Measuring What Matters, Counting What Counts To Sustain Salmon, Rivers, and People

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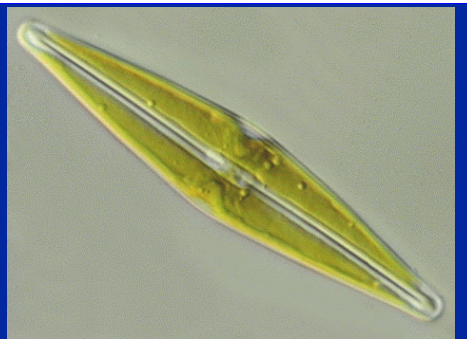
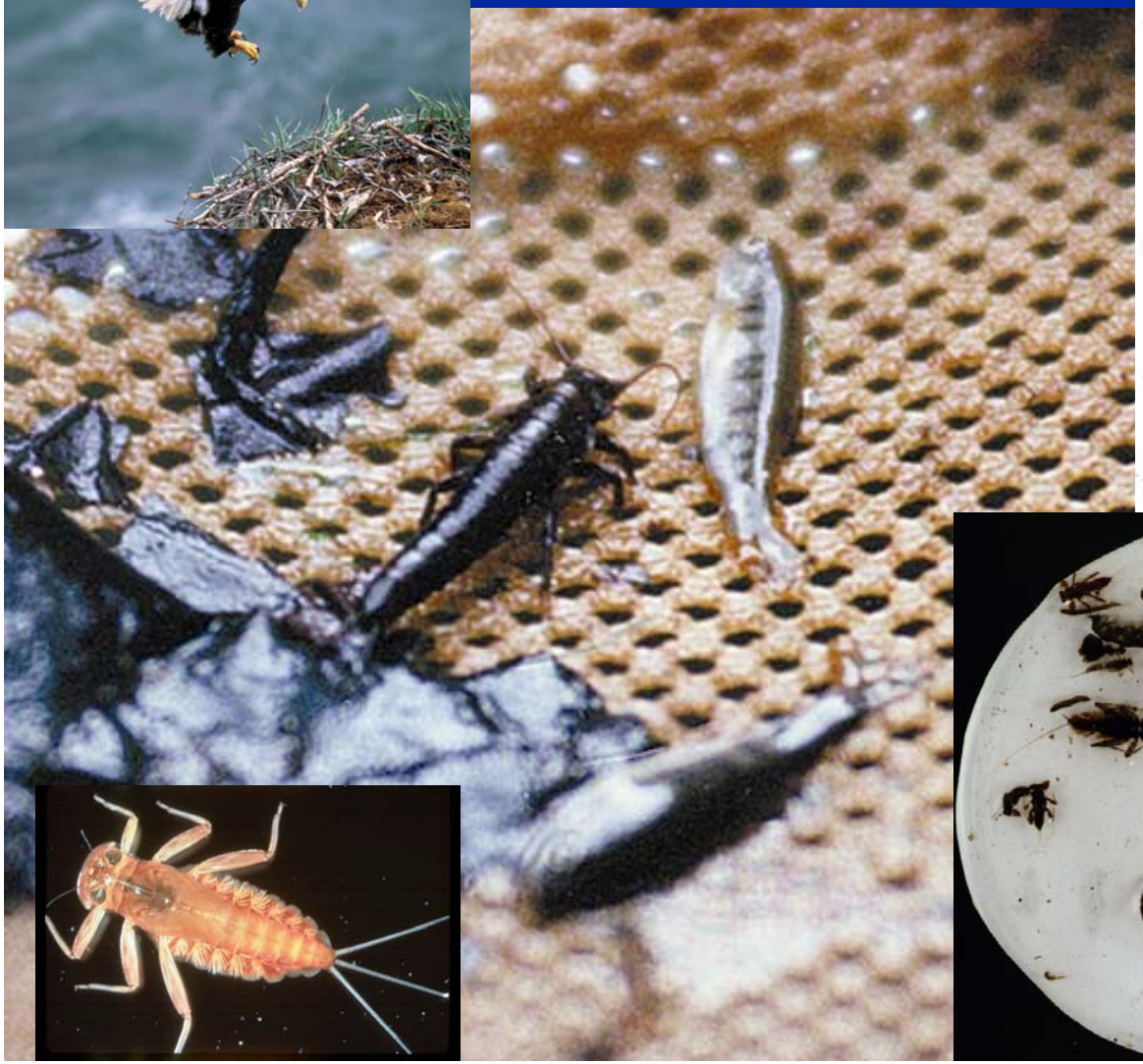
CWWS

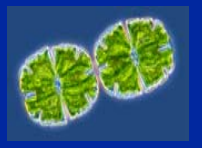
Annual Review

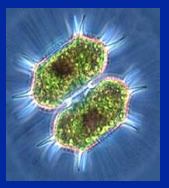
February 6, 2004

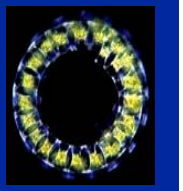
Living Systems











And NUH is the letter I use to spell Nutches

Who live in small caves, known as Nitches, for hutches

These Nutches have troubles, the biggest of which is

The fact that there are many more Nutches than Nitches

Each Nutch in a Nitch knows that some other Nutch

Would like to move into his Nitch very much

So each Nutch in a Nitch has to watch that small Nitch

Or Nutches who haven’t got Nitches will Snitch.

