Measuring the Sustainability of Water Management in the U.S.

SWRR at the COG Meeting

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Sustainable Water Resources Roundtable
January 25, 2007

Sustainable Water Resources Roundtable

A national collaboration of federal, state, local, corporate, non-profit and academic interests

Our Mission

To promote sustainability of our nation's resources through …

- Evaluation of information
- Development & use of indicators
- Targeting of research
- Engagement of people & partners

… to improve the management, conservation and use of water & related resources

Our Vision

A future in which our nation's water resources support the integrity of economic, social, and ecological systems and enhance the capacity of these systems to benefit people and nature

Principles of Water Sustainability

1. ***The value & limits of water***

   People need to understand the value and appreciate the limits of water resources and the risks to people and ecosystems of unbounded water and land use

Principles of Water Sustainability

2. ***Shared responsibility***

   Because water does not respect political boundaries, its management requires shared consideration of the needs of people and ecosystems up- and downstream and throughout the hydrologic cycle

Principles of Water Sustainability

3. ***Equitable access***

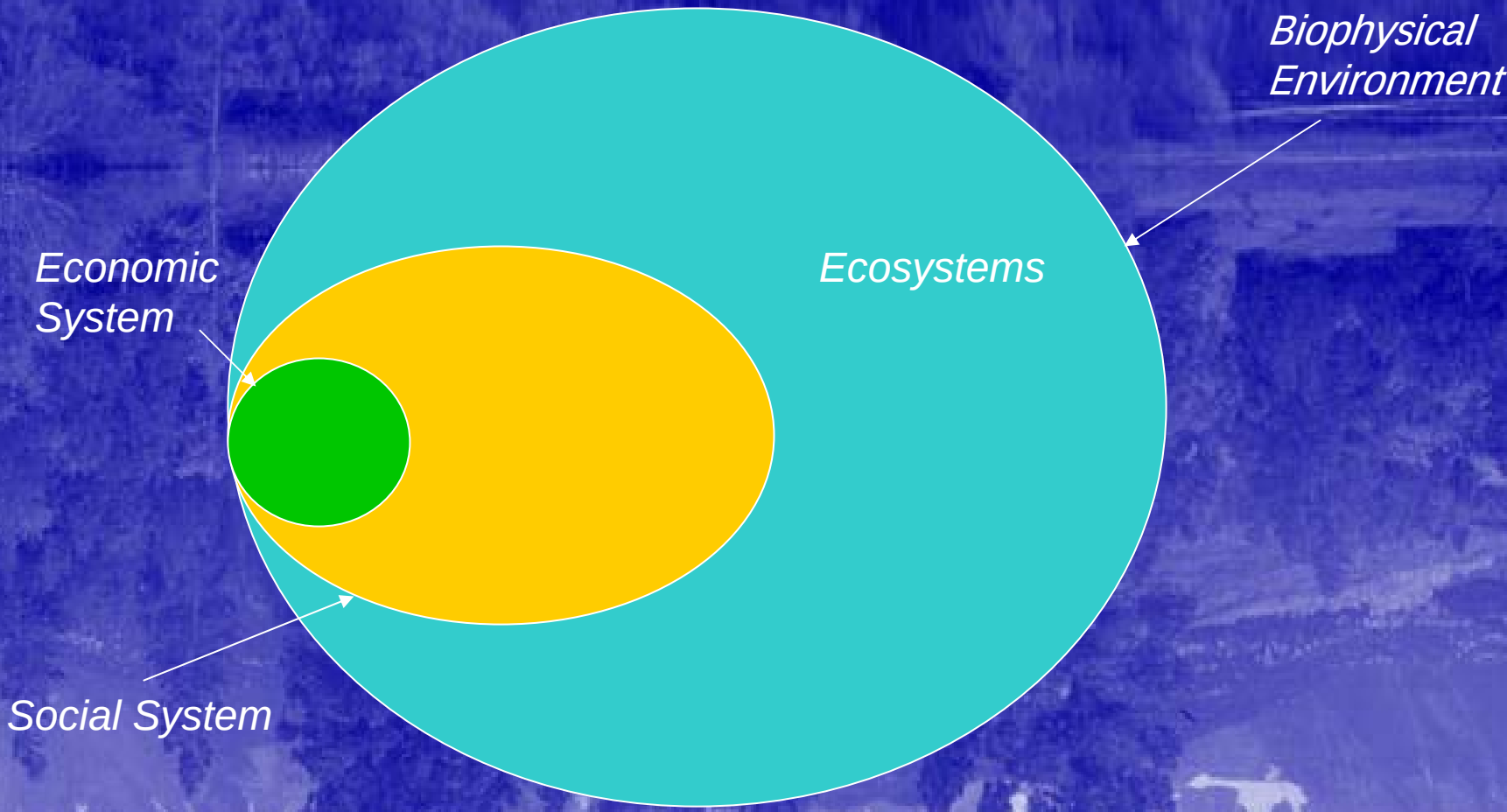
   Sustainability suggests fair and equitable access to water, water dependent resources and related infrastructure

