

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40

**Proposed
National Objectives, Principles and Standards for
Water and Related Resources Implementation Studies**

December 3, 2009

1
2
3
4
5
6
7
8
9
10
11

Proposed National Objectives for Water Resources Planning

12
13
14
15
16
17
18
19

These National Objectives and the supporting Planning Principles and Standards are established pursuant to the Water Resources Planning Act of 1965 (Public Law 89-8), as amended (42 U.S.C.1962a-2) and consistent with Section 2031 of the Water Resources Development Act of 2007 (Public Law 110-114). They supersede the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies dated March 10, 1983.

1. Purpose

20
21
22
23
24
25
26
27
28

These National Objectives and the supporting Planning Principles and Standards establish the National water resources planning policy and the framework for the planning process that supports decisions regarding the Federal implementation of solutions to water resources problems, needs and opportunities.

2. Applicability

29
30
31
32
33
34
35
36
37
38
39
40
41
42

These National Objectives, Principles and Standards apply to Federal water and related resources implementation studies completed 180 days after the publication of the supporting Interagency Guidelines. Such studies investigate and recommend Federal implementation of site-specific projects and project modifications to address water resources problems, needs and opportunities.

3. National Objectives of Water Resources Planning

43
44
45

Federal water resources planning and development should both improve the economic well-being of the Nation for present and future generations and protect and restore the environment. America's water resources – streams, rivers, wetlands, estuaries, lakes, and coasts – are at the heart of our economy, our environment and our history. These water resources support billions of dollars in commerce, provide drinking water for millions of Americans and supply needed habitat for fish and wildlife and other benefits. The National Objective for water resources planning is to develop water resources projects based on sound science that maximize net national economic, environmental, and social benefits. Consistent with this objective, the United States will demonstrate leadership by modernizing the way the Nation plans water resources projects by:

(1) protect and restore natural ecosystems and the environment while encouraging sustainable economic development;

- 1 (2) avoiding adverse impacts to natural ecosystems wherever possible and fully
2 mitigating any unavoidable impacts; and
3
4 (3) avoiding the unwise use of flood plains, flood-prone areas and other ecologically
5 valuable areas.
6
7

8 **4. Approval**
9

10 The National Objectives of Water Resources Planning and the accompanying Planning
11 Principles and Standards are hereby approved.
12
13

14 _____
15 President of the United States
16

17 _____
18 Date

1
2
3
4
5
6
7
8
9

Proposed National Objectives, Principles and Standards for Water and Related Resources Implementation Studies

Table of Contents

<u>Section</u>	<u>Page</u>
Chapter I – Planning Principles	1
1. Principles.....	1
2. Overview of the Planning Process.....	2
3. Planning Guidelines and Procedures	3
Chapter II – Planning Standards	4
1. Implementation Studies.....	4
2. Planning Standards.....	5
A. Protect and restore natural ecosystems and the environment while encouraging sustainable economic development.....	5
B. Account for Ecosystem Services.....	5
C. Avoid the Unwise Use of Floodplains and Flood-prone Areas	6
D. Utilize Watershed and Ecosystem Based Approaches	6
E. Utilize Best Available Science, Practices, Analytical Techniques, Procedures and Tools.....	9
F. Apply a Level of Detail Commensurate with the Potential Decisions.....	9
G. Account for the National Benefits and Costs in Appropriate Monetary and Non-monetary Terms	10
H. Account for Significant Effects and Mitigate Unavoidable Impacts to Ecosystem Services.....	10
I. Address Risk and Uncertainty, Including the Effects of Climate Change and Future Development.....	11
J. Incorporate Public Safety.....	11
K. Ensure Environmental Justice for Low Income, Tribal and Minority Communities	12
L. Ensure the Planning Process is Fully Transparent.....	12
M. Collaborate Implementation Study Activities Broadly	13

10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44

Proposed Principles and Standards

Table of Contents (Continued)

1		
2		
3		
4	<u>Section</u>	<u>Page</u>
5		
6	3. Overview of the Planning Process.....	13
7	A. Initiating Implementation Studies	14
8	B. Scoping Process	14
9	C. Define the Study Area	14
10	D. Determine Existing and Future Conditions.....	15
11	E. Identify and Describe Problems and Opportunities	15
12	F. Specify the Study Objectives.....	16
13	G. Specify the Planning Constraints	16
14	H. Formulate Alternatives	16
15	I. Evaluate the Potential Effects of the Alternatives	18
16	J. Compare and Screen Alternatives	22
17	K. Recommend a Plan.....	23
18		
19	4. Glossary	24
20		

Proposed Principles and Standards

Chapter I – Planning Principles

1. Principles

Water is a valued and limited natural resource that is an absolute requirement for life and vital to human health and our natural environment. The quality and quantity of water resources affect all levels of our society from the national to the individual citizen. Water resources support our local and national economies, provide environmental security, and support this Nation's vast cultural diversity. We depend upon these resources for a myriad of purposes including, drinking water, ecosystem services, irrigation, hydropower, manufacturing, recreation, fish and wildlife, sanitary waste disposal systems, transportation, and public health and safety. Equally important are the management of water to reduce flood risk and storage of water for future use. Therefore, the following principles are established to guide water resources implementation studies. It is the policy of the United States that all Federal water resources implementation studies shall:

- A. Protect and restore natural ecosystems and the environment while encouraging sustainable economic development;
- B. Account for ecosystem services;
- C. Avoid the unwise use of floodplains, flood-prone areas and other ecologically valuable areas;
- D. Utilize watershed and ecosystem based approaches;
- E. Utilize best available science, practices, analytical techniques, procedures and tools;
- F. Apply a level of detail commensurate with the potential decisions;
- G. Account for the benefits and costs in appropriate monetary and non-monetary terms;
- H. Account for significant effects and mitigate any unavoidable adverse impacts to natural ecosystems;
- I. Address risk and uncertainty, including the effects of climate change and future development;
- J. Incorporate public safety;
- K. Ensure environmental justice for low income, tribal and minority communities;

Proposed Principles and Standards

1 L. Ensure the planning process is fully transparent; and

2
3 M. Collaborate implementation study activities broadly.

4 5 **2. Overview of the Planning Process**

6
7 The above Principles shall be implemented in a deliberate planning process. The major
8 steps in the planning process shall include:

9
10 A. Identify the study objectives and ensure that Federal participation in the study is
11 warranted based on the likelihood of fulfilling the National Water Resources Planning
12 Objectives;

13
14 B. Identify and assess the water and related resources problems, needs, and
15 opportunities relevant to the planning setting associated with the study objectives;

16
17 C. Inventory, analyze, and determine the existing and most likely future water and
18 related resources conditions within the study area relevant to the identified problems
19 and opportunities;

20
21 D. Formulate alternatives, including identifying the No Action alternative, as well as
22 nonstructural and structural alternatives, and combinations of nonstructural and/or
23 structural measures to ensure that all reasonable solutions are considered;

24
25 E. Evaluate the potential effects of all reasonable and viable alternatives;

26
27 (1) Evaluate the potential effects, positive and negative, on the significant
28 resources relative to the most likely conditions without action, and

29
30 (2) Evaluate and display the potential effects of alternatives in a systematic
31 manner.

