# Leveraging Technology for Enhanced Water Quality Program Efficiency in Wisconsin

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Introduction

Initiating the Discussion: Our Technological Advancements

- **Objective:** Showcase technological innovation within Wisconsin.

- **Scope:** Highlight three key tools and explore the application of AI.

- **Key Focus:** The potential of transformation using AI within the WDNR Bureau of Water Quality.
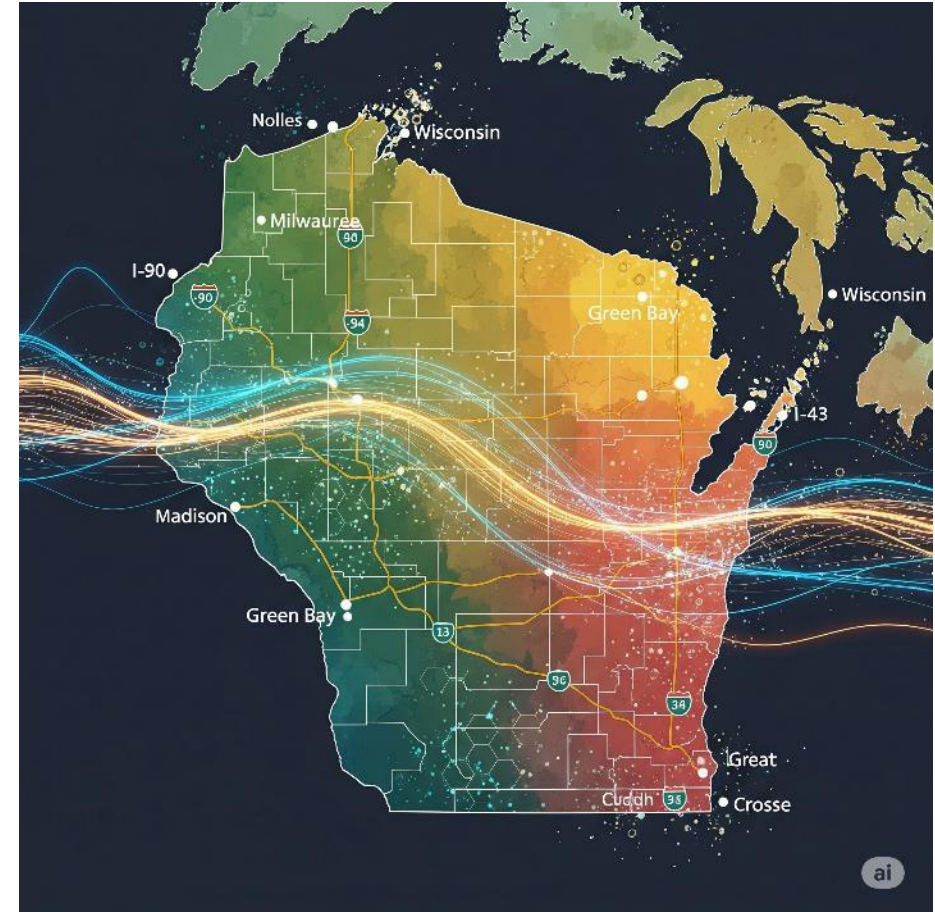
The Imperative for Technology

Addressing Programmatic Challenges Through Innovation

- **Core Challenges:** Managing extensive data, diverse geographies, complex issues.
- **Communication:** Web portals, viewers, visualizations.
- **Assessment/trends:** Monitoring databases, automated assessment with visualizations, remote sensing.
- **Approach:** User-friendly tools, advanced analytics.

Enabling Programs with Accessible Tools

Wisconsin Water Explorer (WEx)

- **Function:** Primary public data portal for water quality information.

- **Purpose:** Centralized access to monitoring data, assessment results, trends.

