Environmental Results Management

The Role of Indicators

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Environmental Results Management

Moving from Planning to Action by
Measuring What Counts

You can't manage what you can't measure

Environmental Results Management

Check & Adapt ~

- Select indicator/metric to measure
- Assess
- Compare to desired outcomes
- Adapt policy or management program as necessary

Environmental Results Management

Adaptive management requires information & communication

Universe of Actors:

SCIENTIFIC COMMUNITY
RESOURCE MANAGERS
DECISION MAKERS
PUBLIC

Linking tool:

Routine appraisal of progress toward desired ecological goals:
the
ENVIRONMENTAL CONDITIONS REPORT

Environmental Condition Reporting

Developing a *"State of "* Report
for the Delaware River Basin

Environmental Condition Reporting

- Theory vs Praxis
- Issues
  - Linking to Management Goals
  - Selecting indicators
  - Data availability & comparability
- Making a difference: Linking to monitoring & management

Environmental Condition Reporting

Assumptions

- Measurable Goals
- Relevant Indicators
- Complete data sets
- Robust assessments
- Link to monitoring programs, resource programs & policy making

Environmental Condition Reporting

Goals/Objectives must be measurable.

- Good: Target flow of 1,750 cfs @ Montague NY
- Problematic: Assess the ecological integrity of watersheds & integrate criteria into water allocation strategies [BP 1.1B]
- Note: Scales differ, too.

Environmental Condition Reporting

Indicator – a measurement/ value/ statistic of a condition or outcome

- Relevant
- Sensitive to change
- Easy to measure w/ low measurement error
- Cost effective
- and available
- time frames vary: diurnal to decadal
- have assessment methods (detection limits) changed over time?
- available

In practice, indicator selection is opportunistic.

Environmental Condition Reporting

Complete data sets.

- Data gaps?

  Many longterm data sets for flow, water quality & selected species, but there are also many with temporal & geographic gaps

- Data freshness?

  Also very mixed.

- DO, nutrients, metals, TSS et al.

- Water use: 1996, 2003
- LU/LC: 2001
- Some living resources

Environmental Condition Reporting

Robust assessments.

Data comparability issues: 4 states

- Monitoring:
  - TN, NO_3+NO_4, TKN
  - Benthic macroinvertebrates
- Criteria
  - 303(d) assessments
  - Fish consumption advisories

Environmental Condition Reporting

Link to monitoring & policy setting.

- Reporting must link indicators to a desired outcome or endpoint.
- Communication, coordination & collaboration with decision-makers.

Praxis: State of the Basin 2008

Indicator Selection & Data Assembly:

- WRRIs (U Del), DRBC, USGS, PDE;
- Primarily State, DRBC & USGS data
- 37 Indicators selected for relevance, availability, length of record
- 4 categories:

  Hydrology (7), Water Quality (10),

  Living Resources (12), Landscapes (8)
- Desired Condition statement: link to management goals

Praxis: State of the Basin 2008

Hydrology:

- Flows at Trenton NJ (& precipitation trend)
- Salt line location
- Water use efficiency (per capita & consumptive use)
- Total Water Use (2003)
- Water supply sources & areas of stress
- Flood damage (repetitive losses)

Wish List: tributary flow evaluation, hydromodification, sediment movement, stormwater management, et al.

Praxis: State of the Basin 2008

Water Quality/ Ecosystem & Human Health

- WQ : nutrients, DO, water clarity, copper
- Pesticides in surface & groundwater (1998-2001, USGS)
- PCBs: loadings & fish tissue concentrations
- Fish consumption advisories
- Designated use support in main stem & tribs

Wish List : pH, temperature, metals other than copper, comprehensive tributary water quality (N), et al.

Praxis: State of the Basin 2008

Living Resources :

- Benthic macro-invertebrates/ mussels/ oysters
- Horseshoe crab & red knot
- Other avian (2): Louisiana waterthrush & bald eagle
- Finfish (5): striped bass, weakfish, atlantic sturgeon, shad, brook trout

Wish List : keystone/critical species, amphibians, reptiles, waterfowl, trophic structure, community diversity, indices for biotic integrity; et al.

