Dealing with Uncertainty in policy decisions:
Tales of flips

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Topics

- Ecological Surprise in Florida Bay
- Institutional Responses to Surprises
- Where’s the Problem?
- Types of Learning

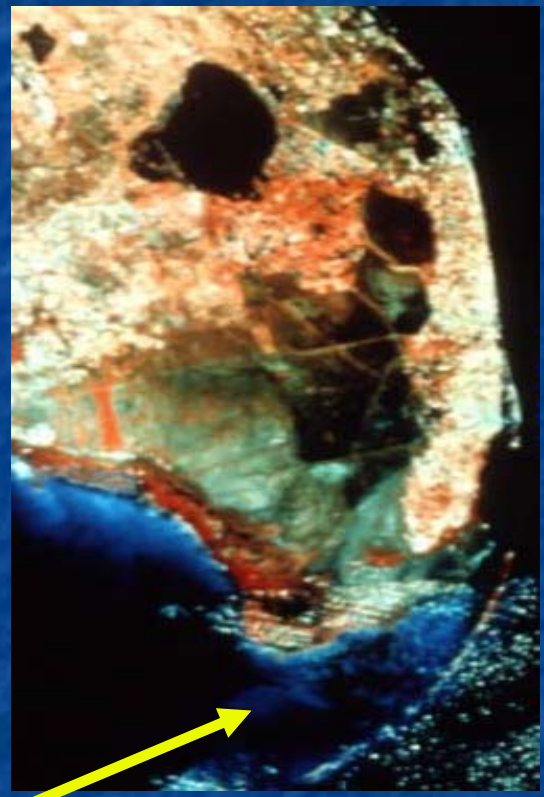
Florida Bay

Shallow Marine Lagoon

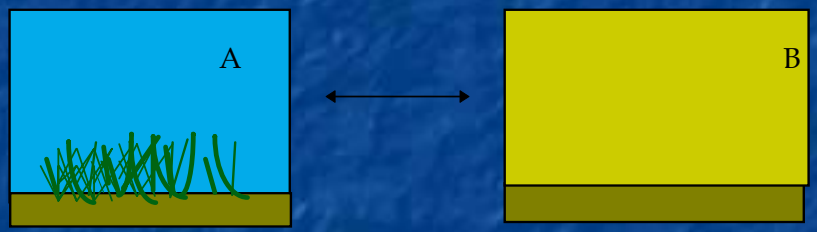
Everglades National Park

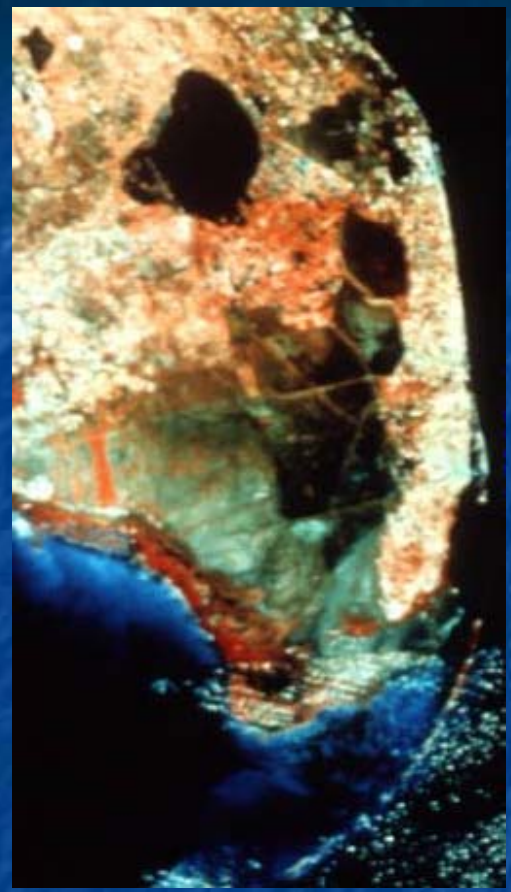
100 years - Seagrass

