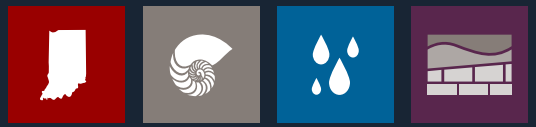
Source Water Protection

Proactive vs Reactive



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Source Water Protection Planning

Assessment Phase

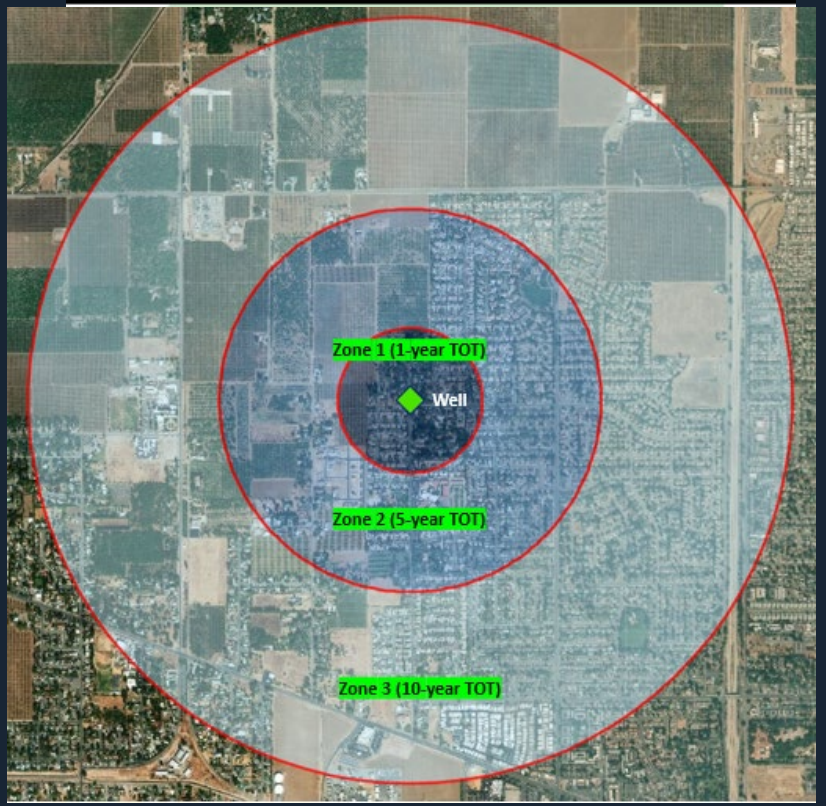
- Step 1: Know the area that needs protection
- Step 2: Inventory potential sources of contamination or overuse
- Step 3: Determine vulnerability
- Step4: Engaged the public - transparency

Protection Phase

- Step 5a: Identify actions steps and activities
- Step 5b: Prioritize actions
- Step 6: Implement protection steps
- Step 7: Evaluate effectiveness and update

Source Water Protection Areas

- area of influence (time of travel, direction, etc.)
- climatic factors (rainfall pattern, drought, etc.)
- geology and aquifer properties
- sources of potential contamination
- raw water quality and trends
- monitoring (levels, quality, recharge, etc.)
- history of land use, industrial, land applications
- projected growth
- *communities' water goals*



