

NEW TECHNOLOGIES

IN THE

SOURCE WATER PROTECTION PROGRAM



SPOTTS | STEVENS | MCCOY

@ssmgroup.com

New Technologies

- Overview of the Source Water Protection Technical Assistance Program
 - SWPTAP
- New Technologies
 - Online data
 - Mobile GIS applications
 - Operations Dashboards

A HISTORY IN PENNSYLVANIA

SOURCE WATER PROTECTION

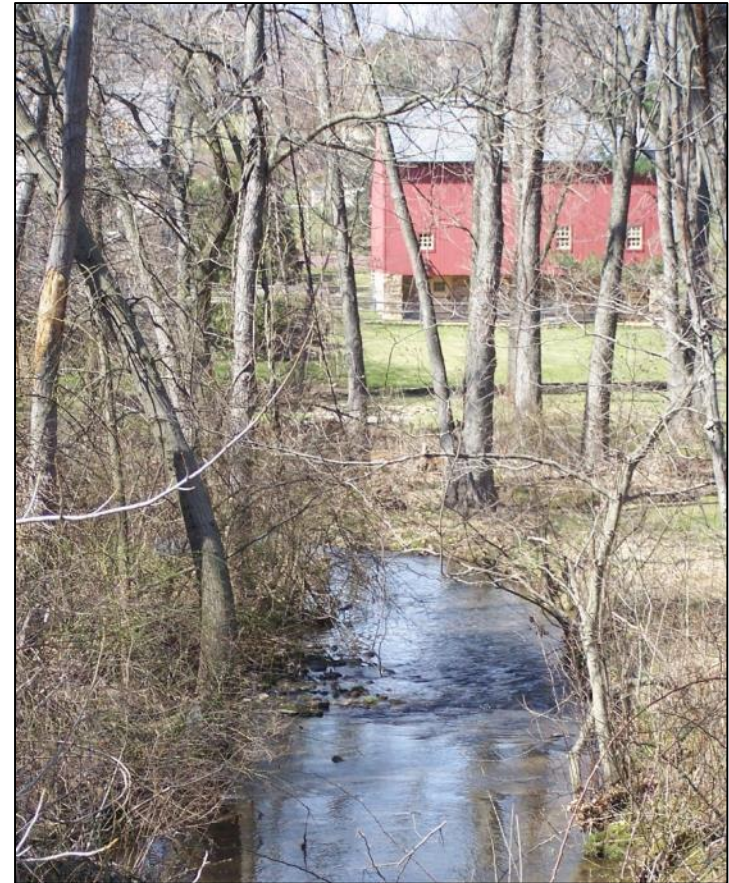
▶ SWP Program Background/Authority

- Concept is not new: Jamestown, VA (1610)
- 1986 Federal Safe Drinking Water Act (SDWA) => State WHP Programs
- 1996 SDWA => Source Water Assessments (contributing area, potential threats, susceptibility & inform public)
- Purpose: framework for local SWP program
- Local SWP program is voluntary! (“*Your water. Your decision.*”)



More History

In 1992, EPA awarded Kutztown Borough and the Lehigh/Northampton Joint Planning Commission with grants to develop Wellhead Protection pilot studies.



Buckingham Township

SWP Planning in Pennsylvania – Part I

- In early 2000s, DEP staff and contractors developed Source Water Assessment Reports for most of the groundwater and surface water sources.
- These reports were an overview of the watershed and potential threats to water, and some recommendations for protecting the watershed.



SWP Planning in Pennsylvania – Part II

- In 2000-2004, DEP implemented a grant program that provided funding to water systems to select a Professional Geologist to delineate what land areas contributed to the water sources and select some management strategies to develop a voluntary plan. \$3.6M in grant funds resulted in 88 approved plans.
- While there were required elements for each project, there was no consistent plan format.
- The water system also had to front the professional services expense and provide matching funds, then get reimbursed by DEP.

