Environmental Information Exchange Network

EN2017

# INTEROPERABLE WATERSHEDS NETWORK (Continuous Monitoring Pilot)

Dwane Young, *U.S. EPA Office of Water*

Mike Kusmiesz, *NJ Department of Environmental Protection*

**2017 Exchange Network National Meeting**

Innovation and Partnership

**May 16-18, 2017**
**Sheraton Philadelphia Society Hill Hotel**
**Philadelphia, Pennsylvania**

**http://www.exchangenetwork.net/en2017**

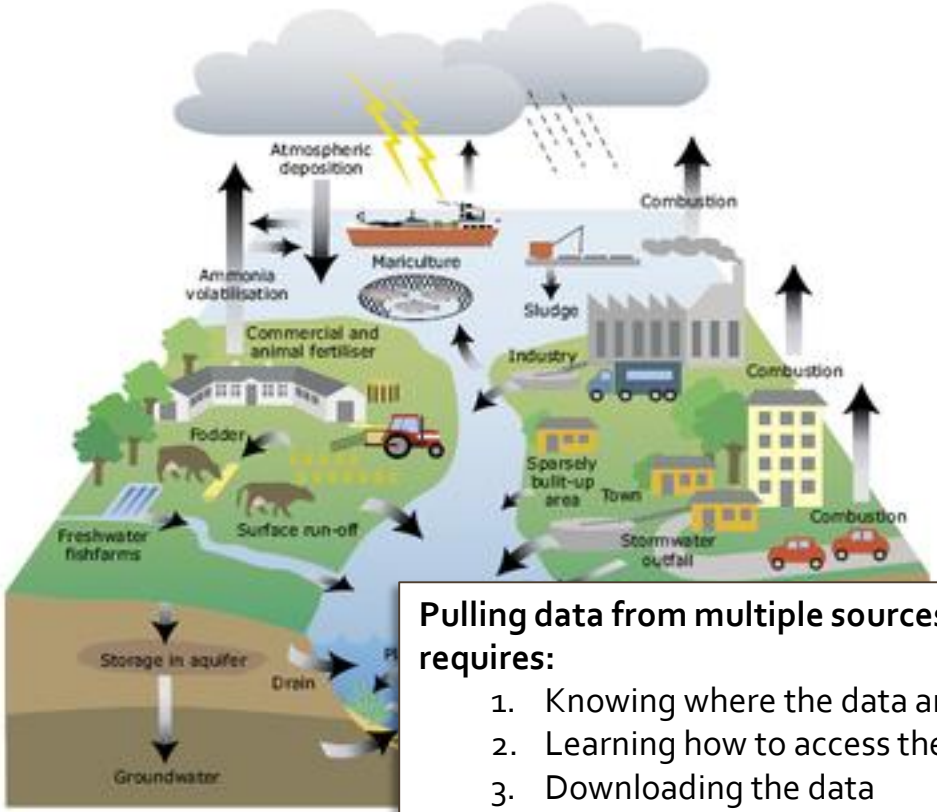
# ABSTRACT

The Interoperable Watersheds Network was a demonstration project that focused on evaluating approaches to improve sensor data sharing. It was based on knowledge gained from a recommendations report that EPA developed in 2014. The project focused on addressing three major areas:

1. Data Standards
2. Metadata
3. System Architecture

# Why Do We Need a Sensor Data Sharing Network?

- Water sensors are emerging as a key technology that can be used to improve monitoring efforts
- Multiple entities (EPA, other federal agencies, states, tribes, local groups) are investing in these new technologies
- This has already resulted in a proliferation of data that are not interoperable