Principles of Water Sustainability

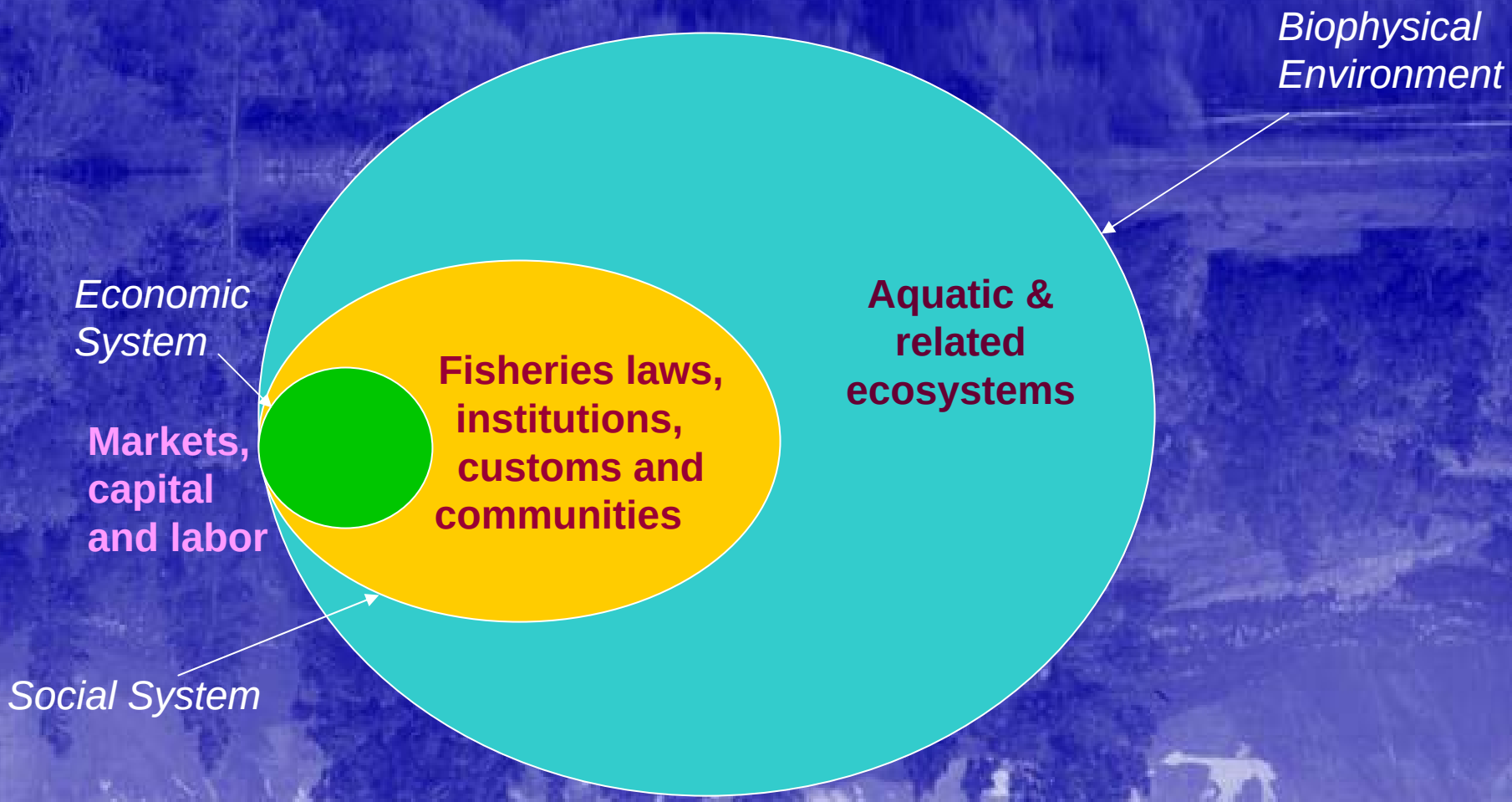
4. ***Stewardship***

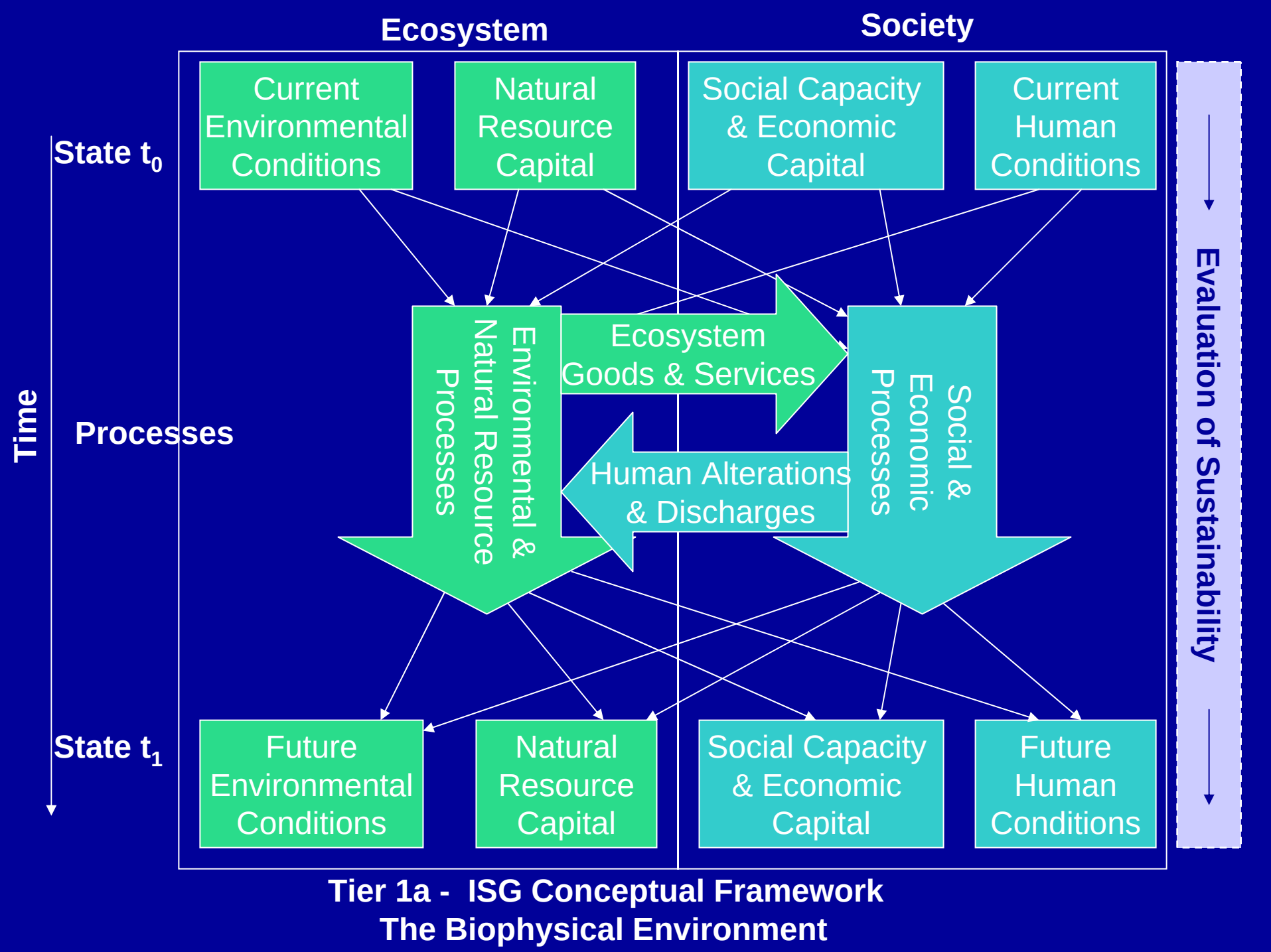
   Managing water to achieve sustainability challenges us while meeting today's needs to address the implications of our decisions on future generations and the ecosystems upon which they will rely

General Systems Perspective



Fisheries Systems Perspective





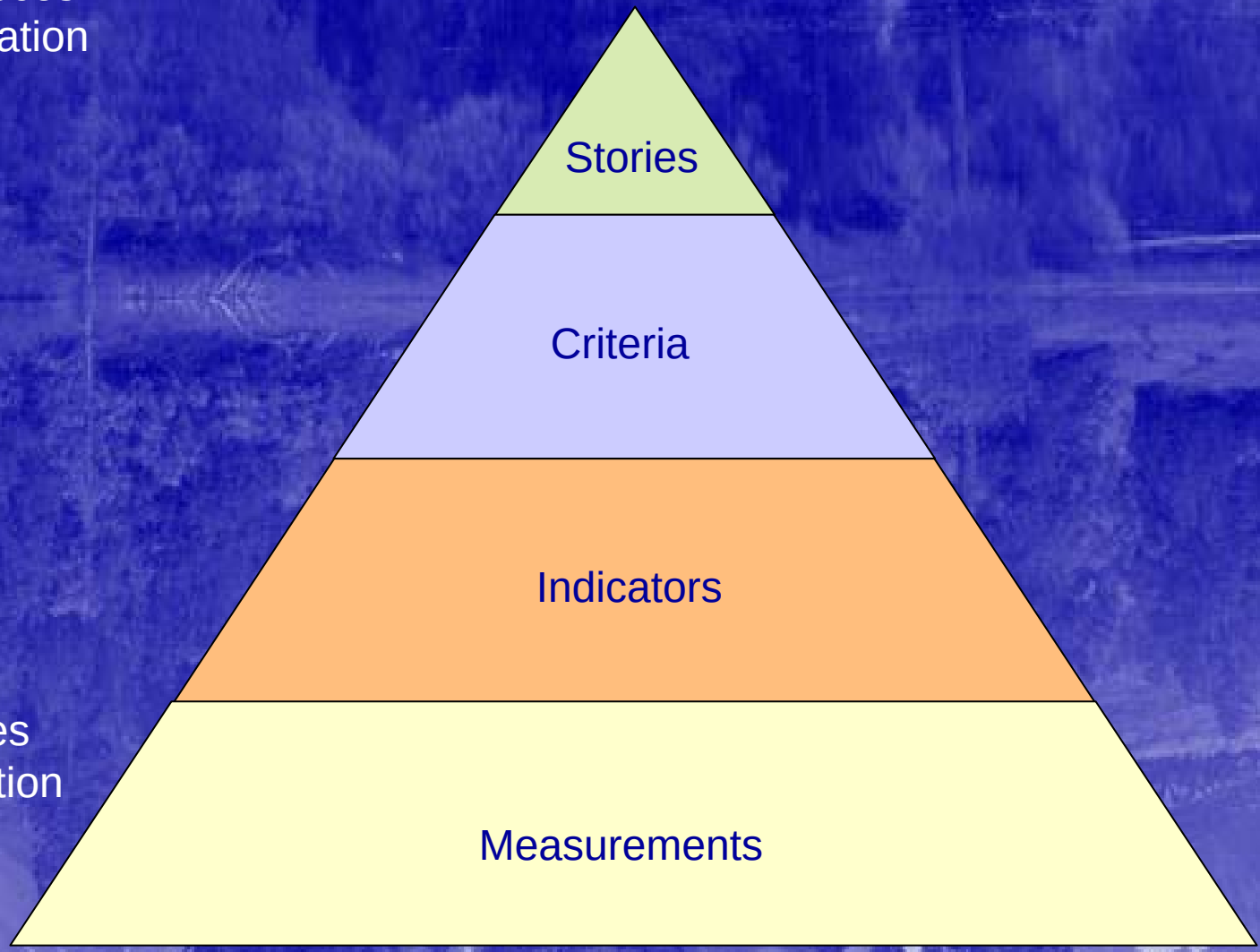
Tier 1a - ISG Conceptual Framework
The Biophysical Environment

Capital and Systems Capacities

- Capital is the capacity to produce value over time
- Natural, social and economic systems produce value through flows of services, experiences, or goods that meet human and ecosystem needs over time
- We achieve sustainability by maintaining capital to meet needs

