adaptation. The following existing and future uses and demands on the resources should be considered.

1. Relationship to population. The degree that the area can or does receive use. Consider time and distance factors relative to origin of users and location of resource.

2. Public access. The degree or extent of area open to public use, considering existing or proposed transportation systems.

3. Public amenities. The degree to which public use facilities are developed and maintained in the area. Consider picnicking, camping, fishing, hiking, riding areas, overlooks, scenic viewpoints, golf courses, etc.

4. Legal and/or administrative protection. The degree to which the area is reserved from encroachment by industrial or residential developments.

5. Legal and/or administrative restrictions to orderly public use. Consider both positive and negative effects. (i.e., overuse may be detrimental to the resources; whereas too many restrictions may preclude satisfaction of recreation demands.)

6. Physical protection. The degree of change expected to occur as a result of natural processes, considering the amount of land management practices expected.

7. The ability of the area to accommodate the anticipated use without degradation of natural values. Use in this situation would refer to human impact, including recreation, urban or industrial development, etc.

8. Effect of climate on public use of area

4. Beaches and Shores

Land areas adjacent to salt water, estuarine areas, fresh water lakes, reservoirs, and streams that provide access to and from the water. Consideration should be given to access

and use for swimming, boating, fishing, and hunting (waterfowl), etc. Area of influence should agree with area of influence considered under Stream and Stream-Systems and Lakes and Reservoirs.

(A) Quantity Factors:

1. Total miles of shoreline. Identify as to stream, lake or reservoir, salt water, etc.

2. Total miles of shoreline that provides access to and from the water for above-mentioned recreation activities

3. Total acres of support land for beach and shore recreation

4. Total acres of land in use or available for use for: Swimming beaches; fishing access points; boat ramps or marinas, etc.

(B) Quality Factors:

1. Water quality. Suitability for recreation use

2. Related features. Upland areas - scenic aspects; underwater areas - condition, such as mud, rocks, gravel, sand, etc.

3. Scenic setting. Line of sight from shoreline area

4. Composition of beach material (of particular importance for swimming)

5. Effect of biota (pests, poison oak, etc.) on use of beaches and shorelines.

(C) Human Influence Factors. Human influence is conditioned in a large measure by the social and economic values of the natural resource to human use or adaptation. The following existing and future uses and demands on the resources should be considered.

1. Relationship to population. The degree that the area can or does receive use. Consider time and distance factors relative to origin of users and location of resource.

2. Public access. The degree or extent of area open to public use, considering existing or proposed transportation systems.

3. Public amenities. The degree to which public use facilities are developed and maintained in the area. Consider picnicking, fishing, hiking, camping, riding areas, overlooks, scenic viewpoints, golf courses, etc.

4. Legal and/or administrative protection. The degree to which the area is reserved from encroachment by industrial or residential developments.

5. Legal and/or administrative restrictions to public use. Consider both positive and negative effects. (i.e., overuse may be detrimental to the resources, whereas too many restrictions may preclude satisfaction of recreation demands.)

6. Physical protection. The degree of change expected to occur as a result of natural processes considering the amount of land management practices expected.

7. The ability of the area to accommodate the anticipated use without degradation of natural values. Use in this situation would refer to human impact, including recreation, urban or industrial development, etc.

8. Effect of climate on public use of area.

5. Wilderness, Primitive, and Natural Areas

Wilderness and Primitive areas are those areas defined as lands included within or having the potential for inclusion within the National Wilderness Preservation System, or have similar qualities and characteristics. Such areas should be undeveloped land retaining primeval character and influence, without permanent improvements or human habitation, which is protected and managed (or has the potential for so

being) so as to preserve its natural conditions. The area should be of sufficient size to make practicable its preservation and use in an unimpaired condition. The area may contain ecological, geological, or other features of scientific, educational, scenic, or historical value. Prairie grasslands and desert areas, as well as forested mountain areas, could be included in the above category.

Natural areas are those areas defined as containing rare and/or unique biotic, geologic, pedologic, or aquatic characteristics, forms, and processes. Such areas may range in size from less than 1 acre to many thousands of acres. Areas may be set aside for scenic aspects (Grand Canyon National Park) or as Research Natural Areas for scientific and educational purposes. Area of influence should consider the significance of natural values to project area, particularly any impacts on the resources by project development or increased use induced by the project.

(A) Quantity Factors:

1. Wilderness and Primitive areas. Number of areas of 5,000 acres or more with wilderness or primitive characteristics (separately identify any areas that are officially part of the wilderness system); total acreage of wilderness and primitive areas.

2. Natural areas. Total number of Natural areas that have scenic, scientific or educational value; total acreage of Natural areas.

(B) Quality Factors:

1. Land features. Topography

2. Water features

3. Living natural resources of the area. Consider primary vegetal cover, primary wildlife, unique, rare or endangered biota

4. Significant size or visual impact

(C) Human Influence Factors. Human influence is conditioned in a large measure by the social and economic values of the natural resource to human use or adaptation. The following existing and future uses and demands on the resource should be considered.

