

A Decision Support System Framework for Sustainable Fisheries in Mobile Bay Watershed and Nearshore Waters of the Gulf Coast: Phase 1 Results and Recommendations

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Initial Project Objectives

- **Provide** a decision support tool for the responsible stewardship of Alabama's coastal and marine resources
- **Evaluate and Model** the social, economic, constructed, and natural factors that impact management of sustainable fisheries
- **Provide** a common language for disparate constituents to express their goals, concerns, constraints, and processes
- **Support** policy decisions such as: constructed infrastructure investment decisions, geospatial use decisions, balancing trade-offs among capitals

Phased Project Approach

Integrated Environmental, Economic, and Social Resource Management Framework

- Structural Adjustment
- Communication/Education
- Policy and Regulatory Adjustment
- Institutional Strengthening
- Resourcing/Finance
- Monitoring and Evaluation

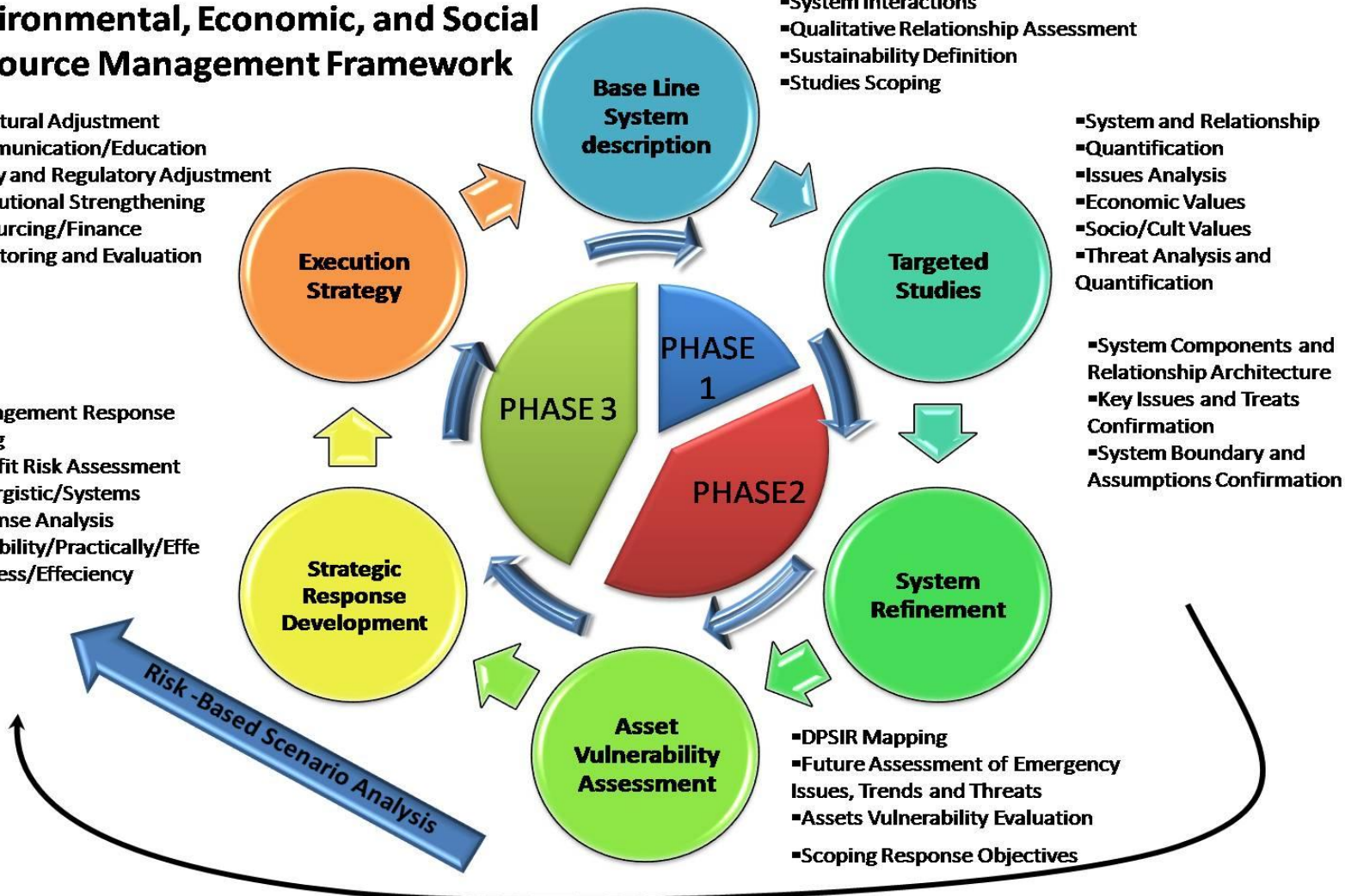
- Management Response Coping
- Benefit Risk Assessment
- Synergistic/Systems Response Analysis
- Feasibility/Practicality/Effectiveness/Efficiency