SWP Planning in Pennsylvania – Part III

- By 2007, the DEP reworked the grant program into the Source Water Protection Technical Assistance Program, continued the list of Minimum Elements for each project, and underwrote all professional services:
 - Steering Committee/Public Participation
 - Rigorous delineation of protection areas
 - Potential Sources of Contamination inventory
 - Development of management strategies
 - Contingency Planning
 - Protection of areas planned for future sources



Benefits of a Plan

- Plans for the future!
- Helps the water system select and implement local actions that will reduce the risks to your drinking water.
- Provides the scientific basis for identifying source water protection areas on a map.
- Provides a great educational tool for customers and residents
- Helps when applying for a grant, because the SWPP links benefits to public health through safe drinking water.

A Basic SWPP Includes

PART I

- Delineated SWP Zones: Identify surface and groundwater sensitive areas and recharge zones.

PART II

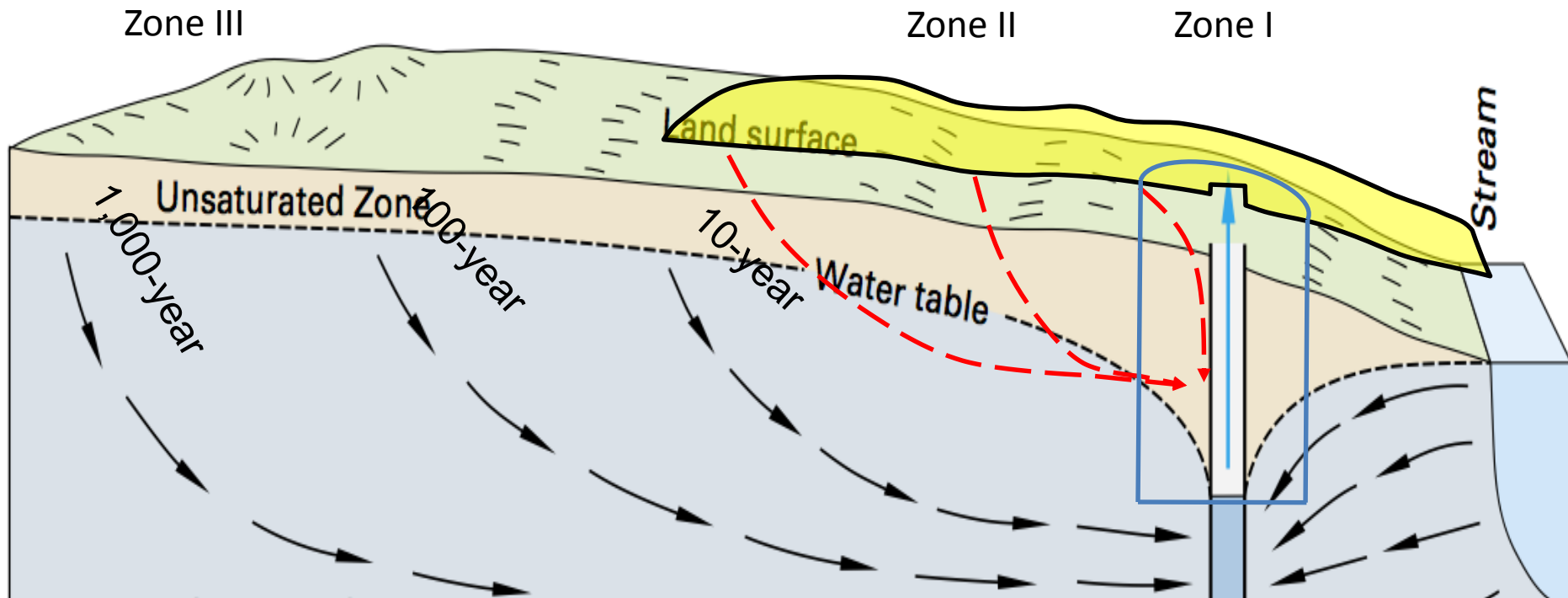
- Pollution Risk Assessment: Identify existing pollution sources from database searches and field reconnaissance.

PART III

- Management Options: Choosing short and long-term risk reduction measures for water resource protection.

