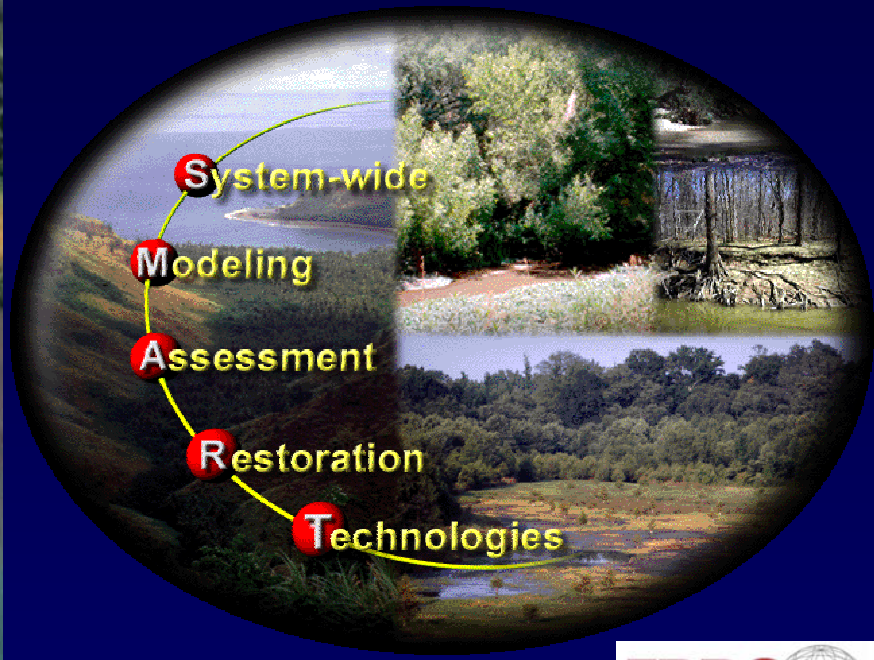
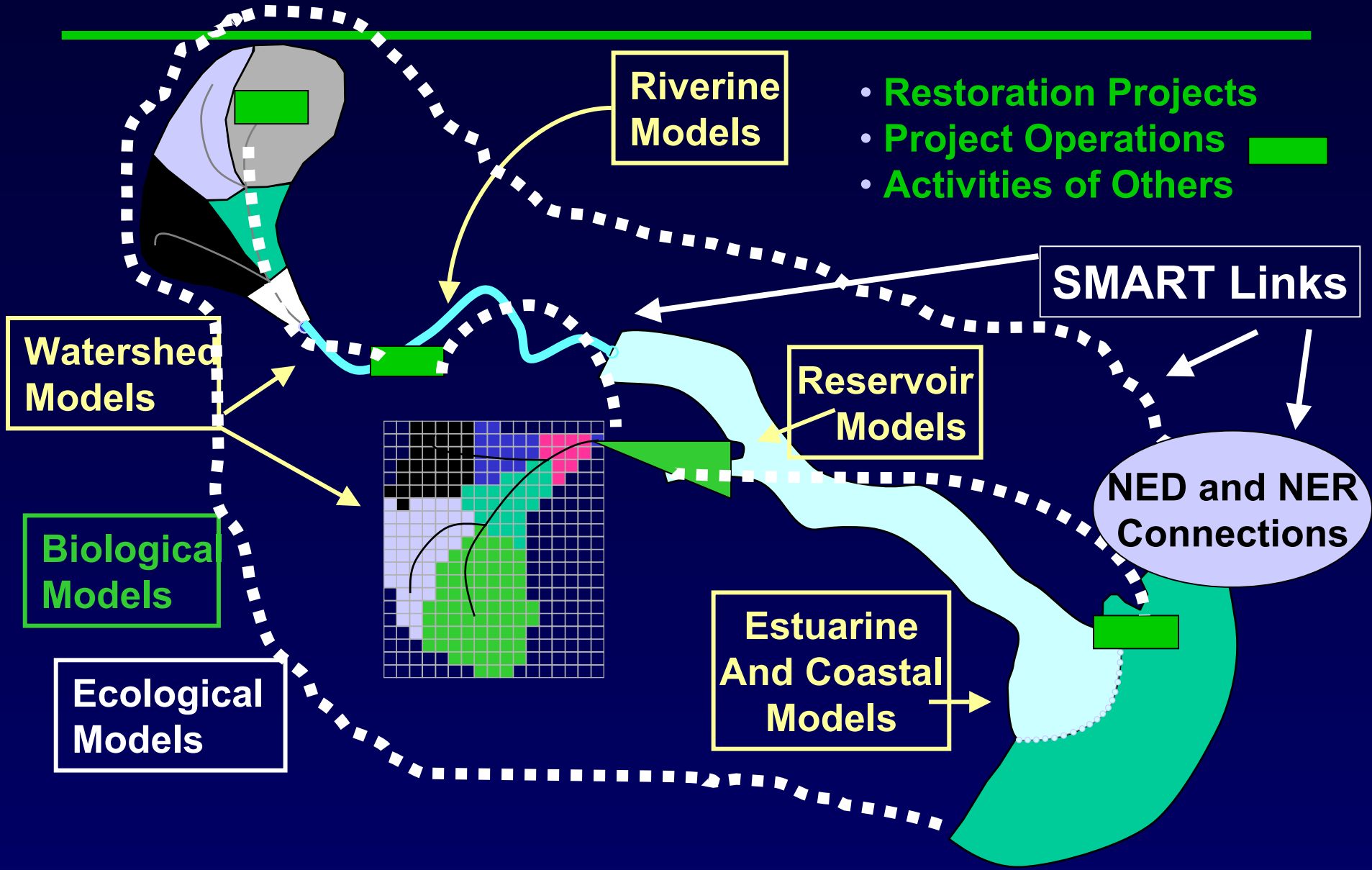
System-wide considerations for selecting restoration opportunities