32
33 F. Compare alternatives; and

34
35 G. Select and recommend the plan that:

36
37 (a) Complies with existing statutes including, but not limited to, Clean Water Act,
38 Endangered Species Act, National Environmental Policy Act, Fish and Wildlife
39 Coordination Act, National Historic Preservation Act, Wild and Scenic Rivers Act;
40 authorities; and policy; and

41
42 (b) Provides the greatest net overall contribution to the National Water
43 Resources Planning Objectives considering both monetary and non-monetary
44 effects.

Proposed Principles and Standards

3. Planning Guidelines and Procedures

The Council on Environmental Quality (CEQ), in cooperation with the Water Resources Council, shall issue Interagency Guidelines to implement these Principles and Standards. The Guidelines shall require that all Federal agencies conduct water resources implementation studies in a generally common manner and enable the public to comprehend and evaluate those studies. Each Federal agency shall develop and apply Agency-Specific Procedures to implement the Principles, Standards and Guidelines as needed for its respective water resources missions.

Proposed Principles and Standards

Chapter II – Planning Standards

1. Implementation Studies

A. Water and related resources implementation studies covered by these Principles and Standards investigate and recommend Federal implementation of site-specific projects and project modifications. “Projects” include significant structures and landform changes, and any nonstructural plans that might be implemented. Modifications include the reevaluation of implemented projects, as well as those authorized but not yet implemented. Modifications also include significant changes in features or operations that materially affect project impacts, rehabilitation, safety, reallocation, termination, and removal. Implementation studies include pre- and post authorization project formulation or evaluation studies undertaken by Federal agencies.

Implementation studies conducted by the following agencies to develop water resources project plans are explicitly covered by these Principles and Standards:

- (a) U.S. Army Corps of Engineers (Civil Works);
- (b) Bureau of Reclamation;
- (c) Tennessee Valley Authority;
- (d) Natural Resources Conservation Service; and
- (e) Any other Federal agency studies meeting the general criteria presented above.

B. The Principles and Standards do not apply to routine project operations, basic maintenance and minor repairs, or watershed plans or regulatory activities. Additionally, the Principles and Standards do not apply to grants, technical assistance, and other financial assistance or authorization for work implemented by non-Federal entities on facilities to which the United States does not hold title.

Proposed Principles and Standards

2. Planning Standards

The following standards are established to implement the Principles by further defining and guiding the conduct of Federal water resources implementation studies, which shall:

A. Protect and Restore Natural Ecosystems and the Environment while Encouraging Sustainable Economic Development

Federal water resources implementation studies shall seek to protect and restore natural ecosystems and the environment while encouraging sustainable economic development. Proposals developed through such studies shall assure the appropriate use of these limited resources and avoid their unwise use. The appropriateness of modifying water resources shall be based on evaluations of the services gained and lost, and only those actions that provide a net national gain shall be considered further or selected. This is best done in accordance with the National Objectives by determining both economic and environmental outputs, as well as the likely impacts of one upon the other. The economic and environmental outputs are inextricably linked and both must be considered if the desired outputs are to be sustained.

B. Account for Ecosystem Services

Ecosystem services are the direct or indirect contributions that ecosystems make to the environment and human populations. Ecosystems provide not only goods and services directly consumed by society such as food, fish and game, timber, and water, but also services such as flood and storm abatement, disease regulation, pollination, and disease, pest, and climate control. Ecosystem processes and functions contribute to the provision of ecosystem services, but they are not synonymous with ecosystem services. Ecosystem processes and functions describe biophysical relationships that have value regardless of whether humans recognize the benefits.

Consideration of ecosystem services can play a key role in evaluating water resource alternatives. Using the best available methods in the ecological, social, and behavioral sciences to develop an explicit list of the services derived from an ecosystem is the first step in ensuring appropriate recognition of the full range of potential impacts of a given alternative. This can help make the formulation and the analysis of alternatives more transparent and accessible and can help inform decision makers of the full range of potential impacts stemming from different options before them. The second step is establishing the significance or value of changes in the quality or quantity of services over time, with and without the effects of proposed alternatives on ecosystem services.

Proposed Principles and Standards

1 The concept of ecosystem services provides an approach to evaluating the ways in
2 which ecological systems, and changes to those systems induced by human actions,
3 affect human well-being. Ecosystems, however, can also be valued not only for the
4 services they provide to humans directly or indirectly, but for other reasons, including
5 intrinsic natural values such as biodiversity.
6

7 In the context of these Standards, evaluations shall focus on identifying ecological
8 service and intrinsic natural value **changes** and the significance of those changes,
9 rather than attempting to assess the value of entire ecosystems.
10

11 **C. Avoid the Unwise Use of Floodplains and Flood-prone Areas**

12 Water resources implementation studies, especially when seeking to reduce the
13 Nation's vulnerability to floods and storms, must recognize floodplains as critical
14 components of watersheds. Studies shall evaluate proposed alternatives for
15 potential direct and indirect adverse effects on floodplain functions. Studies shall
16 give full and equal treatment to nonstructural approaches that avoid and minimize
17 actions and changes that are incompatible with or adversely impact floodplain
18 functions. Studies shall further reflect sound floodplain management by formulating
19 alternatives to:
20
21

22
23 (1) Preserve and restore the hydrologic and natural resources functions and the
24 integrity of floodplains to the extent practicable by avoiding and minimizing
25 actions and changes, including induced development, that are incompatible with
26 floodplain functions;
27

28 (2) Help communities to move damageable properties and critical infrastructure
29 out of flood-prone areas to reduce repetitive losses and risks to life;
30

31 (3) Inform the public about floodplain impacts and the associated risks to life,
32 health and property, including descriptions of historical and probable future flood
33 and storm events, and how climate change may affect these events; and
34

35 (4) Encourage communities to develop and use floodplain management and
36 hazard mitigation plans in their community planning and decision making.
37
38

39 **D. Utilize Watershed and Ecosystem Based Approaches**

40
41 (1) Watershed Perspective. Watershed planning addresses resource conditions
42 and needs based on water and land uses, and multiple stakeholder interests
43 throughout a watershed. By definition, watershed planning focuses on a
44 watershed, a geographic area that is defined by a drainage basin. Most
45 frequently this geographic area is described using hydrologic cataloging units.
46 Watershed planning shall address a geographic area large enough to ensure that

Proposed Principles and Standards

1 plans address the cause and effect relationships among affected resources and
2 activities that are pertinent to achieving the study objectives; i.e., evaluate the
3 resources and related demands as a system. The scope and degree of
4 evaluations across a watershed shall reflect the nature of these relationships and
5 the study objectives. All aspects of a watershed may not necessarily require the
6 same detailed level of analysis. Once a relationship is established as non-
7 existent or insensitive, further analysis of that relationship may not be necessary.
8 Also, while a watershed is generally the appropriate study area, individual
9 analyses within a study may utilize other boundaries where appropriate. For
10 example, political boundaries may be pertinent when evaluating regional impacts.
11 The intent is to address watershed stressors and solutions in a rational and
12 efficient manner rather than focus on a single waterbody segment or other
13 narrowly defined areas, which would preclude a more holistic analysis. The
14 scale selected shall also consider the probability of involvement by key
15 stakeholders. As such, in some cases, aspects other than hydrologic interaction
16 may contribute to defining the “study area.” For example, the study area
17 associated with an inland waterway or port project is likely to include the regional
18 transportation sector, especially alternate modes of transportation, as well as
19 other affected ports. If a species of interest is identified for a restoration plan, the
20 ecoregion that defines the species habitat throughout its life cycle may not
21 coincide with a watershed definition.

