

**DM 9500-013**

**United States  
Department of  
Agriculture**

**Natural Resources  
and Environment**

**GUIDANCE FOR CONDUCTING ANALYSES UNDER THE PRINCIPLES,  
REQUIREMENTS, AND GUIDELINES FOR WATER AND LAND RELATED  
RESOURCES IMPLEMENTATION STUDIES AND FEDERAL WATER RESOURCE  
INVESTMENTS  
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<b>DEPARTMENTAL MANUAL</b>	Number: DM 9500-013
SUBJECT: Guidance for Conducting Analyses Under the Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation Studies and Federal Water Resource Investments	DATE: January 5, 2017
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1. PURPOSE

This Departmental Manual (DM) provides guidance on how to analyze Federal investments in water resources. It follows the policy outlined in DR 9500-013, *Conducting Analyses Under the Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation Studies and Federal Water Resource Investments*, and other requirements set forth in the Council on Environmental Quality (CEQ) [Principles and Requirements for Federal Investments in Water Resources](#) (P&R) and [Interagency Guidelines](#) (IAG).

2. SPECIAL INSTRUCTIONS

This DM is one portion of guidance on analyzing Federal investments in water resources. The remaining guidance is included in the P&R, IAG, and DR 9500-013.

3. BACKGROUND

Over the past three decades, certain Federal investments in projects that impacted water resources were analyzed under the “Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies,” commonly referred to as the “P&G.” This framework provided direction to Federal agencies when evaluating and selecting major water projects, including projects related to navigation, storm resilience, wetland restoration, and flood prevention. It focused on economic development and initially only covered water resources projects, programs, and plans (generally shortened here to “activities”) within the U.S. Army Corps of Engineers, Bureau of Reclamation, Tennessee Valley Authority, and the Natural Resources Conservation Service (NRCS).

With the passage of the Water Resources Development Act of 2007, Congress directed the Federal government to update this framework. To do so, CEQ led a process to establish new guidance to incorporate a more balanced consideration of economic, social, and environmental objectives. The framework was also expanded to cover applicable activities within additional agencies, including the Environmental Protection Agency, and the

Departments of Commerce, the Interior, Agriculture, and Homeland Security. Within USDA, this framework will continue to apply to NRCS and will be expanded to include the Farm Service Agency (FSA), Forest Service (FS), and the Rural Utilities Service (RUS).

The IAG provides direction to agencies for implementing the concepts included in the P&R. In addition, it directs USDA to develop Agency Specific Procedures (ASP) to apply this approach to water-related investments in the context of the Department’s mission and authorities. DR 9500-013 and this DM constitute the USDA ASP as required by the IAG. Together, the P&R, IAG, and USDA ASP establish a complete framework for analyzing water resource development activities, and collectively, they are referred to as the PR&G.

This DM provides guidance on completing a PR&G analysis, including steps in the planning and evaluation process, differences between project- and programmatic-level evaluations, direction on incorporating an ecosystem services framework, and techniques for economic analysis.

#### 4. ANALYTIC REQUIREMENTS

##### a. Best Available Science

The PR&G provides that agencies should, “...utilize the best available science, data, analytical techniques, procedures, models, and tools in hydrology, engineering, economics, biology, ecology, risk and uncertainty, and other fields to the extent that sufficient funding is available” ([P&R](#), p. 7). Agencies are expected to continuously update their analytical tools and resources to ensure that their decisions are fully informed, and their understanding of public concerns is current.

##### b. Commensurate Level of Detail

The PR&G envisions that analysis will vary in scope and magnitude across projects. In many cases professional judgment and available resources will be important factors in determining the appropriate level of analysis, facilitated by project scoping.

The level and scale of an analysis will be commensurate with an activity’s cost, impact, and other issues that inform decision-making. In this DR and associated DM, the term “commensurate” is applied by the analyst and decision maker on a case-by-case basis.

(1) To assist analysts and decision makers in determining the appropriate level of detail, the level of detail is considered “commensurate” when:

- (a) The decision maker has the information he or she decides is needed to make an informed decision;
- (b) The analyst is not aware of additional information, available within time and budget constraints, that would significantly change the analysis (e.g., would have

the potential to change the selection of a recommended alternative); and

- (c) All relevant stakeholders are informed of the level of detail.
- (2) Agencies should also consider the following elements when determining the appropriate level of detail for a specific analysis:
- (a) Magnitude and significance of specific problems and opportunities the investment seeks to address;
  - (b) Significance of natural resources within the study area;
  - (c) Magnitude and significance of expected impacts of the investment;
  - (d) Expected investment scale and/or costs;
  - (e) Complexity in science, engineering, ecosystems, cultural values, resource management;
  - (f) Projected service or operational life of the project or facility;
  - (g) Stakeholder concerns;
  - (h) Authority under which the investment decision/recommendation is made;
  - (i) Uncertainty in decision variables and resulting risk exposure;
  - (j) Degree of performance or irreversibility of potential investment decision;
  - (k) Nature and extent of tribal trust responsibilities in the study area;
  - (l) Best scientific information available;
  - (m) Cumulative effects of the activity and any related activities; and
  - (n) Controversy associated with any of the above.

c. Peer Review

Agencies should establish a peer review process for PR&G analyses or should integrate these analyses into existing processes. The peer review process should follow existing USDA and agency guidance on peer review, the use of scientific information, and information quality (e.g., [USDA's guidelines on information quality](#)).

d. Collaboration

When two or more Federal agencies are funding a water resources project, the agencies are expected to collaborate to achieve the most efficient implementation of the PR&G analysis. Collaborating Federal agencies will memorialize by letter or memorandum which agency is the lead agency and has the primary responsibility for completing the PR&G analysis.

(1) The following factors (which are listed in order of descending importance) can be used to determine lead agency designation:

(a) Magnitude of an agency's involvement.

(b) Expertise concerning the project's environmental and economic effects.

(c) Duration of an agency's involvement.

(d) Sequence of agency involvement. For more information, see [IAG](#), p. 11.

(2) Collaboration with non-Federal Organizations

Increasingly, the solutions put forth to address the complex water resources problems facing the Nation involve activities by many other entities at varying levels of scale and scope. Participation by State, Tribal, and local governments, private entities, and not-for-profit organizations is to be actively encouraged in all aspects of water resources planning in the multitude of projects and programs carried out by Federal agencies. Specific effort should be made to provide opportunities for effective participation by underrepresented groups, such as Tribal, minority, and low-income communities in Federal planning and decision making processes.

Collaboration may include, but is not limited to: the sharing of science and data, analytical tools, or expertise unless protected from release by law; inclusion on interdisciplinary or inter-agency study teams; participation in independent or peer review of study products; development and implementation of complementary projects and programs by others; and post-project review and development of adaptive management strategies. For more information, see [P&R](#), p. 8.

e. Integration with Existing Processes, including NEPA

Where Federal investments in water resources require a PR&G analysis, agencies should integrate, to the extent possible, their PR&G analysis into existing processes. It is recommended that agencies produce a single analytical document, if that is the most efficient method for fulfilling PR&G and other requirements. A single analytical document could help ensure consistency across the alternatives analyzed and the other components common to the two processes, as well as reduce the workload for reviewers.

A PR&G analysis does not replace other required analyses, such as environmental impact analysis done under the National Environmental Policy Act of 1969 (NEPA). Rather,

PR&G analysis supplements and complements, but is not intended to duplicate, the analyses used by an agency to inform decision-making, and analyses conducted under NEPA and the PR&G processes may not always overlap. Integrating PR&G planning efforts into existing project planning efforts may reduce duplication of analyses.

#### (1) PR&G and NEPA

The NEPA and associated CEQ implementing regulations require environmental analysis of actions affecting the environment. (See [42 U.S.C. 4321 et seq.](#) and [42 CFR 1500 et seq.](#) for details.)

The PR&G apply to a subset of the Federal proposed actions that are subject to the NEPA, specifically applicable to “investments that by purpose, either directly or indirectly, affect water quality or quantity, including ecosystem restoration or land management activities” ([P&R](#), p. 1). The PR&G analysis is intended to complement and expand on or refine the NEPA analysis to ensure that, for the purposes of the PR&G, a) environmental effects disclosed are monetized and quantified to the extent possible; and b) alternatives considered adequately reflect the Federal Objective and Guiding Principles.

##### (a) Comparing PR&G and NEPA

PR&G applicability and NEPA compliance may be based on different criteria. If a proposed activity is exempt from the PR&G, NEPA compliance still may be required. Conversely, a proposed activity for which NEPA analysis is already complete may still require a PR&G analysis.

For applicable activities that have a combined NEPA and PR&G analysis, the NEPA analysis should integrate the PR&G analysis with a clear explanation of any requirements, considerations and choices that are specific to the PR&G (not otherwise required under NEPA). For activities for which new NEPA analysis is not necessary, agencies may present PR&G analysis in a stand-alone document.

As part of an EIS, agencies may consider benefit-cost analysis in certain circumstances, but a monetary benefit-cost analysis within an EIS is not required when comparing alternatives, and such analysis “should not be used when there are important qualitative considerations” ([40 CFR 1502.23](#)), yet it does allow agencies to consider a benefit-cost analysis “relevant to the choice among environmentally different alternatives that are being considered for the proposed action,” provided the analysis incorporates by reference or appends the analysis and discusses its relationship to “any analyses of unquantified environmental impacts, values and amenities” ([40 CFR 1502.23](#)). PR&G builds on the lead agency’s consideration of social and economic effects while incorporating appropriate benefit-cost analysis.

A NEPA analysis requires consideration of the effects of the proposed action on

climate change as part of the environmental effects of a proposed action where relevant (See CEQ's [Final Guidance on the Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in NEPA Reviews](#).) For activities covered by the PR&G, the analysis must also identify, describe and consider areas of risk and uncertainty for potential investments in water resources, specifically projecting climate change and future land use trends as well as opportunities for adaptive management.

Other analytical requirements specific to a PR&G analysis but not addressed in NEPA include:

#### 1 Federal Objective

Under the PR&G, Federal investments are evaluated with respect to the Federal Objective and Guiding Principles. By contrast, under NEPA, the PR&G Federal Objective and Guiding Principles are not incorporated into the purpose and need contained in an EIS. The lead agency's purpose and need for the proposed action frames the NEPA analysis, and is not part of the PR&G analysis. The Federal Objective may overlap the purpose and need, but the Federal Objective should be stated separately and not incorporated into the purpose and need statement in the EIS.

#### 2 Alternatives

The requirements for analyzing alternatives under the PR&G differ from the requirements for analyzing alternatives under NEPA, although both authorities ask agencies to consider a reasonable range of alternatives. The PR&G contain specific requirements for developing and analyzing alternatives, in contrast to the more general NEPA requirement that a lead agency consider a reasonable range of alternatives that may be narrower than those considered under PR&G (see [40 CFR 1502.14](#)). Unique requirements of the PR&G include "full consideration and reporting on nonstructural alternatives or plans" ([P&R](#), p. 11) and "an alternative plan, strategy, or action that is preferred by a local interest with oversight or implementation responsibilities" (For more information, see [P&R](#), p. 12). The PR&G also requires a transparent comparison of the effects of alternatives for their contribution to the Federal Objective and each of the Guiding Principles using an ecosystem services approach and including a discussion of tradeoffs in documentation provided in display and narrative form. While an ecosystem services approach may be used in NEPA analysis, it is not explicitly required.

#### (b) Integrating PR&G and NEPA

To most fully integrate the PR&G and NEPA processes at the earliest stages, agencies should describe and request public input on the PR&G analysis in the scoping NEPA process (e.g., the Notice of Intent to prepare an Environmental

Impact Statement). Agencies should also use the NEPA scoping process to inform State, Tribal, and local governments and the public of the need for a PR&G analysis where applicable, and to learn of any information or concerns relevant to the analysis. Agencies should clearly separate out what the agency wants to know for PR&G purposes and what is desired for NEPA purposes.

To facilitate integration of PR&G analysis into NEPA analysis, agencies should alert direct or third-party contractors preparing NEPA documents to the requirements for a PR&G analysis. Agencies may also need to include elements of PR&G analysis into statements of work where a contractor is hired to do environmental analysis or draft the EIS.

To allow for agencies to easily separate out the administrative records for NEPA and those for PR&G, separate administrative records may be prepared for each analysis. Because the PR&G may require analysis beyond what would be included in the NEPA analysis, separate administrative records may help agencies clarify what information within the record is only relevant to the PR&G. Agencies may prepare the administrative records for NEPA and duplicate it for the PR&G analysis, addition whatever additional materials should be included as part of the PR&G administrative record.

Table 1 (p. 75) compares key characteristics of a PR&G analysis with the NEPA process. For more detail on how individual agencies will integrate PR&G into existing processes, including NEPA, see Section 10.

## (2) Privacy Requirements

PR&G analyses are intended to assist decision-makers within USDA and to inform the public about why and how a decision is made. In releasing information to the public, personally identifiable information and other confidential information protected by the Privacy Act or other statutes need to be reviewed, aggregated, and screened to protect individual participants (see [5 U.S.C. 552a](#) and [7 U.S.C. 8791](#) and their implementing regulations and any relevant agency regulations, directives or guidance).

## 5. APPLICABILITY

The PR&G apply to a diverse range of water resource investments, including:

### a. Projects

- (1) New or existing Federal investments to construct new infrastructure, modify or replace existing infrastructure, or implement major changes to the operations and maintenance of Federal assets. Operations and maintenance (O&M) activities that are included in the original project authorizations do not require separate analysis as long

as the activity is carried out in a manner that is consistent with that authorization. Significantly changed O&M activities or those changed to meet new goals may need a new analysis;

- (2) Ecosystem restoration activities that will have a direct or indirect impact on water quality or quantity;
- (3) Existing assets that may not result in a change in water quality or quantity by themselves, but without which unintended changes to water resources may occur. These situations may occur when existing infrastructure may fail or degrade in the absence of additional Federal investment, resulting in a change in quality or quantity of the water resources, or the level of service provided. Examples include dam safety modifications to existing projects, and major rehabilitation or replacement of facilities that have exceeded their useful life; and
- (4) Activities where the Federal government is responsible for implementation of an action, or when another party is responsible for implementation using Federal funds.

b. Programs

Includes grant or funding programs, including, but not limited to, programs that:

- (1) Fund project level activities but have limited discretion in designing site-specific alternatives for addressing water resources issues. These situations include Federal grant programs that solicit project proposals to address specific types of water resources needs (e.g., wetland restoration, fish passage improvements); or
- (2) Fund another entity (e.g., State, Tribe, locality) to carry out projects or issue grants to address a specific water resource challenge.

c. Plans

Includes, but it not limited to, studies or plans for potential new actions that meet threshold criteria, management plans for Federal lands, and operational plans for existing Federal water resources infrastructure. Management plans could be analyzed as a whole or as individual activities on the landscape, as appropriate for the specific agency. Such plans could be analyzed at either the project- or programmatic-level, as described in Section 10.

- (1) New or existing Federal investments to construct new infrastructure, modify or replace existing infrastructure, or implement major changes to the operations and maintenance of Federal assets. As with projects, O&M activities that are included in the original authorizations do not require separate analysis as long as the activity is carried out in a manner that is consistent with that authorization. Significantly changed O&M activities or those changed to meet new goals may need a new

analysis;

- (2) Ecosystem restoration activities that will have a direct or indirect impact on water quality or quantity;

d. Exclusions and Exemptions

There are agency activities related to water resources that are excluded from the scope of the PR&G or exempt from additional analysis, including the following:

(1) Regulatory Actions

Regulatory actions include, but not limited to permits under sections 402 and 404 of the Clean Water Act, Endangered Species Act consultations, and requirements under the Safe Water Drinking Act.

(2) Research or Monitoring

Activities that gather or create knowledge that is general in nature, but that do not accomplish additional, permanent site specific actions. Such activities include, but are not limited to, research on water efficiency, studies to examine the role of water in providing benefits, and monitoring stream characteristics.

(3) Emergency Actions

Activities such as those that are undertaken to remove immediate danger to public health and safety or to prevent imminent harm to property or the environment. These actions include, but are not limited to, emergency repair of dams or levees to prevent flood breach, short-term containment and clean-up of toxic chemical spills, and wildland firefighting and associated emergency response. Agencies must certify that actions carried out as emergency actions meet the agency's established criteria for emergencies. In many cases a short-term action to address an immediate emergency may be followed up by longer term actions to rehabilitate damaged resources or better prepare for similar emergencies in the future. Such longer term actions would generally be subject to the PR&G.

(4) Activities under Specified Cost Thresholds

Projects and programs that meet agency specific threshold criteria for exclusion or that fall below the project and program thresholds. USDA is adopting the minimum threshold criteria established by CEQ for PR&G analyses shown in Table 2 (p. 76). The thresholds established by CEQ in the IAG divide projects, programs, and plans into various "levels of analysis." Using authorities provided in the IAG, USDA has modified this approach to have a single level of analysis. Analysis under the PR&G should be completed at a level of detail that is commensurate with an activity's cost, impact, and other sensitivities that inform decision-making. For additional discussion

on “commensurate level of detail, see Section 4b.

These thresholds represent guidelines for the level of analysis that is likely to be most appropriate for an activity, given the level of investment in, appropriations for, or cost of that activity. However, for a particular activity a different level of analysis may be more appropriate, and agencies may depart from these guidelines where such a departure is justified. For more information on how individual agencies interpret these thresholds, see Section 10.

#### (5) Activities with Equivalent Pathways

In addition to the exclusions above, existing agency policies and procedures may meet the spirit and intent of the PR&G and address the Federal Objective, Guiding Principles, and General Requirements. These “equivalent pathways” exempt the activities from further analysis under the PR&G. A list of agency-specific activities that are covered, excluded, and exempt through an equivalent pathway are discussed in greater detail in Section 10.

### 6. PLANNING AND EVALUATION PROCESS

Agencies will use the following planning and evaluation process based on the framework outlined in the [IAG](#) to analyze applicable water resource investments. This approach will ensure that formulation, evaluation, and implementation of agency activities will incorporate the Federal Objective, Guiding Principles, and General Requirements, including an ecosystem services framework, described in Section 8. USDA’s process presents an orderly and systematic approach to making and documenting determinations and decisions at each step so that the interested public and decision makers are fully aware of options and consequences. The steps described in this DM are complementary and consistent with existing agency planning processes, including NEPA regulations, where applicable.

The planning process is not linear, but dynamic and iterative, and previously completed steps may be revisited and refined. Complete documentation is critical at each step of the planning process to ensure adequate information is available for the decision-maker and public. Individual agencies within USDA may have other defined planning processes that could be used as alternative pathways to address these requirements.

Agencies should use an interdisciplinary planning approach in which specialists having different technical expertise act as a team to jointly evaluate the selected activity. The interdisciplinary group considers structure and function of natural resource systems, complexity of problems, and the economic, social, and environmental effects of alternative actions. The disciplines involved should be appropriate to the issues identified in the scoping process and should be augmented as needed with experts from cooperating Federal agencies, universities, consultants, and others.

The quantitative and qualitative analyses need to be conducted at an appropriate,

commensurate level of detail to support the Federal investment and inform the decision making process efficiently and effectively. A broadly inclusive analysis of beneficial and adverse effects is warranted when evaluating projects that involve substantial Federal investment or environmental impact. Evaluation of a specific activity must maintain all the steps of the planning process, but adjustments for commensurate level of detail are possible in the data needs, detail, and scope of the analysis.

a. Summary of the PR&G Evaluation Process

The PR&G evaluation process consists of eight steps, which cover the development and selection of a Federal water resource investment:

- (1) Identify Problems and Opportunities;
- (2) Inventory Existing Resources and Conditions;
- (3) Forecast Future Conditions;
- (4) Develop Array of Alternatives;
- (5) Evaluate Effects of Individual Alternatives;
- (6) Compare Alternatives;
- (7) Identify Recommended Alternative; and
- (8) Implement and Evaluate.

b. Additional Information on PR&G Evaluation Process

The following sub-sections describe each step in more detail:

(1) Identify Problems and Opportunities

This section of a PR&G analysis explains the underlying problems and opportunities and the goals to be achieved by Federal investment. This section will begin with a clear and concise summary statement of the problems and/or opportunities to be addressed by the activity. The statement will be followed by sufficient information to support the need for the activity.

