Ecosystem Services and the Corps of Engineers: We Identified Them and Now We’re Waiting

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Where the Corps is with

- Where the Corps is with Services
- Interests and efforts made
- Strengths
- Limitations
- Recent events and the way forward
Definitions - Ecosystem Services are:

- Natural components
  - Restored functions, structures, and dynamics
- End result or consumable commodity of ecosystem restoration
- Conditions and Processes
- Benefits or Outcomes
Water Cycling
Water Purification
Stormwater Management
Air Purification
Climate Regulation
Soil and Sediment
Erosion Regulation
Pollination
Nutrient Cycling
Biodiversity Maintenance
Genetic Storage
Aesthetics
Recreation
- Recreation
- Education and Cultural
- Water Salvage
- Maintenance of Natural and Cultural Integrity
- Heat Island Mitigation /Carbon Sequestration

- Access
- Shallow Aquifer Recharge
- Maintenance of Natural and Cultural Integrity
- Education
- Catastrophic Fire Suppression
• WRDA 1986 Sec 1135 Project Modifications for Improvement of the Environment
• Kissimmee River, South Florida, Upper Mississippi
• Wetlands
- Site Question
- Portfolio Question
Portfolio Question

- Rio Grande R., NM
- Missouri R.
- Canadian R., OK
- Mono Lake, CA
PROGRAM ASSESSMENT

Aquatic Ecosystem Restoration
The Corps Aquatic Ecosystem Restoration program focuses on restoring degraded ecosystem processes to a more natural condition. Projects restore aquatic resources such as wetlands, rivers and estuaries. The primary focus is on large hydrologically complex projects. Non-Federal partners share the cost and maintain projects.

NOT PERFORMING
Results Not Demonstrated

- The Corps has revised its measures and has baselines for two annual and one efficiency measure. Targets have been developed for the revised measures, except for the new efficiency measure. The number of acres restored annually, the percentage of the four year total that is nationally significant, and the cost per acre to restore nationally significant acres will be among the metrics measured.

- Individual projects receive extensive review but the program as a whole has not been subject to regular independent evaluation. Such evaluation may contribute to identification of enhanced methods for performing comparative analysis of projects with dissimilar ecological outputs, refinement of the definition of nationally significant, and improved or alternative performance metrics.

We are taking the following actions to improve the performance of the program:

- Increasing focus on project effectiveness through environmental benefit assessment research. Increased project effectiveness will contribute to increased program effectiveness.

- Database development will provide new information about the projects and habitats restored. This will aid in answering questions about outputs and may assist with evaluation of program performance.

- Identifying the most effective means to obtain independent program evaluation. Specific criteria will be developed to be considered in a program review by building on previous and ongoing reviews.
Environmental Benefits Analysis Research Program

Themes of EBA Research Program

- **Conceptual models** to link restoration actions to predicted benefits

  Empirical, stochastic and mechanistic **forecasts** of ecosystem response to hydro-geomorphic manipulation

- **Metrics** for assessing benefits in different ecosystem types, across regions and applicable at the project and program scale

  Multi-criteria **decision analysis** to support risk-informed planning, recognizing local needs while ensuring national interest

- **Environmental benefits quantification** in alternatives and post-project evaluation to document contribution to NER account

- **Ecosystem services** using economic principals to account for social, economic, and ecological benefits

  Tools for **programmatic assessment** at national and regional levels

“Providing Solutions for Tomorrow’s Environmental Challenges”
Environmental Benefits Assessment (EBA)


- Access
- Shallow Aquifer Recharge
- Maintenance of Natural and Cultural Integrity
- Education
- Catastrophic Fire Suppression
Review of the Rio Grande Study

• Ecosystem Restoration projects are evaluated on increases in degraded ecological structure, function, and dynamics
• Ecosystem services may be a viable mechanism to respond to a systems approach in evaluation, but they cannot be used as the sole evaluation approach
MSCIP Objectives and Metrics

Planning Objectives

- Reduce risk to public health and safety from catastrophic storm inundation
- Reduce storm damages to infrastructure from catastrophic storm inundation
- Restore and protect upland and tidal wetland habitats
- Reduce residual risk from catastrophic storm damage