Tourism, Recreational Fishery



~1990- Seagrass Dieoff

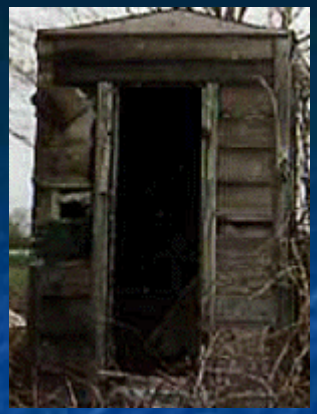




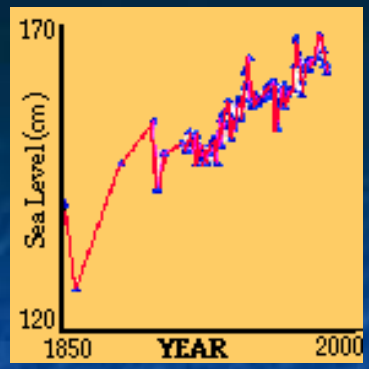
Seagrass
Clear Water

Muddy Water
Algae Blooms

Florida Bay Hypotheses

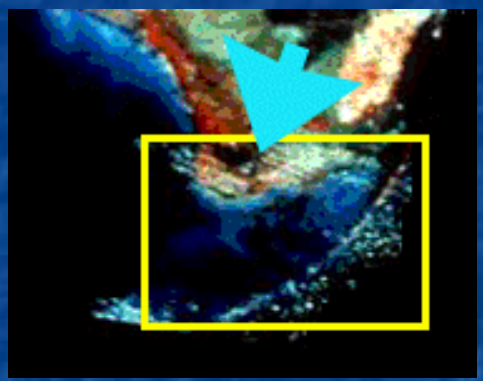


Outhouse Bay



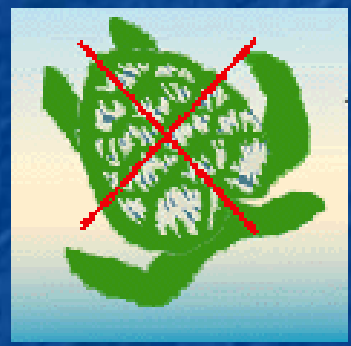
Rising Bay

Senile Bay



Thirsty Bay

Strangled Bay

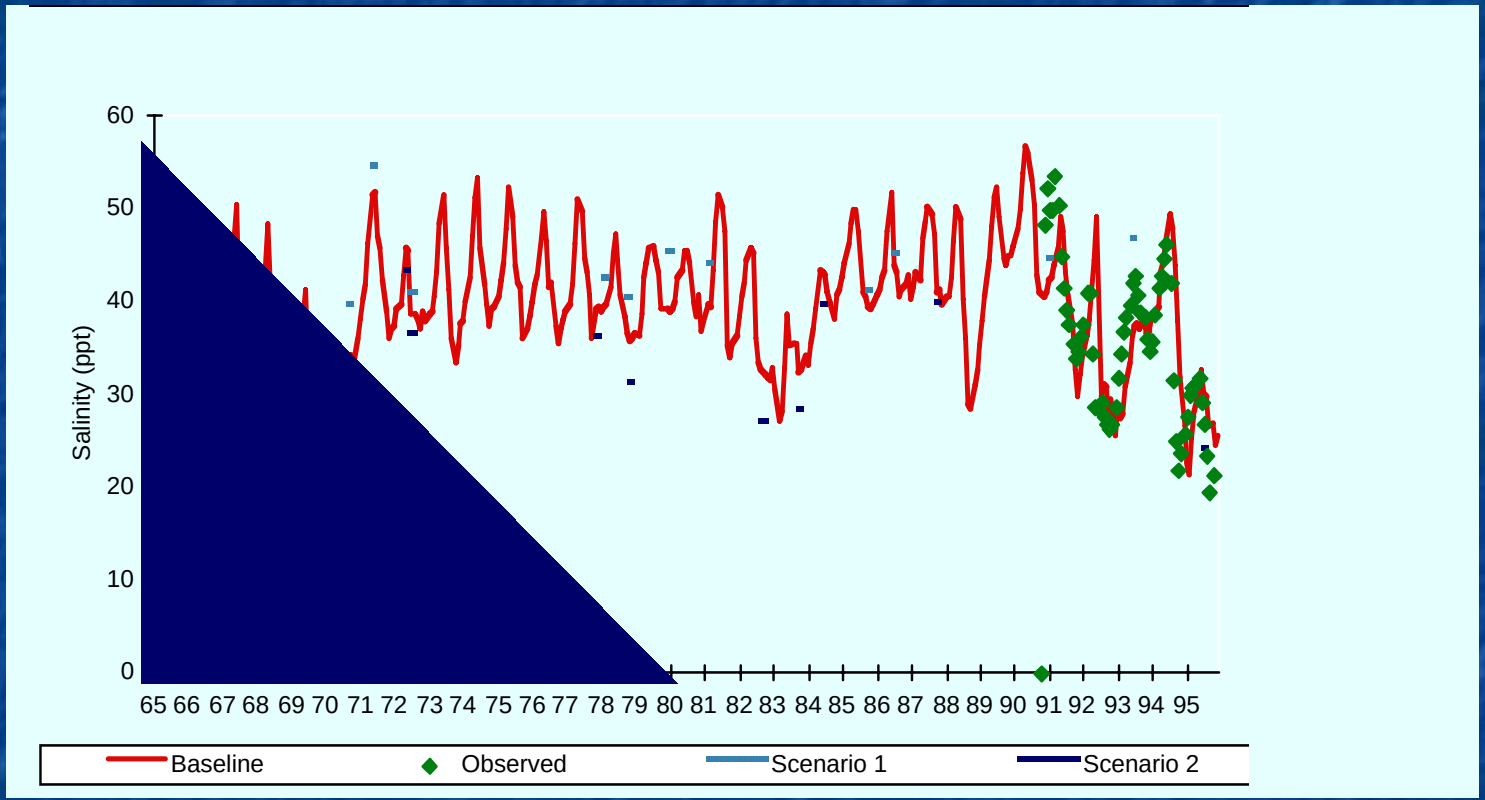


Topless Bay