This step should be used by agencies to scope with affected stakeholders to identify the water resources and associated problems or opportunities and evaluate potential collaboration with other Federal, State, and local stakeholders to integrate the activity with other water resource investments. In addition to documenting these findings, this section should also include a description of:

- (a) The study area and how its boundaries were determined;
- (b) Other water resources in the study area that may be affected; and
- (c) Stakeholders affected by the potential activity and how the planning process ensured collaboration with them, including collaboration on identifying the study area and key concerns.

If the PR&G analysis is done in conjunction with a NEPA analysis, this section may correspond to the definition of the purpose and need.

## (2) Inventory Existing Resources and Conditions

This step begins with inventories of the resource conditions of the study area at an appropriate scale and level of detail. Inventories should include data appropriate to the identified problems and opportunities, as determined by the previous step. Inventories will include the quantity and quality of current and potential environmental, economic and social resources, and ecosystem services found within the study area, and the relationships and connections between them. Inventories may suggest additional problems or opportunities. The inventories will not necessarily include an exhaustive list of resources and ecosystem services of the area, but should list and describe the resources and services most likely to be impacted by the activity.

Inventories must include an explicit list of ecosystem services that flow from the existing study area ecosystems and infrastructure (including operational plans) with identification of those that are likely to meaningfully change because of the Federal investment. The inventories should be developed in a manner that will facilitate analysis under the ecosystem services approach and should describe the existing resource conditions; ecosystem services provided; and local economic and social conditions.

Inventories will be done at a commensurate level of detail with the rest of the analysis, and may range from development of a strictly conceptual model to models based on detailed surveys and fieldwork. A conceptual model is a simplified visual representation and written description of interactions among natural, social, and economic systems that affect or are affected by identified actions. Such documentation will help analysts and the public clearly understand how ecosystems contribute to the provision of services and may highlight potential metrics.

If the PR&G analysis is done in conjunction with a NEPA analysis, this step corresponds with the requirement to “Inventory Existing Resources” that identifies the affected environment.

## (3) Forecast Future Conditions

Following the inventory, the existing resources and conditions will be projected into

the future to establish a benchmark against which alternatives can be evaluated. In a PR&G analysis, this benchmark is known as the future without Federal investment (FWOFI). The FWOFI does not assume that existing conditions continue as-is into the future. Rather, it is the most likely future condition if no change to existing activities occur and it includes any changes expected to directly, indirectly, or cumulatively result from all reasonably foreseeable actions without any of the analysis's alternatives. For example, if it is most probable that within period of analysis about 60 percent of a woodland will be cleared for agricultural purposes without any of the plans being considered by the agency, the effects of such clearing would be included in the FWOFI. Similarly, if existing legislation, such as the Clean Water Act, is expected to improve water quality in a river, such improvement would be included in the FWOFI. In some cases, the FWOFI evaluates the continuance of an existing investment or activity. For example, in an analysis of a dam decommissioning, the continued dam operation and effects of that operation would be the FWOFI. When the PR&G analysis is completed in conjunction with a NEPA analysis, the FWOFI may be synonymous with "no action" as used in NEPA and the accompanying CEQ regulations ([40 CFR 1502.14\(d\)](#)). The FWOFI is also referred to as future-without-project, no action, no action alternative (or condition), and without project alternative (or plan).

Once additional alternatives have been developed, projections for those actions will also be developed. Projections will be described in an appropriate amount of detail to provide a transparent projection of future conditions. Projecting future conditions is not an exercise with high certainty, but it can be made transparent with well documented assumptions and methods and can be made more open with peer-reviewed projections of income, employment, output, population, and environmental conditions that are national, State, or regional in scope. Projections should include a summary of the process used to develop them. This summary should include discussion of stakeholder, partner, and public inputs.

(a) Requirements for Projections

Projections should be made for the period of analysis, which is determined, in part, during the next two steps in the analysis process ("Develop Array of Alternatives" and "Evaluate Effects of Individual Alternatives"). Projections should also use the same study area scale used in inventories of current conditions. Projections will also consider:

- 1 The effects of other programs and compliance with existing laws and regulations, including National and State environmental and health standards and regulations. Standards and regulations concerning water quality, air quality, wetlands protection, and floodplain management should be given specific consideration.
- 2 National projections used in planning are to be based on a full employment economy. In this context, assumption of a full employment economy

establishes a rationale for general use of market prices in estimating economic benefits and costs, but does not preclude consideration of special analyses of regions with high rates of unemployment and underemployment in calculating benefits from using unemployed and underemployed labor resources.

- 3 Other plans that have been adopted in the study area that would impact future conditions.

#### (b) Risk and Uncertainty in Projections

Projections should reflect risk and uncertainty, including climate change. In a PR&G analysis, “risk” is the potential for outcomes that can be described in reasonably well-known probability distributions. For example, there may be a 1 percent chance (i.e., risk) of runoff from a 100-year, 24-hour flood event occurring in any given year. Risk can be addressed through various design alternatives, including increasing safety factors of a particular project or selecting project characteristics with lower variation in expected performance.

“Uncertainty” refers to potential outcomes that cannot be described in objectively known probability distributions (e.g., changes in prices or land use that do not follow historic rates of change). Uncertainty arises from measurement errors and from the underlying variability of complex natural, social, and economic situations. Methods of addressing uncertainty include better data identification and collection methods and more refined analytic methods.

Agencies should examine projections of future conditions to determine the level of risk and uncertainty inherent in the data or various assumptions of future economic, demographic, social, environmental, and technological trends. To inform decision makers and the public, the analysis should document key assumptions, the degree of uncertainty of the projection(s), and ways in which the forecast is sensitive to particular changes in existing or future conditions.

Where variability due to risk and uncertainty may meaningfully impact the analysis, multiple forecasts should be developed. Risk and uncertainty may also need to be discussed in other parts of the analysis, where appropriate.

An aspect of risk and uncertainty that deserves specific attention is climate change, and projections should include a reasonable consideration of how climate change will affect the study area. Agencies may examine the impacts of climate change that are relevant for the specific activity, make a professional judgment about what information is reliable to use, and what is practical to analyze. Analysis of climate change impacts should be informed by both historical records and available climate model projections that have been (or can be) downscaled to a resolution adequate for the study area.

The potential impacts of climate change should be considered specifically when

developing hydroclimatic projections associated with environmental conditions, water supply and demand, and operational conditions at existing facilities. Incorporating climate change into these projections may indicate changes and uncertainty beyond what would be expected when only analyzing historic patterns. In addition, the impacts of climate change may vary (e.g., increase in intensity) over the period of analysis. For example, downscaled climate models may indicate that annual precipitation averages will remain constant, but rainfall events will become more intense and will move from being distributed equally over the year to clustered over a period of several months or weeks. These changes would in turn impact the ways in which an activity can address the problems and opportunities identified earlier in the process.

#### (4) Develop Array of Alternatives

The issues relevant in defining the problems and opportunities identified in previous steps form the basis for formulating alternative solutions. Alternatives should be formulated in a systematic manner to ensure that a range of reasonable alternatives are identified. A range of alternatives is necessary to ensure the analysis of significantly different approaches to addressing the problems and opportunities associated with the defined water resource issue while also achieving the Federal Objective; Guiding Principles; and environmental; economic; and social goals. A reasonable range of alternatives are initially investigated, and as they are refined, some may be documented and eliminated from further consideration.

(a) Alternatives should be formulated taking into consideration completeness, effectiveness, efficiency, and acceptability:

- 1 Completeness is the extent to which a given alternative plan provides and accounts for all necessary investments or other actions to ensure the realization of the planned effects, including any necessary actions by others. This may require relating the plan to other types of public or private plans if the other plans are crucial to realization of the contributions to the objective. Completeness does not automatically mean that alternative actions need to be large in scope or scale.
- 2 Effectiveness is the extent to which an alternative alleviates the specified problems and achieves the specified opportunities.
- 3 Efficiency is the extent to which an alternative alleviates the specified problems and realizes the specified opportunities at least cost.
- 4 Acceptability is the viability and appropriateness of an alternative from the perspective of the 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.

(b) Alternatives for Analysis

The PR&G process aims to identify tradeoffs between environmental, economic, and social goals. Including specific alternatives that emphasize these goals individually may more fully illustrate the range of potential tradeoffs. The final analysis may include the following alternatives:

1 FWOFI (No Action)

The FWOFI should be included in the final analysis to serve as a baseline against which other alternatives are evaluated.

2 Nonstructural Alternative

If there are nonstructural approaches to addressing the problems and opportunities identified earlier in the process, they must be fully considered and carried forward into the final array of solutions and given full and equal consideration in the decision making process. For more information on nonstructural approaches, see Section 6c(2)(c).

3 Locally Preferred Alternative

In cooperation with local interests that have oversight or implementation authorities and responsibilities, agencies may identify a “locally preferred” alternative. This alternative may emerge from the collaborative process described in Section 6b(1). If identified, this alternative must be fully considered and carried forward into the final array of solutions and given full and equal consideration in the decision making process.

4 Environmentally Preferable Alternative (from NEPA)

If the PR&G analysis is done in conjunction with a NEPA analysis, and the NEPA analysis identifies an environmentally preferable alternative as part of an Environmental Impact Statement, that alternative must be included in the final PR&G analysis.

5 Additional Alternatives

The required alternatives may not provide decision makers with the full array of decision options and tradeoffs. Other alternatives may be developed and presented in the final analysis to explore opportunities for addressing other Federal, State, local, and international concerns not fully addressed in the required plans.

The number and variety of alternative plans should be governed by the problems and opportunities associated with the water and related land

resources in the study area; the overall resource capabilities of the study area; the available alternative measures; and preferences of and conflicts among State and local entities and different segments of the public. All alternatives developed or considered will be documented as part of the administrative record. All relevant public and USDA identified resource concerns previously identified (see Section 6b(1)) must be considered by one or more alternatives and included in the evaluation (see Section 6b(5)).

In some cases, alternatives may be formulated that require changes in existing statutes, implementation authority, administrative regulations, and/or established law and policies (including existing cost-sharing requirements). When an alternative includes a proposal that relies upon removal of an institutional barrier, it should also include a description of any other effects of removing the institutional barrier. With the exception of proposals that explicitly identify changes in legal requirements as part of the alternative, all alternatives should comply with existing laws and regulations.

(c) Additional Considerations for Alternatives

The alternatives listed above, and any other alternatives included in the PR&G analysis may overlap in whole or in part. For example, the nonstructural alternative may also be the one that is locally preferred. In that case, the alternatives do not need to be analyzed separately, but the overlap should be documented.

Where applicable, alternatives should be formulated to examine the incremental efficiency (varying the scale) of an activity and separating it into various components. Alternatives with multiple components should be considered together and as separate alternatives if the components are independent, meaning there are no obvious dependencies or a scientific need to implement all of the measures as a system.

The alternatives to be studied must be described and compared in equal detail at a level commensurate with the activity's scope. Each alternative plan, including any mitigation, must be clearly described regarding its components, their functions, effects on ecosystem service flows, and costs.

Where appropriate, a description of the hazard potential of each alternative should be included. For example, an alternative that includes construction of a dam should explain the rationale for dam classification and the risk of dam failure from overtopping or from other causes. The analysis should document any remaining hazard potential after implementation of an alternative or alternative components.

If the PR&G analysis is done in conjunction with a NEPA analysis, the alternatives developed at this stage should determine the range of reasonable

alternatives (and vice-versa). Each alternative formulated for the PR&G analysis should be included in the NEPA document, or the differences should be explained and justified.

#### (5) Evaluate Effects of Individual Alternatives

The development of an array of alternatives is followed by their comprehensive evaluation. Evaluation of alternatives must fully consider the array of economic, environmental and social effects, including those that are quantifiable (monetary and nonmonetary) and non-quantifiable.

##### (a) Requirements for Evaluating Alternatives

At a minimum, this step requires:

- 1 Evaluating the alternative against the Federal Objective and Guiding Principles;
- 2 Evaluating the alternatives against the criteria of completeness, effectiveness, efficiency, and acceptability;
- 3 Evaluating the extent to which each alternative addresses the problems and opportunities identified earlier;
- 4 Comparing costs and benefits in terms of ecosystem service flows and social, economic, and environmental impacts using the tools and techniques described in detail in Sections 8 and 9; and
- 5 Documenting arrangements and responsibilities for financing, installation, and operation and maintenance.

##### (b) Alternatives Removed from Detailed Study

After preliminary consideration, agencies may remove from detailed study those alternatives that do not achieve the Federal Objective and Guiding Principles. In addition, alternatives that may at first appear reasonable but clearly become unreasonable because of cost, logistics, existing technology, social, or environmental reasons may also be eliminated from further analysis. These alternatives should be briefly discussed to indicate that they were considered and the analysis should document the reason(s) why they were eliminated (e.g., they do not achieve the Federal Objective and Guiding Principles).

##### (c) Timing and Period of Analysis

Alternatives may differ in their implementation timing affecting the need for capital and resulting discounted costs and benefits. The analysis will reflect any

differences in the timing of implementation, including staged implementation. The effects of individual alternatives should be evaluated over the same period of analysis. The period of analysis is defined as the time required for implementation of the investment plus the lesser of:

- 1 The period of time over which any alternative would have meaningful beneficial or adverse effects; or
- 2 A period not to exceed 100 years.

Elements of an alternative may have different design lives, depending on the features and materials used in construction. If the design life of a particular element is less than the period of analysis for evaluating other alternatives, replacement costs and other effects should be considered. Appropriate consideration should also be given to environmental, economic, and social factors that may extend beyond the period of analysis.

(d) Links to Ongoing Requirements

Agencies may have existing requirements for evaluation (for example, NEPA or the forest planning rule) that are also required either by statute, Executive Order, USDA directives, or agency-specific directives. To the extent possible and accounting for differing objectives, the evaluations should be conducted jointly with common data sources, assumptions, and processes.

(6) Compare Alternatives

Alternatives should be compared to the FWOFI and evaluated against the Federal Objective and Guiding Principles using both qualitative and quantitative information, including monetized and non-monetized indicators. The purpose of the comparison is to provide information on the development, evaluation, and recommendation of alternatives. The comparison of alternatives should:

- (a) Recognize risk and uncertainty and the effects of climate change previously identified in the planning process;
- (b) Be presented from an ecosystem service flow perspective;
- (c) Be displayed in terms of public costs and benefits; and
- (d) Compare effects over the same period of analysis across all alternatives.

It is unlikely that any single alternative will provide the greatest social, environmental, and economic benefits. Thus, the comparison of alternatives will require tradeoffs between these effects as well as the degree to which the

investment's goals are achieved. Tradeoffs and effects must be displayed in a transparent manner to help inform the public and the decision makers.

The tradeoffs among and within economic, environmental, and social goals shall be explicitly identified across alternative plans. Tradeoffs are compared from the perspective of the specific circumstances of each analysis, including the study area, resources, and impacted populations, to form the basis for deciding which plan best addresses the Federal Objective and Guiding Principles.

Some effects are likely to be more relevant than others to the achievement of the investment goals, and these should be noted and separated from incidental effects. Agencies are expected to note effects that are irreversible or that have high end-of-lifecycle costs to reverse (including decommissioning costs).

Different project components may be justified based on different types of public benefits. Similarly, justification may be based on a combination of quantifiable (monetary and non-monetary) and non-quantifiable effects. The tradeoffs between the goals and objectives of separable project components should also be identified to provide a basis for the rationale supporting their inclusion in or exclusion from the alternative.

Displays of information, including the tradeoffs, may help decision-makers evaluate alternatives and document the process for the public. Displays may include graphs, charts, tables, drawings, photographs, summary statements, or other indications of impacts. For transparency and ease of use, the method of display for a specific effect shall be the same across all alternatives. The display should also present the performance of each alternative, relative to the FWOFI, and any other screening or selection criteria used in the analyses.

Agencies may develop additional guidance and direction for displaying alternatives and tradeoffs. For examples of a project-level tradeoff table, see Appendix A.

#### (7) Identify Recommended Alternative

Any recommendation for Federal investments in water resources must be justified by the public benefits when compared to costs. The basis for selection of the recommended plan should be fully reported and documented, including the criteria and considerations used in the selection of the recommended course of action by the Federal government. It is recognized that most of the activities pursued will require an assessment of tradeoffs by decision makers and in many cases the final decision will require judgment that considers the extent of both monetized and non-monetized effects.

The rationale supporting the Federal investment should summarize and explain the decision rationale leading from the identification of need through to the recommendation of a specific action. This should include the steps, basic

assumptions, methods and results of analysis, criteria and results of various screenings and selections of alternatives, peer review proceedings and results, and the supporting reasons for other decisions necessary to execute the planning process. The information should enable the public to understand the decision rationale, confirm the supporting analyses and findings, and develop their own fully-informed opinions and/or decisions regarding the validity of the analysis and any associated recommendations. This information should be presented in a decision document or documents, and made available to the public in draft and final forms. To the extent appropriate, the document(s) should demonstrate compliance with NEPA and other pertinent Federal statutes and authorities.

#### (8) Implement and Evaluate

Implementation may involve agency personnel including engineering, contracting, ecological, cultural staff and staff on the ground for development and construction oversight. Evaluation is necessary to verify success in addressing the resource problem or opportunity and to develop the data and information needed for adaptive management. Some types of project activities will require adjustment in the manner they are managed to achieve their full measure of benefits.

While the PR&G process does not describe the Implementation and Evaluation step, it follows the identification of the recommended alternative. Implementation and evaluation are components in an adaptive management process, described in Section 6c(2)(a)(2)(c), below.

#### c. Considerations for Developing and Evaluating Alternatives

When preparing a PR&G analysis, agencies should consider how the Guiding Principles and General Requirements are incorporated into their process.

##### (1) Guiding Principles

The Guiding Principles identified in the PR&G should be considered when developing and evaluating alternatives, as described below.

##### (a) Healthy and Resilient Ecosystems

A primary objective of the PR&G analysis is the identification of alternatives that will protect and restore the functions of ecosystems. Alternatives should first avoid adverse impact. When environmental impacts occur, alternatives should minimize the impact and mitigate unavoidable damage. If damage occurs, mitigation to offset environmental damage must be included in the alternative's design and costs.

##### (b) Sustainable Economic Development

Alternatives for resolving water resources problems should improve the economic well-being of the Nation for present and future generations. The PR&G analysis will consider the effects of alternatives on both water availability and water quality to evaluate the sustainability of economic activity and ecosystem services. Water use or management factors that provide improved sustainability or reduced uncertainty should be identified in alternatives.

(c) Floodplains

The PR&G seek to avoid unwise use of floodplains and flood prone areas. Alternatives should avoid investments that adversely affect floodplain function, such that the floodplain is no longer self-sustaining. If an alternative impacts floodplain function, then the alternative should describe efforts to minimize and mitigate the impact and the residual loss of floodplain function.

The PR&G investment evaluation of alternatives must be consistent with [Executive Order 11988](#) of May 24, 1977 (Floodplain Management), as modified by [Executive Order 13690](#) of January 30, 2015 (Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input), and the Federal Flood Risk Management Standard, which require executive departments and agencies to avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative. The PR&G investment evaluation is informed by the processes to evaluate the impacts of Federal actions affecting floodplains consistent with Executive Order 11988, as amended.

(d) Public Safety

An objective of the PR&G is to reduce risks to people, including life, injury, property, essential public services, and environmental threats concerning air and water quality. These risks to public health and safety must be evaluated and documented for all alternatives, including those using nonstructural approaches. The residual risks to public health and safety associated with each of the water investment alternatives should be described, quantified if possible, and documented.

(e) Environmental Justice

An objective of the PR&G investment evaluation process is the fair treatment of all people including meaningful involvement in the public comment process. Any disproportionate impact on minority, Tribal, and low-income populations should be avoided. In implementing the PR&G, agencies should seek solutions that would eliminate or avoid disproportionate adverse effects on these communities. For watershed investments, particular attention should be focused to downstream areas. The study area may need to be reexamined to include the concerns of

affected communities downstream of the immediate investment area. The PR&G process should document efforts to include the above-mentioned populations in the planning process.

The PR&G process must be in compliance with [Executive Order 12898](#) of February 11, 1994 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations). Applications of the PR&G process in USDA agencies must be in compliance with [USDA DR 5600-002](#) (Environmental Justice).