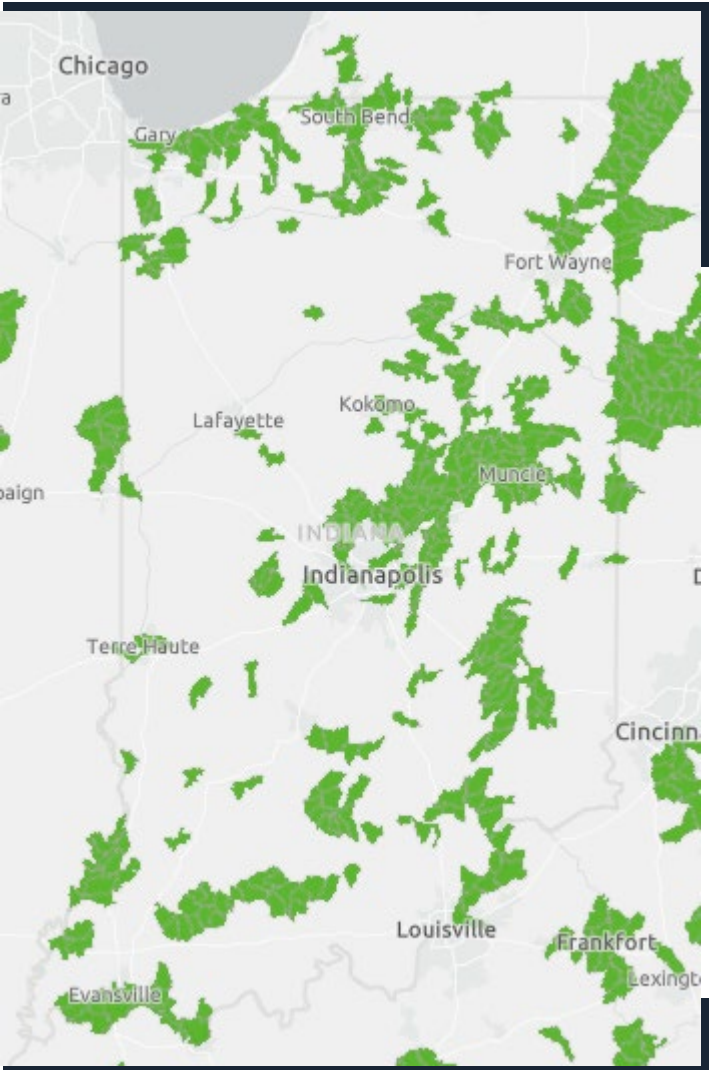
Protection of our vital resource- Our drinking water

Drinking water intakes

- River system dependent
- Lake/reservoir management
- Major actions -> higher risks
  - Nutrient reductions to address harmful algal bloom
  - Erosion prevention to limit
    - bound pollutants
    - reduced reservoir capacity
  - Detection of spills and tank containment actions
  - Organic pollution- pesticides, industrial
  - Fecal materials- septic, manure, sewer, pet, wildlife
  - Wetland restoration/protection

Well head

- Groundwater driven
  - sourced at the surface
- Under the influence of surface water
  - during drought or high demands
- Major actions -> higher risks
  - Monitoring and usage details for maintaining adequate supply & quality
  - Spill and tank containment actions
  - Abandoned well decommissioning
  - Organic pollution- pesticides, industrial
  - Wetland restoration/protection
  - Nutrient conservation



NRCS – Source Water Protection

Indiana SWPA High Priority Practices

"Increased Incentives…"
Indiana NRCS SWPAs

- Providing increased incentives for practices that relate to water quality and quantity and protect drinking water sources while also benefitting producers.

75% Payment Rate -> 90%

328 Conservation Crop Rotation
605 Denitrifying Bioreactor
554 Drainage Water Management
447 Irrigation and Drainage Tailwater Recovery
582 Open Channel = 2-Stage Ditch
782 Phosphorus Removal System
587 Structure for Water Control
620 Underground Outlet – Blind Inlet for Water Quality
351 Well Decommissioning

USDA Forest Service
U.S. DEPARTMENT OF AGRICULTURE
GTR WO-99 | February 2022

er sources. Click one of

Collection

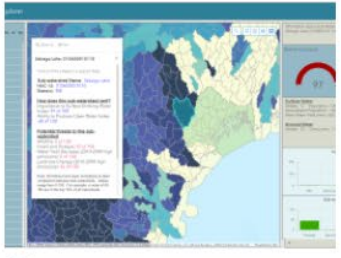
Forests to Faucets 2.0

The Forests to Faucets 2.0 Assessment compares watersheds across the country to show which are most relied upon as sources of drinking water and which are threatened.

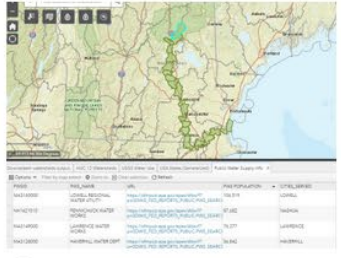
USDA Forest Service

Get started

1 About



2 Data Explorer



3 Reports

4 Methods

5 User Guide

Proactive vs Reactive

Proactive

- Prevention of contamination
- Cost-effective
- Long-term sustainability
- Regulatory compliance
- Community trust & public health
- Resilience to climate change

Reactive

- Immediate response to contamination
- Data-driven actions
- Learning from experience
- Flexibility
- Resource allocation
- Public awareness and engagement

