Research, Education, and Service

IIHR—Hydroscience & Engineering

Iowa Water Conference

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Cyberinfrastructure Framework for the Upper Mississippi River Basin

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Slides Available at:

- **https://www.iihr.uiowa.edu/cjones/welcome/**

IIHR Water Quality Sensor Network

IIHR Water
Quality Sensor

LEGEND

Raccoon River
North Raccoon
"lower" South Raccoon
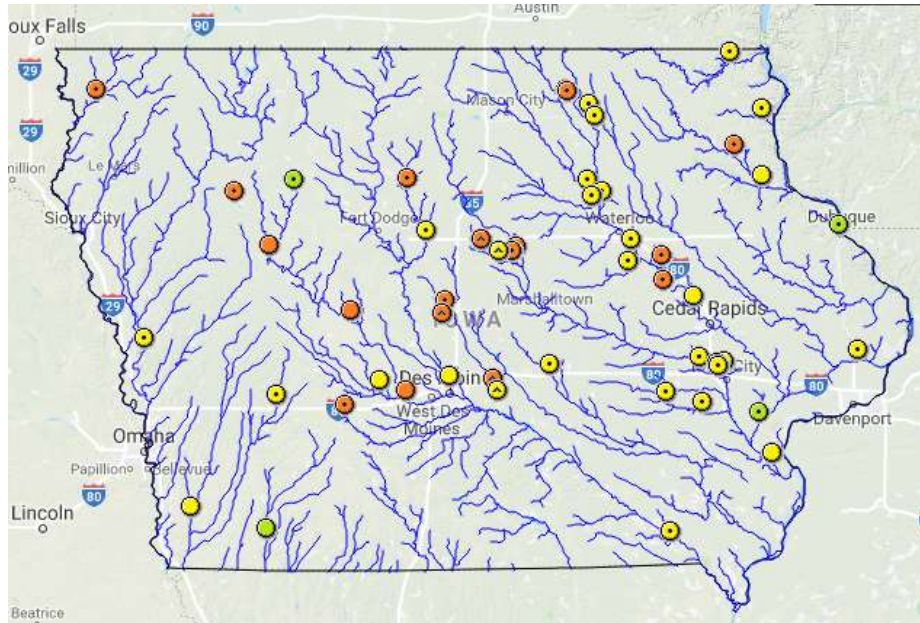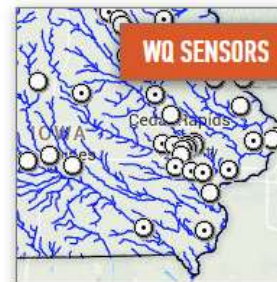Middle Raccoon
South Raccoon

IOWA WATER QUALITY

INFORMATION SYSTEM

Welcome to the Iowa Water Quality Information System. The IWQIS allows access to real-time water-quality data and information such as **nitrate**, **pH**, and **dissolved oxygen concentrations**, discharge rates, and **temperature**.

