ENVIRONMENTAL SUSTAINABILITY AS THE BASIS FOR CUMULATIVE EFFECTS MANAGEMENT: A CASE STUDY

Tom Swor
(presented by Larry Canter)

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The Case Study

- **Corps of Engineer's infrastructure investment strategy for the waterway navigation system on the Ohio River**
- **981-mile River length; 20 existing locks and dams, soon to be 19**
- **Investments in system – routine maintenance, major scheduled maintenance, replacement locks and dams, and auxiliary lock extensions**
- **Authorized ecosystem restoration program**

Sustainability Assessment

- **Added during study**
- **Environmental sustainability was used as integrator of findings of cumulative effects study**
- **Developed a process that facilitated both the SA, the identification of measures which could be used to enhance resource sustainability conditions, and the incorporation of ES alternatives into the overall system investment plan**

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Process (Procedure)

- **Built upon earlier usage of portions of the 11-step CEA procedure promulgated by the CEQ**

- **Identified key Valued Environmental Components based upon historical and current conditions of "traditional agency VECs", the relationship of the conditions to regulatory and other thresholds, public concerns, and the anticipated environmental effects of navigation-related actions (investments) – CEQ Steps 1-2 and 5-7**

SA and Response Process

- **Included five steps**
- **Outgrowth of CEQ's 11-step CEA procedure**
- **SAR Steps 1 and 2 are focused on assessing past, current, and future ES conditions for the key VECs**
- **SAR Steps 3 and 4 relate to the identification of ES alternatives**
- **SAR Step 5 blends the ES alternatives with the economics-driven navigation system alternatives, and an overall plan is identified**

SAR Step 1

- **Identify indicators of ES for each of the six key VECs – water quality, mussels, fish, riparian resources, health and safety, and water-based recreation**

- **Contributors to the identification – the CEA study team, Interagency Working Group, and Expert Elicitation Groups**

- **Develop VEC-specific definitions for three categories of ES**

    -- Not Sustainable

    -- Marginally Sustainable

    -- Sustainable

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SAR Step 2

- **Qualitatively <u>connect </u>the common effects of the RFFAs to the indicators of ES for each key VEC**

- **Key question – will the connected common effect cause the indicator to improve or decline in relation to ES?**

- **Simple matrices used to structure the connections, with the consequences described in the "text"**

- **Analogous to developing more detailed RFFA matrices for the six key VECs; and then "predicting" future ES categories**

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SAR Step 3

- **Identify measures that could be used to improve current and future ES conditions for appropriately grouped VECs**
  - **-- aquatic resources (water quality, mussels, and fish)**
  - **-- riparian resources**
- **Contributors to the identification -- CEA Study team and Expert Elicitation Groups**
- **Groundrules for EE Group meetings**
- **The "resource perspective"**
- **Develop hierchical grouping of methods** 8