Photo Source: Oklahoma Department of Environmental Quality

Data Driven Actions

- Real-Time Monitoring
- GIS Mapping and Risk Assessment
- Historical Data Analysis
- Predictive Modeling
- Adaptive Management
- Response to Public Health Data
- Source Identification Using Isotope Tracing
- Crowd-Sourced Data Collection
- Remote Sensing and Satellite Data

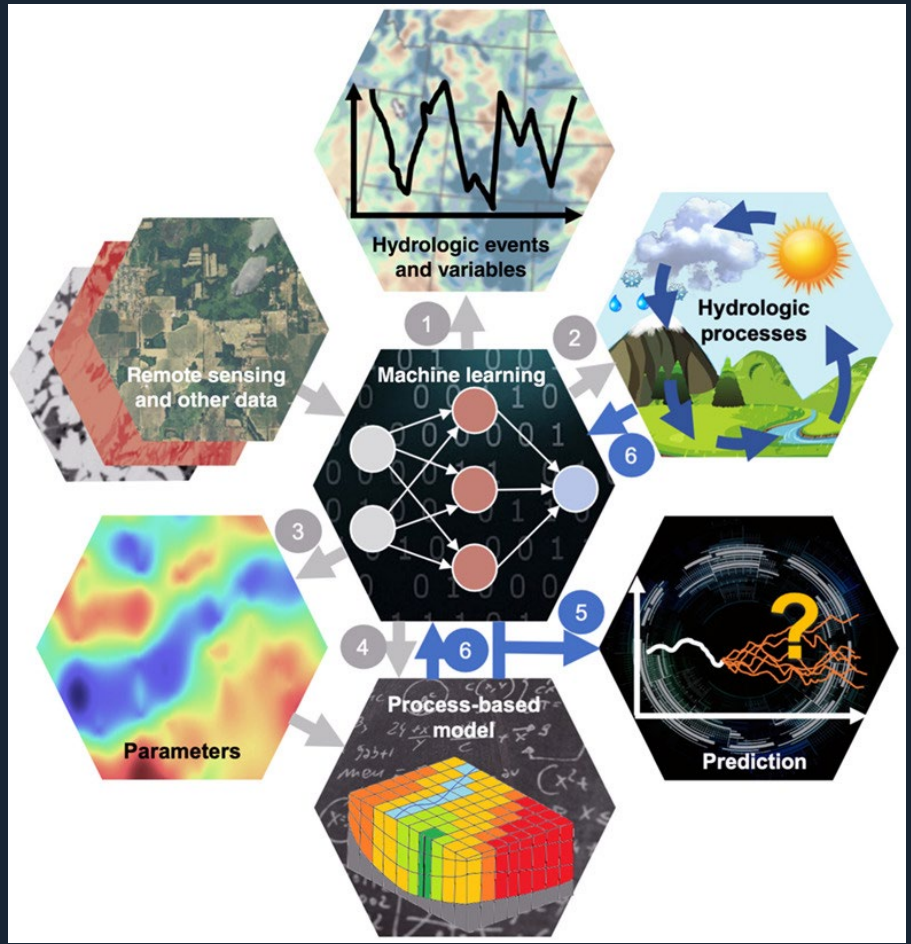
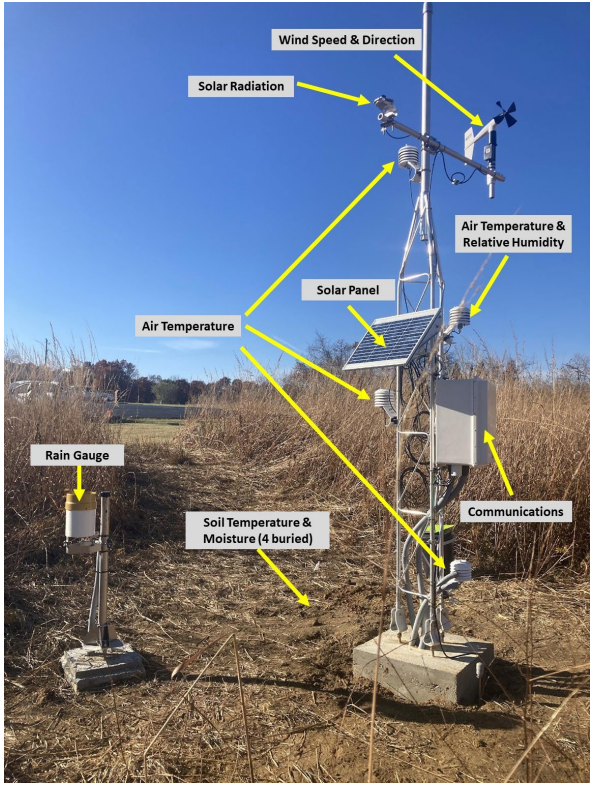


Image source: Machine learning for hydrologic sciences: An introductory overview - Xu - 202

What is a Mesonet?

