

# Research into Incorporating Ecosystems Goods and Services into Restoration Planning, Part II: Policy Review & Analysis

based on the work of (in alphabetical order):  
Janet Cushing, Lynn Martin,  
Elizabeth Murray, Denise Reed,  
and Lisa Wainger



US Army Corps of Engineers  
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# Ecosystem Services

## ***Topics of discussion:***

- Overview of ecosystem goods and services work unit
- Review of Principles & Best Practices
- Results of policy review and analysis
- Interagency coordination efforts





# Ecosystem Goods and Services Work Unit

**PDT Leads:** Janet Cushing, IWR; Elizabeth Murray, ERDC

**Product Development Team:** Guillermo Mendoza, Paul Wagner, Lynn Martin, Shawn Komlos (IWR); Tim Lewis, Sherry Whitaker (ERDC); Lisa Wainger, Hannah Griscom, Anna McMurray (U of Maryland); Denise Reed (The Water Institute of the Gulf); Tomma Barnes (SAW); Chuck Theiling (MVR), Denise Kammerer-Cody (NAE); Kat McCain (MVS); Frank Casey (USGS)

**Project Oversight:** Dr. Al Cofrancesco (ERDC); Ms. Rennie Sherman (HQ)



# Approach

## Six-prong approach to the investigation of EGS

- Principles, best practices, with implications for the Corps: TN and supporting TR (**Both Published**)
- Policy review and analysis: Report (**Published**)
- Review of data analysis and analytical tools: Catalog and synthesis report (**Catalog complete, Report in Review**)
- Interagency Coordination: (**Ongoing**)
- Case Studies: Synthesis report on previous attempts within the Corps (**In Prep**)
- Guidelines/Framework Development: Supporting workshops and reports (**In Prep**)





US Army Corps  
of Engineers  
Engineer Research and  
Development Center



Ecosystem Management and Restoration Research Program

### Incorporating Ecosystem Goods and Services in Environmental Planning

A Literature Review of Definitions, Classification and Operational Approaches

David J. Tazik, Janet Cushing, Elizabeth Murray,  
and Lisa Wainger

February 2013



ERDC TN-EMRRP-ER-18  
July 2013

Approved for public release; distribution is unlimited



### Incorporating Ecosystem Goods and Services in Environmental Planning – Definitions, Classification and Operational Approaches

by Elizabeth Murray, Janet Cushing, Lisa Wainger, and David J. Tazik

**Overview:** There has been interest for several decades in assessing the benefits that humans derive from naturally functioning ecosystems. While the notion of ecosystem goods and services benefiting humans is not entirely new, it has become increasingly formalized for consideration in environmental policy analysis. It is closely tied to concepts in ecosystem-based management of natural resources. The authors' intent in this technical note is to lay the foundation for a framework that the U.S. Army Corps of Engineers (the Corps) can use to incorporate consideration of ecosystem goods and services in water resource project planning and management; the authors also seek to identify any research needs to accommodate that goal. This technical note and the corresponding literature review and report are the first products in a series of publications for the Incorporating Ecosystem Goods and Services (EGS) in Environmental Planning Work Unit. Subsequent related products researching policies, data and tools, interagency coordination and an assessment framework are in progress, and will be released over the next few years.

#### Objective

The objective of this technical note is to explore the challenges and opportunities for incorporating EGS considerations in project planning. These considerations are particularly important for ecological restoration projects; additionally, there is potential for application to all Corps Civil Works business lines. This technical note offers a brief review of the state of the science of EGS and highlights the types of analytical tools, techniques, and considerations that would be needed within a Corps planning community of practice. This publication complements a detailed technical report that provides a more thorough discussion of the concepts, historical development, and alternative perspectives on evaluation methods. The two publications are the first in a series dedicated to investigating the potential for incorporating ecosystem goods and services analysis into Corps planning. Several of the issues raised in this technical note will be explored further in future products addressing this research. Those future research products will examine relevant Corps policies and authorities, published EGS tools and models, and case studies of previous attempts at conducting EGS assessments. The culmination of these efforts will be a framework intended to guide the incorporation of EGS assessment into Corps planning. This technical note is only the first step in (raising and then) addressing the many issues involved in applying ecosystem goods and services to decision-making.