Freshwater Mussel Life Cycle

Fish Host
Juvenile
Glochidia
Adult
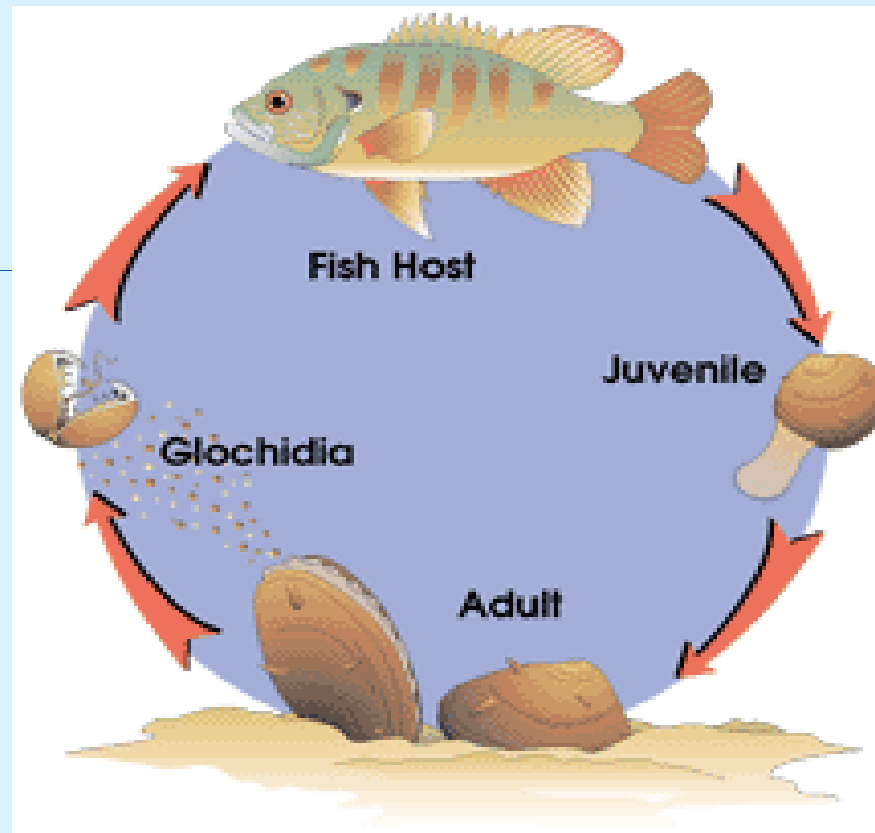
SOURCE : North Carolina Mussel Atlas http://www.ncwildlife.org

RFFA Rankings for Mussels

**70 of 87 actions were ranked high (H) or medium (M) .
What does this reflect??**

- **Current vulnerable condition of mussels**
- **Relatively low level of knowledge**
- **Importance of interactions with other environmental components**
- **Need to implement resource protection measures**

Categories of Effects on Mussels

70 actions ranked H and M were divided into 4 categories based on primary effects:

- Actions directly contributing to habitat degradation and instability
- Actions indirectly contributing to habitat degradation and instability
- Actions affecting reproductive success and community connectivity
- Actions beneficial to mussels

# Examples of Actions Affecting Mussels

Linking Effects and Indicators

Indicators used to assess environmental sustainability (ES) of mussel communities:

- Amount of suitable habitat with connections to other mussel populations
- Important measures of water quality
- Amount of food supplies to ensure good growth
- Availability and mobility of fish hosts
- Amount of disturbance from biotic and abiotic stressors

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ES Categories for Mussels of the Ohio River Mainstem