Information Pyramid

Fewer Pieces
Of Information



More Pieces
Of Information

Indicators

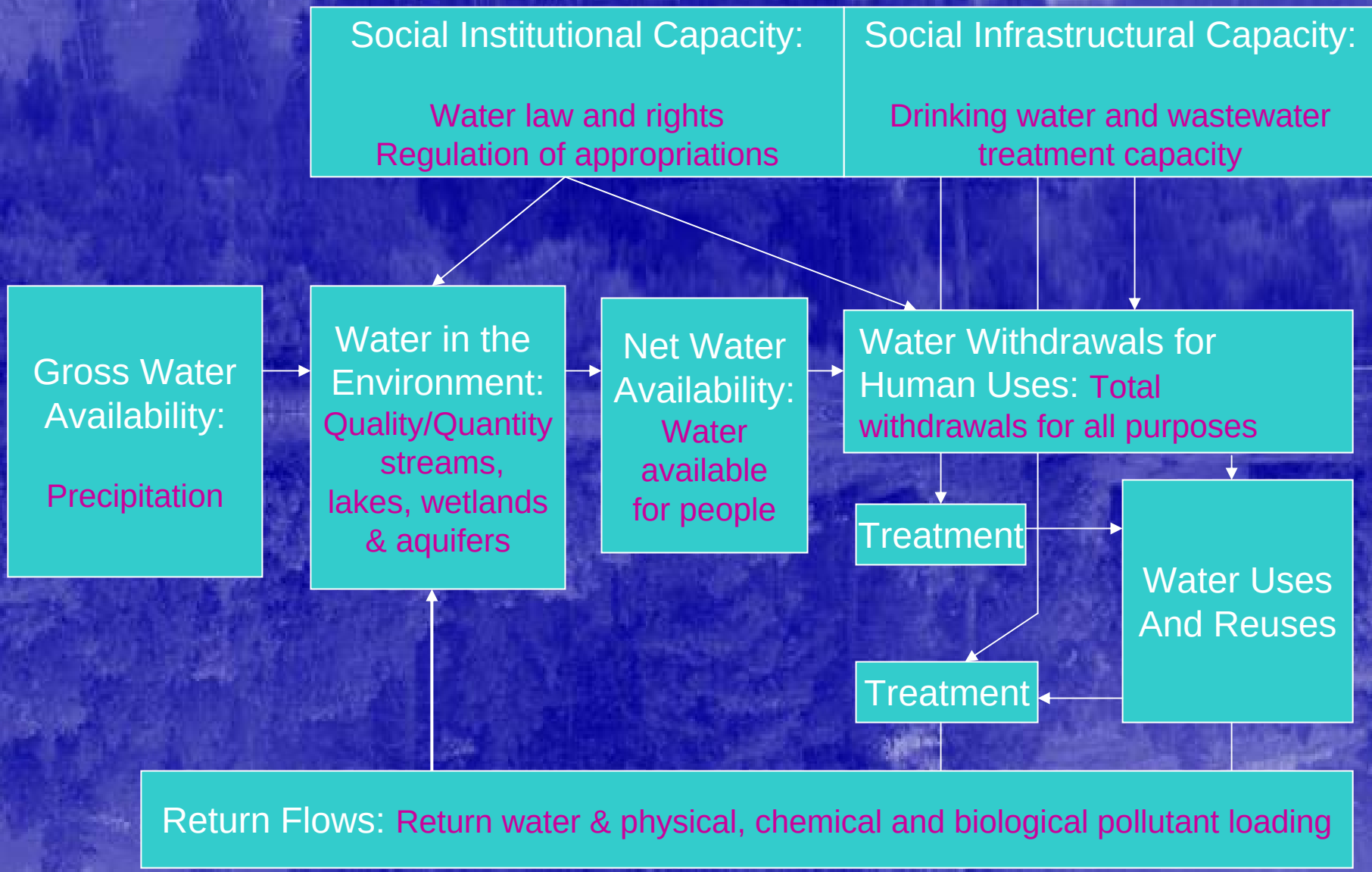
Measures that present information relevant to water sustainability in a readily understandable way

Why Develop Indicators?

- To affect how decisions are made over time
- To improve feedback
  - Indicators add measured facts to the "chatter"
  - Indicators provide common knowledge for the stories we tell each other

Major Categories of Indicators

1. System capacities and their allocation
2. Consequences of water allocation
3. Effects on people
4. Underlying processes and driving forces
5. Composite sustainability assessment



System Capacities and Their Allocation

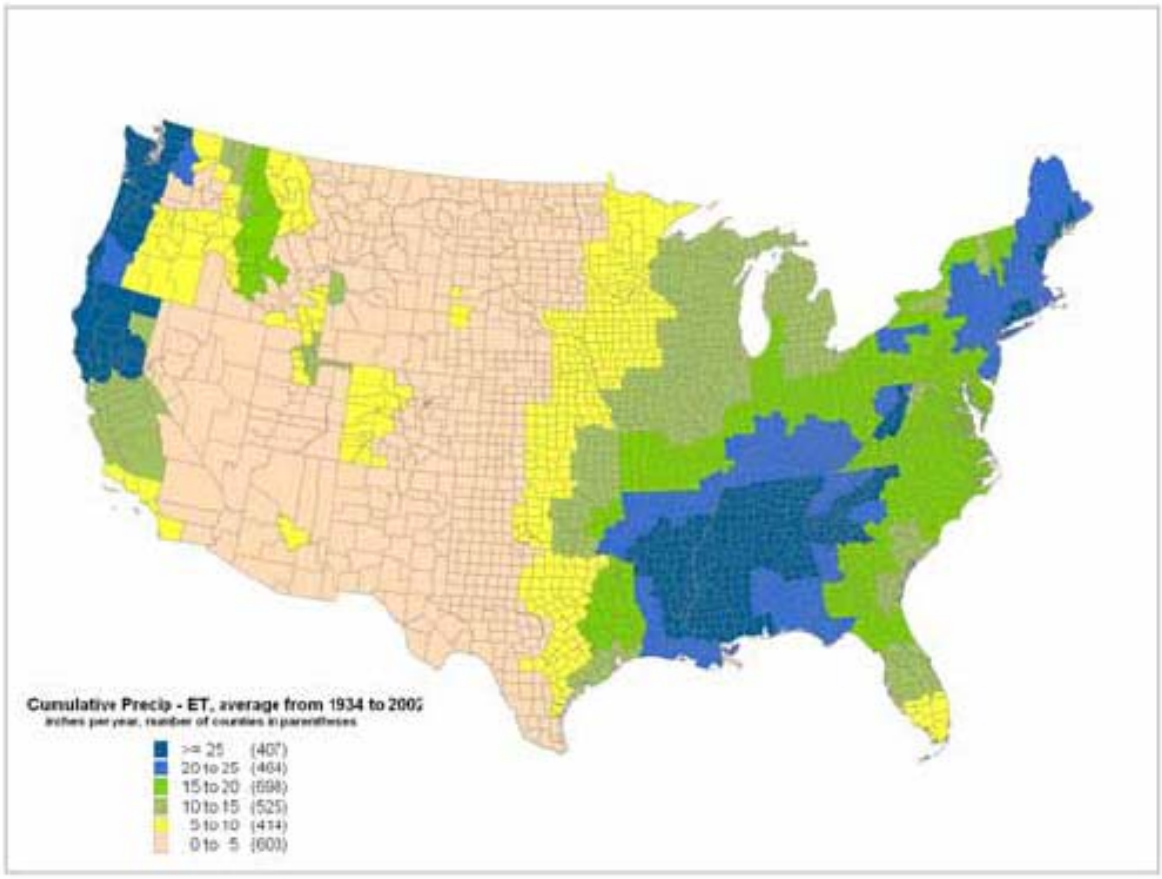
Example Indicators

System capacities and their allocation

1. Gross water availability
2. Total withdrawals for human uses
3. Water remaining in the environment after withdrawals and consumption
4. Water quality in the environment
5. Total capacity to deliver water supply (i.e., infrastructure capacity)
6. Social and organizational capacity to manage water sustainably

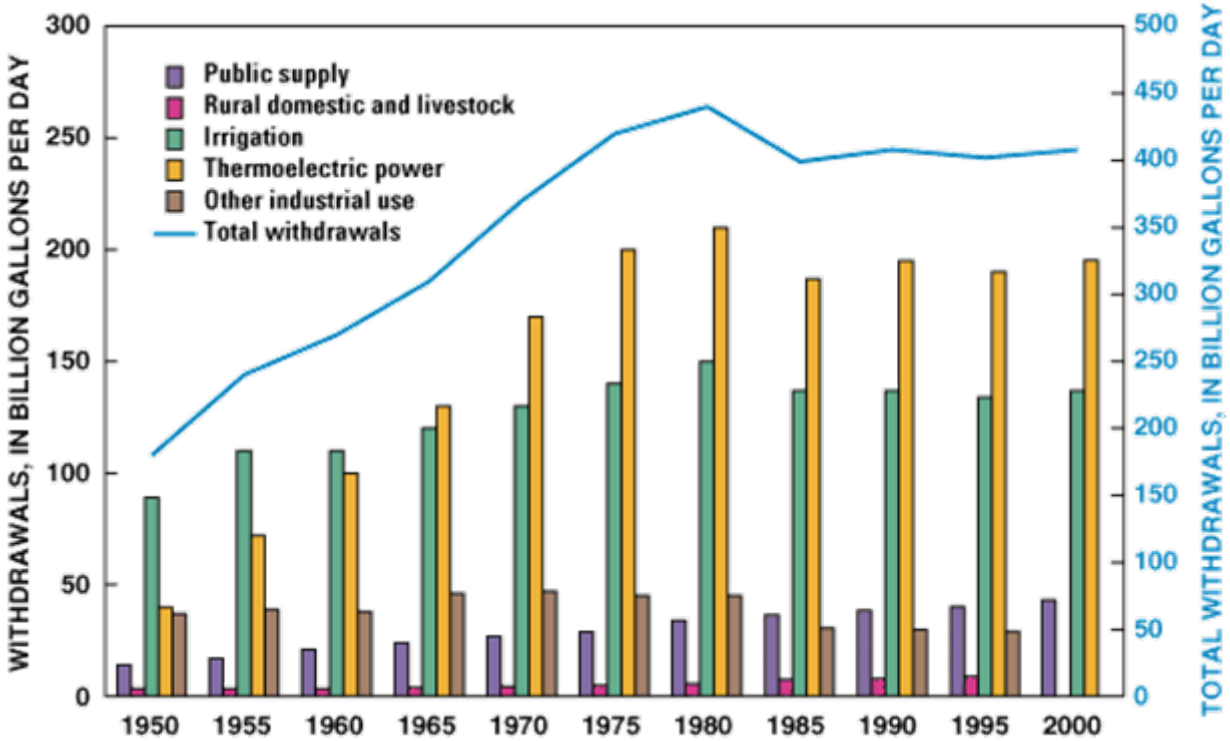
Figure 4.1.1.