22
23 The watershed approach provides a flexible perspective for managing water
24 resource quality and quantity within affected drainage areas or watersheds. The
25 watershed approach allows problems, needs and opportunities to be addressed
26 in a holistic manner, including the interdependency of water uses, competing
27 demands, and the desires of a wide range of stakeholders. The watershed
28 approach is based on:

- 29
30 (a) Sustaining water resources;
- 31
32 (b) Integrating water and related resources management;
- 33
34 (c) Considering future water resources demands;
- 35
36 (d) Coordinating planning and management;
- 37
38 (e) Collaborating among governmental entities at all levels and ensuring
39 broad stakeholder participation;
- 40
41 (f) Evaluating monetary and non-monetary trade-offs;
- 42
43 (g) Utilizing interdisciplinary teams;
- 44

Proposed Principles and Standards

1 (h) Applying principles of adaptive management; and

2
3 (i) Using sound science and data.

4
5 A watershed perspective facilitates evaluation of a more complete range of
6 potential solutions and is more likely to identify the most environmentally
7 preferable, technically sound and economically efficient means to achieve
8 multiple goals over the entire watershed.

9
10 (2) Ecosystem-Based Management. Ecosystem-based management seeks to
11 maintain an ecosystem in a healthy, productive, and resilient condition so that it
12 can sustain necessary ecosystem services. Ecosystem-based management
13 differs from approaches that usually focus on a single species, sector, activity, or
14 concern; it considers the cumulative impacts of different sectors. Specifically,
15 ecosystem-based management:

16
17 (a) Emphasizes the protection of ecosystem structure, functioning, and key
18 processes;

19
20 (b) Is place-based in focusing on a specific ecosystem and the range of
21 activities affecting it;

22
23 (c) Explicitly accounts for the interconnectedness within systems, recognizing
24 the importance of interactions between many target species or key services
25 and other non-target species;

26
27 (d) Acknowledges interconnectedness among systems, such as between air,
28 land and sea; and

29
30 (e) Integrates ecological, social, economic, and institutional perspectives,
31 recognizing their strong interdependences.

32
33 Ecosystem-based management focuses on sustaining the ability of any given
34 ecosystem to continuously provide essential ecosystem services. It recognizes
35 that natural ecosystem boundaries are more important for consideration in
36 management efforts than political jurisdictions and that ecosystem boundaries
37 are porous (that is one system overlaps into another). It also requires accounting
38 for the cumulative human effects on ecosystems via explicit considerations of
39 impacts and tradeoffs.

40
41 (3) Spatial or Geographic Integration. It is important to define the geographic
42 boundaries to encompass areas that are potentially affected by or that could
43 affect candidate solutions so the solutions can be examined appropriately. The
44 watershed is an appropriate geographic area to begin with because it usually
45 encompasses the significant upstream and downstream impacts of an
46 alternative. However, the larger the spatial zone of consideration – for example,

Proposed Principles and Standards

1 a coastal zone or ecoregion – the more likely it becomes possible to examine the
2 full potential for water resources synergies and tradeoffs among all relevant
3 resource elements.

4
5 (4) Information Needs. The Agencies shall recognize the difficulty in obtaining
6 watershed-related information and acknowledge that a balanced approach is
7 needed to address this concern and challenge. However, reasonable efforts
8 must be made to obtain and analyze relevant data, even where available data at
9 the outset may be limited. In addition, watershed planning is an interactive and
10 adaptive process and thus preliminary information may need to be updated over
11 the course of an evaluation where appropriate and accompanied by mid-course
12 corrections.

13 14 15 **E. Utilize Best Available Science, Practices, Analytical Techniques, 16 Procedures and Tools**

17
18 (1) Water resources planners and decision makers shall utilize the best available
19 principles, data, analytical techniques, procedures, and tools in hydrology,
20 engineering, economics, biology, risk and uncertainty, and other sciences. Water
21 resources planning shall use contemporary water resources paradigms such as
22 integrated water resources management and adaptive management, and
23 consider the effects of climate change. Planners shall continuously seek to
24 modernize tools and analytical techniques and not simply rely upon those used in
25 the past because they are familiar. The data used shall be the best available.
26 No data over five years old, other than long-term data sets used to establish
27 historical events, trends and patterns, shall be used to portray existing and future
28 conditions, unless the data are clearly shown to remain valid and representative
29 of current conditions, or unless no other data are available or can be reasonably
30 developed.

31
32 (2) Peer review of applied science and analytical techniques is a particularly
33 valuable practice integral to successful water resources planning. Each agency
34 shall adopt specific guidance on the type, scope and timing of peer review based
35 on their respective types of studies and consistent with peer review standards in
36 the community of practice. The levels of peer review may vary from internal
37 reviews within local offices to fully independent external reviews conducted by
38 third parties, such as the National Academy of Sciences.

39 40 41 **F. Apply a Level of Detail Commensurate with the Potential Decisions**

42
43 The level of detail applied in implementation studies may vary, but shall not be
44 greater than needed to inform the decision efficiently and effectively. The level of
45 detail, scope and complexity of analyses shall be commensurate with the scale,
46 impacts, costs, scientific complexities, uncertainties, risks, and other sensitivities

Proposed Principles and Standards

1 (e.g., public concerns) involved in potential decisions. Each agency shall develop
2 procedures to specify the level of detail for the types of implementation studies that
3 they typically undertake.
4

5 **G. Account for the National Benefits and Costs in Appropriate Monetary and** 6 **Non-monetary Terms** 7

8 The identification and enumeration of potential national benefits and costs are
9 crucial in determining the feasibility of alternatives and selecting plans. In addition to
10 fully documenting both monetary and non-monetary effects, planners shall strive to
11 monetize currently non-monetized units to the extent possible as the ability to
12 monetize various services becomes more well-established. Any application of non-
13 monetary parameters must utilize consistent metrics in order to understand and
14 compare alternatives.
15

16 17 **H. Account for Significant Effects and Mitigate Unavoidable Impacts to** 18 **Ecosystem Services** 19

20 In the evaluation of alternatives (see paragraph 3.I. below), the following
21 requirements for mitigation analyses shall be met:
22

23 (1) Detailed alternatives shall not be considered viable unless they comply with
24 all applicable environmental laws and authorities, including protection of the
25 nation's environment by mitigation of the adverse effects as defined in the Code
26 of Federal Regulations for Compensatory Mitigation for Losses of Aquatic
27 Resources. Key laws on mitigation include, but are not limited to, Section 906(d)
28 of the Water Resources Development Act of 1986, Section 404 of the Clean
29 Water Act, and Section 2036 of the Water Resources Development Act of 2007,
30 all as may be amended. Accordingly, each alternative shall include mitigation
31 developed in coordination with responsible natural resource management
32 authorities and determined to be appropriate by the decision maker. Adaptive
33 management shall be evaluated and incorporated into alternatives to the greatest
34 extent possible when it helps to further avoid and minimize adverse impacts and
35 ensure that any required mitigation performs as intended.
36

