



Watershed Adaptive Management – Conceptual Models and Indicators

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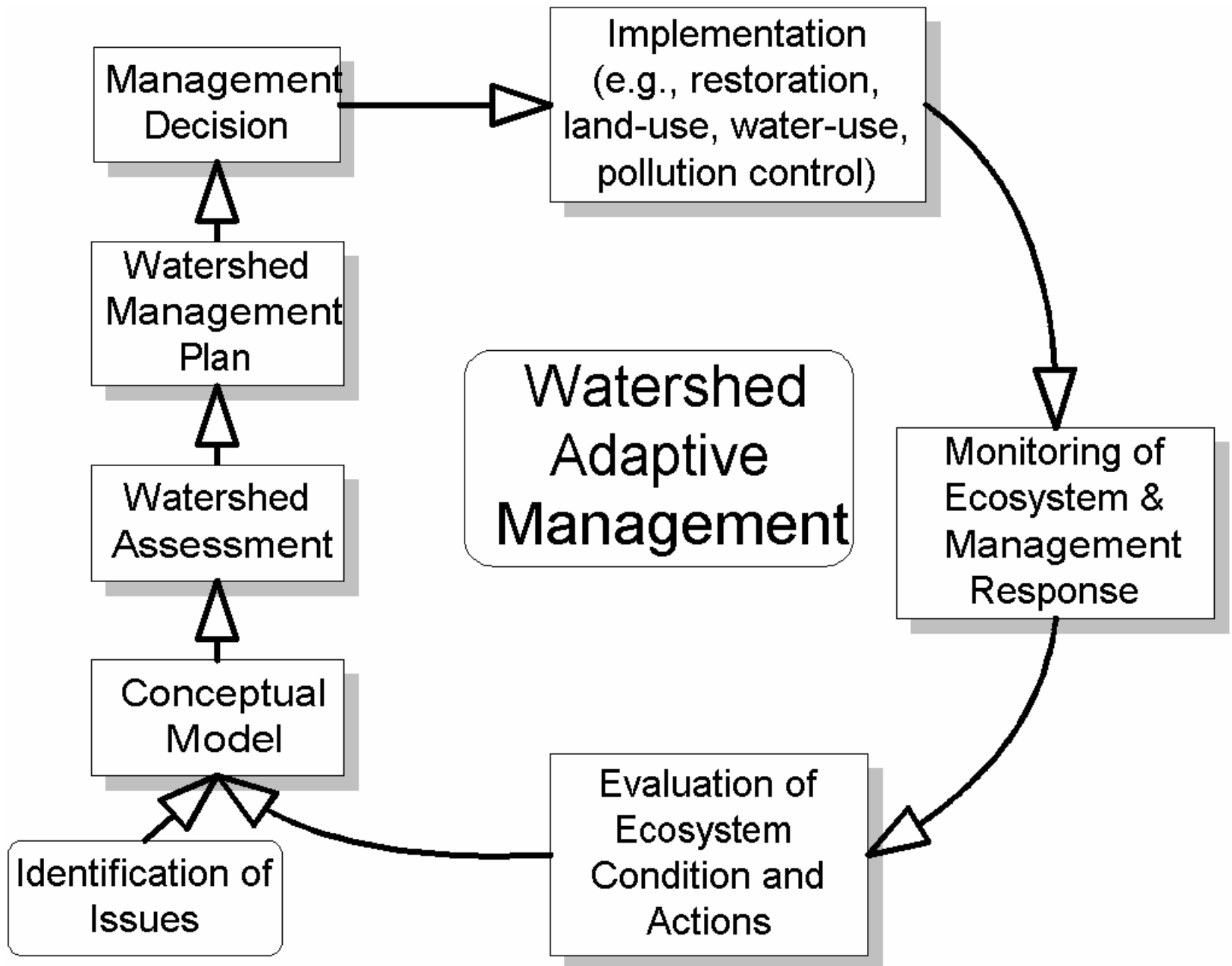
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Watershed Adaptive Management

- Watershed assessment
 - Scoping and question formulation
 - Basic description
- Watershed management
 - What can we influence
 - Conceptual modeling
 - Select environmental and management indicators

What is Adaptive Watershed Management?

- The process of 1) designing management so that effects and effectiveness can be evaluated and 2) using assessment of prior management actions to inform future management decisions.
- In watersheds, it is important to develop a picture of how the parts and processes operate together and what influences those operations.

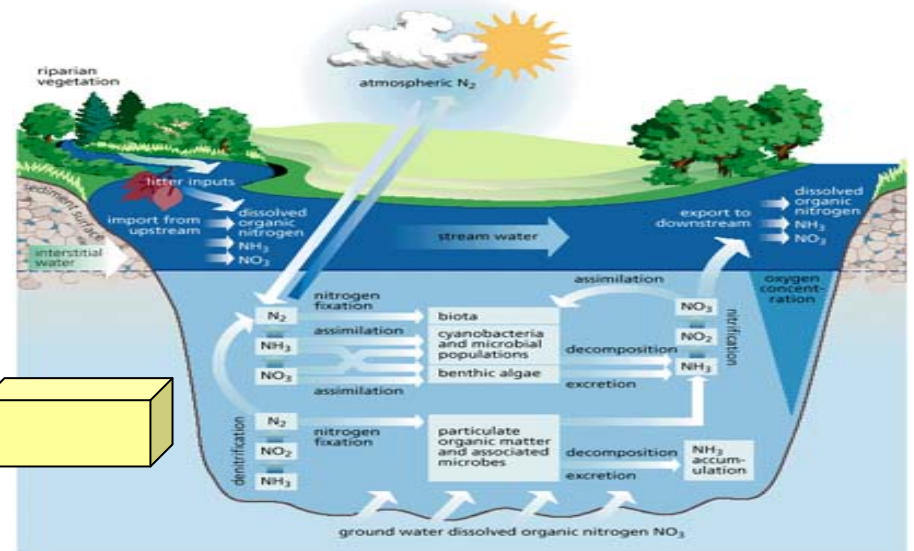
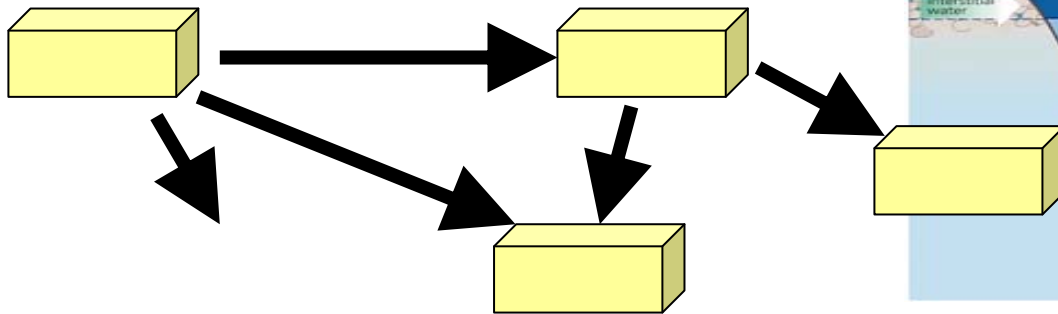