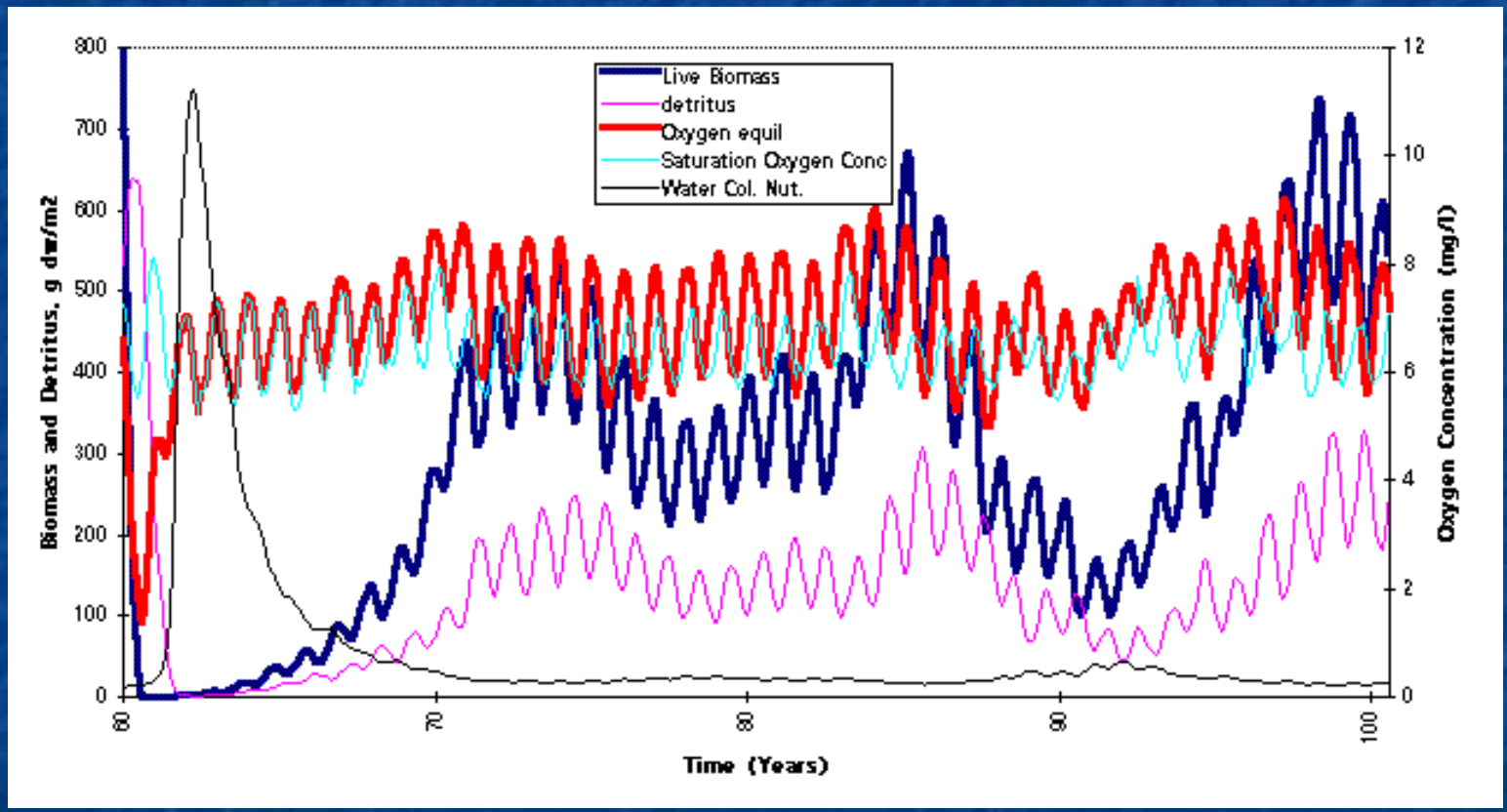
Water Color/Movement Patterns

QuickTime™ and a Graphics decompressor are needed to see this picture.

Modeling Salinity (reconstruction)



Seagrass Biomass



Summary of Assessment

- Die-off not from single ‘stressor’
  - Salinity or disease or nutrients
- System stability led to vulnerability
  - Lack of disturbances (grazers, storms)
- Thermal event, high biomass, spatially homogenous
  - Autocatalytic die-off

