DECISION SUPPORT FRAMEWORK (DSF) FOR PLANNING LAND AND RESOURCE USE TO SUSTAINABLY MAINTAIN HEALTHY ECOSYSTEM SERVICES AND COMMUNITIES

DECISION SUPPORT FRAMEWORK TEAM

Ecosystem Services Research Program (ESRP)

Presented by Ann Vega (EPA)

Decision Analysis Workshop
March 31, 2009 – Cincinnati, OH

ESRP – Mission & Goal

- **Mission: Provide the information and methods needed by decision makers to assess the benefits of ecosystem goods and services to human well-being for inclusion in management alternatives.**

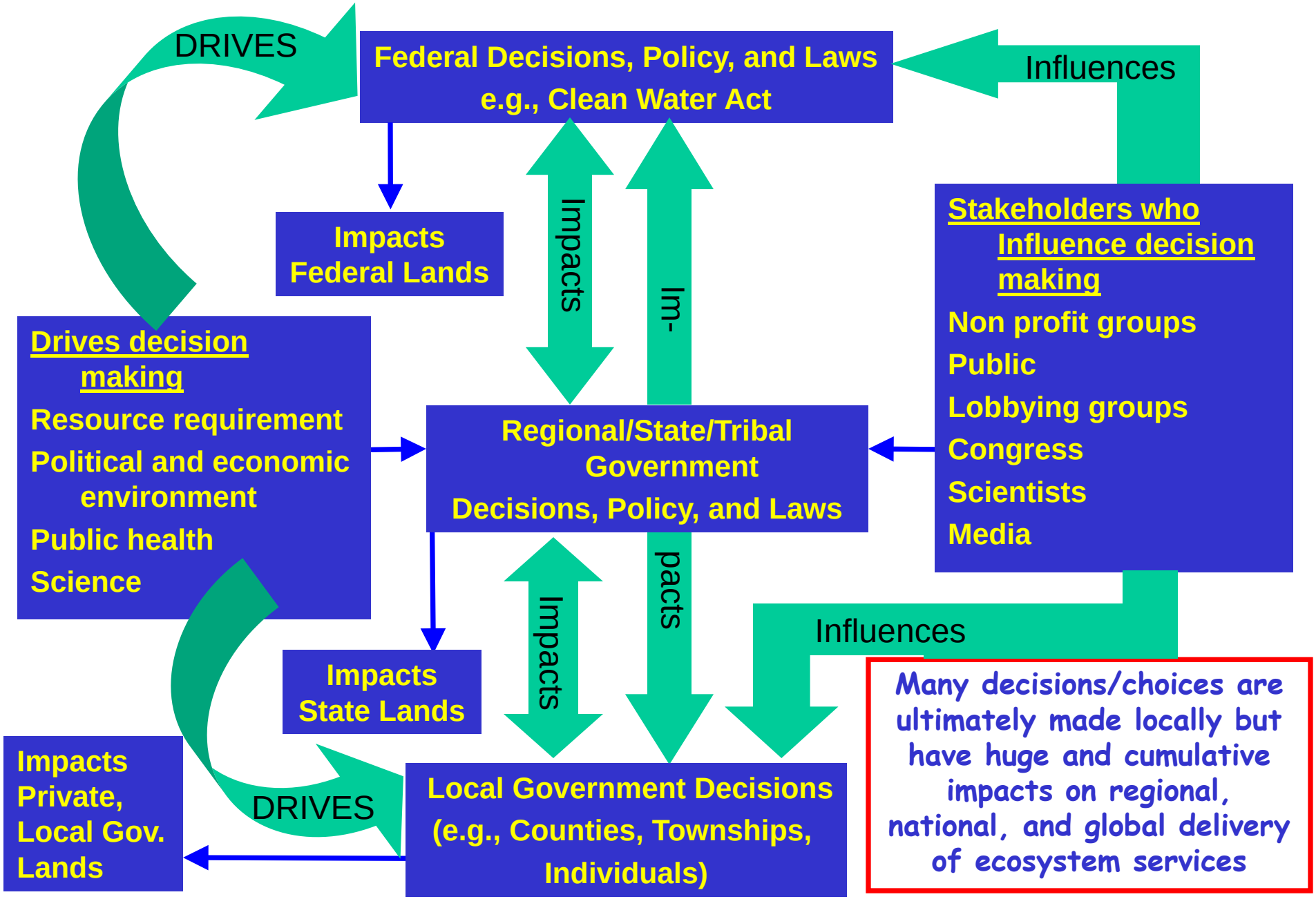
- **Goal: To transform the way decision makers understand and respond to environmental issues by making clear the ways in which our policy and management choices affect the type, quality and magnitude of the goods and services we receive from ecosystems.**