37 (2) The following sequence shall be followed to address adverse impacts to
38 ecosystem services:
39

40 (a) Avoid – Wherever possible, avoid adverse impacts by modifying the
41 alternative or applying another practicable alternative with less adverse
42 impact.
43

44 (b) Minimize - If adverse impacts cannot be avoided, then minimize those
45 impacts by modifying the alternative to the extent appropriate and practicable.
46

Proposed Principles and Standards

1 (c) Compensate – If unavoidable adverse impacts remain, then compensatory
2 mitigation is required to the extent practicable. Compensatory mitigation may
3 not substitute for avoiding and minimizing impacts.
4

5 (3) Compensatory mitigation shall be implemented, to the maximum extent
6 practicable, in advance of or concurrent with the activities causing the impacts.
7 In the rare instances where mitigation cannot be practicably implemented in
8 advance or concurrently, then the reasons are to be presented in the decision
9 document, including why other alternatives cannot more effectively avoid and
10 minimize adverse impacts. The alternative shall show that mitigation will be
11 implemented at the earliest opportunity.
12
13

14 **I. Address Risk and Uncertainty, Including the Effects of Climate Change and** 15 **Future Development** 16

17 Decisions shall be made with knowledge of the degree of reliability of the available
18 information; recognizing that even with the best available engineering and science,
19 risk and uncertainty will always remain. Risks and uncertainties shall be identified
20 and described in a manner that allows the public and decision makers to
21 understand. This includes quantifying and describing the nature, likelihood,
22 limitations, and magnitude of risks and uncertainties associated with key supporting
23 data, projections, and evaluations for competing alternatives. This shall also include
24 a concise discussion of what must happen, including the related probability or
25 likelihood, in order to realize any projections. When uncertainties are about an
26 alternative's ability to function as desired and/or to produce the desired outputs or
27 other potential undesired outputs, and thus potentially affect the justification,
28 selection, and/or acceptability of the alternative, improved data, models, and
29 analyses should be pursued. Adaptive management measures should also be
30 evaluated as part of the alternative in order to further reduce such uncertainty,
31 particularly when more detailed information and better tools are not readily available.
32

33 Climate change represents persistent uncertainty that should be addressed in the
34 planning process. The increased variability in temporal and spatial patterns of
35 precipitation and water availability will challenge water systems serving all human
36 needs. From specification of existing problems and opportunities to the formulation,
37 evaluation and selection of plans, the accelerating changes in aquatic systems
38 caused by a changing climate should inform our understanding of what our water
39 resource needs are and how we can realistically respond to those needs.
40
41

42 **J. Incorporate Public Safety** 43

44 Threats to people, both loss of life and injury, from natural events must be assessed
45 in the determination of existing and future conditions. Alternative solutions, including
46 structural and nonstructural elements, must avoid, reduce and mitigate the risks of

Proposed Principles and Standards

1 such threats to the extent practicable. Alternatives shall include measures to
2 manage residual risks. The impact and reliability of alternatives on these threats
3 must be evaluated and shared with the public and decision-makers in an
4 understandable manner.

5 6 **K. Ensure Environmental Justice for Low Income, Tribal and Minority 7 Communities**

8
9 Evaluation methods shall eliminate any biases in analyzing projects affecting low-
10 income communities by fully reflecting the benefits and costs (monetized and non-
11 monetized) of alternatives to low-income communities.

12
13 Planning studies shall identify any disproportionately high and adverse public safety,
14 human health or environmental effects of projects on minority, tribal and low-income
15 populations and decision makers shall seek solutions that would eliminate or avoid
16 disproportionate adverse effects on low income, tribal or minority communities. In
17 addition, specific efforts shall be made to provide opportunities for effective
18 participation by minority and low-income communities in the planning process,
19 including identifying potential effects and mitigation measures in consultation with
20 affected communities and improving the accessibility of public meetings, documents,
21 and notices.

22 23 24 **L. Ensure the Planning Process is Fully Transparent**

25
26 Planning study results shall be provided to the public in a clear, concise, and timely
27 manner during the planning process in order to ensure public understanding and
28 both enable and solicit public participation. This is intended to ensure that studies
29 reasonably address the needs, interests and concerns of stakeholders, Tribal
30 governments, affected agencies, non-governmental organizations, and individuals;
31 and provide adequate opportunities for all to participate throughout the planning
32 process. The presentations shall summarize and explain the decision rationale
33 leading from the identification of need through the recommendation of a specific
34 alternative. This shall include the steps, basic assumptions, analysis methods and
35 results, criteria and results of various screenings and selections of alternatives, peer
36 review proceedings and results, and the supporting reasons for other decisions
37 necessary to execute the planning process. The information shall enable the public
38 to understand the decision rationale, confirm the supporting analyses and findings,
39 and develop their own fully-informed opinions and/or decisions regarding the validity
40 of the study and its recommendations. Opportunities shall be provided for public
41 reaction and input prior to key study decisions, particularly the tentative and final
42 selection of recommended plans. The above information shall be presented in a
43 decision document or documents, and made available to the public in draft and final
44 forms. The document(s) shall demonstrate compliance with the National
45 Environmental Policy Act (NEPA) and other pertinent Federal statutes and
46 authorities.

Proposed Principles and Standards

M. Collaborate Implementation Study Activities Broadly

Federal agencies shall collaborate fully on water resources studies with other affected Federal agencies, and with Tribal, regional, state, local, and non-governmental entities to realize more comprehensive and better informed problem resolutions. The method and scope of the collaborative effort shall be driven by the nature of the study, problems, and likely solutions.

Collaboration in the Federal water resources planning process may include:

- (1) Sharing of data, analytical tools, or expertise unless protected from release by law;
- (2) Inclusion on interdisciplinary or inter-agency study teams;
- (3) Participation in independent or peer review of the study products;
- (4) Development and implementation of complementary projects and programs by others; and
- (5) Post-project review and development of adaptive management.

3. Overview of the Planning Process

Planning is an orderly and systematic process for solving problems and reaching a rational, unbiased, and fully-informed recommendation for decision makers. Performed transparently, it enables the public to understand the rationale and critical information supporting the recommended decision, and in turn help inform the decision makers. The process is enduring and useful for virtually any public planning activity. The following framework outlines the planning process for Federal water resources implementation studies. It must be applied to ensure recommendations for Federal action are viable and warranted.

The planning process is a dynamic and iterative step-by-step process. Each step confirms, modifies or adds to the information developed in prior steps. New information, regardless of source, may cause prior steps to be reconsidered and revised at any point in the process. This includes adding and modifying objectives and alternatives as well as the many other aspects of studies. Agencies shall consider repeating any of the various steps when potential revisions are likely to significantly change the selection, composition and/or effects of the recommended plan.