(f) Watershed Approach

A watershed approach must be used when completing a PR&G analysis. This approach recognizes that there may be upstream and downstream impacts of a water resources activity that may be outside of the applicable political or administrative boundaries. A watershed approach is not necessarily limited to analyzing impacts within a specific hydrologic unit. Rather, it is broad, systems-based framework that explicitly recognizes the interconnectedness within and among physical, ecological, economic, and social/cultural systems. A watershed approach enables examination of multiple objectives, facilitates the framing of water resources problems, incorporates a broad range of stakeholders, and allows for identification of interdependence of problems and potential solutions.

In many instances, a specific hydrologic unit may be the appropriate scale to examine alternatives to address water resources problems and opportunities. In this case, the watershed would become the study area. In other cases, environmental, economic, or social conditions may merit a study area that is combination of various hydrologic units or other geographic groupings. Ideally, the area of analysis should represent a geographical area large enough to ensure plans address cause and effect relationships among affected resources, stakeholders, and investment options, both upstream and downstream of an investment site.

The watershed approach also establishes the framework to examine cumulative effects and the interaction of a potential Federal investment with other water resources projects and programs. When considering the impact of Federal investments against some economic and ecological measures, the analysis may need to be expanded to include regional markets and habitat considerations beyond the initial study area (e.g., beyond the immediate hydrologic unit).

(2) General Requirements

When developing and evaluating alternatives, agencies should also consider the PR&G General Requirements discussed below.

(a) Risk and Uncertainty

In addition to considering risk and uncertainty when forecasting future conditions (see Section 6b(3)(b)), these concepts should also be identified, described, and considered when developing and evaluating alternatives to address water resource problems and opportunities.

A PR&G analysis should include a description of the residual risk associated with each alternative (i.e., the risk and severity of a specific event, taking into account any safety or mitigation measures included in the alternative). In particular, differences in residual risk between alternatives should be described if the benefits and costs of each alternative are in the same range. Doing so will help the decision maker and public understand how risk varies across alternatives given their particular benefits and costs.

Uncertainty that is inherent in the analyses performed, as well as that associated with the future conditions and potential effects of alternatives, should be identified. Decisions should be made with knowledge of the degree of reliability and the limits of available information, recognizing that even with the best available science and analysis uncertainty will always remain.

1 Addressing Risk and Uncertainty

When there are considerable uncertainties concerning an alternative's ability to address the problems and opportunities defined earlier in the process, the analysts may pursue improved data or models or may perform a sensitivity analysis of the estimated benefits and costs of plans. Reducing risk and uncertainty may involve increased costs or loss of benefits. The advantages and costs of reducing risk and uncertainty should be explicitly considered in the overall decision making process. When developing and evaluating alternatives, risk and uncertainty can also be addressed by:

- a Increasing safety factors in project design to reduce the likelihood of structural failure;
- b Including activity characteristics with lower variation in expected performance; and
- c Reducing the irreversible or irretrievable commitment of resources.

2 Specific Considerations for Risk and Uncertainty

Three particular aspects of risk and uncertainty should be considered when developing and evaluating alternatives:

a Climate Change

It is especially important to evaluate uncertainty if climate change will affect the benefits and costs of particular alternatives. Increased variability in temporal and spatial patterns of precipitation, evaporation, and water availability due to climate change will challenge water resource systems and should be considered in the development of alternatives. Differences between alternatives in resilience to climate stress should be identified and included in the discussion on uncertainty.

b Future Land Use

Future land use patterns, including future development, should be incorporated into the analysis and evaluation process. Future land use patterns may be evaluated in a variety of ways, including through historical trends and projections and assessment of approved local master plans or other land use plans.

c Adaptive Management

Adaptive management is a deliberate iterative and scientific based process of designing, implementing, monitoring, and adjusting an action or project component to reduce uncertainty and maximize achievement of project goals. Where warranted, adaptive management should be evaluated and incorporated into alternatives to avoid and minimize adverse impacts on the environment and achieve economic and social objectives. Adaptive management measures should be clearly identified and evaluated as part of alternatives in order to further reduce uncertainty particularly when more detailed information concerning the alternative is lacking. Adaptive management approaches should be used to the extent they are commensurate with the significance of the proposed activity and available resources.

(b) Water Use

PR&G analyses must consider water use, especially the efficiency of water use. Water supplies will continue to be subject to annual variability in precipitation and runoff and to the uncertain effects of climate change. All alternatives should consider water availability, water use levels and efficiency, and sustainable use and management of water resources. Where applicable, alternatives should consider opportunities to reduce the demand for water, improve water efficiency and reduce losses, and/or improve land management practices to conserve water, with respect to existing water infrastructure and supplies. When efficiency improvements or existing supplies will not suffice, the reuse and reclamation of water should be promoted as a first approach to increasing the available supply of water.

The effect of Federal investments on water quality should also be considered and evaluated. Some adverse effects on water quality may be unavoidable; and these should be documented. Potential impacts and tradeoffs of water resource investments on both water efficiency and water quality should be identified, examined, and documented.

1 Water Use Measures to Consider

A range of measures that can, over time, balance water demand for various purposes with water availability should be considered, including measures that will:

- a Reduce the demand for water;
- b Improve efficiency in use and reduce losses and waste;
- c Improve land management practices to conserve water; and/or
- d Increase the available supply of water.

(c) Nonstructural Approaches

PR&G analyses should consider nonstructural approaches to addressing the problems and opportunities associated with water resources. As opposed to constructing new infrastructure (e.g., dams or levee systems), nonstructural approaches alter the use of existing infrastructure or human activities to avoid or minimize adverse changes to existing hydrologic, geomorphic, and ecological processes. They often minimize adverse effects on floodplain functions and the aquatic environment. Such approaches are typically linked to projects located in floodplains but may be appropriate to address other water resource problems and opportunities. Nonstructural measures include, but are not limited to, modifications to public policy, regulatory policy, and pricing policy, as well as management practices, including the use of green infrastructure.

Nonstructural measures may in some cases provide a more effective alternative than traditional structural measure. In other cases, nonstructural measures may be combined with fewer or smaller structural measures to produce a complete alternative. Full consideration and reporting on nonstructural alternatives should be an integral part in the evaluation of Federal investments in water resources.

(d) International Concerns

A requirement of the PR&G process is consideration of international concerns. Alternatives must consider treaty and other international obligations and develop alternatives that are consistent with meeting such obligations. Analyses should

identify any cases in which an international obligation constrains choices or precludes selection of an alternative. In all cases, timely consultations with relevant foreign governments should be undertaken when a Federal water resources investment is likely to have a meaningful impact on any land or water resources within its territorial boundaries or on the high seas. Where appropriate, the lead Federal agency is responsible for coordinating with the State Department on activities with international concerns.

## 7. PROJECT- AND PROGRAMMATIC-LEVEL EVALUATION

The PR&G apply to a wide range of water resource activities, ranging from specific projects to wide-ranging programs. As such, a PR&G analysis may either take a project- or programmatic-level approach. This chapter describes when agencies should take each type of approach and differences between the levels of analysis. Agencies should generally apply a project-level analysis to water resources investments in which they have discretion in designing site-specific alternatives.

### a. Criteria for Conducting a Programmatic-Level Evaluation

Circumstances that may warrant the use of programmatic-level evaluations include, but are not limited to, situations where an agency:

- (1) Funds project-level activities but has limited discretion in designing site-specific alternatives for addressing water resources issues. These situations include Federal grant programs that solicit project proposals to address specific types of water resources needs (e.g., wetland restoration, fish passage improvements);
- (2) Funds another entity (e.g., State, Tribe, locality) to carry out projects or issue grants to address a specific water resources challenge; or
- (3) Proposes a set of similar projects analyzed under one decision document. Such projects may include those that individually do not have consequential water resources effects, but have cumulative effects on water resources.

### b. Differences between Project- and Programmatic-Level Evaluations

Project- and programmatic-level evaluations should adhere to the Federal Objective, Guiding Principles and General Requirements, and they should follow the same steps outlined in the previous chapter. However, there may be differences between the two levels of analysis within each step. The following subsections outline how aspects of certain steps may vary between the two types of analysis.

#### (1) Step 1: Identify Problems and Opportunities

Project-level analyses should begin with a clear definition of the water resources and

economic challenge(s), including a statement of the problems and/or opportunities to be addressed, the cause or causes of the problem(s), any constraints related to them, and their relationship to the missions, statutory authorities, and other specific statutory or regulatory requirements of the agency or agencies involved.

Programmatic-level analyses should begin with defining the scope of the Federal investment as well as the challenge(s) it seeks to address. A programmatic analysis may describe funding levels, geographic extent, applicability (the target communities and organizations it serves), and existing water resource challenges within a given agency. Programs often do not have a defined study area; rather, they may be applicable across the entire country. In these instances, a programmatic analysis would need to describe problems and opportunities, existing resources, and future conditions in a general manner or in the context of the program goals or needs that it seeks to address.

(2) Steps 2 and 3: Inventory Existing Resources and Conditions and Forecast Future Conditions

Due to the finer scale of a project-level analysis, it will likely include more detailed information than a programmatic-level analysis. Data availability may also be more limited for programmatic-level analysis.

(3) Step 4: Develop Array of Alternatives

Project-level analyses generally include more alternatives because agencies have more options for developing them.

Programmatic-level analyses generally have fewer alternatives because agencies have a different level of detail and consequently fewer ways to develop additional alternatives. Within some programs (e.g., grants), USDA may have limited discretion over the choice and evaluation of alternatives. For example, a grant program may receive individual proposals that have alternatives already defined by the applicant. Review of individual proposals can result in changes to these alternatives, but primarily only for completeness. Agencies may have limited authorities to require specific alternatives for these types of programs and proposals.

Programmatic-level alternatives could be based on changing components like the composition of projects encompassed in the program, the funding level between states or other administrative units, or the criteria by which the proposals are evaluated, among others. In the latter instance, selection and evaluation criteria should be based on the Federal Objective, Guiding Principles, and General Requirements.

(4) Steps 5, 6, and 7: Evaluate Effects of Individual Alternatives, Compare Alternatives, and Identify Recommended Alternative

For programmatic-level evaluations, if alternatives are based on changing

components of the particular program (e.g., funding levels or selection criteria), alternatives may be evaluated and compared by assessing how well projects selected under those program components meet the Federal Objective, Guiding Principles, and General Requirements.

(5) Step 8: Implement and Evaluate

For programmatic-level evaluations implementation of the selected alternatives should be reflected in annual program work plans.

c. Prospective and Retrospective Programmatic Evaluations

USDA identifies two possible approaches to programmatic level evaluations: prospective and retrospective. In the prospective approach, also known as a tiered approach, the agency conducts a programmatic analysis of typical projects within a program to understand how they perform with respect to the PR&G. The programmatic analysis is expected to characterize typical project types; describe the effects of typical project types; describe how typical projects perform with respect to the PR&G; and determine whether the typical level of performance is acceptable. If typical level of performance is determined to be acceptable, the agency will use a checklist, tiered from the programmatic analysis, to review the effects of proposed actions or projects and determine whether they are typical. If a proposed action or project is determined to be typical, then it is covered by the programmatic analysis and may move forward in agency decision making. If the project is determined to be atypical, then the agency will need to further supplement the programmatic analysis before moving the project forward.

A prospective approach can also be used to evaluate the process and criteria by which an agency ranks specific projects or proposals under a particular program. In this case, the current program selection criteria could be reviewed to determine if they incorporate the Federal Objective and Guiding Principles. If not, additional selection criteria could be developed and included either in revised or new guidance for the particular program. The alternatives analysis as such would evaluate different selection criteria and how those would affect program performance, while also seeking to meet the defined problems and opportunities.

Retrospective evaluations help the agency structure its program guidance that fund projects—to the extent that statutory authority allows—to reflect the Principles and Requirements of the PR&G. To employ this approach, an agency would periodically review a collection of funded projects to assess whether they perform appropriately with respect to the PR&G. Based on the results of the review, agency processes and guidance would be modified as necessary to improve alignment with the PR&G. It is expected that such review would not take place until well after existing agency processes are reviewed for incorporation of the PR&G, processes are adjusted or amended accordingly, and the program and applicants have had sufficient time to implement any new processes or procedures.

Agencies may take a prospective or retrospective approach to conducting programmatic PR&G analyses, depending on the particular program and analytic requirements. In some cases, agencies may use a prospective approach for one program and a retrospective approach for another program. The scale of the representative projects must be consistent across alternatives in either method and the cumulative effects of multiple projects shall be recognized.

d. Outlier Projects

Programmatic-level procedures should account for circumstances where an individual project, evaluated under a programmatic-level analysis, may need further evaluation using the level of detail generally associated with projects. Such circumstances address “outlier” projects that are not typical of other projects evaluated at the programmatic level. Such outlier projects may include those that, with respect to the typical program projects, are larger in size, greater in impact, more costly, more controversial, employ novel techniques, or address new problems not typically addressed through the program in question. USDA agencies will develop processes to identify outlier projects and evaluate them using a project-level evaluation, either in part or in whole.

## 8. ECOSYSTEM SERVICES FRAMEWORK

The PR&G require the use of an ecosystem services framework as described in this chapter. This framework is complemented by the methods and guidance of the economic concepts that follow in Section 9. If not already included, planning processes for any activities subject to the PR&G may need to be adjusted to reflect an ecosystem services framework.

The concept of ecosystem services has emerged over the past several decades as a way of framing and describing the comprehensive set of benefits that people receive from nature. They can be characterized as the ecological goods and services provided by a healthy, functioning environment.

Ecosystem services (either tangible or intangible) are the critical link between ecological function and social well-being. They align well with the PR&G: By analyzing and monitoring the ecosystem services produced from a given Federal investment, natural resource managers can also ensure that the detrimental ecological impacts of that decision are minimized to the extent possible.

For the purposes of the PR&G, the ecosystem services framework will provide an integrated approach that articulates the relevant costs and benefits inherent in a decision-making process, to complement any economic and ecological assessment of magnitude. The framework will identify, describe, and quantify environmental impacts through the flows of ecosystem services that result, both directly and indirectly, from a Federal investment. Such values must be elicited through stakeholder engagement, and tradeoffs must be weighed in a transparent, systematic and inclusive process. The information provided in this section is not

intended to be a “how-to guide,” but only provide concepts and methods.

a. Categories of Ecosystem Services

In 2005, the Millennium Ecosystem Assessment (MEA) organized benefits into four service categories:

- (1) Provisioning services are tangible goods provided for direct human use and consumption, such as food, fiber, water, timber or biomass.
- (2) Regulating services maintain a world in which it is possible for people to live, providing critical benefits that buffer against environmental catastrophe – examples include flood and disease control, water filtration, climate stabilization, or crop pollination.
- (3) Supporting services refer to the underlying processes maintaining conditions for life on Earth, including nutrient cycling, soil formation, and primary production.
- (4) Cultural services make the world a place in which people want to live – recreational use, spiritual, aesthetic viewsheds, or tribal values.

b. Selecting Appropriate Ecosystem Services and Metrics

(1) Scoping

Scoping should be used to determine the spatial and temporal extent of the PR&G analysis, the number and variety of ecosystem services to be considered, and the population groups impacted by the decision. It should also incorporate landscape-scale information about ecological processes impacted over time, cultural and distributional implications to potential beneficiaries, and consider the socioeconomic context in which a Federal investment is made. Impacted ecosystems are likely to be both on- and off- site, with respect to the investment. The scope of the analysis is ultimately dependent upon the geographic location and proportion of impact felt by end users or affected stakeholders, the practicability of evaluating services flowing to affected areas, and the commensurate level of detail in the evaluation. Scoping must take into account situations where the dynamic interplay between affected services across a landscape might be too costly for full consideration given the resources available to the authorizing unit.

Scoping also recognizes the need for collaboration when subsequent coordination of data and expertise is needed. Specifically, the process should identify the entities that need to be involved in the decision-making process, analysis of marginal change in ecosystem service flows, and data collection or monitoring based on user groups affected or resources impacted.

Scoping will require early, open solicitation of input to the public in order to glean the

significant resource issues and anticipated effects associated with a Federal investment – these issues could range from threatened ecosystems or species, commercial and recreational uses of lakes and waterways, effects on municipal water supply, or statutory and legal responsibilities relative to lakes and waterways. For the purposes of PR&G, scoping will identify significant ecosystem services and stakeholders affected by the proposed Federal investment both on- and off- site.

These considerations should be integrated into the evaluation step, “Identify Problems and Opportunities” (see Section 6b(1)), and where appropriate, into the NEPA scoping process.

## (2) Selection of Services for Evaluation

Once the scope of the Federal investment is identified, a list of ecosystem services impacted in the context of PR&G should be considered and documented for further analysis. Causal relationships between a preferred action and subsequent change in ecological production – direct, indirect and cumulative – should also be articulated. A formalized stakeholder engagement process may be necessary to glean the critical ecosystem services impacted by a Federal investment or decision, as cultural perceptions can dramatically shape preferences and values. Conceptual models and other visualization aids can broaden the understanding of these linkages. A conceptual model is a simplified visual representation and written description of interactions among natural, social, and economic systems that affect or are affected by identified actions. Options for developing this visual representation include a means-end diagram or a wire frame diagram to help articulate causal relationships in order to inform which ecosystem services will be considered in the analysis. Additional guidance on using conceptual models, including means-end diagrams, can be found in the [Federal Resource Management and Ecosystem Services Guidebook](#).

The selection process will also identify which services can be fully characterized, quantified, or monetized to the extent possible and at the commensurate level of detail. These decisions should be approached on a resource-specific basis – the most critical resources to be thoroughly addressed will typically represent the greatest net impacts over time. The process of identifying ecosystem services should be well documented in the analysis.

There may be an overwhelming number of ecosystem services initially identified, and the framework recognizes the need for selectivity in prioritizing critical services for evaluation. Because ecosystem services are place-based and a matter of public perception, the selection of services for consideration and inclusion in the analysis should be context-specific. However, the following criteria must be considered when evaluating ecosystem services for further analysis:

### (a) Anticipated Magnitude of Impact (Direct, Indirect, And Cumulative)

Identified services may be the most costly to greatest number of people and

ecosystems, or disproportionately affect marginalized groups significantly.

(b) Reversibility of the Given Decision

Potential for the environmental impacts of the decision to be completely or partially reversed eliminated or mitigated in the future.

(c) Irretrievability of Potential Resource Foregone

The decision maker must take into account scarcity of affected resources from the given decision, and whether that resource can be regained or sustained in the future.

(d) Local Societal Importance of Resource

Certain resources may be of significant cultural or regional importance to certain user groups, and should therefore be given priority in consideration.

(e) Potential to Affect Pre-Existing Regulatory Threshold

Certain resources may be highlighted as threatened or protected given existing regulatory statutes and laws. These resources should be given due consideration when identifying critical services.

(3) Identification of Appropriate Metrics

In order to accurately evaluate the ecosystem services affected by a Federal investment, metrics must be defined that reasonably quantify impacted service flows over time. These metrics should be representative of the critical ecosystem services selected for evaluation and reflected by impacts to end users.

Appropriate metrics should be both identifiable to the general public, as well as accurately representative of the causal relationship between change in ecological condition and social well-being. For example, ecological conditions might be described in terms of changes to water quality due to soil disturbances in project construction, but the key indicators reflecting social values might be viewed as dollar values or physical units such as the marginal change in water utility rates to consumers for treatment or number of recreational anglers visiting a lake per year.

Once appropriate metrics are developed to represent the critical ecosystem service flows from the planning area, the actual ecological production functions and assessments can be completed to quantify the marginal change in services based on management action. For example, if the metric for storm surge protection is the financial cost of potential flooding, appropriate ecological production functions must be applied that predict residential/commercial area affected by flooding, as well as expected sedimentation impacts. Metrics dictate the type of valuation and ecological

modeling that must be implemented.

