Upper Mississippi River
Clean Water Act Monitoring Strategy

Dave Hokanson, Upper Mississippi River Basin Association

January 10, 2013

Overview

- **Resource Setting**
- **Institutional Setting/Governance**
- **Monitoring Objectives and Design**
- **Operational Model**
- **Business Model**
- **Successes and Challenges**

Resource Setting

Physical Characteristics

- 189,000 square miles in basin

- 1,300 miles in total length

- 850 miles navigable, 816 interstate

- Avg. Annual Discharge:
  9,200 cfs at St. Paul
  205,000 cfs at Thebes

Resource Setting

Human Uses

- 23 community public water systems

- 29 power plants

- Approximately 300 wastewater dischargers

- 29 navigational locks & dams

- > 100 tons of commodities shipped annually

Natural Resources

- > 250,000 acres in National Wildlife Refuge

- > 120 fish species, 30 mussel species, 300 migratory bird species

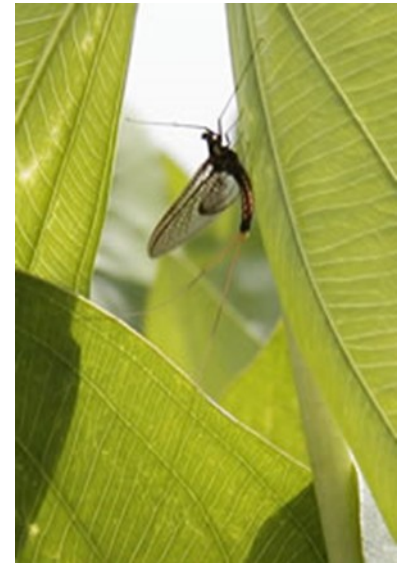- Millions of recreational visits annually

Upper Mississippi River
National Wildlife & Fish Refuge

Resource Setting

Water Quality Issues and Priorities

- Aquatic life/ecosystem support

- Support for recreation

- Use for drinking water supply

- Nutrient and sediment loading & impacts

- Links to Gulf Hypoxia

Resource Setting

Key Considerations for Water Quality Management

- Scale, Complexity, Diversity

- Basin Influence

- Multiple Uses: Recreation, Water Supply, Ecosystem, Navigation

- Institutional Setting: Border River, Multiple Jurisdictions

Institutional Setting

- Five states, multiple agencies within states (environmental, natural resource, transportation, and others

- Several federal agencies (USACE, USFWS, USGS, US EPA and others)

- Local and regional entities

- Commercial interests (shipping, recreation, industry, and others)

- Environmental interests (NGOs)

- Citizens (residents and river users)

- Universities

Institutional Setting

Several prominent, ongoing monitoring programs:

- USACE Environmental Management Program's Long Term Resource Monitoring Program (LTRMP)

- USGS (NASQAN/NAWQA)

- State Programs (IL EPA, MPCA, WI DNR, others)

- Metropolitan Council Environmental Services

Plus periodic and demonstration programs:

- US EPA NRSA, EMAP-GRE

However, none covers full spatial extent for CWA purposes
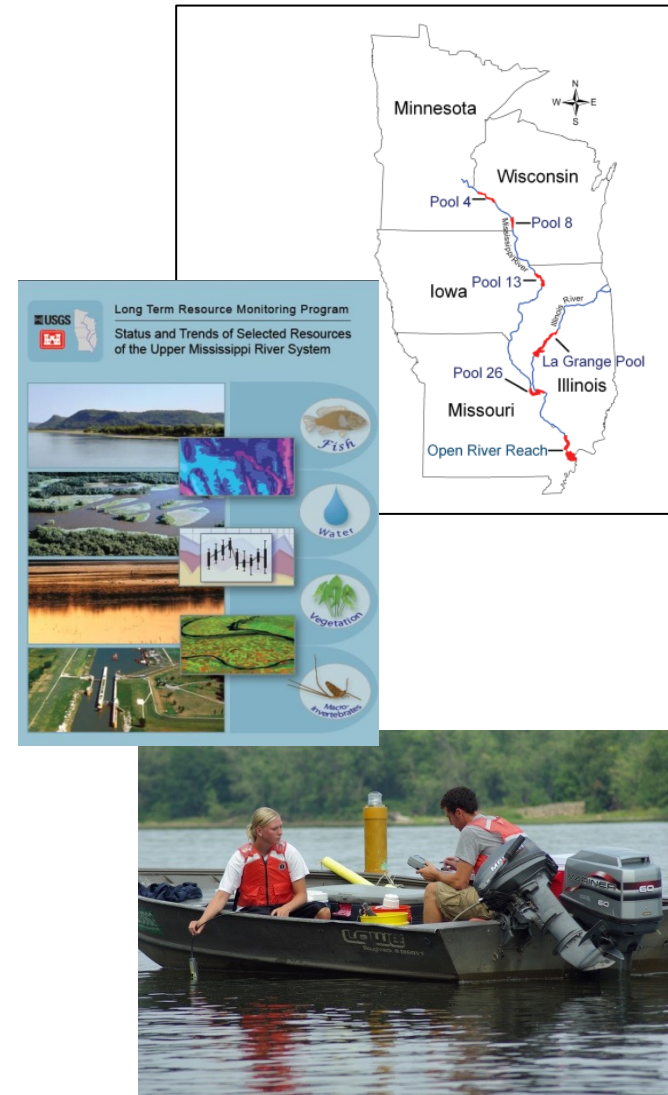
Institutional Setting

Upper Mississippi River Basin Association (UMRBA)

- Spatial scope: the UMR and its basin

- Members: IL, IA, MN, MO, & WI

- Established in 1981 by Governor's action, successor to the federally-funded Upper Mississippi Basin Commission

- Articles of Association (not Compact)

- Board composed of gubernatorial appointees

- Facilitates dialogue and cooperative action

- Doesn't regulate, construct, or operate

- Staff of seven (4 permanent, 3 project)

- State dues and grants/contracts support activities

Governance

"We are committed not only to the protection of the River's water quality, but we are also committed to doing so in a coordinated manner…..**We are therefore supporting the coordination of water quality monitoring,** assessment, and standards for the Upper Mississippi River by the States of Illinois, Iowa, Minnesota, Missouri, and Wisconsin and the Upper Mississippi River Basin Association. This approach will allow the Clean Water Act to be implemented on the Upper Mississippi River in a more coordinated and consistent fashion than has ever been possible previously."