Proposed Principles and Standards

A. Initiating Implementation Studies

The efforts preceding the initiation of a Federal water resources implementation study generally result in preliminary information to help guide the formation of a study. These efforts may include prior studies, coordination within the watershed, and efforts to secure the authorization and/or appropriations for a study. This preliminary information provides a basis for setting the initial study area, objectives, scope, scale, timeframe, tasks, topics for special attention, and sometimes potential solutions necessary to successfully complete a study.

Agencies are responsible, throughout the study process, for ensuring that each study warrants their continued participation based on their authorized missions, Executive Branch priorities, and Congressional directions.

B. Scoping Process

Shortly after initiating the study, pertinent preliminary information regarding the study shall be shared with affected Federal, State, and local agencies, Tribal governments, and other interested groups or persons in an open forum. As a minimum, the forum shall address the tentative study area, problems and opportunities, any related current or future planning or implementation by the agency or others that is not part of the study, needed environmental assessments and consultations, and schedules for the study and decision-making. Input shall be solicited to identify likely significant issues and decision factors, and to help ensure unneeded studies are not undertaken. Plans for executing the study shall be revised as needed in response to this input. This process shall be conducted to fulfill the scoping process requirements described in CEQ's NEPA regulations.

C. Define the Study Area

The study area shall encompass the significant resources affecting the potential need for action or likely to be affected by those potential actions, both directly and indirectly. The watershed, and its surrounding and connected ecosystems, including the coastal and ocean waters into which the watershed may be connected, is generally the most appropriate geographic area. The study area shall be extensive enough to consider synergies and tradeoffs among affected resources, and interactions among existing water resources projects and programs, including watershed planning efforts. This includes any current or future planning by the agency or others and expected implementation that is related to but not part of the study under consideration.

Proposed Principles and Standards

D. Determine Existing and Future Conditions

A determination of the existing conditions within the study area provides the basis for confirming the problems, needs, and opportunities to be addressed in the study, as well as the subsequent steps. Depictions of existing conditions shall be based on inventories and analyses of the quantity and quality of water and related resources in the study area. Aspects include significant hydrologic (surface and subsurface), topographic, geomorphic, economic, ecological, climatic, social, cultural, historic, and aesthetic conditions, including pertinent existing infrastructure. Inventories should include resources pertinent to the study, but not necessarily exhaustively list all resources in the area. They provide an opportunity to identify potential alternative solutions, including preserving and restoring the various resources. This step corresponds to the NEPA requirement to identify the affected environment.

The depiction of existing conditions provides the basis for projecting the future conditions that are the most likely to occur during the period of analysis – without the implementation of any alternatives considered in the study. The most likely without-plan future condition must be identified based on measurements, statistics, observations, and other evidence. Professional judgment may be applied where data are lacking, as long as the rationale and assumptions are displayed. The most likely without-plan future condition shall serve as the basis for evaluating and comparing the incremental effects of alternative solutions. The basis for projecting the changes from the existing condition to the most likely without-plan future condition, including what must happen and the probability or likelihood to realize the expected future condition must be transparent. The most likely without-plan future condition is synonymous with “No Action” as used in NEPA and the CEQ NEPA regulations.

Because the future is uncertain, alternative without-plan future conditions may be identified as separate scenarios. The scenarios shall only be used as sensitivity tests to assess the robustness of competing alternatives, inform the plan selection, and more fully depict the potential performance of the selected plan. The probability or likelihood of each future condition and its affects shall be presented. Key uncertainties for both existing and future conditions shall also be disclosed, such as uncertainties in the water and related resources, climate change, human activities, or in limited understanding of hydrologic, geomorphic or ecological processes. Such information will help establish the soundness of the study’s recommendations.

E. Identify and Describe Problems and Opportunities

Based on the most likely without-plan future conditions, identify the specific problems and opportunities to be addressed by the study. The problem and opportunity statements provide much of the basis for the study objectives and any study constraints developed below. The statements shall address the full range of

Proposed Principles and Standards

1 significant water and related resources problems and opportunities in the study area,
2 particularly those declared to be in the National interest by the Congress or the
3 Executive Branch. They shall reflect the perspectives of the scoping process
4 participants. Statements shall be considered to address whether existing agency
5 owned and operated projects or systems within the study area serve contemporary
6 needs or may warrant modifications. This step corresponds to the requirement in
7 the National Environmental Policy Act (NEPA) to define the purpose and need.
8

9 10 **F. Specify the Study Objectives**

11
12 Study objectives stating desired effects shall be specified to direct and focus study
13 activities. One or more of the study objectives must clearly contribute to the National
14 Objectives and one or more of the agency's missions. The study objectives must be
15 broadly defined to avoid dictating a specific or narrow range of alternatives. They
16 shall reflect the specific effects that are desired by groups and individuals external to
17 the agency as well as any declared to be in the National interest by the Congress or
18 the Executive Branch.
19

20 21 **G. Specify the Planning Constraints**

22
23 Constraints on the planning effort shall be specified. They may include resource
24 constraints, agency policy and mission constraints, legal constraints, actions or
25 effects that must be excluded or avoided, and other limitations.
26

27 28 **H. Formulate Alternatives**

29
30 (1) Alternative solutions or plans shall be formulated in a systematic manner to
31 address the stated study objectives, consistent with the planning constraints.
32 The range of alternatives must allow due consideration of all reasonably
33 practicable solutions, including a full range of potential contributions, and ensure
34 the one with the greatest net contribution to the National Objectives is identified.
35 This includes consideration of incremental differences in scale and measures,
36 and contributions to various mixes of the objectives.
37

38 (2) The most likely without-plan future condition shall be automatically included
39 as the "No Action" Alternative. At least one alternative with nonstructural
40 measures shall be formulated and identified as the "*primarily nonstructural*
41 *alternative.*" Various combinations of structural and nonstructural elements shall
42 be formulated when reasonable to ensure the best alternative is identified. In
43 some cases, a technically and environmentally viable, primarily non-structural
44 alternative might not exist. If so, the study shall document efforts to identify such
45 an alternative and explain why no such alternative other than the No Action

Proposed Principles and Standards

1 alternative could be formulated. Various schedules for implementing alternatives
2 must be considered in order to further maximize net contributions to the National
3 Objectives. Existing water and related resources plans developed by others,
4 such as State water resources plans and watershed plans, shall be included as
5 alternatives when reasonably consistent with the study objectives. Alternatives
6 shall also be formulated as needed to adequately address other Federal, State,
7 Tribal, local, and international concerns. If any reasonable and viable alternative
8 is determined to be “*environmentally preferable*”, then the appropriate NEPA
9 documentation must identify it as such.

10
11 (3) All alternatives shall be formulated to fulfill the following criteria:
12 completeness, effectiveness, efficiency, and acceptability. An alternative must
13 include appropriate compensatory mitigation in accordance with paragraph 2.H.
14 above before it may be considered complete.

15
16 (4) Potentially viable alternatives must also comply with existing Federal
17 statutes, authorities, and policy including, but not limited to the Clean Water Act,
18 Endangered Species Act, and the NEPA, or include proposed changes in any
19 statutes, authorities, or policy that would otherwise preclude implementation.
20 When a law or other institutional barrier would prevent implementation of an
21 otherwise reasonable alternative, the alternative may include a proposal with
22 supporting rationale to remove the barrier.