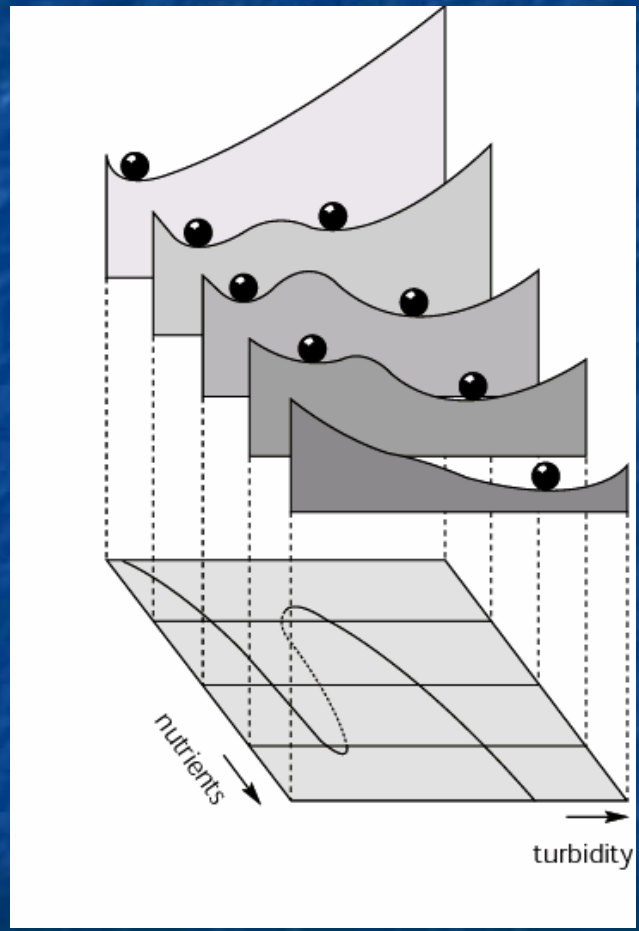
Social Responses

- Blue Ribbon Panel
  - Generate Plausible Hypotheses
  - Paucity of Data
- Lots of Monitoring/Studies
- Management Action: More Freshwater!!!
  - Politically popular
  - Fix that backfired

Ecological Resilience

Multiple Stable States

System	State A	State B
Lakes:	Clear	Turbid
Rangelands:	Grass	Shrub
Coral Reefs:	Corals	Algae
Everglades:	sawgrass	cattail
Forests:	Pines	Hardwoods