- **Programmatic Benefits:**
  - Enhances transparency and public engagement.
  - Streamlined data discovery.
  - Supports evidence-based decision-making.
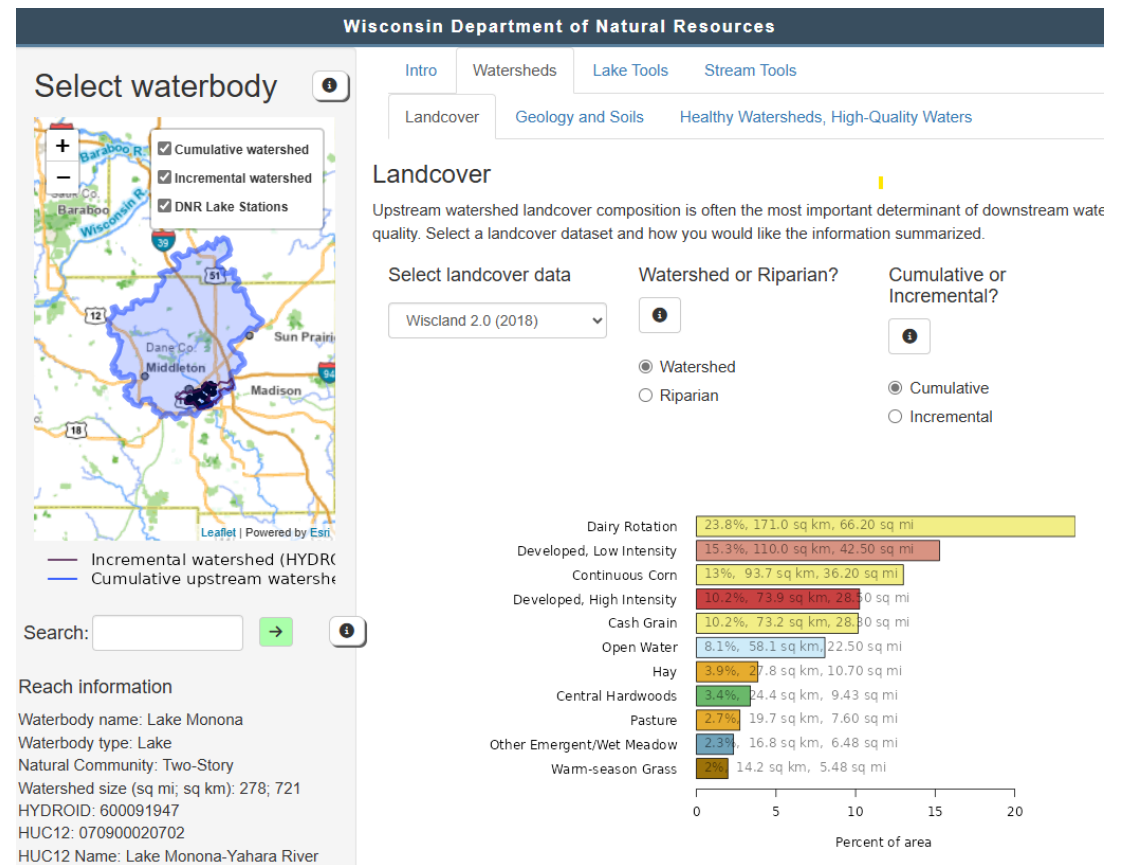
# Enabling Programs with Accessible Tools (Cont.)
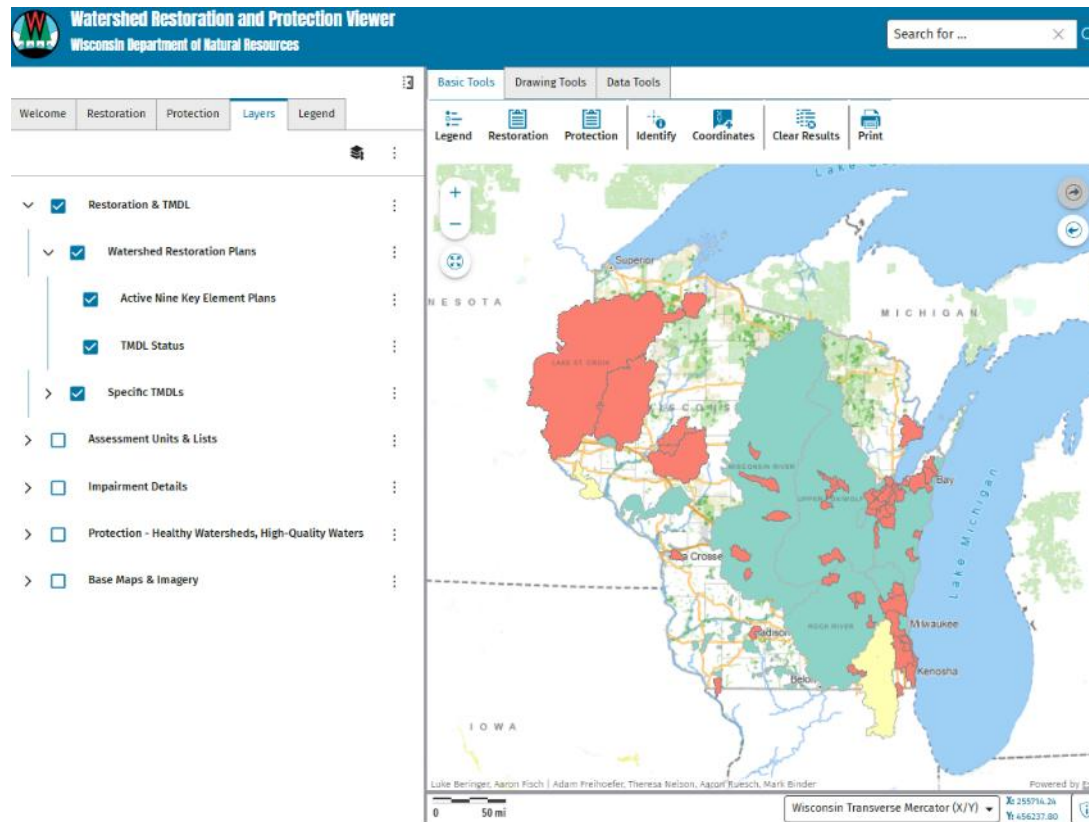
Watershed Restoration and Protection Viewer