1. Relationship to population. The degree that the area can or does receive use. Consider time and distance factors relative to origin of users and location of resource.

2. Public access. The degree to which area is open to public use. Consider positive and negative effects of use versus quality of experience.

3. Public amenities. The degree to which public use facilities are developed in the area. Consider picnicking, camping, fishing, hiking, riding areas, overlooks, scenic viewpoints, etc.

4. Legal and/or administrative protection. The degree to which the area is reserved from encroachment by industrial or residential developments.

5. Legal and/or administrative restrictions to public use. Consider both positive and negative effects. (i.e., overuse may be detrimental to the resources, whereas too many restrictions may preclude satisfaction of demands.)

6. Physical protection. The degree of change expected to occur as a result of natural processes, considering the amount of land management practices expected.

7. The ability of the area to accommodate the anticipated use without degradation of natural values. Use in this situation would refer to human impact, including recreation, urban or industrial development, etc.

8. Effect of climate on public use of area.

9. Scientific value. The degree the area is or may be used to add to scientific knowledge.

10. Educational value. The degree the area contributes to general understanding of wilderness or natural areas.

6. Estuarine and Wetland Areas

An estuary is defined as a semienclosed coastal water body having free connection with the open sea within which sea water is measurably diluted with fresh water drained from the land. The estuarine system would include the water, submerged lands, marshes, intertidal lands, and shoreward (fast) lands, plus the fauna and flora which are characteristic of such a system.

Wetlands are defined as lowland areas that are usually covered with shallow or intermittent water, often referred to as marshes, swamps, sloughs, or potholes, generally with emergent vegetation as a conspicuous feature. Area of influence should consider the significance of the alternative sources of habitat for the particular species of migratory and residential fauna using the area.

(A) Quantity Factors:

1. Total number of wetland areas

2. Total acres of estuarine area

3. Total acres of intermittent wetlands

4. Total acres of wetlands that contain standing water during most years

(B) Quality Factors:

1. Water supply. Availability of water to serve wetlands; availability of fresh water for salinity gradient in estuary

2. Water quality. The degree to which natural values are preserved, degraded, or enhanced

3. Related land features

4. Desirability of the plant and animal species of the area

5. Importance of the area to the production of adequate supplies of desirable plants and animals

(C) Human Influence Factors. Human influence is conditioned in a large measure by the social and economic values of the natural resource to human use or adaptation. The following existing and future uses and demands on the resource should be considered.

1. Relationship to population. The degree to which the area can and does receive use. Consider time and distance factors relative to origin of users and location of resource.

2. Public access. The degree to which the area is open to public use. Consider both positive and negative effects of access.

3. Public amenities. The degree to which public use facilities are developed and maintained in the area. Consider trails, bird watching stations, hunting blinds, etc.

4. Legal and/or administrative protection. The degree to which the area is reserved from encroachment by industrial or residential developments.

5. Legal and/or administrative restrictions to public use. Consider both positive and negative effects. (i.e., overuse may be detrimental to the resources, whereas too many restrictions may preclude satisfaction of recreation demands.)

6. Physical (bioenvironmental) protection. The degree of change expected to occur as a result of natural processes, considering the amount of land management practices expected.

7. The ability of the area to accommodate the anticipated use without degradation of natural values. Use in this situation would refer to human impact, including recreation, urban or industrial development, etc.

8. Effect of climate on public use of area.

9. Scientific value. The degree the area may be used to add to scientific knowledge.

10. Educational value. The degree the area contributes to general understanding of estuaries or wetlands.

7. Other Areas of Natural Beauty

These include any examples of nature's visual magnificance and scenic grandeur not accommodated in other categories which have special appeal to the aesthetic faculties of man. Area of influence should consider the maximum areas of influence utilized in evaluating the other environmental categories with judgment used as to significance of natural resource to project under study.

(A) Quantity Factors:

1. Number of each type (e.g. waterfalls, canyons, etc.).

2. Number of acres or river miles related to each type of area.

(B) Quality Factors:

1. Land features. Describe how land features contribute to the natural beauty feature(s).

2. Water features. Describe how water features contribute to the natural beauty feature(s).

3. Biotic features. Describe how the biota contributes to the natural beauty feature(s).

(C) Human Influence Factors. Human influence is conditioned in a large measure by the social and economic values of the natural resource to human use or adaptation. The following existing and future uses and demands on the resource should be considered.

1. Relationship to population. The degree that the area can or does receive use. Consider time and distance factors relative to origin of users and location of resource.

2. Public access. The degree or extent of area open to public use, considering existing or proposed transportation systems.

3. Public amenities. The degree to which public use facilities are developed in the area. Consider picnicking, camping, fishing, hiking, riding areas, overlooks, scenic viewpoints, golf courses, etc.

4. Legal and/or administrative protection. The degree to which the area is reserved from encroachment by industrial or residential developments.

5. Legal and/or administrative restrictions to public use. Consider both positive and negative effects. (i.e., overuse may be detrimental to the resources whereas too many restrictions may preclude satisfaction of recreation demands.)

6. Physical protection. The degree of change expected to occur as a result of natural processes, considering the amount of land management practices expected.