Available Precipitation

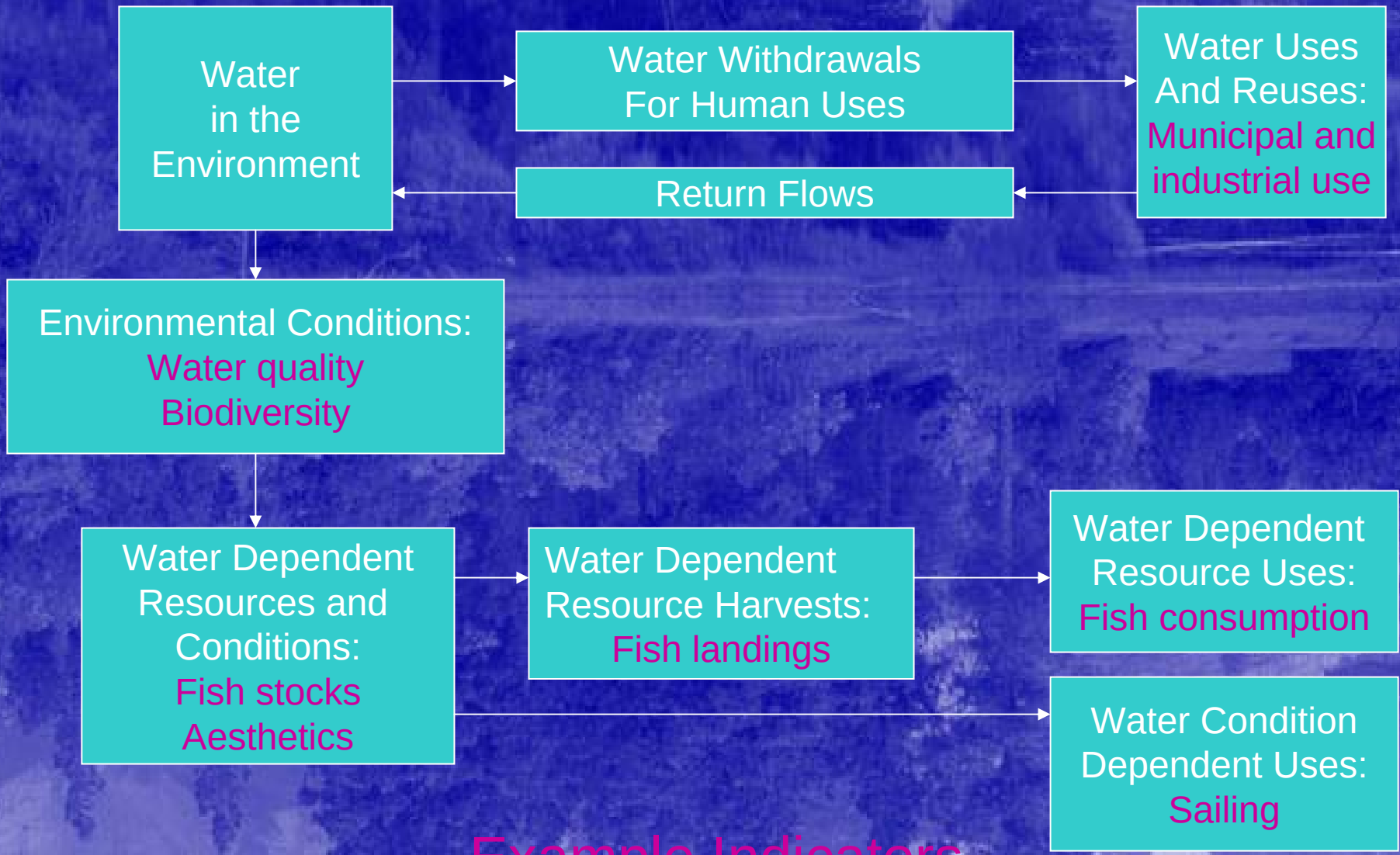


Source: S. Roy, K. Summers and R. Goldstein

Trends in Total US Water Withdrawals, 1950-2000



Consequences of Water Allocation



Consequences of the way we allocate water capacity

7. Environmental conditions
8. Resource conditions
9. The quality and quantity of water for human uses
10. Resources withdrawals and use

Ground Water Levels in the High Plains

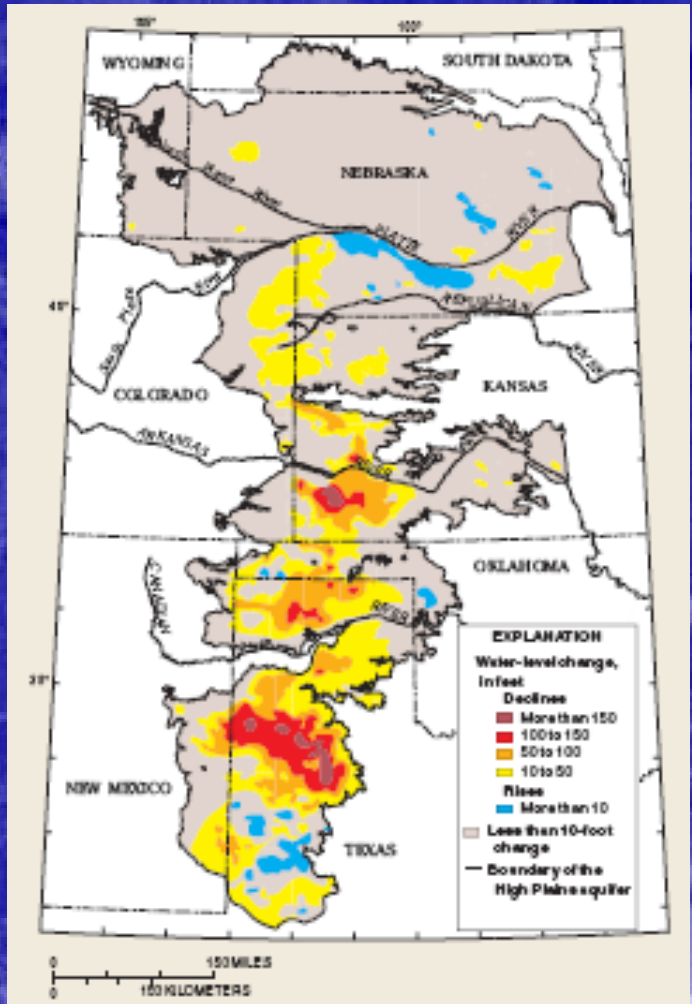
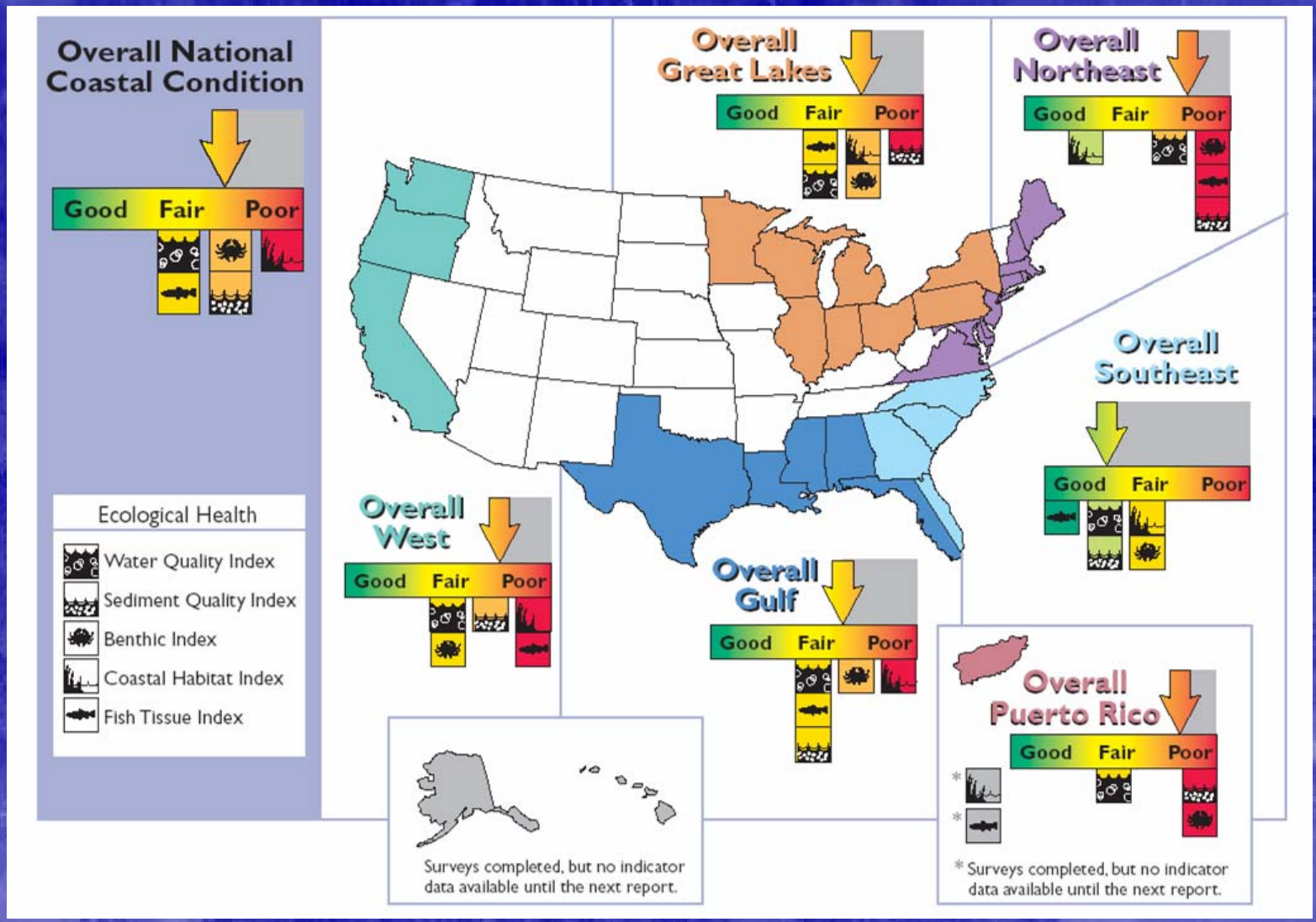