On Beyond Zebra
by Dr. Seuss

Humans:
the ultimate snitching nutch

Humanity has prospered in large part thanks to what it takes from Earth's ecosystems.

But the last 10,000 years of taking have distorted the biosphere in ways that have come back to threaten human well-being.

Evidence?

Salmon and rivers!

Four Realities – Salmon and Rivers

1. Rivers not healthy

   salmon status one manifestation of that

2. Salmon “landscapes” damaged

   natural landscapes distorted

   institutional landscapes dysfunctional

3. Humans (all) are responsible

   human societies not healthy

4. We depend on flawed indicators

   Why?

   Do we really want to change?

LEGISLATIVE MANDATES

- Endangered Species Act
  local emphasis on salmonids

- Clean Water Act (1972, 77, 82, 87)
  "restore and maintain the physical, chemical, and biological integrity of the nation's waters."

150 Years of Flawed Frameworks

Inevitably try to simplify: find the primary factor

Disciplinary blinders: LWD, adipose fins, processes
- treat symptoms rather than disease
- techno-fix junkies (hatcheries, barges, gravel)
- and now genetics - “the next generation”

Institutional blinders persist (NOAA-Fish = hope?)
- *The Logic of Failure* by D. Dorner

Capitalism’s “dirty little secret”

Why so little use of science?

- Trumped by preconceptions and political goals
- Scientists like to remain neutral (getting better)
- Lack of knowledge
  - knowledge not complete but more than enough is known for better decisions!
- Dependence on economic valuation exercises
  - in Old Testament mold, see biosphere as existing for human benefit

Kinds of Indicators

- Individual condition: temperature, cholesterol
- Economic system: income, inflation rate
- Social system: crime rate, literacy rate
- Technology: automobile gas mileage
- Planetary alignments: horoscope
- Ecological/biological: largely left out
  (or use poor surrogates)

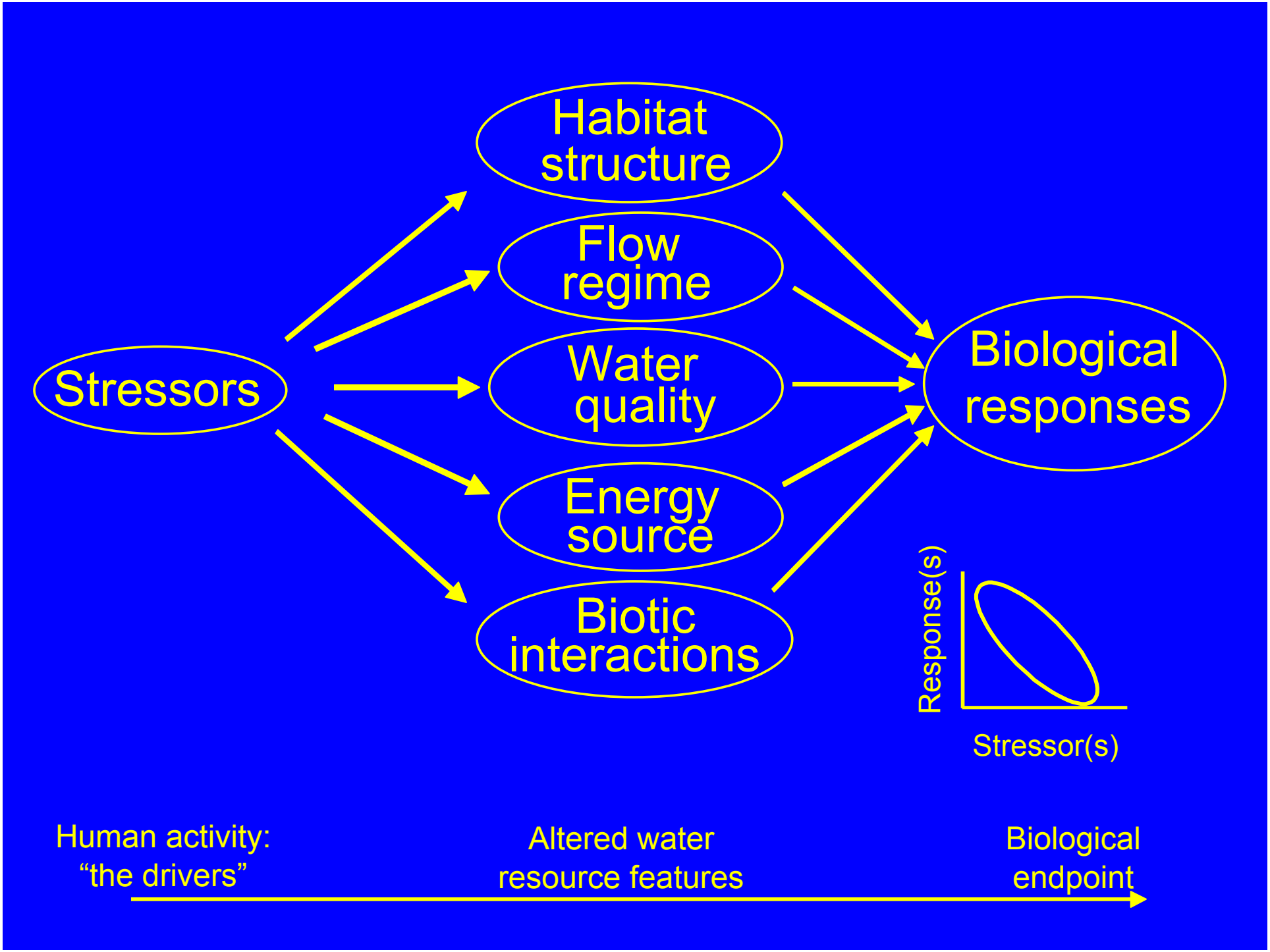
Flawed indicators and models endorse value systems that promote unsustainable lifestyles.