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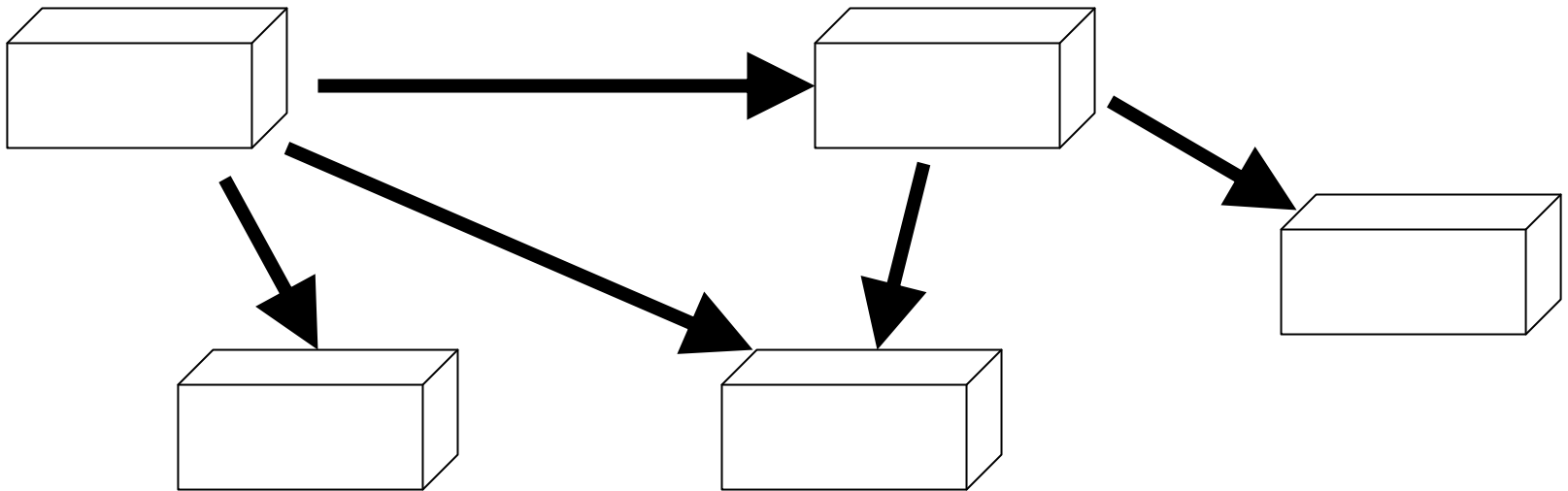
What is a conceptual model?

- A diagrammatic or narrative representation of how a system works
- A visual model representing causal relationships
- Comes in many forms



A conceptual model of the nitrogen cycle

Influence diagrams and conceptual models



Boxes indicate concepts and arrows indicate influence or connection. The boxes can be attributes or processes, the arrows can be hypotheses, or based on knowledge of the system

Key components of a model

Focus or Issue

The part of the system about which you, the conceptual modeler, is most concerned



Affected Processes or Attributes

Natural or human-origin processes (e.g., climate cycles, flow rates) or attributes (e.g., geomorphology) that are altered.



Influences or Causes

Natural or human factors, such as farming, dams, urban development, off-road vehicle use, that produce the altered conditions/processes

1. Begin by formulating your questions or issue of concern

- What do you care about?
 - Decline in a species of concern
 - Loss of riparian habitat and associated recreational opportunities
 - Loss of groundwater recharge
 - Increase in the number or extent of algal blooms
 - Increase in the distribution of invasive plants
 - Loss of fishability due to mercury contamination

2. Consider the things that might affect the issue of concern.... In one example, salmon population.

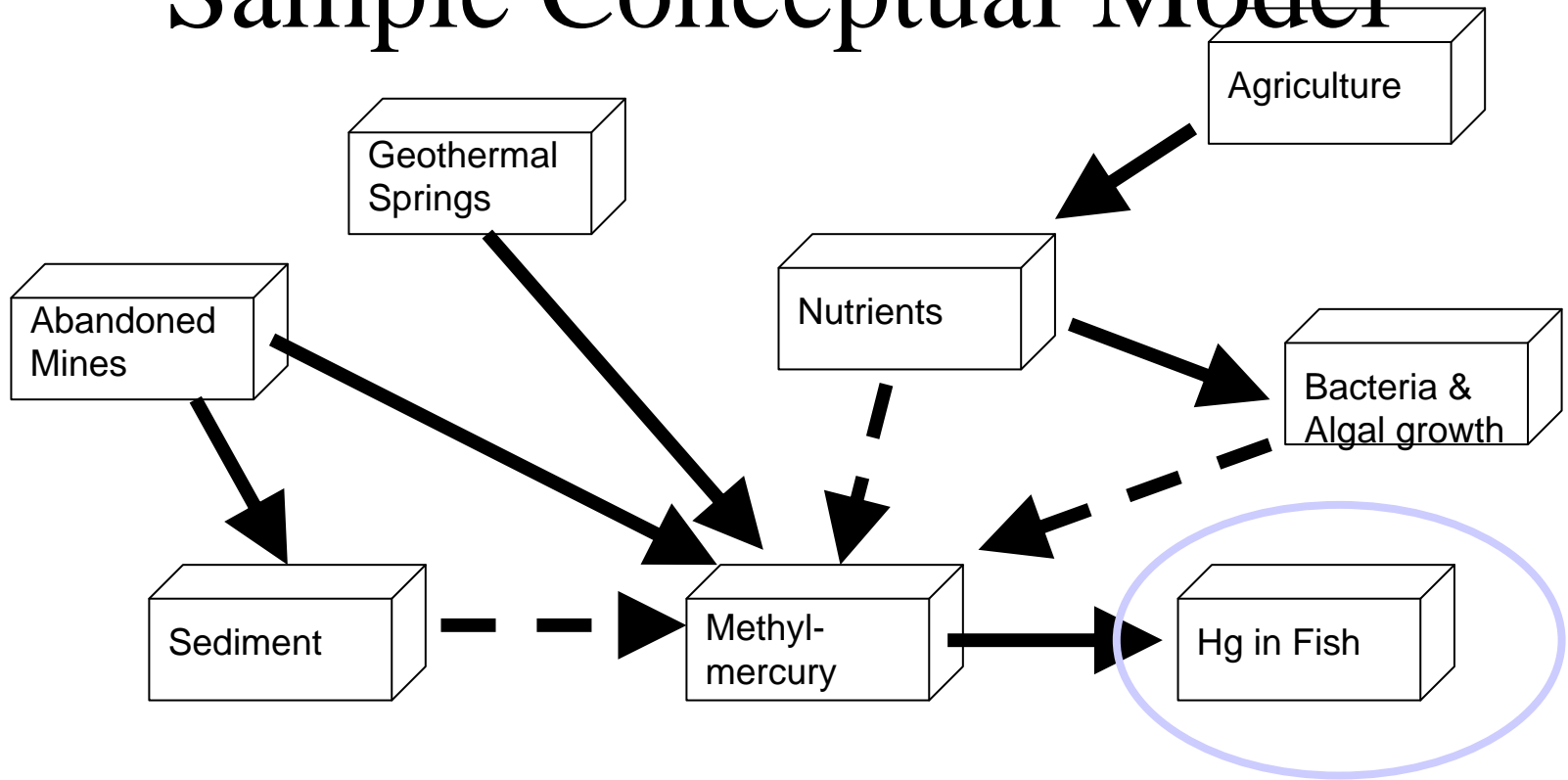
Examples for salmon:

- Increased fines in spawning gravel
- High water temperatures
- Reduced flows
- Increased predation of young
- Loss of canopy cover

3. Consider the causes, drivers, or sources of these alterations on conditions/processes

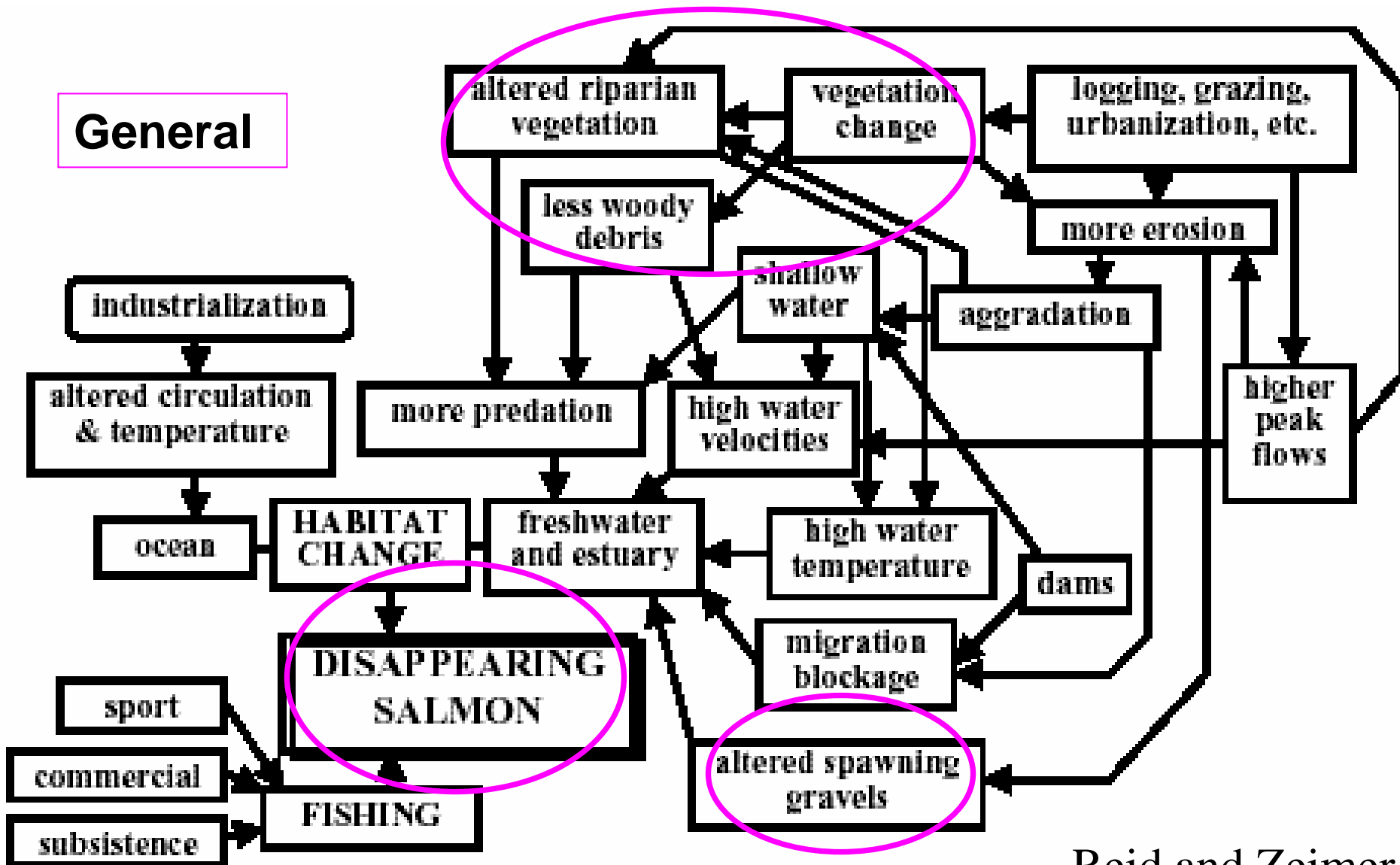
- Logging
- Grazing
- New housing development
- Industrial activity
- Roads
- Climate change