LAUNCH IWQIS

WQ SENSORS | WQ CONDITIONS | STREAM SENSORS | VIDEO TUTORIAL

| ABOUT IWQIS | TOOLS & FEATURES | HELP & TUTORIALS | DATA REQUEST | EMBED WIDGET | CONTACT US |

iwqis.iowawis.org/

http://iwqis.iowawis.org/app/?datetime=2017-06-06T13:00

Contact

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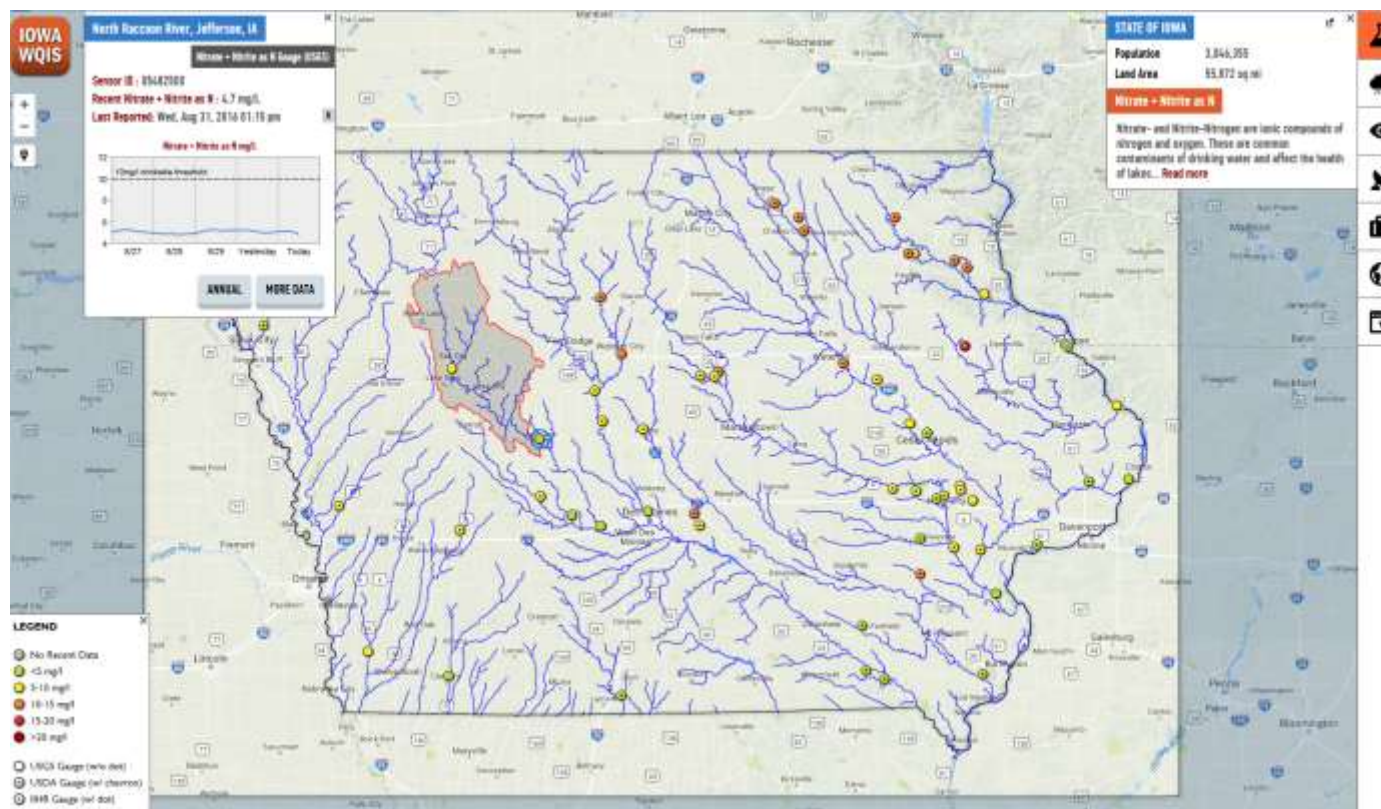
Great Lakes to Gulf Virtual Observatory