http://www.epa.gov/ecology/

ESRP – Overview

- **5 Place-Based Projects:**
  - **Willamette – mixed ag/forest NW watershed**
  - **Tampa Bay – rapid urbanization (sprawl)**
  - **Future Midwestern Landscapes (FML) – corn ethanol biofuel**
  - **Coastal Carolinas – coastal floodplain development**
  - **Southwest watershed – diminishing water resources**
- **2 Ecosystem Specific Studies: Wetlands, Coral Reefs**
- **1 Pollutant Specific Study: Nitrogen**
- **7 Cross-Program Themes: Mapping, Monitoring, Modeling, Human Well-Being, Valuation, Outreach and Education, Decision Support Framework**

Decision Making Occurs at Multiple Levels



2008 SAB Advisory Report Recommendation

"Improve dramatically the integration of economics and the decision and behavioral social sciences into research and policy development across the Agency. **.....While the agency has reasonable staff resources in economics, and maintains some research on issues in environmental economics, its capability in the behavioral social sciences, and decision sciences, is so limited that it typically is not even in a position to ask the right questions."**

SAB (2008). SAB Advisory Report "EPA's Strategic Research Directions 2008." November 26, 2008, EPA-SAB-09-006.

Management Action
Increase R&D Capability

- New Hires: Decision Analysis/Probabilistic Modeling; Economist
  - See your folder for current and projected openings
- Cross-ORD Post-Docs: Valuation/Decision Support; Decision Analyst (DA)
- Experts and Partners
  - Mitch Small (DS/DA expert)
  - Amanda Rehr (DS/DA expert)
  - Peter Shuba (Stakeholder Involvement expert)
  - John Bolte (DS/Modeler expert)
  - Mark Judson (IT expertise - partner)
  - Allyson Beall (Stella Model/Stakeholder Involvement expert)
  - EBM Tools Network
  - Neptune and Company; Shaw (DA/DS/Modeling contractors)