23
24 (5) Each alternative shall be described in sufficient detail to permit the evaluation
25 of effects described in paragraph 3.I. below. Each description shall discuss how
26 the alternative meets the four formulation criteria described in paragraph 3.H. (3)
27 above in this Section. When alternatives include elements that could be
28 implemented collaboratively by other Federal agencies, State, local, and Tribal
29 governments, and/or nongovernmental entities, the description shall identify each
30 element, the implementing entity, and its respective role.

31
32 (6) The NEPA process and alternative formulation are integrally related. As
33 alternatives are developed in the planning process, they must be evaluated for
34 reasonableness under NEPA as well as these standards. Even though
35 alternatives are evaluated based on meeting the stated problems, needs, and
36 opportunities as well as the Federal purposes related to the proposed action,
37 alternatives do not need to be formulated specifically for each of the evaluation
38 categories described below (e.g., Monetary Effects Category, Regional Economic
39 subcategory, Natural Resources Subcategory, etc.). The evaluation categories
40 are used to provide information for the alternative comparison and
41 recommendation process, however, no single category shall be the principal
42 driving factor considered in alternative formulation.

43
44
45
46

Proposed Principles and Standards

I. Evaluate the Potential Effects of the Alternatives

Each alternative shall be evaluated for its effectiveness, completeness, acceptability, and efficiency in contributing to the National Objectives and each of the other study objectives in accordance with the following standards:

- (1) Evaluate the incremental effects of each alternative as the differences between the most likely future conditions with the alternative and the most likely without-plan future conditions (the No Action alternative);
- (2) To the extent practicable, quantify benefits and costs and express them in monetary terms and for quantified effects that are not monetized utilize metrics that allow comparisons and tradeoffs to be made evident;
- (3) Estimate the net overall contribution to each of the study objectives, quantitatively when possible; and
- (4) Report the scope and results of the evaluations in the categories described below. Report the positive and negative effects, including determinations of “no effect.” The categories are organized by benefit type, either monetary or non-monetary. All monetized effects shall be included in the monetary category and excluded from the non-monetary category to avoid double-counting any effect, even when the effects were not ordinarily monetized in the past, such as many environmental effects. The use of standardized categories will assure consistency of displaying and reporting among the agencies, which will in turn make it easier to review documents and compare alternatives, plans and projects. The categories encompass all significant effects of an alternative on the human environment as required by NEPA. They also encompass social well-being as required by the Flood Control Act of 1970.
 - (a) Monetary Effects Category. Monetary effects include the part of the NEPA human environment that identifies effects on the economy. The monetary effects are the beneficial and adverse effects on the economy that can be measured as changes in the value of the output of goods and services, and expressed in monetary units. These can include methods for monetizing non-market goods and services such as ecosystem services and other social effects. “Opportunity cost” is the appropriate concept for valuing both benefits and costs. The principle of “willingness-to-pay” (WTP) captures the notion of opportunity cost by measuring what individuals are willing to forgo to enjoy a particular benefit. Willingness to pay for changes in the quantity or quality of a good or service may be estimated using both revealed and stated preference estimation methods that are theoretically correct in the economics valuation literature. When other considerations are equal, revealed preference data shall be used over stated preference data because revealed preference data are based on actual decisions, where market

Proposed Principles and Standards

1 participants enjoy or suffer the consequences of their decisions. (See OMB
2 Circular A-4 for further discussion).

3
4 Other monetary effect considerations include:

5
6 1. For convenience of measurement and analysis, monetary costs shall
7 be classified as implementation outlays, associated costs and other direct
8 costs.

9
10 2. The monetary effects shall include the incidental direct effects of an
11 alternative that increases economic efficiency and are not otherwise
12 accounted for in the evaluation.

13
14 3. Each monetary effect, including any monetized ecological service or
15 other social effects shall be displayed in one or both of the following
16 categories:

17
18 a. National Economic Subcategory. This subcategory includes the
19 changes in the economic value of the output of goods and services,
20 both market and non-market, and the value of using otherwise
21 unemployed or under-employed labor resources. Adverse effects
22 include the opportunity costs of resources used in implementing an
23 alternative; i.e., implementation outlays, associated costs, and other
24 direct costs. Beneficial and adverse effects on the National economy
25 shall be determined and shall be displayed separately from regional
26 monetary effects.

27
28 b. Regional Economic Subcategory. This subcategory includes the
29 changes in the distribution of regional monetary effects that result from
30 each alternative shall be displayed when they are significant to local,
31 state, and regional decision making, or needed to address other
32 concerns of the public. A region may be defined as needed to address
33 these concerns. Regional effects include the National effects that
34 accrue within the region, plus transfers of income into or out of the
35 region relative to the rest of the Nation. The monetary effects of an
36 alternative not occurring within the defined region shall be displayed in
37 a "Rest of Nation" category. Regional changes include National
38 effects, income transfers, and employment effects.

39
40 (b) Non-Monetary Effects Category. Non-monetary effects include that part
41 of the NEPA human environment that identifies effects on ecological
42 resources and attributes, risks to humans from natural disasters, and other
43 types of social effects including aesthetics, cultural resources, and the portion
44 of ecosystems that are not successfully monetized.

Proposed Principles and Standards

1 1. Natural Resources Subcategory. This subcategory shall display the
2 effects of alternatives on significant ecological resources and attributes of
3 the NEPA human environment. Effects shall be measured as favorable
4 and unfavorable changes in significant natural resource quality and
5 quantity. Value is indicated by the scarcity and significance of ecosystem
6 components. Significance shall be based on scientific, technical,
7 institutional and other indication of public desire for certain ecological
8 conditions.
9

10 Relationships between short-term use of the human environment and the
11 maintenance and enhancement of long-term productivity shall be
12 displayed in this category. Any irreversible or irretrievable commitments of
13 resources shall be displayed.
14

15 2. Public Safety Subcategory. This subcategory shall display the effects
16 of alternatives on risks to humans from floods, storms and droughts.
17 These effects include changes in residual risk, the frequency or intensity
18 of natural hazards, reliability of risk management measures, the number of
19 people at risk in hazardous events, the number of potential fatalities that
20 could result from the hazard, and the ability and means for affected people
21 to evacuate or otherwise avoid injury and loss of life. This subcategory
22 shall display all beneficial and adverse Public Safety effects for each
23 alternative, particularly residual risks and measures necessary to address
24 and communicate residual risks to the affected population. These effects
25 shall generally be expressed numerically.
26

27 3. Other Social Effects Subcategory. This subcategory displays effects
28 that are not addressed monetarily or in the other two categories
29 immediately above. These effects may be evaluated in terms of their
30 impacts on separate regions and communities. They shall be expressed
31 in numeric units, or non-numeric terms. This subcategory includes:
32

33 - The Urban and Community impacts include effects on human
34 population groups that are not addressed in the other subcategories,
35 such as income distribution; employment distribution; population
36 distribution and composition; the fiscal condition of the State, Tribal,
37 and local governments; and the quality of community life, including
38 community cohesion. It shall address any disproportionately high and
39 adverse human health or environmental effects on minority
40 populations. Effects on low-income populations shall be addressed in
41 order to assure environmental justice. This category shall demonstrate
42 that the alternatives would not exclude people (including populations)
43 from participation or benefits, or subject them to discrimination
44 because of their race, color, or national origin. Types and locations of
45 significant impacts, broken down by salient population groups and
46 geographic areas, may be reported here. It shall address the relative

Proposed Principles and Standards

1 value of alternatives to any potentially affected low-income
2 communities.