- System Components
- System Interactions
- Qualitative Relationship Assessment
- Sustainability Definition
- Studies Scoping

- System and Relationship
- Quantification
- Issues Analysis
- Economic Values
- Socio/Cult Values
- Threat Analysis and Quantification

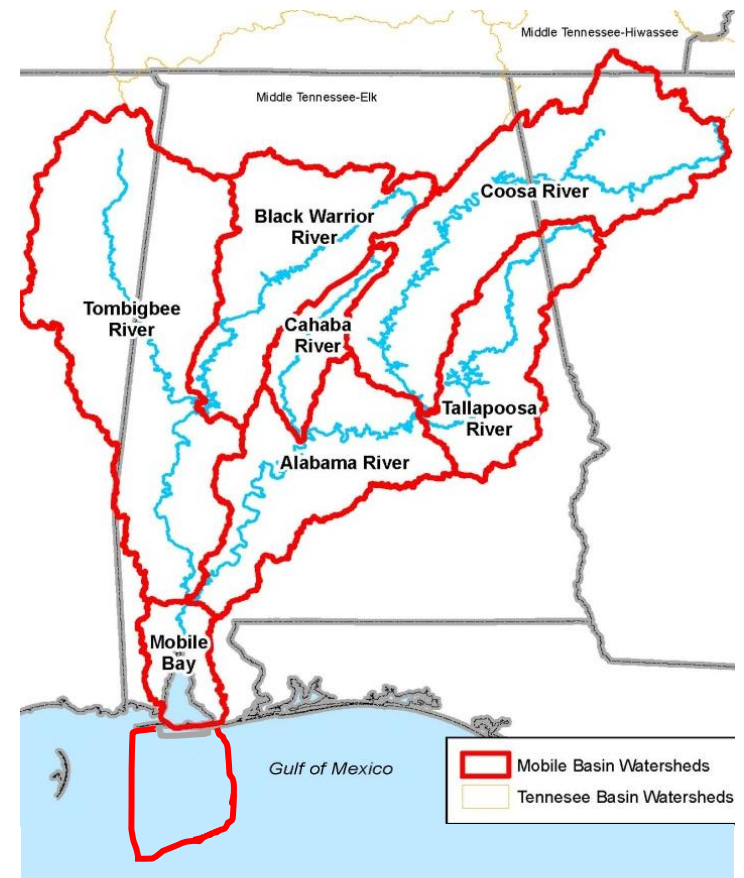
- System Components and Relationship Architecture
- Key Issues and Treats Confirmation
- System Boundary and Assumptions Confirmation

- DPSIR Mapping
- Future Assessment of Emergency Issues, Trends and Threats
- Assets Vulnerability Evaluation
- Scoping Response Objectives



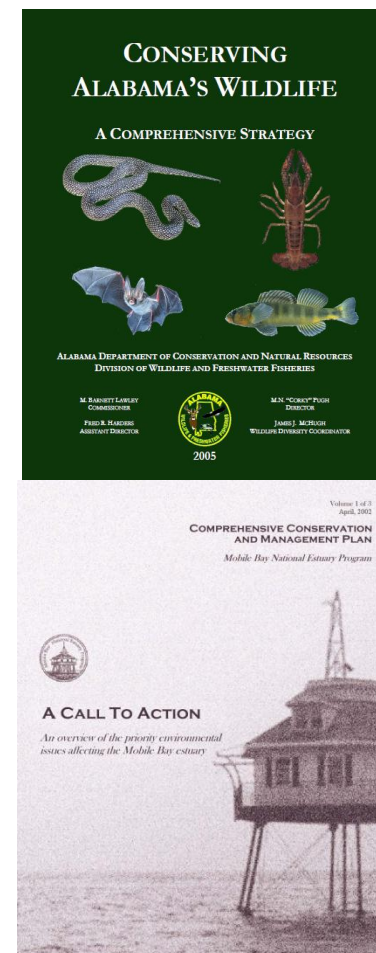
Project Background: Initial System Boundaries

- Mobile Bay Watershed
- Mobile Bay
- Nearshore Gulf of Mexico
 - To 100 fathoms (about 25 miles)



Unique Biodiversity with Significant Challenges

- Unique biodiversity
 - 1st nationally in freshwater diversity
 - 2nd nationally in extinct species
 - Invasive species
- Habitat losses
 - >50% loss of wetlands
 - >50% loss of SAVs in estuarine and nearshore waters
 - Impoundments responsible for lost riverine habitat, system fragmentation, and altered flow
 - Navigation dredging & dredge spoils
- Water Quality
 - Non-point source agriculture, forestry, mining, and urbanization impacts to water quality



Stakeholder Workshops

- Held in Mobile and Montgomery (spring and summer 2009)
- Issues identified and discussed
 - Major uses of watershed/bay and needs to meet those uses
 - System health and attributes
 - System limitations and threats
 - Management needs
- Stakeholders asked to prioritize issues based on their perspective
- Identify other stakeholders not represented at workshop
- How might missing stakeholders prioritize issues?