Figure 4.3.1

Environmental Conditions

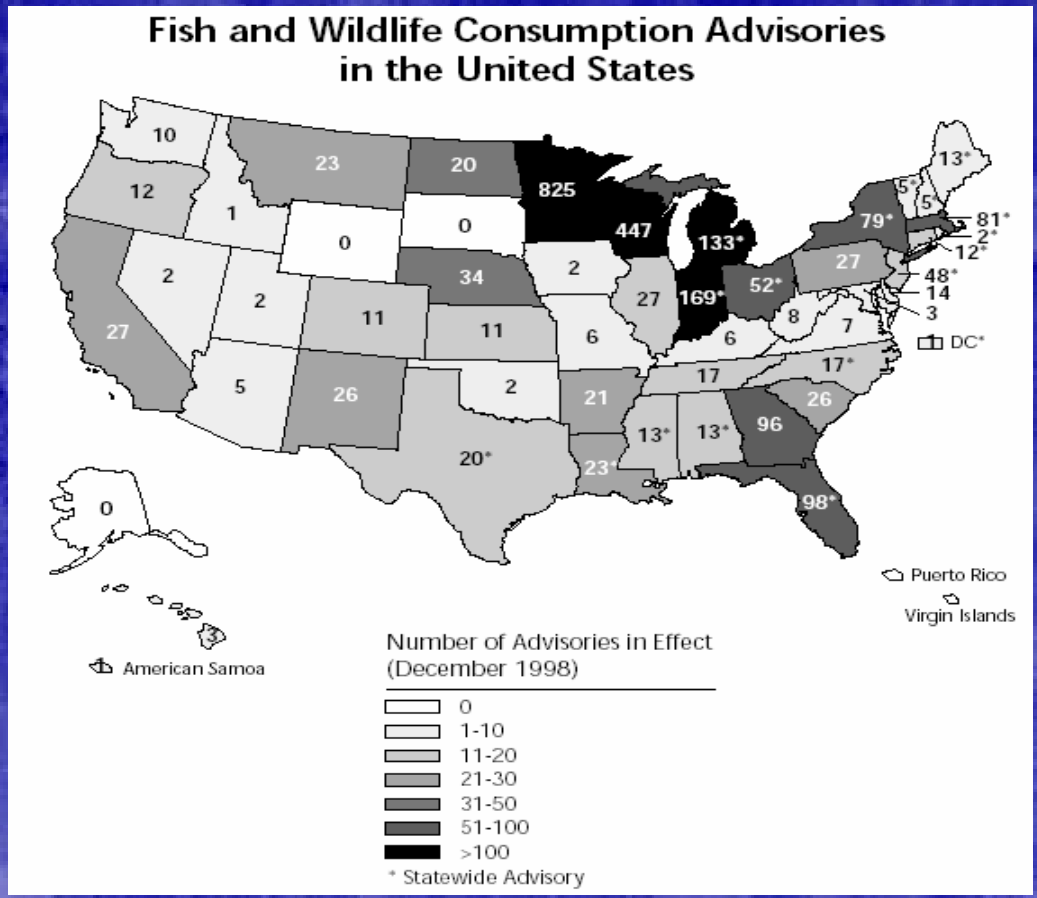


Overall national and regional coastal condition between 1997 and 2000

Source: U.S. EPA, December 2004. National Coastal Condition Report II. Office of Research and Development/Office of Water. EPA-620/R-03/002.

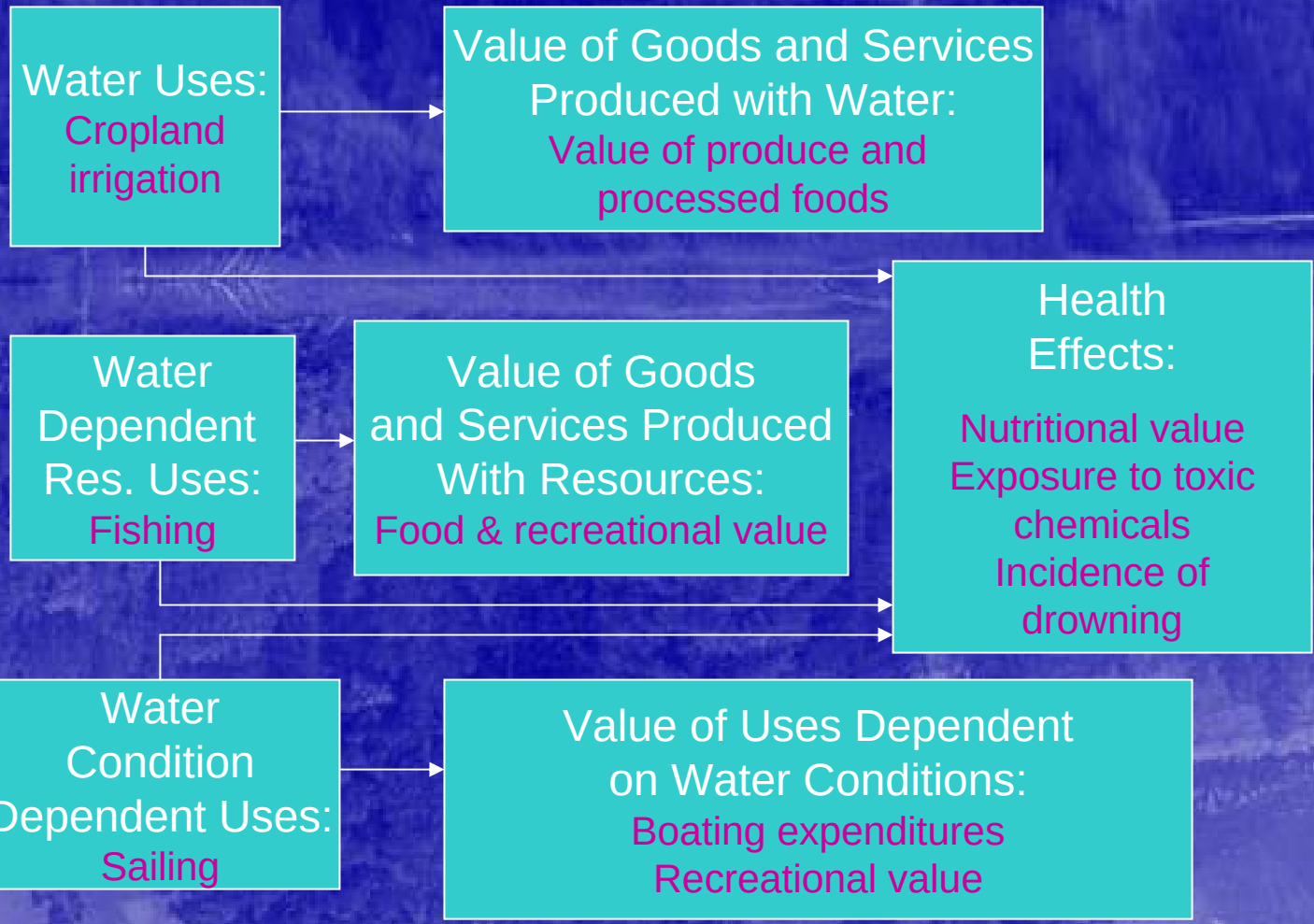
Figure 4.8.1

Contamination of Fish & Wildlife



Source: U.S. Environmental Protection Agency, National Water Quality Inventory 1998 Report