Common economic indicators in effect give people permission to escape responsibility for diverse effects of their actions on the world beyond human economies.

We come to value what we measure, rather than measuring what is valuable.

“. . . the various forms of life in a river are purely incidental, compared with the main task of a river, which is to conduct water runoff from an area toward the oceans.”

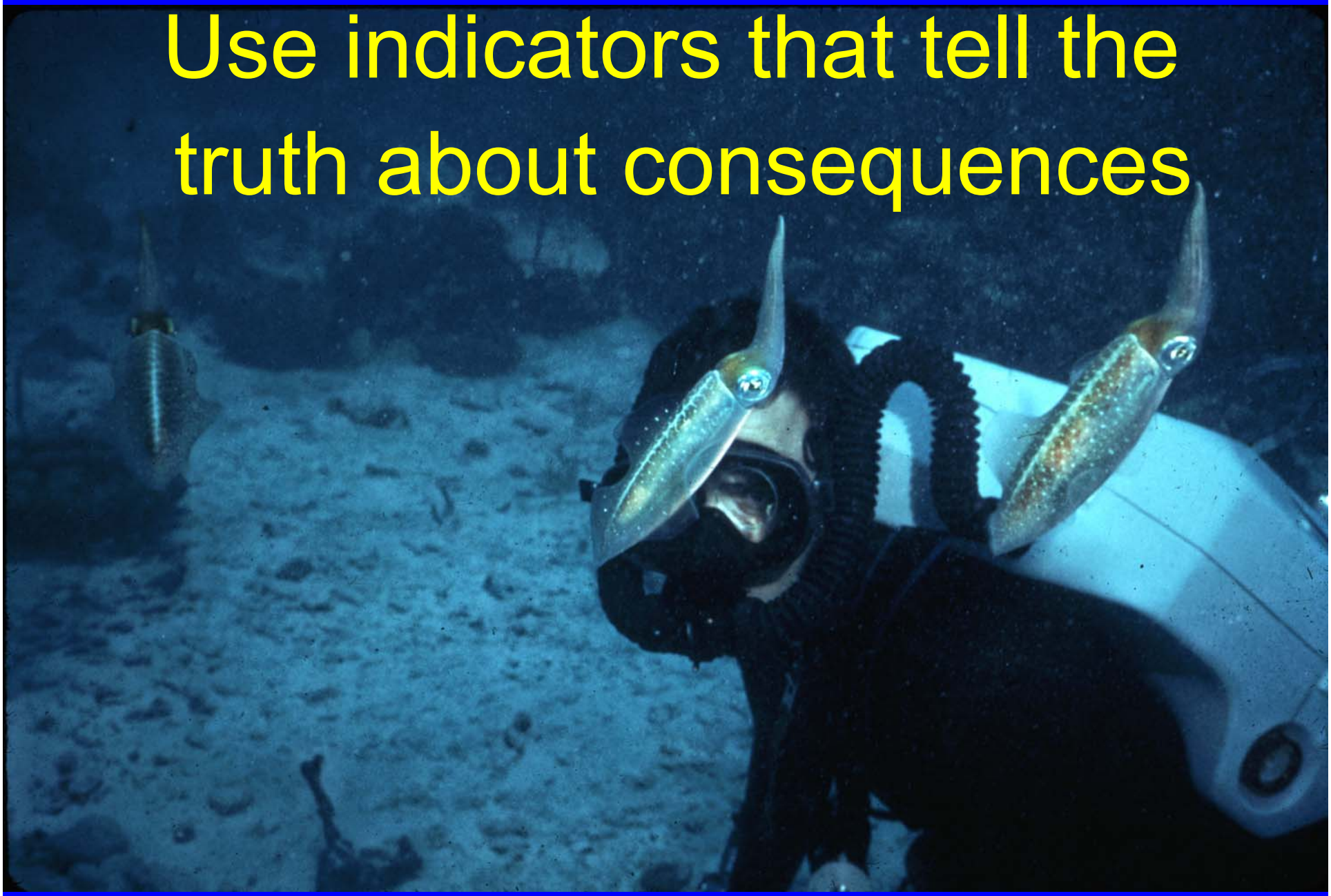
H. A. Einstein, 1972


Habitat structure
Flow regime
Water quality
Energy source
Biotic interactions
Stressors
Biological responses
Response(s)
Stressor(s)
Human activity: "the drivers"
Altered water resource features
Biological endpoint