From the Statement of the Governors of Illinois, Iowa, Minnesota, Missouri, and Wisconsin on Water Quality Protection for the Mississippi River (August 2, 2007).

Governance

UMRBA Board
(Governors' Appointees)

Water Quality Executive Committee
(CWA Program Directors, Policy Level)

Water Quality Task Force
(Program Staff/ Supervisors, Technical Level)

UMRBA Board (1981)
- Illinois
- Iowa
- Minnesota
- Missouri
- Wisconsin

Water Quality Executive Committee (2006)
State (Voting) Members
- Illinois EPA
- Iowa DNR
- Minnesota PCA
- Missouri DNR
- Wisconsin DNR

Federal (Non-Voting) Members
- US EPA Region 5
- US EPA Region 7

Water Quality Task Force (1999)
- Illinois EPA
- Iowa DNR
- Minnesota PCA
- Missouri DNR
- Wisconsin DNR
- US EPA Region 5
- US EPA Region 7

Rationale

- No unified or comprehensive UMR CWA monitoring
- Existing programs not designed for CWA purposes nor cover full spatial extent
- Biology not integrated
- Inconsistent and limited assessments result
- UMRBA's aquatic life use, nutrient, and bioassessment project recommendations

Project Purpose

"...develop a monitoring strategy framework via a collaborative interagency process to aid the UMR states in moving forward with more comprehensive, consistent, and accurate CWA assessments of the River, leading to both a better understanding of its condition and improvements to its water quality." - from UMRBA-Illinois EPA funding agreement
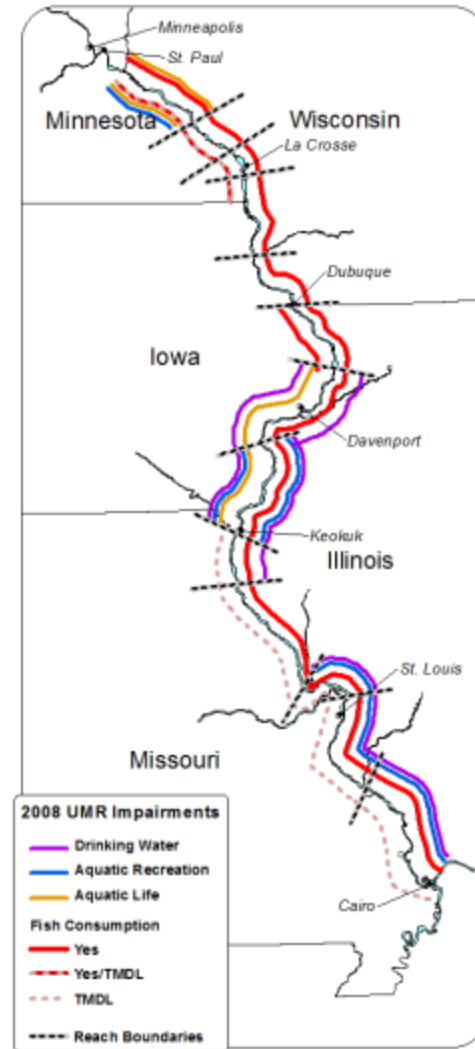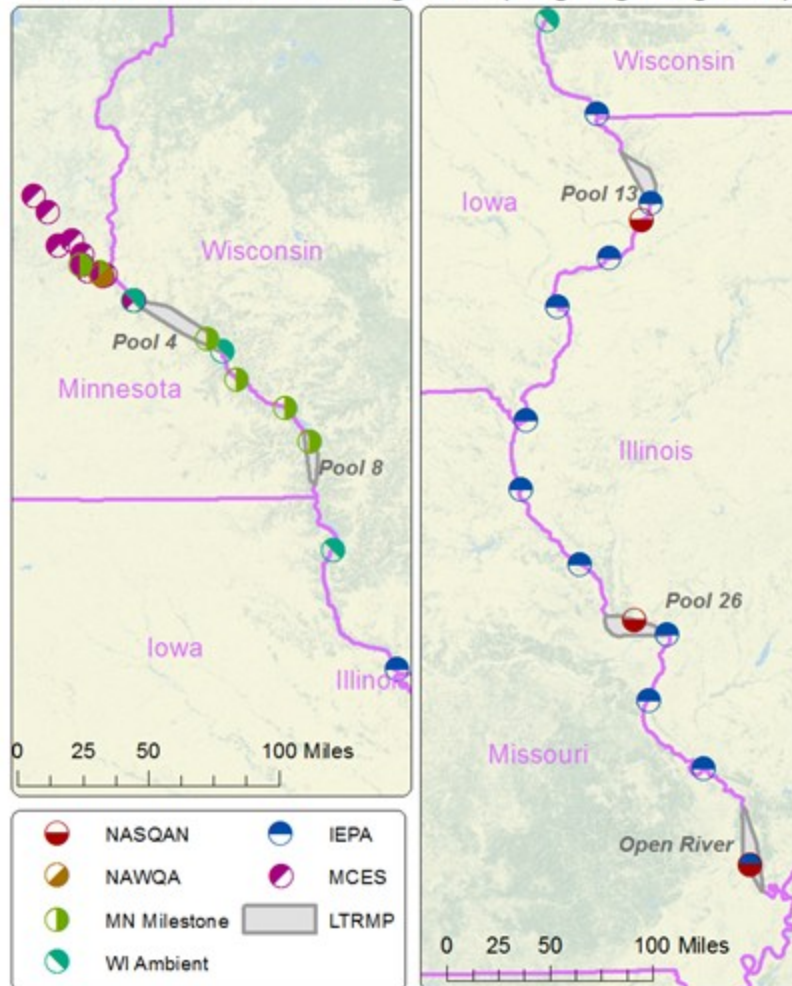
UMR Mainstem Monitoring Sites (Ongoing Programs)