Risk Metrics

- National Economic Development
  - Monetary damages reduced/avoided (EAD)
  - Residual damages
  - Cost to implement plan
- Regional Economic Development
  - Positive regional economic benefits (sales, income and jobs)
  - Local cost burdens
- Environmental Quality
  - Tidal habitat lost
  - Tidal habitat restored
  - Non-tidal habitat lost
  - Non-tidal habitat restored
- Other Social Effects
  - Cultural and historical heritage impacts
  - Public service and infrastructure disruptions
  - Personal impacts
- Risk Metrics
  - Long-term sustainability of plan
  - Consequences of plan failing
  - Residual risk
<table>
<thead>
<tr>
<th>Ecosystem Services Affected by Corps Activities¹</th>
<th>¹ Indentified by Corps Workshop</th>
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<tbody>
<tr>
<td>Water Supply and Regulation</td>
<td>Erosion Regulation/Sediment Management</td>
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<td>Water Purification and Waste Treatment</td>
<td>Natural Hazard Regulation</td>
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<td>Biodiversity Maintenance</td>
<td>Recreational Opportunities</td>
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<td>Food</td>
<td>Fiber, Fuel, and other Raw Materials</td>
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<td>Science and Education</td>
<td>Maintain Cultural Diversity</td>
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<td>Spiritual and Inspirational</td>
<td>Aesthetics</td>
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<td>Ecosystem Service</td>
<td>Explanation / Definition</td>
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<tr>
<td>--------------------------------------</td>
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<tr>
<td>Water Supply and Regulation</td>
<td>Abundance, distribution, frequency, and duration for domestic, industrial, agricultural, and ecological responses</td>
</tr>
<tr>
<td>Erosion Regulation/Sediment Management</td>
<td>Protection of infrastructure through natural channel design and other measures to achieve a balance among sediment transport, distribution, and land development</td>
</tr>
<tr>
<td>Water Purification and Waste Treatment</td>
<td>Retention, recovery, and removal of excess nutrients, other pollutants as well as other water parameters</td>
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<tr>
<td>Natural Hazard Regulation</td>
<td>Management of coastal storm protection, fire management, flood damage, disease outbreaks, landslides</td>
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<tr>
<td>Food</td>
<td>Commercial and subsistence fisheries, crops</td>
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<td>Fiber, Fuel, and other Raw Materials</td>
<td>Production of woody and other vegetation products.</td>
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<td>Biodiversity Maintenance</td>
<td>Opportunities for future generations; keystone for other services</td>
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<tr>
<td>Climate Regulation</td>
<td>Source and sink of greenhouse gases</td>
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<td>Clean Air</td>
<td>Storage and processing of pollutants. Support for alternative fuel productions, transportation, energy production.</td>
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<tr>
<td>Recreational Opportunities</td>
<td>Sporting activities, water-based, land-based, consumptive, non-consumptive, ecotourism</td>
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<tr>
<td>Science and Education</td>
<td>Ecosystems provide opportunity for science, education, and public outreach</td>
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<td>Maintain Cultural Diversity</td>
<td>Certain cultures defined by the ecosystem they are developed in, e.g., New Orleans, Chesapeake Watermen</td>
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<td>Spiritual and Inspirational</td>
<td>Source of inspiration; many cultures attach spiritual and religious values to ecosystems</td>
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<td>Aesthetics</td>
<td>Attractive landscape attributes for the five senses; experiencing the five senses.</td>
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<td>Components of Nature and Natural Processes</td>
<td>Natural Components to Fulfill Human Demands</td>
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Evaluation

Corps Planning Guidance - Broad

- Headquarters guidance – “a systems approach that could measure and reflect the “(1) understanding of the interconnectedness of water and land resources, (2) dynamic nature of economic and environmental factors and (3) the variability of social interests over time

- Understanding the ecosystem approach as a means to “restore and sustain the health, productivity, and biological diversity, and overall quality of life through a natural resources management approach that is fully integrated with social and economic goals”
Evaluation
Corps Planning Guidance - Narrow

• Corps expertise is used to restore “significant ecosystem function, structure, and dynamic processes that have been degraded,”

• The Federal objective of ecosystem restoration is to result in “increases in the net quantity and/or quality of desired ecosystem resources, measured as changes in ecological resource quality”.
Fundamentals

What Is the Planning Process?

A planning process is a structured approach to problem solving. A six-step planning process is commonly used in water resource development studies conducted by Federal agencies. The steps, illustrated in the figure, are:

1. Step 1 - Identifying problems and opportunities.
2. Step 2 - Inventorying and forecasting conditions.
3. Step 3 - Formulating alternative plans.
4. Step 4 - Evaluating alternative plans.
5. Step 5 - Comparing alternative plans.