Key Issues Identified by George Perkins Marsh in 1864

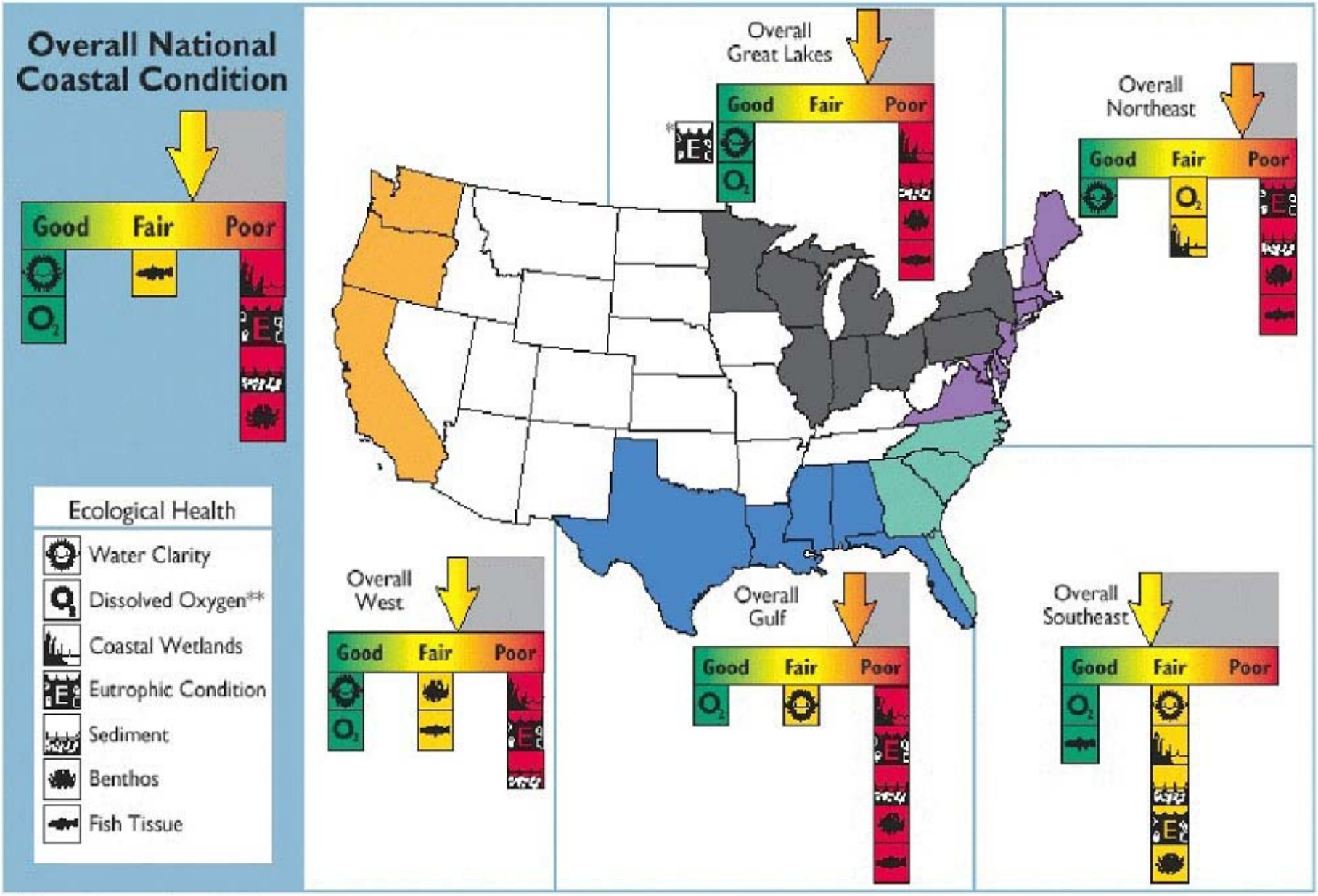
Energy source	stream no longer “shaded” or “protected by wood”	??
Chemical variables	“temperature,” “turbidness”	Ecol
Flow regime	changes in “currents,” “quickened velocity”	USFWS
Physical habitat	changes “in beds,” “mechanical disturbance”	F&W NOAA-Fish
Biotic interactions	smaller organisms “disappear or reduced in numbers”	F&W

Use indicators that tell the truth about consequences



Need Improved Indicators

- Convey biological consequences
  - human and nonhuman
- Better assessments
  - rank social and ecological risks
  - both wealth and “ill-th”
- More inclusive policy process
  - understanding all risks
  - diverse temporal and spatial scales



* No indicator data available.
** Does not include the hypoxic zone in offshore Gulf of Mexico waters.