**Pulling data from multiple sources requires:**

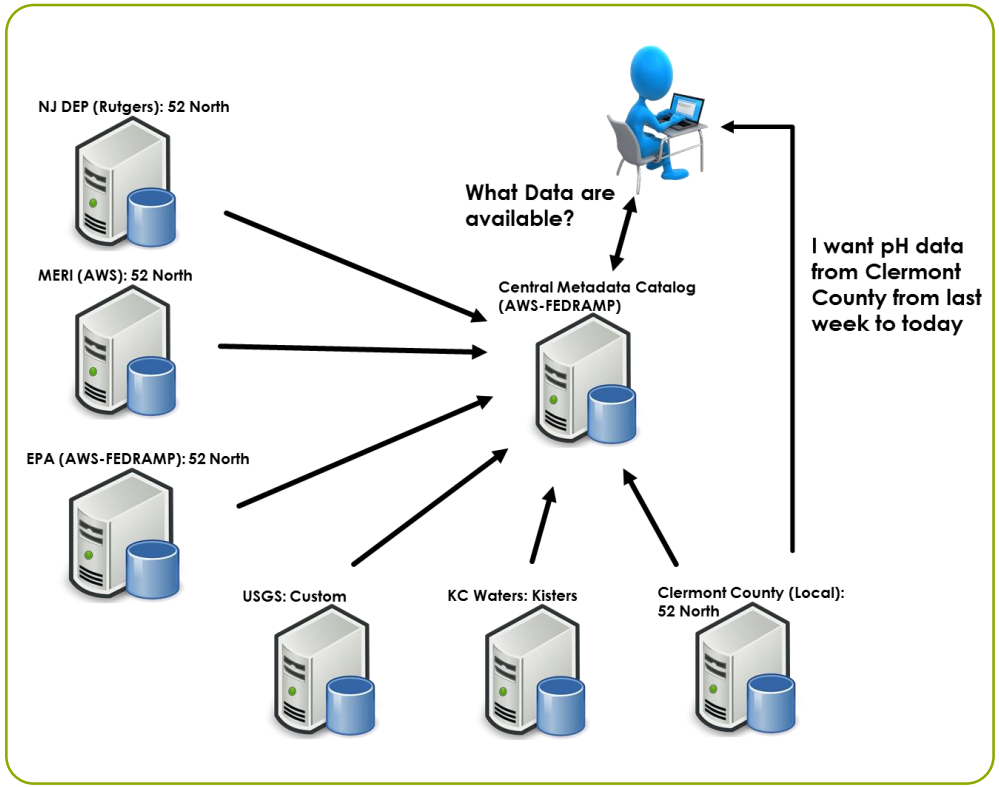
1. Knowing where the data are stored
2. Learning how to access the data
3. Downloading the data
4. Reformatting the data
5. Harmonizing Terms

**This results in ~~a~~ significant time lost**

# IWN Used a New Approach for Sharing Data

How do you solve the problem of multiple data providers with large amounts of data that have the potential to change every 3-15 minutes?

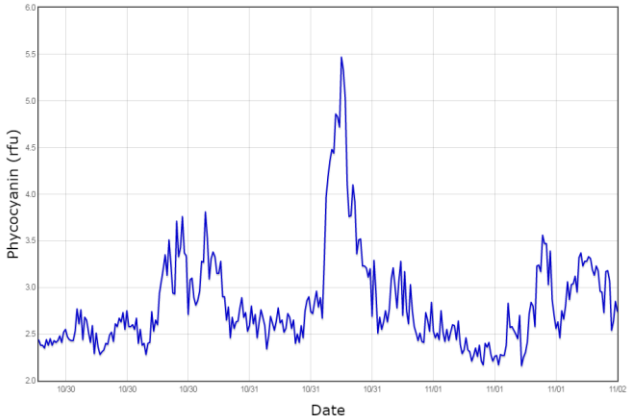
- Used a central catalog/index that references every data owner's assets with the corresponding metadata for each sensor
- Allowed for quick searching and discovery of available data
- This approach is similar to how Google allows you to search the internet
- Actual data comes from the partners systems in real-time



# The Data Standards Problem

- We needed a common way to represent and communicate the data
- Standards for sensor data already exist, there was no need to create new standards
  - OGC Sensor Observation Service
  - OGC Water ML 2 and Sensor ML
- The Open Geospatial Consortium is an open-source, international standards setting body

OGC®
Making location count.