2009 Stakeholder Workshops: Diverse Representation of Participants & Stakeholders



2010 Identified More Stakeholders and “Leaky Boundaries”



Stakeholder Workshops: Threats to Sustainable System

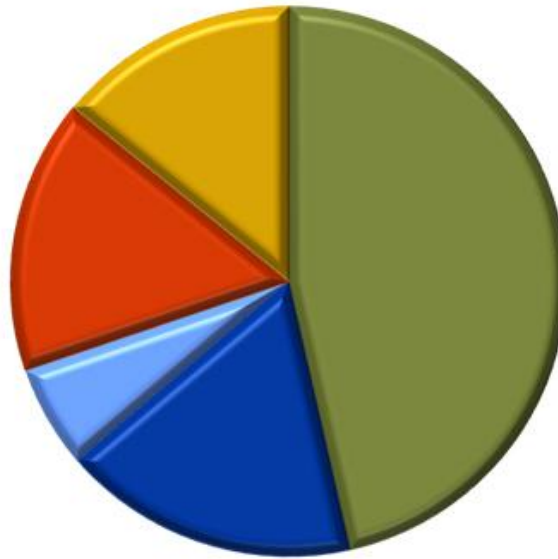
- Economic
 - Unfettered development and population growth
- Environmental
 - Non-point source water quality and sediment issues
- Infrastructure
 - Aging infrastructure, climate resiliency, and displacement
- Social
 - Lack of understanding or apathy
- Governance
 - Stove-piped agencies, regulations and programs
 - Understanding and balance of trade-offs in environmental, economic, and social goals

Stakeholder Workshops: Priority Threats to Mobile Bay System by Capital Classification

Mobile Workshop



Montgomery Workshop



- At the capital level, similar outcomes from both workshops
- Governance system is a key threat to a sustainable system
 - Stove-piped
 - Inability to address multiple perspectives and trade-offs

■ Governance ■ Economic ■ Environmental ■ Social ■ Infrastructure

Qualitative System Interactions

Constraints

	Environment (ENV)	Economic (ECON)	Infrastructure (INFRA)	Social (SOCIAL)
System Integration Framework				
Environment (ENV)		Will ECON growth degrade ENV?	Will aging INFRA degrade ENV?	Do we understand and value ENV issues?
Economic (ECON)	Will ENV restrictions limit ECON growth?		Have INFRA to support ECON growth?	Are ECON benefits and impacts shared?
Infrastructure (INFRA)	Will ENV impacts prevent new INFRA?	Can ECON afford desired INFRA?		No INFRA in my backyard!
Social (SOCIAL)	Is there ENV justice?	Who should pay for your SOC benefits?	Is needed INFRA appropriately distributed?	