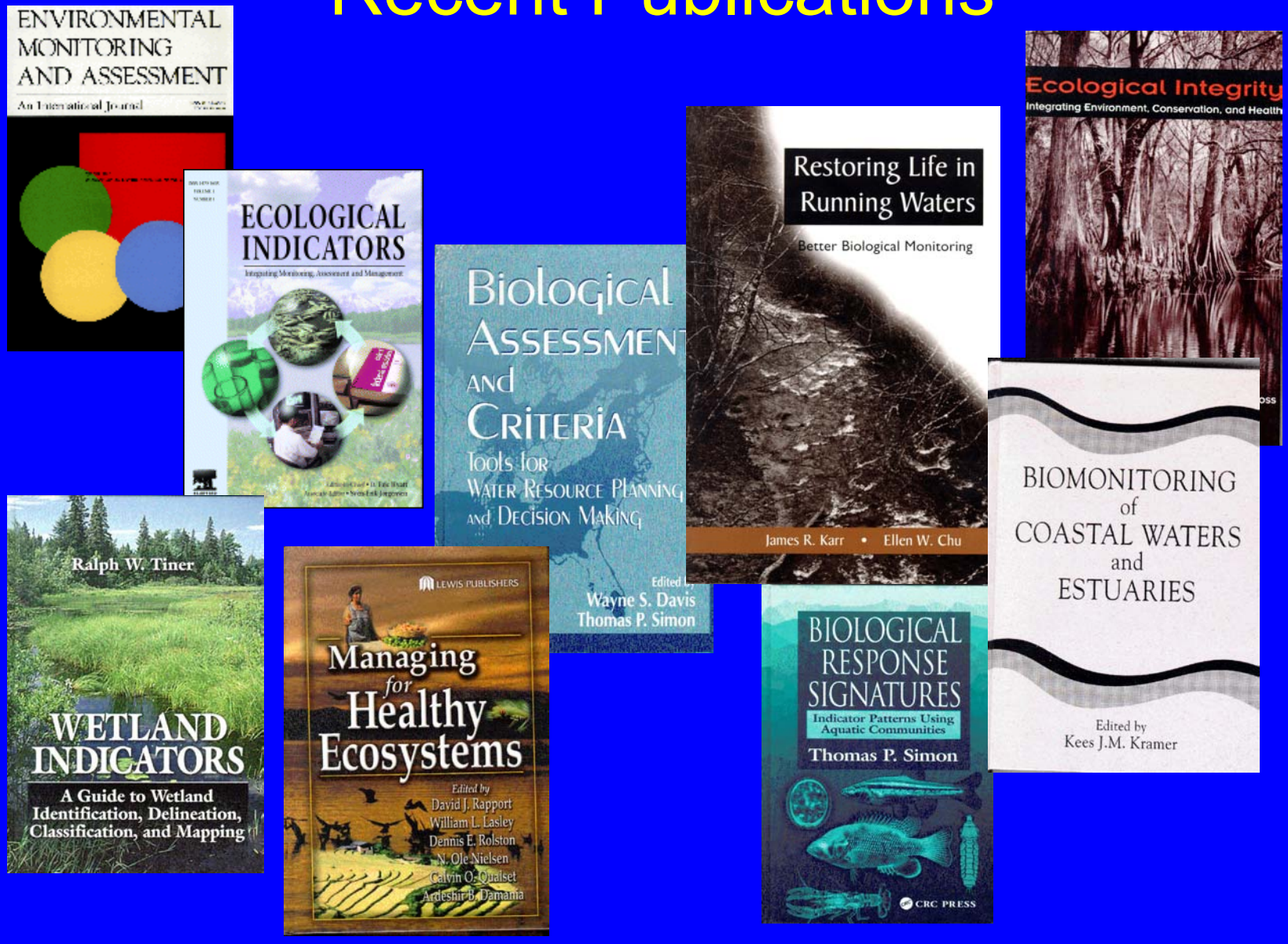
NOTE: Overall conditions are shown for each coastal region (e.g., purple represents the northeast coast).

General Trends

1. Physical variables → Biological variables
2. Chemical stressors → All stressors
3. Local approaches → Integrative approaches
4. Individual indicators → Multimetric indicators*

* Index of biological integrity (IBI; fish, inverts, algae)