# Why Did NJDEP Participate?

- **Influence**: A state's perspective
  - Our sensor experience
- **Compatibility**: Part of future solution
  - Home Grown (RU System)
  - Off the shelf (Kisters)
  - Mature (USGS)
- **Seamless Transition:** All done, set to go
  - Minimal funding if moved to Production
  - Reduced staff commitment
- **Future Work Flow**: Impact on staff
  - Internal management of data
  - Feasibility
- **Useful Tool**: Product that makes sense

# What Role Did NJDEP Play?

- **Case Study**: Water Quality Assessment Group
  - Benefits the state
- **Discussions**: Ongoing communication
  - Conference Calls
  - Homework
  - Respond back to EPA/Contractors
- **Metadata Balance**: Too much vs. Too Little
- **Database Schema:** What stays vs. What goes?
- **Testing**: Provide feedback
  - Flow
  - Errors

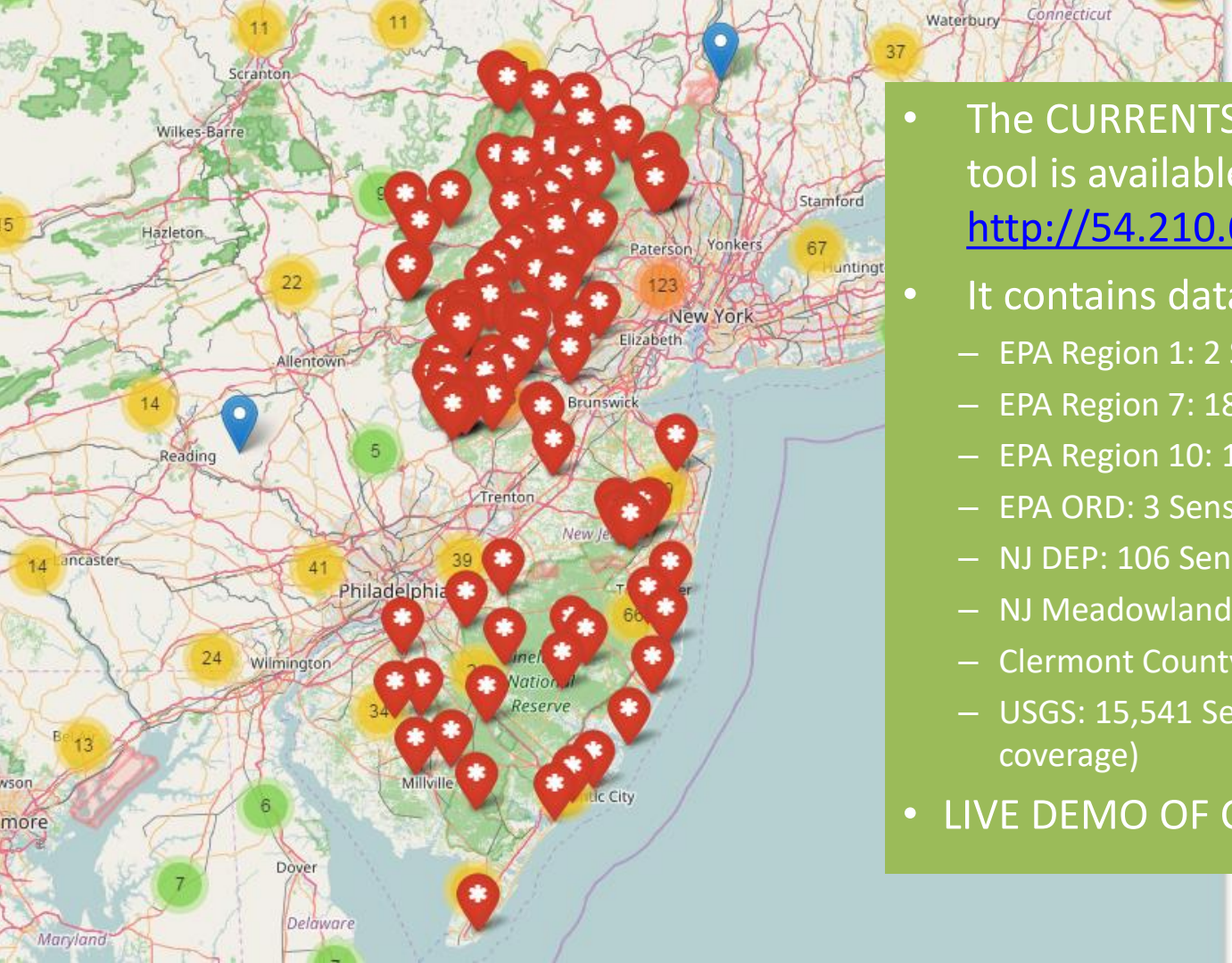
# Underlying Catalog Services IWN Defined