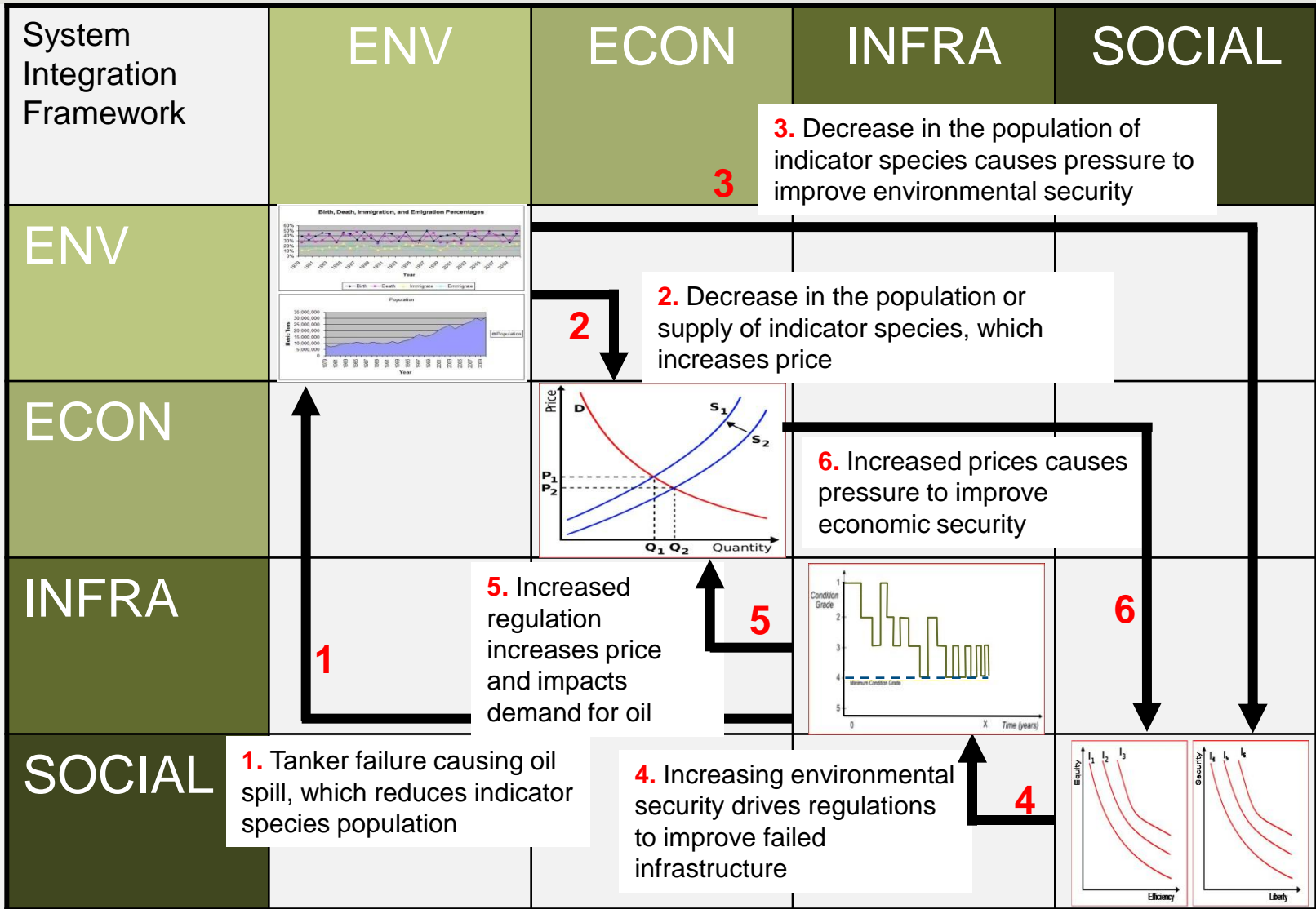
Goals

Governance and tools stove-piped

ECON vs. ENV is classic paradigm

Information is needed to address cross-capital perspectives

Qualitative System Interactions (Example)



Qualitative System Interaction: Tools and Approaches New to Progress

Current tools: allow cross-capital inputs and constraints

Next generation: need to also address trade-offs across capitals

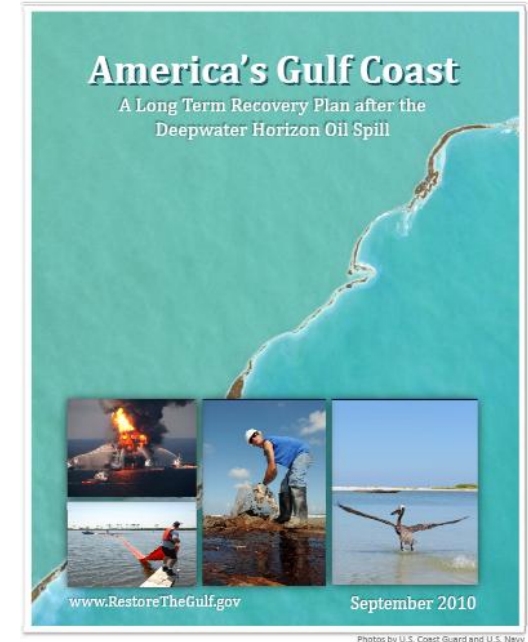
System Integration Framework	ENV	ECON	INFRA	SOCIAL
ENV				
ECON				
INFRA				
SOCIAL				

System Integration Framework	ENV	ECON	INFRA	SOCIAL
ENV				
ECON				
INFRA				
SOCIAL				

Overview: Alabama Sustainable Fisheries Approach

- Develop robust strategies for sustaining Alabama Gulf fisheries
 - Restore environmental health
 - Assure that relationships between human and environmental systems are recognized and respected
 - Minimize negative effects of one system over another through informed decision support system
- Address sustainability through outcome-oriented systems approach
 - Provide analytical construct to support communications and decisions
 - Science-based, integration of existing tools and their principal components where possible
- Collaborative demonstration project
 - Regional expertise and participation, programmatic approach