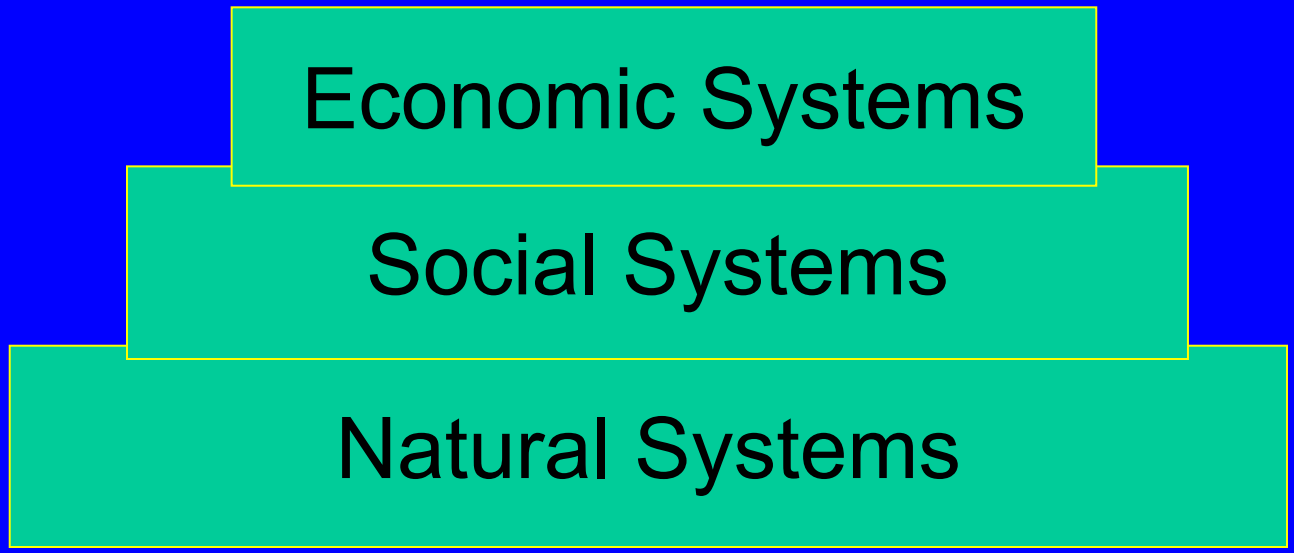
Recent Publications



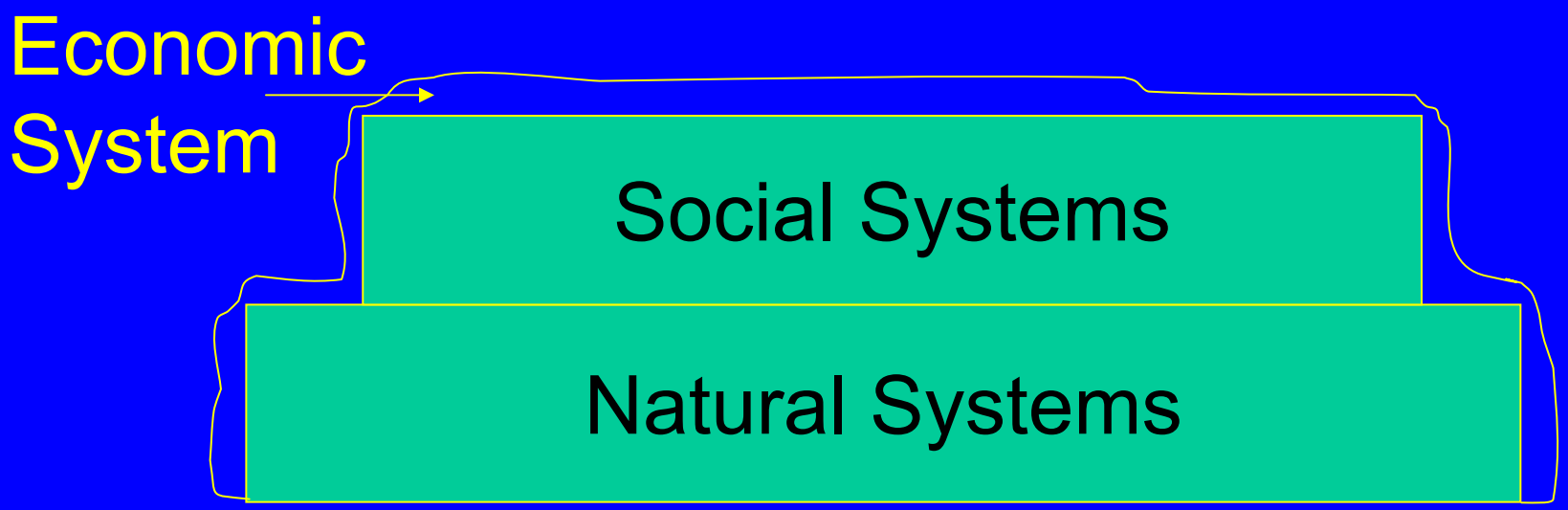
Alternative Models

1. Economy preeminent:
   narrow conception of "goods" crucial to society
2. Environment preeminent:
   narrow conception of society's needs
3. Balance:
   euphemism for "compromise environment to protect economic status quo"
4. The layer cake:
   understanding relationships among economy, society, environment, and national security

Three-layer Cake



Two-layer Cake with Frosting



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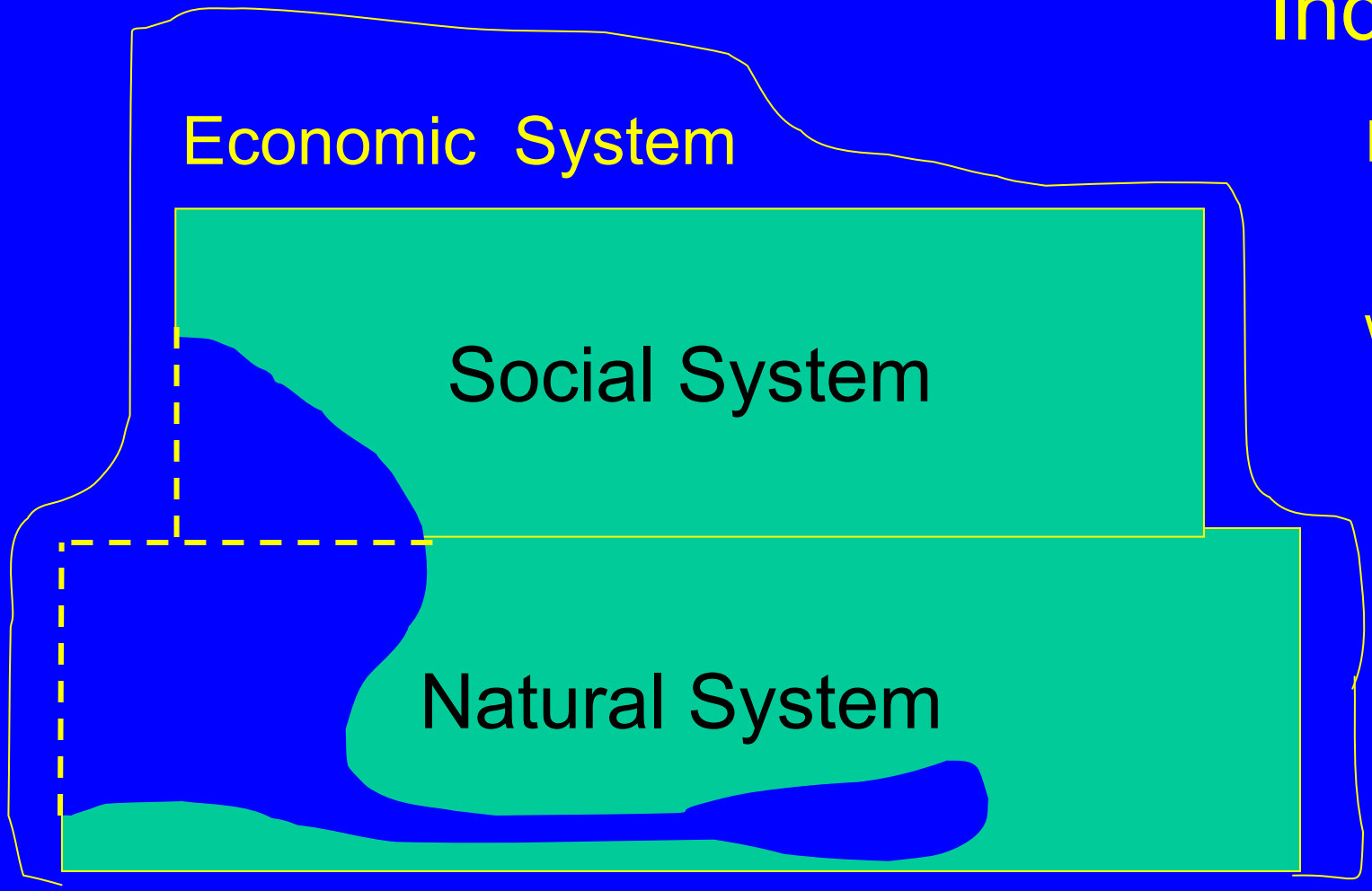