Praxis: State of the Basin 2008

Landscape:

- Population growth & distribution (regional)
- Population density (regional)
- Land use & change 1996-2001
- Land consumption 1996-2001
- Tributary dams/ fish passage
- Forest loss & Wetland loss (1996-2001)
- Tidal wetland buffers (1992)

Wish List : riparian corridor condition, wetland & forest health, current landscape info, et al.

Praxis: State of the Basin 2008

BONUS: 4 Features ~ new directions

- Climate change issues
- Contaminants of emerging concern
- Invasive species of concern
- Valuing natural landscapes: summary of NJ's Natural Capital project (2002)

Recommendations

Improvements needed:

- Spatial mapping capability often lacking; hinders display & regional reporting
- Synchronized land use assessments (states)
- Synchronized census/ land use assessments
- Revise management goals: measurable is better.

Recommendations

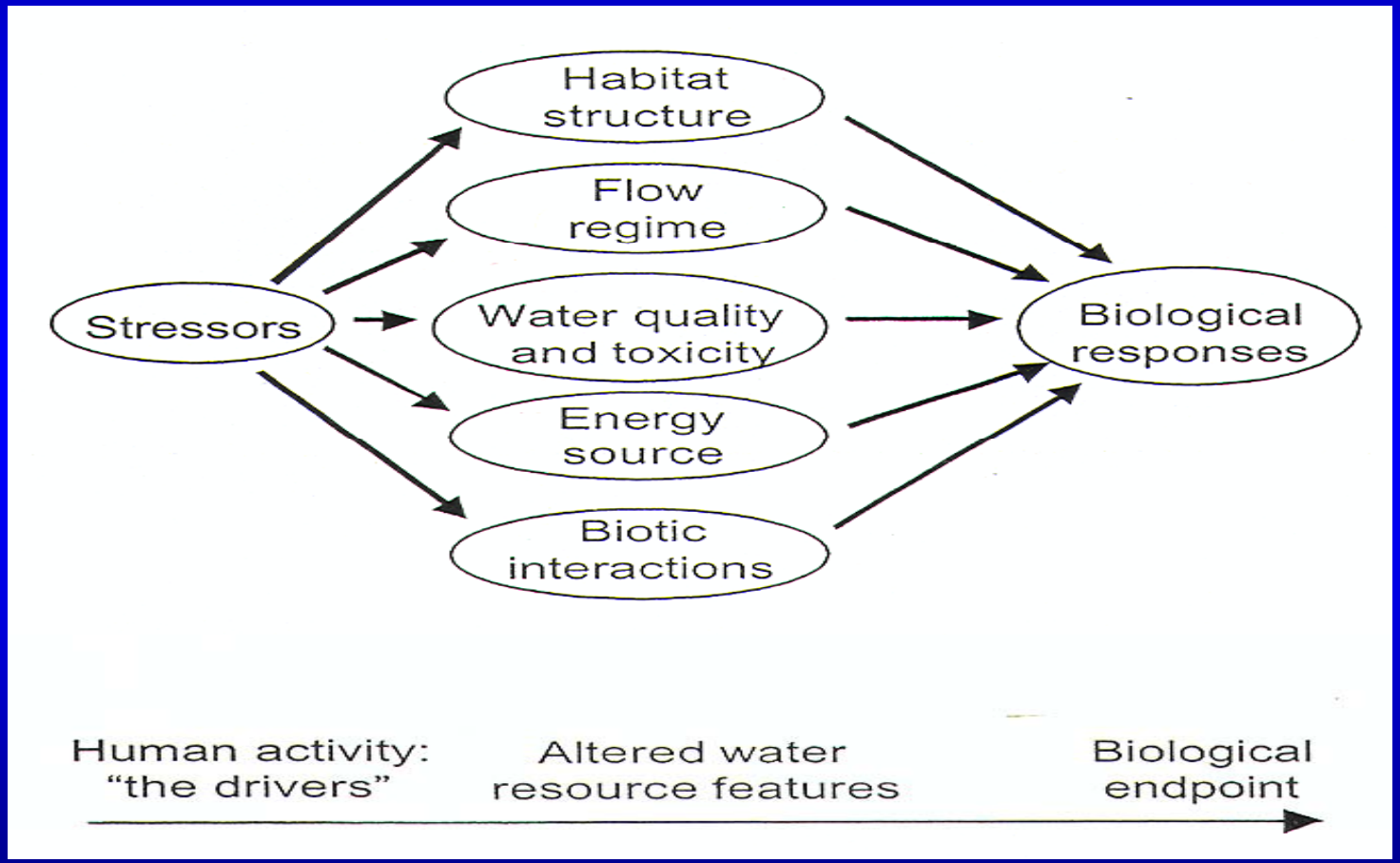
- Reassess monitoring programs to support management goals (CCMP, Basin Plan)
- Additional real-time monitoring
- Additional / different indicators for next report (esp hydrology & living resources)
- Select indicators to measure ecosystem function and health, not single parameters