The Plenary Session Speaker for the **5th National Conference on Ecosystem Restoration** was **Ms Rachel Jacobson**, Acting Assistant Secretary for Fish and Wildlife and Parks, U.S. Department of the Interior, who reported:

*Incorporating Ecosystem Goods and Services in Environmental Planning – Definitions, Classification and Operational Approaches (ERDC TN-EMRRP-ER-18) would act as a foundational document in how we should look at Ecosystem Goods and Services.*

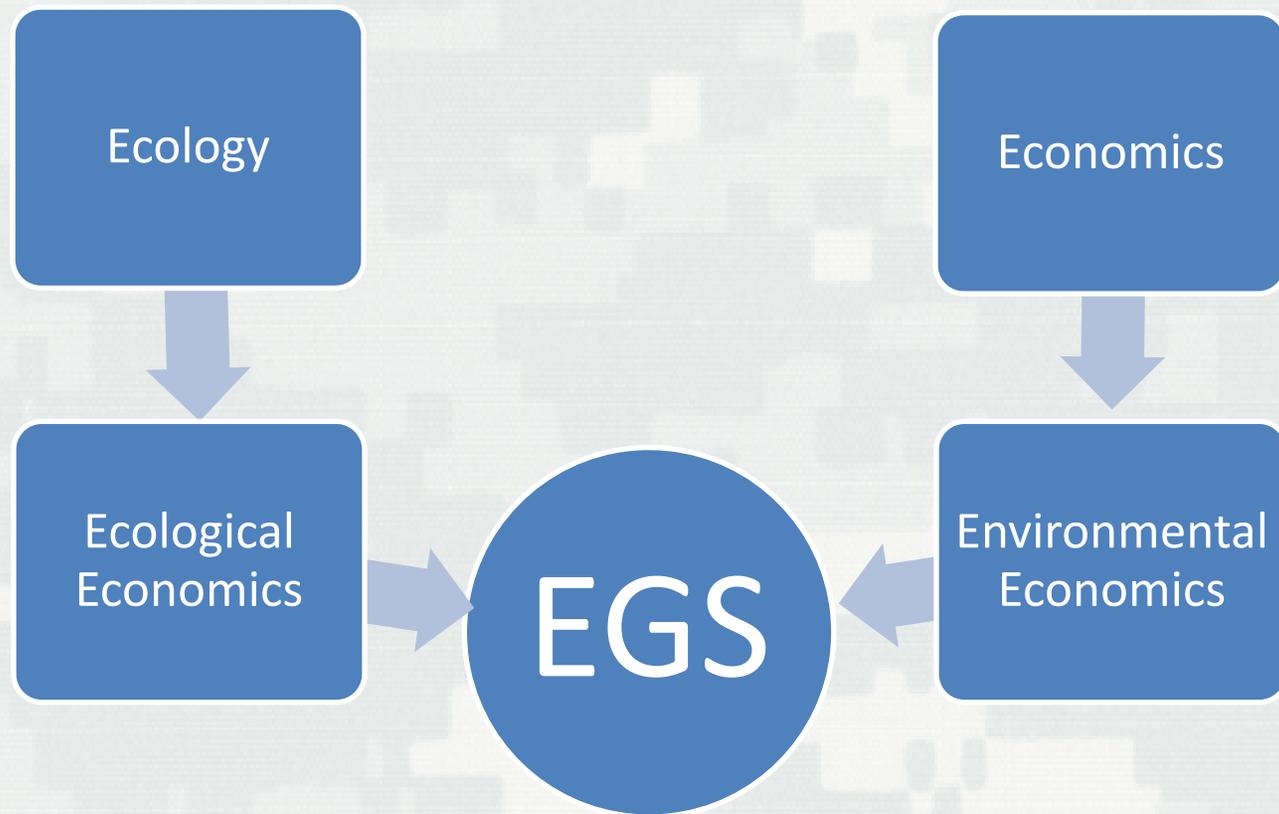
Webinar covering the concepts in these reports plus how they are being incorporated into a Framework for the Corps can be found at the Civil Work Environment Gateway:

<http://cw-environment.usace.army.mil/learning.cfm?CoP=Env>



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# Ecosystem Goods and Services



# Ecosystem Goods and Services

Recommended USACE Definition:

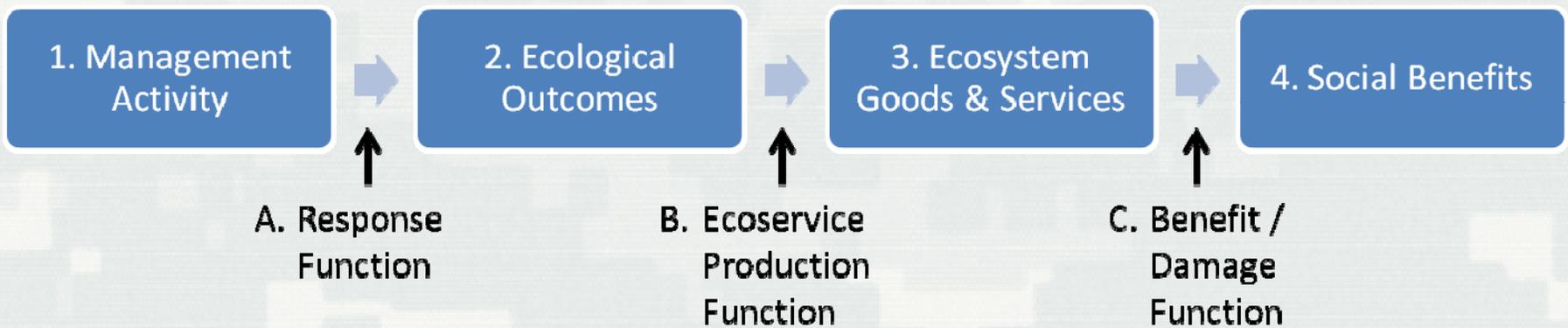
**Ecosystem goods and services** are socially valued aspects or outputs of ecosystems that depend on self-regulating or managed ecosystem structures and processes.



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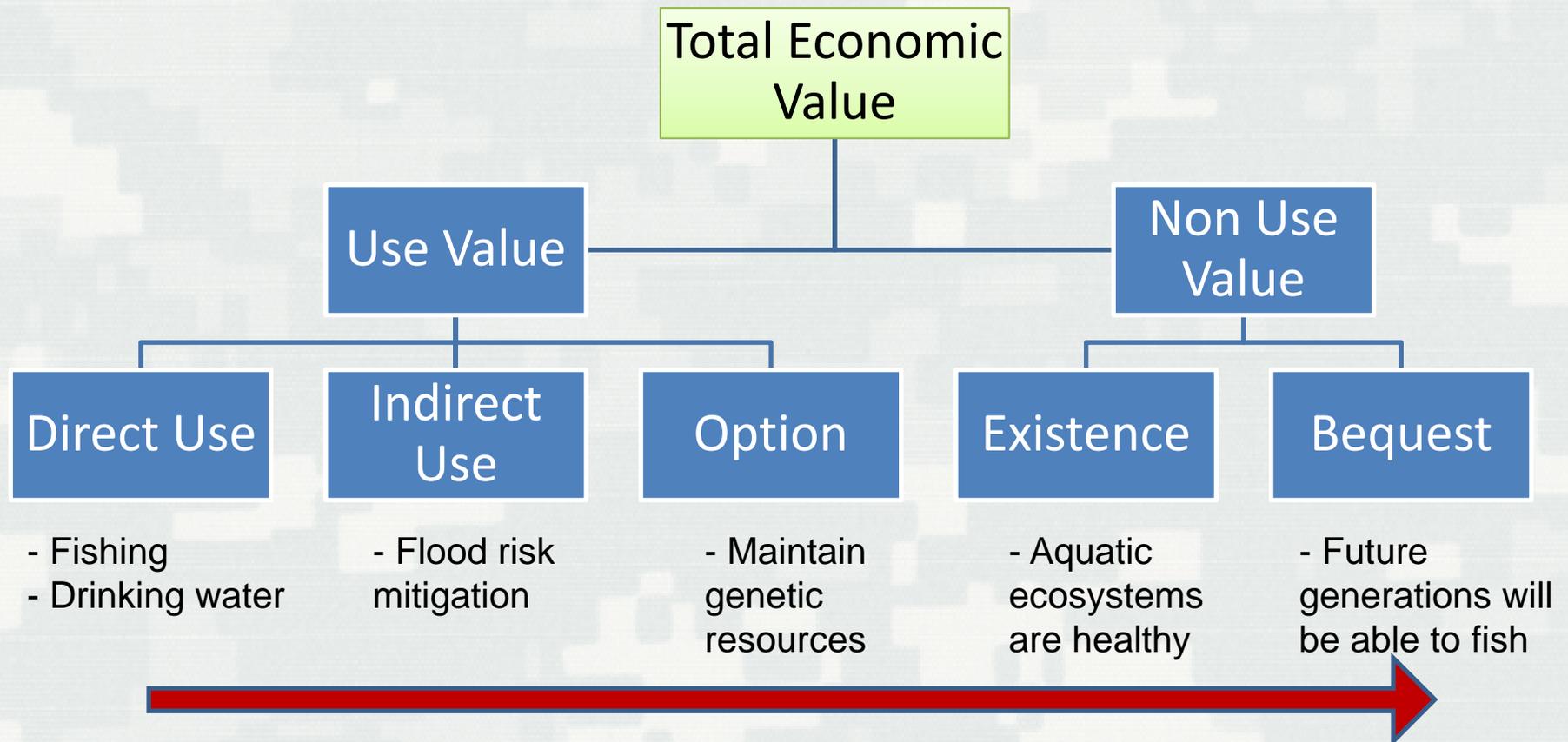
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# Conceptual Model for Quantifying EGS