Deepwater Horizon Incident (April 2010) and Response



1. Secretary Mabus – Long-term Recovery Plan

May 24, 2010 NASA Terra satellite photo from Wikipedia

Principles for Long-Term Ecosystem Restoration

Source: Mabus Report Sept. 2010

1. Coastal Wetland and Barrier Shoreline Habitats are Healthy and Resilient
2. Fisheries are Healthy, Diverse and Sustainable
3. Coastal Communities are Adaptive and Resilient
4. A More Sustainable Storm Buffer Exists
5. Inland Habitats, Watersheds and Off-Shore Waters are Healthy and Well-Managed

"Recovery and sustainability for the Gulf depends on three critical resources: our people; our environment; and our commerce. We need a recovery plan that brings these aspects back into balance." (Town Hall Participant Ocean Springs, Mississippi)

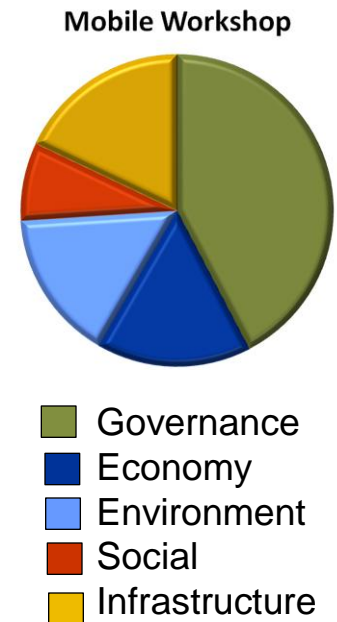
Gulf Coast Ecosystem Restoration Task Force: Proposed Goals

(Task Force Press Release May 6, 2011)

1. Enhance Community Resilience
2. Restore and Conserve Habitat
3. Restore Water Quality
4. Replenish and Protect Living Coastal and Marine Resources

Preliminary Priority Decision Support System Relationships

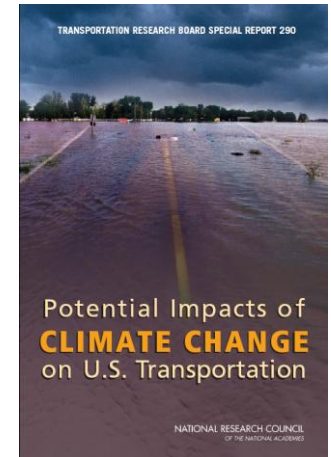
1. Enhance Community Resilience
 - a) Infrastructure Vulnerability Assessment and Strategies
2. Restore and Conserve Habitat
 - a) Habitat Restoration and Preservation Prioritization
 - b) Improve Sediment Delivery - Location and Quality
3. Restore Water Quality
 - a) Providing a Framework for Valuing BMPs
4. Replenish and Protect Living Coastal and Marine Resources
 - a) Identifying Critical Connectivity and Function Linkages
 - b) Supporting Ecosystem-based Fisheries Management
5. Clearing the Path for Restoration and Commerce
 - a) Using technology to improve collaboration and efficiency



Enhance Community Resilience:

1(a) - Infrastructure Vulnerability Assessment/Strategies

- US DOT Gulf Coast Study
 - Phase 1 – overview of CC impacts on Gulf Coast transportation systems with general options for addressing challenges
 - Phase 2 – more detailed study in identifying priority transportation assets in Mobile, assessing vulnerability, and developing strategies
- EPA Climate Ready Estuaries Programs
- Build on DOT and EPA efforts to identify and assess vulnerability of other built and natural infrastructure assets, to SLR, tropical storms, and high and low precipitation events
- Assess vulnerability and risks to environment from aging infrastructure
- Evaluate sustainability of restoration efforts within context of living coastal and riverine systems



Restore and Improve Habitat:

2(b) - Habitat Restoration Prioritization Framework

- **The Problem:** Habitat restoration and preservation key for sustainable system
 - Multiple stresses & sources across numerous species, services and systems
 - Changes due to natural processes and climate
 - Restoration associated with Deepwater Horizon oil spill
- **Many possible actions**
 - Expected to start with “low-hanging fruit,” but where do you go next?
 - How to prioritize investments, track progress, and learn from experience?
- **The Need:** An analytical ecosystem recovery framework to
 - View the problem from both the species and human perspectives
 - Organize information, establish priorities and schedules
 - Evaluate actions and adjust based on adaptive management
- **Benefit:** Collaboration across states and federal agencies; accountability; link to ecosystem-based fisheries management; and increased likelihood of success

Restore and Improve Habitat:

2(b) - Habitat Restoration Prioritization Framework

- Based on integration of best concepts of existing tools
 - Ecosystem Diagnosis and Treatment Model (EDT)
 - Louisiana Integrated Ecosystem Restoration and Hurricane Protection Prioritization Tool

EDT Applications

- Aquatic and avian species in 6 states and 1 CN province
- Most widely used, scientifically reviewed, and generally understood analytical tool used in West Coast salmon management
- >250 watersheds, thousands of stream & coastal shoreline miles
- >500 user community
- thousands of management scenarios
- Federal, state, interstate, tribal, and regional collaborators

