Monitoreando los recursos de los humedales basados en modelos ecológicos conceptuales

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Manejo de humedales para técnicos en México
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ALL MODELS ARE WRONG [OR INCOMPLETE], BUT SOME ARE USEFUL

(Box 1979 as cited in Gross 2003)

WHAT IS A CONCEPTUAL ECOLOGICAL MODEL?

Conceptual Ecological Models

- Integrate our current understanding of system dynamics
- Identify important processes
- Facilitate communication
- Illustrate connection between variables and processes
- May be in different forms
  - Narratives
  - Tables or matrices
  - Artistic drawings or diagrams
  - Box and arrow diagrams

Two Types of CEMs

- Control models – describe how an ecosytem functions (e.g., many of the wetland models presented during this workshop)
- Stressor models – describe the relationships between stressors, ecological effects, and indicators

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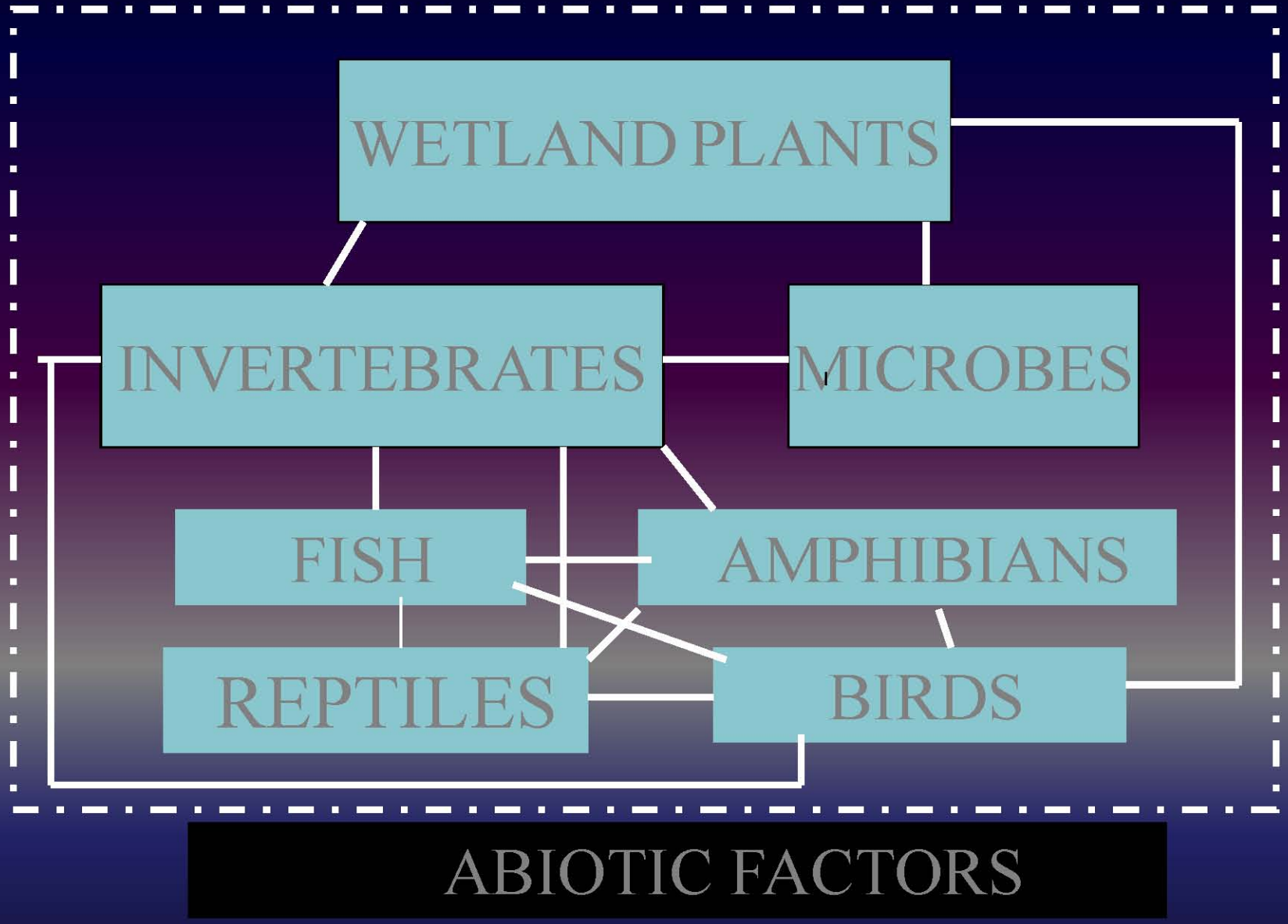
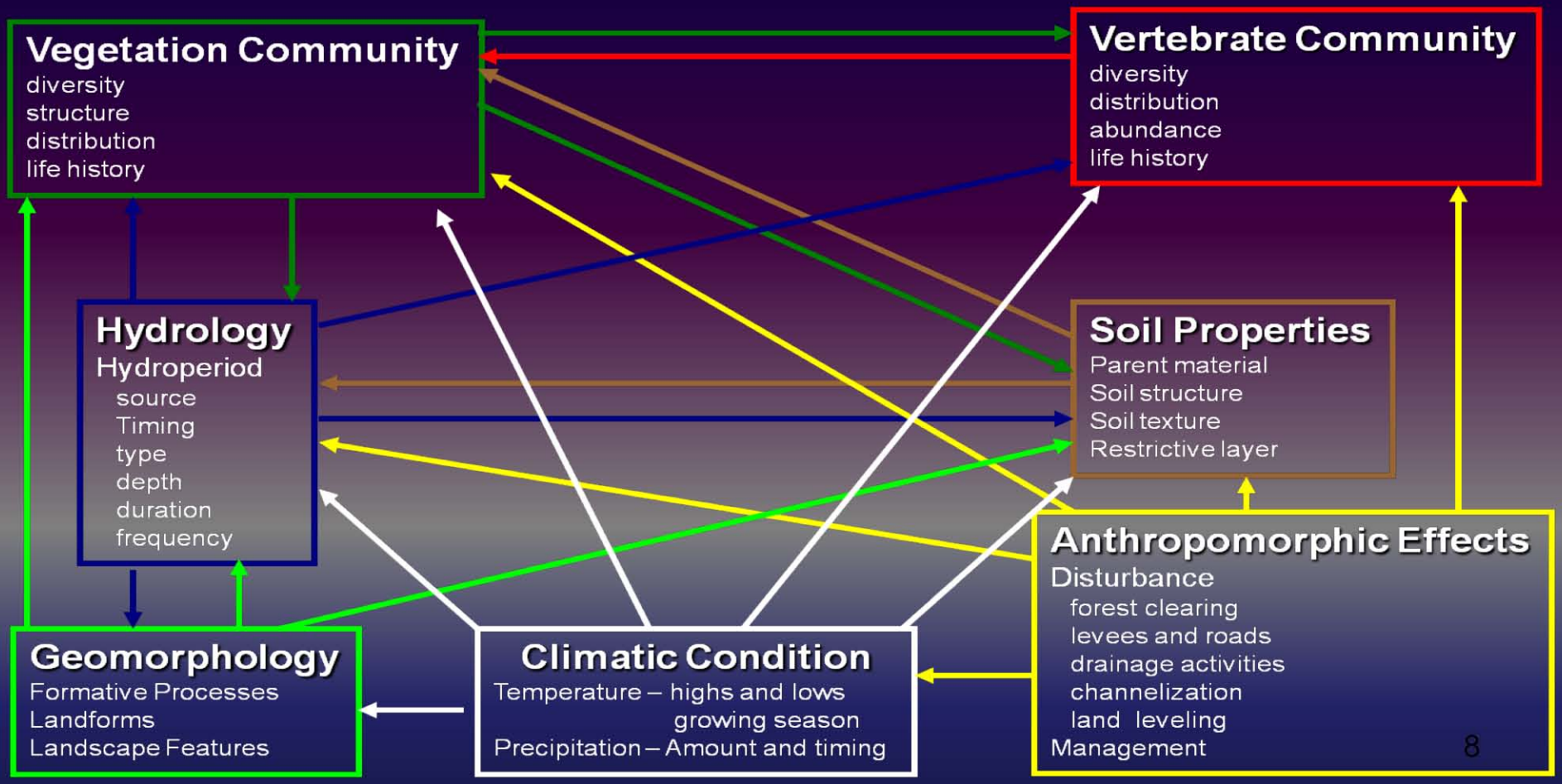
LEIGH'S WETLAND MODEL