Sample Conceptual Model

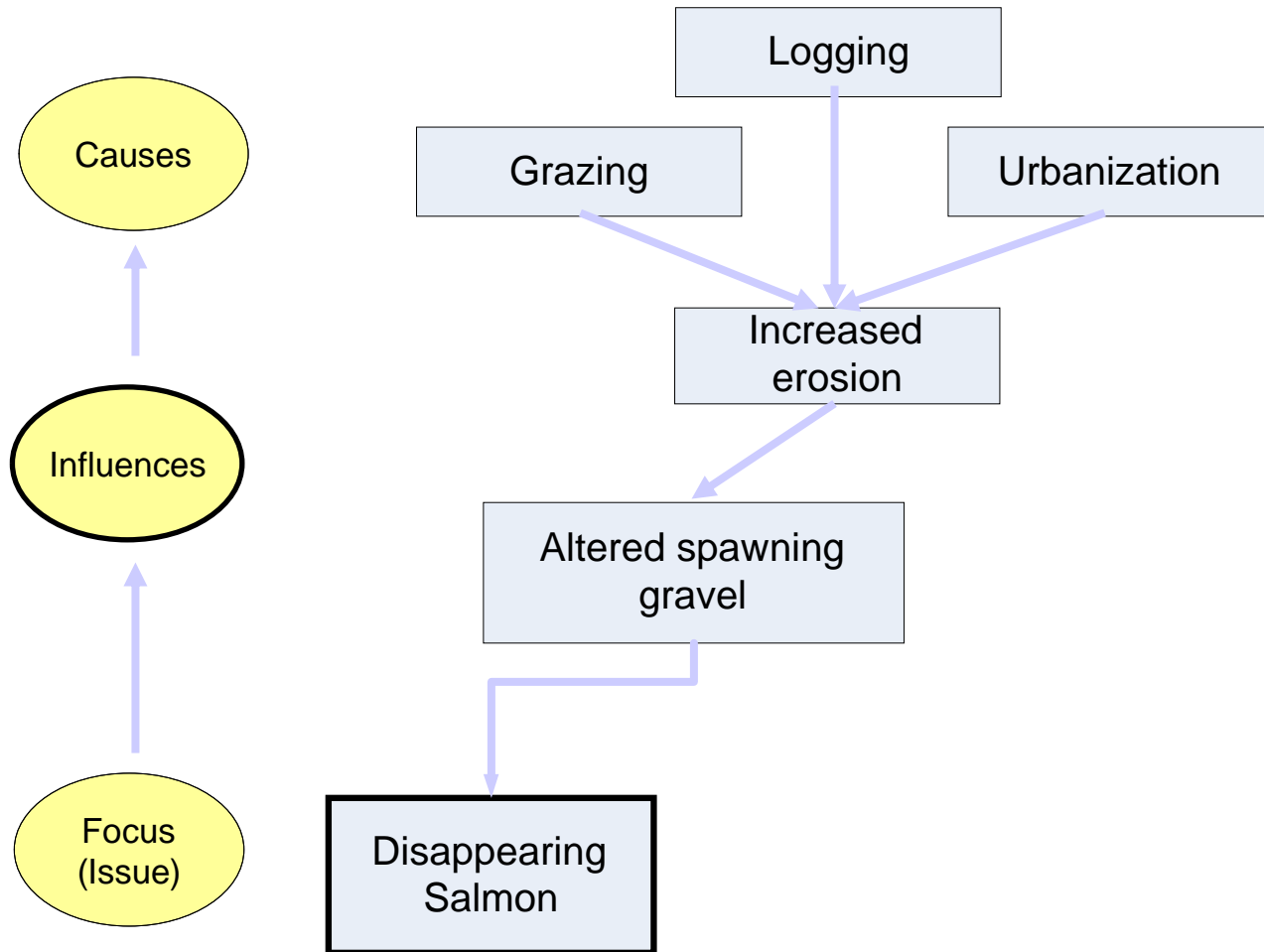


Boxes indicate watershed conditions and processes, arrows indicate possible influences and connections. Starting with the issue of “Hg in fish” you can work backwards to find the natural and human influences and contributors to this problem.