Elements of Ecosystem Diagnosis and Treatment

Examination

Knowledge of Condition
Assessment (No-Action Prognosis)

Diagnosis

Limiting Factors
Limiting Life Stages
Limiting Geographies

Treatment

Management Hypotheses
Action Plan
Expected Outcome (Alternative Prognosis)

Diagnostics

Problems

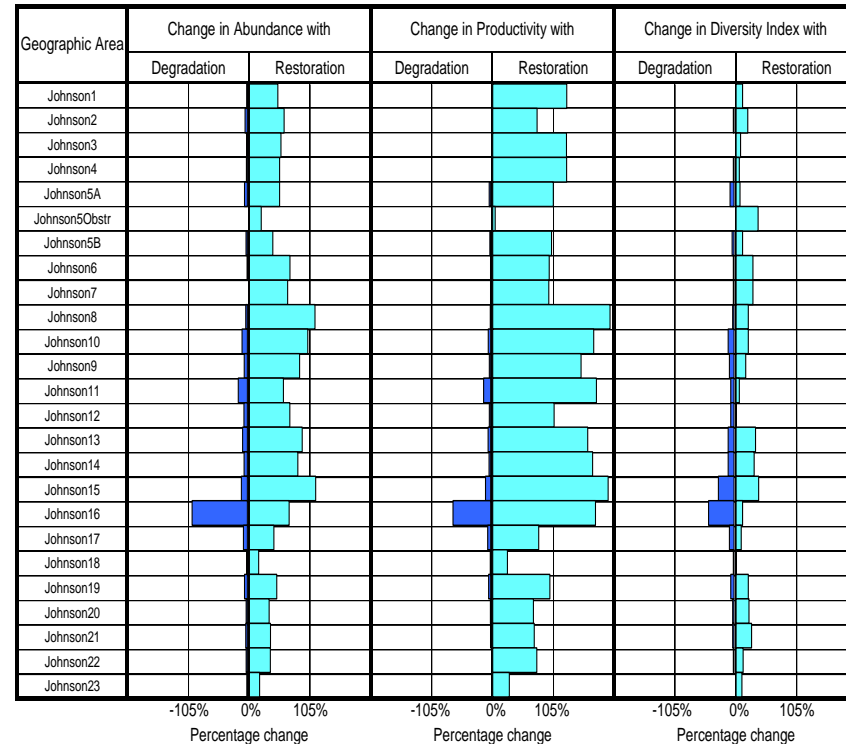
Stream Reach	Habitat Attribute														
	Channel Form	Chemicals	Competition (w/hatch)	Competition (other sp)	Flow	Food	Habitat diversity	Harassment	Obstructions	Oxygen	Pathogens	Predation	Sediment load	Temperature	Key habitat quantity
Johnson1	●		●		●	●	●					●	●	●	●
Johnson2	●		●		●	●	●					●	●	●	●
Johnson3	●		●		●	●	●					●	●	●	●
Johnson4	●				●	●	●					●	●	●	●
Johnson5A	●				●	●	●					●	●	●	●
Johnson5B	●				●	●	●					●	●	●	●
Johnson6	●				●	●	●					●	●	●	●
Johnson7	●				●	●	●					●	●	●	●
Johnson8	●				●	●	●					●	●	●	●
Johnson10	●				●	●	●					●	●	●	●
Johnson9	●				●	●	●					●	●	●	●
Johnson11	●				●	●	●					●	●	●	●
Johnson12	●				●	●	●					●	●	●	●
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Johnson21	●				●	●	●					●	●	●	●
Johnson22	●				●	●	●					●	●	●	●
Johnson23	●				●	●	●					●	●	●	●

Change in coho performance with restoration
 ○ High ○ Medium ○ Low □ Indirect or General
 ● ● ● □

Possibilities

Johnson Creek Coho
 Relative Importance Of Geographic Areas For Protection and Restoration Measures

Places



Restore Water Quality:

3(a) - Framework for Valuing Land Use and BMPs

- Agricultural and urban non-point nutrients TMDLs and 303d listings
- Water quality models one dimension vector driven, not truly geospatial
 - Identify & manage sub-basin loadings; don't relate to land owners
 - What's missing in current approach ... the benefits to farmers Lisa Jackson, May 6, 2011
- WQ trading models for point source to non-point source trades require benefits clarification but imbalance between supply & demand
- Farm conservation programs not allocated on outcomes
- Linking land-use and water quality models would provide information to both land owners, local economies, and environmental community
 - Geospatially-based loadings for environmental management
 - NPV of land costs and benefits for land operations
 - Basis for valuing BMPs from multiple perspectives

Replenish and Protect Living Resources:

4(a) Connectivity, Functional, & Geospatial Linkages

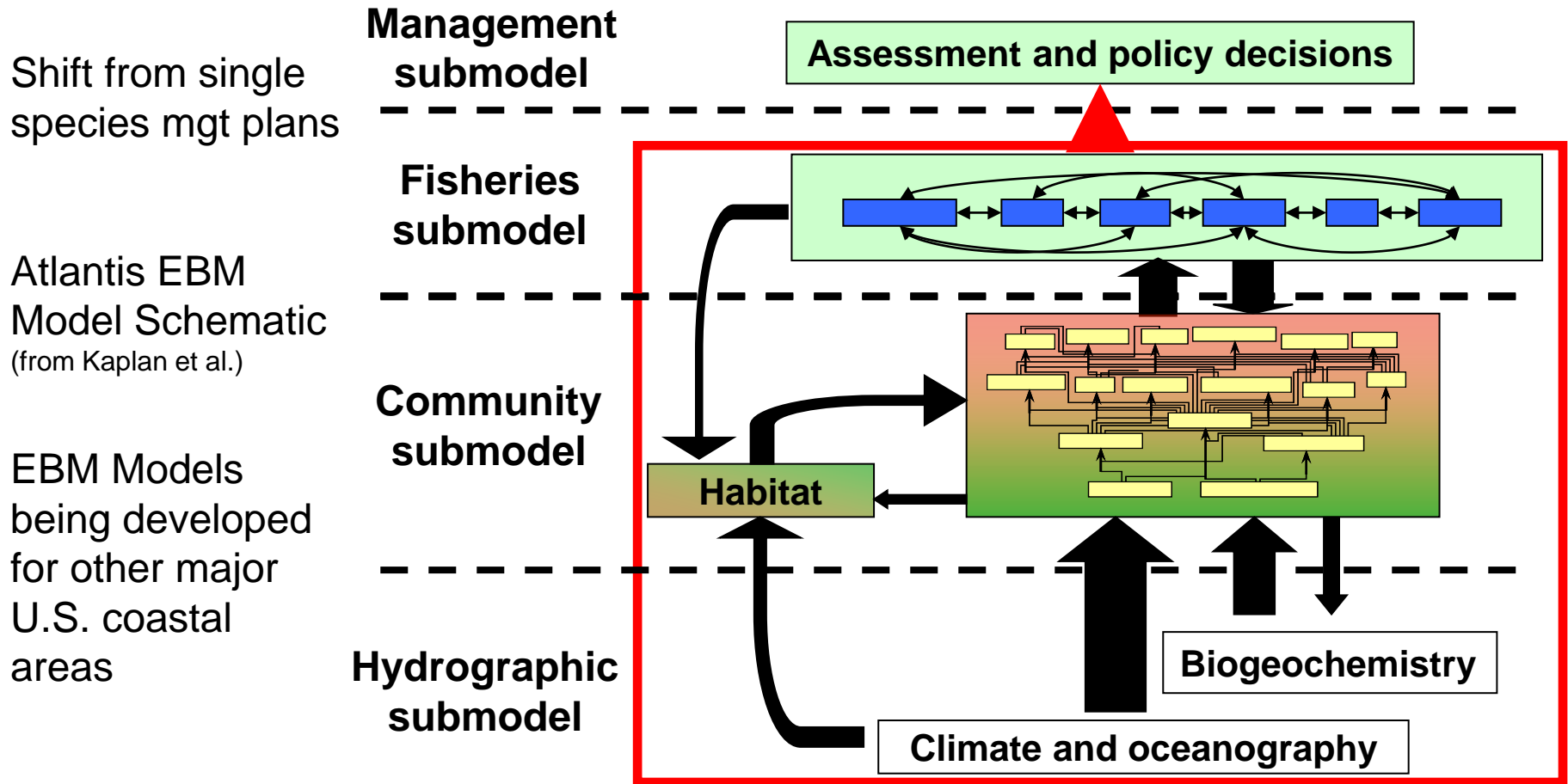
Example 1: Plum Creek Timber Cascades HCP

- Modeled 650k acres of highly diverse mountainous land under checkerboard ownership
- 316 vertebrate species included
- Received Presidential Award; habitat verification program on track

Example 2: WA DNR Sustainable Harvest Levels

- 1.6M acres scattered over Cascade and Olympic Mountains
- Resulted in \$80M increase in sustainable annual revenue for State Trust Fund and verifiable increases in critical habitat

Replenish and Protect Living Resources: 4(b) – Implement Ecosystem-based Management