8. Archeological Resources.

This category considers those material remains such as occupation sites, work areas, evidence of farming or hunting and gathering, burial sites, artifacts, and structures of all types of past human life and activities during prehistoric periods (or during historic periods for which only vestiges remain). An example of a high-value area would be a State or National Monument or Park, such as Mesa Verde National Park, that preserves and develops archeological resources.

(A) Quantity Factors:

1. Total number of sites listed in the National Register of Historic Places, with locations and descriptions

2. Total number of sizable structural remains, such as Anasazi ruins in the Southwest or burial and temple mounds with locations and descriptions

3. Total number of other occupation sites, such as vestiges of substantial structures, pithouses, campsites, mounds or middens, quarrying and worksites, or sites giving evidence of agricultural, hunting, or other prehistoric use, with locations and descriptions (if great quantities of certain types exist, summary descriptions and locations)

4. Summary of scattered artifactual material if widely dispersed

5. Total number of sites displaying petroglyphs, pictographs, or pictorial or symbolic graphic modification of the earth surface, with locations and descriptions.

6. Total number of rock alinements, circles of stones ("wickiup rings" or "tipi rings"), cairns, or other such remains apparently of human design but with which little other archeological evidence of indication of use or purpose is associated, with locations and descriptions

7. Total number of burials or other funerary sites, or sites of apparently religious associations if not covered above, with locations and descriptions

8. Miles and number of prehistoric trails, steps carved into cliffs, etc., with locations and descriptions

(B) Quality Factors (as determined by professional evaluation):

1. Size of sites and extent or volume of material

2. Condition or preservation of material

3. Record of past investigation of sites or related sites

4. Uniqueness of resources, as illustrative of the assoicated cultures and/or time periods

5. Worthiness for preservation and/or restoration and interpretation to the public (and consequent worthiness for nomination to the National Register of Historic Places) compared to potential contribution to knowledge expected from salvage excavation

6. Aesthetic setting, or to what extent the prehistoric environment has been altered by natural processes or by human activity in recent period

(C) Human Influence Factors:

1. Relationship to the population. The degree to which the resource is visited by the public, or is elsewhere interpreted to the public - present and potential

2. Public access and amenities. Facilities existing or proposed to accommodate visitation

3. Legal and/or administrative protection. Present status of land, and Federal, State, and local laws, regulations, orders, ordinances, and agreements affecting preservation, registration, investigation, and salvage of archeological resources

4. Physical (environmental) protection. To what extent continued survival or preservation of the resources is affected by natural action without change of the status quo

5. Educational value. To what extent the resources are or might be useful in interpreting some phase of prehistory, either on-site, or through the preparation of educational materials (films, books, etc.)

6. Scientific value. To what extent the resources have provided or potentially may provide significant contributions to archeological knowledge or understanding of some phase of the prehistory of the area or continent

9. Historical Resources

This category includes those remaining evidences of the origins, evolution, and development of the Nation, State, or locality. It also encompasses recognition of places where significant historical or unusual events occurred even though no evidence of the event remains, or places associated with a personality important in history. An example of a high-value area would be the site of a battlefield that is now protected and developed by Federal, State, or local legislation.

(A) Quantity Factors:

1. Total number of sites listed in the National Register of Historic Places, with locations and descriptions

2. Total number of structures, with locations and descriptions, and their historical significance

3. Total number of sites where significant events occurred, or where structures of significance once existed, with locations and descriptions

4. Total number of trails, historic roads, etc., with locations and descriptions

5. Total number of historic farms, fields, etc., with locations, sizes, and descriptions

(B) Quality Factors (as determined by professional evaluation):

1. Historical significance of resources

2. Condition or preservation of structures. Extent of deterioration, extent of change from historic period, etc.

3. Condition preservation of other historic resources. Extent of deterioration, extent of natural or man-caused change from historic period, etc.

4. Record of past investigation or preservation of sites and structures

5. Worthiness for preservation and/or restoration and interpretation to the public (and consequent worthiness for nomination to the National Register of Historic Places), compared to potential contribution to knowledge expected from salvage

6. Aesthetic setting, or to what extent the historic environment has been altered by natural processes or by human activity in recent period

(C) Human Influence Factors:

1. Relationship to the population. The degree to which the resource is visited by the public, or is elsewhere interpreted to the public - present and potential

2. Public access and amenities. Facilities existing or proposed to facilitate visitation

3. Legal and/or administrative protection. Present status of land, and Federal, State, and local laws, regulations, orders, ordinances, and agreements affecting preservation, registration, investigation, and salvage of historic resources

4. Physical (environmental) protection. To what extent continued survival or preservation of the resources is affected by natural action without change of the status quo

5. Educational value. To what extent the resources are or might be useful in interpreting some phase of history, either onsite, or through the preparation of educational materials (films, books, etc.)

6. Scientific value. To what extent the resources have provided or potentially may provide significant contributions to historical knowledge or understanding of some phase of the history of the area of Nation

10. Cultural Resources

This category includes those identifiable human cultures that exist somewhat as a unit and contribute to the diversity of American life styles. Of high value would be the Indian cultures that remain in areas of the Southwest.