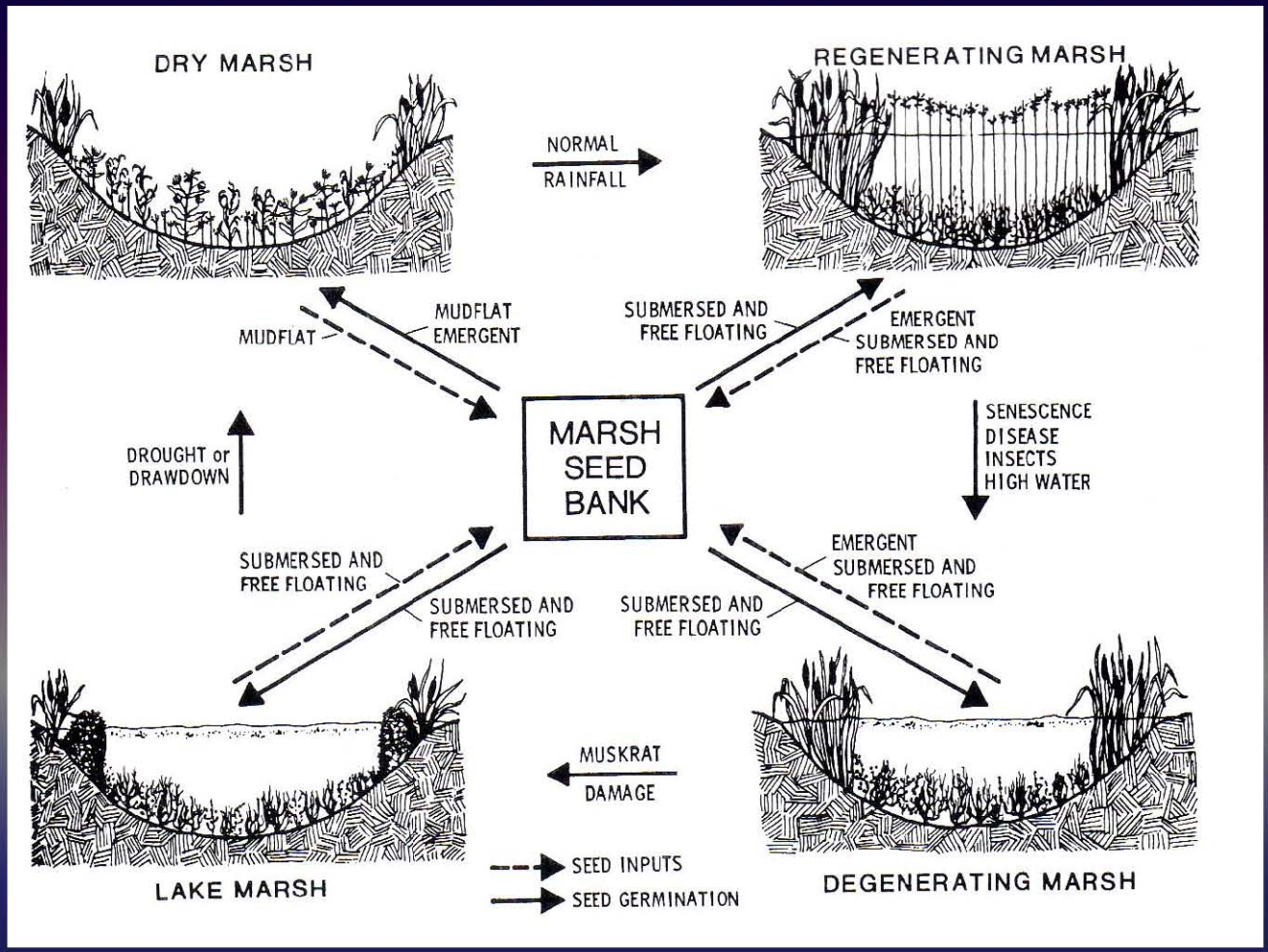
BROAD RANGE OF INTER-RELATED FACTORS

Wetland Model

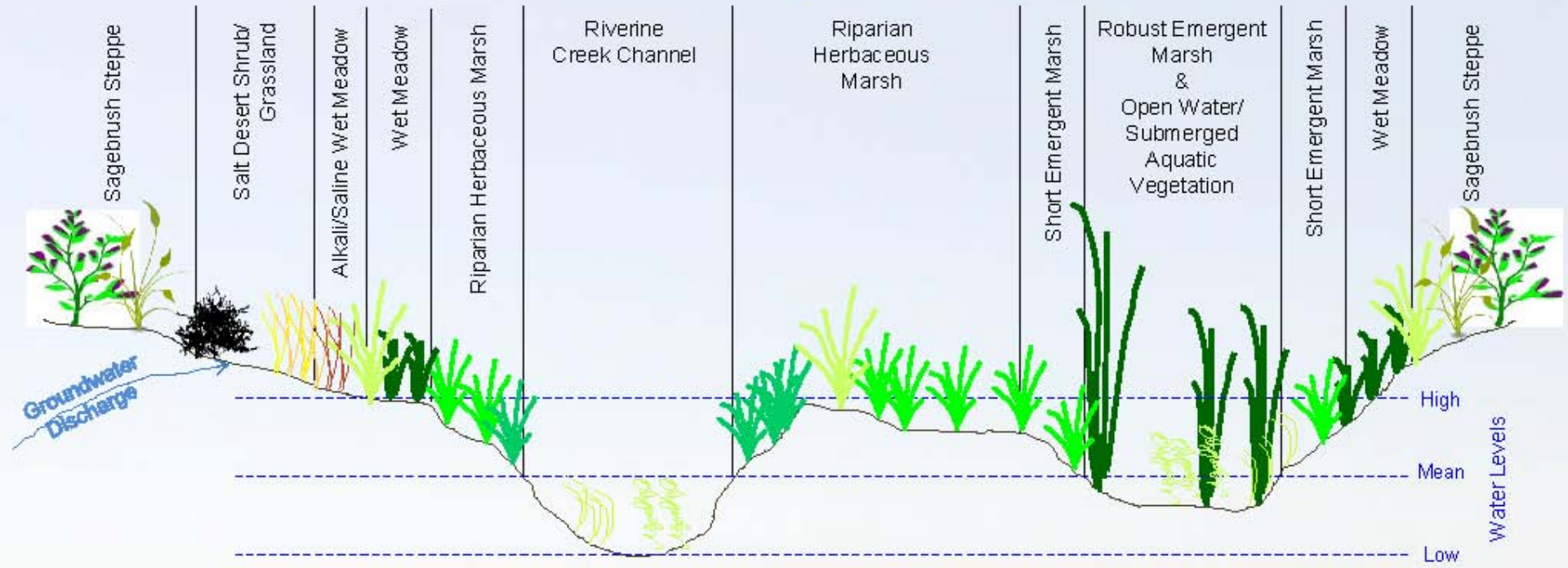


MARSH CYCLE MODEL

Hydrology, Seedbanks, Germination, and Persistence of Wetland Plants



Potential Historical Vegetation Cross Section



All of these Conceptual Ecological Models…..

- Express ideas about components and processes thought to be important in a system.
- Integrate available knowledge and document assumptions about how components and processes are related
- Identify gaps in our knowledge
- Hypotheses about system form and function

Approaches to CEMs that are Useful for Monitoring

- Articulate important processes and variables
- Increase our understanding of interactions between ecosystem processes and dynamics
- Identify key links between drivers, stressors, and system responses
- Facilitate monitoring components
  - Selection and justification of monitoring variables
  - Evaluation of data from the monitoring program