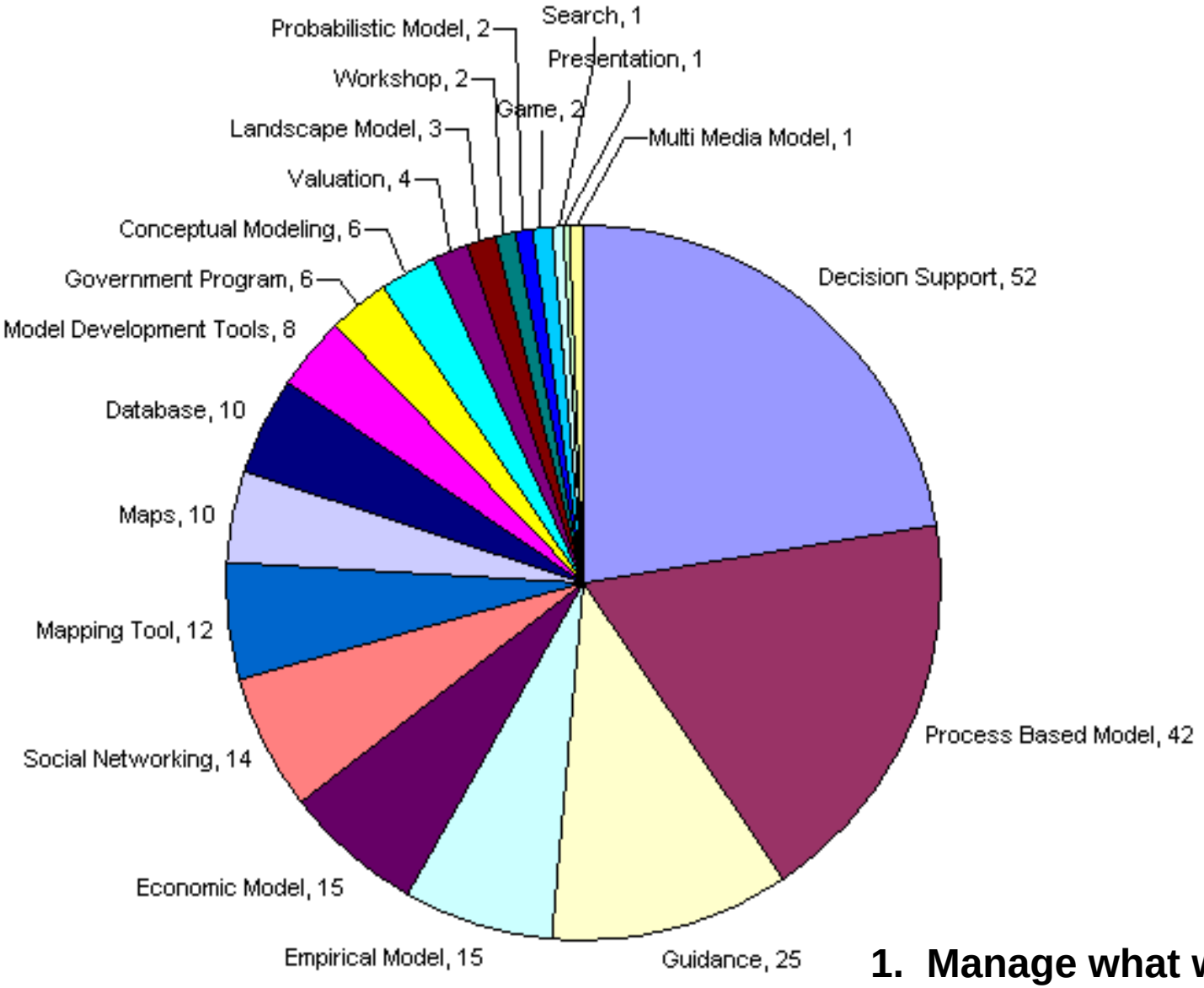
Technical Approach

1. **Manage what we know:** Review existing tools and collect information in a searchable database.
2. **Identify what decision-makers and stakeholders want/need:** Concurrent with 1, gather information from decision-makers and stakeholders through workshops and from existing documentation.
3. **Use analytic-deliberation** to begin to integrate scientific information with decision-maker/stakeholder values and to help determine what we don't know.
4. **Target research and tools** to meet needs of decision-makers: Evolve the conceptual model.