# Total Economic Value

Sum of use and non-use values



Decreasing ability to value (\$)



# Characteristics of Intermediate vs. Final Goods & Services

## Ecosystem Structure or Function

- Nutrient cycling
- Sedimentation rate
- Water depth
- Biodiversity

- Often quantifiable
- Often academic

• Components of intermediate or final services

- Independent of demand

## Intermediate Good or Service

- Quality of water
- Water supply capacity
- Species preservation

- Often elusive
- Often intuitive

• Components of final services

- Relation to potential demand

## Final Good or Service

- Drinking water supply
- Flood risk management
- Commercial fisheries
- Aesthetics

- Often quantifiable
- Often recognizable

• Contributes to society

- Relation to or reliant on demand

<b>Ecosystem Service Categories</b>	<b>Corps' Influence on Service</b>
Ecosystem Sustainability/Habitat	Ecosystem impacts and restoration
Water Supply and Regulation	Stream restoration; reforestation; impervious surface creation
Natural Hazard Mitigation, Property & Infrastructure Protection, Human Safety (storms, floods, landslides, fires & droughts)	Tidal wetland restoration; invasive species control; alteration of hydrology, landforms, and plant communities
Navigation	Riparian restoration, erosion control, distribution of dredge material
Recreation	Wetland, riparian & stream restoration; revegetation; alteration of water and land resources
Cultural, Spiritual , & Educational Support	Revegetation; invasive species control
Aesthetics	Wetland, riparian & stream restoration; revegetation; location, design and operation of built structures
Food Provisioning: Wild foods (fish, game, grains) and aquaculture	Water management; revegetation; impact on fisheries habitat
Raw Goods & Materials Provisioning	Subsidence prevention; ecosystem improvements; In-water structures; invasive species control
Water Purification and waste treatment	Ecosystem restoration; water management; riparian restoration; channel configuration
Climate Regulation, Carbon Sequestration	Reforestation; wetland restoration
Human Health	Pathogen and contaminant processing and dilution via wetland and river restoration

# Approach

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- Interagency Coordination: Informational website
- Case Studies: Synthesis report on previous attempts within the Corps
- Guidelines/Framework Development: Supporting workshops and reports



September 2013

Using Information on  
Ecosystem Goods and  
Services in Corps Planning:  
An Examination of  
Authorities, Policies, Guidance,  
and Practices

2013-R-07



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# Bottom Line Up Front

- Other than for NDARR, little observed use of EGS information in project level planning or decision making at the US federal level
- Key component of some environmental management decisions by state agencies and governments outside the U.S.
- There are more formal EGS policies and guidance in other agencies compared to within the Corps.