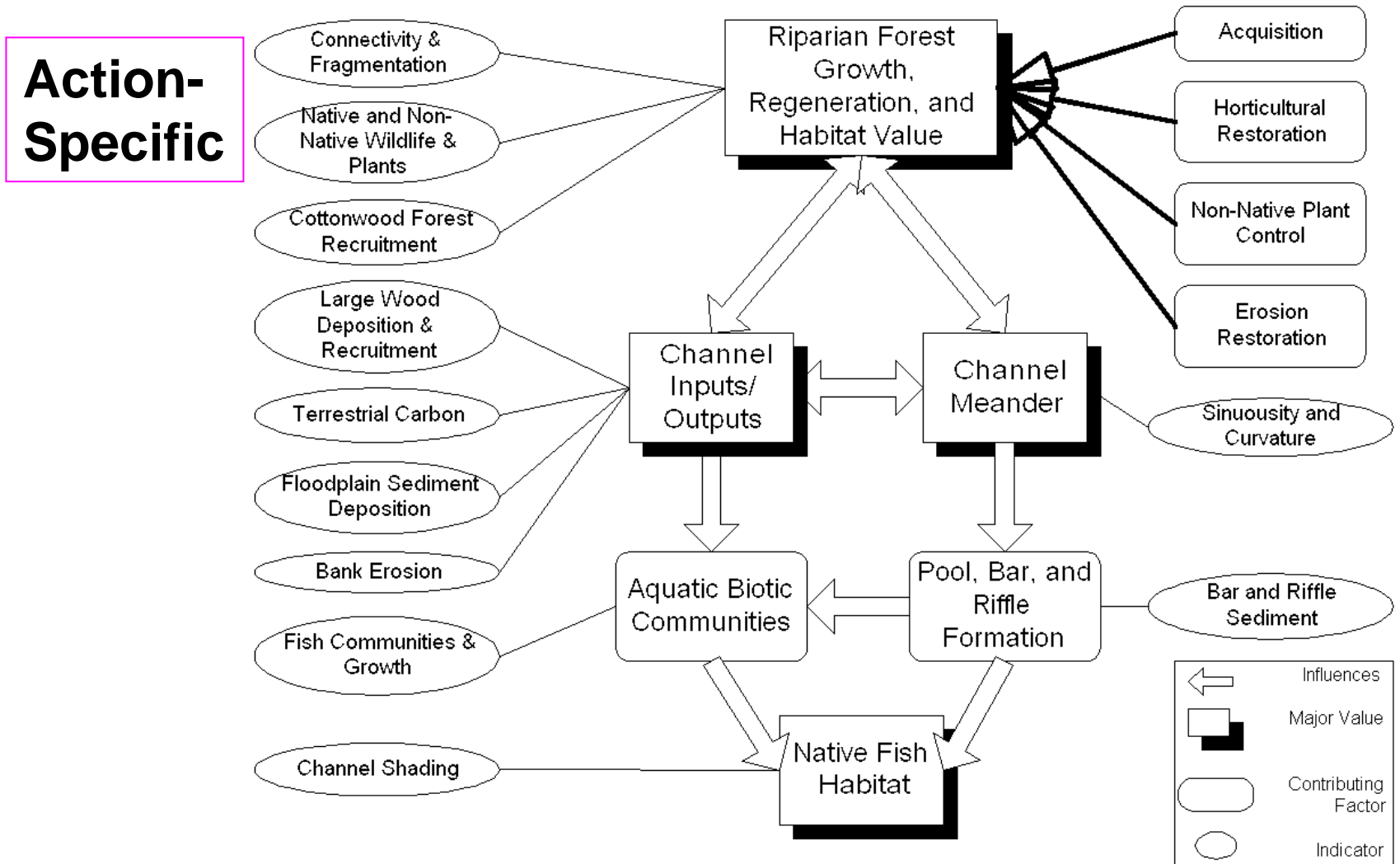
Ecosystem Attribute Conceptual Model



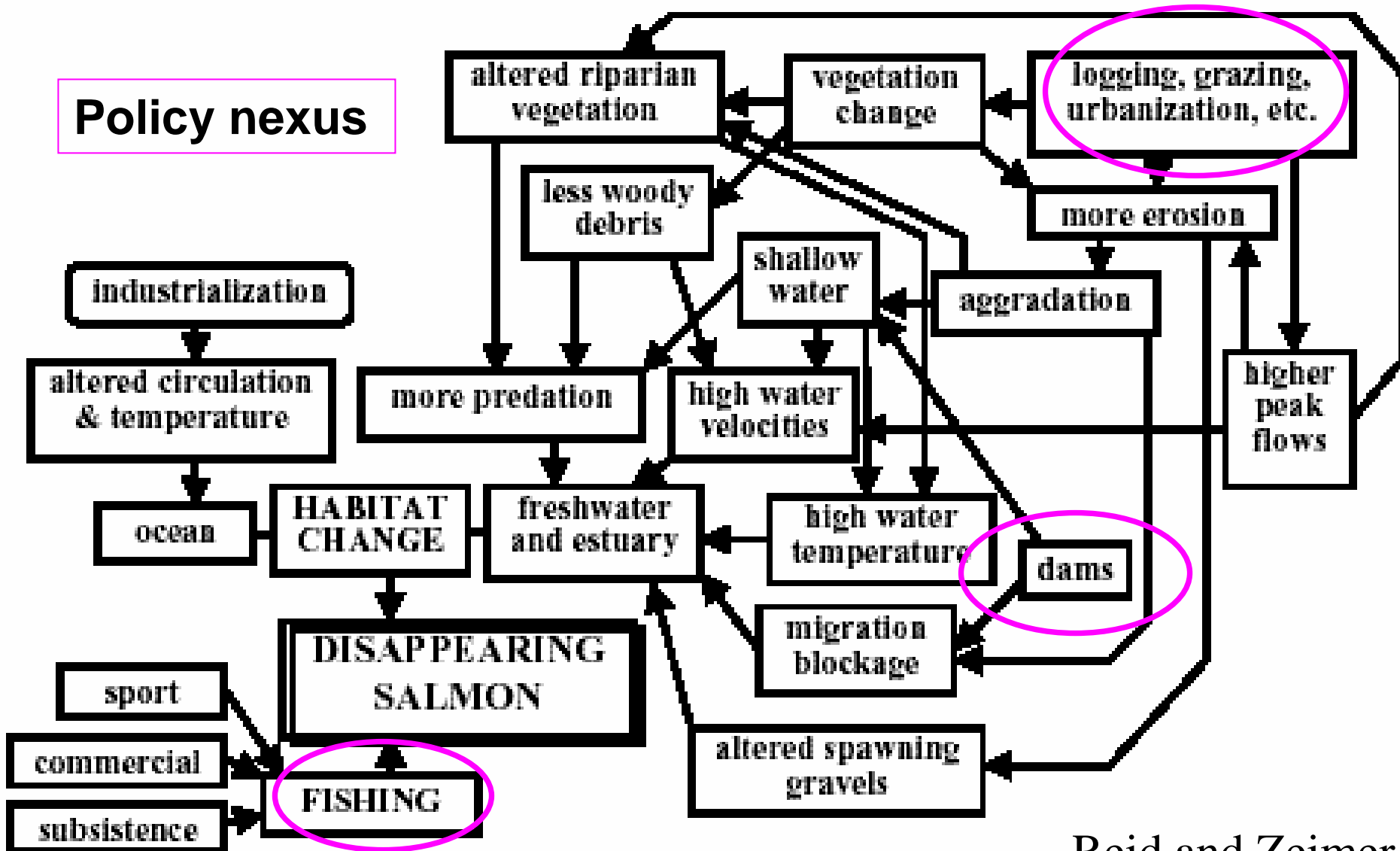
Building an ecosystem-based conceptual model