(A) Quantity Factors:

1. The number of individuals associated with each type of culture

2. The extent and intensity of geographic distribution of the cultures, and of land considered traditionally or religiously significant by such cultures (though not actually occupied - e.g., as Blue Lake is significant to Taos culture)

(B) Quality Factors (as determined by professional evaluation and the testimony of members of the culture):

1. Extent to which members of the cultural group identify with the group of culture

2. Contribution of the culture to the life style of others

3. Importance of the land, the earth, or particular sites or areas to the people or cultures with which they are associated

4. Extent of culture change intruded or imposed from outside

(C) Human Influence Factors:

1. The ability of the culture to retain its identifiable characteristics and unity

11. Biological Resources

This category includes beneficial and adverse effects on individuals, species, and populations of living organisms.

Two subcategroies, flora and fauna, are part of this category. Flora includes plants as individual species, as stands of individual species, and as communities of associated species. Examples of high-value plant communities are those protected for public use and study within State and Federal reservations.

(A) Quantity Factors:

1. Approximate population numbers of species that are rare or in danger of extinction

2. Approximate amount of area dominated by tree species

3. Approximate amount of area where shrub species dominate

4. Approximate amount of area where grass species dominate

5. Approximate amount of area where forb species dominate

(B) Quality Factors:

1. Degree that the plant communities are in good condition and tend to remain stable

2. Diversity of species within the community

3. Desirability of the types of plants that occur

4. Degree that the area is free from pestilent or nuisance plant species

(C) Human Influence Factors:

1. Scientific value

2. Educational value
3. Recreational value
4. Physical (bioenvironmental) protection
5. Legal and/or administrative protection

The subcategory of fauna includes all major types of animals and their habitats within the areas of potential impact for each. At least eight groupings of animals should be considered on separate work sheet for probable impacts for each condition analysis (i.e., existing condition, without the project and the various project alternatives). Each of the animal groups is composed of species having generally similar life cycles or habitat requirements or otherwise logically fitting together for purposes of analysis. When circumstances warrant, impacts on subgroupings of animals or on individual species should be analyzed as subdivisions of the major groupsings. Threatened species should be treated individually. Areas of impact for each animal species, subgrouping, or grouping being rated may vary in size, location or other characteristic. If certain of the animal groupings do not exist in the area of analysis, or would not be significantly impacted by any of the several condition analyses, not ratings are necessary. Habitat base will be expressed quantitatively (in acres, sections, or other appropriate unit) and qualitatively (high, medium or low value). Populations or animals may be expressed either as unit

capacities of the habitat to support animals or as standing or harvestable crops per habitat unit, whichever best facilitates analysis of the expected impacts. The population dynamics[18] (relative condition analysis will be subjectively rated and expressed using the appropriate 0 to 10 scale as previously described. Similar subjective ratings will be made of factors selected to show human influence (values, accessibility and protection). A summary display will reflect only subjective ratings of the factors included in the work sheet which are materially affected by one of the plans.

(A) Quantity Factors:

1. Habitat and carrying capacity for individual threatened species

2. Habitat and carrying capacity for big game species

3. Habitat and carrying capacity for upland game species

4. Habitat and carrying capacity for fur bearing species

5. Habitat and carrying capacity for waterfowl species

6. Habitat and carrying capacity for other bird and mammal species

7. Habitat and carrying capacity for fish species

8. Habitat and carrying capacity for other animal species considered important in planning setting

(B) Quality Factors:

1. The population dynamics (relative condition or stability of habitat and populations) expected under each condition of analysis for each group of animals listed above

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[18]This reflects what is or will tend to occur, not whether the occurrence is desirable or undesirable.

(C) Human Influence Factors:

1. Scientific and educational value of each grouping of animal species

2. Recreational value of each grouping of animal species

3. Accessibility or visibility to the public for each grouping of animal species

4. Legal and administrative protection of each grouping of animal species

5. Physical protection of each group of animal species

12. Geological Resources

This category covers areas of geological importance as future mineral supplies as well as those areas of geological interest in studying or displaying the development of the earth. An example of a high-value area would be a fossil bed protected and developed under National legislation.

(A) Quantity Factors:

1. Approximate volume of important mineral deposits

2. Number of locations where fossil beds occur

3. Number of locations where exposed rock formations illustrate the structure of the surface composition of the earth

4. Number of locations where land features demonstrate past and present geologic processes that take place in or on the surface layer of the earth

(B) Quality Factors:

1. Uniqueness of the geological formations and processes in the area

2. Size of the geological sites

3. Condition of preservation in natural conditions
4. Chance for fossil or mineral recovery
5. Aesthetic setting of structures or processes

(C) Human Influence Factors:

1. Relationship to the population
2. Public access
3. Public amentities
4. Educational values
5. Scientific value
6. Legal and/or administrative protection
7. Physical (bioenvironmental) protection

13. Ecological Systems

This category covers the identifiable communities of organisms and the physical conditions in which they exist. Each natural area, such as a watershed, a vegetation and soil type, a tidal salt marsh, a swamp, a lake, or a stream complex, represents an ecosystem, an interdependent physical and biotic environment that functions as a continuing dynamic unit, possessing not only intrinsic values but also contributing to the enrichment of the general quality of life in a variety of subtle ways. Conversely, when such natural areas are lost or otherwise diminished in size or quality, there are corresponding adverse environmental effects borne by society.