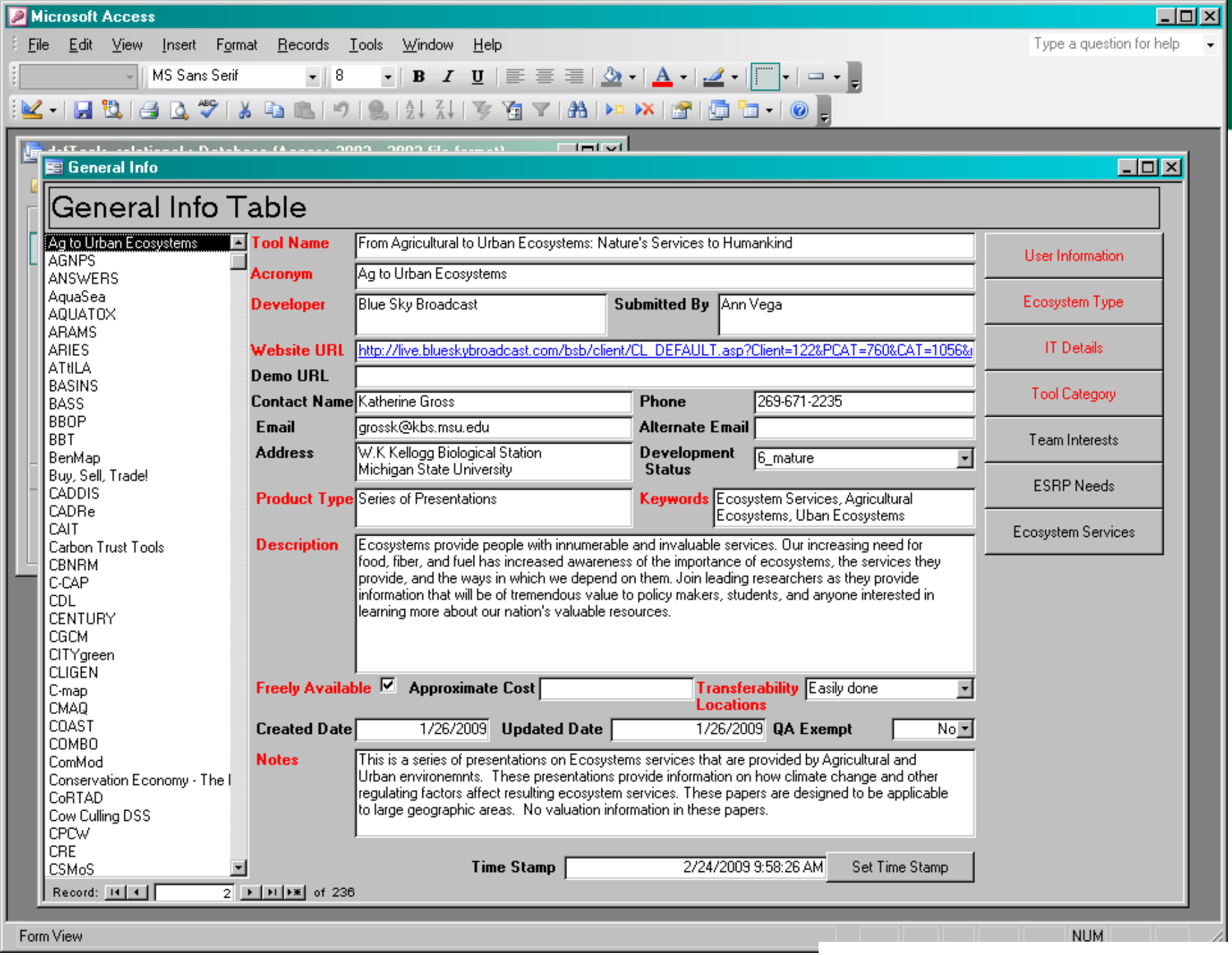
Existing Tools Database

APM 374 (2009):

Develop a database of characteristics of existing information, tools, approaches and techniques both electronic and non-electronic in concert with stakeholder/user inputs via outreach and education and the ESRP teams (content developers) to assist in the design of the DSF architecture.



1. Manage what we know



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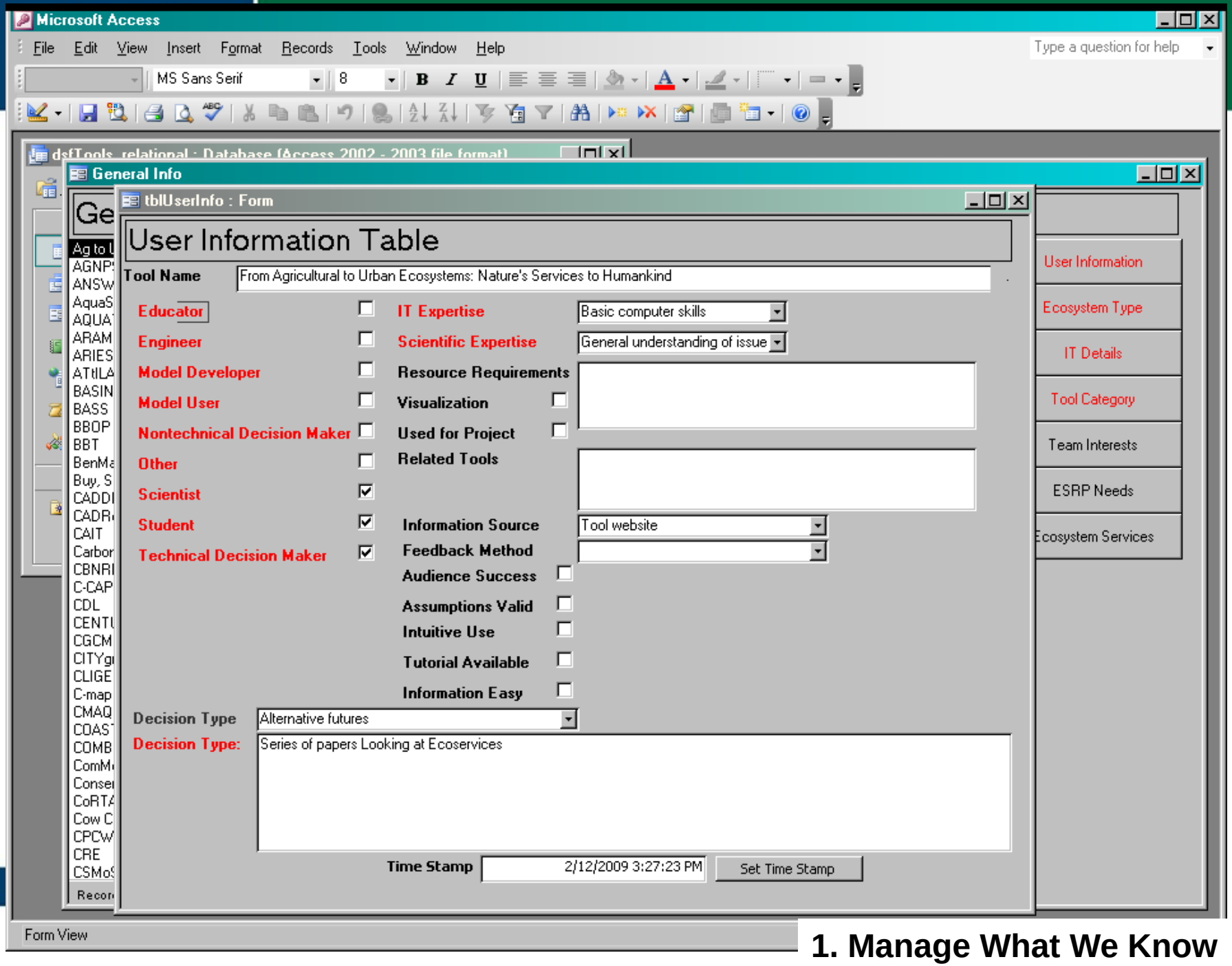