- **Function:** Geospatial viewer for watershed planning.
- **Purpose:** identifies problem areas, formulates restoration and protection strategies.
- **Programmatic Benefits:**
  - Promotes collaborative planning.
  - Supports holistic, watershed-based management.

Precision Prioritization

The EVAAL Tool (Erosion Vulnerability on Agricultural Lands)

- **Problem:** Nonpoint source pollution (sediment, phosphorus) and BMP prioritization challenges.

- **Mechanism:** Uses LiDAR data and web services for erosion assessment.
  - Identifies high-susceptibility areas.

- **Benefits:**
  - Data-driven, targeted conservation investments.
  - Maximizes resource efficiency.
  - Reduces planning uncertainty.

USLE + SPI + IDA = EROSION VULNERABILITY INDEX

Low
Medium
High
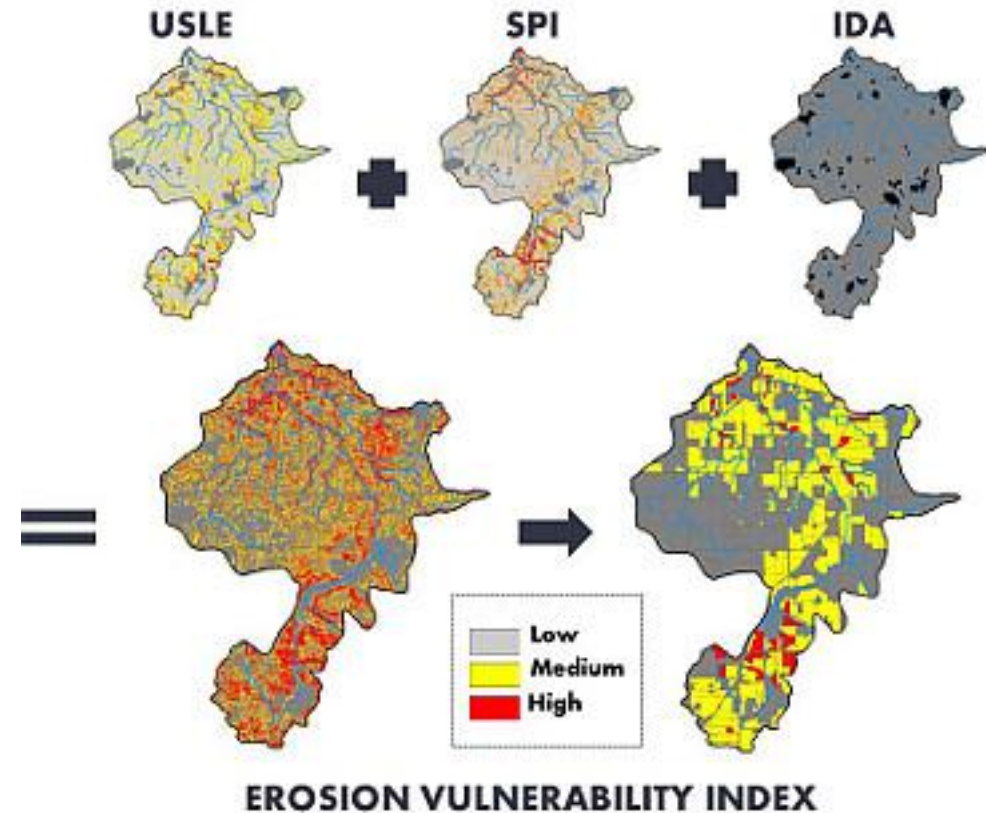
Advanced Analytical Capabilities