IN MESONET
Indiana State Climate Office
Indiana Geological & Water Survey

- Mesonet
  - A spatially-dense network of environmental monitoring infrastructure that provides high-quality, frequent weather, long-term water, and soil observations.
  - Ideally, one or more stations per county.

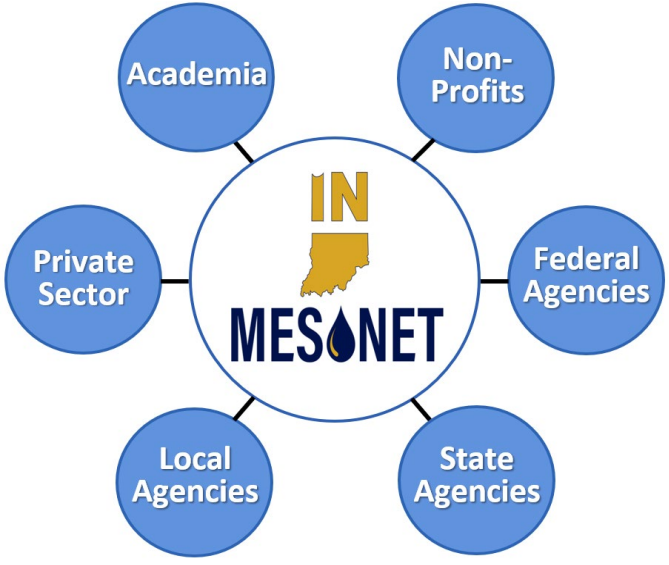


The Indiana Mesonet

IN MESONET
Indiana State Climate Office
Indiana Geological & Water Survey

- Mission
  - Collect and deliver ***reliable***, ***high-quality***, local weather, water, and soil information across Indiana to be used for the public good.

- Vision
  - An ***accessible*** weather, water, and soil observational network across Indiana serving all communities, to ***enhance*** public safety, improve economic and resource management, and ***meet evolving needs***.



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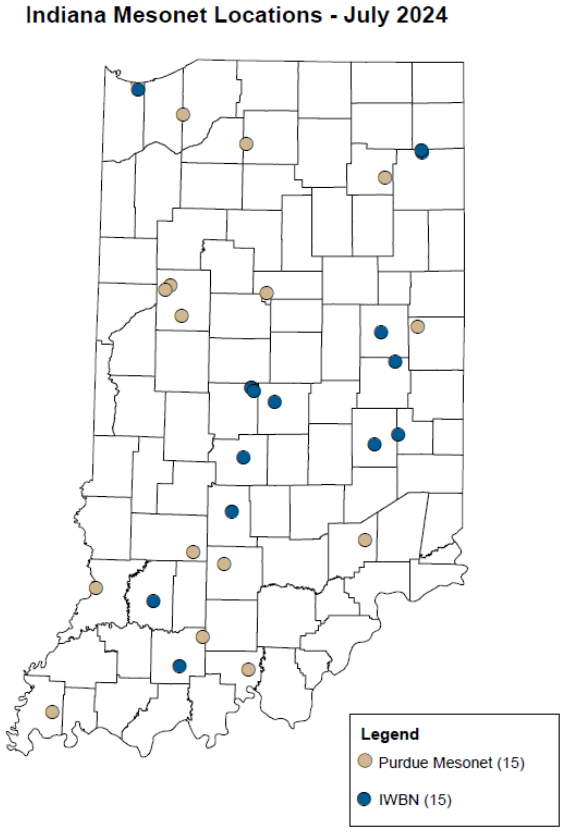
The Current Mesonet

- Comprises two networks:
  - Purdue Mesonet – managed by the Indiana State Climate Office
  - Indiana Water Balance Network – managed by the Indiana Geological & Water Survey
- Reflects only about a quarter of Indiana's 92 counties.
- Limited funding currently impedes the maintenance and expansion of the Indiana Mesonet and its partnerships.