Ecosystem Restoration Conceptual Model

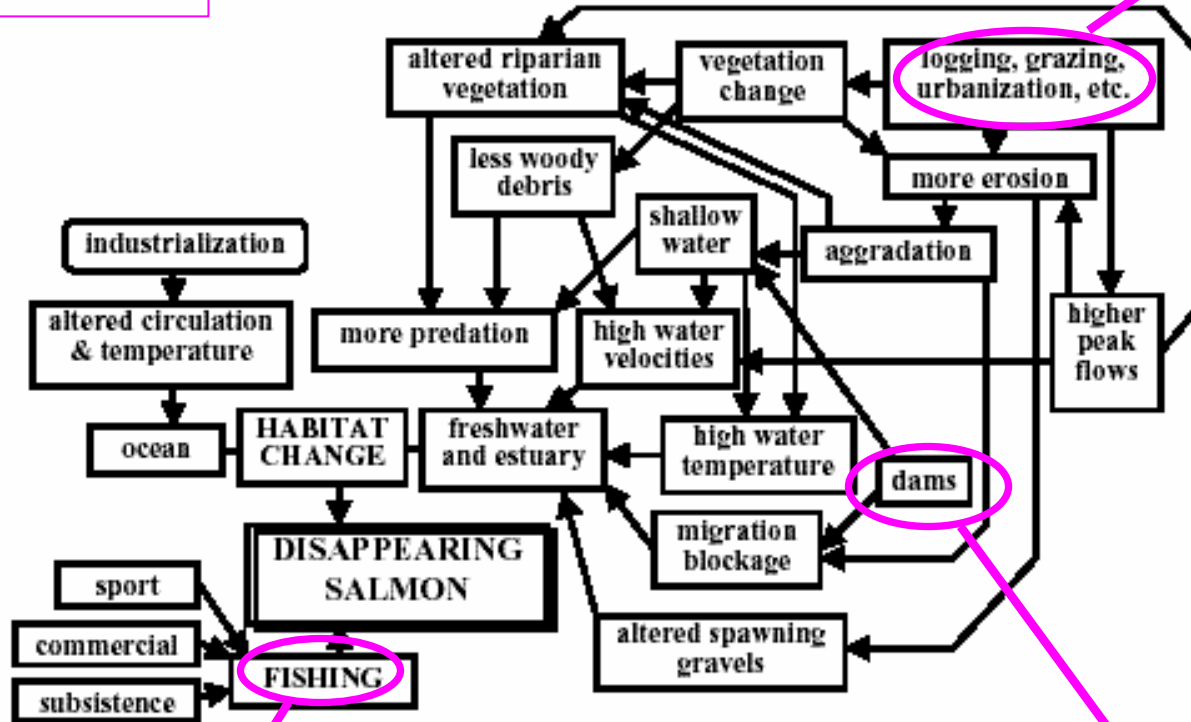


Ecosystem Attribute Conceptual Model



Ecosystem Attribute Conceptual Model

Policy nexus



Endangered Species Act, SWRCB permits, THPs, CEQA, ACE 404

Endangered Species Act, Federal Fisheries statutes, Int'l treaties

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Selecting Indicators

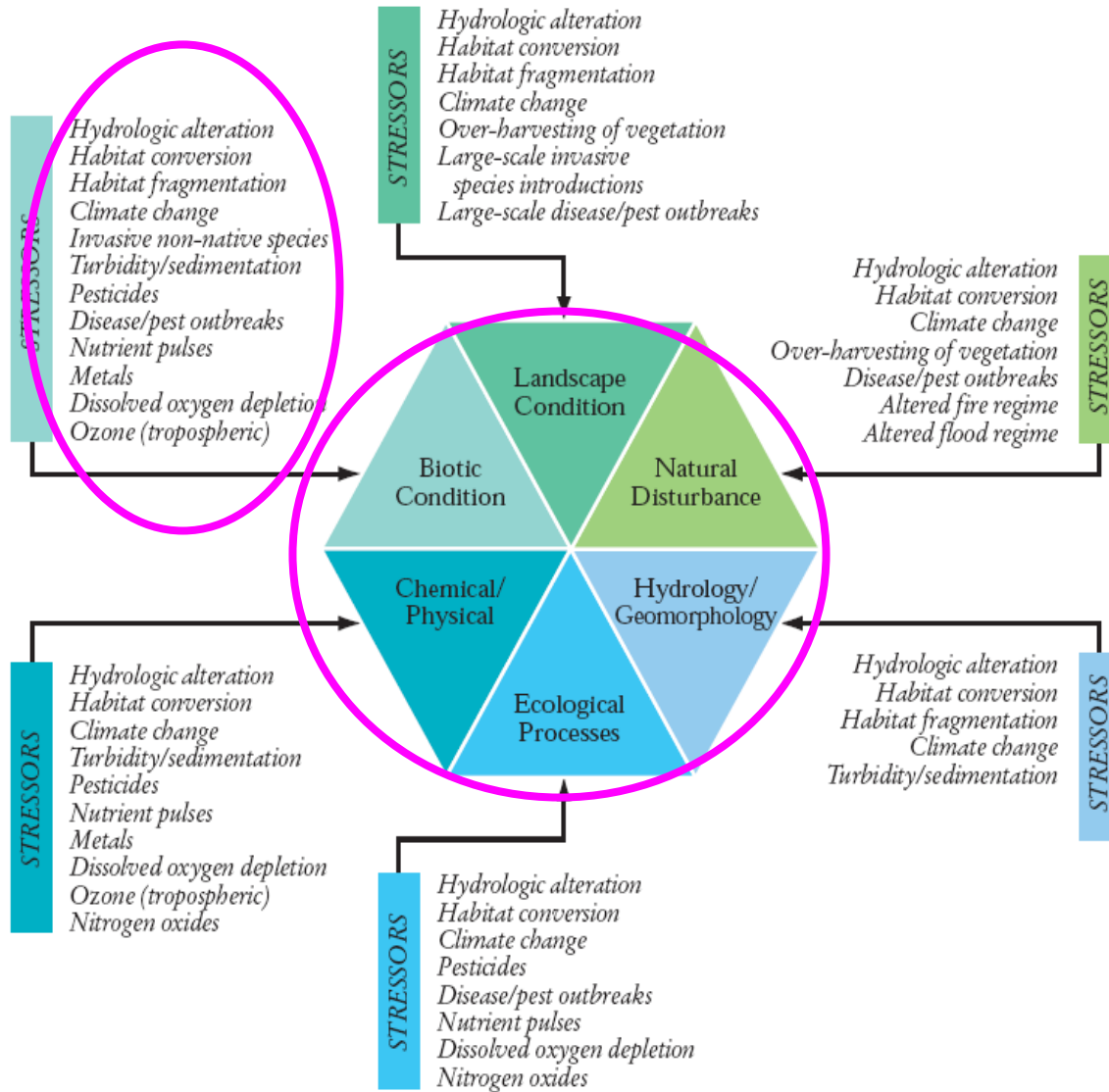
- “An environmental indicator is a discreet measure of one aspect of environmental quality that can be used alone or in combination with other indicators to deliver a message or tell a story related to the overall environmental health of an ecosystem.”
(Chesapeake Bay Program, 2002)

Selecting Indicators

- What are you trying to measure with indicators?
- Are you concerned more about natural processes, or the impact of human actions on natural processes?
- What time scale are you interested in?
- Are there existing indicators that others have used in the same watershed that you could replicate or continue?
- Who are the other parties that may be interested in these indicators and who could assist with investigating them now or in the future?
- Do you have the financial or community resources to investigate indicators?

(Draft guidance in Volume II of the California Watershed Assessment Manual)