Remote Sensing: Tracking Tillage Practices with NDTI

- **Advantages:** Efficient monitoring, temporal change identification, broader insights.
- **NDTI Project Highlight:**
  - Uses Normalized Difference Tillage Index (NDTI) metrics from satellite imagery.
  - Analysis in Google Earth Engine (GEE):
  - *Access to petabytes of data for planetary-scale analysis; uses JavaScript scripting.*
- **Objective:** Assess ag practice (tillage) trends contributing to sediment delivery.
- **Programmatic Benefits:** Objective, large-scale agricultural practice insights.

The Capacity Multiplier

AI: A Transformative Force in Analytical Work

- **Historical Constraints:**
  - Advanced analyses (e.g., GEE scripting) required programming expertise.
  - Programs often lack dedicated advanced programmers/data scientists.
  - Leads to outsourcing specialized analytical projects.

BRIDGING THE GAP
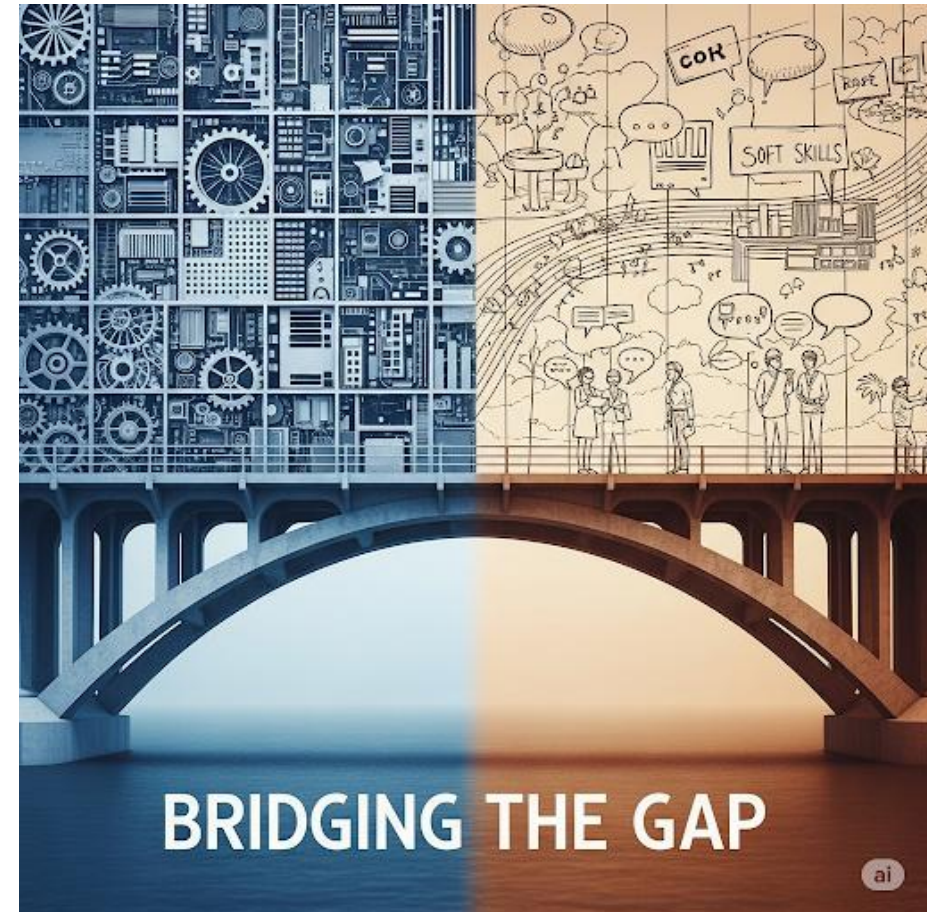
AI in Practice

Case Study: AI and In-House Remote Sensing Capabilities

- **Programmatic Challenge:** Multi-year NDTI project stalled; in-house feasibility uncertain; substantial consultant cost.
- **Experimental Approach:** Leveraged AI (code-generating LLM) for complex GEE JavaScript script.
- **Impact Assessment:**
  - In-house cost with AI: estimated less than a quarter of consultant expense.
  - Provides greater control over product, not just deliverables.
  - AI functioned as a "co-developer," overcoming programming obstacles and advancing project.