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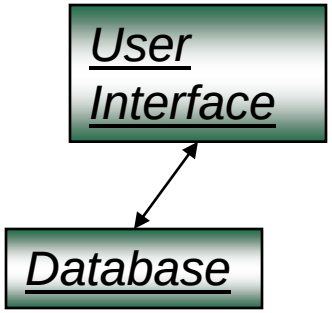


Applet Viewer: DSFToolsApplet.class

Applet

Decision Type

Alternative Futures

User Information

Your Role	Technical Expertise	Scientific Background	Operating System
Educator	Basic computer skills	Some science	Windows

Ecosystem Type

☑ Agricultural Land	☐ Coral Reef
☐ Desert	☐ Estuary
☑ Forest	☑ Lake/Pond
☑ Grasslands	☐ Marine
☐ Outer Continental Shelf	☑ Prairie
☐ River	☐ Savanna
☐ Terrestrial	☐ Urban
☐ Freshwater Wetland	☐ Coastal Wetland

Features

- ☑ Visual Outputs
- ☐ Tutorials
- ☑ Web Based
- ☑ Desktop
- ☐ Hardcopy Based
- ☐ Open Source

Attributes

☐ Valuation	☐ Social Networking
☑ Societal Values	☐ Physically Based
☐ Empirical	☐ Semiempirical

Submit Query

Results

- CBNRM
  - Community-Based Natural Resource Management Network
  - Worldwide people working on Community-Based Natural Resource Management (CBNRM), as practitioners, managers and researche
  - #http://www.cbnrm.net/index.html#
- Learner.org
- Marine Biodiversity Wiki
- MARKAL
- MCAT
- MIDAS

Applet started.

First, Who Are the Decision-Makers?

- Policy-makers (multiple scales)
  - Develop laws and regulations
- Regional/State/Territorial/Tribal
  - Environmental Managers
  - Natural Resource Managers
- Local Government
  - Land-Use Planning, Permitting, Zoning
- Public and Other Stakeholders

2. Identify what decision-makers and stakeholders want/need

Approach

Capture decision-making information from ESRP Place-based and Ecosystem-specific studies

- Who is making decisions?
- What processes are being employed?
- What economic and social (legal) constraints are imposed?
- What decision support tools are being used?
- What analytical data is used?
- How are social values incorporated into process?
- Each study is unique and using different DS approaches.

2. Identify what decision-makers and stakeholders want/need

Multiple methods to collect information

- Mining Information from Documents/Web
- Workshops
- Interviews
- Surveys (requires OMB approval)

Questions Posed by FML Decision-Makers Relative to scale

Local Scale

What can I do to protect water quality on my property?

How can I attract more wildlife (e.g. songbirds)?