Effects on People



Example Indicators

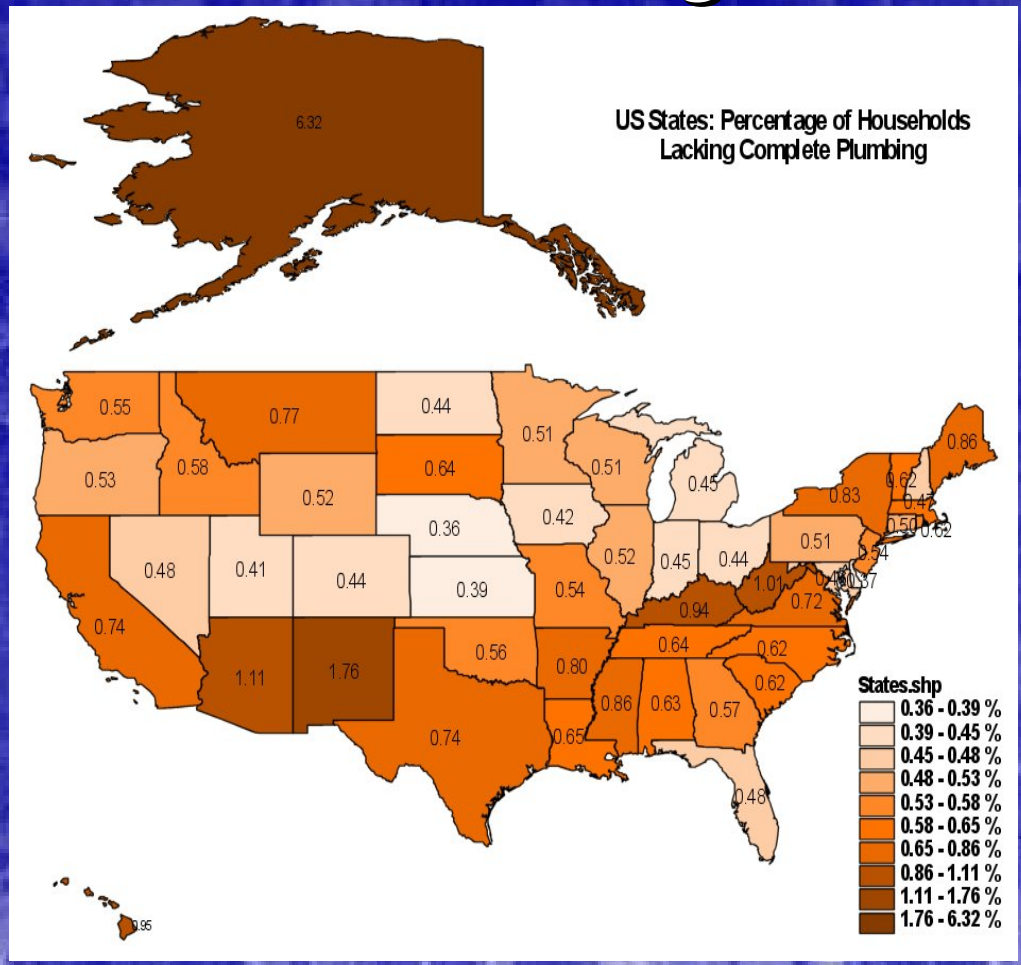
Effects on people of the conditions and uses of water resources

11. Human conditions

- Value people receive from the uses of water
- Costs people incur, including health effects