Ecosystem Endpoints Hierarchy

Modified from Harwell et al (1990)

- **Species-level**: e.g., critical and keystone species; nuisance; dominant; economically important
- **Community-level**: trophic structure; species & biotic diversity
- **Ecosystem-level**: water quality, eco-processes (primary productivity, etc.)
- **Landscape-level**: mosaic, corridors/habitat; spatial & temporal patterns; feedback to regional & global physical systems
- **Human health**: e.g., vectors for human exposure; fish consumption, etc.

Ecosystem Endpoints: Biological



State of the Basin 2013

- Learn from mistakes & successes
- Evaluate process
- Expand partnerships
- Organize, organize (LOTS of information)
- Work to improve metrics
- Focus on linking to desired outcomes and informing management decisions

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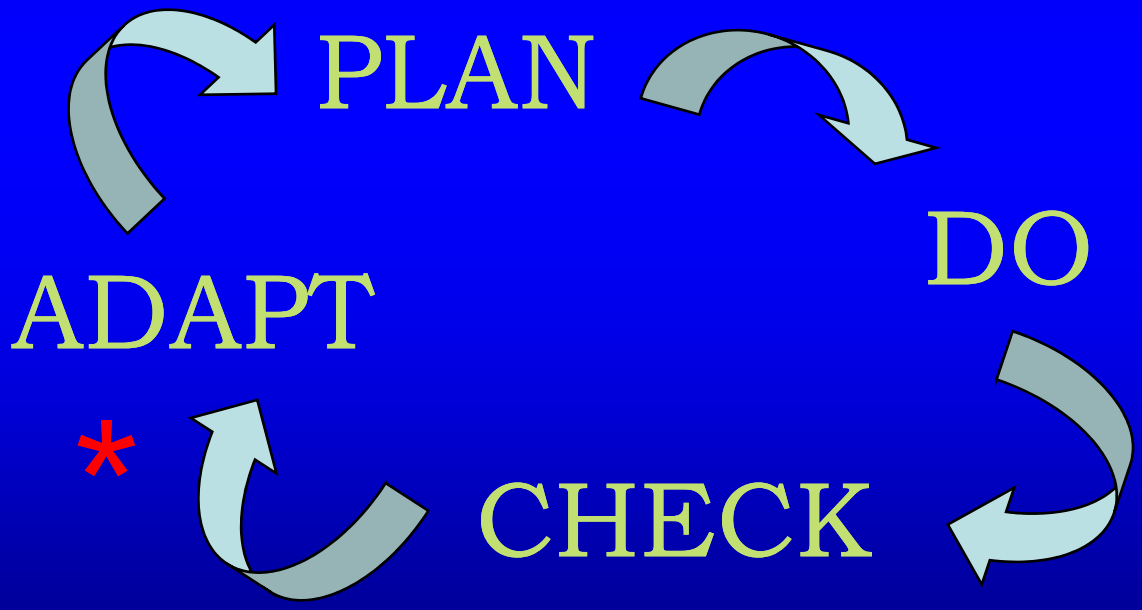

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