Objectives and Design

Scope

- Full longitudinal extent
- Four lateral strata (where tools available), main channel highest priority
- Four major designated uses – aquatic life, drinking water, recreation, fish consumption
- Chemical, physical, and biological parameters

Goals

- Central goal – support improved assessment of the UMR under the CWA [305(b) and 303(d)]
- Also aid other key CWA program functions including standards development, NPDES permits, TMDLs, nonpoint source assessment & management, and measurement of nutrient & sediment loading from tributaries
- *Recently:* More emphasis on building robust data set & detecting change, less on regulatory elements *per se*

Midwest Biodiversity Institute
Center for Applied Bioassessment & Biocriteria
P.O. Box 21561
Columbus, OH 43221-0561

Upper Mississippi River Clean Water Act Monitoring Strategy 2013-2022, Part 1:
Options and Considerations
June 30, 2013

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photo courtesy of Wisconsin DNR

Peter A. Precario, Executive Director
Dr. David J. Horn, Board President

Upper Mississippi River
Clean Water Act Monitoring Strategy 2013-2022

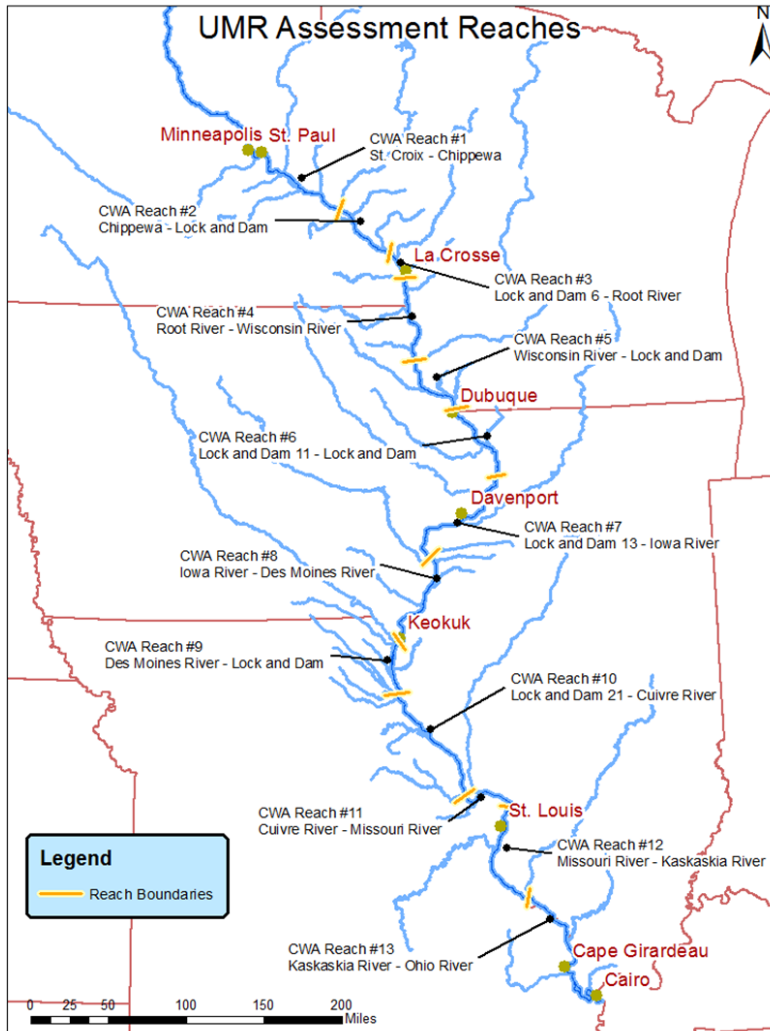# PART 2: RECOMMENDED MONITORING PLAN

Draft – July 17, 2013

Upper Mississippi River Basin Association

Thirteen "minimum" UMR CWA assessment reaches

Objectives and Design

Monitoring/Assessment focus for the near-term:

Longitudinal Reaches		Main Channel	Side Channel	Impounded	Contiguous Backwater
	St. Croix River				
	Upper Impounded to Chippewa River *CWA Assessment Reach 1*				
	Chippewa River (base of Lake Pepin)				
	Upper Impounded below Chippewa River *CWA Assessment Reaches 2-6*				
	Lock and Dam # 13				
	Lower Impounded *CWA Assessment Reaches 7-11*				
	Missouri River				
	Unimpounded (Open River) CWA Assessment Reaches 12-13			*(Not Applicable)*	
	Ohio River				

Objectives and Design

Range of Spatial Intensity in Design Options

Figure 2. Probabilistic A design option sites based on the 2013-14 NRSA draw and including 50 sites for the UMR main channel.

Probabilistic Design A
Entire river as one system (30-50 sites)

Figure 3. Intensive Pollution Survey design option sites based on site location methodology and also including 2004-6 GRE and existing fixed station sites as a part of the design and to show a comparison of site density. This includes main channel and side channel sites.

Intensive Survey Design/Probabilistic Design D
Assessment to site/13 assessment reach level (approx. 400 sites)

Objectives and Design
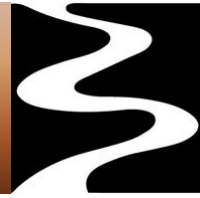
Selection of Recommended Monitoring Plan:

- *Many meetings & many options considered. . .*

- **Selected a UMR-wide probabilistic design**:

  - 15 randomly distributed samples in flowing channels (main & side channels) in each of the 13 UMR assessment reaches

  - Includes chemical, physical, fish tissue, biological assemblage, indicator bacteria sampling

  - For assessing aquatic life, fish consumption, & recreation use support

- **Supplemented by fixed stations, targeted sites, and followup monitoring** :

  - <u>Fixed Stations</u>: For aquatic life, recreation, and drinking water assessments *(use existing fixed stations)*

  - <u>Targeted Sites</u>: For drinking water *(intakes)* and recreation use *(urban areas)* assessments

  - <u>Follow-Up Sampling</u>: As needed for aquatic life and fish consumption uses

