Assessing Ecosystem Restoration Benefits

Briefing for Mr. Rock Salt, Deputy ASA(CW)

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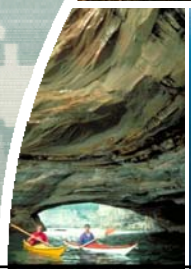

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Objective

Address the Office of ASA(CW) directive regarding deficiencies in Corps ER feasibility reports and studies, and to demonstrate programmatic success to OMB and the public through:

- Establishment of the **state-of-the-science** and improvements in practice by those engaged in EBA
- Development of **scientifically valid metrics and methods** for assessing benefits from environmental restoration
- **Clear communication and accounting** of the benefits of proposed and in-place restoration projects, as well as the Corps' ER Program

Problem/Approach

- Poor fundamental understanding of ecosystem process and condition,
- No consensus for scientifically-recognized and peer reviewed methods and metrics,
- Failure to identify and quantify uncertainty,
- Incomplete accounting of benefits,
- Poor documentation,
- Model certification.

- Primary audience are District planners; broader benefits to HQUSACE and ASA(CW),
- Focus on providing key capabilities that improve EBA practice,
- Limited investments in model development and service-based research

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Capabilities

- **Conceptual models** to link ecological state, uncertainties, restoration actions, metrics, and predicted trajectories,
- **Objectives and Metrics** for scientifically-valid assessment of project benefits,
- **Ecological Modeling** for forecasting ecosystem response to hydro-geomorphic manipulation and associated algorithms for quantifying benefits,
- **Characterizing uncertainty** for risk-informed planning and improved decisions,
- **Reference systems** to serve as a guiding image and a basis for scaling benefits.
- **Adaptive management** to manage risks and maximize benefits
- **Programmatic assessment** tools, guidance and information applicable at regional and national levels
- **Ecosystem services** to account for social and economic benefits

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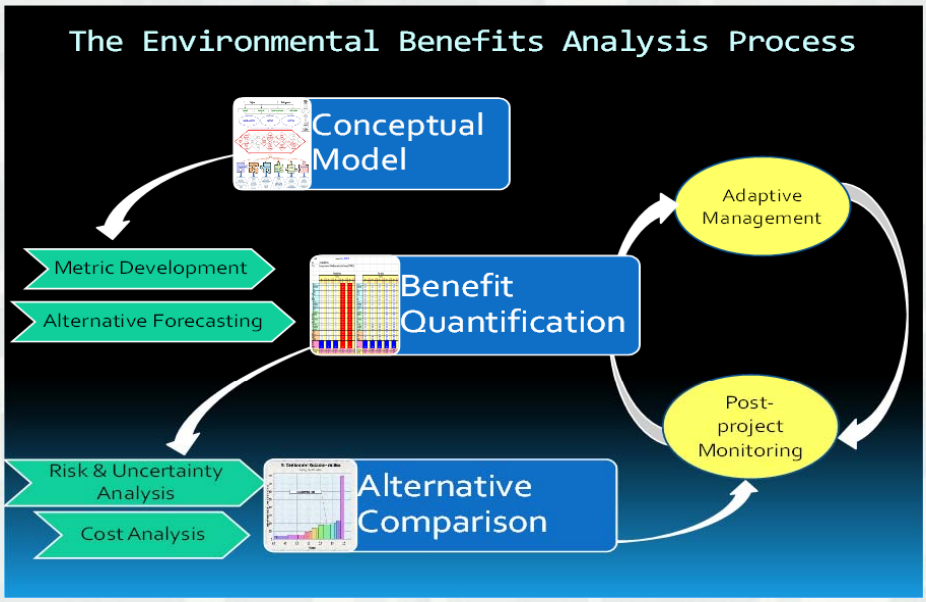
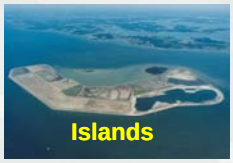
Framework