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Station Specifications

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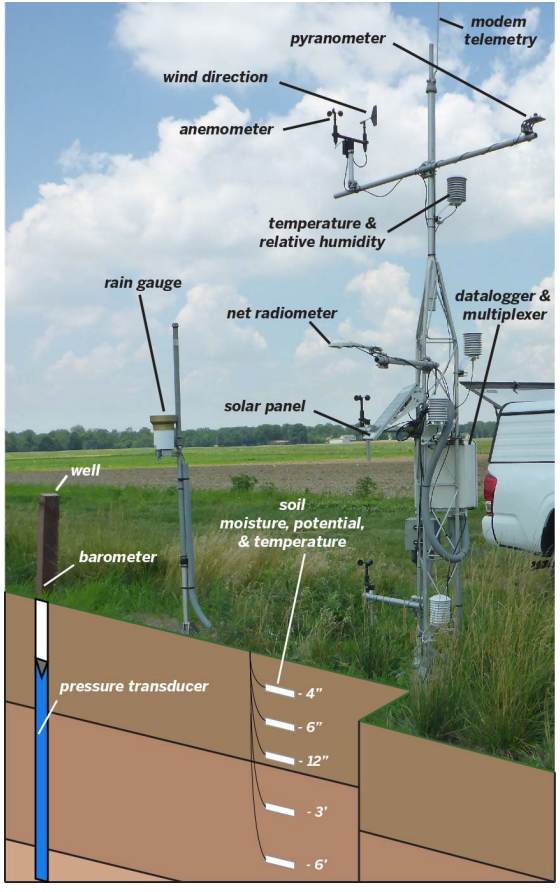
Indiana Geological & Water Survey

Full Station Specifications

Monitoring system	Sensors	Materials	Installation	Power	Site Control
Atmosphere - Weather	Temperature, humidity, wind, solar, and rain	Tower, fence, modem, datalogger, and antenna	Tower and concrete	Solar & battery	Fence, strong box
Soil - Moisture Movement	Temperature, moisture, movements	Pole datalogger, transmitter	Soil pit	Solar & battery	Strong box
Water - Groundwater, Runoff, Streamflow	Water levels, flow, temperature	Casing, Riprap, Datalogger, Transmitter	Well -Drill or probe Runoff - weir or flume	Solar & battery	Steel cover, box, or fence



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Expanding the Network

- Sustainable funding:
  - To maintain and expand the Indiana Mesonet.
  - To ensure reliable access to high-quality environmental monitoring and decision support tools
  - To serve multiple agencies
  - Across ALL Indiana counties.
- Our partnership allows leverage of expertise and resources to sustain a holistic network of quality data.
- Help support technicians, database managers, and program specialists.

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Benefits

IN MESONET
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Indiana Geological & Water Survey

- Mesonets with paired deep soil, water table, and groundwater monitoring.

ECONOMIC PROSPERITY

- Data for determining regions with ample water recharge and supply

WEATHER HAZARDS & IMPACTS

- Long term data for drought and flood
- Better analysis of precipitation extremes

AGRICULTURAL PRODUCTIVITY

- Optimize agrochemical application timing
- Improve irrigation scheduling

INFRASTRUCTURAL DEMAND

- Enhance water supply monitoring
- Determine spaces for recharge

COMMUNITY INVOLVEMENT

- Expand education and research
- Guide community planning for extremes

PUBLIC HEALTH

- Source water protection data
- Assist water security decisions

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Benefits

IN MESONET
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- Mesonets provide other major benefits. Here are a few more examples.

ECONOMIC PROSPERITY
- Decision tools that add economic value
- Support organizational efficiency
- Data for innovation, growth, research

WEATHER HAZARDS & IMPACTS
- Facilitate protection of life and property
- Dense data for forecasts, climate record
- Better analysis of precipitation extremes

AGRICULTURAL PRODUCTIVITY
- Optimize pesticide application timing
- Improve irrigation scheduling
- Aid crop and livestock health monitoring

INFRASTRUCTURAL DEMAND
- Enhance water supply monitoring
- Aid energy production and distribution
- Improve knowledge of road conditions

COMMUNITY INVOLVEMENT
- Expand education and research
- Guide community planning for extremes
- Perform impact analysis after disasters

PUBLIC HEALTH
- Facilitate protection from heat illnesses
- Aid hazmat planning and response
- Assist food and water security decisions

Questions?

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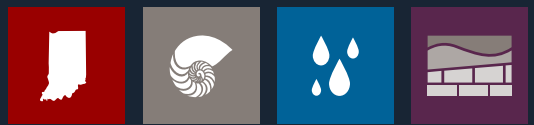
gindavis@iu.edu



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