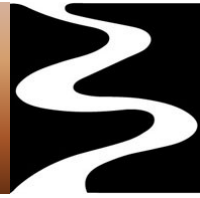- **And includes tributary loading network recommendation**
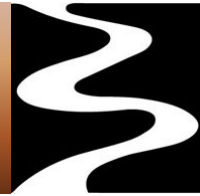
Rationale For Selection of Recommended Plan

- Compatibility with LTRMP and existing UMR fixed stations

- Builds on EMAP-GRE program methods and indices, similar in approach to ORSANCO

- Covers all uses, integrates chemical, physical, and biological information

- Combination of probabilistic, targeted, and fixed sites yield robust assessment
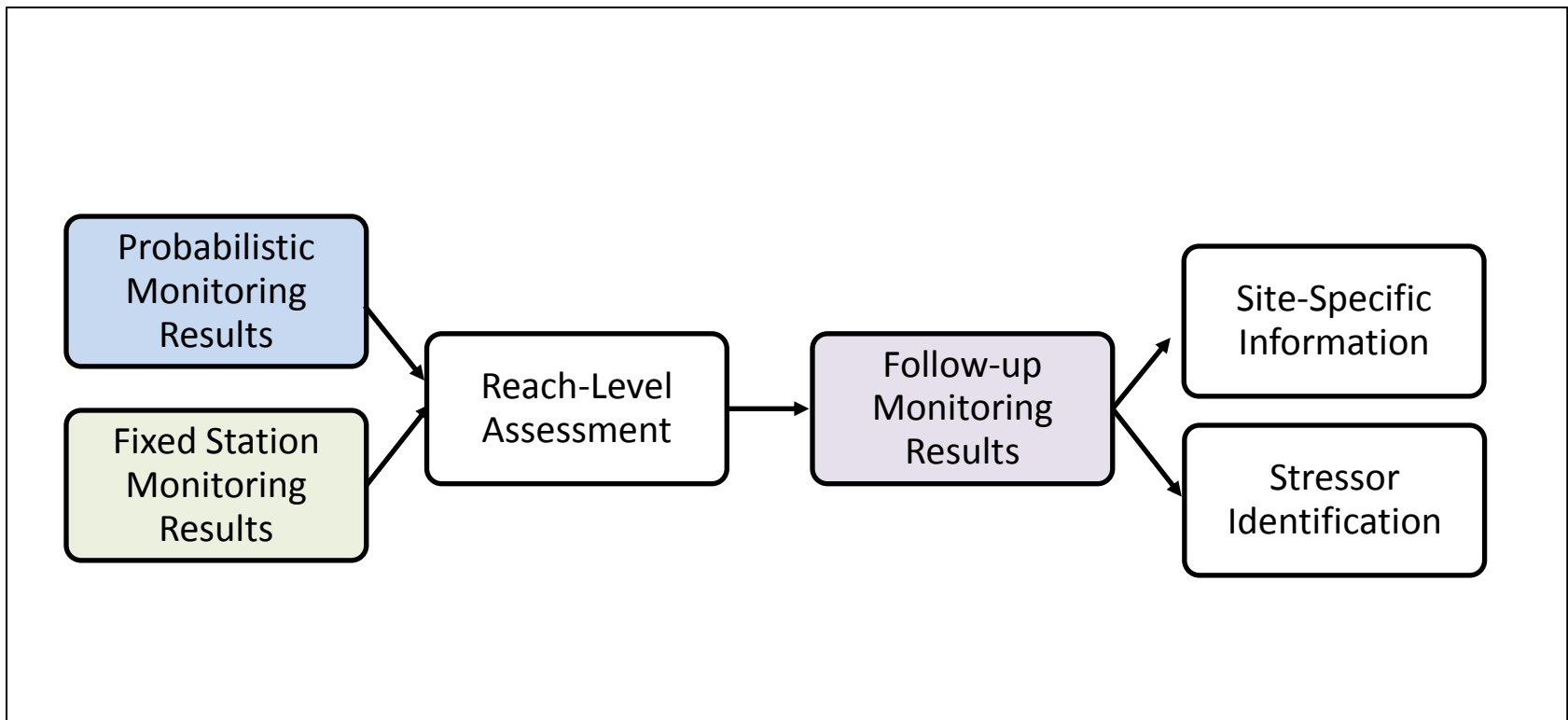
Objectives and Design

Multiple monitoring networks to assess multiple uses, plus tributary loading network

|	
CWA Assessment-Focused Monitoring	**Loading-Focused Monitoring**
Reach-Based Probability Sampling (195 sites) *Aquatic Life, Fish Consumption, Recreation*	**Tributary Loading Network (34 sites)** *Nutrient and Sediment Loads*
Mainstem Fixed Site Sampling (11 sites) *Aquatic Life, Recreation, Drinking Water* / **Targeted Site Sampling** *Recreation (24 Sites, Urban Areas) Drinking Water (19 Sites, Intakes)*	
Follow-Up Sampling (Sites TBD) *Aquatic Life, Fish Consumption*	

Aquatic Life Use Assessment – Example of Utilizing Probabilistic, Fixed, and Follow-up Networks