- Clearly communicate complex ecosystem processes to technical and non-technical audiences

Monitoring based on solid CEMs are more likely to identify key processes and indicators…

and therefore contribute significantly to management

This Monitoring Strategy Builds on Goals & Objectives

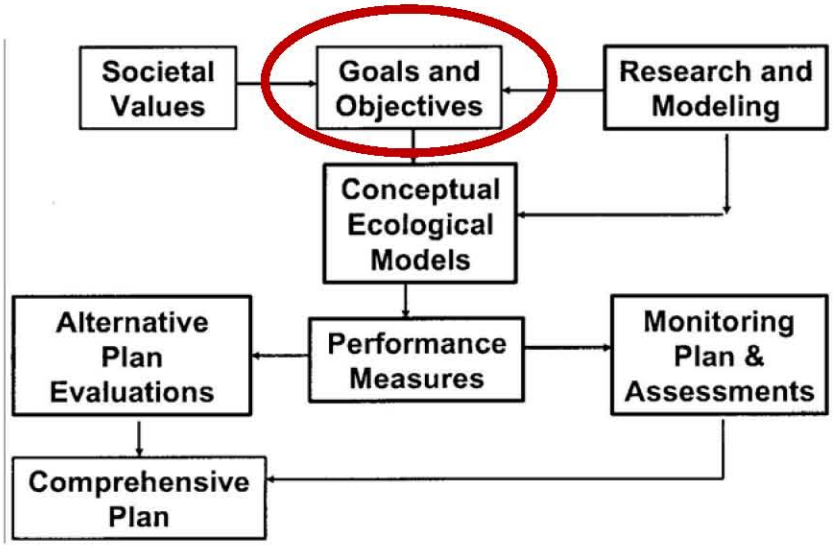


Figure 2. Flow chart of the "Applied Science Strategy" process adopted by the South Florida Ecosystem Restoration Working Group. The "Applied Science Strategy" effectively met the need to use a broadly accepted process to organize and convert large amounts of scientific and technical information into planning and evaluation tools that directly supported restoration programs. Conceptual models, which consisted of diagrams and narratives, were central to the success of the approach . Note iterative development of models, informed by research and other sources of information (Appendix A, March 2003 RECOVER draft plan; http://www.evergladesplan.org/pm/recover/aat.cfm).