How can community zoning ensure adequate green space?

How many people can our available water resources supply?

How can we reduce traffic congestion in developing neighborhoods?

Regional Scale

How do we target watersheds for improving water quality most efficiently? Which linkages among watersheds are the most critical for reducing pollution downstream?

How can this region accommodate an increasing population and maintain good air quality?

Where are the areas most vulnerable to multiple stresses?

How effective are local conservation measures in protecting migratory bird stopovers?

How effective are local BMPs in protecting large water bodies?

National Scale

What policies are needed to reduce the hypoxic zones in the Gulf of Mexico and Lake Erie?

How do we ensure adequate habitat for federally protected migratory species?

How do we evaluate areas to optimize the production of ecosystem services through programs such as the Conservation Reserve Program?

What restoration methods work where?

How can we quantify the success of environmental protection legislation?

2. Identify what decision-makers and stakeholders want/need

Coastal Carolinas Workshop

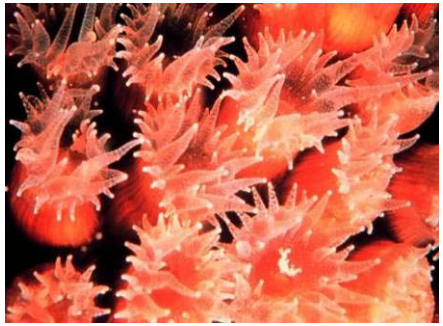
- No regional planning
  - Cumulative impacts not considered
- Global Climate Change (sea level rise) not of concern
- Technical information not being used in decision making
- “I don’t need [more] data, I need to know who to talk to.”

2. Identify what decision-makers and stakeholders want/need

Coral Reef Decision Workshops

US Virgin Islands (2007)

Florida Keys, SE Florida (Miami-Dade to Martin Counties), Puerto Rico (2009-2010)