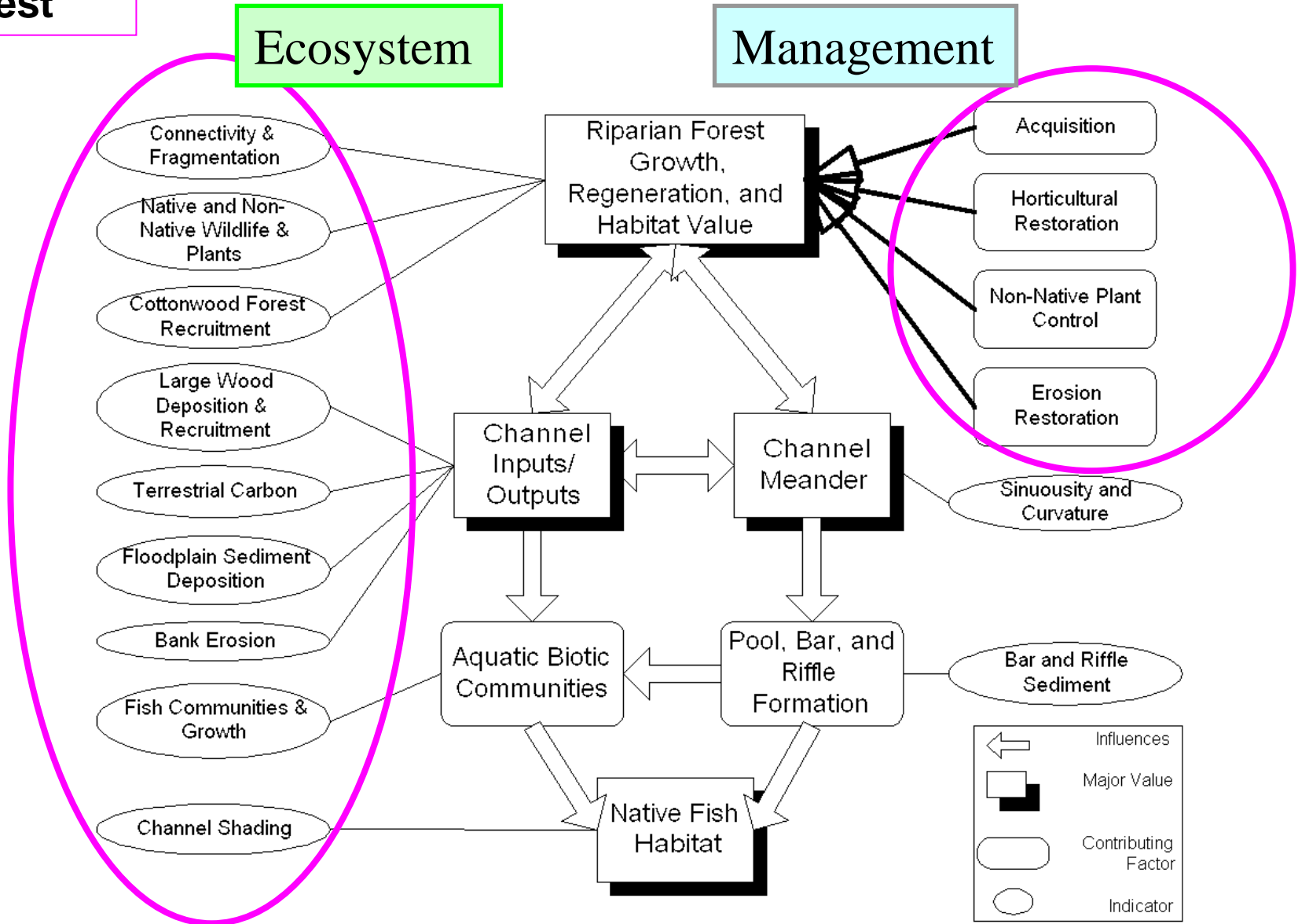
Selecting Indicators



(Draft guidance in Volume II of the California Watershed Assessment Manual, based on USEPA Science Advisory Board Framework)

**Example:
Riparian
Forest**

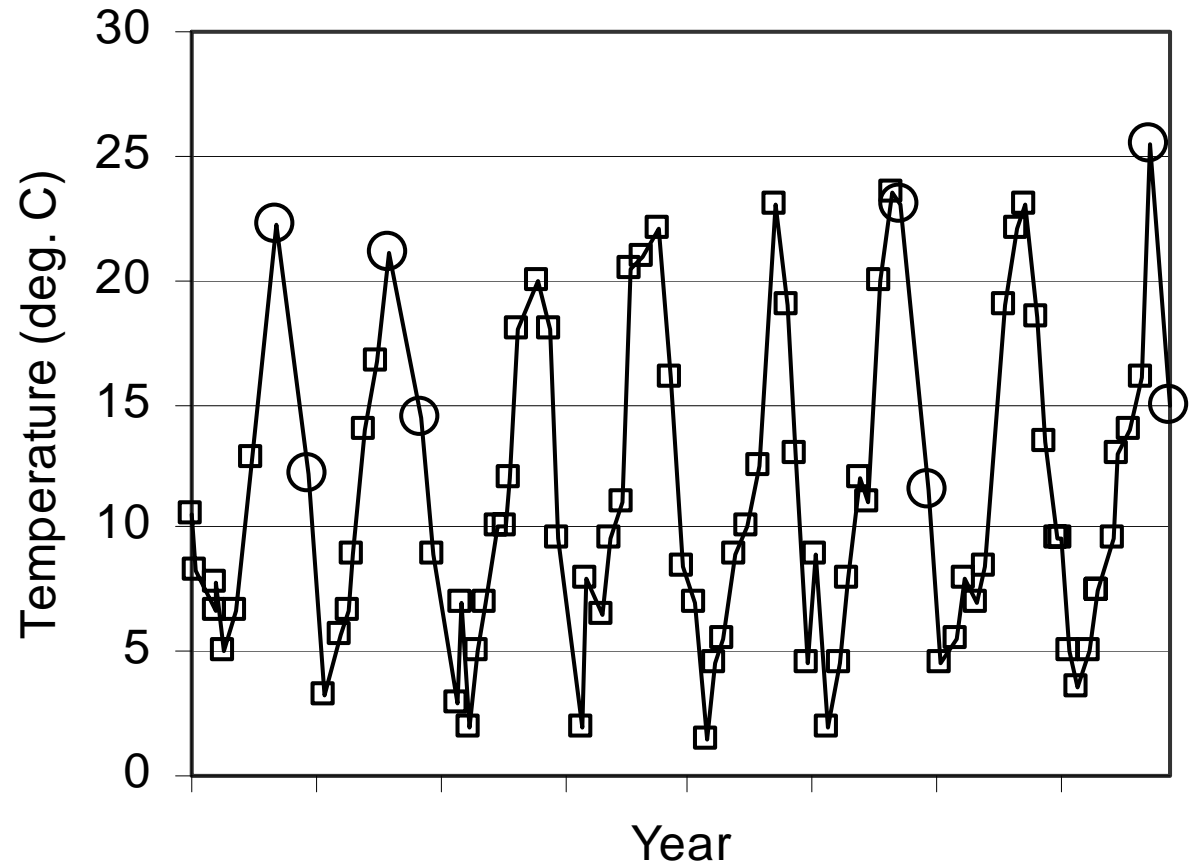
Selecting Indicators



Selecting Indicators

What will they look like?