It is important to note that not all activities will have refined production functions or models to evaluate changes in ecosystem services. Planners should choose metrics that can be quantified by response functions (or vice versa, biophysical models that can contribute to identified metrics). If an analyst wishes to quantify provisioning services (i.e. fish) as a result of riparian restoration, he or she may not be able to rely on the number of recreational angling days if a viable fish population cannot be directly linked to water quality or temperature impacted by the Federal investment. However, he or she may be able to identify another metric – such as annual local and foreign recreationists – which may more broadly capture the revealed preferences reflected by the value of clean water in the area of study. If there is a lack of response functions or biophysical models available for critical services identified, other methods, including, but not limited to, benefit transfer may be applied (see Section 9).

c. Measurement of Changes in Services based on Changes in Ecosystem Structure or Function

Once critical services are identified and metrics are developed, proper measurement of marginal change in those services based on changes to ecosystem structure or function due to a Federal investment must be completed. This process will describe how the impacts to the planning area will affect the provision of services in question (degree and frequency over time).

Changes in service provisioning should be compared to the FWOFI. Specifically, the framework should measure how each alternative will affect the quantity and quality of ecosystem and economic functions, processes, outputs and resulting services.

Such considerations would ideally monetize ecosystem services when feasible (see Section 9 for possible valuation methodologies. Additional examples of ecosystem services and associated methods and tools to quantify them can be found in Appendix B). However, not all metrics can easily or feasibly be translated into monetary value, as is the case with many cultural or aesthetic values. In evaluating and comparing non-monetary and monetary ecosystem services delivered by a given investment, social surveys or questionnaires may be necessary to ascertain resource significance or establish a proxy for characterizing tradeoffs. If the informational or resource capacity for monetary valuation is not feasible, critical ecosystem services should still be quantified and/or characterized to the extent possible. Best available science and commensurate level of detail will dictate the extent of the ecosystem service flow analysis. Ultimately, accurate assessment of marginal change in ecosystem services is contingent upon: 1) the application of scientifically credible and tested ecological production functions that can accurately model and simulate fluctuations in ecosystem services over time given potential management actions; and 2) market and non-market economic valuation techniques, physical quantification methods, and descriptive characterizations that avoid double-counting and accurately reflect the role of the ecosystem service to the stakeholders in the decision.

Analysis of ecosystem services impacts should address the levels of uncertainty inherent in the expected outcomes. Uncertainty should be recognized as a potentially confounding variable of simulations and modeling, tied to climate change, land use change, future management actions and any sociopolitical restructuring that might occur. Valuation methodology and rationale for application of models and metrics should be well-documented throughout the analysis.

d. Characterization of Relative Change in Ecosystem Services for each Alternative

All ecosystem services assessed in a Federal investment context should be compared based on the decision objectives established by the Guiding Principles, and ultimately, the decision may involve tradeoffs between them.

(1) Consideration and Prioritization of Ecosystem Services and Values

The extent to which the intentions of the proposed decision and alternatives meet the desired objectives of the project or program are contingent upon which ecosystem service benefits are prioritized in the affected area. Because services are expected to be impacted by a decision, these Federal investment decisions and alternatives should each be considered as a portfolio of potential returns. In order to effectively consider and weigh ecosystem service tradeoffs in a decision context, planners must take into account the values of both stakeholders and specialists to determine which benefits should be prioritized.

(2) Distributional Differences

Distributional differences account for any ecosystem service flows that disproportionately impact certain beneficiary populations both within and outside the planning area. The analysis should clearly identify subpopulations that may experience greater net benefits, or greater detrimental impacts under each alternative. The documentation of direct and indirect ecosystem service impacts should be developed in accordance with geographic location of beneficiaries (who will be impacted) and the degree or frequency to which they receive or forego the identified services. Additionally, it should be noted that certain services will have benefits that are national and long-term in scale, while others may be limited to the study area but are of greater significance to affected stakeholders.

(3) Characterization of Values and Tradeoffs

When evaluating and comparing alternatives, agencies should describe both the qualitative and quantitative ecosystem services affected under each alternative plan and an analysis of potential opportunity costs associated with each management decision. Net benefits projected from the proposed action should be described in terms of ecosystem service flows to end users. For more information on discounting

both monetary and non-monetary impacts, see Section 9f(5).

## 9. ECONOMIC ANALYSIS

The PR&G state that Federal investments in water resources as a whole should strive to maximize public benefits, with appropriate consideration of costs. Public benefits (i.e., positive ecosystem services) encompass environmental, economic, and social goals; include monetary and non-monetary effects; and allow for the consideration of both quantified and unquantified measures.

The focus of this section is to discuss the estimation of benefits and costs resulting from activities covered by the PR&G, including from environmental and social effects. This guidance provides brief descriptions of the economic analyses that are commonly used to evaluate Federal investments; agencies should use the tools included here to analyze the impact to the ecosystem services that are being evaluated for a particular project or program. Much of the information included here is relevant to monetized benefits and costs, although a PR&G analysis should also consider other quantified effects that are not monetized, as well as effects that cannot be quantified. The monetized benefits and cost will be evaluated based on [OMB Circular A-4](#), and [OMB Circular A-94](#), and other applicable statutory requirements. Although not covered in detail in this guidance, quantifiable non-monetary benefits and costs will be evaluated using methods from OMB Circulars A-4 and A-94. An agency program or plan will likely develop an analysis for both monetized and non-monetized benefits and cost depending on the effects to national income and national ecosystem services.

The information presented in this section of the DM is not intended to be a “how-to guide” but only to provide concepts and methods. These procedures do not prescribe the techniques to be used to quantify and monetize benefits or costs. Analysts should use their best professional judgement when selecting appropriate techniques, with justification appropriately documented.

In addition, valuation methodologies continue to improve and be refined, and the methods outlined here are not the only techniques for valuation and are not always appropriate even if included. New analytical techniques and methodologies may be used as they become available and cost effective. Peer review of methods is an important part of the valuation process, with any disputes in method suitability determined by the USDA Chief Economist or other appropriate executive.

The justification of any economic valuation techniques used should include discussion on why the method is appropriate for the analysis, how it compares to other methods that could have been used (pros vs. cons), and what are the risks and uncertainties inherent in using that particular technique.

The economic analyses discussed in this section include: benefit-cost analysis, cost effectiveness analysis, break-even analysis, incremental analysis, and regional impact

analysis.

a. Benefit-Cost Analysis

The principles of a benefit-cost analysis (BCA) can be used to evaluate economic, social, and environmental effects that are quantified (monetized and non-monetized) and those that are describe qualitatively. BCA is the standard technique for evaluating the net national impacts (i.e., benefits minus costs) of a PR&G activity. This section provide guidance on the monetized portion of the BCA, which evaluates the derived/estimated economic benefits and costs of an action and its effects on the national economy. Monetary beneficial and adverse effects are evaluated and measured in terms of changes in national income, thus accounting for offsetting gains and losses across different regions of the nation. Beneficial effects in a BCA are net increases, after accounting for costs, in the value of the national output of goods and services resulting from an investment, and improvements in national economic efficiency.

The results of the BCA are discounted to the net present value (NPV), in accordance with economic theory, for comparability. If the NPV is demonstrated to be positive, implying that present value of the benefits exceeds the present value of the costs, the project is considered to be economically justified given the capability to quantify available information and valuation methods employed. Present values can be further converted to average annual basis by amortizing benefits and costs over the period of analysis at the discount rate of the Federal investment.

Quantifiable benefits should be evaluated in a form to disclose cost-efficiency for non-monetary outputs. Economic efficiency may be defined as maximizing output per unit of resource input, or conversely minimizing resource inputs per unit of output. Costs are represented as a loss in utility as measured by the opportunity cost (value of resources forgone) from an action. In theory, a BCA takes into account all quantitative and qualitative benefits and costs that accrue to society. However, in practice, due in part to a lack of information and technical limitations, it is rarely possible to quantify and monetize all of the benefits and costs. The exclusion of relevant benefits and costs biases the results and reduces the robustness of a monetized benefit-cost analysis. To address this challenge, a PR&G analysis should consider other quantified and qualified effects (e.g., social and environmental impacts) using the ecosystem services framework described in Section 8.

(1) Benefits

Economic values represent the utility (welfare or satisfaction) received or lost by an individual or society resulting from people's preferences and their utilization of resources. The general measurement standard of the value of goods and services is defined as a user's willingness to pay (WTP) for each increment of output from an investment. Such a value would be obtained if the "seller" of the output were able to apply a variable unit price and charge each user an individual price to capture the full value of the output to the user. Since it is not possible in most instances for the

planner to measure the actual demand situation, various techniques, as presented below, are used to obtain an estimate of the total value of an investment. Some methods are more complex, data-intensive, and time-consuming than others to implement.

The complexity of the analysis should match the scale, scope, and cost of the proposed project or plan. Note that the list of methods in the following sub-sections is not all-inclusive and other methods may be utilized with justification. Examples of ecosystem services and associated methods and tools to quantify them can be found in Appendix B.

Monetized economic values can be categorized into two broad classifications of use and non-use. The delineation between these two value categories is due in part to preference, proximity, and timing.

#### (a) Use Values

Use values are derived from the use or consumption of specific resources or ecosystem service. They include both direct and indirect utilization of resources or ecosystem services.

##### 1 Types of Use Values

###### a Direct Use

Direct use values encompass the values associated with human physical interaction and involvement with resources (e.g., timber harvested from the forest, water extracted from a stream for irrigation, and tourism). Direct use values can further be disaggregated into the subsets of “consumptive” use in which resources are actively consumed (e.g., logging, fishing) and “non-consumptive” use which do not deplete resources (e.g., certain types of recreation such as enjoying the scenic beauty of a natural vista).

###### b Indirect Use

Indirect use refers to the category of resources that are passively used to support humans or intermediary to what humans directly use, including: climate regulation, carbon sinks, flood control, animal and fish refugia, pollination, and waste assimilation from wetlands.

##### 2 Methods for Evaluating Use Values

###### a Actual or Simulated Market Price

If, in an efficient market, the additional output from an investment is too

small to have a meaningful effect on price, actual or simulated market price will closely approximate the marginal value of the output and may be used to estimate WTP. If the additional output is expected to have a meaningful effect on market price then an attempt should be made to estimate the marginal effects of the added output. As stated in the assumptions below, in this context project evaluation is generally based on full employment economy; assumption of a full employment economy establishes a rationale for general use of market prices in estimating economic benefits and costs.

b Change in Net Income

When outputs of an investment are intermediate goods or services, the net income of the direct user may be increased. Where changes in net income of each individual user can be estimated, a close approximation of the total value of the output of the plan will be obtained. An example of this method is the increase in net farm income received from the use of irrigation water to produce agricultural commodities.

c Cost of the Most Likely Alternative

The costs associated with obtaining the desired output by the most likely alternative can be used to approximate total value. This method lacks the robustness of willingness to pay or change in net income methods. The cost of the most likely alternative will indicate the value of the output of an investment to the users assuming that society would, in fact, undertake the alternative. This method should only be used where a realistic alternative is available and there is a reasonable expectation that it would be undertaken in the absence of the Federal investment. Adequate consideration should be given to nonstructural and demand management measures as well as structural measures. This method can be used in evaluating the benefits of projects for hydropower, municipal and industrial water supply, or for ecosystem services that can be replicated through mechanical means, such as water quality improvements.

d Avoidance Expenditure

This method considers the cost of actions taken to avoid harm as a way to value the experience of some current condition, absent the harm. For example, the expenditures a homeowner makes to reduce the risk of flood damage provide a lower bound estimate of the value placed on the current condition of the property and its setting.

e Hedonic Valuation

Hedonic valuation models gather exogenous market data and utilize

multiple regression analysis techniques to analyze the data in order to predict/forecast the significance and impact of the variable(s) under examination. Hedonic models allow for the measurement of the marginal willingness to pay for discrete changes in an attribute. An example of this method is a study that examines the effects of a proposed project or investment on property values (e.g., the change in the value of land with waterfront access that is created with the construction of a dam).

f Agent Based Modeling (ABM)

An ABM is a computational model for simulating the actions and interactions of autonomous individuals. The model attempts to represent the simultaneous actions of multiple agents, in an attempt to recreate and predict the actions of complex phenomena. ABMs are particularly valuable because they can be used to assess the effects of aggregate behavior on the system as a whole. ABMs combine some elements of game theory, complex adaptive systems, sociology, and evolutionary programming. As an example, an ABM could be utilized to quantitatively estimate the extent of recreation use and the net increase in economic value which results from a park that does not currently exist.

g Contingent Valuation (CV)

The contingent valuation method is based on survey responses to a proposed change in resource use or a change in the distribution of use. For example, the benefits to water users of converting from groundwater to surface water supplies could be estimated by asking water users their willingness to pay for the project given improvements in municipal and industrial water quality and reliability that would result. In addition, other questions such as household income, current water costs, perceptions of current water quality and supplies, and other measures of need could be asked to understand the factors that influence willingness to pay. The responses to some of these other questions can also be used to evaluate the representativeness or demographics of the survey respondents.

h Conjoint Analysis (Choice Experiments)

Conjoint analysis is similar to contingent valuation in that it is a survey-based technique, but instead of asking participants to state their WTP, respondents choose between alternate states of the world. Each state of the world has a set of attributes, and a price. For example, a questionnaire on forest management might describe alternative management prescriptions with different options for the spacing of roads, treatment of dead and dying trees, and techniques of riparian protection, as well as the hypothetical payment the respondent would make to value each alternative. This method elicits economic values for sets of choices that

more closely resemble management decisions than contingent valuation, but such surveys are correspondingly more complex to design and interpret.

i Travel Cost

Travel cost methods attempt to infer the value of a resource (such as a park or lake) by using information on the visitor's costs and tradeoffs in traveling to the site. With the cost information obtained a demand curve for willingness to pay can be constructed and the values understudy estimated. This method is useful for valuing recreation benefits, however, values obtained through this method are likely the lower bound on the value of recreation (i.e., it may underestimate the value of recreation activities and effects).

(b) Non-Use Values

Non-use values reflect the common observation that people are willing to pay for resources, especially those involving changes in unique natural resources, which they may never directly or indirectly use.

1 Types of Non-Use Values

a Existence Values

Existence values are not derived from either direct or potential use and arises from the value placed on the intrinsic value of a resource apart from its use (e.g., individuals get pleasure from knowing a wilderness or animal and fish refugia exist).

b Bequest Values

Bequest values arrive from and are based on the ideas of altruism. Bequest values are derived from individual's willingness to pay for the pleasure they get from knowing that a resource is used by others, either currently or by future generations.

2 Methods for Evaluating Non-Use Values

a Contingent Valuation

This is the same method as defined above (Section 9a(1)(a)(2)(g), however, the respondents are individuals who may never actually use or interact with the resource. The simplest version of this approach merely asks respondents what value they would place on an environmental change (such as the loss of a wetland) or preserving the resource in its current

state.

b Conjoint Analysis

This is the same method as defined above (Section 9a(1)(a)(2)(h), but the survey is conducted on participants whom do not directly use the resource. This is a complex and evolving analysis approach that has great potential in mitigating some of the concerns with the robustness of the CV method.

(c) Proxy Values: Administratively Established Values and Benefit Transfer

Other methods used to assign value applicable to both use and non-use values include monetization or quantification using proxy values. Proxy values are generally in two forms: administratively established values; or values established via benefit transfer from previous studies or investigations. Preferably, proxy values should primarily be used in projects or plans that require a lower level of detail to make an informed decision or only for specific effects that have limited impact. Administratively established values are proxy values for specific goods and services cooperatively established by resource management agencies.

The benefit transfer method uses results from other similar studies to estimate benefits. Site-specific and project-specific variables and assumptions used in an economic analysis cause results of the benefit transfer method to be less reliable and more uncertain when applied to other studies. Therefore, additional justification is required when the benefit transfer method is used, and caution should be observed when interpreting or reporting results. The justification should include a discussion on what method was originally used to derive the benefits that are being transferred. Benefit transfer can often be used when the level of detail required for a PR&G analysis does not justify performing a new study using one of the methods described previously.

(d) Other Direct Benefits and Externalities

Many economic activities provide incidental benefits which represent net increases in national economic efficiency to parties other than those for whom the project was intended. The occurrence of these benefits are considered incidental or external to the main project beneficiaries and the purpose for which the plan is being formulated.

A beneficial externality can be defined as an increase in utility or welfare due to the increase in output of goods and services and incidental reductions in production costs to indirect beneficiaries under conditions with the activity. The increase or reduction is compared to the FWOFI and accounts for the opportunity cost of any additional factors of production employed by the indirect beneficiaries.

The term “indirect beneficiaries” in this definition means firms or individuals benefitting from the project other than the direct users of project outputs. “Opportunity cost” means the income, produced by a factor of production in its next best alternative use. This concept is a critical part of the definition because only the increase in goods and services of production over its return without the project may be properly identified as an externality. For example, the return to labor and capital resources imported into the study area would not be considered an externality because presumably these resources could have earned an approximately equal return elsewhere in the national economy.

There are no uniform factors which can be applied to direct benefits to estimate other direct benefits/externalities, but the same methods or procedures used to measure direct benefits can be used. Identification and measurement must be treated on a case-by-case basis and care should be taken to eliminate the possibility of any double counting.

## (2) Costs

The discussion on values would be incomplete without a discussion of the cost aspects of a BCA. The basis of valuing costs originates in the theory of “opportunity costs,” which is defined as the forgone value that would have resulted from the utilization of resources in the next-best alternative, given the preference of the individual or populace under study. An example of opportunity cost, as it relates to time, is the value of work or leisure activities foregone when traveling to a recreation site. The associated costs are broadly defined to include all aspects of the economic value of the resources required to construct, manage, operate, maintain, or replace the features of a project whether structural or nonstructural throughout the period of analysis. BCA costs should reflect the salvage value of land, equipment, and facilities that may have value at the end of the analysis period. Consideration should be given to the direct private and public uses that producers and consumers are currently making of available resources or are expected to make of them in the future.

If market prices reflect the full economic value of a resource to society, they are to be used to determine project costs. When market prices do not reflect these values then an estimate of other direct costs should be included. Surrogate values can be used appropriately to adjust or replace market values. Surrogate values are an approximation of opportunity costs based on an equivalent use or condition in restricted markets or non-market situations.

### (a) Implementation Outlays

These are financial outlays incurred by the organization and, where appropriate, contributed by other Federal or non-Federal entities incurred for the implementation of a project and/or to place it in operation. They include estimates of construction costs; construction contingency; corollary costs, such as transitional development costs; transfers of investment costs from related projects;

interest during construction; post authorization planning and design; operation, maintenance, and replacement costs; and any other implementation cost, such as relocating facilities; land, water, and mineral rights; archeological recovery costs; or mitigating damages.

(b) Associated Costs

These are costs associated with the project in addition to the implementation outlays which are needed to achieve the benefits claimed during the period of analysis. An example would be on-farm irrigation water supply costs that are necessary for the realization of irrigation benefits.

(c) Other Direct Costs and Externalities (Induced Damages)

Other direct costs (negative externalities) are the reverse of other direct benefits (positive externalities) as discussed previously. The concept is the same except in this instance the effect is harmful. Other direct costs/negative externalities include costs for which no implementation outlays are made. Those costs that are uncompensated become project costs and are included in the economic analysis of an investment. Other direct costs include losses in production efficiency due either to some harmful product of the project (e.g., pollution) or reduction in the scale of output due to displacement of some activity by the project. One example would be the loss of existing project irrigation benefits if a project is re-operated to maintain instream flows for environmental purposes. Another example would be lost power generation ability downstream due to an investment for increased upstream water depletions. External costs may also be imposed directly on consumers such as the effect of a project-induced road relocation which results in increased transportation costs to users of the route.

b. Cost Effectiveness Analysis

Cost effectiveness analysis, a subset of BCA, is a method that seeks to identify the least-cost way to achieve a given objective, without considering whether there is any economic justification for achieving that objective. Cost effectiveness is derived by dividing the total discounted costs by the physical output or service that is generated by the project over the period of analysis. A cost-effective plan is one that, for a given level of output, there is no other plan that costs less.

A cost effectiveness analysis should be used when a level of service is mandated and thus the objective of the analysis is to determine which alternative achieves the mandated level at the lowest cost (e.g., dam safety projects). When activities are mandated it is assumed that the economic benefits outweigh the costs. However, the limitation of a cost effectiveness analysis is that the analysis does not provide the necessary information to determine if project or alternative is economically justified.