2. Identify what decision-makers and stakeholders want/need

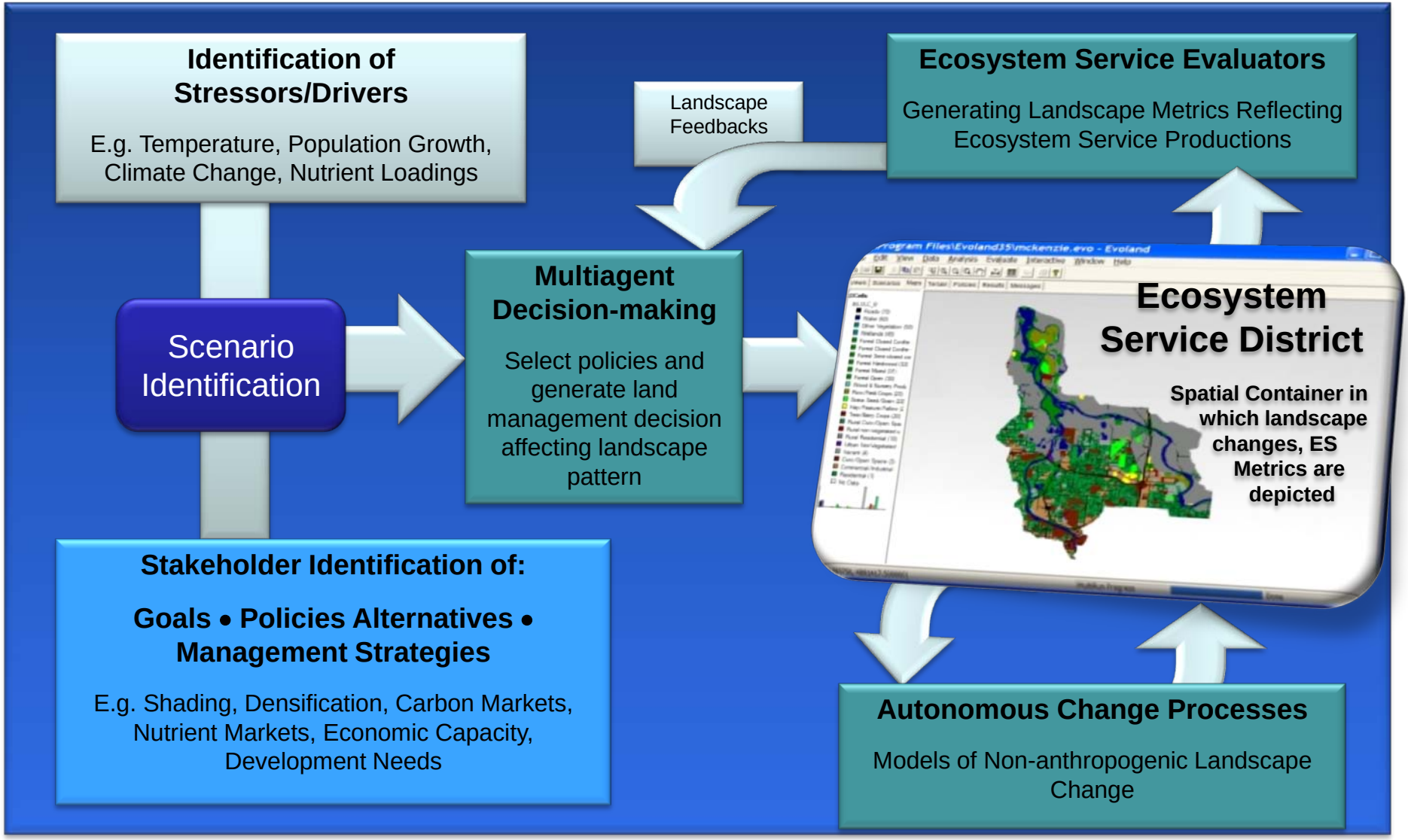
Tampa Bay Workshop Results

- Priorities:
  - Agriculture and forest
    - Locations of specific agricultural activities and forest types needed
    - Resulting water quality
  - Wetlands
    - Nitrogen processing rates needed
  - Open Water
    - Human use effects on habitat/biodiversity
    - Ground water nutrient inputs and water quality
    - Secondary production and bioaccumulation effects on food and fiber production and habitat quality
  - Connectivity between ecosystems

- **Scale of results must reflect local decision maker's needs**

2. Identify what decision-makers and stakeholders want/need

ENVISION - Willamette



2. Identify what decision-makers and stakeholders want/need

Using Analytic Deliberation as a model – conduct a gap analysis using information derived from placed-based and ecosystem specific studies.

Where are there gaps in the scientific information?

- Why do land and resource use decisions typically ignore consideration of sustaining ecosystem services?
- Which analytic-deliberative process(es) should be used for which situations?
- For each situation, what are decision-maker/stakeholder values/preferences? Needs? Decision-making processes? Capabilities? Limits/Boundaries? Regulations/Policies? Authority? Scales of relevant ecosystem services; stressors?
- How do we create a decision support framework that increases the capacity for better decisions at all scales?

Target Tools to Decision-Makers' Needs

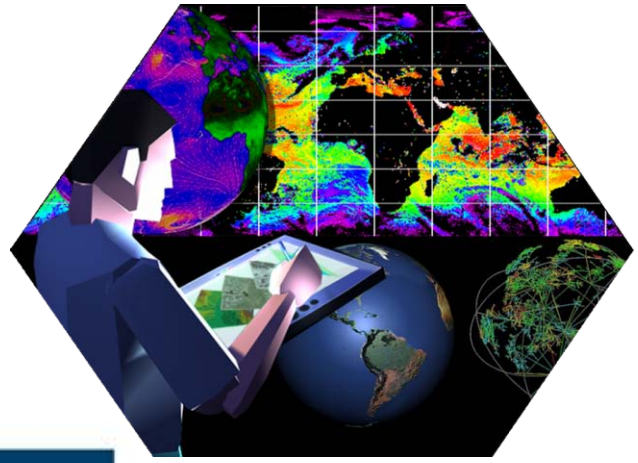
- Flow chart decision-making processes
- A variety of use cases
- Continuous decision-maker/stakeholder involvement and interaction
- An example from ReVA resulted in a Decision Support Tool that had 3 levels of users:
  - Management (canned indices, quick answers),
  - Planners (ability to query data for specific endpoints), and
  - Analysts (access to all DST capabilities, ability to modify data).