Surprises from Nature

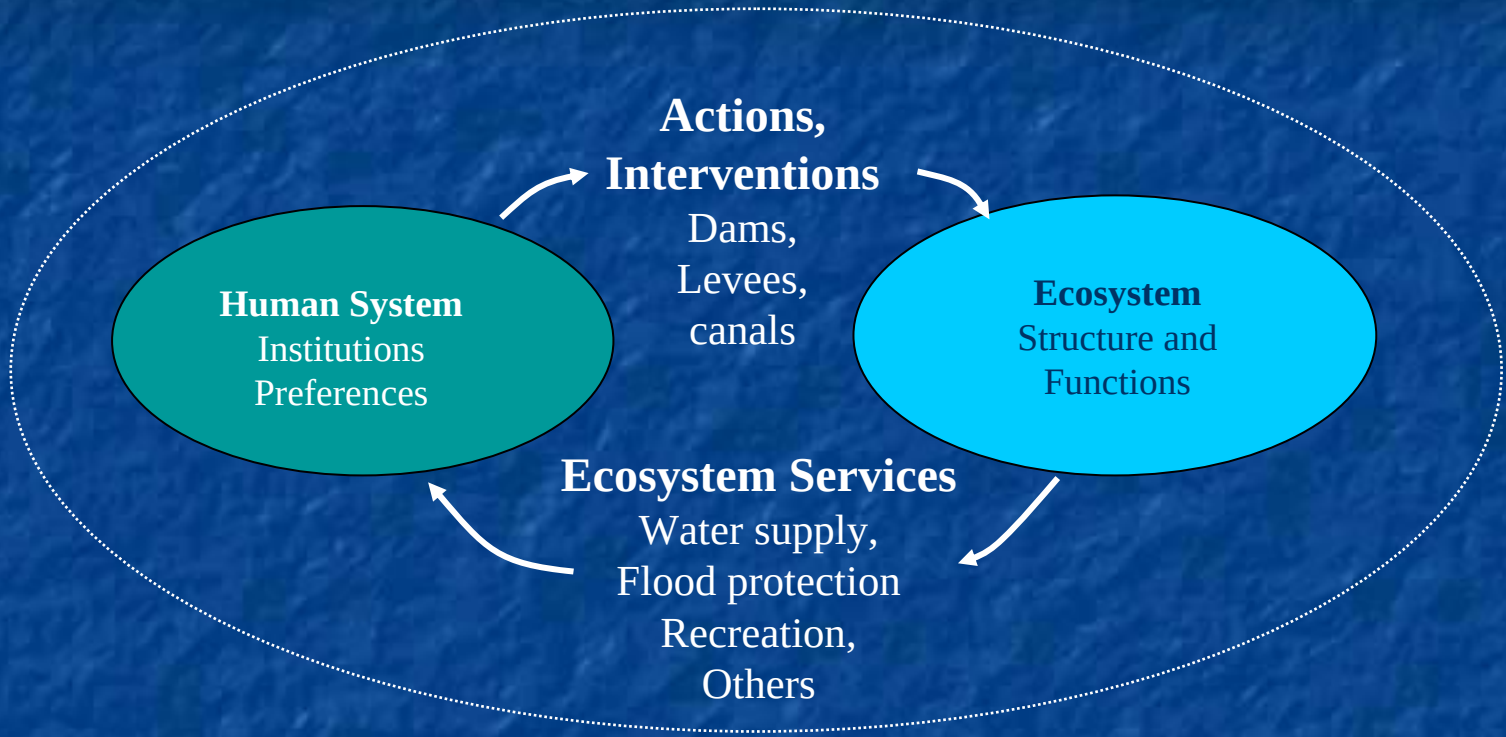
- Drought-flood cycles
- Nutrients in lakes, wetlands
- Population declines
- Spread of exotic organisms
- global climate change

Everglades

Ecosystem Change	Institutional Respon
Flood 1903	Drainage District
Hurricanes 1920's	Corps of Engineers
Flood 1947	Flood Control District
Drought 1971	Water Management District
Crisis 1983	Everglades Coalition
Restoration 1994	Fed/State/Local Meshing Groups