A cost effectiveness analysis is useful when evaluating quantified, but non-monetized

benefits. It can be applied when the purpose of the plan is to maximize a particular output at the lowest cost possible. The subset of cost effective alternatives are examined sequentially (by increasing scale and increment of output) to ascertain which alternatives are most efficient in the production of benefits. Those most efficient alternatives provide the greatest increase in output for the least increases in cost, and they have the lowest incremental costs per unit of output.

c. Break-Even Analysis

The term break-even point is used to describe the point at which benefits exactly equal costs. A break-even analysis, another subset of BCA, can be used as a method of quasi-monetization, when applying it to an investment that has both monetized and non-monetized benefits, and requires the inclusion of non-monetized benefits for the plan to be economically justified. The break-even analysis determines how large or small the monetary value of an impact would need to be to have a material effect on the alternative plan, i.e. switching the plan from economically unjustified to justified, in a traditional benefit-cost analysis.

Break-even analysis enables a fully monetized decision making process, in cases where monetization of previously non-monetized benefits is necessary for economic justification. If certain categories of benefits or costs are not monetized, a separate calculation should be performed to display the magnitude of the present value costs that would be required to switch the project between economically unjustified (benefit-cost ratio less than 1:1) and justified (benefit-cost ratio greater than or equal to 1:1). The accompanying text to this analysis should provide a discussion regarding the extent to which the value calculated for the non-monetized benefits is reasonable.

d. Incremental Analysis

Incremental cost analysis is a process to identify efficient alternative plans by comparing the additional costs to the additional outputs of an alternative. For non-monetary benefits it is used for determining per unit least cost. For optimizing monetary net benefits the process replicates the marginal analysis for financial optimization.

Its use when evaluating monetized benefits for a particular purpose will assist in identifying the plan or plan component that maximizes net benefits for evaluated activities (i.e., when marginal revenue is greater or equal to marginal cost). The analysis will avoid over investment in works that are not net beneficial to society such as adding an additional irrigation canal or canal footage when the added length will not result in increased net income.

Usually, the incremental analysis by itself will not point to the selection of any single plan. The results of the incremental analysis must be synthesized with other decision-making criteria (for example, significance of outputs, risk and uncertainty, reasonableness of costs) to help the planning team select and recommend a particular

plan.

e. Regional Impact Analysis

A regional impact analysis measures the effect of the alternatives on a region's economy. This analysis is completed by measuring the changes in the distribution of regional economic activity as a result of an action and does not account for gains or losses outside the region of study. The regional analysis typically measures the changes in employment, income, and industry output resulting from an action.

The regional analysis is important to local interests where an action is under consideration. An action that will attract new sources of revenues and activities to a region may result in increased employment, income, and production to that region. Local government officials, business leaders, and the general population would likely want to know the extent of these impacts for future planning purposes and how their community would be affected. If the local economy is currently experiencing high unemployment and low income levels, then the action may be encouraged locally. However, if the action is perceived as causing growth related problems such as overcrowding and high housing costs with little benefit, then the action may be opposed locally. The regional analysis provides information to local parties most affected by a proposed action and estimates the effect of the action on the local economy.

A regional analysis is distinctly different from an economic benefit-cost analysis, and should not be used as a substitute for a BCA. A benefit-cost analysis is a measure of economic benefits to the nation as a whole and should be the primary technique for evaluating the net benefits of a particular activity. A regional impact analysis can complement a BCA by measuring regional activity (sales), jobs, and of regional economic benefits (wages, profits, local tax revenue). The regional impacts from an action may result in substantial increases in income or employment within a specific region, but may generate little or no net benefits to society at the national level since the Federal investment could have been made with similar impacts in a different region. It is also possible that an action may result in reduced regional output and income in a particular area, while generating positive benefits to the nation as a result of potential environmental enhancement activities or other improvements that are not translated into short-term economic gains.

(1) Regional Impact Methods

A variety of regional impact methodologies are available, each having distinct advantages and disadvantages. The choice of a regional impact estimation method depends ultimately on the size and complexity of the region under consideration, the magnitude and types of changes in expenditures associated with the action under consideration, the time and budget available to complete the impact analysis, the level of detail required, and the information available. Current commonly used methods include input-output models and computable general equilibrium (CGE) models. New analytical techniques and methodologies may become available and cost effective in

the future, and these procedures allow for their adoption.

Input-output-based analyses, such as the IMPLAN model, are better for larger impact regions that have more complicated trade patterns and more complex production and consumption relationships. The input-output-based method is presented in the greatest detail because it is currently the most widely used technique for estimating regional impacts and is most applicable to the types of analyses performed for evaluating alternatives. IMPLAN is a propriety product of MIG, Inc. More information on IMPLAN can be found at: <http://www.implan.com>. Mention of a propriety product or technique does not imply endorsement by USDA or its employees.

CGE models, such as REMI can account for price changes related to changes in input requirements and substitution of inputs that may occur as a result of the impacts under consideration in the analysis. As a result, an analysis based on a computable general equilibrium model is most appropriate when impacts are estimated for a large change in production and output that would affect regional input and output prices. REMI is a propriety product of Regional Economic Models, Inc. More information on REMI can be found at: <http://www.remi.com/the-remi-model>. Mention of a propriety product or technique does not imply endorsement by USDA or its employees.

Regardless of the method used to estimate impacts from a project or action, there are three basic steps in a regional impact analysis:

(a) Determine Region of Concern

The region selected could be the local watershed, counties, and/or the state. Analyses may need to be done at multiple scales (e.g., both a local and state-level analysis).

(b) Identify Affected Activities

Identify the types of activities that will be affected by the action under consideration and the level of expenditures associated with each. Activity categories could include construction, agricultural production, recreation visitation, power generation, municipal and industrial water supplies, direct government payments to households or businesses in the region, and many others. Expenditure categories for example may include items such as groceries, gasoline, utilities, vehicles and other equipment.

(c) Determine Changes in Regional Impacts

Determine the changes in regional impacts (e.g., expenditures, jobs, wages, and profits) that represent a true change in final demand. That is, expenditures that occur in the region must be separated from expenditures that occur outside the

region.

f. Common Assumptions

The purpose of this subdivision is to identify a set of common assumptions that would be used across all of the agencies. Common assumptions include the following:

(1) Full Employment

Full employment will be assumed except in regional planning areas with persistently high rates of chronic unemployment. Plans and project evaluation will be based on projections of income, employment, output, and population, and the amounts of goods and services that are likely to be demanded. Actual or projected needs for ecosystem services will be related to these projections (which are often subject to considerable uncertainty).

(2) Period of Analysis

The period of analysis should be the time required for implementation of the investment plus the lesser of (1) the period of time over which any alternative would have meaningful beneficial or adverse effects; or (2) a period not to exceed 100 years. (See Section 6b(5)(c).)

(3) Prices

The prices used in evaluation should reflect the real exchange value expected over the period of analysis. For this purpose, relative price relationships and the general level of prices prevailing during the planning study will be assumed to hold generally for the period of analysis, except where specific studies and considerations indicate that prices will increase or decrease at a rate different than the overall national inflation rate (an increase in real prices). In the case of agricultural planning, [normalized prices prepared by the USDA Economic Research Service](#) should be used.

(4) Technology

Benefits and costs may change over time due to such causes as technological advances, population growth, and changes in use. The assumed period for projecting growth in benefits may vary among purposes/activities/programs depending upon the reliability of data and other pertinent factors in a given situation. However, because of the inherent uncertainties of future projections and the effect of discounting, caution should be exercised in extending the assumed period of growth in benefits beyond 20-25 years. Although the period of analysis may be longer (up to 100 years), the annual amount of benefits should remain constant after a buildup period of 50 years or less.

(5) Discount Rates, Timing, and Trajectory of Benefits and Costs

Net benefits are to be adjusted for time of occurrence to annual equivalent values over the period of analysis by use of the interest or discount rate. For analysis of Federal investments the discount rate is often prescribed in the Federal requirements pertaining to the analysis. Where not precluded from doing so, real interest rates should be used. Note that discounting is the method for converting costs and benefits that occur at different points in time to a present value. The rate at which future costs and benefits are discounted is called the discount rate.

The current discount rate for water resources investments is provided by the Bureau of the Public Debt (found in [Table 4 of the Annual Interest Rate Certification](#) for the fiscal year (FY) in which the analysis is performed). The interest rate based on average market yields during the preceding fiscal year on interest-bearing marketable securities that have 15 years or more remaining to maturity. This rate is used for the Water Resources Council Rules and Regulations ([18 CFR 704.39\(a\)](#)). The published rate does not include any adjustment that may be needed to show the maximum rate change of one-quarter of one percent per year. Agencies are expected to follow this discount rate for Federal water investments unless otherwise precluded by other authority responsible for the Federal investment.

Non-monetized impacts, especially those quantified in physical units, may be discounted using the same concepts as monetized impacts. Non-quantified impacts that are described should account for the timing of benefits and costs by describing their timing and trajectory. Differences in when the benefits and costs accrue should be noted among the alternatives.

g. Risk and Uncertainty

Risk and uncertainty is inherent in economic analyses no matter the technique or methodology employed. Uncertainty can be caused by unpredictability of future events and by limitations in the availability or precision of data. The analyses should identify areas of risk and uncertainty and describe them clearly, so that decisions can be made with knowledge of the degree of reliability of the estimated results and of the effectiveness of alternative plans.

The economic analyses need to reflect the uncertainty inherent in the data or various assumptions as to future economic, demographic, environmental, and technological trends. Various projections and assumptions of reasonable alternative forecasts, if realized, should be analyzed to determine if they would appreciably affect estimated results. Methods of dealing with risk and uncertainty and the use of sensitivity analysis are located in agency policy.

For more discussion on risk and uncertainty, see Sections 6b(3)(b) and 6c(2)(a).

## 10. AGENCY-SPECIFIC IMPLEMENTATION

With the goal of maximizing public benefits, the Federal government has enumerated Principles to which water resource investments must accord. The Requirements and IAG describe a common framework for assessing whether an investment accords with the Principles. Agencies are charged with identifying covered water resources investments—projects, programs, activities, and related actions—in the context of their missions and authorities and developing ASP for applying the PR&G to them.

To increase consistency and comparability in Federal water resources investment decision making across the Federal government, the scope of the PR&G has expanded beyond the four agencies originally covered, the U.S. Army Corps of Engineers, Bureau of Reclamation, Tennessee Valley Authority and Natural Resources Conservation Service and has been interpreted to include additional programs. At USDA, this expansion encompasses the Forest Service, FSA, NRCS, and RUS.

a. Forest Service

Established in 1905, the Forest Service is the agency in USDA responsible for managing 193 million acres of national forests and grasslands, as well as other Congressionally designated areas. The Forest Service is also the largest forestry research organization in the world and provides technical and financial assistance to state and private forestry agencies. The mission of the Forest Service is to sustain the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations. The Forest Service manages 154 national forests and 20 grasslands, 20 national recreation areas, 6 national scenic areas, 7 national monuments, 2 national volcanic monuments, and 2 national historic areas in the National Forest System (NFS). These lands also include 439 Wilderness areas totaling over 36 million acres and 4,400 miles of Wild and Scenic Rivers.

Nearly 20 percent of the Nation's fresh water comes from NFS lands and is affected by management decisions made by the Forest Service. These decisions range in scope from site-specific to landscape-level, often times crossing jurisdictional boundaries and including a wide range of public and private partners to leverage resources and expertise. Watershed restoration, ecosystem restoration, and third party infrastructure projects on NFS land may have water purposes and potential water quality or quantity implications and may require PR&G analyses.

(1) General Approach to PR&G

The PR&G process is intended to help Federal agencies plan Federal investments with a water resource purpose that have direct or indirect water quality or quantity impacts. This includes projects or actions that involve constructing new water-related infrastructure, modifying or replacing existing water-related infrastructure, restoring watersheds or ecosystems where water resources are purposefully involved, and other water-related activities where the Forest Service or another Federal agency is responsible for implementation or authorization of an action. This could also include grant or funding programs for a suite of projects that involve the potential for new or

continued actions with a water resource purpose. For the purposes of Forest Service implementation of the PR&G, Federal investments include the use of National Forests and Grasslands for specific projects, activities, or programs.

Though PR&G covers all actions with a water resource purpose, PR&G analyses are not required for every relevant action by the Forest Service, as detailed in Section 10a(2), below. The land management planning process under the 2012 planning rule is an equivalent pathway to satisfy the PR&G. Other Forest Service water-related projects, activities, or programs would be subject to the established USDA thresholds in Table 1. Existing Forest Service grant programs with a water resource purpose would not require a PR&G analysis under current and anticipated future funding levels because they fall below the established thresholds. Existing Forest Service watershed and ecosystem restoration activities with a water resource purpose would also not require a PR&G analysis under current and anticipated future funding levels because they fall below the established thresholds. Additionally, for water resource infrastructure projects or activities proposed by third parties that utilize National Forest System lands and involve a Forest Service authorization or agreement, the aggregate Federal and non-federal investment should be compared with the USDA thresholds in Table 1 to determine whether a PR&G analysis is warranted.

Programmatic PR&G analyses are unlikely for the Forest Service, as there are few national programs which administer funding directly for projects that are by purpose water resource-related. There may be elements of some programs or projects within a program that affect water resources, but in general those elements are not the sole purpose of the projects or programs. In order to determine whether PR&G analysis is warranted, the portion of the Federal funding for activities within a program or project that are specifically administered for water resource-related objectives must exceed the established financial threshold (>\$50 million for a program or >\$10 million for a project).

For example, essential projects implemented under Watershed Restoration Action Plans (WRAP) may require a PR&G analysis if the total project cost exceeds \$10 million. However, the Collaborative Forest Landscape Restoration (CFLR) program would not require a programmatic PR&G analysis even if funding exceeded \$50 million because the program is not by purpose a water resources-related program, although elements of the program may have indirect impacts on water. Most CFLR projects exceeding \$10 million in total would not be applicable for PR&G analysis unless the estimated cost of the particular elements undertaken to affect water quality or quantity exceeded that threshold.

## (2) Applicability

See Table 3 (p. 77), to understand the applicability of PR&G analysis to Forest Service projects, programs, and activities.

(a) Equivalent Pathways: 2012 Land Management Planning Rule

The Forest and Rangeland Renewable Resources Planning Act of 1974, as amended by the National Forest Management Act of 1976 (NFMA) (16 U.S.C. at 1601-1614), requires the Secretary of Agriculture to promulgate regulations under the principles of the Multiple-Use Sustained-Yield Act of 1960 to establish the process for the development and revision of land and resource management plans as well as guidelines and standards for those plans. The Forest Service adopted the first planning rule in 1979, and revised it in 1982 and 1983. Until recently, the 1983 rule guided the development, amendment, and revision of land management plans on all units of the NFS.

In 2012, the Forest Service published a revised final land management planning rule that updates procedures for national forests and grasslands to develop, revise, and amend land management plans that will enable land managers to consistently and efficiently respond to the social, economic, and ecological conditions across all of the 127 land management planning units in the NFS (note that a number of management units are joined for planning purposes). A number of planning units are currently using the 2012 planning rule to revise their land management plans.

The 2012 planning rule contains many concepts that align with the PR&G objectives for evaluating Federal water investment projects. The 2012 planning rule establishes an iterative and adaptive approach that is intended to provide overarching guidance for all future land management plans and revisions. It utilizes an integrated “all-lands” (landscape- or watershed- scale) strategy in assessing, revising, and monitoring all plans. The 2012 planning rule meets PR&G goals in that it explicitly involves an institutionalized process of directly engaging with the affected public and utilizes a systematic approach to environmental, social, and economic analysis of land management impacts on planning units and the surrounding area.

The 2012 planning rule mandates, “...plans to maintain and restore land and water ecosystems while providing for ecosystem services and multiple uses...designed to ensure sustainability of ecosystems and resources, meeting the need for restoration and conservation, watershed protection, species diversity...while assisting the Agency in providing a sustainable flow of benefits, services and uses of National Forest System (NFS) lands...”. The rule emphasizes flexibility and consistency in responding to various social, economic and ecological needs at a landscape scale in order to make NFS lands more resilient to climate change, sustaining water resources while improving forest health, conserving critical species and promoting biodiversity, and identifying additional opportunities to contribute to local communities through ecosystem services and external collaboration. The rule also articulates eight major components of the planning effort: 1) Ecosystem Restoration and Ecological Integrity; 2) Watershed Protection; 3) Diversity of Plant and Animal Communities; 4) Climate Change; 5) Multiple Uses; 6) Efficiency and Effectiveness; 7) Transparency and

Collaboration; and 8) External Coordination. The 2012 planning rule is well-formulated to meet the goals of the PR&G with respect to planning for the management of NFS lands.

The PR&G reflects the need to maximize public benefits encompassing environmental, economic and social goals while minimizing/mitigating adverse impacts and protecting/restoring functions of natural systems. It also emphasizes fostering healthy and resilient ecosystems with the capacity to respond to changes in conditions, enhancing sustainable economic development through ensuring economic well-being, enhancing habitat connectivity of land and water through floodplain vulnerability assessment, enhancing ecosystem services through a social equity lens, and creating a consistent evaluation framework using a watershed (i.e., “all-lands”) iterative approach. This holistic approach – underscored by both the PR&G and the 2012 planning rule – enables solutions that consider resource benefits for a wider range of stakeholders both within and beyond the proposed plan area.

Both the PR&G and the 2012 planning rule approaches seek to maximize public benefit through sustainable economic development while conserving the natural integrity of the land and providing for the full suite of ecosystem services. Institutionalized public engagement will further seek to ensure that these needs are continually met through a constantly changing process which can more accurately assess future conditions of the land and water, and respond accordingly. The alignment between the PR&G and the 2012 planning rule substantially addresses the objectives of and the process in the PR&G, making a separate PR&G analysis unnecessary. The PR&G elaborates on Guiding Principles that are addressed and considered by plan components of the 2012 planning rule:

#### 1 Evaluation Framework

Both approaches prioritize sustainable development in terms of public benefit through an ecosystem services approach. The 2012 planning rule directly considers multiple use mandates for NFS lands in evaluating and quantifying resource tradeoffs, recognizing the need to maintain timber and non-timber forest products as well as the full suite of ecosystem services associated with healthy land and water, from recreation to fisheries. The agency’s Ecosystem Services Evaluation Framework (ESEF) provides guidance to the planning units in highlighting tools and methodology to help monitor these services.

#### 2 Best Available Science and Commensurate Level of Detail

Both approaches call for the use of evidentiary support backed on scientific expertise. The 2012 planning rule specifically highlights the importance of consistency with Federal policy on the use of scientific information, expertise and best available information and data to be well-documented in decision-

making.

### 3 Collaboration

The PR&G specifies the need for extensive collaboration and coordination, both with other affected agencies as well as external stakeholders in order to better inform decision-making. This is a central objective of the 2012 planning rule – it specifically requires early and repeated engagement with minority communities, Federally-recognized Tribes, and low-income groups, as well as traditional stakeholder interest groups that may be affected by the management actions. Direct public engagement can help facilitate a dialogue to establish priorities, illuminate resource tradeoffs, and identify potential undesired planning outcomes in order to alter decisions as necessary to reduce these externalities. Furthermore, the 2012 planning rule requires responsible Forest Service officials to coordinate with entities that have equivalent or related planning responsibilities in order to ensure that the best available knowledge and expertise is employed at the appropriate level.

### 4 Risk and Uncertainty

The PR&G requires that major risks (either associated with the analysis performed, or those associated with future conditions and potential impacts) be identified and quantified to the extent possible. Future land management plans must take into account these risks, and must each articulate the associated costs and benefits resulting from directly addressing these risks in order to determine tradeoffs of development/investment alternatives. The 2012 planning rule underscores climate change and ecosystem resiliency, as well as adaptive management and monitoring of environmental conditions on selected landscapes as measures to anticipate future stressors to ecological and public health. The Forest Service already collects and monitors both coarse-scale and fine-filter ecological indicators and manages the information through a variety of agency-wide databases, with resources specifically targeted to climate change, wildfire risk, and forest health.

### 5 Water Use

The 2012 planning rule’s requirement for “maintenance or restoration of structure, function, composition and connectivity of healthy and resilient watersheds in the plan area contributing to social and economic sustainability” directly aligns with the PR&G mandate for detailed consideration of both water use/quantity and quality impacts of selected projects. Both evaluations include components to address competing demands of water resources, highlight potential inefficiencies in water service delivery, and develop consistent guidance on any necessary mitigation or management on a watershed scale (e.g., riparian buffering, grazing fences, and native plant

reestablishment).