Figure 4.11.1

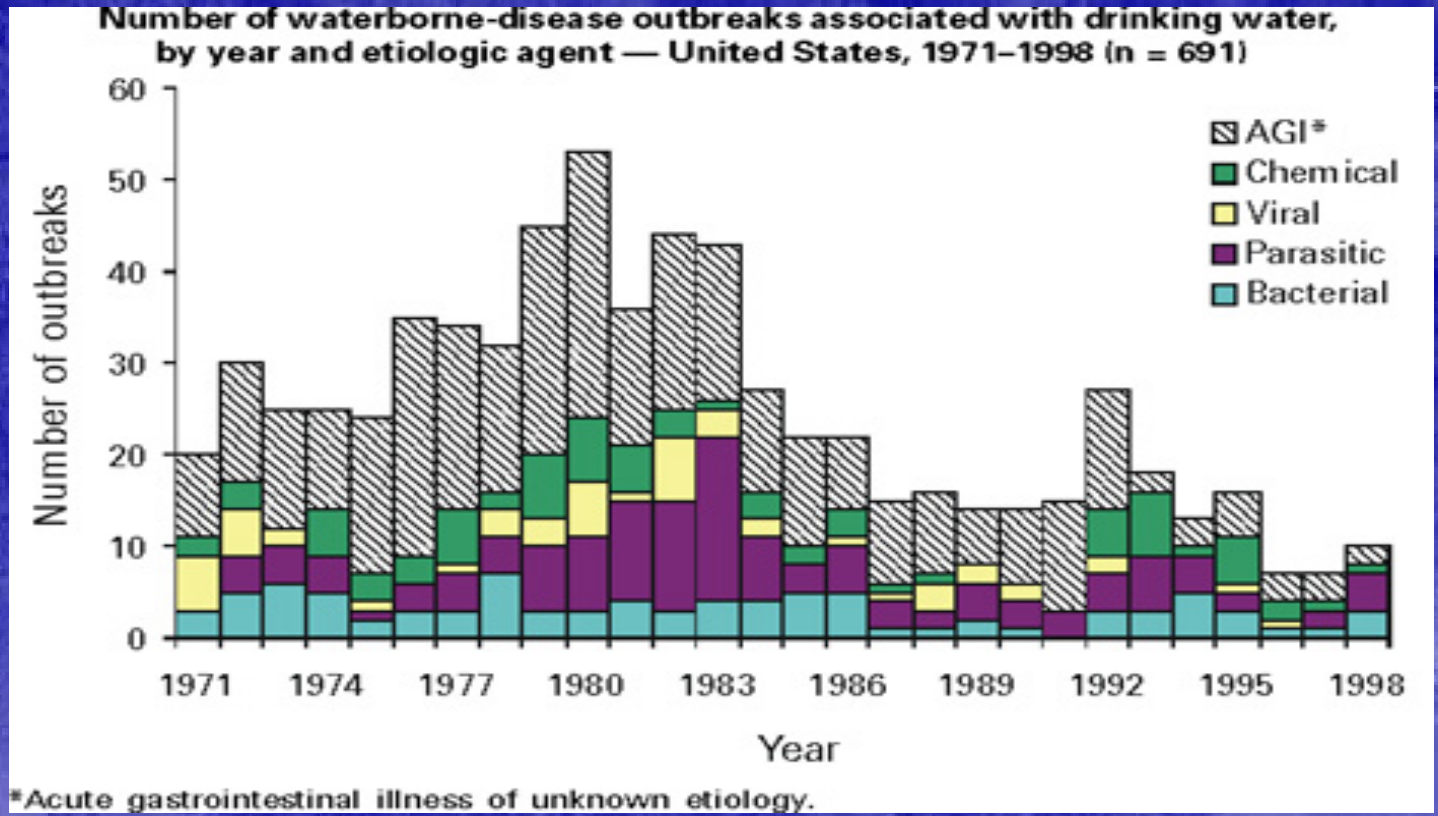
Population Lacking Complete Plumbing



Source: Rural Community Assistance Partnership 2004

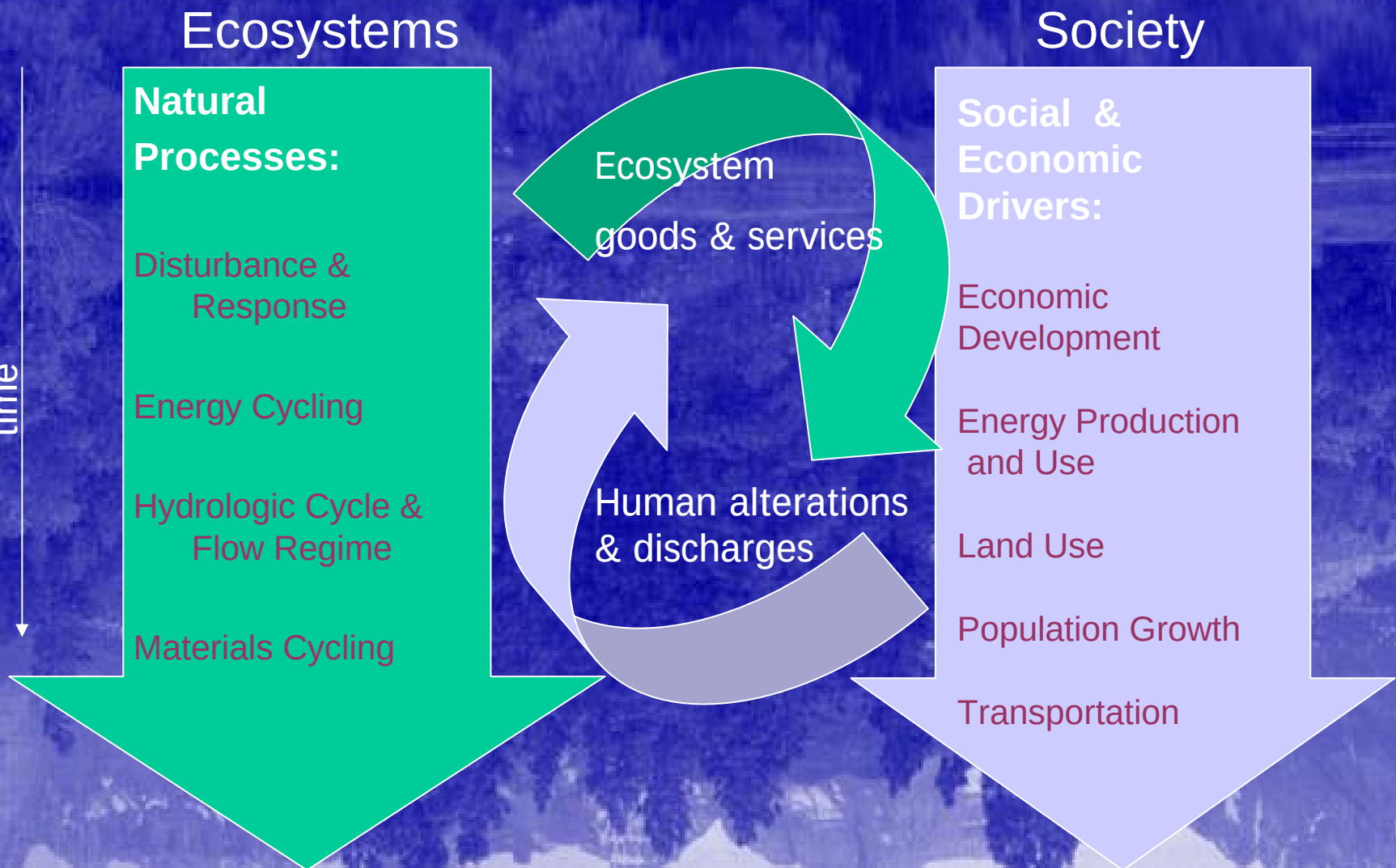
Figure 4.11.2

Reported Incidence of Waterborne Disease



Source: Surveillance for Waterborne Disease Outbreaks - US, 1997-1998

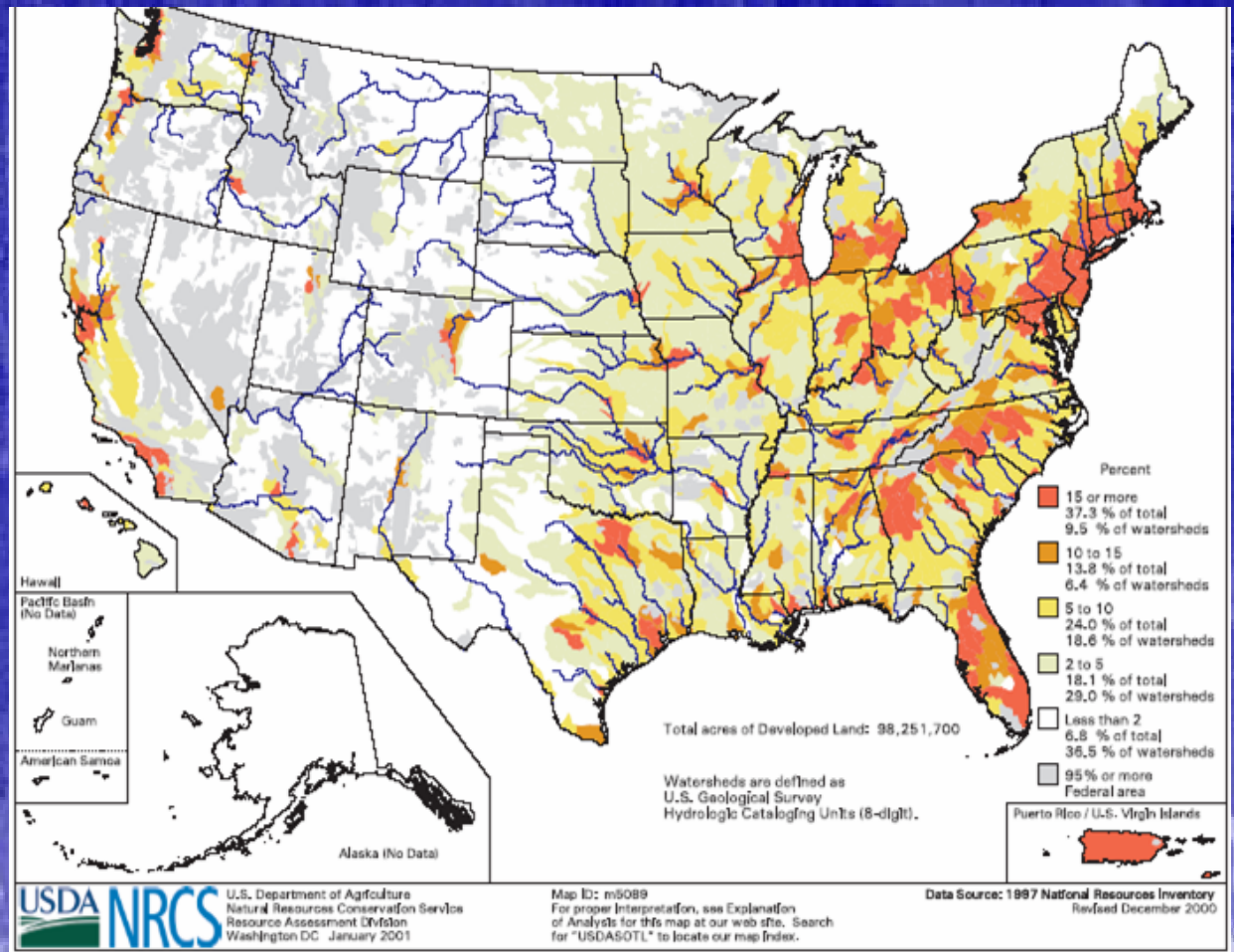
Ecosystem Processes & Societal Drivers



Underlying processes and driving forces

12. Land use
13. Residual flows – the flow of water and wastes back into the water system
14. Social and economic processes – the systems people and organizations develop to influence water resources and sustainability
15. Ecosystem processes

Figure 4.12.1
Percent of Hydrologic Unit in Developed Land, 1997



Composite sustainability assessment

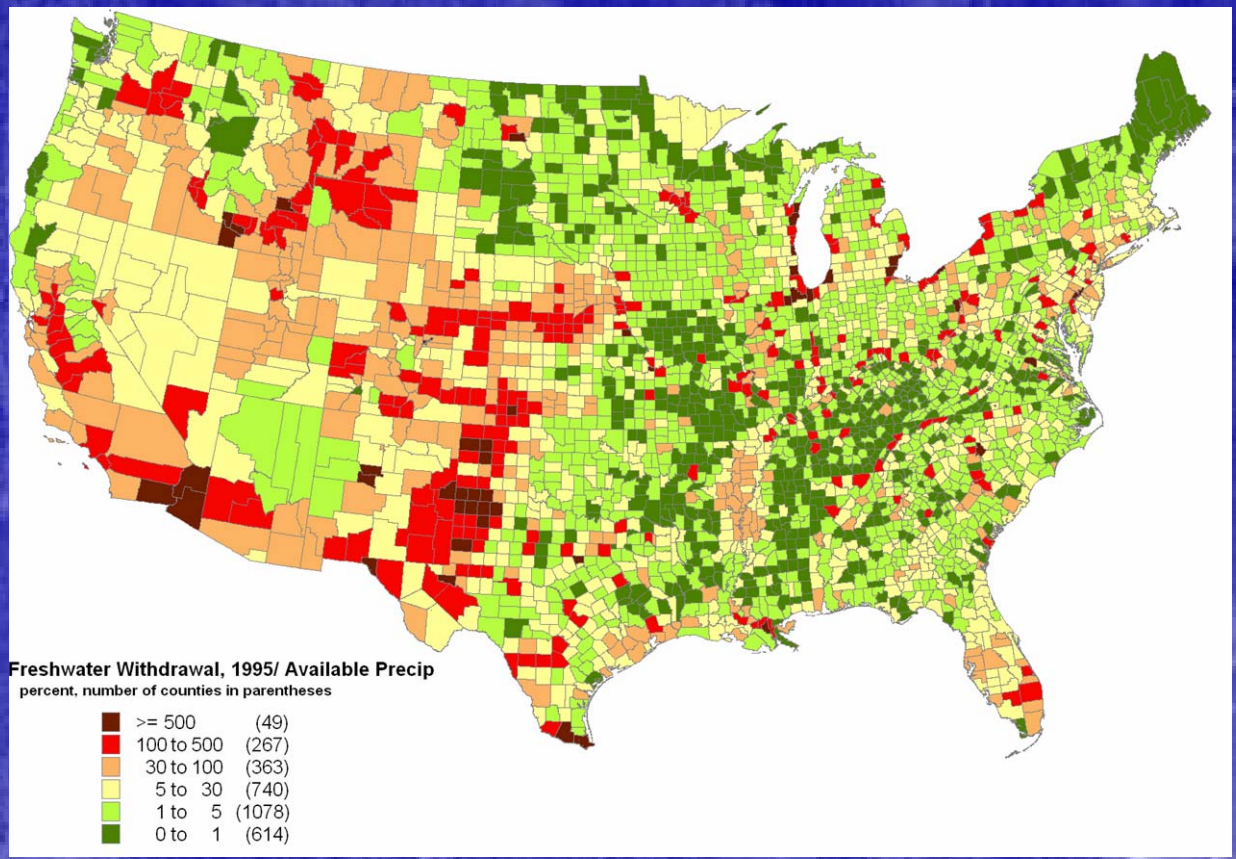
16. Water use sustainability – in each watershed, the ratio of water withdrawn to renewable supply