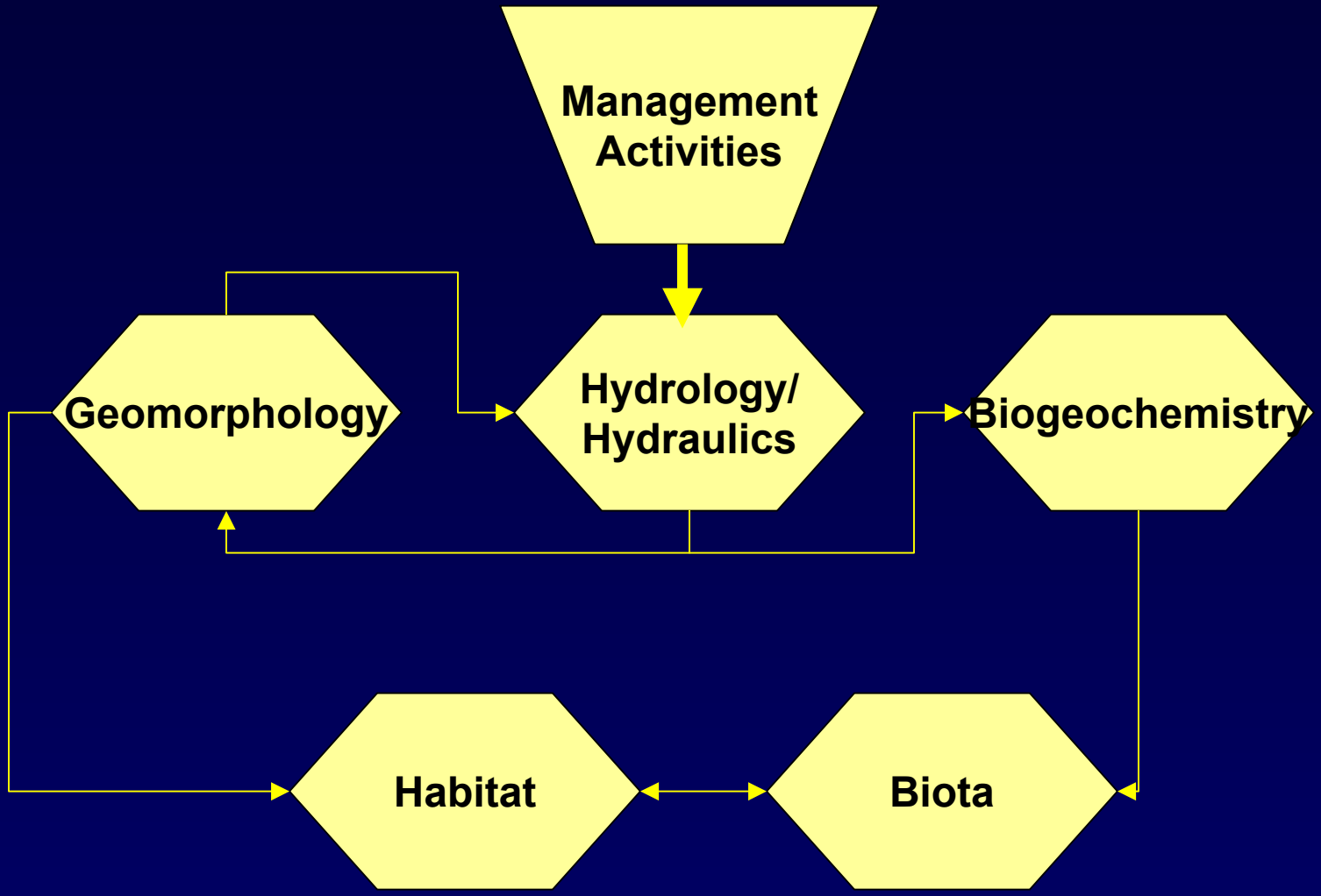
ERDC
Engineer Research and Development Center