Two Types of CEMs

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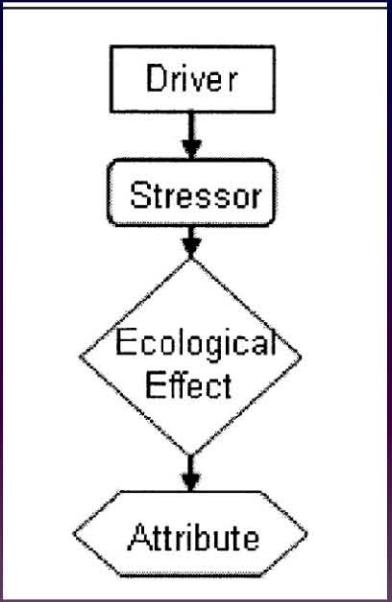
MODEL COMPONENTS



- Drivers—major driving forces that occur outside the natural system, which have large-scale influences on natural systems. Drivers are natural forces (e.g., sea-level rise) or anthropogenic (e.g., water management).
- Stressors—physical or chemical changes that occur within natural systems that are brought about by drivers, causing significant changes in biological components, patterns and relationships in natural systems.
- Ecological Effects—physical, chemical, and biological responses caused by stressors.
- Attributes—a parsimonious subset of all potential biological elements or components of natural systems that are representative of overall ecological conditions of the system. Attributes typically are populations, species, guilds, communities, or processes. Attributes, also known as indicators or endpoints, are selected to represent known or hypothesized effects of stressors (e.g., nesting wading bird numbers) and elements of systems that have important human values (e.g., endangered species, sports fishing).

Specific Wetland System Conceptual Ecological Models

- Florida Everglades
- Other wetland systems in southeastern US
  - Wetlands, Vol. 25, No. 4 (2005)

CEM Component for Florida Everglades

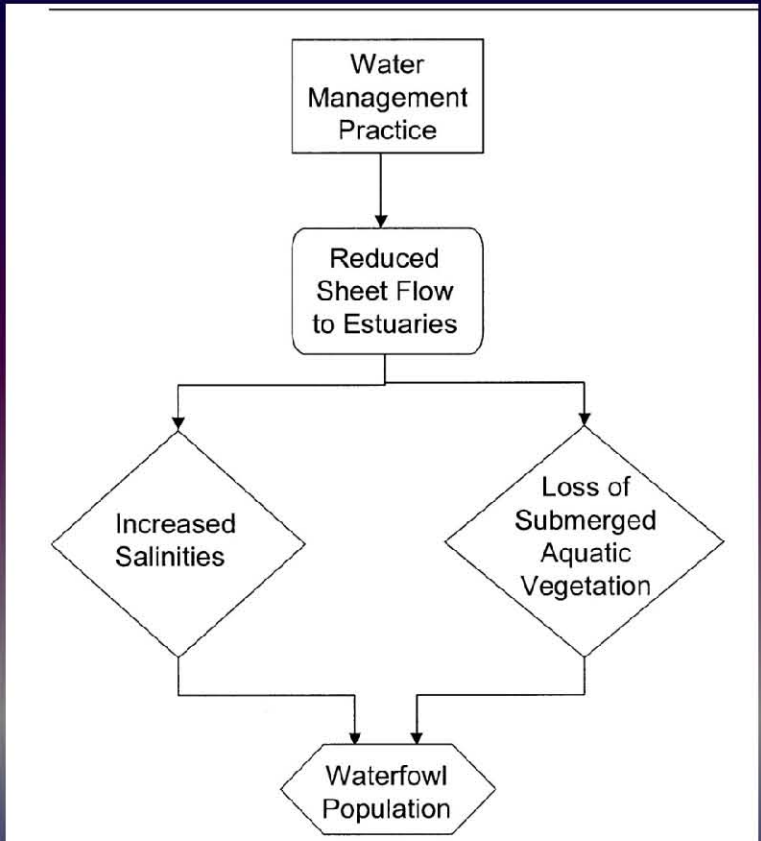


Figure 4. An example of an Everglades working hypothesis as diagramed in a conceptual model.