Beneficial effects resulting from preservation of ecological systems include:

1. The maintenance of a natural environment in a state of equilibrium as an intrinsic value to society

2. The provision of the purest form of aesthetic contact with nature

3. Contributions to the development, appreciation, and integration of a "land ethic" or environmental conscience as part of man's culture

4. Scientific understanding derived from the preservation and study of natural ecological systems which contributes to the conservation of natural resources in general, the most practical application of ecology

Conversely, adverse effects are the reduction or loss of opportunity to a society as a result of a plan.

An example of high-value area would be one where the ecosystem (e.g., prairie, marsh, estuary, river) is stable and the plants, animals, and physical conditions associated with it fluctuate within normal ranges. A low-value area would be one where abrupt changes are occurring that destroy the balance of interactions within the ecosystem.

(A) Quantity Factors:

1. Size in acres of tundra ecosystems

2. Size in acres of forest ecosystems

3. Size in acres of shrublands and desert ecosystems

4. Size in acres of grassland ecosystems

5. Size in acres of lake and river ecosystems

6. Size in acres of bog, marsh, swamp, and estuarine ecosystems

(B) Quality Factors:

1. Degree that each ecosystem is in good condition and its dynamics tend to remain in a state of equilibrium

2. Degree to which conditions contribute to maintainance of desirable steps in natural ecological succession (i.e., maintenance of good brouse conditions for big game, maintenance of good food production for waterfowl)

3. Degree that the types of ecosystems that occur contribute to environmental conscience and are a part of man's culture

(C) Human Influence Factors:

1. Physical (bioenvironmental) protection

2. Legal and/or administrative portection

3. Scientific value

4. Educational value

14. Water Quality

This category includes the chemical, physical and biological aspects of fresh, brackish, and salt water with respect to its suitability for a particular use. Of highest value would be water of a quality better than that which is needed for the expected uses. The effects of a project on water quality may extend well beyond the immediate project area; therefore, the area to be used for this evaluation should be carefully considered in order to measure the cumulative environmental effects of the proposed action. An example of this is an irrigation project in which the effects of salinity on water quality may extend far beyond the project

area, but which effects may be partially mitigated by salinity control measures incorporated into the project or outside the project area.

(A) Quantity Factors:

1. Type, number, and quantity of each wastewater source. For reconnaissance reports identify industrial waste sources by at least two-digit Standard Industrial Classification Code (SIC). Include number of sources in each classification, and discharge in millions of gallons per day for each source. As available include date on BOD of discharge, suspended solids, temperature, metals and other parameters as necessary. For implementation studies, source identification should be expanded to at least four-digit SIC. Specific source locations should be shown on a map.

Identify municipal wastewater sources including data on discharge, BOD, etc. Indicate instances where significant quantities of industrial waste are included in data for a municipal source.

2. Miles of river are not meeting established water quality standards. (Indicate which criteria contained in the standards are violated.)

3. Area of volume of reservoirs and/or natural lakes not meeting established standards. (Indicate criteria that are violated.)

4. Miles of river that meets established water quality standards. (The term "meets standards" includes water that is as good or better than required by standards established by states and approved by the Federal government.)

5. Areas of reservoirs and natural lakes meeting established standards.

6. Number of miles of streams that are dry as a result of diversions.

7. Number and area of diffused sources of pollution such as overgrazed lands which may contribute to silt pollution, improper road construction or maintenance practices, etc.

8. Miles of river and/or surface acres of water where the quality of water limits one or more desired or existing uses of the water. (Consider factors such as salinity, taste, odor, appearance, etc. There may be instances in which standards are met, but the public is using the waters for a purpose requiring a higher standard, thus indicating a possible need for upward revision of standards.)

(B) Quality Factors:

1. Extent to which water supports desirable aquatic organisms (caddis flies, mayflies, hellgrammites, fresh water clams, trout, etc.) thus indicating a lack of pollution.

2. Extent to which undesirable organisms are absent in the water (midges, leeches, air breathing snails, moth flies) thus indicating the lack of a pollution problem.

3. Extent to which water quality impairs or enhances desired uses including aesthetics.

4. Extent to which stream reaches not meeting standards fail to meet standards. (A rating of 0, 1, or 2 would indicate that a stream violated most, or all of the quality criteria while an 8, 9, or 10 would indicate that the quality of water is approaching the standards but fails to meet them for all of the criteria or for certain seasons of the year.)

5. Extent to which reservoirs and/or natural lakes not meeting standards fail to meet standards.

6. Extent to which stream reaches meeting standards are above standards. (A rating of 0, 1, or 2 would indicate that a stream reach meets standards and to a small degree is better than required by the standards. A rating of 8, 9, or 10 would indicate that water quality is to a high degree, better than required by standards.)