Evolving Roles and Enhanced Capacity

AI's Transformative Potential for Programmatic Teams

- **For Technically Proficient Personnel:** AI serves as a collaborative assistant, accelerating skill acquisition and fostering expansion into diverse data domains.

- **For Moderately/Marginally Technical Personnel:** AI significantly reduces entry barriers, empowering basic scripting, workflow automation, and tailor-made tool development.

- **Contracts:** Expect more from your consultants.

- **Overall Implication:** This paradigm shift enables more sophisticated, data-driven work, fostering innovation and facilitating the transition of outsourced work to internal execution.

Technical staff   Less technical staff

Conclusion and Future Prospects
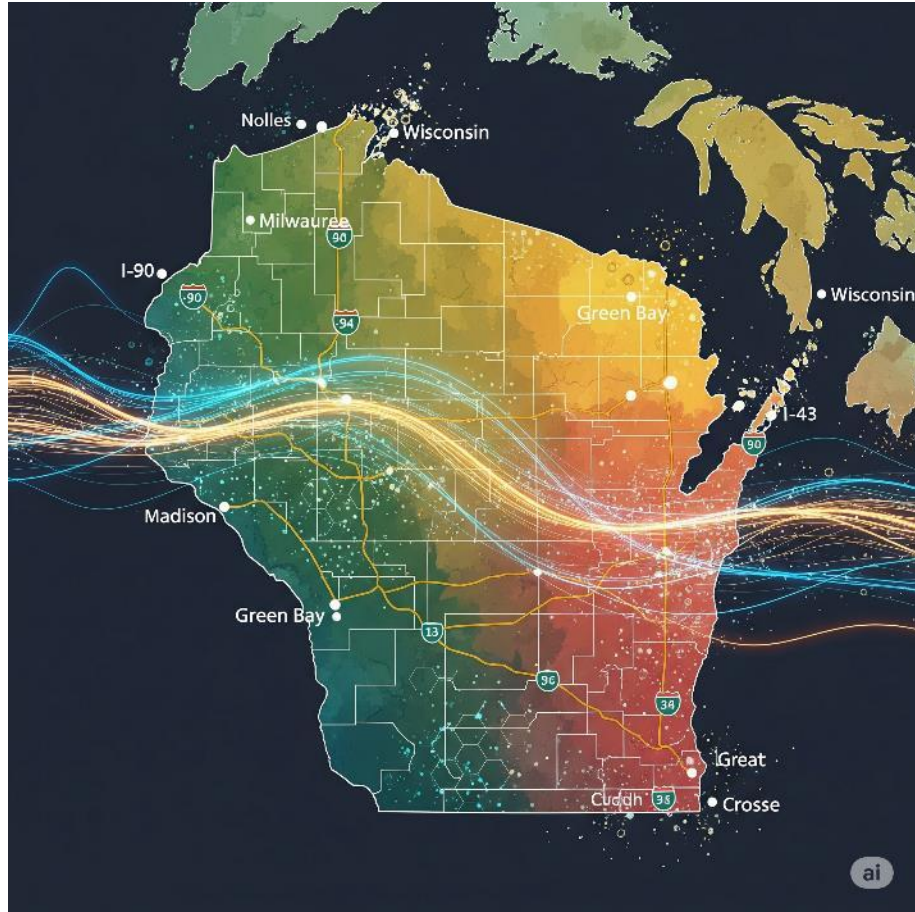
Looking Ahead: Towards Responsible AI Adoption

- **Summary:** Technology integration is foundational to programmatic success. AI expands human capacity, enabling more complex work.

- **Future Outlook:**
  - Agency apprehension towards AI; shift in perspective warranted.
  - AI's potential for in-house capacity demands robust, secure, responsible AI-adoption program.
  - Goal: Transition from fear to acceptance, unlock new efficiencies.