Environmental Monitoring and Assessment of Great River Ecosystems (EMAP-GRE)

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EMAP-GRE is improving the science and practice of assessing the health of the Mississippi, Missouri, and Ohio Rivers by demonstrating probability sample designs and biological indicators.

Office of Research and Development

EPA

Program Basics

Motivation

Better sample designs and indicators are needed for better CWA reports and to evaluate environmental protection measures.

Guiding Principles

- Involve stakeholders. Interstate strategies are important.
- Biology integrates environmental stresses.
- Probability surveys are only scientifically-sound strategy for resource assessment.

Schedule

- Baseline sampling: 2004-2005
- Extend assessments, reference condition research, & indicator evaluations: 2005-2009
- Expand research and demonstration on Lower Mississippi and other Great Rivers

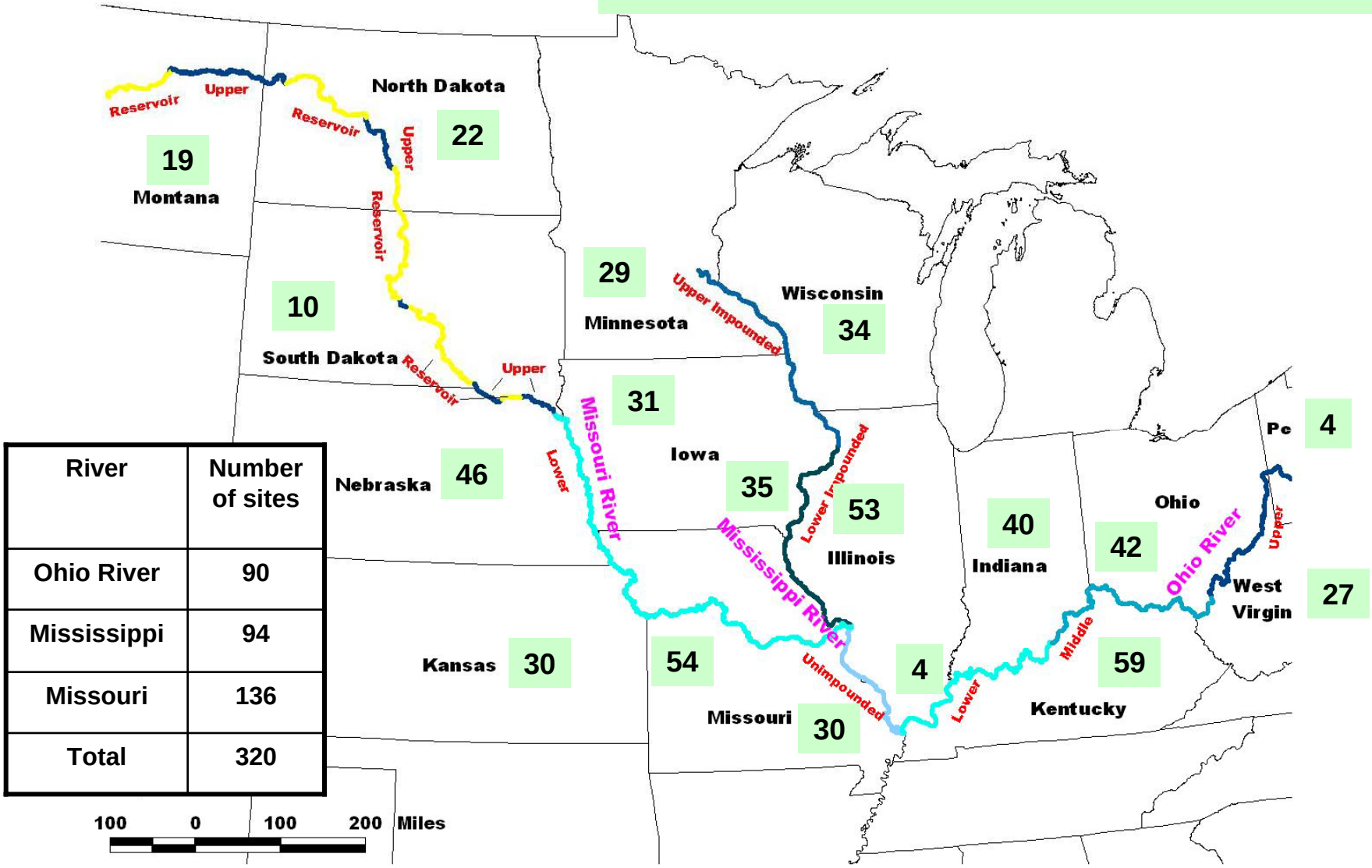
Outcomes & Products

- Transfer tools to states to build their monitoring and assessment capabilities.
- River & State Condition or Assessment Reports