# Guiding our Civil Works Activities

<b>1950's</b>	- Proposed Practices for Economic Analysis of River Basin Projects - Treatment of Tangible and Intangible Effects
<b>1962</b>	- Policies, Standards, and Procedures in the Formulation, Evaluation, and Review of Plans for Use and Development of Water and Related Land Resources
<b>1965</b>	- Water Resources Planning Act
<b>1969</b>	- National Environmental Policy Act
<b>1970</b>	- River and Harbors and Flood Control Act
<b>1986</b>	- Water Resources Development Act



# 2012 Environmental Operating Principles

- Foster a culture of sustainability throughout the organization.
- Proactively consider environmental consequences of all USACE activities, and act accordingly.
- Create mutually supporting economic and environmental solutions.
- Continue to meet corporate responsibility and accountability under the law for activities undertaken by the Corps, which may impact human and natural environments.
- Consider the environment in employing a risk management and systems approach throughout life cycles of projects and programs.
- Leverage scientific, economic and social knowledge to understand the environmental context and effects of USACE actions in a collaborative manner.
- Employ an open, transparent process that respects views of individuals and groups interested in Corps activities.



# Considerations in Planning AER Projects

- Cost effectiveness and incremental cost analyses
- Significance of ecosystem outputs
- Information about acceptability, completeness, efficiency, and effectiveness



# EGS in Other Agencies



Photo credit: USGS



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# Ecosystem Service Definitions

<b>USACE</b>	Socially valued aspects or outputs of ecosystems that depend on self-regulating or managed ecosystem structures and processes.
<b>EPA</b>	Direct or indirect contributions that ecosystems make to human well-being.
<b>NOAA</b>	Contributions that a biological community and its habitat provide to our day-to-day lives. Defining ecosystem services is dependent on human values.
<b>USDA</b>	USDA Office of the Chief Economist refers to the natural assets that provide benefits to society. USDA Forest Service notes that ecosystem services are commonly defined as the benefits people obtain from ecosystems.
<b>DOI</b>	Generally understood to be the benefits of nature to individuals, communities, and economies.
<b>DOD</b>	The benefits obtained from ecosystems. These include provisioning, regulating, cultural, and supporting services.

# Mission Areas

<b>USACE</b>	Navigation, Flood risk management, Ecosystem restoration, Water supply, Environmental stewardship, Regulatory (Clean Water Act, Rivers & Harbors Act), Coastal storm damage reduction, Hydropower, Emergency response, Military support
<b>EPA</b>	Regulatory (laws pertaining to human health and environment via media (air, water, land etc), Grant administration, Science research (environmental, health and well-being)
<b>NOAA</b>	Climate and ocean/coastal science research, Marine and coastal resources management, Regulatory, Fisheries management, Natural Resource Damage Assessment, Environmental satellite information management
<b>USDA</b>	Environmental markets; Farm Bill administration; Natural resources management on public/private lands, Forest management; Recreation; Rural community development; Wildland fire management; Nutrition programs; Agricultural and forest research
<b>DOI</b>	Fish and wildlife, natural resources, land, and cultural resources management, Regulatory (e.g., Endangered Species Act, etc.), Scientific research, Manage recreation, Mineral resources management
<b>DOD</b>	Land management to support DOD mission of providing military forces needed to deter war and to protect the security of the US

# Context for Use of EGS

<b>USACE</b>	Planning or watershed studies, assessing Value to the Nation, natural resources management; mitigation banks
<b>EPA</b>	Integrating predictive ecological modeling with economic valuation methods that support local, regional, and national decision-making for sustainability; evaluating the economic effects of EPA regulatory decisions.
<b>NOAA</b>	Damage assessment and restoration plans use service-based analyses and valuation techniques; ecosystem-based management, which incorporates the consideration of ecosystem services.
<b>USDA</b>	Payments for ecosystem services (Environmental markets) in regional settings (e.g., Chesapeake Bay); Forest Management Plans; broad-scale planning, such as the State Forest Action Plans; identifying watersheds for payment for watershed services (PWS) projects on forest lands.
<b>DOI</b>	Resource evaluation and management, planning, and resource damage assessment and restoration
<b>DOD</b>	Incorporate into Integrated Natural Resource Management Plans