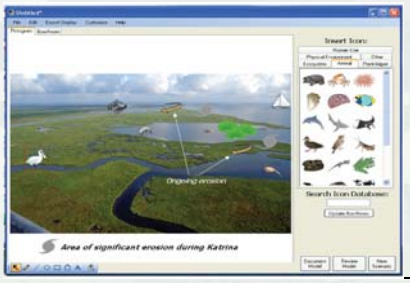
Discussion



Remaining Slides are to Support Discussion, not Part of the Formal Presentation

Conceptual Modeling

- **Problem addressed**
  - Poor understanding of ecosystem response
  - Poor objective statements
  - Metrics not associated with ecological realities
  - Lack of a consensus view



How are we addressing:

- Defined principles and good practice
- Developed support tool
- Several case study applications
- Library of examples

Model Documentation:

- Allows ***on-the-fly*** notes/comments
- Keeps narrative description w/ visual display

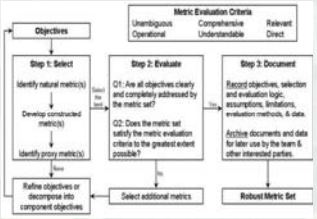
Metric Development for EBA

Challenges:

- **Critical considerations in development of metric sets often overlooked**
- **Diversity of projects w/ diverse objectives**
  - ***a challenge to compare dissimilar metrics within & between projects***
- **How to ensure metrics are scientifically valid**

How are we addressing:

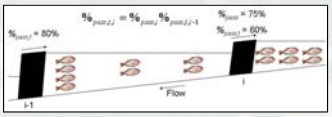
- **Protocols for Metrics Development**
- **Comparing Project with Dissimilar Metrics**
- **How to Ensure Scientific Validity**
- **Common Practices: Nonmonetary Metrics**
- **New Metrics: e.g. A Biotic Security Index**

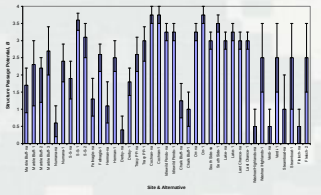


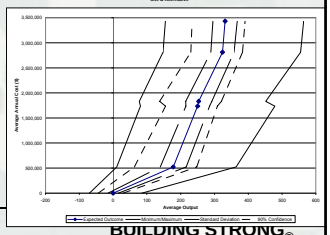
$$\text{BSI} = \sum_{s=1\ldots n} (h(wR)(wD)(wG)(A_1 - A_0))_s$$

Forecasting and Modeling

- Challenges
  - Lack of familiarity with modeling and model development
  - Depth and breadth of need
  - Model certification
- How being addressed
  - Establishing principles and outlining standards of practice
  - Providing case studies
  - Fostering comfort with model development and use





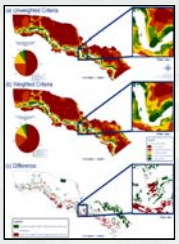


Uncertainty & Risk-Informed Decision Making

Challenge: addressing disparate, conflicting physical, environmental, economic, & societal considerations

- Perceived as overly complex
- MCDA not well documented for restoration projects

LCA & Sea Level Rise



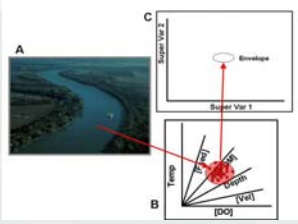
How are we addressing:

- Method for identifying and quantifying uncertainty
- Protocols for using MCDA to support ER planning and risk management
- Guidance for incorporating uncertainty into decisions
- Several case study summaries
- Monitoring and adaptive management guidelines

Missouri River Cottonwood Restoration

Reference Based Concepts

Challenge: Is there utility in using reference based concepts as fundamental objective in Corps Ecosystem Restoration Planning?



Key Considerations:

- Which reference target to choose?
- Which parameters to measure?
- How to address projects of differing scale?
- How to reconcile reference conditions characterized by different metrics? Multiple metrics?
- How to incorporate reference condition comparisons into a national ecosystem restoration program?

$$C.M. = \frac{1}{n}\sum_{1}^{n}\frac{\left|x_{1_i} - x_{2_i}\right|}{\left(x_{1_i} + x_{2_i}\right)}$$

Monitoring & Adaptive Management

Challenge:

- WRDA 2007 Monitoring Requirements
- Quantification of project success & to facilitate adaptive management
- Standards & needs not uniform across project types
- Return on Investment?