Ogden 2005

Example CEM for Mexicanos

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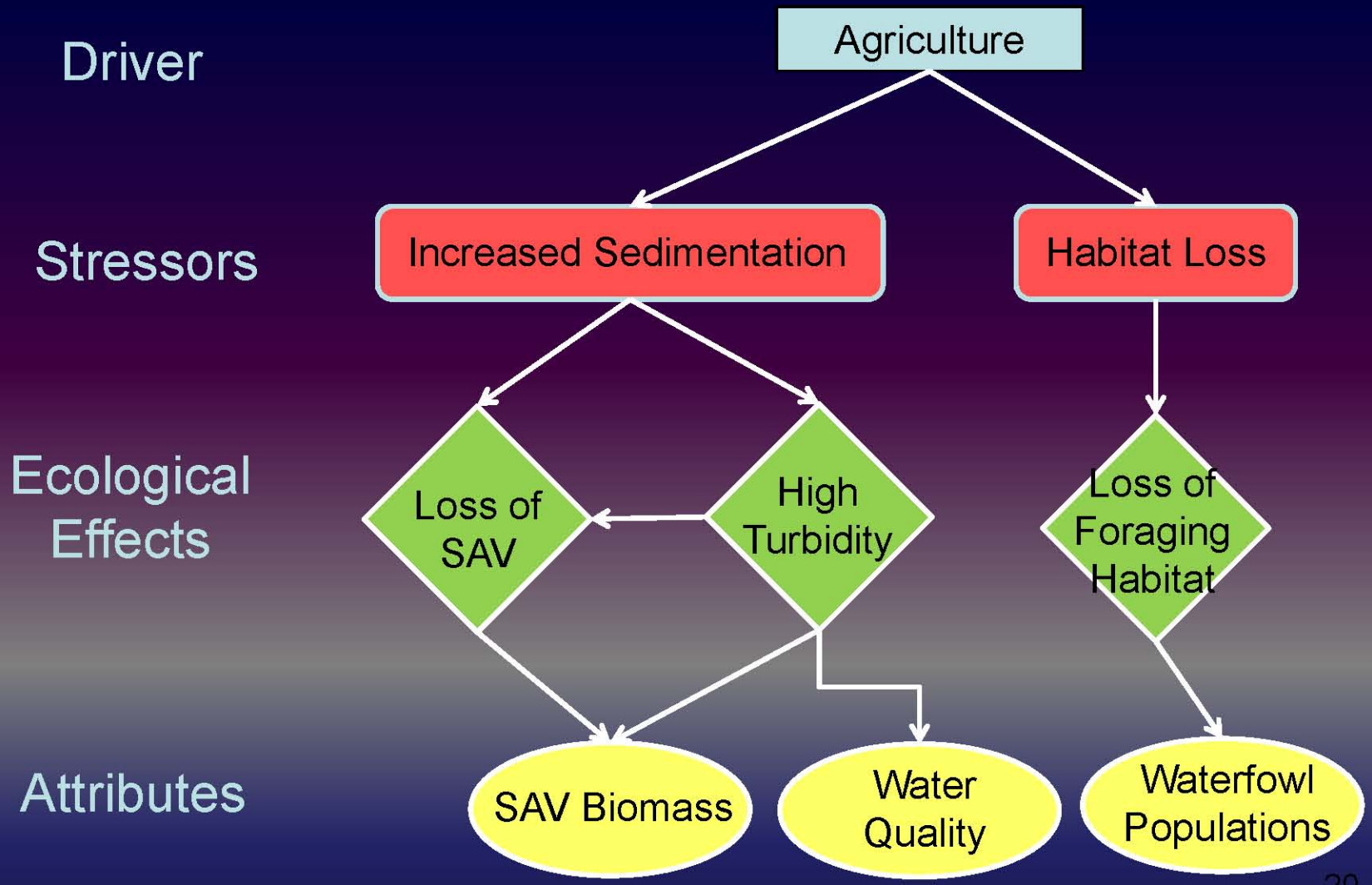
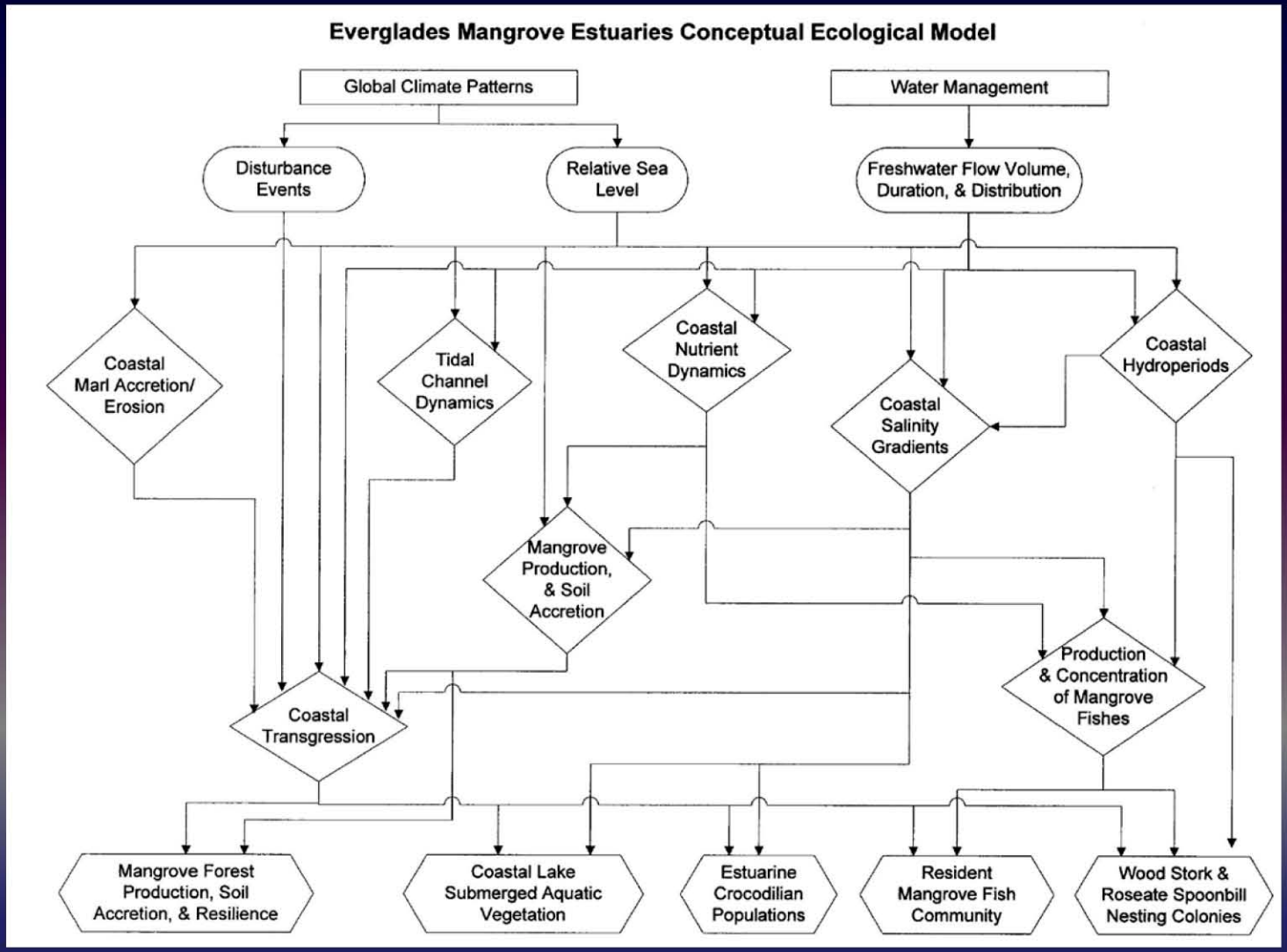