Similar approach for other use assessments, incorporating multiple networks.
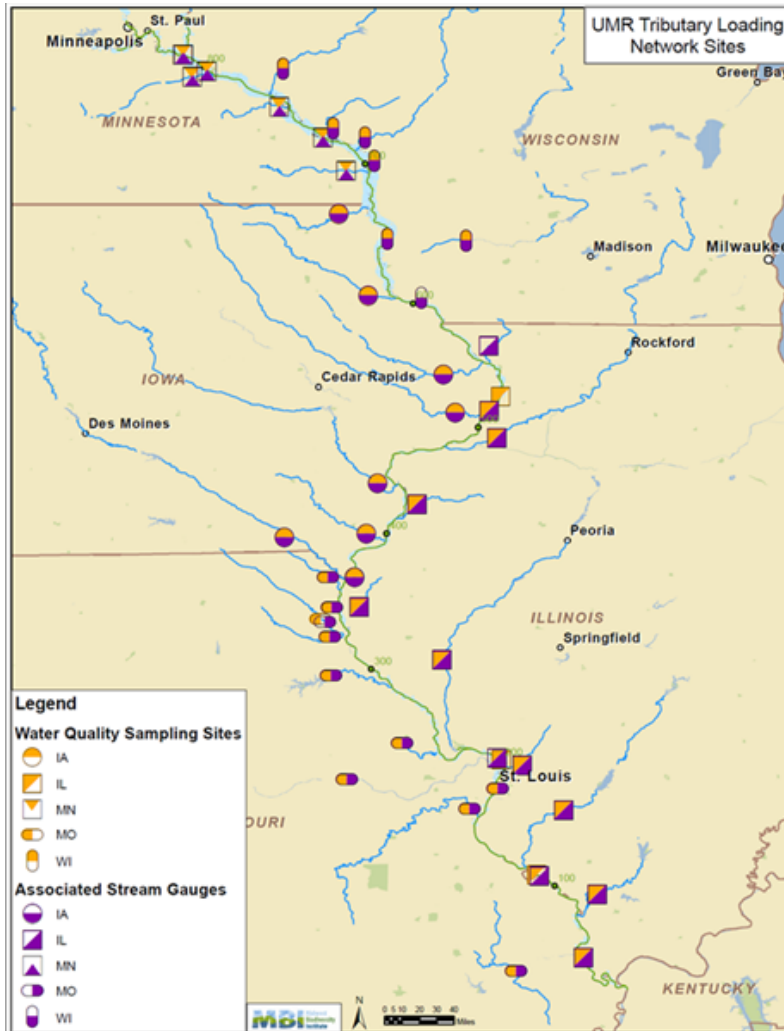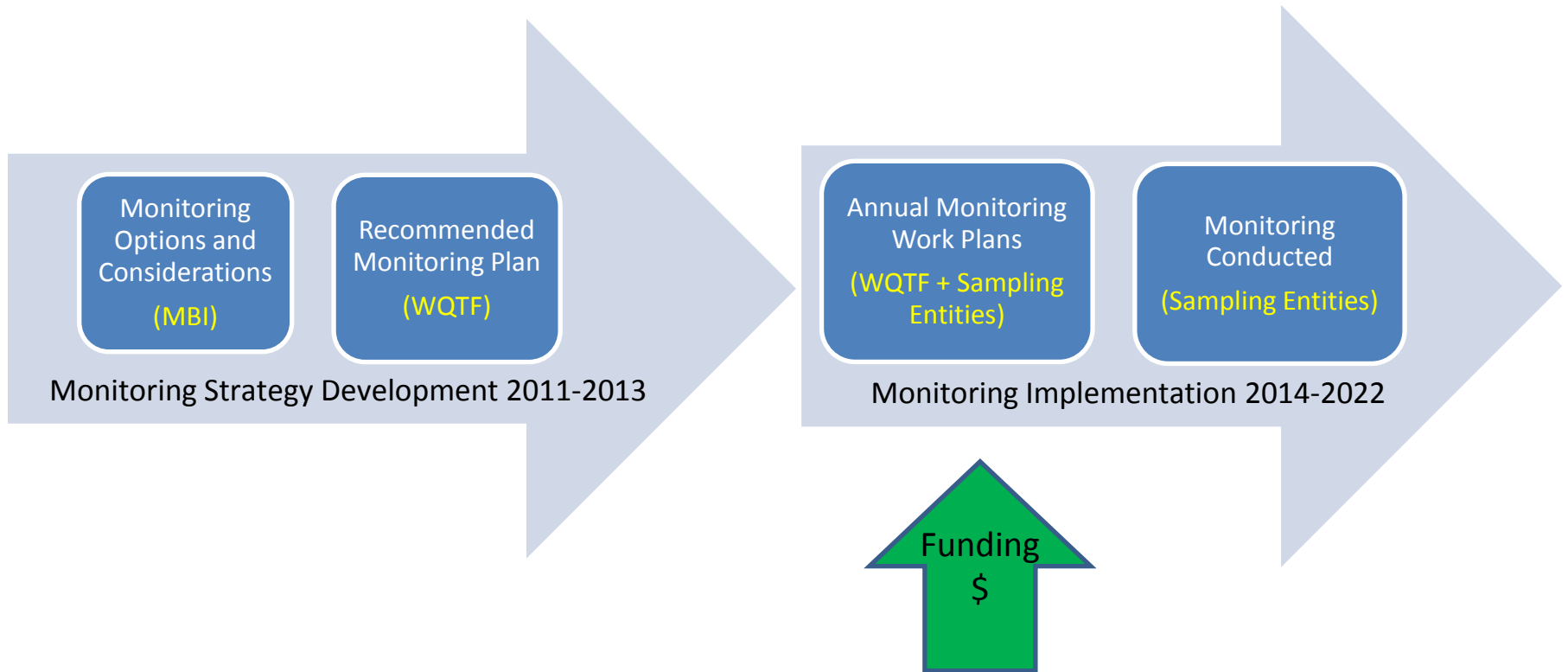
Tributary Loading Network

- **45 total sites**

- **11 mainstem** already incorporated in mainstem fixed site network

- **34 tributary**

- **Parameters** field (*DO, temp, pH, turbidity, conductivity, Secchi*), nutrients (*TN, TP, NHx, nitrate/nitrite, dissolved P, chl-a*), TSS, TOC, discharge

- **All existing stations** (except one)