# Examples of Different Uses of EGS

System Characterization	<ul style="list-style-type: none"><li>• FWS, NPS and BLM management policies require consideration of and managing for a broad range of resource qualities, activities and human uses and values.</li></ul>
Risk Assessment	<ul style="list-style-type: none"><li>• EPA “Guidelines for Ecological Risk Assessment” recognize that definition of ecological values to be protected provides the best foundation for assessing risk.</li></ul>
Inform Program Direction	<ul style="list-style-type: none"><li>• USDA FS 2012 rules for National Forest System Land Management Planning require consideration of contributions to ecosystem services and multiple uses to the local area, region and the nation.</li><li>• DOD Natural Resources Program guidance includes protecting, enhancing and sustaining ecosystem services as part of its natural resources management.</li></ul>

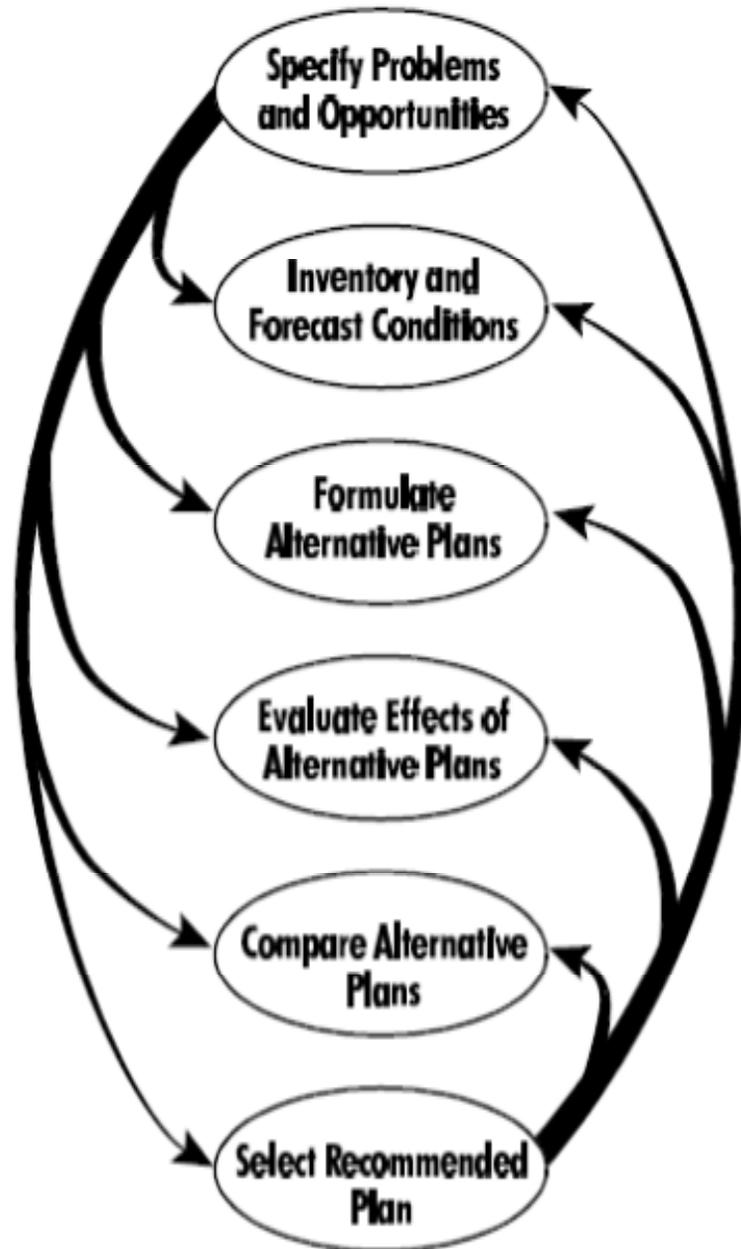
# Examples of Different Uses of EGS

Informing Specific Actions - Compensatory Mitigation	<ul style="list-style-type: none"><li>• NOAA Damage Assessment, Remediation &amp; Restoration Program Habitat Equivalency Analysis uses a service-to-service approach to scaling compensatory mitigation relative to impacted services.</li></ul>
Informing Specific Actions - Conservation Incentives	<ul style="list-style-type: none"><li>• USDA Conservation Reserve Program calls for conservation that protects and enhances services.</li></ul>
Informing Specific Actions - Environmental Markets	<ul style="list-style-type: none"><li>• Chesapeake Bay strategy (implementation of EO 15308) identifies environmental markets as a tool to provide financial incentives to facilitate conservation, including water quality trading.</li></ul>



# Corps' Planning Process

Consideration of EGS during the Planning phase can expand partnering opportunities.