Proposed Purpose of the Decision Support Framework

Employ scientific methods of mapping, monitoring and modeling

To assist decision-makers at the local, tribal, state, regional, and national levels

With decision support for land and resource use planning



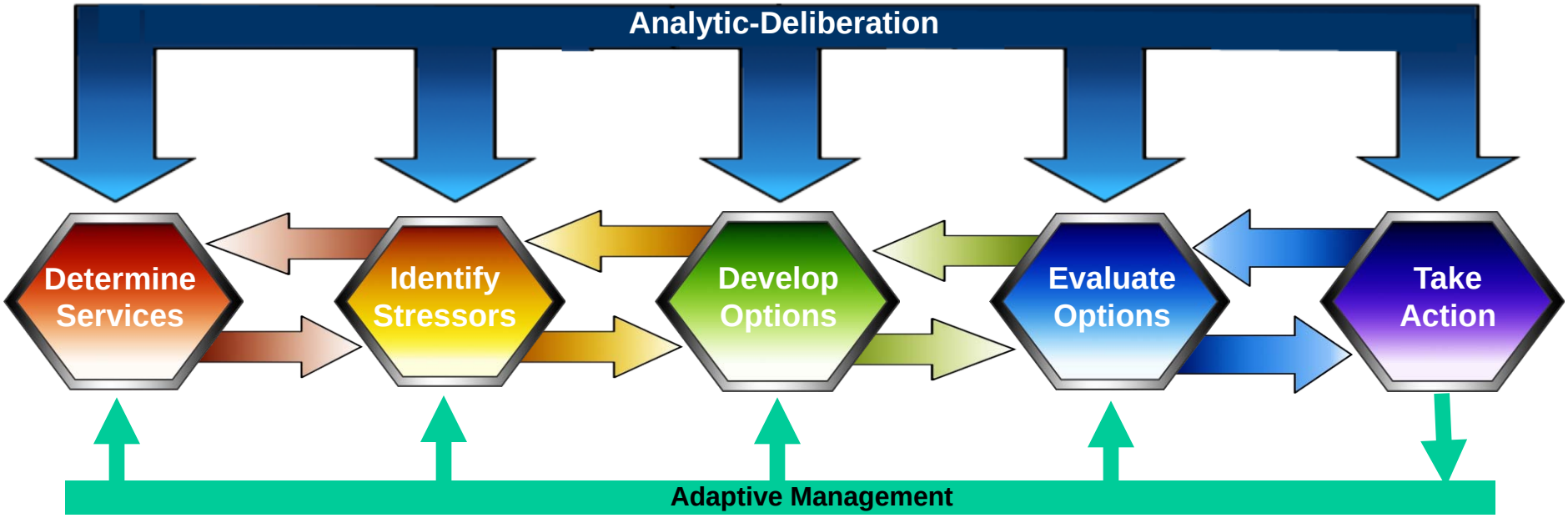
4. Target research and tools

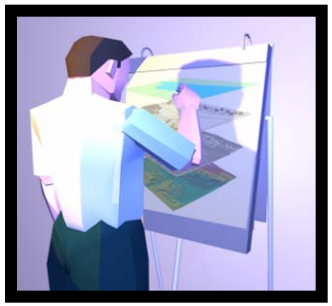
Evolve Conceptual Model

APM 375 (2009):

Develop conceptual model for the Decision Support Framework (DSF).

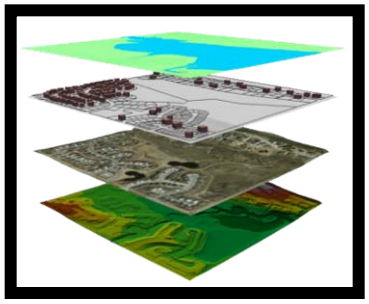
A Framework for Making Land and Resource Use Decisions





Define region, map current uses and capacity of services

Identify Stressors



Develop sustainable land and resource use options

Negotiate inputs, evaluate, determine path forward, begin to implement

Carry out plan with adaptive management

4. Target research and tools

Challenges

- Environmental DM resources are limited
- Decisions are made everyday that impact us and will continue to impact our grandchildren
- Decision-makers' responsibilities and authorities are often narrowly defined

Therefore, decisions are often made with insufficient attention paid to resources that are difficult to monetize and potential of cumulative impacts at different spatial and temporal scales.

Summary

To begin to integrate scientific information with land and resource use decision-maker/stakeholder values we are:

- Increasing our capability
- Documenting/Managing what we know (tool database/knowledgebase), what we learn, and what we know we don't know
- Identifying what decision-makers and stakeholders want/need
- Evaluating analytic-deliberative approaches
- Targeting research and tools to meet needs of decision-makers (evolving the conceptual model)