17. Water quality sustainability – in each watershed, indicators of the suitability of water quality for the uses desired, including ecosystem uses

Figure 4.16.1

Water Use Sustainability

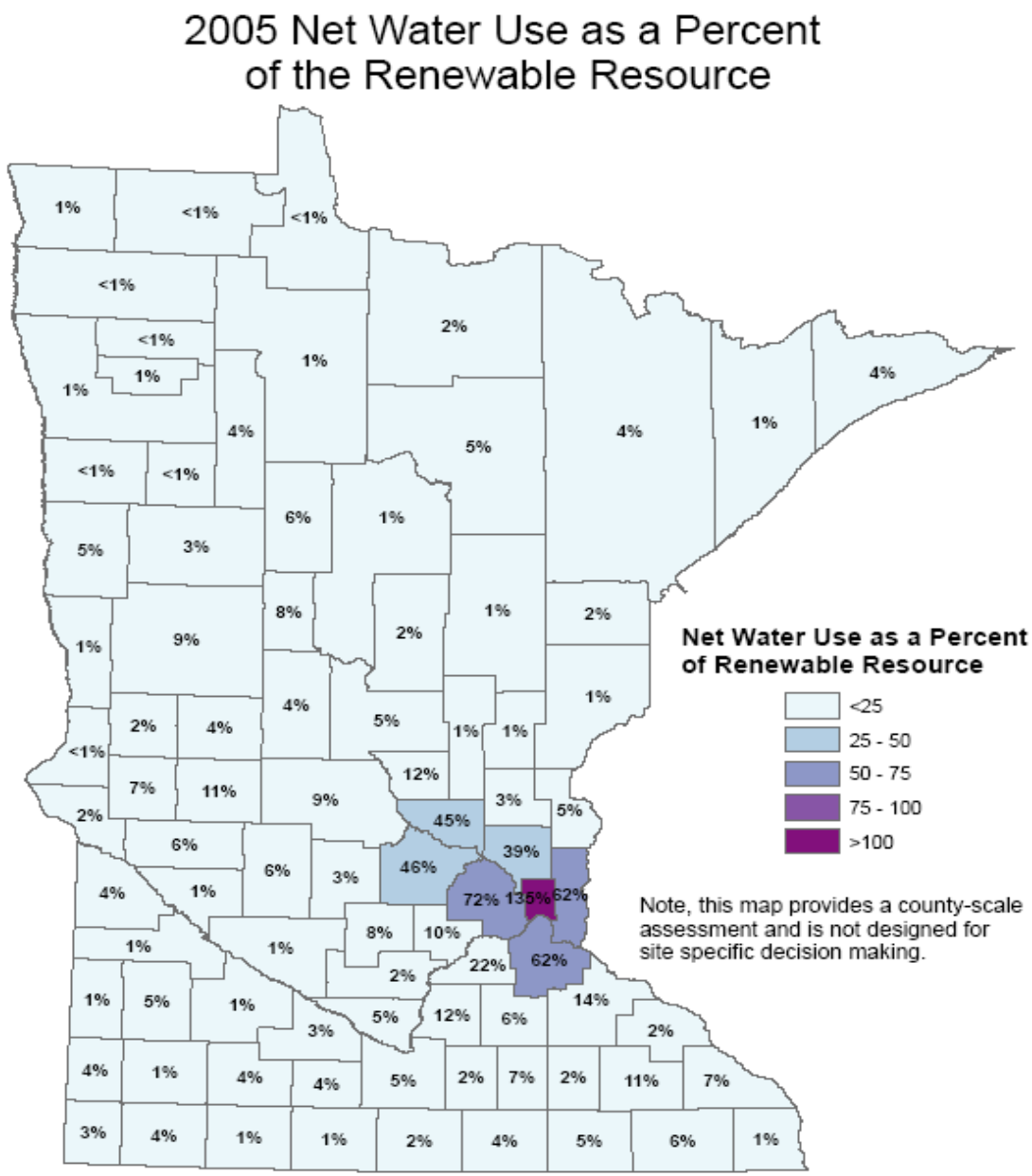
Withdrawals as a % of available precipitation, 1995



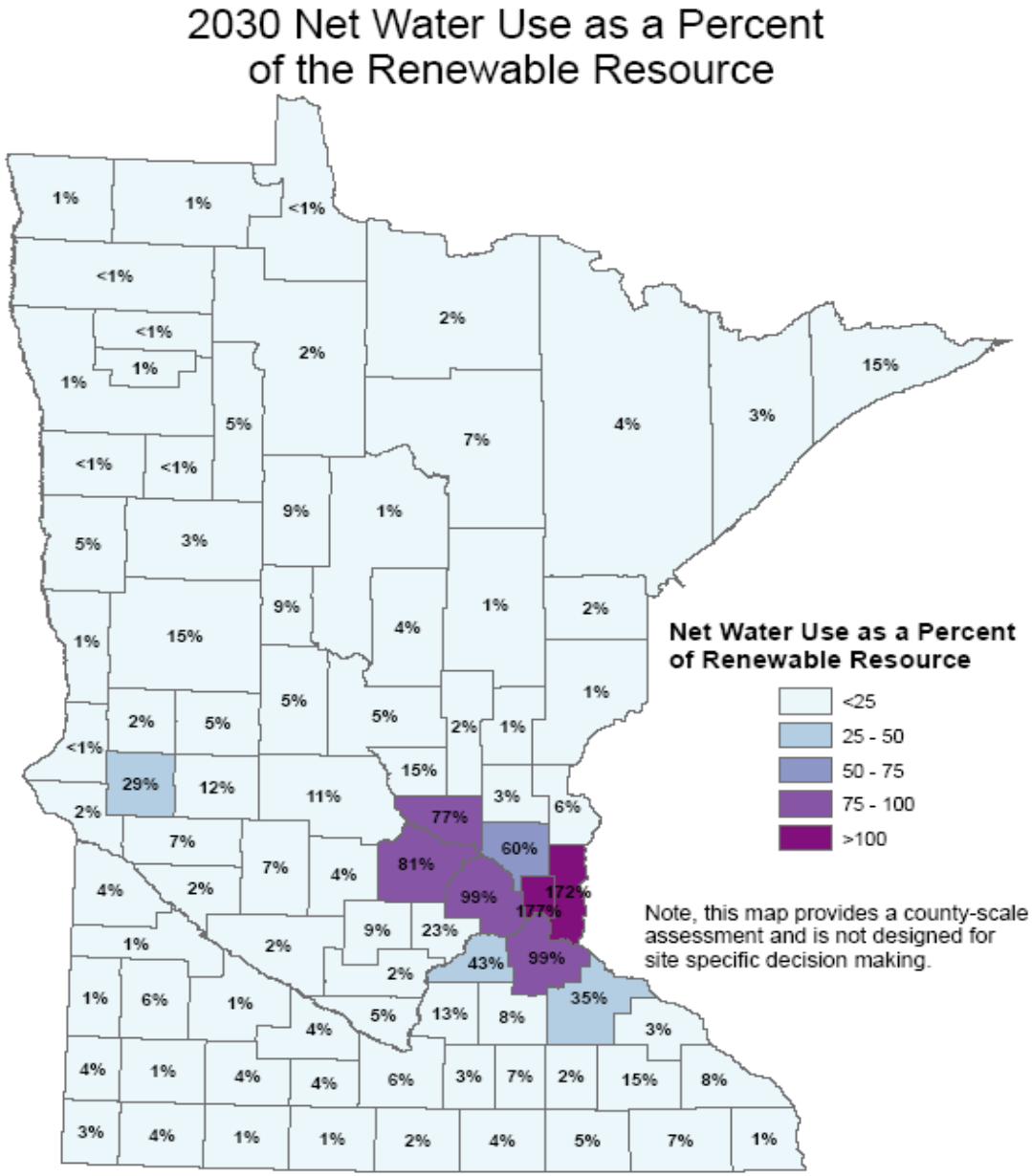
Source: S. Roy, K. Summers and R. Goldstein

An indicator of scale

- Ramsey County 135%
- Four counties used more than 50%
- Metro range was 10% to 135%
- Greater Minnesota range was <1% to 46%



- Ramsey County 177% Washington County 172%
- Seven counties used more than 50%
- Metro range was 23% to 177%
- Greater Minnesota range was <1% to 81%



Water Use in a Typical Minnesota County

An indicator that puts a proposed water use in perspective

A 750 MGY ethanol plant

1.4% of the county's supply

36% of the county's current gross water use (41% of the net use)

10 square miles of renewable water

The Work Ahead

- **Complete, revise and refine indicators**
  - **including indicators scalable to national, state and local levels**
- **Assist agencies**
  - **describing the need for programs to collect the information necessary for generating indicators**
- **Increase representation**
  - **incorporating indicators of regional water management programs**

Future Work, cont'd

- Expand relationships with the business and scientific communities
- Consult with other programs on water related indicators
  - DOE, EPA, NOAA, USGS, USFS, USFWS, USDA, etc.
  - National Research Council *Key National Indicator Initiative*
  - Council on Environmental Quality
  - Heinz Foundation

Indicators and Action

1. Does the package make sense?
2. Are the categories appropriate / inclusive?
3. Should we include other indicators?
4. What would energize you & your organization?

Contact Information

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