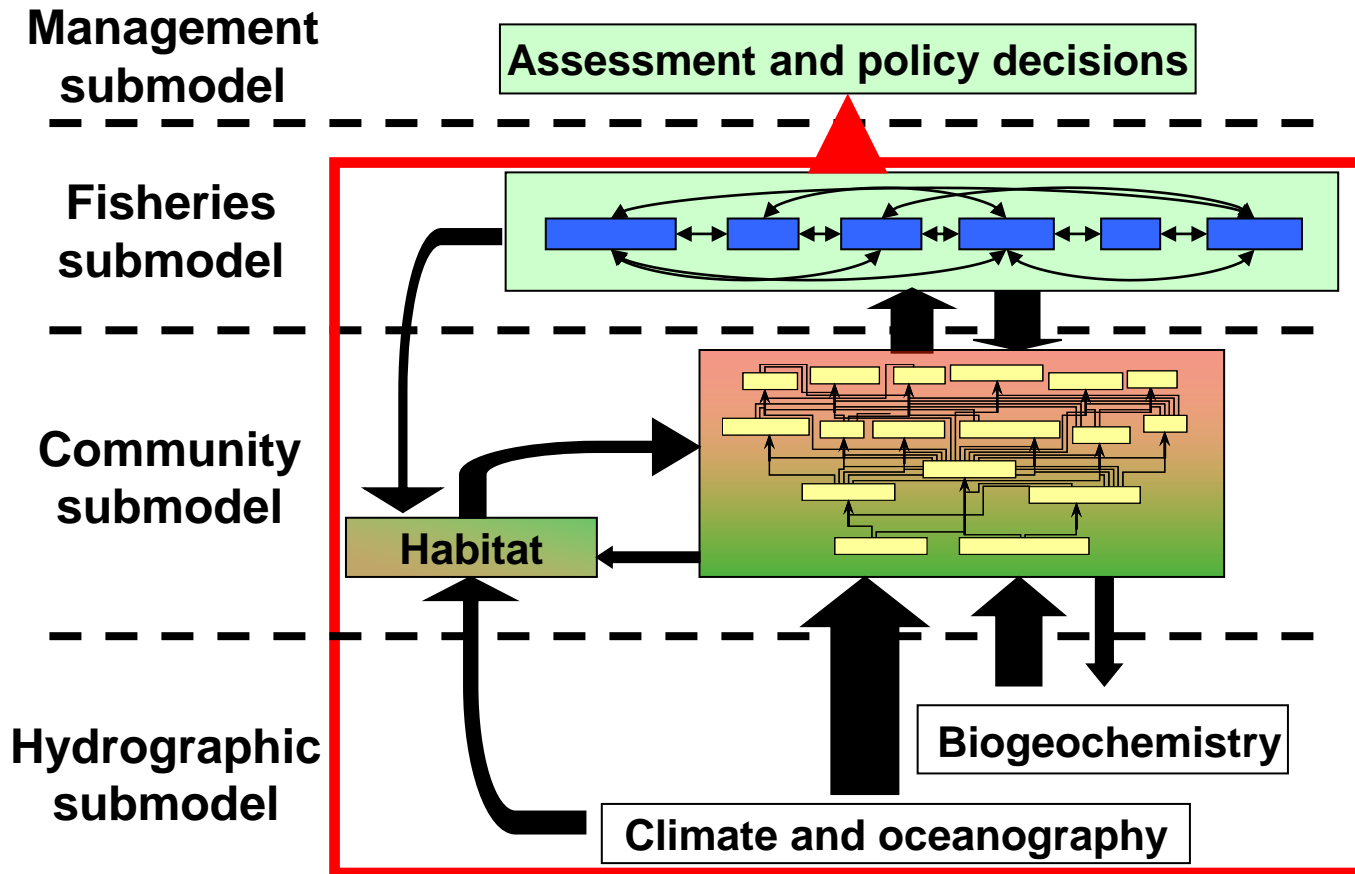
Shift from single species mgt plans

Atlantis EBM Model Schematic (from Kaplan et al.)

EBM Models being developed for other major U.S. coastal areas

Replenish and Protect Living Resources: 4(b) – Implement Ecosystem-based Management

1. Community Resilience
 - 1(a) Infrastructure Vulnerability/Strategies
2. Restore and Conserve Habitat
 - 2(a) Habitat Prioritization
 - 2(b) Sediment Delivery
3. Restore Water Quality
 - 3(a) Valuing BMPs & Land Use
4. Restore Living Resources
 - (4) Critical Linkages
 - (4b) Support EBM
5. Clearing the Path
 - 5(a) Improve Collaboration



Philosophy and Approach for Next Steps

- Demonstration project for Mobile Bay watershed and adjacent nearshore waters of Gulf
 - Refine priority relationships, decision requirements, and appropriate level of simplicity/complexity
 - Collaborative partnerships and programmatic implementation to leverage knowledge and acceptance
- Expand successful demonstration project to entire Gulf Coast using integrated programmatic approach

Discussion and Feedback

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