3
4 - The Life and Health impacts include effects on the quality of life and
5 health as a result, for example, of potential loss of property and
6 essential public services, and other environmental effects such as
7 changes in air and water quality, as well as soil and solid waste not
8 reported in the other categories. It also encompasses social well-
9 being, as required by Section 122 of the Flood Control Act of 1970
10 (Public Law 91-611, 84 Stat. 1823).

11
12 - Displacement includes the displacement of people, businesses, and
13 farms.

14
15 - Long-Term Productivity includes sustaining and enhancing the
16 productivity of resources, including the maintenance of ecosystem
17 services, processes, and biodiversity,, for use by future generations.

18
19 - Cultural and Historic Resources include effects on cultural and
20 historic resources, including traditional cultural properties, and describe
21 measures to preserve such resources and the mitigation of
22 unavoidable adverse impacts.

23
24 - Aesthetics include effects on perceptual stimuli that provide diverse
25 and pleasant surroundings for human enjoyment and appreciation,
26 including sights, sounds, scents, tastes, and tactile impressions and
27 the interactions of these sensations, of and with natural, cultural and
28 historic resources.

29
30 (5) Alternatives shall be evaluated for their degree of integration with and
31 contribution to established Federal, State, Tribal, and local watershed plans.

32
33 (6) Other information that is required by law or that would have a material
34 bearing on the decision making process shall be included within the above
35 categories or in some other appropriate format used to organize information on
36 effects.

37
38 (7) Each category shall summarize the available assessments of risk or
39 uncertainty regarding any of the effects addressed within the category in order to
40 convey the likelihood that the alternative will actually produce the predicted
41 effects and achieve the National Objectives and the rest of the study objectives.

42
43 (8) An effect may be shown only once within a given category except that the
44 Other Social Effects category may address an effect from more than one point of
45 view. Beyond this exception, claiming the same benefit, cost, or effect more than

Proposed Principles and Standards

1 once in a given category would constitute double counting, which is
2 unacceptable.

3
4 (9) The period of analysis shall be the same for all alternatives, and shall reflect
5 the period of time that alternatives would produce significant beneficial or
6 adverse effects. The period of analysis begins when alternatives begin to
7 produce substantial benefits, typically when basic implementation is completed.
8

9 (10) All monetary values shall be converted to a common time basis. Cost
10 estimates shall be presented as present values. Costs and benefits shall be
11 presented as average annual equivalent values. Costs and benefits shall be
12 discounted using rates prescribed by law or executive order.
13

14 **J. Compare and Screen Alternatives**

15
16
17 (1) Alternatives shall be compared and, based on the differences in effects as
18 determined in the evaluation phase above, either selected for further analysis or
19 selected as the recommended plan for approval and implementation.
20 Alternatives are considered potentially viable if they fulfill all of the criteria cited
21 above – completeness, effectiveness, efficiency, and acceptability. Only
22 potentially viable alternatives shall be carried through screening and selection
23 steps. Alternatives may be reformulated and reevaluated as needed to help
24 meet these criteria and the study objectives. A stepwise screening process to
25 limit the alternatives subjected to more detailed analyses may reduce study time
26 and cost. Any screening or selecting of alternatives shall apply common criteria
27 and use a similar level of detail of information for all alternatives under
28 consideration. When an alternative is added or altered, any prior screening or
29 selection steps must be updated to reconfirm those actions. The criteria and
30 other information used in comparisons shall be displayed to aid decision making
31 and ensure transparency. The effects and related tradeoffs among the
32 alternatives shall be clearly displayed using the five categories outlined in
33 paragraph 3.i. above.
34

35 (2) Multiple alternatives shall be carried forward into subsequent analyses if the
36 choice of any alternative requires a significant tradeoff among the problems and
37 opportunities to be served. The alternatives that could be recommended for
38 implementation are identified as the final array of alternatives. As a minimum,
39 the final array shall include the No Action alternative, the primarily nonstructural
40 alternative, and the environmentally preferable alternative. The No Action and
41 environmentally preferable alternatives may be the same.
42

43 (3) The comparison, screening, and selection of alternatives shall consider both
44 monetary and non-monetary impacts, including significant impacts that are not
45 quantified. Trade-offs across all impacts should be fully displayed and explained
46 to support all screening and selection decisions. In situations involving impacts

Proposed Principles and Standards

1 with different units of measurement and/or impacts that are not quantified,
2 threshold or break-even analyses should be applied as needed to help compare
3 alternatives and support tradeoff decisions. This includes the analysis and
4 display of incremental changes in the various impacts due to incremental
5 changes in the scale and composition of alternatives. Decisions to select
6 alternatives for further consideration should emphasize contributions to the
7 National Objectives and areas of special consideration, including achieving public
8 safety, environmental justice, equal treatment for low income and minority
9 communities, and the application of nonstructural solutions. When nonstructural
10 alternatives or alternatives that would achieve environmental justice or equal
11 treatment for low income and minority communities are screened from further
12 consideration, the rationale shall be fully explained and highlighted in the
13 decision document.
14

15 **K. Recommend a Plan**

16 (1) The decision maker shall recommend the alternative for implementation that
17 provides the greatest net combined contribution to the National Objectives,
18 subject to the following:
19

20 (a) The recommended plan must provide combined beneficial effects for the
21 Nation that outweigh the combined adverse effects considering all significant
22 monetary and non-monetary impacts, both quantified and unquantified;
23

24 (b) If the recommended plan is not a primarily non-structural alternative, the
25 decision maker must explicitly address the reasons why these objectives are
26 not reasonably achievable; and
27

28 (c) The recommended plan must not preclude other non-Federal plans that
29 would likely be undertaken in the absence of the Federal plan and/or that
30 would more effectively contribute to the National Objectives;
31

32 (2) The Secretary or Independent Agency Head may grant an exception to allow
33 the decision maker to recommend an alternative that does not provide the
34 greatest net overall contribution to the National Objectives where there are
35 overriding reasons for recommending another alternative, including other
36 Federal, State, Tribal, local and international concerns, and to address
37 environmental justice issues.
38

39 (3) The basis for selection of the recommended plan shall be fully reported and
40 documented, including the criteria and considerations used in the selection and
41 the overriding reasons for any exception granted as described immediately
42 above, to ensure the basis for the recommendation is fully transparent.
43
44
45
46

Proposed Principles and Standards

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45

4. Glossary

Acceptability is the viability and appropriateness of an alternative from the perspective of the Nation’s general public and consistency with existing Federal laws, authorities, and public policies. It does not include local or regional preferences for particular solutions or political expediency.

Adaptive Management is a deliberate, iterative, and scientific based process of designing, implementing, monitoring and adjusting a measure or project to reduce uncertainty and maximize one or more resource objectives over time.

Associated Costs are the costs, in addition to implementation outlays, for measures needed to achieve the benefits claimed during the period of analysis.