Other Examples

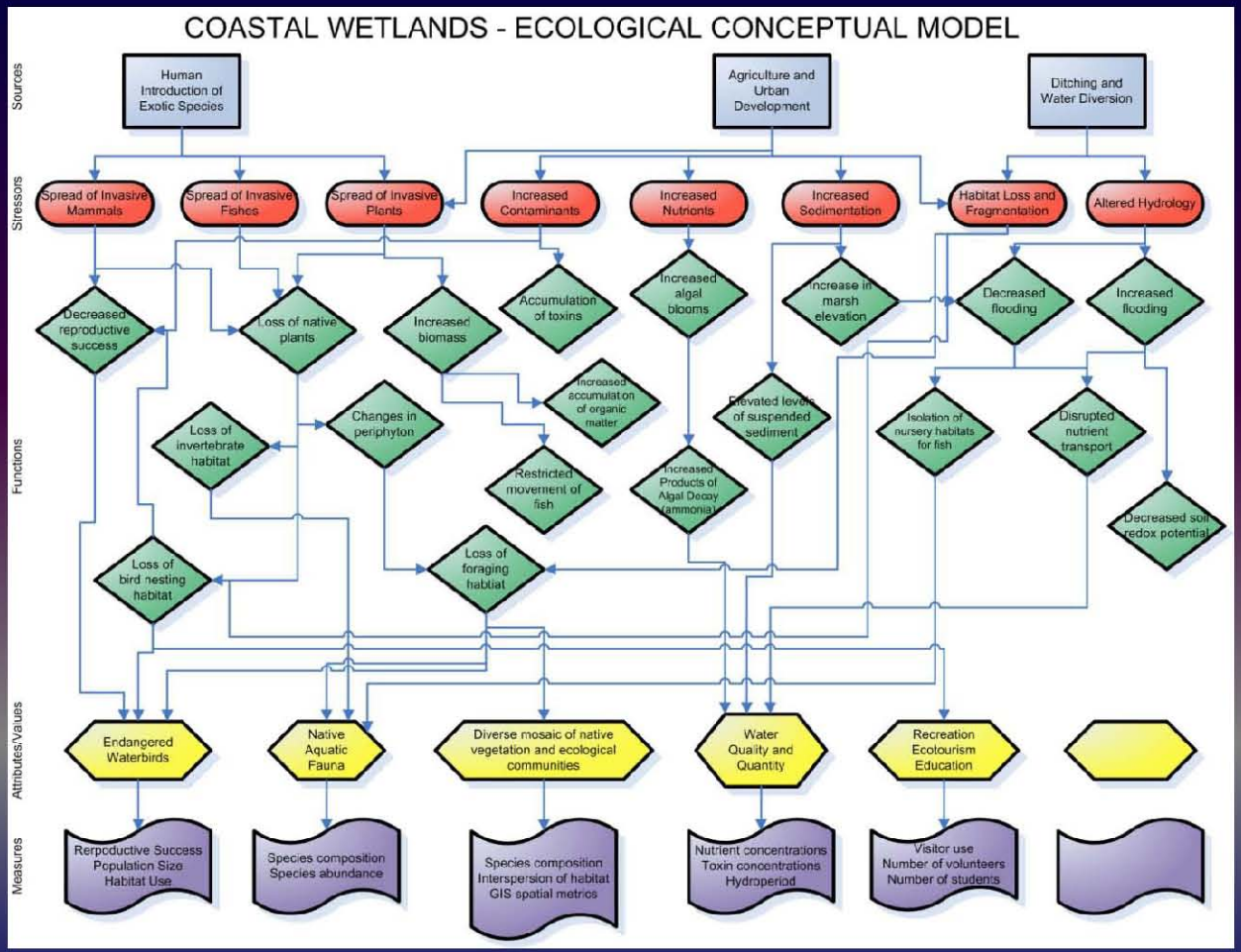
- Florida Coastal Mangroves
- Hawaii Coastal Wetlands