Example of a SMART Application

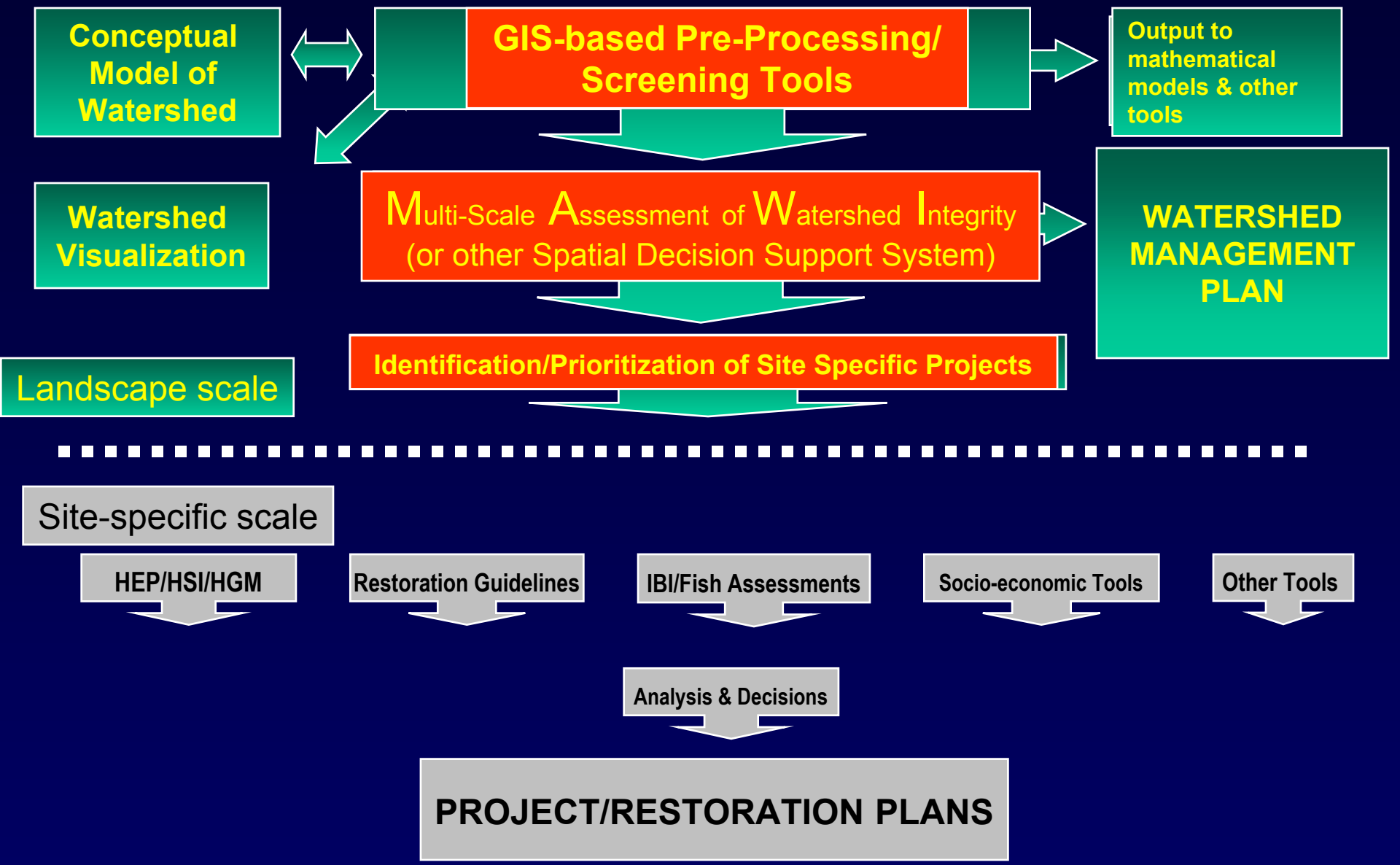


Conceptual Modeling


Conceptual model for assessing system-wide response to management activities

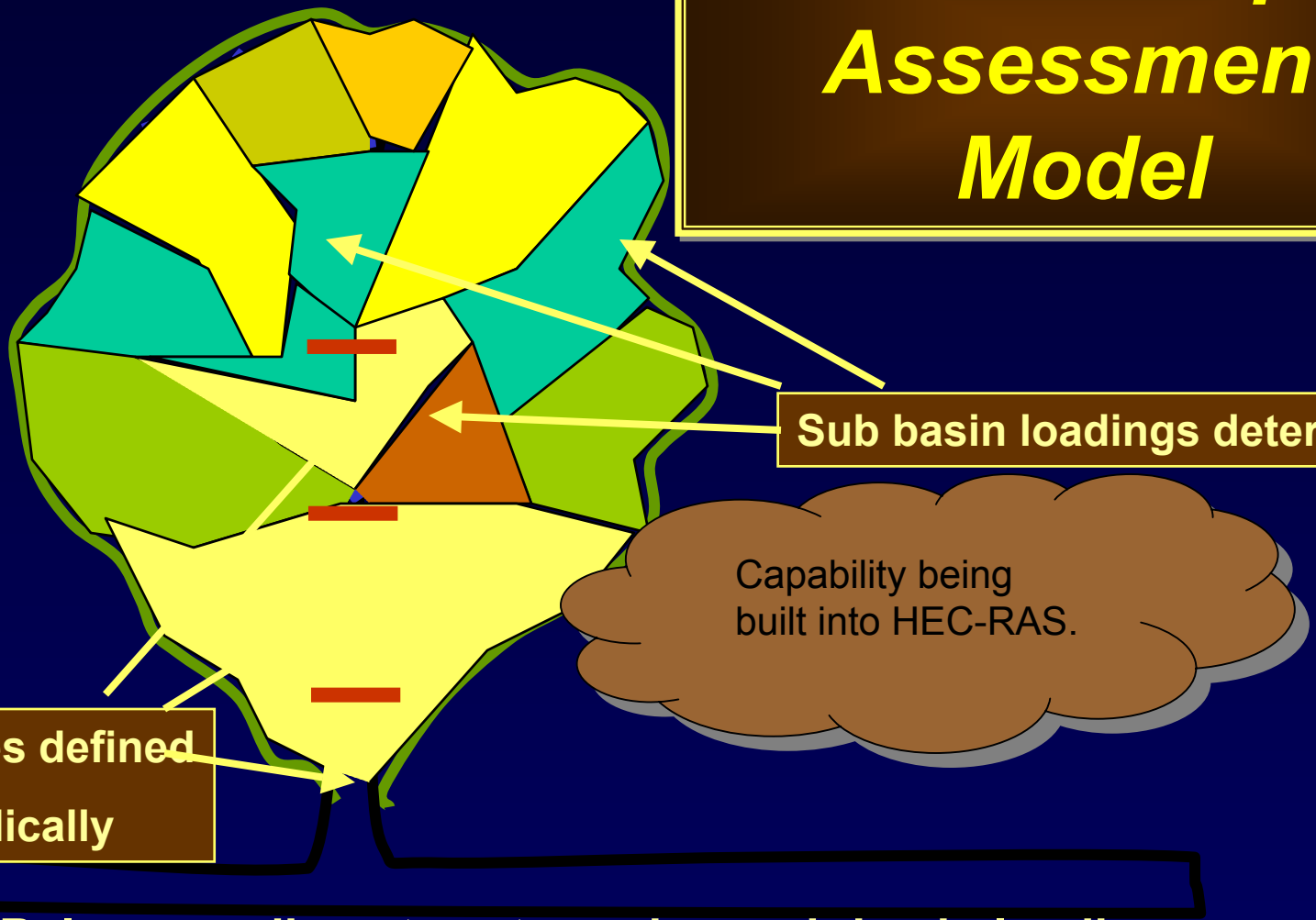


Watershed Assessment Framework



Dan Smith and Barb Kleiss - EL

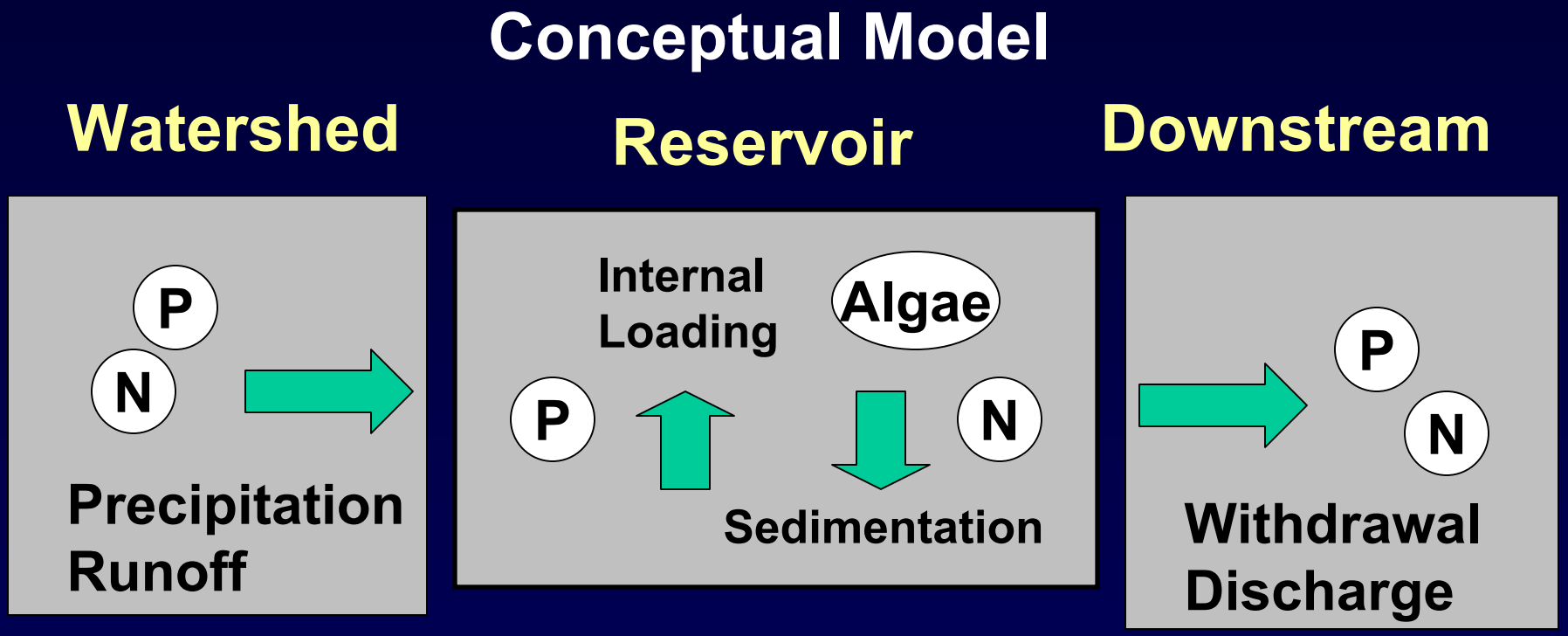
Sediment Impact Assessment Model



Goal: Balance sediment system when sub-basin loadings change (e.g. due to grade control, bank stabilization) & predict resulting instabilities/stability in downstream channel reaches.

POC David Biedenharn ERDC CHL

Loading and Response Evaluations



Tools

Runoff	Loading	Reservoir Response	Tailwater
HSPF	FLUX	BATHTUB	TWQM
GSSHA	HEC-RAS	CEQUALW2	HEC-RAS

Criteria and Constraints

- Proximity to other high quality areas
- Geographic spacing to maximize benefits to river system to support fish populations