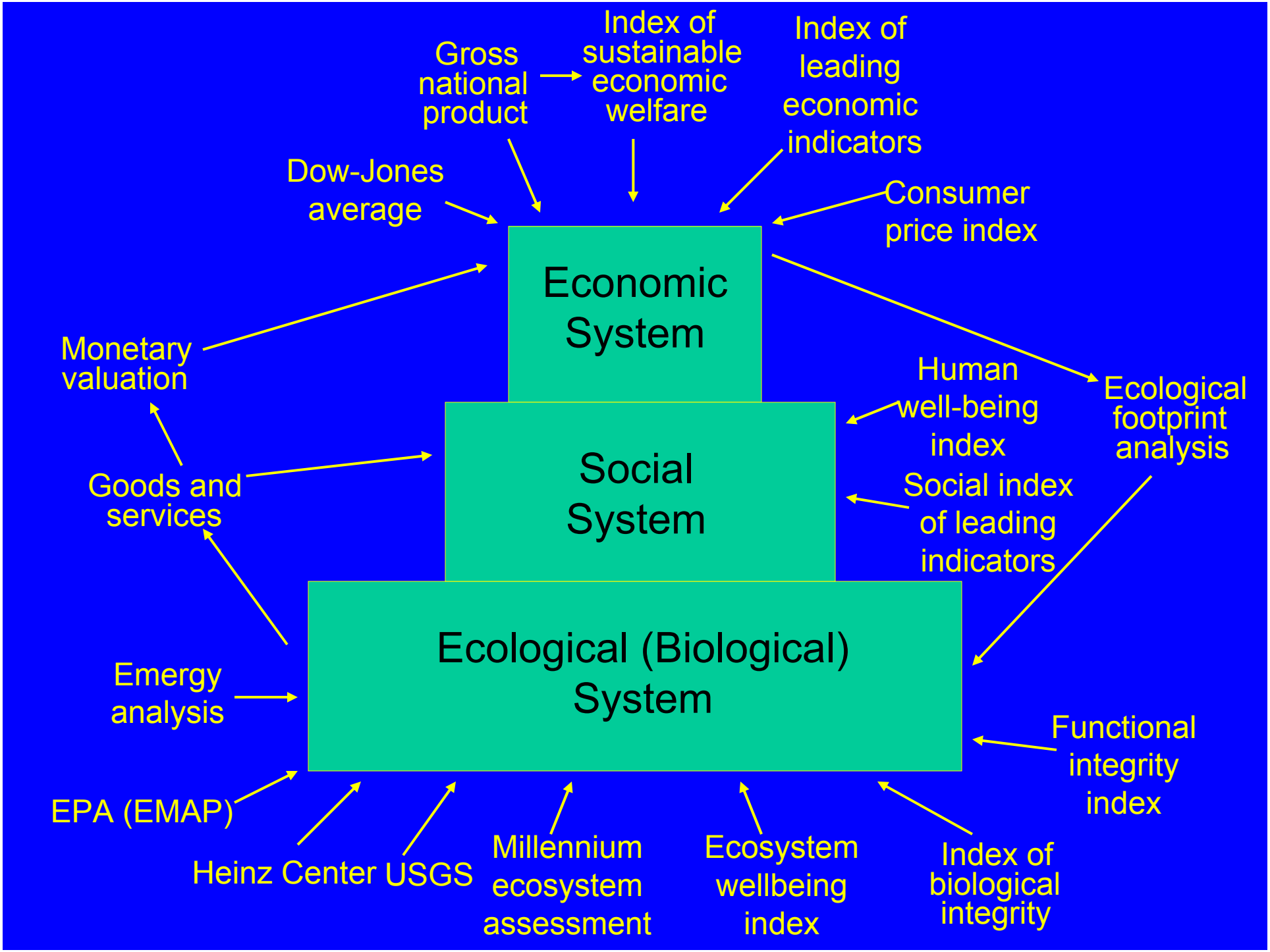
Indicators

Economic

Social well-being

Human health

Ecological health


Gross national product
Index of sustainable economic welfare
Index of leading economic indicators
Dow-Jones average
Consumer price index
Economic System
Monetary valuation
Human well-being index
Ecological footprint analysis
Goods and services
Social System
Social index of leading indicators
Ecological (Biological) System
Emergy analysis
Functional integrity index
EPA (EMAP)
Heinz Center USGS
Millennium ecosystem assessment
Ecosystem wellbeing index
Index of biological integrity