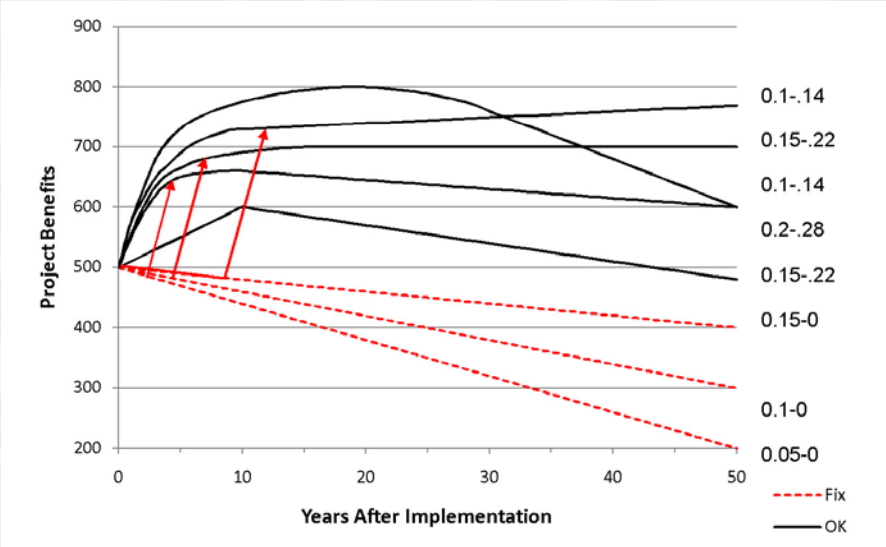
Milltown Dam

Truckee River

How Addressed:

- Guidance documents describing how to develop and implement monitoring and adaptive management plans
- Several case studies (Louisiana Coastal Authority, Truckee River, Milltown Dam, Yellowstone R.)
- Methods for quantifying the benefits of adaptive management and assessing return on investment.

Assessing AM Benefits



Ecosystem Services & Corps Activities

Ecosystem Service	Evaluation Account
Water Supply and Regulation	NED & EQ
Erosion Regulation/ Sediment Management	EQ & NED
Natural Hazard Regulation	EQ & NED
Water Purification and Waste Treatment	OSE
Biodiversity Maintenance	EQ
Recreational Opportunities	NED
Food	OSE
Fiber, Fuel, and other Raw Materials	NED
Climate Regulation	EQ & OSE
Clean Air	EQ
Science and Education	OSE
Maintain Cultural Diversity	OSE
Spiritual and Inspirational	OSE
Aesthetics	EQ

Demonstrations/Case Studies

Purpose: Illustrating the benefits assessment process, methods and tools – e.g., conceptual modeling, metrics development, decision analysis, modeling and forecasting, benefits quantification.

Status: Have several complete and ongoing projects and are prioritizing based upon value and schedule.

Retrospective Project Evaluation

Authorization	# Complete	Total Cost (M)
CAP Sec. 204	13	$6.9
CAP Sec. 205	# / 66 *w/ environmental features*	$ / $165.5
CAP Sec. 206	29	$45.1
CAP Sec. 1135	55 *12/28 w/ monitoring plans*	$78.4
WRDA (1996, 1999, 2000)	8/21 approved	$ / $620

Everglades/Kissimmee River
Columbia River Mitigation
CWPPRA(39/175)
Missouri River Mitigation
UMRS-EMP(50)

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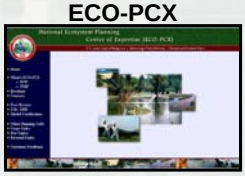
Technology Transfer

Ecosystem Restoration Gateway

www.CorpsEcoRestoration.us

ECO-PCX



EBA & Research

Restoration Fact Sheets

Community of Practice

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