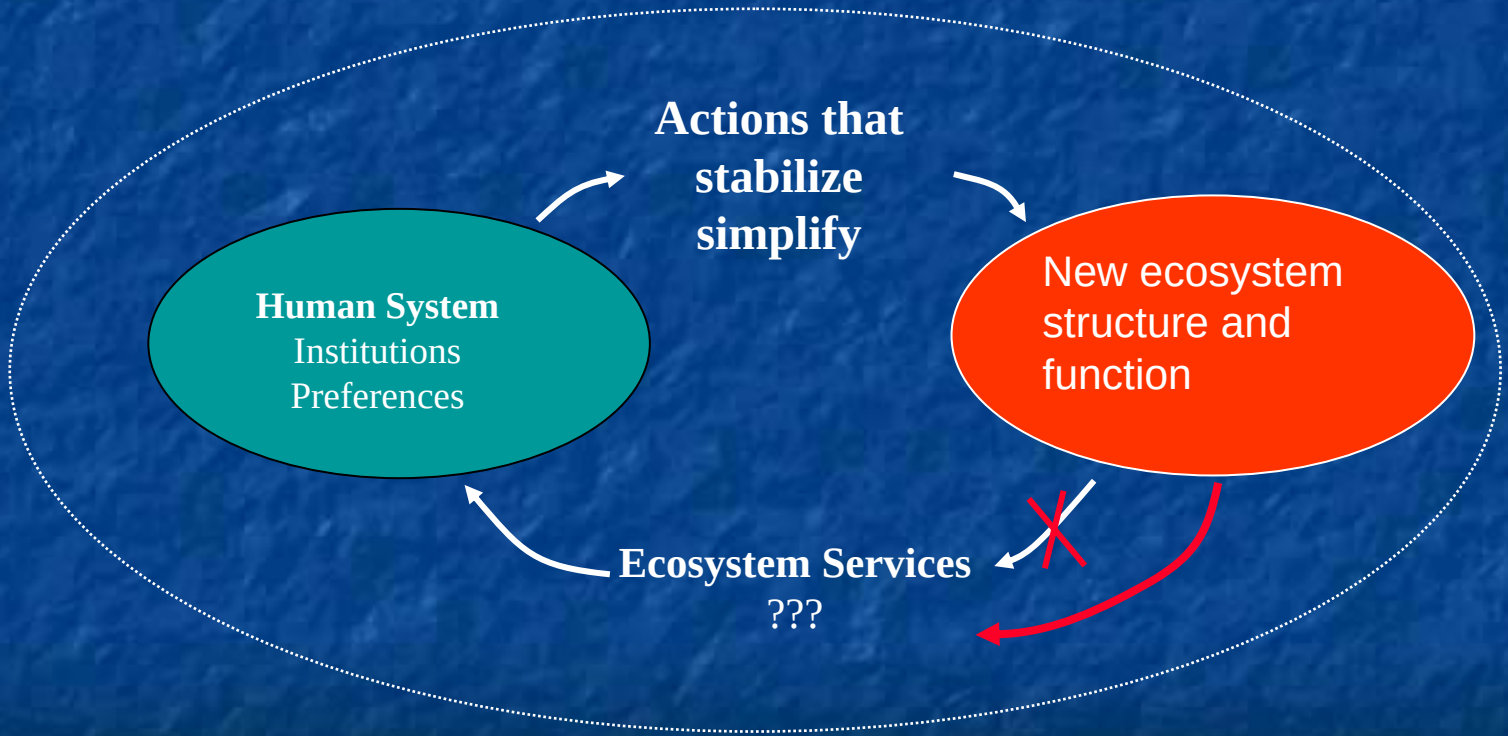
Grand Canyon

Ecosystem Change	→	Institutional Respo
Water Shortage (1910s) (population in California)	→	Colorado Compact
Variable Flow (1940s)	→	Colorado Storage Project (Dam Construction 1950-60)
Extirpation of Fish (1970)	→	Multi Agency Task Force
Sediment, Fish declines (1980)	→	Ecosystem Study
Endangered Fish Act (1994)	→	Adaptive Management Group