Clean Water Is Not Enough

Redefining conceptions:

- Pollution vs. pollutants
- Water quality
- Water dichotomies
- Water for people's needs and the river's needs

Salmon Habitat Is Not Enough

Redefining endpoints

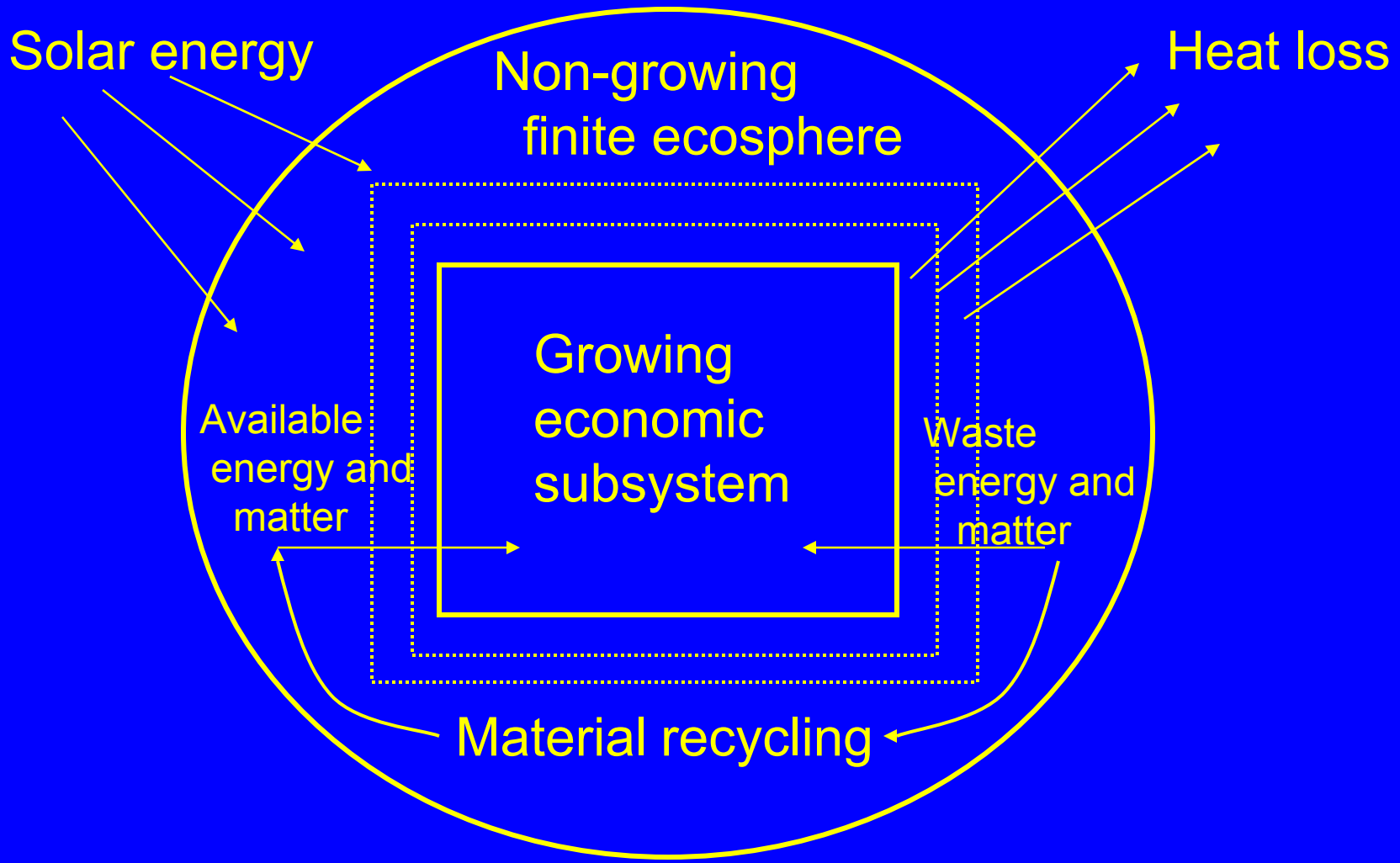
- Habitat
- Salmon (symptom/disease)
- Healthy rivers

Watershed Management Is Not Enough

Redefining challenges

- More than hydrologic processes
- Institutional landscapes
- Citizen participation

The Steady-State Perspective



Modified from Rees, 2002

"Just as parents struggle to teach their children to think ahead, to choose a future and not just drift through life, it is high time that human society as a whole learns to do the same.“

Allan Hammond, 1998

Which World?

On Beyond Salmon

Healthy Rivers

Healthy Landscapes

Healthy Human Societies