## 6 Nonstructural Approaches

The PR&G requires detailed documentation and consideration of nonstructural project alternatives that achieve the same desired objectives while minimizing environmental risks – this could range from green infrastructure to modifications in public, regulatory or pricing policy linking back to restoration and sustained water flows and quality. From a Forest Service perspective, land management has always focused on addressing the nonstructural “green infrastructure” of NFS lands to sustain water resources, and this is emphasized in the 2012 planning rule. Activities, such as riparian vegetative planting and road decommissioning are central elements of watershed restoration due to their cost efficiency and potential to achieve multiple water quality and habitat connectivity goals.

## 7 International Concerns

The PR&G addresses the need for water resource development projects to remain sensitive to longstanding international treaties or obligations. The 2012 planning rule’s stated commitment to engage with affected stakeholders and leverage all relevant resources transcends international boundaries in order to ensure that multiple interests are given due consideration in the planning process.

## 8 Design of Alternatives

While the 2012 planning rule does not explicitly articulate the development of alternative project proposals to address the objectives of an investment, it does require clear documentation of all local interests and preferences, anticipated environmental impacts given future trends, and mitigation strategies to curb potentially adverse and unavoidable consequences of a given action. Furthermore, planning requires a systematic interdisciplinary approach to assessing environmental and socioeconomic impacts under NEPA, including a consideration of alternatives to proposed actions after deliberated engagement from a diversity of interests. Any plan alternative must reflect the need to minimize environmental harm while enhancing long-term productivity and sustainability of existing natural resources.

## 9 Transparency in Decision-Making

Both approaches specify the need for documentation of how science was considered in the planning processes. The 2012 planning rule requires clarity for the desired conditions, objectives, standards, guidelines, suitability of areas for resource management, and plan monitoring. A final land management plan decision document needs to address these points, as well as

a rationale for approval, an explanation of how plan components meet objectives of sustainability and ecological integrity, justification of best available science, and a recommended direction for project application.

(b) Third Party Investments in Water Resource Infrastructure Affecting National Forest System Lands

For water resource infrastructure projects or activities proposed by third parties that utilize National Forest System lands and involve a Forest Service authorization or agreement, the aggregate Federal and non-federal investment should be compared with the USDA thresholds in Table 1 to determine whether a PR&G analysis is warranted.

The following criteria determine whether PR&G analysis is warranted by a third party investment in water resource infrastructure affecting NFS lands:

- 1 The third party investment utilizes NFS lands for access, location of infrastructure, or inundation; and
- 2 The third party investment involves a Forest Service authorization or agreement.

(c) Excluded Activities

Based on the thresholds outlined in Table 2 (p. 76), the following Forest Service activities will typically be excluded from PR&G analysis:

1 Watershed Restoration Action Plans (WRAPs)

Essential projects implemented under WRAPs under the Watershed Condition Framework do not involve any decisions and therefore would not require a PR&G analysis. Regardless, they typically do not exceed the \$10 million cost threshold. However, any essential projects identified in a WRAP that exceed the threshold would require a PR&G analysis.

2 Collaborative Forest Landscape Restoration (CFLR)

CFLR projects would likely not meet the \$10 million cost threshold and would typically be excluded from PR&G analysis. Those CFLR projects that do exceed the threshold and by purpose affect water resources would require a PR&G analysis. CFLR has the potential to require a programmatic-level PR&G analysis if annual appropriations exceed \$50 million in the future.

3 Community Forestry

Community Forestry Grants do not meet the established threshold and will not

require a PR&G analysis under current and anticipated future funding levels. Current funding is \$4 million for the program as a whole, with individual projects typically less than \$500,000.

#### 4 Forest Stewardship Program

Forest Stewardship Grants do not meet the established threshold and will not require a PR&G analysis under current and anticipated future funding levels. Current funding is \$28 million for the program as a whole, with individual projects generally less than \$5 million.

#### 5 Land Ownership Adjustments (LOA)

LOA projects, including land purchases, sales, exchanges, donations and easements, do not typically meet the \$10 million cost threshold for water resource project investments, nor would the programmatic funding through the Land and Water Conservation Fund exceed \$50 million for water resource project portions of LOA investments. The vast majority of these investments will not require a PR&G analysis.

### (3) Integration with Existing Procedures

The Forest Service anticipates that PR&G implementation for the programs and activities identified above will work well with existing agency procedures. It may be necessary to consider modifying Agency direction for special uses to address third party water resource infrastructure projects on NFS land. Any need for changes to existing direction will be determined as the Agency gains more familiarity with PR&G implementation.

#### (a) NEPA

PR&G will be incorporated as appropriate to decisions subject to agency National Environmental Policy Act regulations ([36 CFR 220](#)). Incorporation will be commensurate with the scope of the proposal and relative to the significance of environmental effects as defined by [40 CFR 1508.27](#) for projects documented in an environmental assessment or subject to being categorically excluded from documentation in an environmental assessment or environmental impact statement where no significant effects are expected.

#### (b) Special Uses Requiring Authorization

Forest Service regulations ([36 CFR 251 Subpart B](#)) govern authorizations for occupancy and use of NFS lands. The regulation characterizes as “special uses” all resource uses on NFS units by third parties or private industries, with the exception of the sale and disposal of forest products, disposal of minerals, livestock grazing, or any noncommercial recreational activities. Examples of

special uses include road rights-of-way accessing private property, domestic water supplies and water conveyance systems, utility rights-of-way, ski areas, resorts, marinas, outfitting and guiding services, or public parks and campgrounds. Special use proposals submitted to the agency must be presented through the appropriate line officer with responsibility for the affected land.

Information disclosed in a Special Use Proposal must include a justification for financial capability, a project description detailing the feasibility of the project and public benefits provided, the safety of the proposed project, the lands to be occupied or used, the proposal's consistency with the applicable land management plan, and the proposal's compliance with applicable laws, regulations and orders.

The assessment of public benefits, consistency with the land management plan, and public safety provisions provided by the proposal should inform the PR&G analysis when necessary. Articulation of financial and technical feasibility by project proponent should also inform the cost-benefit calculations undertaken by a PR&G analysis. Additionally, any special use proposal with a water resource purpose that satisfies second-level screening and is accepted by the agency will require evaluation under NEPA. Special use proposals with a water resource purpose that exceed the cost threshold, will be subjected to a PR&G analysis that will be included in the decision making process. Any required PR&G analysis will be integrated with the NEPA process, including project scoping and alternative plan development.

#### (4) Technical Contact Offices

Director, Watershed, Fish, Wildlife, Air and Rare Plants; and

Director, Ecosystem Management Coordination.

#### b. Farm Service Agency

The Farm Service Agency (FSA) administers a diverse programmatic portfolio that helps farmers to mitigate risks associated with agricultural production, conserve natural resources, obtain credit when it is otherwise unavailable, make the switch to energy crops, and recover from natural disasters. The agency also purchases and delivers agricultural commodities for use in humanitarian programs at domestically and abroad.

These programs are designed to improve the economic stability of the agricultural industry and to help farmers adjust production to meet demand. Economically, the desired result of these programs is a steady price range for agricultural commodities for both farmers and consumers.

State and county offices directly administer FSA programs. These offices certify farmers for farm programs and pay out farm subsidies and disaster payments. Currently, there are

more than 2,000 FSA county offices in the continental states. FSA also has offices in Hawaii, and a few American territories.

More than 8,000 farmer county committee members serve in FSA county offices nationwide. Committee members are the local authorities responsible for fairly and equitably resolving local issues while remaining dually and directly accountable to the Secretary of Agriculture and local producers through the elective process. They make decisions affecting which FSA programs are implemented countywide, the establishment of allotment and yields, commodity price support loans and payments, conservation programs, incentive, indemnity, and disaster payments for commodities, and other farm disaster assistance.

#### (1) General Approach to PR&G

FSA is a program agency: Any water resource investments it makes are in terms of programs that it administers to support landowners, operators, and agricultural production or of specific projects undertaken as a result of a program. Program- or project-level PR&G analyses could conceivably be triggered by rule making resulting from statutory changes or by new enrollments in programs, respectively.

In light of the conditions by which programs and projects are exempted or excluded from the Requirements, FSA has determined that PR&G-related analyses are not necessary at this time.

#### (2) Applicability

The PR&G requirements apply only to programs or specific actions due to a program that “by purpose, either directly or indirectly, affect[s] water quality or water quantity, including ecosystem restoration or land management activities.” Accordingly, the Requirements conceivably apply at the program level to the Conservation Reserve Program (CRP). The Requirements may also apply to specific actions attributable to several other FSA programs, such as the Emergency Conservation Program and the Direct Operating Loans Program.

Any particular action attributable to any program that FSA administers falls well below the \$10 million monetary threshold triggering consideration (Table 2, p. 76). As such, all programs are excluded from the PR&G at the project level.

While the CRP does affect water resources by purpose, the program is exempted from the Requirements at the program level because it is, by purpose, unambiguously consistent with the Principles.

##### (a) Exempt Activities – Conservation Reserve Program

The CRP is a voluntary program that provides financial incentives for landowners to take environmentally sensitive cropland out of production and apply

conservation practices on it in order to stop soil erosion, enhance water quality, create wildlife habitat, and mitigate greenhouse gas emissions. FSA provides annual payments, cost share assistance, and additional incentives for land enrolled in ten to fifteen-year contracts.

A site-specific conservation plan is required for final approval of a CRP contract and is developed by the participant in coordination with the local NRCS representative or authorized technical service provider. Each plan is tailored to solve site-specific natural resource problems and meet the objectives of the CRP.

The CRP is statutorily required to address erosion, water, and wildlife resource concerns. The program is optimized by selecting offers to enroll in the program either according to the score they receive on a multi-metric index of ecological benefits (including soil erosion, water quality, wildlife habitat, and carbon sequestration) and cost or if they satisfy eligibility criteria (in terms of practice and location) specified to address a specific resource concern.

While the CRP does affect water resources by purpose, the program is exempted from the Requirements at the program level because it is, by purpose, unambiguously consistent with the Federal Objective, Guiding Principles, and General Requirements.

(b) Excluded Activities – All other FSA Programs

While certain individual FSA projects can impact water resources by purpose, they are excluded from PR&G because participants cannot receive FSA funding in excess of the monetary threshold for project-level analysis.

(3) Integration with Existing Procedures

The PR&G process is not required for any FSA program. Nevertheless, the PR&G process would have been integrated with similar existing processes whenever possible, including NEPA and benefit-cost analyses associated with rule making.

(a) NEPA

The programmatic environmental impact statement (EIS) for CRP, for example, is national in scope and provides the basis for site-specific NEPA documentation that would occur prior to enrollment of any land into the CRP. The EIS analyzes the impacts, whether negative or positive, of proposed discretionary actions on potentially impacted resources, such as biological (vegetation, wildlife, and protected species); water (surface water, groundwater, wetlands, and floodplains); soils; air quality; and socioeconomics (recreation, employment, and income).

Site-specific environmental evaluations (EE) also contribute to the NEPA process for CRP. Together, the site-specific EEs and the programmatic EIS provide full

NEPA coverage for each CRP contract.

(b) Other Processes

When changes to the program are mandated in a Farm Bill, FSA conducts a cost-benefit analysis for the program to comply with [Executive Order 12866](#), “Regulatory Planning and Review,” and [Executive Order 13563](#), “Improving Regulation and Regulatory Review.” These Executive Orders direct agencies to assess all costs and benefits of available regulatory alternatives and, if regulation is necessary, to select regulatory approaches that maximize net benefits (including potential economic, environmental, public health and safety effects, distributive impacts, and equity). Executive Order 13563 emphasizes the importance of quantifying both costs and benefits, of reducing costs, of harmonizing rules, and of promoting flexibility. This assessment is conducted whenever changes are made to program regulations (or when they are first developed).

(4) Technical Contact Office

Director, Economic and Policy Analysis

c. Natural Resources Conservation Service

Established in 1935, as the Soil Conservation Service, NRCS is a Federal agency in the USDA that provides conservation assistance, on a voluntary basis, to non-Federal landowners and operators. NRCS conservation programs authorized under farm bills and the Soil Conservation and Domestic Allotment Act provide technical assistance (TA) and financial assistance (FA) to eligible participants to implement conservation measures, helping both the environment and agricultural operations, and to provide conservation grants.

In addition to individual landowner or operator assistance, NRCS provides landscape-scale planning assistance in the form of area wide conservation plans, which are typically watershed-based. NRCS also has authority to assist sponsoring local organizations to address emergencies created by natural disasters in order to relieve imminent hazards to life and property, and to implement watershed protection and flood prevention projects. NRCS also has authority to provide grants to assist State and tribal governments to implement public access and habitat improvement programs. In addition, NRCS provides grants to organizations exploring innovative conservation measures and approaches.

All NRCS programs are voluntary, and use a holistic and comprehensive natural resources planning approach that integrates economic, social, and ecological considerations. The planning approach addresses private and public needs based on desired future conditions, helps improve natural resource management and associated ecosystem services, minimizes conflict, and addresses both natural resource and disaster-related problems and opportunities. Depending on the program, TA and FA may be

provided to individuals, legal entities, agencies of State and local governments, and Indian Tribes.

## (1) General Approach to PR&G

Though PR&G covers all actions with a water resource purpose, PR&G analyses are not required for every such action funded by the NRCS as summarized in Table 5 (p. 79) and discussed in more detail below. Some programs and projects are subject to PR&G evaluations, some excluded from PR&G requirements, some use an analytical process that is functionally equivalent to PR&G and provides an “equivalent pathway” to meeting the PR&G process, and others fall below the established thresholds.

### (a) NRCS Farm Bill Conservation Programs

The majority of NRCS’s conservation programs are authorized by the [Food Security Act of 1985, as amended](#). Most of these conservation programs are described in Title XII and are commonly referred to as Farm Bill Conservation Programs. The programs assist individual farmers, ranchers non-industrial private forest land owners, and other non-Federal land holders to implement locally-led, voluntary, incentive-based conservation measures on private lands through agreements and easements.

#### 1 Financial Assistance Programs

Congress has authorized NRCS to provide financial assistance to address a wide range of natural resource concerns through Farm Bill programs, extending well beyond those related to water quality and quantity. Those projects that do directly or indirectly affect water quality or quantity include an analytical process that is functionally equivalent to PR&G.

The conservation practice standards in the NRCS National Handbook of Conservation Practices (NHCP) incorporate best available science and are subject to public review and comment. Additionally, NRCS conservation programs prioritize projects based upon goals and values that have been developed in consultation with the broad array of expertise and perspectives of the State Technical Committee through a process that is open to the public.

NRCS State Technical Committees serve in an advisory capacity to NRCS (and USDA) regarding the resource concerns that should be addressed, and the conservation practices that should be applied in the State, as well as other issues at the heart of NRCS conservation programs. Committees receive input from the public and provide a method for interested individuals and organizations to voice opinions. Members come from a wide variety of natural resource and agricultural interests, Federal and State natural resource agencies, American Indian Tribes, agricultural and environmental

organizations, and agricultural producers.

As set forth in the NRCS [National Planning Procedures Handbook](#) (NPPH), conservation plans are voluntary, site-specific, and comprehensive. Conservation planning incorporates an environmental evaluation, which is “the part of planning that inventories and estimates the potential effects on the human environment of alternative solutions to resource problems. A wide range of environmental data together with social and economic information is considered in determining whether a proposed action is a major Federal action significantly affecting the human environment.” ([7 CFR 650.4\(c\)](#)) As a result, a conservation plan contains natural resource information and a record of alternatives and outcome analysis, including decisions made by the client. It describes the schedule of operations and activities needed to solve identified natural resource problems, and take advantage of opportunities. Using the NPPH planning process to develop conservation plans helps ensure that the needs of the client and the resource needs will be met, and that Federal, State, and local requirements will be achieved.

NRCS provides TA on private lands using a nine-step conservation planning process that is distinctly iterative (see steps below). The planning process is structured to recognize that: 1) every client is unique; 2) every farm or ranch is unique; 3) every planning situation is unique; 4) conservation planning on the part of the client is voluntary; and 5) individual producers/program participants share in the costs of conservation implementation. The conservation practices recommended to address identified natural resource problems and opportunities are applied to meet the conservation practice standards.

The Farm Bill conservation program implementation process is an integrated, systematic, agency-wide process that incorporates:

- a The identification of resource concerns, and alternatives for addressing those resource concerns through the NRCS conservation planning environmental evaluation process, which includes consideration of effects, mitigation measures, and compliance with laws, regulations, executive orders, and policies for protection of the environment, including environmental justice considerations.
- b The development of National priorities and State-level ranking criteria that identify priority resource concerns in consultation with each State’s Technical Committees.
- c The application of those ranking criteria to natural resource concerns and treatment alternatives identified on particular project areas in a consistent and transparent process.

- d The procedures for the development and implementation of conservation programs and activities guided by NRCS practice standards and site-specific specifications as described in the NHCP.

## 2 Conservation Technical Assistance (CTA) Program

NRCS provides technical assistance for soil and water conservation purposes through its CTA Program under the authorities of the [Soil Conservation and Domestic Allotment Act, as amended](#). The majority of these funds are not used for water resource project planning and none are used for water resource project implementation. Technical assistance at a farm-level are well below financial thresholds. Any water resource planning that is done incorporates an analytical process very similar to the planning and environmental evaluation process used for Farm Bill financial assistance programs.

## 3 Conservation Easement Programs

The Farm Bill Conservation Programs includes an easement program, currently with two main components. One component is a program to assist farmers and ranchers keep their land in production agriculture. This component does not have a water purpose or measurable impact. The second component is a program to voluntarily protect, restore and enhance critical wetlands on private and tribal agricultural land. This component incorporates an analytical process very similar to the planning and environmental evaluation process used for Farm Bill financial assistance programs. Any restoration activities undertaken by the easement programs use the authorities and standards of the financial assistance programs.

## 4 Farm Bill Authorized Grant Programs

The Farm Bill authorizes NRCS to carry out a number of grant programs, the majority of which are not water resource programs or projects. These grant programs include Conservation Innovation Grants, Voluntary Public Access and Habitat Incentive Program grants, and Terminal Lakes Program. All the grant programs and individual grants administered by NRCS fall below the monetary thresholds and are excluded from PR&G requirements.

### (b) NRCS Watershed Assistance Programs

NRCS's Watershed Assistance programs are authorized by the Watersheds Protection and Flood Prevention Act of 1954 ([Public Law \(PL\) 83-566](#)) and the Flood Control Act of 1944 ([PL 78-534](#)). Three programs comprise the Watershed Planning portfolio: Watershed and Flood Prevention Operations Program, Watershed Surveys and Planning Program, and Watershed Rehabilitation Program (WRP).

## 1 Purpose of Watershed Programs

These programs, commonly referred to as Watershed Programs, provide for NRCS cooperation, TA and FA to:

- a Develop plans to protect watersheds from damage caused by erosion, floodwater, sediment, and to conserve and develop water and land resources.
- b For planning and installing watershed projects for qualified entities of State and local governments and Tribes.
- c To assist project sponsors rehabilitate aging dams reaching the end of their design lifespan.

## 2 Integration with Regional Conservation Partnership Program (RCPP)

The 2014 Agricultural Act amendment to the Food Security Act of 1985 instituted a new effort in cooperative conservation enabling local partners to submit partnership proposals to accelerate locally-led conservation using the Farm Bill Authorized Financial Programs and Watershed Planning Authorities. This new effort, the Regional Conservation Partnership Program (RCPP), has increased interest in new uses of the Watershed Planning Authorities.

## 3 Emergency Watershed Protection Programs (EWP)

Congress established the EWP program as authorized in amendments in Section 216 of the Flood Control Act of 1950 ([Public Law 81-516](#)). The program is administered by NRCS with funding provided directly by Congress. The EWP has a provision to establish of floodplain easements for restoring, protecting, maintaining, and enhancing the functions and values of floodplains, including associated wetlands and riparian areas. These easements help safeguard lives and property from floods, drought, and erosion and also help conserve fish and wildlife habitat, water quality, flood water retention, and ground water recharge. The EWP program also addresses watershed impairments in conjunction with a local sponsor, which include, but are not limited to:

- a Debris-clogged stream channels;
- b Undermined and unstable streambanks;
- c Jeopardized water control structures and public infrastructures; and

d Damaged upland sites stripped of protective vegetation by fire or drought.