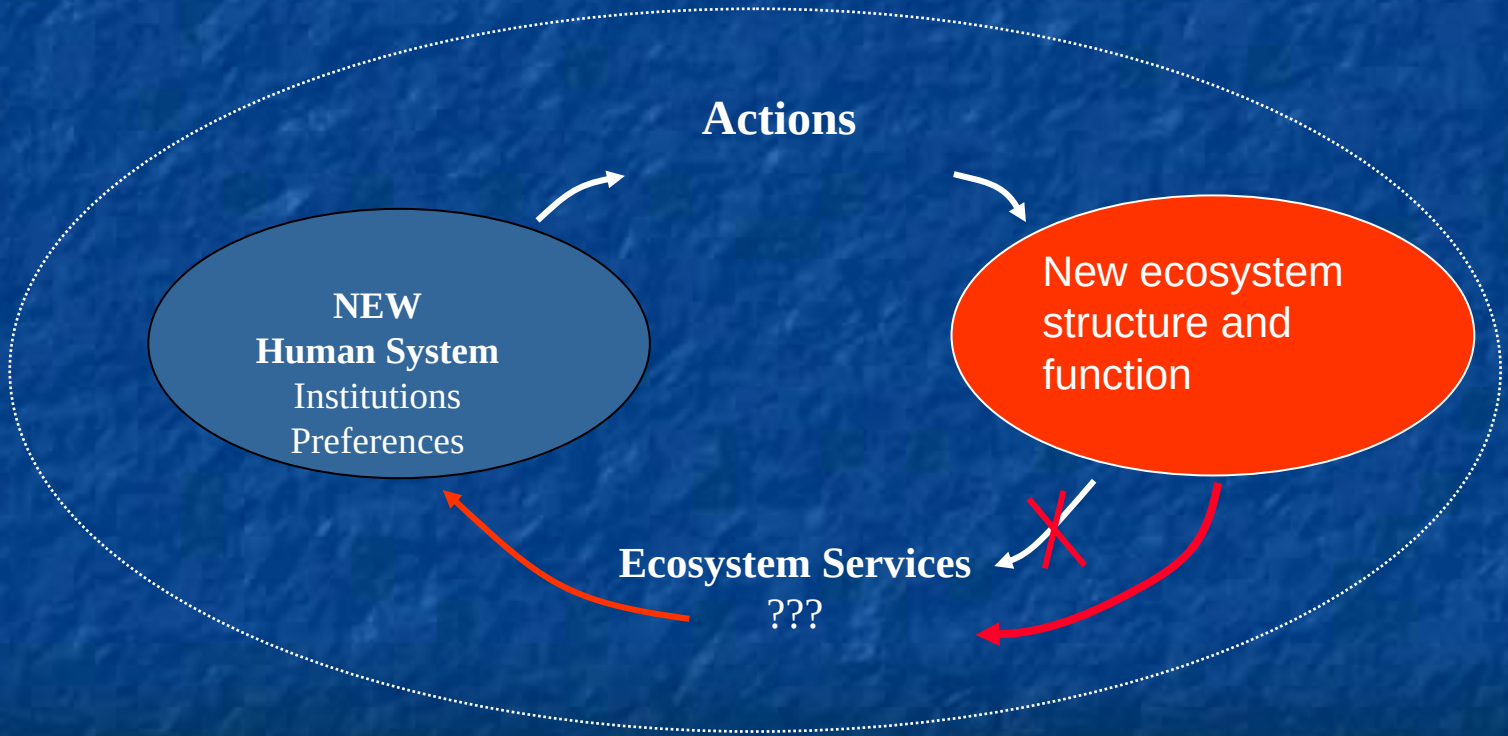


Social-Ecological System

Pathology of Command and Control



Pathology of Command and Control



Where's the Problem?

Problem Domains

- Science
- Organization
- Community
- Politics

Managing Uncertainty

-Problem Domain

-science

-organizational

-community

-political

- adequate theory
-multiple hypotheses
-tractability (complexity)
-confronting models w/data
-independence/ rigor
-novel approaches
-types of inquiry

Managing Uncertainty

-Problem Domain

-science

-organizational
-community
-political

- expressions of power
- no correct scale
- windows for change
- issue phases
- diversity of groups
- multiple discourses
- arenas for discourse

Types of Learning

- Incremental - update existing model within domain (single loop)
- Lurching - generate new model (double loop)
- Transformative - new model, new problem domain

Keys to Resilience Management

- Focus on Learning
  - Question/test assumptions
  - Multiple modes of inquiry
  - Integration of understanding
  - Sorting among hypotheses
- Manage multiple problem domains
  - Ecological Resilience
    - Provides buffer for actions
  - Social Capital and Trust
  - Need for arenas for resolving uncertainties

Questions/Comments?

Alice felt dreadfully puzzled. The Hatter's remark seemed to have no sort of meaning in it, and yet it was certainly English. `I don't quite understand you,' she said, as politely as she could.