- Anticipated sedimentation rates
- Availability of placement areas (dredging)
- Willing landowners
- Site will maintain desirable water quality
- Provisions for habitat diversity

Illinois River Basin Restoration
(draft feasibility plan)

Criteria for Prioritization

Combining habitat restoration and/or protection projects closely coordinated with projects developed under other goals to maximize systemic ecological integrity and effectiveness of restoration efforts and dollars.

Focus on quality of habitat and the presence of threats to the integrity of the quality of the area under consideration. Areas threatened most immediately should be targeted for protection.

Illinois River Basin Restoration
(draft feasibility plan)

Criteria for Prioritization

Connectivity to the Illinois River and major tributaries and between protected areas

Improve and protect existing moderately degraded habitats near rare and unique communities

Altered hydrologic regime in the most relevant disturbance regime

Rare area

Illinois River Basin Restoration
(draft feasibility plan)

Criteria for Prioritization

Terrestrial Patch Size Recommendations

- **Bottomland hardwood forests – 500-1000 acres**
  3000 acres for some interior avian species
- **Grasslands – 100-500 acres**
- **Nonforested wetlands – 100 acres**
  spaced 30-40 miles apart
- **Riparian zone – 100 feet each side**
  200-300 feet wide total

Illinois River Basin Restoration
(draft feasibility plan)

Criteria for Prioritization

Aquatic Habitat Recommendations

- **Main stem backwaters/side channels**
  > 6 feet deep, spaced 3-5 miles apart
- **In-stream riffles – Depending on stream size number of structures range from 4 per mile (large tributaries) to 22 per mile (minor tributaries)**