CEM for Coastal Mangroves



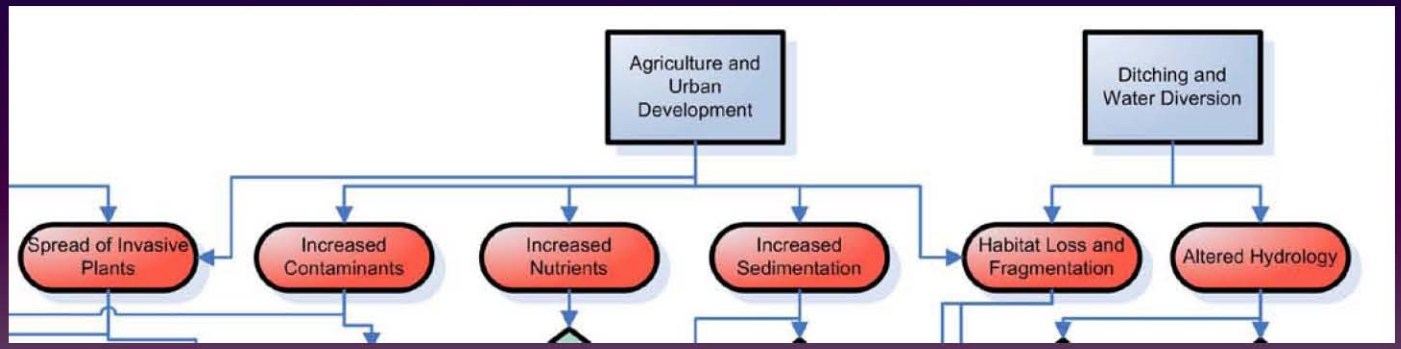
Davis et al 2005

CEM for Hawaiian Coastal Wetlands



Wetland Conceptual Ecological Models

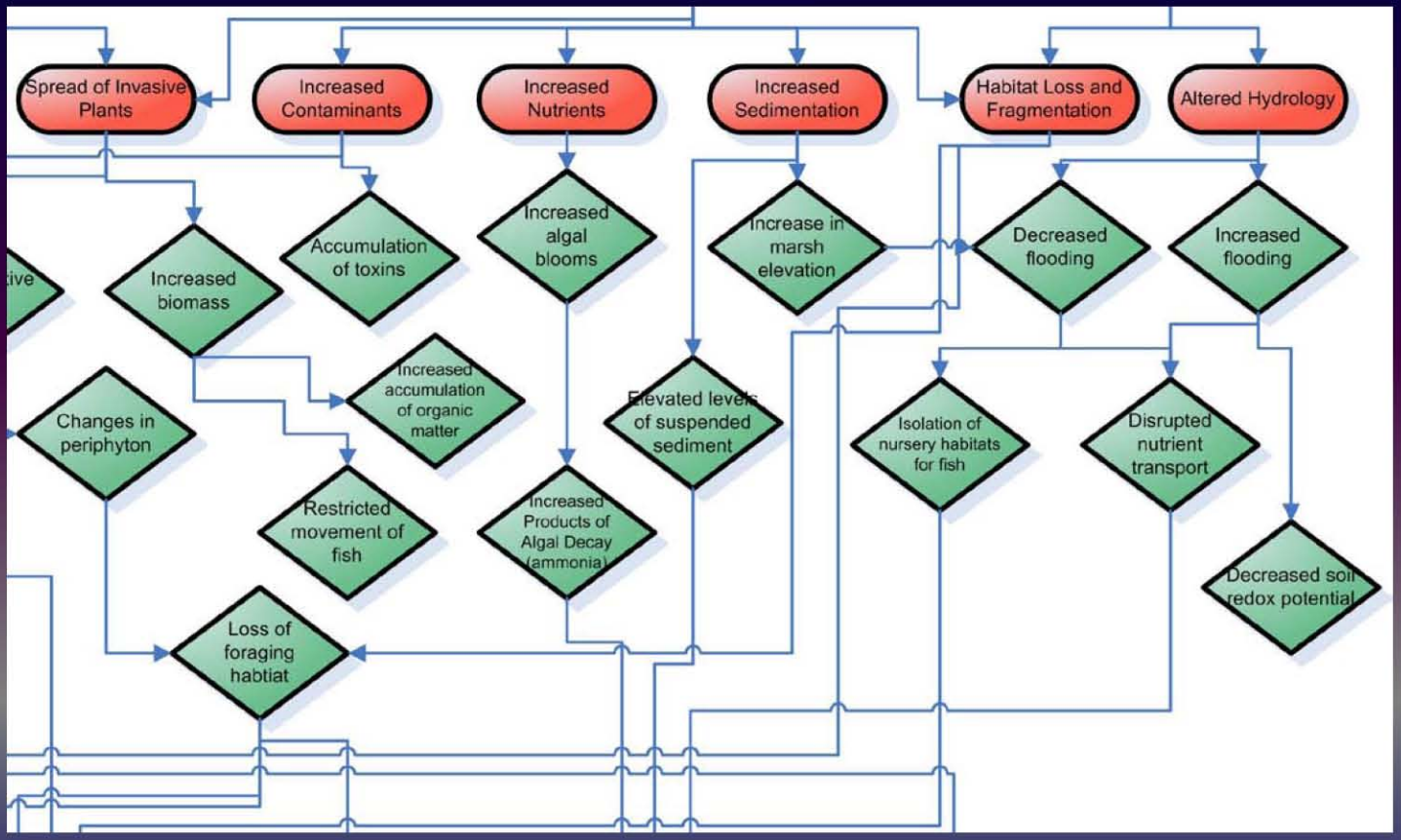
Sources and Stressors



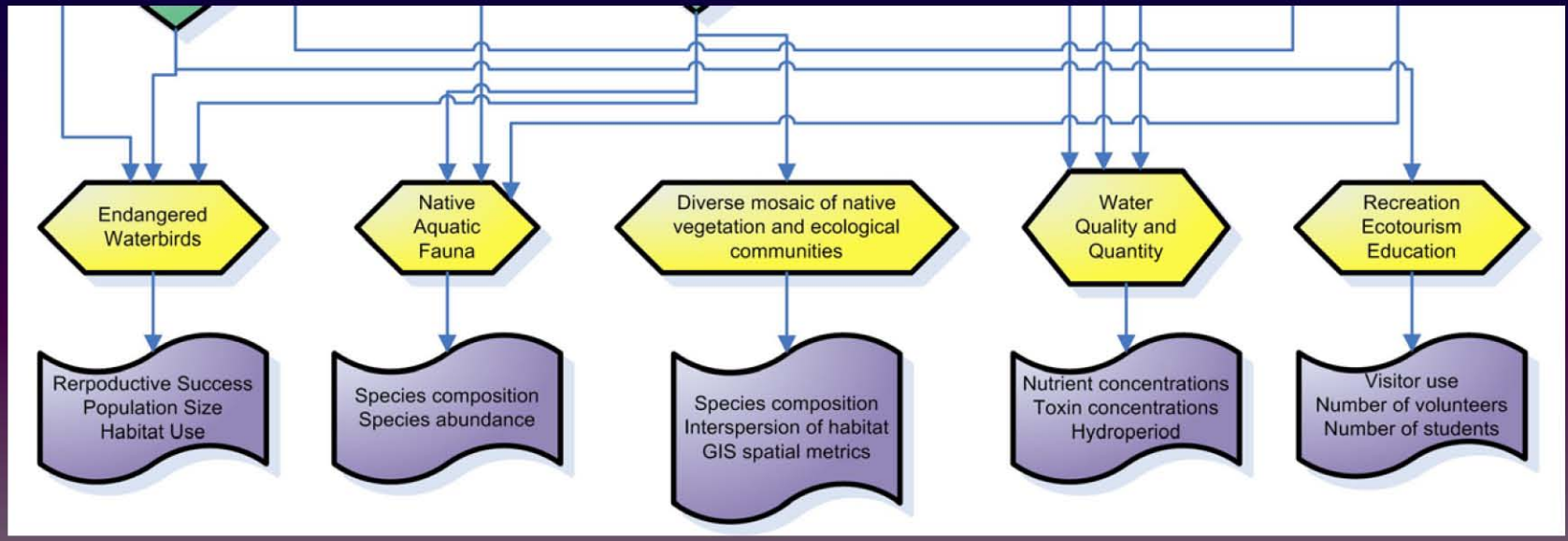
Wetland Conceptual Ecological Models

Functions

What are the threshold values?



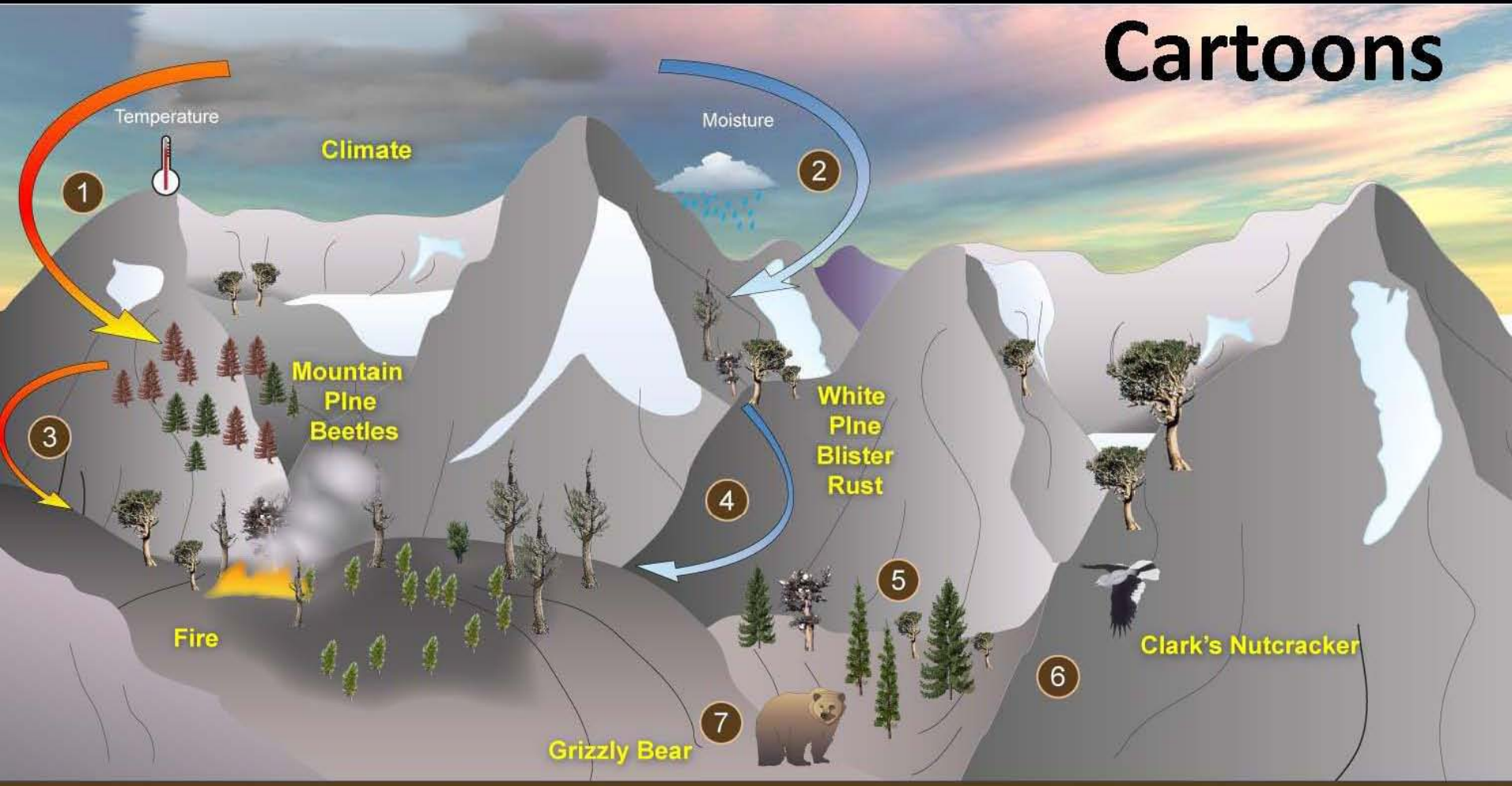
Wetland Conceptual Ecological Models



Conceptual Ecological Models

- These examples are great for biologists, ecologists, etc.
- But what about communicating these issues to the public?

Cartoons



1. Increased temperature regimes can results in increases in mountain pine beetle outbreaks (Gibson 2005).
2. The spread of white pine blister rust is stronlgy associated with high moisture regimes (citation).
3. Increased temperature regimes combined with increased tree mortaility could dramatically alter fire regimes.
4. Even if white pine blister rust does not kill a given tree, it can affect its cone production (i.e., reproductive capability) if the top is killed.
5. The mixed species stands, that tend occur at mid elevations of whitebark distribution, are the most used by red squirrels, which cache seeds in middens.
6. The loss of whitebark cones may affect the distribution of Clark's Nutcrackers, which are a primary means of whitebark seed dispersal (citaion).
7. The movements and reproduction of grizzly bears are associated with whitebark cone production, which could be altered shoud cone production decrease.

QUESTIONS?