Operations Model

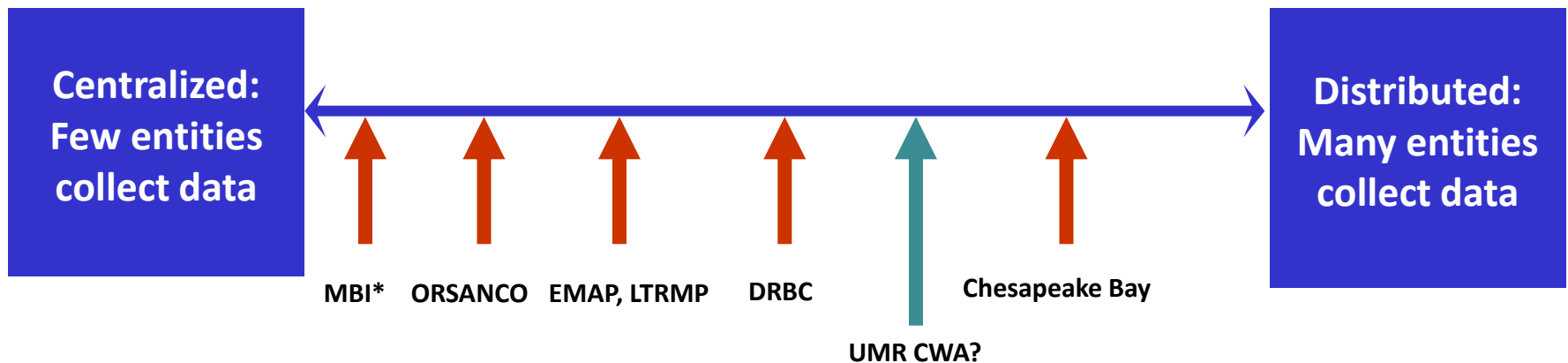## UMR CWA Monitoring Strategy - Process

Monitoring Strategy Development 2011-2013	Monitoring Implementation 2014-2022
Monitoring Options and Considerations (MBI) · **Recommended Monitoring Plan** (WQTF)	**Annual Monitoring Work Plans** (WQTF + Sampling Entities) · **Monitoring Conducted** (Sampling Entities)

Funding $

Data Collection

- **Centralized** ⟺ **Distributed Data Collection**
- **Other program examples:**

| Centralized: Few entities collect data | | Distributed: Many entities collect data |

MBI*   ORSANCO   EMAP, LTRMP   DRBC   Chesapeake Bay

UMR CWA?

- **Assuming we are headed towards more of distributed model**
- **Potential UMR partners: state CWA programs, state-based field stations, USACE, US EPA, USGS, UMRBA, universities, private contractor** *(citizen monitoring a challenge)*

*Approach used for cost estimates in MBI's Options & Considerations document

Operations Model
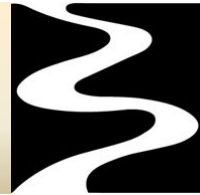
Emphasizing Use of Existing Program Data – Gap Analysis

	Upper Impounded (Above Chippewa R.)	Upper Impounded (Below Chippewa R.)	Lower Impounded		Open River
	Reach 1 (RM 812-763)	**Reach 4** (RM 694-631)	**Reach 7** (RM 523-434)	**Reach 9** (RM 361-325)	**Reach 13** (RM 118-0)
Aquatic Life - Biological	Compatible data: LTRMP (Fish, Veg) MNDR (Veg) UMRCC (Veg) Gaps: Spatial gap for fish. No macroinvert. data	Compatible data: LTRMP (Fish, Veg) UMRCC (Veg) Gaps: Spatial gap for fish, possible spatial/ temporal gap for veg. No macroinvert. data	Compatible Data: Iowa DNR (Fish) Gaps: Fish data is very limited spatially. No macroinvert. data	Compatible data: INHS (Fish) Gaps: Spatial gap for fish No macroinvert. data	Compatible data: LTRMP (Fish) Gaps: Spatial gap for fish No macroinvert. data
Aquatic Life- Chemical - Physical	Compatible data: LTRMP MCES Gaps: Except for fixed site, have spatial gaps and missing metals & organics	Compatible data: LTRMP WI DNR Gaps: Spatial gaps and missing metals & organics	Compatible data: IL EPA Gaps: Only have fixed site data, nothing for probabilistic, so significant spatial gap	Compatible data: None Gaps: No data meeting design	Compatible data: LTRMP IL EPA USGS Gaps: Spatial gaps and missing metals & organics
Fish Consumption	Compatible data: None Gaps: No data meeting design	Compatible data: None Gaps: No data meeting design	Compatible data: None Gaps: No data meeting design	Compatible data: None Gaps: No data meeting design	Compatible data: None Gaps: No data meeting design
Recreation	Compatible data: MCES Gaps: Only have fixed site data, nothing for probabilistic or targeted network	Compatible data: WI DNR Gaps: May have some fixed site data, nothing for probabilistic or targeted network	Compatible data: None Gaps: No data meeting design	Compatible data: None Gaps: No data meeting design	Compatible data: IL EPA USGS Gaps: Only have fixed site data, nothing for probabilistic or targeted network
Drinking Water	Not applicable, use not assigned.	Not applicable, use not assigned.	Compatible data: Water suppliers Gaps: Several missing parameters, not all intakes may have data	Compatible data: Water suppliers (?) Gaps: Cities may have some data, did not respond to survey	Compatible data: Water supplier (?) Gaps: City may have some data, did not respond to survey

Operations Model

## Preliminary Observations on the Use of Existing Program Data

- **It's all a bit subjective so far, but…**
- **There appears to be a significant amount of compatible data available**
- **However:**
    - Not enough to conduct "full" assessment for any use on any reach
    - Perhaps some "partial" or "preliminary" assessment could be done
    - More data typically available for aquatic life use
    - Majority of data would still need to be collected to meet plan specifications
    - Transaction costs of compiling data:
        - Gather from multiple sources (>10 so far in five reaches studied)
        - Manipulate to standardize/fit assessment needs (e.g., LTRMP fish data aggregation)
        - Put and maintain in one place
- **Questions:**
    - Make better use of existing fish tissue programs?
    - Integrate more fixed sites?
    - How/if to integrate NRSA?