NS = Not Sustainable
MS = Marginally Sustainable
 S = Sustainable
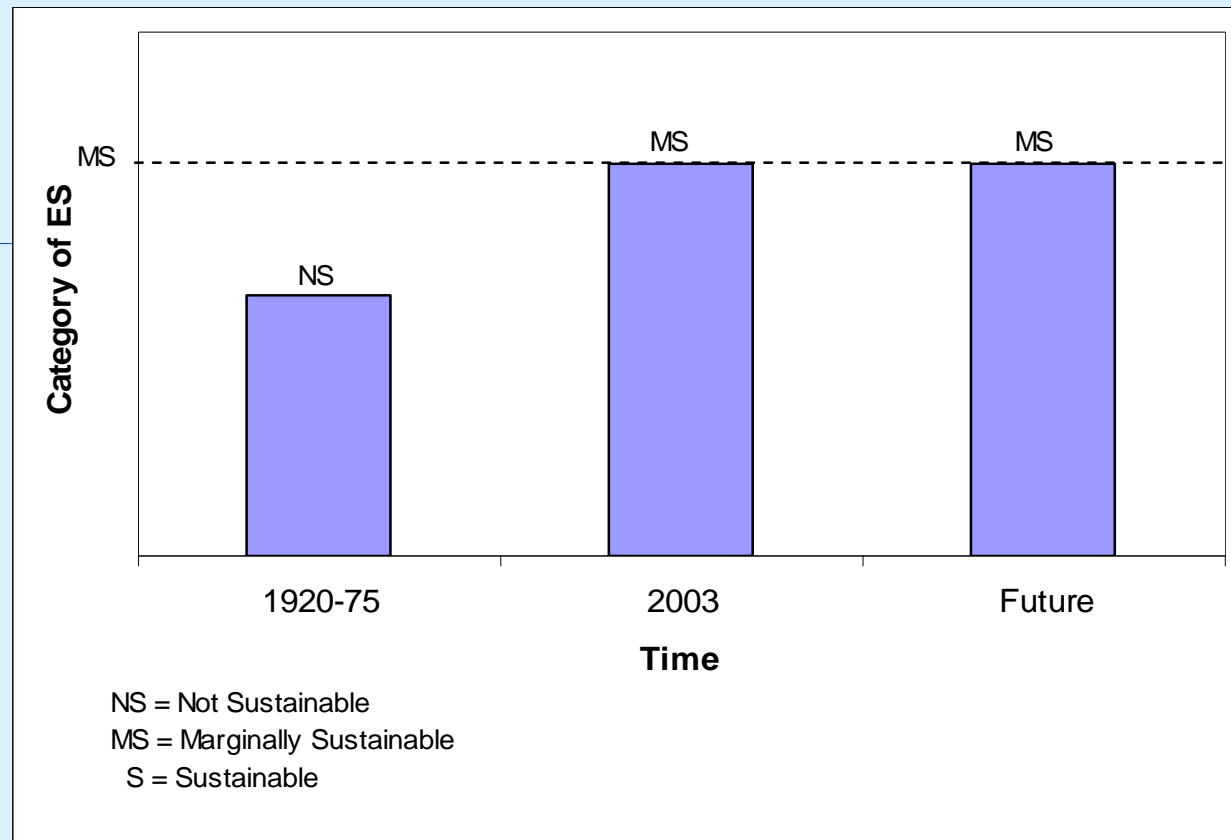
Steps to Facilitate Recovery

Potential ways to facilitate recovery of
Ohio River mussels:

- Enhance knowledge of species of concern and their fish hosts.
- Restore habitats and reintroduce mussels to suitable areas.
- Identify effects and responses to zebra mussel and Asian carp invasions.
- Enforce all laws and regulations pertaining to mussel collection and habitat protection.
- Restore movement of fish hosts through dams at important times of year for reproductive success.
- Increase public and agency awareness of mussels.

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SAR Step 4

- **Categorize the aquatic and riparian measures based on a qualitative analysis of their relative costs, potential effectiveness in improving ES, implementing authority, and other factors**

- **Delineate ES alternatives consisting of "packages" of measures**

- **Range of ES alternatives was developed**

SAR Step 5

- **Applied Corps' existing policy and procedure for systematically comparing alternatives and identifying key "plans" – in Planning Guidance Notebook (2000)**

- **Requirements – identify NED plan, NER (NES) plan, and best combined NED-NES plan**

- **NED plan identification was based on economic indicators**

- **NES plan identification was based on relative comparisons of features**

- **NED-NES plan was recommended as proposed strategy**

Lessons Learned

- With careful planning regarding SA, one can move from concept to process to implementation

- The "process" could be a work-in-progress until study completion

- Use simple and understandable definitions for the categories of ES

- Do not identify a large number of indicators of ES for a VEC; are really developing "an up-down conceptual" model for each VEC

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- The IWG and EE Groups provided both validation of the SAR process and critical input on certain steps
- Evaluation and integration of navigation-related and ES plans was strengthened via the use of agency policy
- The SAR process encourages the user to think about connections and the synthesis of information

- **Quantitative information would strengthen the SAR process**
- **The SAR process could be used to identify monitoring needs and plan an adaptive management program for key ES indicators and VECs**