7. Extent to which reservoirs and/or natural lakes meeting standards are above standards.

8. Extent to which desired or existing uses are limited by water quality. (Consider irrigation, municipal and industrial water supply, recreation, etc.)

(C) Human Influence Factors:

1. Extent to which use has an adverse effect on water quality.

2. Where pollution occurs, the extent to which technology is available to meet water quality standards.

3. Extent to which water is available for beneficial uses such as irrigation, water supply, etc. (Consider overappropriation, water laws, water compacts, etc.)

14. Air Quality

This category includes the chemical, physical and biological aspects of air. Of highest quality would be air that is free from chemicals or materials that adversely affect man.

(A) Quantity Factors:

1. Type, number, and quantity of each air pollution source. Identify fossil fuel powerplants, smelters, tepee burners and other sources of air pollution. Include data on plant capacities (megawatts, tons/day or year), quantities of pollutants emitted (oxides of nitrogen, sulfur dioxide, trace elements, etc.).

2. Approximate area in square miles where air does not meet standards. (Indicate which criteria contained in the standards are violated.)

3. Approximate area in square miles where air meets standards. (The term "meets standards" includes areas in which air quality is as good or better than required by standards.)

(B) Quality Factors:

1. Extent to which air quality degrades or enhances other environmental values (e.g., consider scenic vistas unimpaired or impaired by visual pollution, areas in which air pollution has had an adverse effect on flora).

2. Extent to which air is free from nuisance causing materials or materials harmful to human health and to flora and fauna.

3. Extent to which areas not meeting standards fail to do so. (A rating of 0, 1, or 2 would indicate that an area violated most or all of the quality criteria, while a rating of 8, 9, or 10 would indicate that the area is approaching the standards but fails to meet them for all criteria.)

4. Extent to which areas meeting standards are above standards. (A rating of 0, 1, or 2 would indicate that standards are met, and that to a small degree the air is better than required by the standards. A rating of 8, 9, or 10 would indicate that air quality is, to a high degree, better than required by standards.)

5. Extent to which thermal inversions are a factor in air quality.

(C) Human Influence Factors:

1. Extent to which human use has an adverse effect on air quality. (Consider thermal powerplants, smelters, automobiles, etc.)

2. Where pollution occurs, the extent to which technology is available to meet air quality standards.

16. Land Quality

This category includes chemical, physical, and biological aspects of land in relationship to the suitability of the land for particular uses. Of highest value would be land that can be maintained and/or productively used for purposes within its use capability.

(A) Quantity Factors: Land areas with identifiable existing and/or potential quality problems are to be evaluated under this category.

1. Farmland areas. Quantity of land suitable for irrigated or dryland farming. Area of land subject to quality degradation - drainage problems, salt buildup, erosion, flooding, drouth - quantity of land being used for farmaing not in its best use class.

2. Rangeland areas. Quantity of rangeland in terms of grazing capability and carrying capacities (short-grass prairie, long-grass, sagebrush, desert shrub, etc.) - quantity of rangeland subject to and/or already degraded from overgrazing, erosion, invasion of less desirable forage, etc.

3. Forest areas. Quantity and type of timber present - quantity of land subject to quality problems (insects, blowdown, poor forestry, erosion, undesirable regrowth species, etc.) - quantity of forest land suited for multiple use management of water wildlife, recreation, timber grazing, and urban-industrial development.

4. Other (alpine, desert, etc.). Quantity of land in these classification subject to quality degradation - alpine areas subject to grazing, vehicle use, mining, road construction etc. - (desert areas subject to grazing, vehicle use, mining, etc.)

5. Urban and industrial land areas. Quantity of land suitable for urban and industrial use - quantity and value of land taken from some other classification and used for urban and/or industrial uses - quantity of urban and industrial land subject to quality degradation from erosion, construction, ecological disruption, etc.

(B) Quality Factors:

1. Extent to which land of each class is suitable for uses normally expected of that class

2. Degree and type of quality problem or potential problem found in each class

(C) Human Influence Factors:

1. Degree to which land management practices can improve the usability of the land for its best use

2. Degree to which the results of land management practices enhances other environmental components

3. Degree to which the results of land management practices degrade other environmental components

17. Sound Quality

This category covers the benefits and adverse effects of sound as it relates to the quality of the environment. Of high value would be areas where sounds are pleasing rather than annoying and do not exceed levels which cause physical discomfort, annoyance, or difficulty in conversing.

(A) Quantity Factors. Number of areas in which sound levels exceed levels that cause physical discomfort, annoyance, or difficulty in conversing. (Consider all noise sources including projects and programs. Is the area a natural one in which exposure to sound causes an annoyance which detracts from surroundings; consider ambient sound levels in determining whether a particular sound level is objectionable.)