(2) Applicability

(a) Implementation of the PR&G process – Watershed Activities

NRCS has historically applied the P&G analysis to actions in Watershed programs. This application was consistent with [EO 11747](#) (November 7, 1973), which identified the Soil Conservation Service, now NRCS, as having water resources implementation studies and activities covered by the historic P&G evaluation process.

The WRP authorizes TA and FA to local organizations to cover a portion of the costs of rehabilitation dams originally constructed as part of a project carried out under any of the following authorities: the Watershed Protection and Flood Control Act of 1954 ([PL 83-566](#)), [PL 78-534](#), the pilot watershed program authorized under the [Department of Agriculture Appropriation Act of 1954](#), or the Resource Conservation and Development Program authorized by the [Agriculture and Food Act of 1981](#). Rehabilitation must extend the life of the dam and meet applicable safety and performance standards. Priority is given to dams that could result in loss of life if the dam should fail. NRCS proposes to continue application of the PR&G evaluation process to the Watershed Rehabilitation Program. The application of PR&G will be conditioned on USDA's application of threshold levels and at an appropriate level of analysis commensurate to the nature of the water resources investment.

(b) Equivalent Pathway: Project-Level Evaluation

Agency actions that employ the site-specific NRCS conservation planning process, which precedes the Federal investment action, meets the PR&G Federal Objective, Guiding Principles, and General Requirements for evaluating Federal water investment projects. These Agency actions include: Technical and Financial Assistance and Easements authorized by the Farm Bill and the long-term (easement) actions of Emergency Watershed Program.

NRCS's iterative and adaptive planning approach is intended to provide comprehensive guidance for addressing natural resource concerns on private lands, including those that directly or indirectly, affect water quality or water quantity. The NRCS planning process meets PR&G goals in that it explicitly involves an institutionalized process of directly engaging with the affected public in a systematic approach, while recognizing that implementation decisions reside with the private landowner.

1 NRCS Eligibility and Priority-Setting Requirements that Meet PR&G Requirements

The NRCS conservation program eligibility and priority-setting requirements, in and of themselves, reflect many of the Principles contained in the PR&G and may include, for example, a review based upon:

- a “Overall level of cost-effectiveness to ensure that the conservation practices and approaches proposed are the most efficient means of achieving the anticipated conservation benefits of the project;”
- b “How effectively and comprehensively the project addresses the designated resource concern or resource concerns;”
- c Applications that “best fulfill the purposes of the program;” and
- d Those that “will improve conservation practices or systems in place on the operation at the time the contract offer is accepted or that will complete a conservation system.” ([Section 1240C of the Food Security Act of 1985 \(16 USC 3839aa-3\)](#))

## 2 Additional NRCS Processes that Meet PR&G Requirements

NRCS regulations at [7 CFR 650](#) require an Environmental Evaluation for all planning, implementation and operation of NRCS-assisted activities. Documentation of the planning and environmental evaluation process, including many of the PR&G Principles, is accomplished with the completion of the required [NRCS-CPA-52, Environmental Evaluation Worksheet](#).

Additional Principles in the PR&G are considered by NRCS as special environmental concerns during the planning and environmental evaluation process, including the effects of the proposed action and alternatives on floodplains and environmental justice. Regulations require the agency to provide leadership and take action, where practicable, to conserve, preserve, and restore existing natural and beneficial values in flood plains as part of TA and FA in the programs it administers ([7 CFR 650.25\(a\)](#)). NRCS policy includes consideration of environmental justice – or disproportionate impacts on minority, Tribal and low-income communities – as well as EO 12898 and USDA [DR5600-002](#). Public safety, risk, and other social concerns are included in the planning process when the site specific conditions warrant.

The planning process used by NRCS is a comprehensive, nine-step process containing similar steps as the planning process identified in the Guidelines section of the PR&G. Although the nine NRCS steps are shown in sequence, the process is very dynamic. The process may start with any of the first three steps or even step nine, cycling back to previous steps as often as necessary. The same iterative process is called for in the PR&G planning process stating, Decisions or recommendations involving Federal investments affecting water resources, quantity, or quality should be made through a dynamic process,

both iterative and progressive. The process should be responsive to significant changes in information, conditions, and/or objectives. The steps in the two planning processes are described in Table 6 (p. 81).

NRCS maintains that the existing planning and environmental evaluation process for Farm Bill Programs for Technical and Financial Assistance, Easements, and the Emergency Watershed Program's floodplain easement implementation represents an Equivalent Pathway to achieve the purpose and intent of the PR&G. This is reflected by 1) the significant alignment between the PR&G and the documented NRCS environmental evaluation and planning processes required for program authorized under Farm Bill authorities, 2) the requirements to seek decisions that consider the full suite of ecosystem services, and 3) an institutionalized and congressionally mandated public engagement process.

(c) Equivalent Pathways: Programmatic-Level Evaluation

The alignment between the NRCS planning and environmental evaluation processes for Technical and Financial Assistance and Easements authorized by the Farm Bill and the long-term (easement) actions of Emergency Watershed Program represents an "Equivalent Pathway" to achieve the purpose and intent of the PR&G at the programmatic-level.

(d) Excluded Activities based on Financial Thresholds

Several of the Farm Bill-authorized conservation programs have limits on the extent of payments that any particular person or legal entity may receive over the course of the Farm Bill. Payment limits are specified in the Agricultural Act of 2014, and vary by specific conservation program. Currently, the maximum payment limit per conservation program ranges from \$50,000 to \$450,000 per program. Additionally, the Agricultural Act of 2014 specified that persons or legal entities are not eligible for any conservation program payments or benefits if they have an average adjusted gross income greater than \$900,000. Thus, funding for Farm Bill conservation activities that deliver technical and financial assistance to private lands is limited to amounts well below the USDA project-level threshold levels that trigger PR&G evaluation.

The Farm Bill-authorized programs that provide grants, where the funds are administered by NRCS, are limited to annual levels that are well below the programmatic threshold for analysis.

(e) Excluded Activities based on Emergency Actions

Most water-related activities of the Emergency Watershed Protection (EWP) program alleviates threats to life and property that remain in the Nation's watersheds in the aftermath of natural disasters such as floods, hurricanes,

tornadoes, and wildfires. The EWP program, administered by NRCS, provides TA and FA assistance to local sponsoring authorities to preserve life and property threatened by disaster-caused erosion and flooding. Funding is provided through Congressional emergency appropriations. Exigent work under EWP is exempt from the PR&G evaluation process under the emergency actions exclusion. (The longer-term work undertaken by the EWP is addressed above.)

### (3) Integration with Existing Procedures

#### (a) NEPA

NRCS activities undertaken with authorities in the Watershed and Flood Prevention Operations Program, Watershed Surveys and Planning Program, and Watershed Rehabilitation Program are subject to NEPA review. In those cases where an Environmental Analysis or Environmental Impact Assessment are required NRCS will incorporate the NEPA and PR&G processes into a single document to satisfy both review processes. Common assumptions, data, and public outreach will underpin the analysis.

### (4) Technical Contact Office

Associate Chief for Conservation

#### d. Rural Utilities Service

The Rural Development (RD) mission area within USDA consists of three agencies: The Rural Utilities Service (RUS), Rural Housing Service (RHS), and Rural Business-Cooperative Service (RBS). The overall mission of RD is to help improve the economy and quality of life in all of rural America by providing financial programs to support essential public facilities and services such as water and sewer systems, housing, health clinics, emergency service facilities and electric and telephone service. Rural Development promotes economic development by providing loans to businesses through banks and community-managed lending pools, while also assisting communities to participate in community empowerment programs. RD helps rural areas to develop and grow by offering Federal assistance that improves quality of life. RD targets communities in need and then empowers them with financial and technical resources.

Of the three RD agencies, RUS, through its Water and Waste Disposal (WWD) Loan and Grant Program (which is housed administratively within the Water and Environmental Programs, or WEP), funds activities that have the potential to directly or indirectly affect water quality and quantity. WWD provides funding for the construction of water and waste facilities in rural communities and is proud to be the only Federal program exclusively focused on rural water and waste infrastructure needs of rural communities with populations of 10,000 or less. This program is a needs-based program, where loan and grant are combined based on a strict underwriting process to keep rates reasonable for rural residents. In FY 2014 the program invested \$1.5 billion in direct and guaranteed

loans and grants to provide technical assistance and to help rural communities develop 1,007 water and waste disposal projects that have helped safeguard the health of over 2 million rural residents. The majority of funds provided through the direct loan and grant program, 54.9 percent, were in the form of loans. These investments will provide safe, affordable water, sewer, and waste disposal services to rural communities.

#### (1) General Approach to PR&G

With oversight from the National Office, the WWD Program is administered by RD's 47 State Offices. Applicants work directly with State Office staff throughout the entire funding process, from the submittal of an application to construction closeout. Each State Office is allocated a portion of the overall program funding based on a formula which considers population, income (poverty level), and unemployment, with weights assigned to each criterion based on relative importance.

Additional targets or goals for program investments may be set according to overarching USDA or Administration initiatives (e.g., Community Economic Development, Strike Zones, poverty targeting). Applicants in turn approach the Agency with proposals that aim to address their most basic health and sanitation needs. So while some elements or principles from the PR&G are addressed directly or indirectly in program planning, technical assistance and funding decisions (sustainability, public safety, environmental justice, water efficiency), the WWD program is primarily needs-based. Program regulations at [7 CFR 1780.2](#) state that the purpose is to: "Provide loan and grant funds for water and waste projects serving the most financially needy communities. Financial assistance should result in reasonable user costs for rural residents, rural businesses, and other rural users."

As noted above, the WWD program funded over 1,000 projects in FY 2014. Applicants and borrowers 'plan' and evaluate their proposals as part of their application package; while a proposal may be modified based on Agency review, resulting from engineering, environmental and financial reviews, Agency staff do not plan, evaluate and implement proposals. Thus RUS will implement the PR&G through a programmatic approach (see Section 7).

#### (2) Applicability

##### (a) Equivalent Pathways

RUS, as an assistance agency, does not have any existing processes that could be considered an equivalent pathway.

##### (b) Excluded Activities

The PR&G establishes thresholds for application based on funding levels of a project or program/plan, and excludes those activities that are either regulatory actions, involve research or monitoring, or are emergency actions. Table 7 (p. 82)

displays the applicability criteria and decisions for the primary WEP programs.

As the table indicates, only WEP's regular loan and grant programs, due to their funding levels, would be subject to a PR&G analysis. In 2014 the regular loan and grant programs funded 696 projects. The remaining programs would be excluded based on financial thresholds or other exclusionary criteria included in the IAG.

### (3) Integration with Existing Procedures

#### (a) NEPA

Program applicants (or more typically their consultants) complete environmental reviews for proposals essentially on behalf of the agency. The reviews and associated documentation are checked for sufficiency and acceptability by agency environmental staff. If the review is deemed complete and acceptable, the agency issues a decision document. The reviews are almost exclusively classified as categorical exclusions or environmental assessments; the preparation of an environmental impact statement is extremely rare in the water programs.

These environmental reviews are project-specific, and currently RUS-WEP has not conducted any programmatic NEPA analyses. Should programmatic-level NEPA analyses be conducted in the future, there may be an opportunity to integrate a PR&G analysis. However, it should be recognized that several elements or issues addressed in the NEPA reviews align with or will support several of the PR&G principles and requirements. These include floodplains, environmental justice, public safety, water use, watershed approach and collaboration.

#### (b) Other Processes

The WEP program has in the past and will continue to seek improved efficiency and effectiveness in the implementation of its programs, and suggests that this effort can be assisted through incorporation of the PR&G. To the extent possible, the PR&G would be incorporated into existing Agency policies and procedures. Implementation would need to be seamless to agency staff and borrowers, and should not add to their administrative burden or costs. Implementation would build on existing agency initiatives with similar objectives (e.g. sustainability, border health initiative, and energy efficiency).

Programmatic application of the PR&G is described in Section 7 of this ASP. In the case of RUS-WEP, the programs meet two of the specific criteria included in the IAG for programmatic analyses, specifically: 1) funding project-level activities with limited discretion over site-specific alternatives; these include grant programs for water and wastewater infrastructure in underserved rural areas; and, 2) funding another entity (e.g., State, Tribe, locality) to carry out projects or issue grants to address water quality and quantity.

Program regulations for WEP are found at [7 CFR 1780](#) (Water and Waste Loans and Grants). Selection criteria for water and waste program funding are at [7 CFR 1780.17](#) (Selection priorities and process). The main priorities are population, health risk, and median household income, with lesser priority given to consolidation of systems, extension of service, type of applicant, cost-sharing, target areas, waste recycling, drinking water need, and other considerations of the agency. A point system is used to rank applications. Additional points may be awarded at the discretion of the Administrator. New areas of prioritization include regional development, sustainability, green infrastructure, and energy efficiency.

RUS would take both a prospective and a retrospective approach to conducting the PR&G analyses. Prospectively, the current program selection criteria just described would be reviewed to determine if they include, or could include, criteria from the PR&G. Additional evaluation criteria would be developed to the extent possible, and be included either in new guidance or as existing regulations and guidance are revised in the future. The prospective approach would aim to better align project selection and program implementation with the PR&G to achieve their economic, environmental and social goals.

Particular circumstances and agency guidance will help determine if the project-level procedures need to be applied in part or in whole to so-called outlier projects. RUS-WEP proposes to evaluate those projects that are subject to Senior Loan Committee review as outlier projects. The Senior Loan Committee is required to review projects whose funding request is \$25 million or greater. Typically this amounts to one to two projects per year, but could be as many as four to five. These projects require additional review and justification by the National Office loan staff. It is envisioned that a partial project-level review would be conducted on these projects, and additional guidance will be developed to explain the review process.

#### (4) Technical Contact Office

Assistant Administrator, Water and Environmental Programs

## 11. ABBREVIATIONS

ASP	Agency-Specific Procedures
BCA	Benefit Cost Analysis
CEQ	Council on Environmental Quality
CFLR	Collaborative Forest Landscape Restoration

CFR	Code of Federal Regulations
CGE	Computable General Equilibrium
CRP	Conservation Reserve Program
DM	Departmental Manual
DR	Departmental Regulation
ECP	Emergency Conservation Program
EE	Environmental Evaluation
EIS	Environmental Impact Statement
EWP	Emergency Watershed Protection Program
FA	Financial Assistance
FS	Forest Service
FSA	Farm Service Agency
FWOFI	Future Without Federal Investment
FY	Fiscal Year
IAG	Interagency Guidelines
LOA	Land Ownerships Adjustments
MCDA	Multi-Criteria Decision Analysis
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act of 1976
NFS	National Forest System
NHCP	National Handbook of Conservation Practices
NPPH	National Planning Procedures Handbook
NPV	Net Present Value

NRCS	Natural Resources Conservation Service
O&M	Operations and maintenance
OMB	Office of Management and Budget
P&G	Principles and Guidelines for Water and Related Land Resources Implementation Studies (1983)
P&R	Principles and Requirements for Federal Investments in Water Resources (2013)
PL	Public Law
PR&G	Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation
RBS	Rural Business-Cooperative Service
RCPP	Regional Conservation Partnership Program
RHS	Rural Housing Service
RUS	Rural Utilities Service
TA	Technical Assistance
USDA	U.S. Department of Agriculture
WEP	Water and Environmental Programs
WRAPs	Watershed Restoration Action Plans
WRP	Watershed Rehabilitation Program
WTP	Willingness to Pay
WWD	Water and Waste Disposal

TABLE 1

COMPARISON OF KEY CHARACTERISTICS OF A PR&G ANALYSIS AND NEPA PROCESS

<b>Issue</b>	<b>PR&amp;G</b>	<b>NEPA</b>
Federal Objective	Should promote the Guiding Principles: Healthy and Resilient Ecosystems; Sustainable Economic Development; Floodplains; Public Safety; Environmental Justice; and Watershed Approach	A lead agency's purpose and need for the proposed action frame the analysis, and is grounded in other statutory authorities (e.g., National Forest Management Act)
Range of Alternatives	Allows a wide range of alternatives to illustrate the range of potential tradeoffs among environmental, economic, and social goals. Where applicable, must include nonstructural and locally preferred alternatives	Generally directed toward evaluating and mitigating environmental impacts, but a wider range of alternatives is allowed.
Comparison of Alternatives	Alternatives should be compared against the Future Without Federal Investment; tradeoffs between alternatives with respect to environmental, economic, and social goals should be clear.	Alternatives must meet the purpose and need for the proposed action. NEPA alternatives should differ from PR&G alternatives for proposed actions with a different purpose and need, where water resources are a minor consideration.
Activity Formulation Criteria	Completeness, effectiveness, efficiency, acceptability	NEPA criteria are generally similar to those of the PR&G
Ecosystem Service Framework	Required, including consideration of stakeholder values (potential ecosystem services) at the onset of the scoping process.	Not required but may be used. The NEPA statement of Purpose and Need justifies an action needed to solve a particular issue without necessarily focusing on end user or beneficiary.

TABLE 2

MINIMUM FINANCIAL THRESHOLDS FOR PR&G ANALYSIS

<b>Type of Activity</b>	<b>Federal investment over life of project (\$M, Net present value)</b>	<b>Annual Federal appropriations or Federal plan development costs (\$M, Net present value)</b>
<b>Projects</b>	≥10	--
<b>Programs</b>	--	≥50
<b>Plans</b>	--	≥10

TABLE 3

APPLICABILITY OF PR&G TO FOREST SERVICE ACTIVITIES

Activity	PR&G Analysis	Notes
Land Management Planning	Exempted (Equivalent Pathway)	The 2012 planning rule contains substantively similar processes and procedures to PR&G. Costs typically do not exceed \$2 million over a four year period.
Third-Party Water Infrastructure Development on NFS Land	Project/Excluded	Proposed water infrastructure development sited on NFS lands that costs more than \$10 million in aggregate Federal and non-Federal expenditures.
Essential projects implemented under Watershed Restoration Action Plans (WRAPs) developed through the Watershed Condition Framework	Project/Excluded	The majority of essential projects will not exceed the cost threshold of \$10 million.
Collaborative Forest Landscape Restoration program (CFLR)	Project/Excluded	The majority of CFLR projects will not exceed cost of \$10 million or have a specific water purpose. The program currently does not exceed \$50 million. Some CFLR projects may have a specific water purpose and trigger a project-level analysis.
Community Forestry Grants	Excluded	Below cost threshold. \$4 million for program as a whole; individual projects are less than \$500,000.
Forest Stewardship Grants	Excluded	Below cost threshold. \$28 million for program as a whole; individual projects are less than \$5 million.
Land Ownership Adjustments (LOA)	Excluded	The majority of the LOA projects related to water resource investments are below the project threshold of \$10 million or do not have specific water purposes. LOA program funding related to water resources investments does not exceed \$50 million.

TABLE 4

APPLICABILITY OF PR&G TO FARM SERVICE AGENCY ACTIVITIES

<b>Activity</b>	<b>PR&amp;G Analysis</b>	<b>Notes</b>
Conservation Reserve Program	Exempt	Program requirements and processes accord with Federal Objective and Guiding Principles.
All Other FSA Programs	Excluded	Under per-project dollar threshold.