The National Great Rivers Research and Education Center (NGRREC℠), Illinois-Indiana
Sea Grant, and the National Center for Supercomputing Applications (NCSA)
partnered in the development of the Great Lakes to Gulf (GLTG℠) Virtual Observatory.
The GLTG℠ Virtual Observatory provides access to water resource information, from
the Mississippi River and featured watersheds in the Mississippi River Basin.
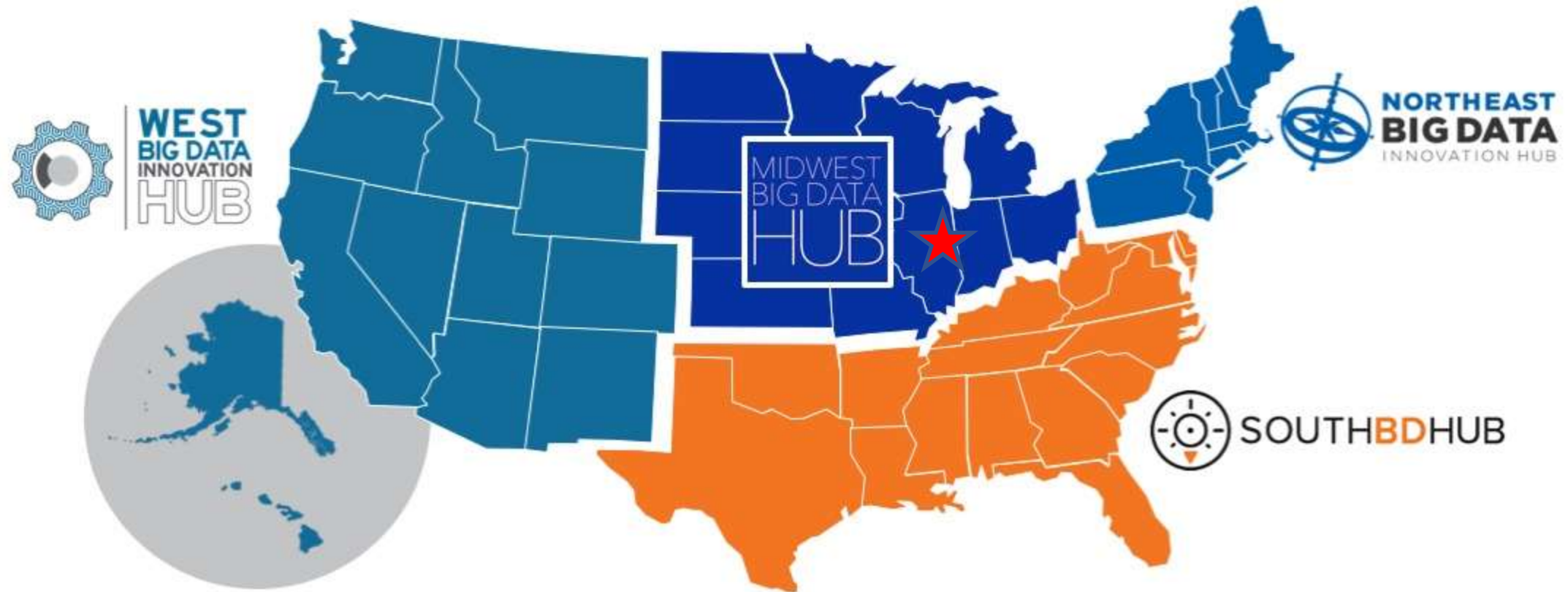
Researchers

- Witek Krajewski, UI (PI)

- Ibrahim Demir, UI

- Richard Warner, UIUC

- Larry Weber, UI

- Jong Sung Lee, UIUC

- Chris Jones, UI

- Keith Schilling, IGS

Partners

Core University Partners

THE UNIVERSITY OF IOWA

ILLINOIS
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

IOWA STATE UNIVERSITY

Institutional

LEWIS&CLARK COMMUNITY COLLEGE
Empowering People

MIDWEST BIG DATA HUB

NCSA

The National Great Rivers Research & Education Center

IIHR Hydroscience & Engineering

THE UNIVERSITY OF IOWA
College of Engineering

Research Priorities: Midwest Big Data Hub

Proposed development of a cyberinfrastructure framework to support large-scale water-quality data integration, analyses, and visualization in the Upper Mississippi River Basin (UMRB) in real time using data-enabled information technologies.