Completeness is the extent to which an alternative provides and accounts for all features, investments, and/or other actions necessary to realize the planned effects, including any necessary actions by others.

Cost Effectiveness is the extent to which an alternative achieves a set of objectives at the least cost.

Ecological Attributes are components of the environment and the interactions among all of its living (including people) and nonliving components that directly or indirectly sustain dynamic, naturally diverse, viable ecosystems. This includes functional and structural aspects that require special consideration.

Ecological Resources are natural forms, processes, systems, or other phenomena that are related to land, water, atmosphere, plants, or animals; and have one or more ecological attributes.

Ecoregion is a large area of land or water that contains a geographically distinct assemblage of natural communities that share a large majority of their species and ecological dynamics; share similar environmental conditions, and; interact ecologically in ways that are critical for their long-term persistence (from World Wildlife Fund).

Ecosystem is the dynamic complex of plant, animal, and microorganism communities and the non-living environment interacting as a system.

Ecosystem-Based Management is an integrated approach to management that considers the entire ecosystem, including humans.

Ecosystem Functions are the interactions among organisms and between organisms and their environment.

Proposed Principles and Standards

1 **Ecosystem Services** are the direct or indirect contributions that ecosystems make to
2 the environment and human populations.

3 **Effectiveness** is the extent to which an alternative alleviates the specified problems
4 and achieves the specified opportunities.

5
6 **Efficiency** is the extent to which an alternative alleviates the specified problems and
7 realizes the specified opportunities at the least cost.

8
9 **Floodplain Functions** include, but are not limited to: a) water resources (natural flood,
10 sedimentation and erosion control, water quality maintenance, groundwater recharge);
11 b) living resources (fish, wildlife, plant resources and habitats); c) societal resources
12 (open space, natural beauty, scientific study, outdoor education, archaeological and
13 historic sites, recreation); and d) cultivated resource values (agriculture, aquaculture,
14 forestry).

15
16 **Implementation Outlays** are the financial outlays (including operation, maintenance
17 and replacement costs) incurred by the responsible Federal entity and by other Federal
18 or non-Federal entities for implementation of the alternative in accordance with sound
19 management principles. These costs do not include transfer payments such as
20 replacement housing assistance payments as specified in 42 U.S.C. 4623 and 4624.

21
22 **Incidental Direct Effects** are National Economic effects that increase economic
23 efficiency but are not otherwise accounted for in the evaluation. They are incidental to
24 the purposes for which the alternative is formulated. They include incidental increases
25 in output of goods and services and incidental reductions in production costs.

26
27 **Incremental Cost Analysis** compares the incremental costs of measures to their
28 incremental outputs in an orderly manner to identify the optimal scale or combination of
29 measures. Increments continue to be added as long as the incremental benefits are
30 judged to exceed the incremental costs. When the incremental costs are judged to
31 exceed the incremental benefits, no further increments are added. The outputs may be
32 monetary or non-monetary. When used in conjunction with cost effectiveness
33 information, an incremental cost analysis can help decision makers compare
34 alternatives and determine the most desirable level of output relative to costs and other
35 decision criteria.

36
37 **Integrated Water Resources Management** is a deliberate, systematic and balanced
38 approach to making management and development decisions for water resources. It
39 considers potential effects on all of the different yet interdependent uses of water
40 resources. It accounts for the needs of a sustainable environment and the many
41 different and competing social and economic interests.

42
43 **No Action Alternative** is the set of future conditions that are the most likely to occur
44 during the period of analysis without the implementation of any alternatives considered
45 in the study; i.e., the most likely without-plan future condition.

46

Proposed Principles and Standards

1
2 **Nonstructural Measures** generally avoid or minimize adverse changes to the existing
3 hydrologic, geomorphic, and ecological processes, particularly for floodplain functions
4 and the aquatic environment, by altering the use of existing infrastructure or by altering
5 human activities (for example, revised operation plans, congestion pricing or green
6 infrastructure techniques). Nonstructural measures include, but are not limited to,
7 modifications in public policy, management practice, regulatory policy, and pricing
8 policy.

9
10 **Operation and Maintenance** is the daily and annual routine work necessary for the
11 safe and efficient functioning of a project to produce the benefits set forth in its
12 authorization.

13
14 **Other Direct Costs** are the costs of resources directly required for an alternative, but
15 for which no implementation outlays are made. These costs are uncompensated,
16 unmitigated National Economic losses caused by the installation, operation,
17 maintenance, or replacement of an alternative's measures.

18
19 **Period of Analysis** is the time duration used in the evaluation of impacts of the
20 alternatives, particularly the economic costs and benefits. It normally begins on the
21 date construction would end and/or the alternative would begin to produce a significant
22 portion of its intended benefits. A period of analysis is not the service life, which may be
23 longer or shorter, or the life of the project, which is generally indefinite for specifically
24 authorized projects; i.e., until Congress deauthorizes the project and subsequent
25 removal, abandonment, and/or divestiture actions are completed.

26
27 **Practicable** alternative, project or plan is if it is available and capable of being done
28 after taking into consideration cost, existing technology and logistics in light of the
29 project purpose.

30
31 **Study Objectives** are statements to alleviate specific problems and/or realize specific
32 opportunities; i.e., achieve certain effects. They are statements of the study purpose
33 and are intended to focus the study activities.

34
35 **Preserve** is to protect ecosystem resources from harm and destruction.

36
37 **Primarily Nonstructural Alternative** consists primarily, if not entirely, of nonstructural
38 measures.

39
40 **Reallocation** is the reassignment of a resource, such as storage space in a reservoir,
41 from one purpose to another, generally with measurable impacts on various resource
42 users.

43
44 **Rehabilitation** refers to the activities necessary to bring a deteriorated project back to
45 its original condition.

46

Proposed Principles and Standards

1 **Repairs** entail those activities of a routine nature that maintain the project in a well kept
2 condition.

3 **Replacement** covers those activities taken when a worn-out element of a project or a
4 portion of an element is replaced.

5
6 **Restore** means to return to a less degraded state.

7
8 **Separable Element** is any part of a project which has separately assigned benefits and
9 costs, and which can be implemented as a separate action (at a later date or as a
10 separate project). A separable element has independent utility.

11
12 **Significance** means likely to have a material bearing on the decision making process.
13 Significant non-monetary resources, attributes and/or effects are institutionally, publicly,
14 and/or technically recognized as important to people. The criteria for significance may
15 vary by resource, location and perspective.

16
17 **Structural Measures** are those that intentionally modify existing hydrologic and/or
18 geomorphic processes, often by constructing or modifying a hydraulic control structure
19 such as a dam, levee or pumping plant.

20
21 **Sustainable** means to create and maintain conditions, under which humans and nature
22 can exist in productive harmony, that permit fulfilling the social, economic, and other
23 requirements of present and future generations of Americans (Executive Order 13423,
24 January 26, 2007).

25
26 **Unwise Use** is any action or change that is incompatible with or adversely impacts one
27 or more resources to the extent that it or they are no longer self-sustainable. For
28 floodplains this includes floodplain functions.

29
30 **Watershed** means a land area that drains to a common waterbody, such as a stream,
31 lake, estuary, wetland, or ultimately the ocean.
32