TABLE 5

APPLICABILITY OF PR&G TO NATURAL RESOURCES CONSERVATION SERVICE ACTIVITIES

Activity	PR&G Analysis	Notes
<p>Farm Bill authorized Programs providing Technical and Financial Assistance to producers, including Environmental Quality Incentives Program (EQIP), Conservation Stewardship Program (CSP), and Agricultural Management Assistance (AMA)</p>	<p>Many actions excluded by purpose (soil conservation, habitat improvement); All project level actions are excluded from PR&amp;G on Farm Bill financial thresholds. When water purpose applies, programmatic evaluation is exempt through Equivalent Pathway.</p>	<p>Conservation planning with environmental evaluation precede in-field actions when there is a water purpose. These programs are voluntary. Payments limited to \$450,000 for EQIP and \$200,000 for CSP over 5 years.</p>
<p>Soil Conservation and Domestic Allotment Act of 1935 (16 U.S.C. 3B) authorizes Conservation Technical Assistance (CTA)</p>	<p>Many actions excluded by purpose (soil conservation, habitat improvement); All project level actions are excluded from PR&amp;G on financial thresholds</p>	<p>Conservation technical assistance is the in-field planning process containing an environmental evaluation that precedes in-field actions.</p>

<b>Activity</b>	<b>PR&amp;G Analysis</b>	<b>Notes</b>
Farm Bill Authorized Programs securing conservation easements, including Agricultural Conservation Easement Program (ACEP)	Many excluded by purpose (continued agricultural production) When water purpose applies, programmatic evaluation is exempt through Equivalent Pathway	Voluntary program participation; easements with water purpose follow conservation planning process with environmental evaluation preceding in-field actions.
Farm Bill Authorized Programs providing grants	Many programs excluded by purpose (demonstrating improved soil conservation methods). When water purpose applies, excluded based on financial threshold	Programs are excluded on financial program threshold.
Watershed activities authorized by the Watershed and Flood Prevention Act, (P.L. 566), including Watershed Surveys and Planning Program, Watershed and Flood Prevention, Operations Program, and Watershed Rehabilitation Program	PR&G process applies to these activities on a project basis; most projects will not meet financial threshold for required analysis.	Only the Rehabilitation program has been funded in recent years; When funded, most projects are below project threshold for PR&G analysis but agency requires project evaluations at smaller scales.
Emergency Watershed Protection Program	Immediate actions excluded by emergency provisions. Longer-term actions excluded based on financial threshold or exempt through Equivalent Pathway	Emergency immediate programs and projects are excluded from the PR&G. Longer-term recovery projects undergo extensive planning and reach an “Equivalent Pathway” of evaluation if of sufficient scale to require a PR&G evaluation.

TABLE 6

COMPARISON BETWEEN NRCS PLANNING PROCESS AND THE PR&G PROJECT-LEVEL PROCEDURES

<b>Steps in the NRCS Planning Process</b>	<b>Steps in the PR&amp;G Project Level Procedures</b>
1. Identify Problems and Opportunities	1. Identify Problems and Opportunities
2. Determine Objectives	No equivalent step; objectives specified in the Federal Objective and Principles
3. Inventory Resources	2. Inventory Existing Resources and Conditions
4. Analyze Resource Data	3. Forecast Future Conditions
5. Formulate Alternatives	4. Develop Array of Alternatives
6. Evaluate Alternatives	5. Evaluate Effects of Individual Alternatives
7. Make Decisions	6. Compare Alternatives and 7. Identify Recommended Alternative
8. Implement the Plan	8. Implement and Evaluate
9. Evaluate the Plan	<i>See step above</i>

Note: Both planning processes recommend “Iteration” as needed but do not specify it as a separate step (see the [National Planning Procedures Handbook \(NPPH 600.20A\)](#))

TABLE 7

APPLICABILITY OF PR&G TO RURAL UTILITIES SERVICE ACTIVITIES

Activity	PR&G Analysis	Notes
Direct Loan, Guaranteed Loan, and Farm Bill programs. These programs provide funding for the construction of water and waste facilities in rural communities with populations of 10,000 or less	Programmatic	These programs and activities exceed the programmatic funding threshold of \$50 million.
Circuit Rider, Solid Waste Management, and Technical Assistance and Training. These programs provide technical assistance and training to RUS funding partners to improve and expand program implementation.	Excluded	These programs and activities are equivalent to the “research and monitoring” activities which are specifically identified in the IAG as being excluded from PR&G analysis.
Alaska, Alaska PPG, Colonias, HI Homelands, Native American, Pre-Development Planning Grant, and Special Evaluation Assistance for Rural Communities and Household Water Well Grants. These programs provide either pre-application planning assistance or fund specific population segments/geographic areas.	Excluded	These programs and activities are excluded from PR&G analysis as they do not meet the \$50 million cost threshold for programs.

-END-

## APPENDIX A

### TEMPLATE TABLES AND GUIDANCE FOR PR&G ANALYSES

#### 1. COMPARISON OF ALTERNATIVES AND DISPLAY OF TRADEOFFS

A key component of the PR&G is to display tradeoffs in a manner that informs decision making. Such displays should be understandable, transparent, and constructed in a generally consistent fashion for all PR&G analyses. A PR&G analysis should include a combination of both tables and explanatory materials to help inform a decision. This appendix includes examples of analytical tools and displays that agencies can include in a PR&G analysis. The examples included here are not exhaustive, and they are not necessarily appropriate for every scale and type of analyses. Rather, they are meant to offer additional guidance that can be modified to fit the requirements of the particular analysis and updated to reflect recent methods and tools for displaying tradeoffs.

a. Agencies can include the following tables in a PR&G analysis

- (1) A matrix summarizing the impacts and tradeoffs to the resources and ecosystem services affected by the project or program, relative to the FWOFI, on a resource-by-resource. This matrix can include:
  - (a) The annual and total estimated changes in the quantity and/or quality of each affected resource and ecosystem service relative to the baseline;
  - (b) Relevant time periods over which the changes are anticipated to occur;
  - (c) The level of certainty associated with each estimates; and
  - (d) Information on the financial elements of a project/activity. For example, if repayment by non-Federal entities, lease payments, or other financial considerations are required the table should display the magnitude of the annual payments as well as the present value of the payments over the life of the project/activity.
- (2) A summary table displaying the present value of benefits, costs, and net benefits (benefits less costs). Include all benefit estimates, regardless of the technique used to estimate them, in the table. To the extent feasible, all cost and benefit estimates should be accompanied by either quantitative or qualitative estimates or descriptions of the certainty of the estimate. This table should identify and include information on benefits and costs that are not monetized.
- (3) A cost implementation table that displays program or installation cost by applicable purpose (cost allocation for Federal construction cost is required for historical water

resources projects and by PL 83-566 law for NRCS Watershed Projects).

(4) A table indicating the extent to which the PR&G's Guiding Principles have been achieved. The information in this table may be qualitative in nature.

b. Template for Table Displaying Alternatives and Tradeoffs

Table A-1 and associated guidance provide a template for displaying alternatives and tradeoffs in a project-level PR&G analysis. The template may be adjusted for individual projects, or to meet specific agency needs, by including the relevant row headings (with additional or fewer headings depending on the application) and adding alternatives. In addition, a similar set of decision tables with a regional or local view may need to be developed to support partner decisions.

(1) Guidance for Template Table

Display of alternatives should indicate the magnitude, timing, and scale of impacts, and uncertainty in the direction or magnitude of the impacts should be indicated. Impacts should be indicated in a manner that is easily interpreted by a reader of the summary table (e.g., through a narrative description or the use of symbols). More detailed qualitative or quantitative description of impacts can be included in additional impact tables.

It may not be possible to evaluate all of the ecosystem services impacted by a particular project using the same metric (e.g., by monetizing them). Using symbols is an appropriate mechanism for representing relative changes to the same ecosystem service under each alternative. However, the display of those impacts are comparable only within a row (i.e., across alternatives) and should not be used to compare the relative impact *between* different ecosystem services.

Impacts should be described in terms and level of detail appropriate to the level of analysis. Qualitative impacts can be described through text or symbols, while quantitative impacts can be either monetized or measured through other indicators. Likewise, the display of alternatives should be consistent with the scale of analysis. For example, a small project may not require a full regional economic analysis. In that case, the associated rows in the template tables can be excluded.

Where possible, the summary table should be formatted to fit on a single page. If that is not possible, format the table to provide ease of readability and comparability across pages.

(2) Notes on Social, Environmental, and Economic Goals

Alternatives may produce varying degrees of effects relative to environmental, economic, and social goals. No hierarchical relationship exists among these three goals, and as a result, tradeoffs between potential solutions will need to be evaluated and

communicated during the decision making process.

The tradeoffs—monetary, quantitative, and/or qualitative—among and within economic, environmental, and social goals shall be explicitly identified across alternative plans. Tradeoffs are compared from the perspective of the specific circumstances of each study, including the study area, resources, impacted populations, and study authority, to form the basis for deciding which plan best addresses the Federal Objective and Guiding Principles.

### (3) Notes on Net Social Benefit

At the most general level, there are two considerations for selecting the optimal investment alternative: efficiency and equity. The most efficient alternative is the one that has the largest net social benefit (or social welfare). Likewise, the most equitable alternative is the one that most equally distributes the benefits and costs of investments over space and time.

Ideally, the net social benefit would be summarized in dollar terms to facilitate comparison across investment alternatives. However, this assumes that every change in ecosystem service flow can be monetized, which is highly unlikely in practice. Instead, the analyst should break out each impacted ecosystem service and describe the magnitude of change separately. This magnitude should be quantified in physical units or even monetized when doing so is feasible and defensible.

By breaking down net social benefit into its constituent parts, changes in ecosystem service flows, the magnitude of change can be expressed at the appropriate level of detail (narrative description, quantified, or monetized), along with its uncertainty and spatial and temporal dimensions (i.e., distributional impacts).

### (4) Notes on Table A-1

- (a) Alternatives may be indicated by an “X” or other mechanism. Alternatives may be the same (e.g., FWOFI may be same as non-structural).
- (b) In cooperation with local interests that have oversight or implementation authorities and responsibilities, agencies may identify a “locally preferred” alternative. This alternative may emerge from the collaborative process described in Section 4d(2). If identified, this alternative must be fully considered and carried forward into the final array of solutions and given full and equal consideration in the decision making process.
- (c) A nonstructural alternative may not be included in final analysis: Alternative plans, strategies, or actions that can effectively address a problem through the use of nonstructural approaches, if they exist, must be fully considered and carried forward to the final array of solutions. Such solutions must be given full and equal consideration in the decision making process. In addition, an analysis may

include alternatives that have higher or lower levels of non-structural approaches. The relative level of non-structural approaches may be indicated as appropriate (e.g., \*, \*\*, and \*\*\* to indicate the extent of non-structural approaches).

- (d) If the PR&G analysis is performed in conjunction with a NEPA analysis, and an EIS is developed, the environmentally preferred alternative from the NEPA analysis should be included in the final PR&G analysis. For more detail on the environmentally preferred alternative, see “Forty Most Asked Questions Concerning CEQ’s National Environmental Policy Act Regulations,” available at: <https://ceq.doe.gov/nepa/regs/40/40P1.HTM>.
- (e) Total project investment includes the net present value of both one-time costs (e.g., construction) and operations and maintenance costs.
- (f) The monetized net benefits are the NPV of monetized benefits minus monetized costs (where available). Includes net present value of project investment (costs) and benefits from monetizable ecosystem services.
- (g) The regional economic impacts summary should be included if a regional impact analysis is performed as part of project evaluation. The display could include regional impacts measured with changes in output (sales), jobs, and value added (wages, profits, rental income, local tax revenue).

## 2. DISPLAYING CONSIDERATION OF PR&G GUIDING PRINCIPLES

The IAG calls for a comparison of alternatives that accounts for their “contributions to the Federal Objective and Guiding Principles” ([IAG](#), p. 23). Table A-2 may be used as a template by USDA agencies to summarize and describe this contribution within a PR&G analysis. The Federal Objective, as described in the [P&R](#) (p. 3), is represented by the first three Guiding Principles. The contribution of each alternative to the Federal Objective and Guiding Principles (i.e., how well each alternative addresses each Guiding Principle), can be indicated through symbols, summary text, or other means. Agencies may include references to the page numbers of a PR&G analysis that provides additional documentation on how each alternative contributes to the Federal Objective and Guiding Principles.

TABLE A-1

TEMPLATE FOR TABLE SUMMARIZING PROJECT ALTERNATIVES AND ASSOCIATED ECOSYSTEM SERVICES

	Alternatives			
	A (FWOFI)	B	C	D
<b>Alternatives<sup>a</sup></b>				
Locally Preferred <sup>b</sup>				
Non-Structural <sup>c</sup>				
Environmentally Preferable <sup>d</sup>				
<b>Brief Description of Major Project Features</b>				
<b>Total Project Investment<sup>e</sup></b>				
<b>Monetized Net Benefits<sup>f</sup></b>				
<b>Provisioning Services</b>				
[Service 1]				
[Service 2]				
[Service 3]				
<b>Regulating Services</b>				
[Service 4]				
[Service 5]				
[Service 6]				
<b>Cultural Services</b>				
[Service 7]				
[Service 8]				
[Service 9]				
<b>Regional Economic Impacts<sup>g</sup></b>				

See subdivision “Notes on Table A-1” on p. A-3 for more details.

TABLE A-2

TEMPLATE FOR TABLE DISPLAYING CONSIDERATION OF PR&G GUIDING PRINCIPLES

<b>PR&amp;G GUIDING PRINCIPLES</b>	Alternative A (FWOFI)	Alternative B	Alternative C	Alternative D
Healthy and Resilient Ecosystems				
Sustainable Economic Development				
Floodplains				
Public Safety				
Environmental Justice				
Watershed Approach				

## APPENDIX B

### METHODS AND TOOLS TO EVALUATE ECOSYSTEM SERVICE IMPACTS

#### 1. ECONOMIC ANALYSIS TOOLS FOR ECOSYSTEM SERVICE ANALYSIS

Table B-1 shows relevant benefit cost analysis methods for a variety of ecosystem services. The examples included below are not exhaustive, but rather meant to convey potential methods and tools available to an analyst.

#### 2. EXAMPLES OF BIOPHYSICAL MODELS TO QUANTIFY ECOSYSTEM SERVICES INTO MONETARY AND NON-MONETARY METRICS

The following list provides examples of models and tools that can be used to quantify ecosystem services into monetary and non-monetary metrics. The list is not exhaustive, and inclusion of a proprietary product or technique does not imply endorsement by USDA or its employees.

- a. The Nutrient Tracking Tool developed by the U.S. Department of Agriculture uses ecological simulation modeling to estimate how land management practices and land cover characteristics will affect nitrogen, phosphorus and sediment runoff into adjacent waterways.

Citation: Saleh, A., O. Gallego, E. Osei, H. Lal, C. Gross, S. McKinney, and H. Cover. "Nutrient Tracking Tool – a user-friendly tool for calculating nutrient reductions for water quality trading". *Journal of Soil and Water Conservation* 2011 66(6): 400-410; doi: 10.2489/jswc.66.6.400.

- b. The W3T tool was developed by the Freshwater Trust to quantify hourly incoming solar radiation and overall heat losses or gains from a water body based on river and landscape characteristics, from baseline temperature and flow inputs to riparian vegetation and meteorological information.

Citation: The Freshwater Trust, 2014 Uplift Report.  
<http://www.thefreshwatertrust.org/impact>.

- c. ARIES was developed to geospatially map and quantify a variety of ecological outcomes – including flood hazard risk – by coupling information on biophysical or anthropogenic features that deplete or alter flood sinks with the geographic location of vulnerable populations.

Citation: Bagstad, K.J., F. Villa, D. Batker, J. Harrison-Cox, B. Voigt, and G.W. Johnson. "From theoretical to actual ecosystem services: mapping beneficiaries and spatial flows in ecosystem service assessments". *Ecology and Society* 2014 19(2): 64-77.

- d. Like ARIES, U.S. HAZUS-MH MR5 provided by the U.S. Federal Emergency Management Agency may also be applied to capture avoided monetary damages (property, relocation expenses, capital related income loss, wage loss, rental income loss) resulting from flood exposure.

Citation: European Commission Floods Working Group. "Flood Risk Management, Economics, and Decision Making Support." October 2012.

[http://ec.europa.eu/environment/water/flood\\_risk/pdf/WGF\\_Resource\\_doc.pdf](http://ec.europa.eu/environment/water/flood_risk/pdf/WGF_Resource_doc.pdf)

- e. The [Hydrologic Engineering Center's Flood Damage Analysis \(HEC-FDA\)](#) was developed by the U.S. Army Corps of Engineers (USACE) to capture monetized flood damages. Another USACE program, HEC-Flood Impact Analysis (HEC-FIA), is designed to provide single event flood damage estimates and normally used for consequence analysis of dam failure. The Urban Floodwater damage Economic Evaluation (URB1) from NRCS monetizes flood damages for homes and business. The Flood Water Damage Economic Evaluation (ECON2) captures monetary cropland damages associated with flood events.

Citation: NRCS models located

at: [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/technical/econ/references/?cid=nrcs143\\_009725](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/technical/econ/references/?cid=nrcs143_009725). USACE models located at:

<http://www.hec.usace.army.mil/software/>

- f. InVEST is a suite of freely available, spatially explicit models of ecosystem services, such as wildlife habitat, pollination, and carbon storage. Each model works in the same way: Factors, such as land use and climate, affecting the provision of an ecosystem service are input into a model as maps. The model then generates a map depicting the distribution and magnitude of the service in question. These relatively simple process models are easy to use: They are typically run as "tools" in ArcGIS, with their resolution and scope are flexible and determined by the input data. However, the applicability of a particular model to an assessment will depend on comfort with its simplifying assumptions, e.g., relationships are often assumed to be additive, along with input data quality. InVEST models are written in open source code and researchers periodically contribute new models to the suite.

Citation: Natural Capital Project: <http://www.naturalcapitalproject.org/invest/>

### 3. MULTI-CRITERIA DECISION ANALYSIS

Multi-Criteria Decision Analysis (MCDA) is a form of structured decision-making in which stakeholder preferences for changes in ecosystem services are expressed in relative terms, compared in an alternatives matrix, and ranked or prioritized accordingly. Although MCDA is a developing technique, it allows for critical nonmonetary benefits identified (e.g.,

existence value of biodiversity) or cultural values to maintain standing equivalent with that of monetary or quantifiable benefits derived from direct measurement. More specifically, it reflects how well the Federal investment and alternatives will yield ecosystem services selected for evaluation. It is recommended that those involved in this approach should include affected stakeholders as well as the interdisciplinary team of specialists, ensuring that all values are held in equal regard.

Examples of MCDA can be found in the following articles and websites:

- a. The Natural Resources Institute at North Carolina State University (<https://www.ncsu.edu/nrli/decision-making/MCDA.php>)
- b. Veronika Fontana, Anna Radtke, Valérie Bossi Fedrigotti, Ulrike Tappeiner, Erich Tasser, Stefan Zerbe, Thomas Buchholz, Comparing land-use alternatives: Using the ecosystem services concept to define a multi-criteria decision analysis, *Ecological Economics*, Volume 93, September 2013, Pages 128-136, ISSN 0921-8009, <http://dx.doi.org/10.1016/j.ecolecon.2013.05.007>.
- c. Schwenk, W. S., Donovan, T. M., Keeton, W. S. and Nunery, J. S. (2012), Carbon storage, timber production, and biodiversity: comparing ecosystem services with multi-criteria decision analysis. *Ecological Applications*, 22: 1612–1627. doi:10.1890/11-0864.1

As with any method or technique, analysts should consult with appropriate subject-matter experts when considering MCDA.

TABLE B-1

EXAMPLES OF ECOSYSTEM SERVICES AND RELEVANT BENEFIT COST ANALYSIS METHODS

<b>Provisioning Services</b>	<b>Potential Direct Use Method</b>	<b>Potential Indirect Use Method</b>
Municipal and Industrial Water	Cost of Most Likely Alternative, Contingent Valuation (CV)	N/A
Irrigation Water	Change in Net Income, Cost of Most Likely Alternative	N/A
Commercial Fishing	Change in Net Income	N/A
Hydropower	Cost of Most Likely Alternative	N/A

<b>Regulating Services</b>	<b>Potential Direct Use Method</b>	<b>Potential Indirect Use Method</b>
Urban Flood Damage Reduction	Avoidance Expenditure Method, Hedonic Valuation Method, Change in Net Income	N/A
Agricultural Flood Damage Reduction	Change in Net Income	N/A

<b>Cultural Services</b>	<b>Potential Direct Use Method</b>	<b>Potential Indirect Use Method</b>
Recreation	Travel Cost Method, Agent Based Modeling, Administratively Established Values, Hedonic Valuation Method Benefit Transfer	N/A
Ecosystem Restoration	Hedonic Valuation Method Benefit Transfer	Existence values, Bequest values

Note: Although not a separate method, benefit transfer is a technique that is often used when performing a benefit cost analysis related to recreation or ecosystem restoration.