Advanced Materials and Manufacturing

Digital Agriculture

Smart & Resilient Communities

Water Quality

Big Data in Health

Data Science Education and Workforce Development
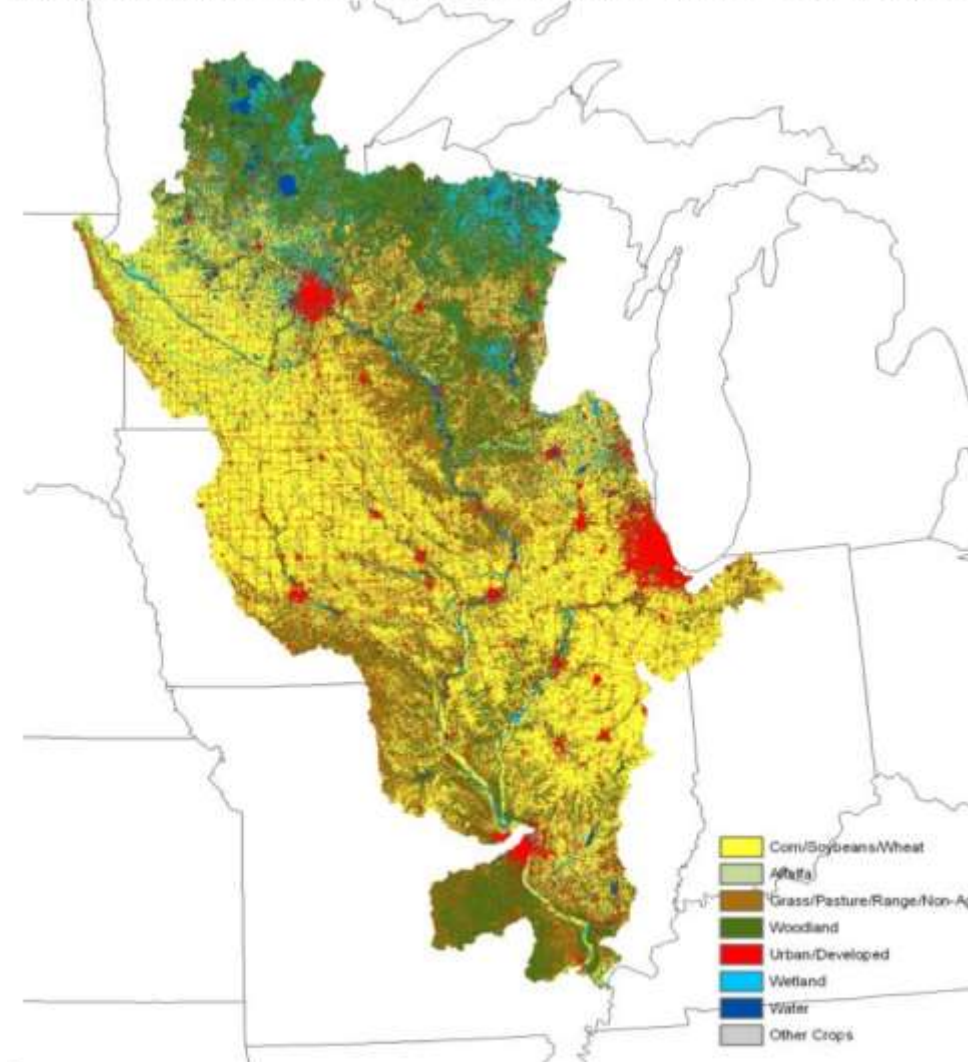
Cyberinfrastructure and Data Sharing

UMIS directly addresses three of the Grand Challenges for Engineering identified by the National Academy of Engineering

- Provide Access to Clean Drinking Water

- Manage the Nitrogen Cycle

- Engineer the Tools of Scientific Discovery

- 190,000 square miles (122 million acres)
- Urban Area: 8%
- Crop Area: 50%
- Corn: 32 million acres
- Soybean: 17 million acres
- 19% of US cropland
- 17% of US crop sales
- ~50% of US hogs
- ~17% of US dairy

- Iowa: 1st in corn, hogs, eggs
- Illinois: 1st in soybeans
- Minnesota: 1st in turkeys
- Wisconsin: 2nd in dairy

Figure 1. *Location of and land cover in the Upper Mississippi River Basin*

Legend:
- Corn/Soybeans/Wheat
- Alfalfa
- Grass/Pasture/Range/Non-Ag
- Woodland
- Urban/Developed
- Wetland
- Water
- Other Crops