EMAP Partners	
EPA Regions 3, 4, 5, 7, 8	**Wisconsin Dept of Nat. Resources**
EPA ORD NERL and NCEA	**Iowa Dept of Nat. Resources**
USGS Upper Midwest Environmental Sciences Center	**Illinois Natural History Survey**
USGS District Offices (Missouri, North Dakota, Montana, Iowa, Nebraska)	**Minnesota Dept of Nat. Resources**
Ohio River Valley Water Sanitation Commission (ORSANCO)	**Missouri Dept of Conservation**
Nebraska Game Fish & Parks Commission	**North Dakota Dept of Health**
	University of Iowa
	Stroud Water Center
	University of Louisville
	Southwest Missouri State University

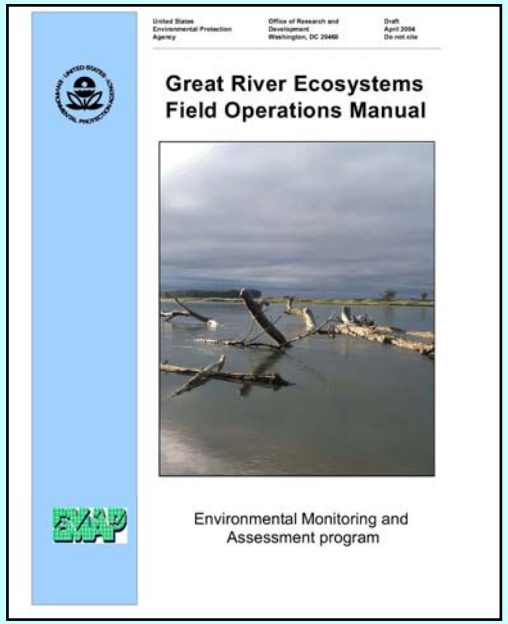
EMAP-GRE Baseline Sampling Design: 2004-2005

Number of sites in each state
Illinois has sites on both the MS and OH Rivers.
Missouri and Iowa have sites on both the MS and MO Rivers.



River	Number of sites
Ohio River	90
Mississippi	94
Missouri	136
Total	320

Indicators & Methods



EMAP-GRE Field Operations Manual

- **Water Quality**
  - Dissolved oxygen
  - Dissolved N (NO_x, ammonia)
  - Conductivity
  - pH
  - Metals (As, Pb, Se, CU, Fe, Ni)
  - Temperature
  - Anions & Cations
  - Turbidity, suspended matter
  - Alkalinity
  - Total & Dissolved P, N, & C
  - Elemental particle analysis
  - Particulate stable isotopes
  - Chlorophyll
- **Sediment**
  - Enzyme activity
  - Toxicity
  - Total and volatile matter
  - Chemistry (organics, inorganics)
- **Biotic Assemblages**
  - Fish
    - Tissue contaminants
  - Invertebrates
    - Littoral benthos
    - Snags
  - Zooplankton
  - Phytoplankton
  - Periphyton
  - Submersed aquatic vegetation
- **Habitat**
  - Littoral
    - Vegetation cover
    - Substrate
    - Velocity
    - Woody debris
  - Riparian
    - Vegetation cover
    - Invasive species

Indicators, WQ standards, biocritiera, and reference conditions are not well developed for great rivers.

Outputs

Products range from statistical summaries of conditions found ("condition reports") to finding impairments leading to 303(d) listing ("assessments"). Both require explicit definitions of the resources and units. The latter requires reference data, standards, and/or criteria.

What % ("error) of [resource] in [unit] is in [condition] as indicated by [indicator] ?			
Resource	***Unit***	***Condition***	***Indicator***
Main-channel Main-channel border Side channel Back-waters	River State Interstate Assessment Reaches	Good Marginal Poor Threatened Impaired	Biotic integrity fish, benthic inverts, zooplankton, algae Water Quality nutrients, DO, temperature, turbidity Habitat Integrity
Limitations			
Relevancy Data limitations Delineations	Sample size Funding	Reference conditions Biocriteria WQ standards	Variability & performance? Relevancy Cost-effectiveness
Example Outputs			
What % (±) of the main channel of the Apple-Plum HUC is impaired by [NH_3]? What % (±) of the main channel border from Kaskaskia R. to Ohio River is poor fish habitat? What % (±) of the main channel border of Pools 12 & 13 (Apple-Plum HUC) has benthic inverts dominated by tolerant taxa?			

Proposals for Bioassessment Research on the Upper Mississippi River

The RFA invites state agencies responsible for CWA reports to direct future implementations of sampling designs and indicators for the Upper Mississippi River. Proposals are collaborations with ORD. ORD could continue to support training, information management, and WQ & taxonomy lab analyses. The RFA has two major components:

1) Extend the design and sampling to the unified assessment units of the Upper Mississippi River.

- **This would be the basis of a comprehensive monitoring strategy. It would address the data adequacy, availability, and consistency deficiencies identified in the UMRBA report (Jan 2004).**

2) Extend the use of assessment indicators by sampling reference conditions, resolving inter-state criteria differences, and/or developing criteria from new and existing data.

- **The RFA emphasizes, but is not limited to, indicators of fish, benthic invertebrates, zooplankton, and algae of the main-channel and main-channel borders.**

Applications must be submitted by agencies with CWA responsibilities but sub-agreements may include with other state and federal agencies.