Data Management
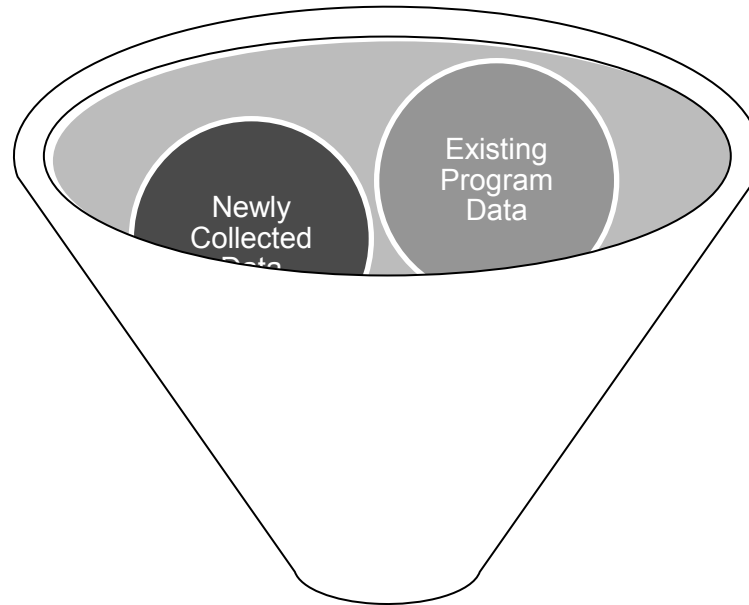
Near-term use by states in **CWA assessment & listing** with existing standards and methodologies

UMR CWA Data Set

Other near-term uses, for CWA (standards, TMDL, permits) and otherwise (loading, trends)

Possible Future Use:
**Comprehensive, Shared 305(b)-type Assessment**

Data Management - Options

- **Presumably works best as a centralized function, but still choices to be made**

- **Database(s) to use?**
  - New, stand-alone UMR database
  - Use existing database (LTRMP, state, WQX, or other)
  - Housing some data (probably biological) in a new database, with chemical/physical data going into WQX or other existing database

- **Who manages data?**
  - UMRBA
  - A single state
  - US EPA
  - USGS
  - Private contractor
  - Presumably need at least one "dedicated" staff person under any scenario
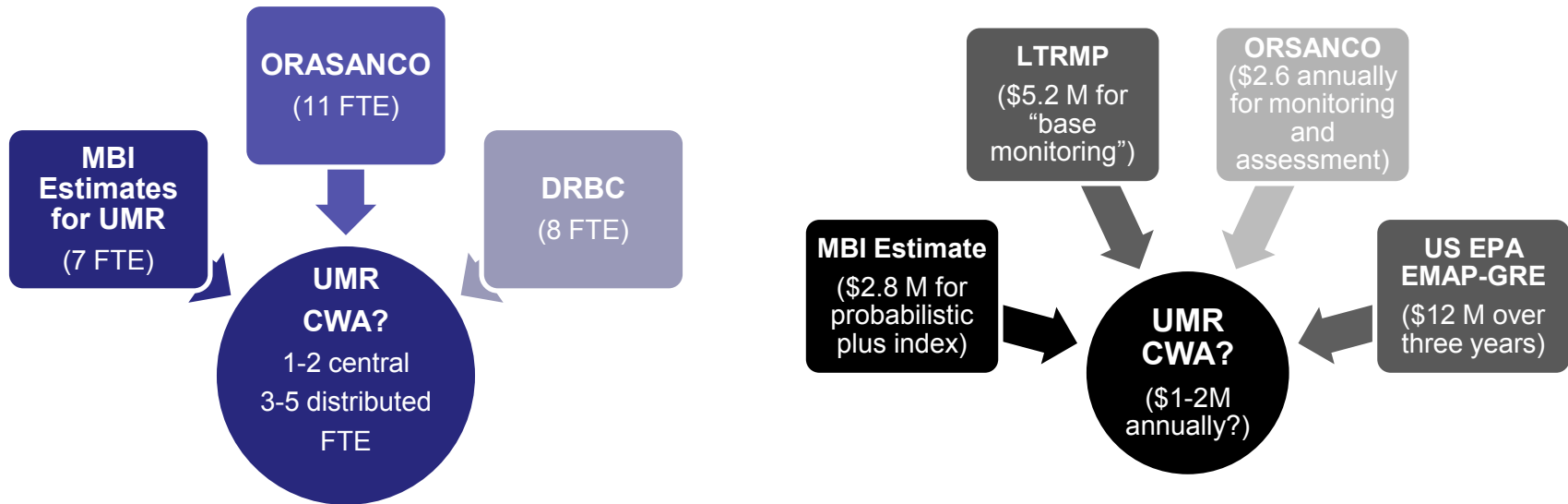
Staffing – One Possible Model
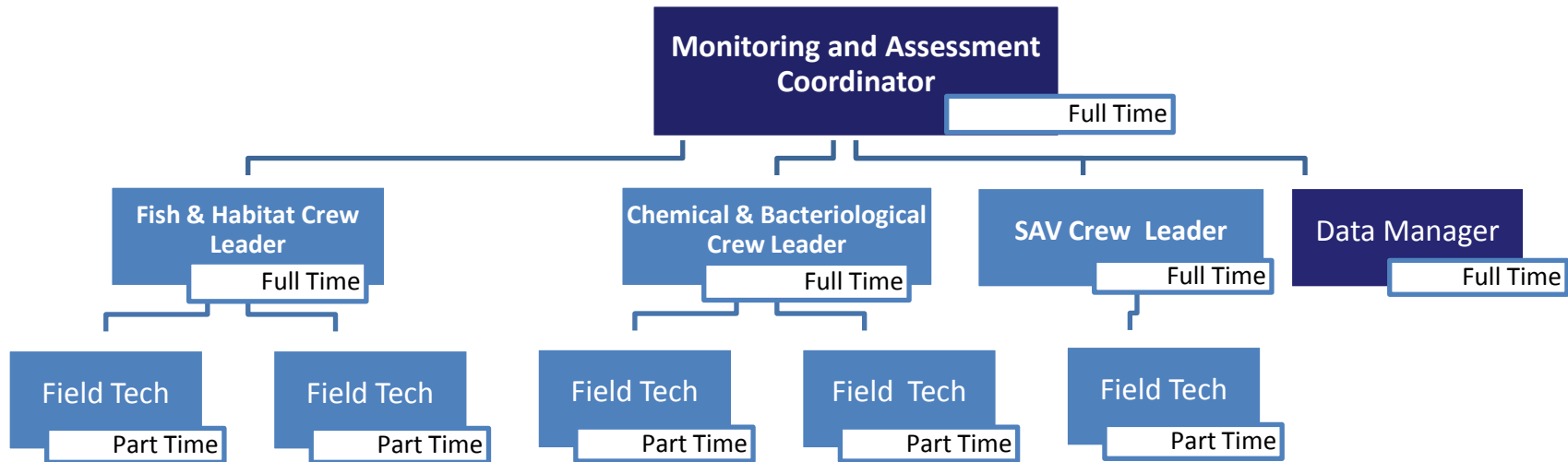
Monitoring and assessment coordinator, data manager are "central, dedicated" staff (entity TBD) – others likely distributed at various entities.