- **GetOrganizations**: Returns who is providing data with their endpoints
- **AvailableParameters**: What parameters can be queried
- **GetSensors:** Gets the sensor information and provides different methods for querying sensors (i.e. by county, by HUC, by buffer, by a bounding box, upstream, and downstream)
- **GetSensorParameters**: Gets parameters for a sensor, including the period of record
- **GetOrganizationParameters**: Gets the parameters for an entire Organization

# OGC Defined Services (SOS 2)

## Each endpoint supports Sensor Observation Service in XML format (WaterML2)

- **GetObservation**: Gets the most recent data or retrieves a collection of data
- **GetDataAvailability**: Getting all the metadata from the endpoint
- **DescribeSensor**: Describes the sensor

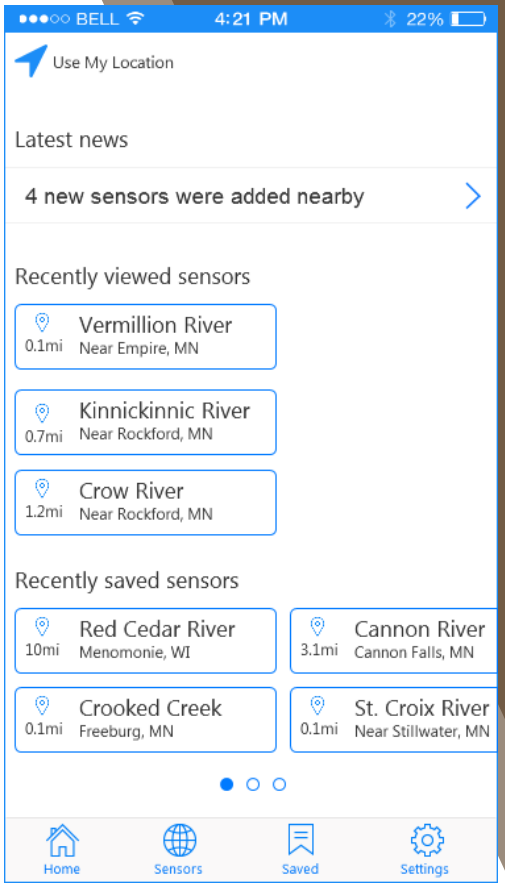



- The CURRENTS demonstration tool is available at: http://54.210.62.171
- It contains data from 8 Partners:
  - EPA Region 1: 2 Sensors
  - EPA Region 7: 18 Sensors
  - EPA Region 10: 1 Sensor
  - EPA ORD: 3 Sensors
  - NJ DEP: 106 Sensors
  - NJ Meadowlands: 3 Sensors
  - Clermont County, OH: 4 Sensors
  - USGS: 15,541 Sensors (nationwide coverage)
- LIVE DEMO OF CURRENTS

Organizations

to Results

an0742




# IWN's Open Architecture Allows Other Possibilities

- IWN is built using an open architecture, meaning that all the functionality you see in the demonstration tool is also available as a corresponding **Web Service** or **Application Program Interface (API)**
- Enables other apps to be developed (like mobile apps)
- Also allows other third-party applications (like Excel) to be able to directly interact with the data without having to go to a website and 'download' the data

# Next Steps

- Demonstration project ended in December
  - A Lessons Learned Report has been completed
  - Demonstration tool will continue to be available
  - A mobile app is being developed that leverages the services/API developed as part of this project
- Demonstration proved successful
  - Services worked better than expected
  - Setting up a data appliance was simpler than anticipated
- Ready to  move to a production-level system, pending resources
- Advanced Monitoring Team is exploring if the services and standards would work for Air data as well
- Lessons Learned Document is available at: https://www.epa.gov/sites/production/files/2017-01/documents/iwn_lessonslearned_final_201612.pdf

# QUESTIONS?

Dwane Young
Young.dwane@epa.gov
202-566-1214

Mike Kusmiesz
Mike.Kusmiesz@dep.nj.gov
609-292-5602