(B) Quality Factors:

1. Extent to which sounds are conducive to, or do not detract from, an enjoyable environmental setting

2. Extent to which sounds exceed levels that cause physical discomfort, annoyance, or difficulty in conversing

3. Extent to which disagreeable sounds are suppressed

(C) Human Influence Factors:

1. Extent to which institutional arrangements can be made to limit objectionable sound levels

2. Extent to which projects can be designed to minimize noise impacts

18. Visual Quality

This category assesses the benefits from visually attractive landscapes as well as the adverse effects of

features that destroy, disrupt, or intrude on pleasing settings. Of high value would be areas where the view of the visually attractive landscape is not spoiled by unsightly intrusions.

(A) Quantity Factors:

1. Number and size of areas of scenic beauty

2. Number of established and potential scenic vistas

3. Number and size of access routes (roads, trails, etc.)

(B) Quality Factors:

1. Naturalness. Extent that the viewer appears to be in a natural landscape

2. The degree that manmade structures or changes to the natural landscape blend into or add beauty to the scenic setting

3. The degree that manmade structures or changes to the natural landscape detract from the beauty of the natural setting

(C) Human Influence Factors:

1. Degree that the public has access to view the scenic qualities

2. Degree that public access influences the quality of the scenic setting

3. Presence and influence of public amenities (visitor centers, campgrounds, restrooms, etc.)

19. Uniqueness Considerations

Some environmental resources are of particular significance in that they are rare, unusual or extraordinary in the Nation or in the region. The degradation or destruction of

such a resource may deprive future generations of the opportunity of viewing or otherwise enjoying it. Those resources rated under the other categories which are considered to be unique should be also identified and evaluated under the uniqueness category.

The uniqueness of the resource will be evaluated in relation to its frequency of occurrence in the Nation or region in accordance with the following scale:

1-2 Unique in the planning setting but occurs in abundance throughout other parts of the region

3-4 Unique in the region but occurs in abundance in other parts of the Nation

5 Unique in the region but examples occur frequently in other parts of the Nation

6-7 Rare throughout the Nation but several examples occur within the region

8-9 Very rare throughout the Nation and region with one of few examples occurring in the planning setting

10 The only one of its kind or only population of a species occurring in the Nation

The effect of the project on the environmental resource considered in the uniqueness category is to be measured in relation to the degree of degradation or destruction of the resource. The scale of measurement is as follows:

0 Resource totally destroyed

1-4 Severely affected. A major portion of the resource degraded or destroyed

5 Moderately affected. A portion of the resource degraded or destroyed but an adequate portion remaining to preserve the resource on a reduced scale

6-9 Minor affect. A minor portion of the resource degraded or destroyed but not significantly affecting the resource within the planning setting

10 No measureable effect on the resource

20. Irreversibility Considerations

The irreversibility category is evaluated by identifying each natural, physical and cultural resource affected by the proposed project or program; comparing the occurrence of the resource with occurrences of similar resources on and off the site; and determining the significance of the effect by the degree to which the effects are reversible. Resources are identified as those described under quantity factors for each major resource category. All of the specific resources occurring within the proposed project area (i.e., within the reservoir take line, and in the case of irrigation, the service area of the project; or within conduit or transmission line right-of-way) that are affected should be listed and quantified. Those resources occurring outside of the project and service areas should also be listed if it is anticipated that the proposed project will significantly affect them.

Significance values range from 0 to a maximum of 10 units for each resource listed. The higher the value, the more significant action taken affecting the resource. The evaluation should be applied to each proposed plan or program in perspective with the alternative of no project at a specific site.

Each resource listed should be evaluated in terms of the evaluation factors listed here. For each resource and under each evaluation factor a 0 to 10 unit value scale should be used to indicate significance. Zero indicates no significance and 10 indicates the highest significance.

After rating each resource under each evaluation factor, a summary irreversibility rating should be made for each resource. This significance rating should be based on overall judgment of the evaluation. It would relate to the significance ratings of the other evaluation factors, but would not be a mathematical average of them. For instance, one rating of 10 in any one of the evaluation factors might be sufficient cause to rate the overall irreversibility significance at 10.

Each plan and alternative represents a varying degree of development. It may be assumed that the greater the proposed development, the greater the number of resources which might be affected. Conversely, it may also be true that the least amount of development would require a lesser amount of resource commitment. Each alternative needs to be put in perspective with the other alternatives when considering resource commitments.

Evaluation factors for irreversibility considerations include:

(A) Nature of Occurrence. This factor puts the resource in perspective with other similar resources. It compares present supply with the probable future supply of the resource.

These resources which are both exhaustible and nonrenewable such as oil, the Grand Canyon, and the last ivory billed woodpecker would receive the highest significance value unit rating.

(B) Interrelationship of Supply. This factor reflects the availability and distribution of the resource. The resource being evaluated should be compared with similar resources of comparable quality. The factor indicates how far a person would have to go to obtain a comparable resource setting or occurrence with the same degree of public access and opportunity for consumption. The scarcer the supply of the resource of comparable quality, the more significant it is. If a similar resource supply may be found locally the unit rating should be low, while a high rating should be given when a similar supply could be found only at a location in another part of the Nation.