Operations Model

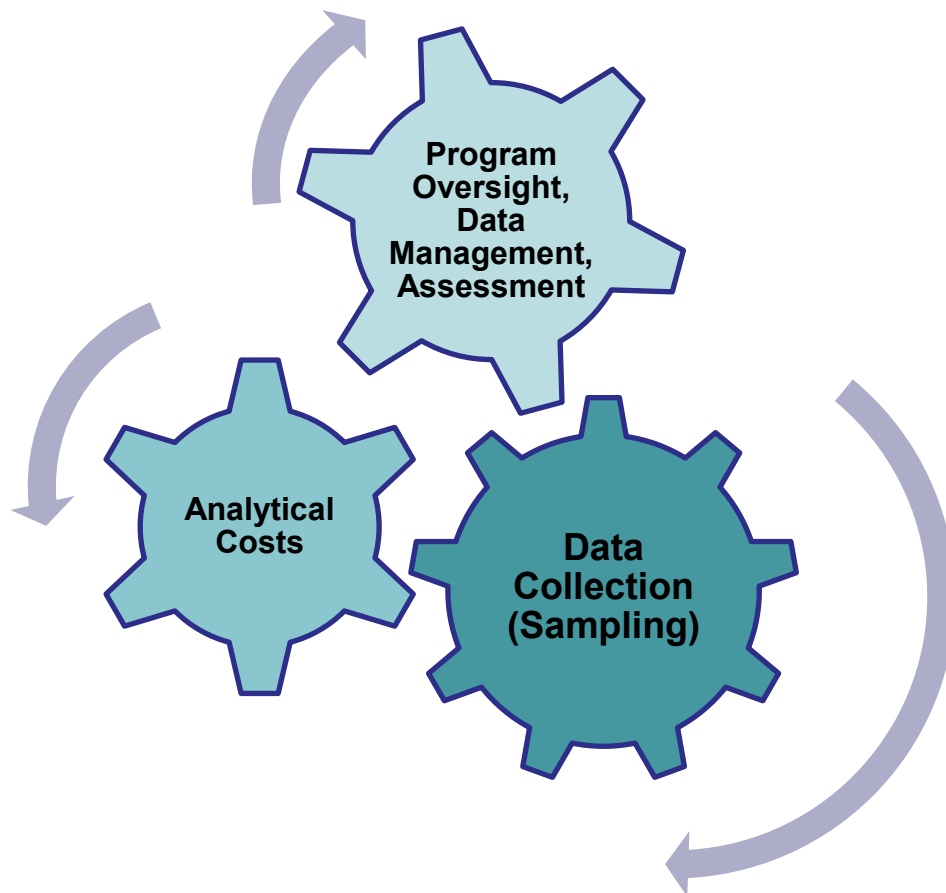## Staffing and Costs - *Very Much Ballpark at This Point!*

Costs – Moving Parts

Affected by:

- **Use of existing program data**
  - ⬇ Collection and analytical costs
  - ⬆ Coordination and data management costs
- **Structural/staffing choices**
  - ⬌ Dependent on many variables (in kind contributions, pay rates, permanent vs. contract, etc.)
- **Pace of implementation**
  - ⬆ Faster, increased annual cost
  - ⬇ Slower, decreased annual cost

Business Model

Current UMR Water Quality Funding/Resources
(Baseline + Special Projects)

- **Baseline UMRBA WQ Activities**
  - Water quality work group support and coordination, some technical work
  - States' self-imposed water quality "assessment" of $17K each ($85K total); plus small portion of states' dues
  - Approx. 1 FTE supported
- **Monitoring Strategy Development**
  - CWA Section 106 monitoring funds, via Illinois EPA ($130K over 2 years)
  - Contractor and UMRBA staff support
- **Other Special Project Funding as Available**

Future Funding/Resources
(Including Monitoring Coordination & Data Management)

- **Continue Baseline**

- **In-Kind Contributions (?)**
  - States implement monitoring as feasible/in pilot areas
  - Work with partners to gather existing data

- **New Sources of Support (??)**
  - Direct 106 not available
  - Dedicated federal/EPA funding (unlikely)
  - Further use of states 106 monitoring supplement funds (possible)
  - Private or foundation support (need to explore)

- **Unlikely to get all at once = phased implementation likely**

- **Cultivate constituencies to build support** (e.g., mayors' group, water suppliers, recreation interests)

Successes and Challenges

Successes

- **Documented states' desired CWA monitoring, allowing:**
    - Comparison to existing programs
    - Conversations with partners
    - Thinking about implementation, costs, and staff
    - Pilot projects
    - Pursuit of resources/funding
- **Interest from river scientists and management agencies**
- **Sharpens questions about data use, assessment, listing, and standards**

Successes and Challenges

Challenges

- **Sufficient, sustained funding/resources;** also getting a better handle on costs

- **Coordination and partner buy-in;** includes cultivating support *beyond* interest from river scientists and management agencies

- ***Answering* questions about data use;** including assessment, listing, and standards <u>and</u> connecting the data to other management uses

Successes and Challenges

Next Steps

- **Board Consideration of Recommended Plan/Policy Resolution**
  - To be put before UMRBA Board in February
- **Partner Outreach**
- **Shared Assessment/Methodology**
  - Examine feasibility
- **Data Management Plan**
- **Pilot Monitoring Implementation**
- **Build Staff Capacity**
- **Pursue Funding/Resource Ideas**

Questions and Discussion

For More Information, Contact:

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See also:

UMRBA Web Site

www.umrba.org