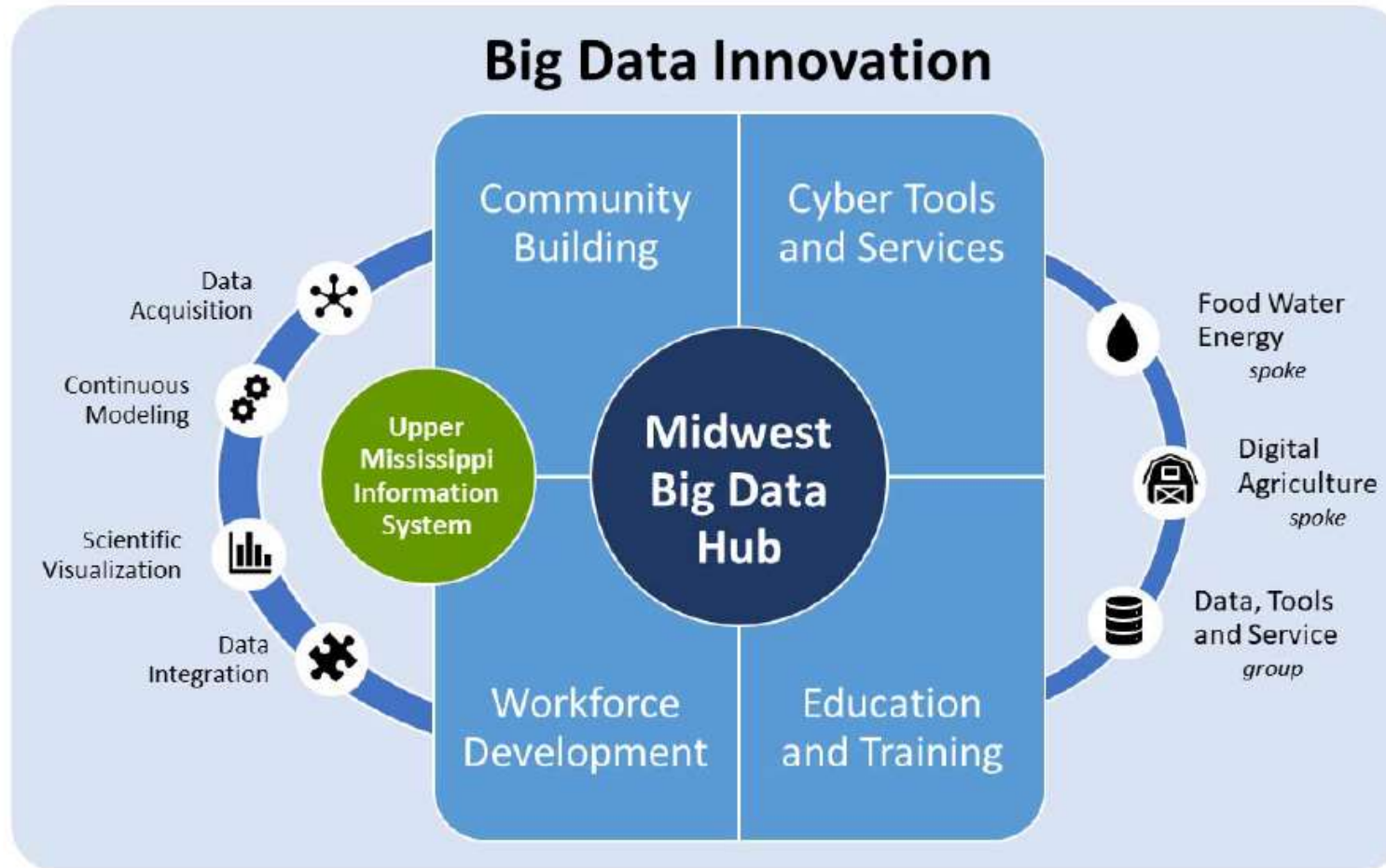SOURCE: TEXAS AGRILIFE RESEARCH, TEXAS A&M UNIVERSITY (USDA-NASS DATA)

Figure 1: Big Data context of the project's vision and structure, with the Midwest BD Hub serving as an "amplifier" of the potential impact.

Capacities

Capacity to generate water quality and quantity data exceeds our capacity to use it

1. a lack of awareness of large but disparate data sources

2. the data's inaccessibility.

Upper Mississippi Information System

www.umissis.org

Platform Goals

- Provide novel data analytics and visualization capabilities to support development of solutions for and monitor progress toward the Gulf of Mexico Hypoxia Task Force

- Support the states' nutrient reduction strategies with real-time data streams

- Enable data-driven visual analysis techniques

- Integrate Citizen-Science generated data (crowd-sourcing)

Research questions that could be addressed:

▪How could projected climate change affect water quality in the region from the UMRB to the Gulf of Mexico?

▪What conservation practices are most effective in reducing water-quality issues?

▪Are the goals of the Gulf of Mexico Hypoxia Task Force achievable? If so, what will it really take to achieve them?

▪What is the most effective way to communicate water-quality and quantity information to facilitate decision-making processes by diverse stakeholders?