Illinois River Basin Restoration
(draft feasibility plan)

Physical Quality Index (PQI)

- Index values determined by expert opinion
- Assessed only the physical configuration of the backwater habitat in terms of depth to maximize value and use by a broad range of plant, fish, and wildlife species
- Applied to without-project and all levels of restoration being considered

Illinois River Basin Restoration
(draft feasibility plan)

Tiered Approach

- General criteria for the ecosystem
- Connectivity and patches
- Detailed assessments for individual projects

Measures of Success

- Measured in time scales related to species and system
- Consider periodicity of extreme environmental events
- Measured in spatial scales that relate to a whole ecosystem with long-term evaluation (Zedler 1988).
- Ecological meaningful indicators that mark progress toward ecosystem management and restoration goals (Richter et al. 1996)

Illinois River Basin Restoration
(draft feasibility plan)

Measures of Success

- Illinois River Monitoring Program
  - Fish IBI
  - Macroinvertebrate IBI
  - Acres of quality habitat (backwater, bottomland forest, grassland, nonforested wetland, riparian corridor)
  - Increase in number/range of terrestrial area-sensitive species
  - Connectivity to other habitats (lateral and longitudinal)
  - Waterfowl use days, connected and isolated areas
  - Presence of natural disturbance regimes (hydrology, fire)
  - Range expansion of indicator species

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(draft feasibility plan)

Measures of Success

- System Ecological Integrity Metric
  Develop a systemic evaluation, from a series of Indicators, based on process developed for others

  Chesapeake Bay Foundation

  Upper Mississippi River – Illinois Waterway System Navigation Study

Illinois River Basin Restoration
(draft feasibility plan)

Measures of Success

- Focused Studies
  - Identify data gaps
  - Establishment of reference conditions
  - Effects of agricultural chemicals on ecosystems
  - Role of groundwater, degree of impairment

  - Risk and uncertainty analyses
  - Adaptive management

Illinois River Basin Restoration
(draft feasibility plan)

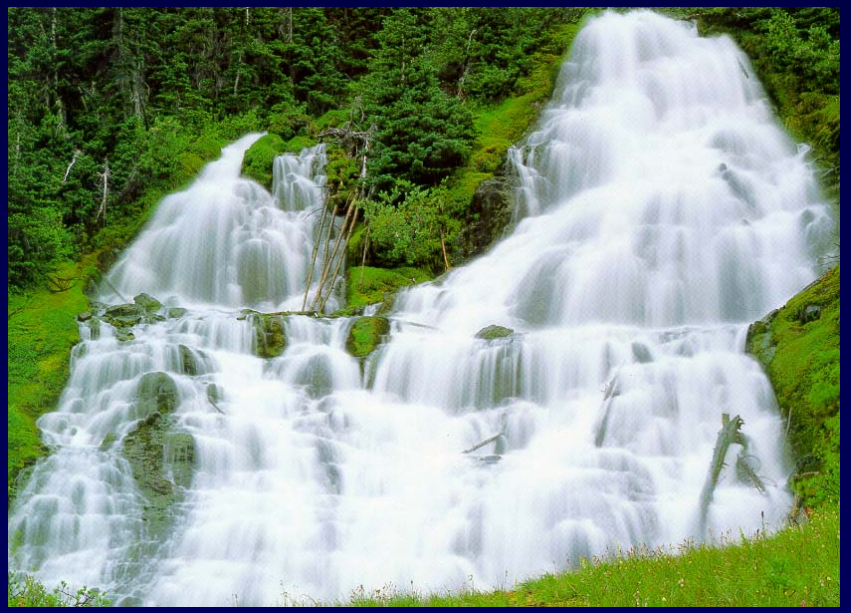
Summary

SMART is building tools for system-wide assessments

Conceptual modeling can assist in criteria development

Tiered approach is useful (System, Connectivity, Site)

We need temporal and spatial metrics



Risk and uncertainty – we need adaptive management