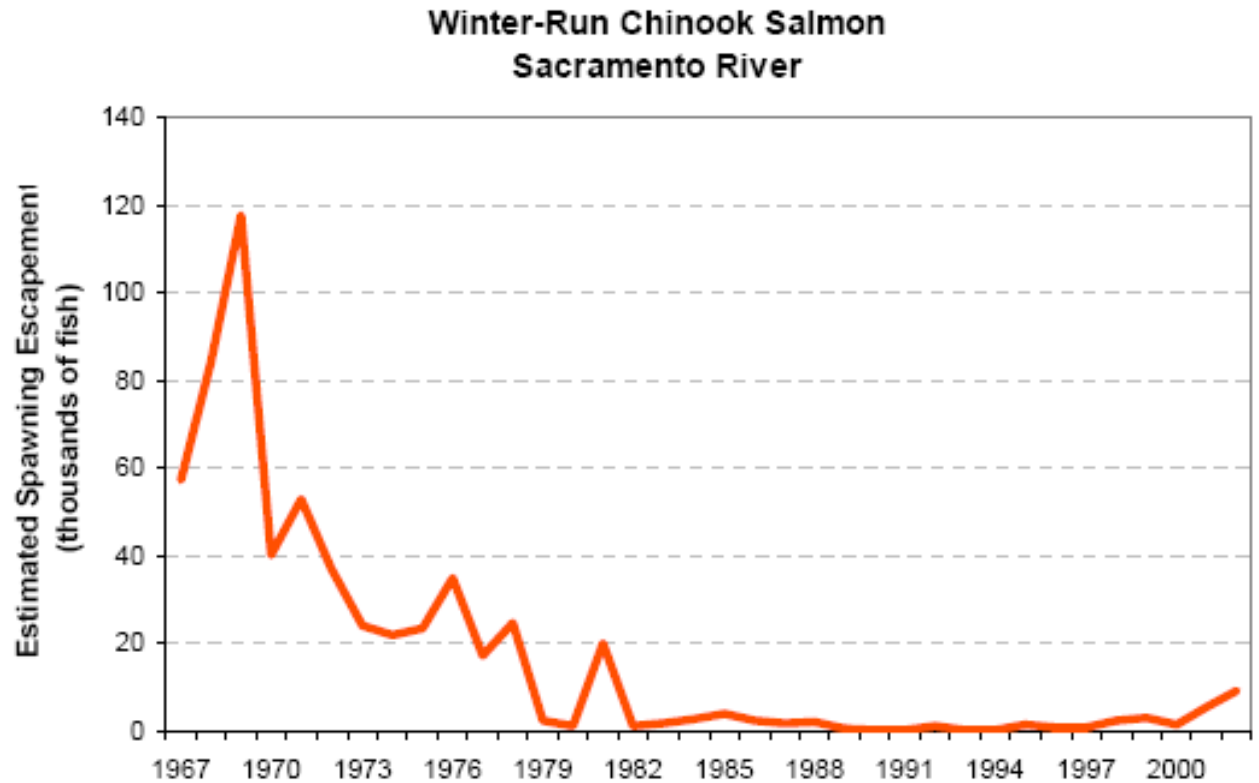
Example –
surface water
temperature
measured several
times a year



Selecting Indicators

What will they look like?

Example – adult salmon escapement from Sacramento River over 3 decades



The background is a colorful painting of a coastal scene. In the foreground, there are green hills with yellow flowers. A bay with blue water and white waves is in the middle ground. In the background, there are blue mountains under a light sky. The overall style is impressionistic and bright.

Contact

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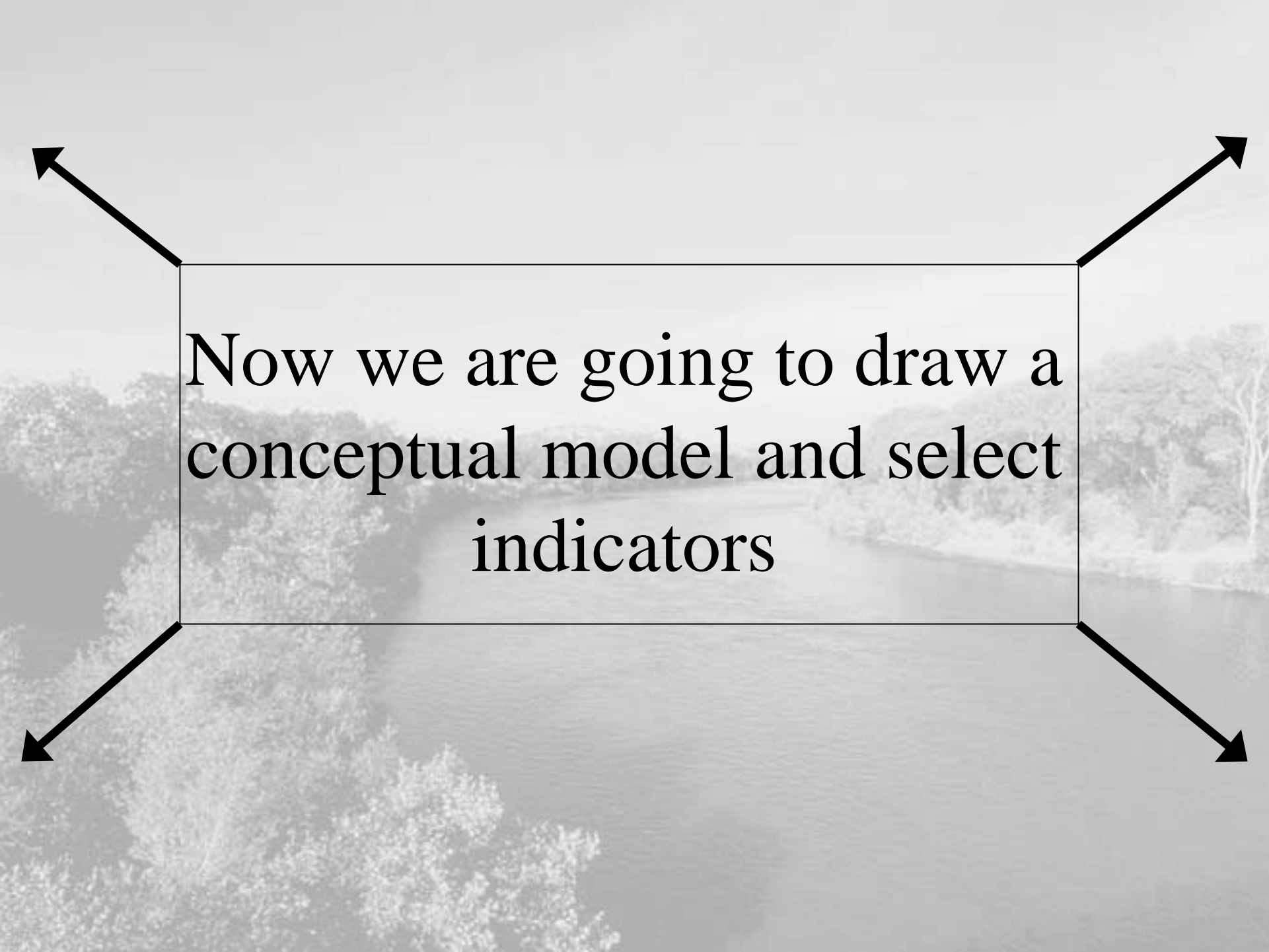
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Big Sur Coast, Pracheta Kokate (Grade 11)

(courtesy California Coastal Commission, 2005, Coastal Art & Poetry Contest)

Pracheta



Now we are going to draw a
conceptual model and select
indicators