Tasks

- Task 1: Data Acquisition and Integration Survey of Existing Data Resources (IIHR, UIUC)

- Task 2: Set up large-scale integrated modeling framework for continuous modeling activities within UMRB (ISU, IIHR)

Tasks

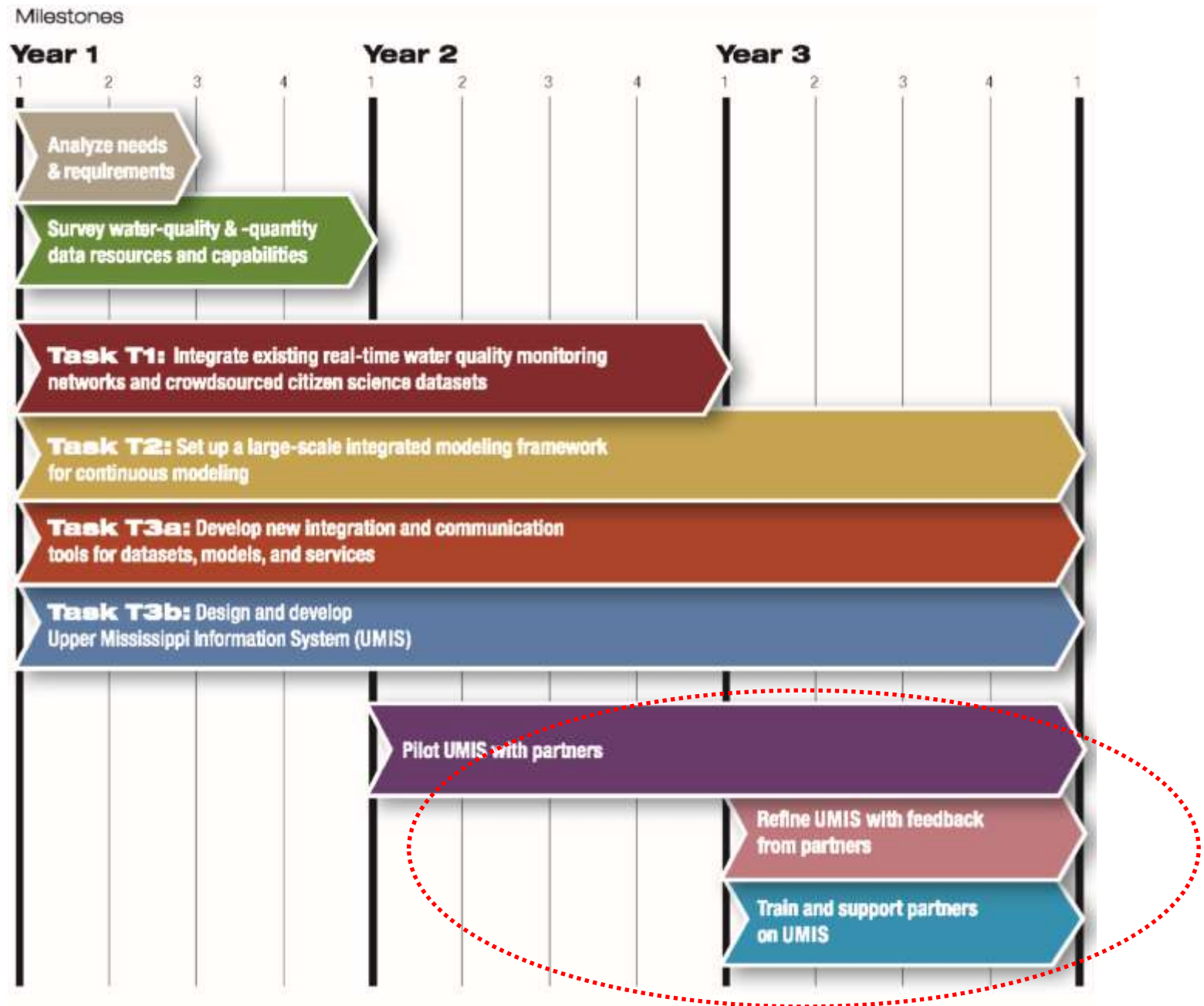- Task 3a: Data Access and Visualization tools