(C) Reversibility. For every project effect on the resource in question, the capability of its returning to its initial state after the proposed project is implemented should be determined. If it does not, then the proposed action will induce a permanent effect which cannot be annulled. Examples which should receive high-value units include cuts into rock formations for access roads, inundation of free-flowing streams, or the destruction of historic artifacts.

If it is likely that the resource will be restored to preconstruction condition or better, low-value units should be assigned.

(D) Effect on Remaining Resources. In evaluating this factor consider the remaining supply of the particular type of resource in question, and its ability to accommodate an incremental increase in public use. Reference should be made to the "Interrelationship of Supply" for the relevant scope to consider. Consider the effects of the proposed project or program on the remaining resources both within and outside of the area of primary import.

For example, if a portion of the stream is inundated by a reservoir, the other streams will have to absorb the use formerly accommodated by the inundated stream. The total mileage of free-flowing streams will be reduced by an increment equal to the inundated stream portion. If the remaining streams are used to capacity, the effect of the project on remaining streams will be "major." If there is either light use of existing streams or a local abundance of streams that are used to less than capacity, the project's effect would be considered "minor." The greater the additional burden thrust upon the remaining resources, or the scarcer the remaining resources are, the higher the significance value.

(E) Mitigatory Actions. The intent of this factor is to explore avenues of action which may reduce the severity of adverse impacts. Many adverse effects can be mitigated by substitution, replacement, or tradeoff. However, truly unique or scarce resources cannot be mitigated satisfactorily, thus should receive high significance value units.

For purposes of this evaluation, substitution is defined as replacing in kind (within reason) the resource to be lost, all or in part, because of the proposed project's adverse impact. The substitute does not need to be in the same position nor on the same site. However, the substitute (if any) should occur within the total impact area established by the evaluators. For example, if 10 miles of stream are inundated, that resource is lost. This loss might be substituted if similar type streams in the immediate locale were upgraded to equal the resource lost by inundation. Where it is necessary to go elsewhere in the State, region or Nation to find a comparable resource occurrence, the resource would not be substitutable.

Some resources can be successfully moved to a new location. In some cases historic structures and artifacts may be relocated. If the resource can be moved, then the significance of the adverse impact is much less than a total loss.

A lost resource may be replaced with something less in kind and in experience opportunity offered. A shade shelter

can replace a tree, although it may not be as aesthetically pleasing and does not serve the same functions. Likewise, the water in a reservoir may not replace the quality of a fishing experience in the stream which was inundated.

EXHIBIT 7

SELECTED PLAN
RIO PUERCO WATERSHED
ENVIRONMENTAL QUALITY ACCOUNT

COMPONENTS	MEASURES OF EFFECTS
Beneficial and Adverse Effects:	
A. Areas of Natural Beauty	1. The Ignacio Chavez Grant and Continental Divide Areas offer significant scenic values as characterized by the volcanic plugs and geologic formations (e.g., Cabezon Peak). 2. Past histroy and culture can be traced in the old villages of San Luis and Cabezon and in several abandoned stagecoach stop stations along the Chico and Torreon Arroyos. 3. Increased traffic associated with hunting and other recreation opportunites (esp. 1 & 2 above) will be accompanied by increased noise, solid wastes and dust pollution from 11,600 additional recreation visits and 1,880 increased hunter days.
B. Biological Resources and Ecosystems	1. Increase deer population from an average of .25 per section to .60 per section, increasing deer days of use by 315 days. 2. Increase the number of scale quail coveys to two per square mile by increasing four-wing saltbush and forb density from 2 percent to 15 percent along floodplains. 3. Increase mountain meadow park areas by 3,000 acres through control of pinon-juniper invasion. 4. Increase browse composition on 25,000 acres of winter elk range from 15 percent to 20 percent. 5. Convert warm season grasses on Chivato Mesa (2,000 acres) to cool season grasses and forbs for deer and elk.

SELECTED PLAN
RIO PUERCO WATERSHED
ENVIRONMENTAL QUALITY ACCOUNT
(CONTINUED)

COMPONENTS	MEASURES OF EFFECTS
Beneficial and Adverse Effects:	6. Increase antelope population from 70 to 200. 7. Increase average forage density of shortgrass subtype from 21 to 30 percent and change average composition of alkali sacation and fourwing saltbush from 40 to 55 percent.
C. Quality Consideration of Water, Land and Air Resources	1. Increase stable acres from 151,492 to 181,961 or 30,469 stable acres. 2. Reduce annual runoff from 2,645 ac. ft./yr. to 1,585 ac. ft./yr., or 1,060 ac.ft./yr. 3. Reduce sediment load in runoff above existing livestock reservoirs by 65 percent by reducing present sediment load of 350 a/ft/yr (which may increase to 400/a/ft/yr) to 121.5 a/ft/yr, or 228.5 to 278.5 a/ft/yr. 4. Reduce by 7 percent the average annual sediment load being delivered into the Rio Grande at Bernardo from the Rio Puerco. 5. Reduce channel erosion damages on Rio Puerco to Chico Crossing and adjacent roadway by reducing peak flows. 6. Reduce erosion classification to moderate condition through livestock management and land treatment, reducing present SSF from average of 60 to 40.