Although developed for water resources planning, this process can be a much more universal problem solving approach. It is essentially the same as the National Environmental Policy Act (NEPA) process and similar approaches.
Updated Principles and Guidelines for Water and Land Related Resources Implementation Studies

On December 3, 2009, the White House Council on Environmental Quality released a proposal to the National Academy of Sciences (NAS) for their review that would significantly change the principles and guidelines that govern America's water resource planning. The proposal would require that such projects help to improve the economic well-being of the Nation for present and future generations, better protect communities from the effects of floods and storms, help communities and individuals make better choices about where to build based on an understanding of the risk, and protect and restore the environment.

The proposal calls for the development of water resources projects to be based on sound science, increased consideration of both monetary and non-monetary benefits to justify and select a project, improved transparency, and consideration of nonstructural approaches that can solve the flooding problem without adversely impacting floodplain functions. The proposal would also expand the scope of the Principles and Guidelines to cover all Federal agencies that undertake water resource projects.

The Administration sent the new draft Principles and Guidelines to both the Federal Register for public comment and, in accordance with WRDA 2007, to the National Academy of Sciences (NAS) for its review. The NAS review is expected to be completed by November 2010. Additionally, CEQ took public comment on the new draft Principles and Guidelines for 90 days.
1. Principles

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

A. Protect and restore natural ecosystems and the environment while encouraging sustainable economic development;

B. Account for ecosystem services;

C. Avoid the unwise use of floodplains, flood-prone areas and other ecologically valuable areas;

D. Utilize watershed and ecosystem based approaches;
The Water Resources Development Act of 2007 redefined national objectives for water resources development and directed the Secretary of the Army to revise the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (P&G) to make them consistent with these objectives. The P&G is the template for water resources planning studies and other decisions necessary to authorize or modify Civil Works water resources projects. The Council on Environmental Quality (CEQ) is leading the revision process that is expected to last at least another year. CEQ has circulated various drafts for agency review and has submitted a draft to the National Academy of Sciences.
Evaluation
Principles and Guidelines Evaluation Accounts
Principles and Standards Effects Categories

• P & G Four Evaluation Accounts
  – National Economic Development
  – Environmental Quality
  – Regional Economic Development
  – Other Social Effects

• Proposed Principles and Standards Effects Categories
  – Monetary Category
    – National Economic
    – Regional Economic
  – Non-Monetary Category
    – Natural Resources
    – Public Safety
    – Other Social Effects
Guidelines: All water resources projects should:

I. Promote economic development;
II. Preserve and restore ecosystem functions and services;
III. Promote wise use of floodplains and flood-prone areas;
IV. Use a watershed approach;
V. Use best available practices, analytical techniques, procedures and tools;
VI. Use a planning process with a level of detail commensurate with the investment level and type of the study;
VII. Account for benefits and costs in appropriate monetary and non-monetary terms;
VIII. Account for significant effects and mitigate any unavoidable impacts to ecosystem functions and services;
IX. Address risk and uncertainty;
X. Address public safety;
XI. Ensure the planning process is fully transparent; and
XII. Promote collaboration.
Figure 2: Ecosystem Services Categories and Perceived Impact to Humans.

- **Level 1:** Ecosystem Foundation or Support Services
- **Level 2:** Provisioning Services, Goods and Services produced by support Services
- **Level 3:** Outcomes and Benefits to Society
Implementation Issue

• No matter how useful or enlightening, the incorporation of a new or innovative analysis into an ongoing, already complex process can be costly and cumbersome.

• The lesson of the Middle Rio Grande study for ecosystem services is that incorporation of services as an evaluation element may be difficult if the data are not available to support the services evaluation.
Not Waiting On....

- Restoration of structure, function, and dynamics
- Stakeholder interest
- Corps interest in relating our efforts to benefits
  - Do fishery restoration result in benefits?
  - Wetland restoration effects?
Waiting On….

- Clarification from Headquarters on the Principles and Standards
- Incorporation into Planning Guidance Notebook
  - Recognition of relationships / way to get recognition for
    - Components of nature to Outcomes and Benefits
    - Regional and local characteristics to Corps’ national missions
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<thead>
<tr>
<th>Step</th>
<th>Description</th>
<th>Source</th>
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<tbody>
<tr>
<td>Step 1</td>
<td>Problem Perception</td>
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<td>Step 2</td>
<td>Request for Federal Assistance</td>
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<td>Step 3</td>
<td>Study, Problem and Report Preparation</td>
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<tr>
<td>Step 4</td>
<td>Report, Review and Approval</td>
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<td>Step 5</td>
<td>Congressional Authorization</td>
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<tr>
<td>Step 6</td>
<td>Project Implementation</td>
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Questions ?