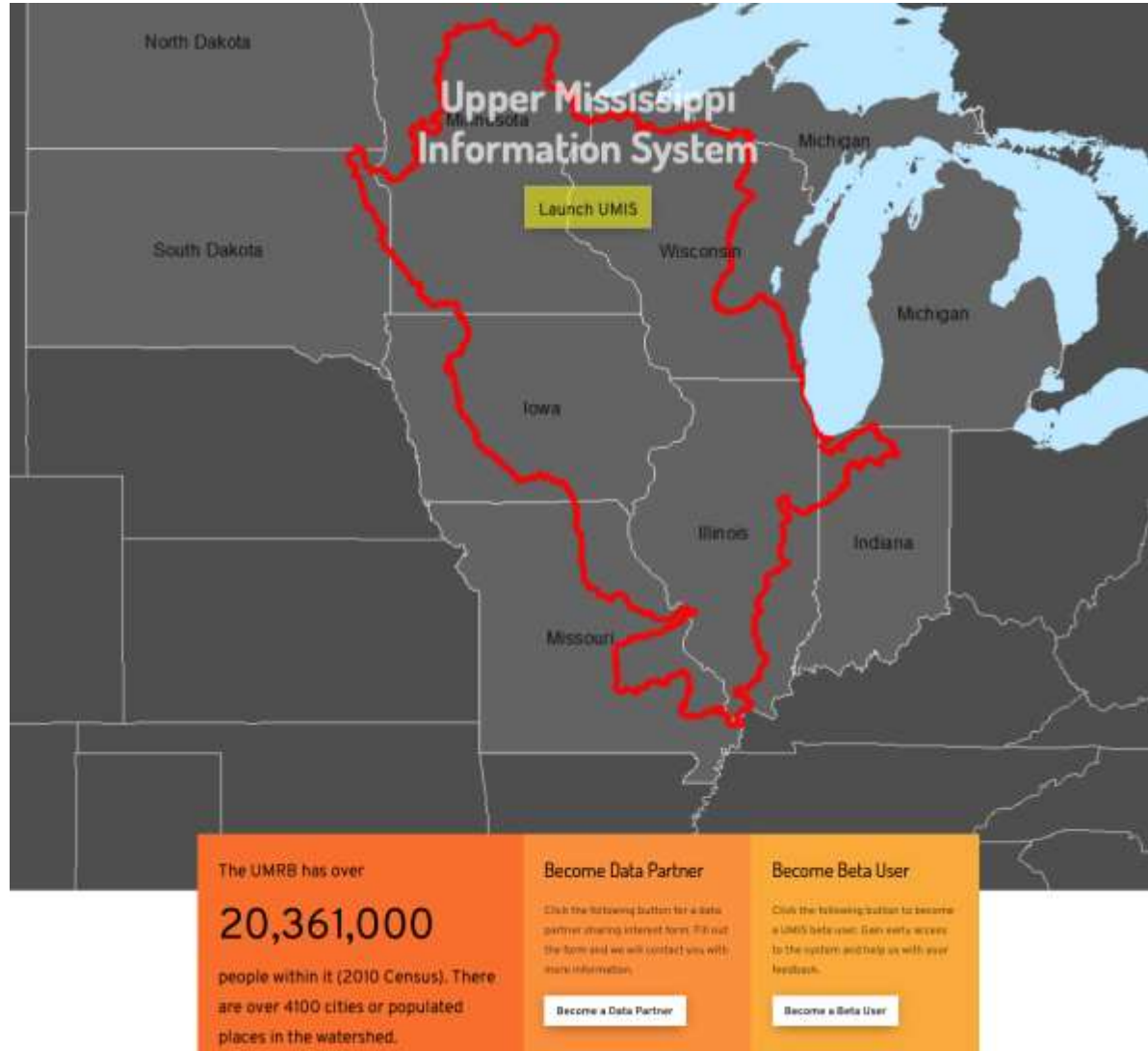 Task 3b: Design and Development of Website

Community Building Workshop

- Stakeholder Workshop - April 2019

- Partnership and Community Building Goals
  - - Analyze needs and requirements
  - - Data owners, users, and other stakeholders
  - - Test users for UMIS, IWQIS and GLTG

Timeline

Project Website

http://www.umissis.org

NO3 Out, kg

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- 233.4 <= x < 507.1
- 507.1 <= x < 932.4
- 932.4 <= x < 1658
- 1658 <= x < 2951
- 2951 <= x < 5319
- 5319 <= x < 10070
- 10070 <= x < 22480
- 22480 <= x < 82230
- 82230 <= x < 7.09921e+07

UMRB SWAT January, 2003