# Interagency Coordination

- National Ecosystem Services Partnership
  - Federal Resource Management and Ecosystem Services (FRMES)
- National Science and Technology Council Subcommittee on Ecological Systems
  - Response to the President's Council of Advisors on Science and Technology report on Sustaining Environmental Capital
- Natural Floodplain Functions Alliance
  - White paper on using ecosystem services to support floodplain decision-making



# Policy Review Findings

EGS in Project- level/Place-based decisions	Potential Use in Program-level decisions
<p>Corps project planning studies:</p> <ul style="list-style-type: none"> <li>- More fully capture benefits and other effects</li> <li>- Illuminate trade-offs</li> </ul>	<p>Corps budget process:</p> <ul style="list-style-type: none"> <li>- Refine Resource Significance criteria</li> </ul>
<p>Corps watershed planning studies:</p> <ul style="list-style-type: none"> <li>- Provide opportunities for considering a broad array of needs and opportunities</li> <li>- Affords collaboration among agencies</li> </ul>	<p>Federal budget process:</p> <ul style="list-style-type: none"> <li>- Fit within changing priorities</li> <li>- Monetization not necessary but potentially useful</li> </ul>
<p>Resource conservation and stewardship:</p> <ul style="list-style-type: none"> <li>- Forest Service planning</li> <li>- Bureau of Land Management land use plans</li> <li>- Dept. Defense Integrated Natural Resource Management Plans</li> </ul>	<p>Value to the Nation:</p> <ul style="list-style-type: none"> <li>- Monetization beneficial</li> </ul>
<p>Restoration Federal decision making:</p> <ul style="list-style-type: none"> <li>- NOAA natural resource damage assessment</li> </ul>	<p>Other Federal Actions:</p> <ul style="list-style-type: none"> <li>- Rule-making cost-benefit analysis, e.g., EPA</li> </ul>

# Summary of Findings

<b>Issue</b>	<b>Findings</b>
Should the Corps formulate for the restoration of EGS?	This will require specificity of the services to ensure the EGS considered by any project are consistent with policy and guidance.
Is the Corps authorized to do so?	Use of some EGS information is consistent with project authority and current policy, but ability to formulate for EGS may vary with authority.
Can the Corps consider EGS in its AER planning, and planning for other purposes?	Use of some EGS information is consistent with current policy and guidance.



# Summary of Findings

## Issue

## Findings

How is this similar or different from current practices used in localized or regional scale planning, and in cost share studies carried out in collaboration with non-federal sponsors, other agencies and stakeholders?

The use of some EGS information maps directly onto existing practice. Use of others may require a new approach and/or the development of additional planning tools, and collaboration with partners on implementation.

Is there a need to change or clarify USACE authority, policy and guidance in order to include EGS in planning?

The need varies with the particular service.



# Summary of Findings

Issue	Findings
How can information about EGS benefits provided by Corps projects be useful in justifying and prioritizing these projects at the programmatic or portfolio levels?	EGS information could be useful in communicating project effects, and EGS may help demonstrate and justify how and where the Corps should collaborate with others to achieve certain types of outcomes.
How can EGS information be used to contribute to the 'Value to the Nation' story of the Civil Works Program?	In addition to supporting budget priorities, a more complete accounting for information on effects and outcomes in project documentation may help a project compete across an array of priorities for ecosystem restoration.



# Potential Benefits

1. Manage natural resources for the highest possible “return” on investment
  - Appropriately comparing locations and designs
  - Appropriately measuring benefits & risks at multiple scales (e.g., site, watershed, ecoregion)
2. Improved communication of social benefits for ecosystem restoration and NR management
  - Fulfilling the Corps’ mission
  - Engaging local communities
  - Securing federal support
3. Provide supporting material for the Army to recommend the best projects for funding



# Questions??

Photo Credit: Brent Anderson, South Florida Water Management District