Wellhead Protection Zones

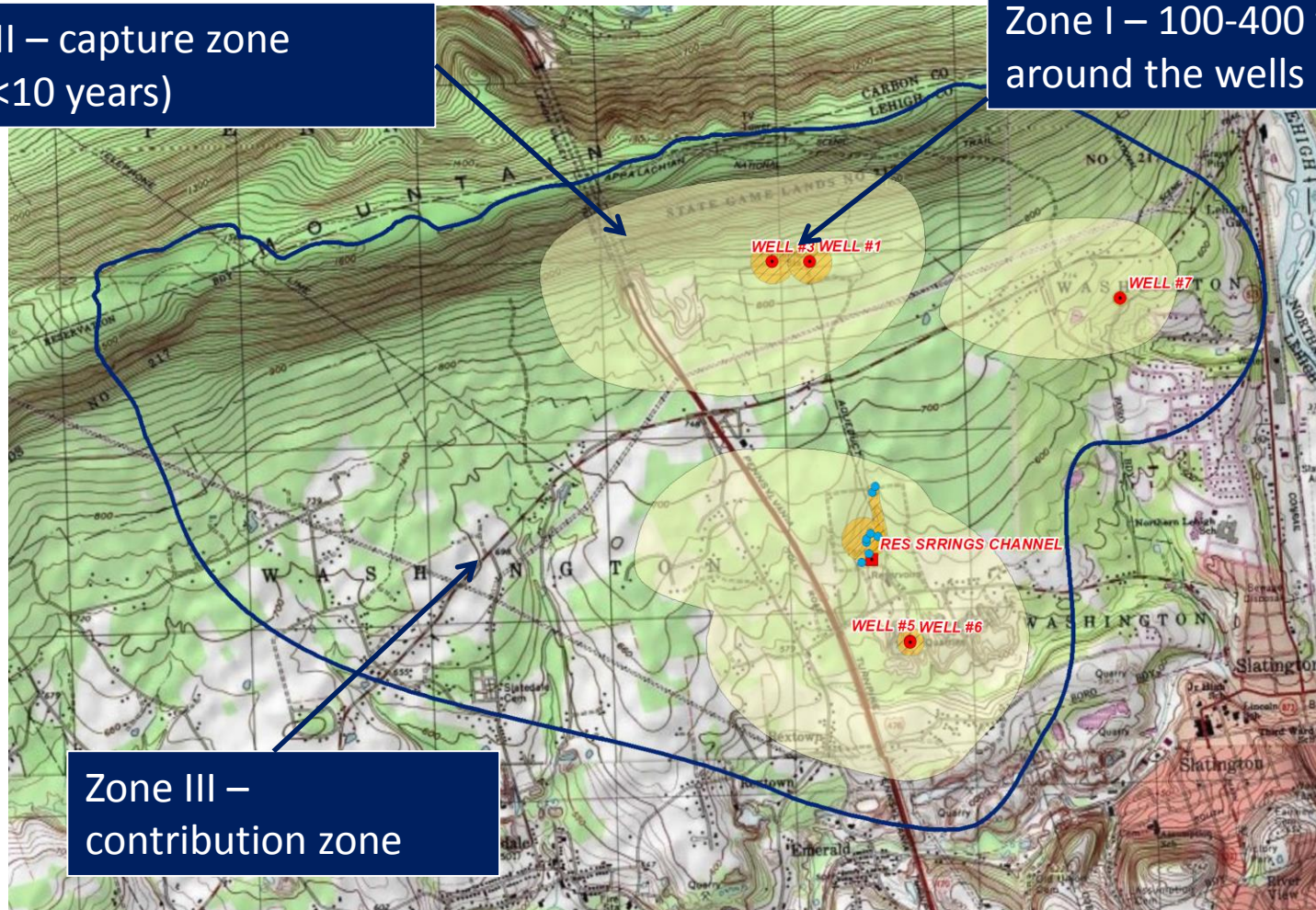
- Zone I – fixed radius around wellhead
- Zone II – Capture Zone, based on a time of travel
- Zone III – Contribution Area



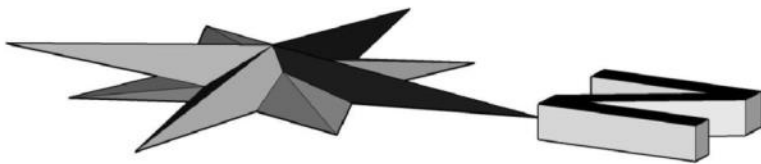
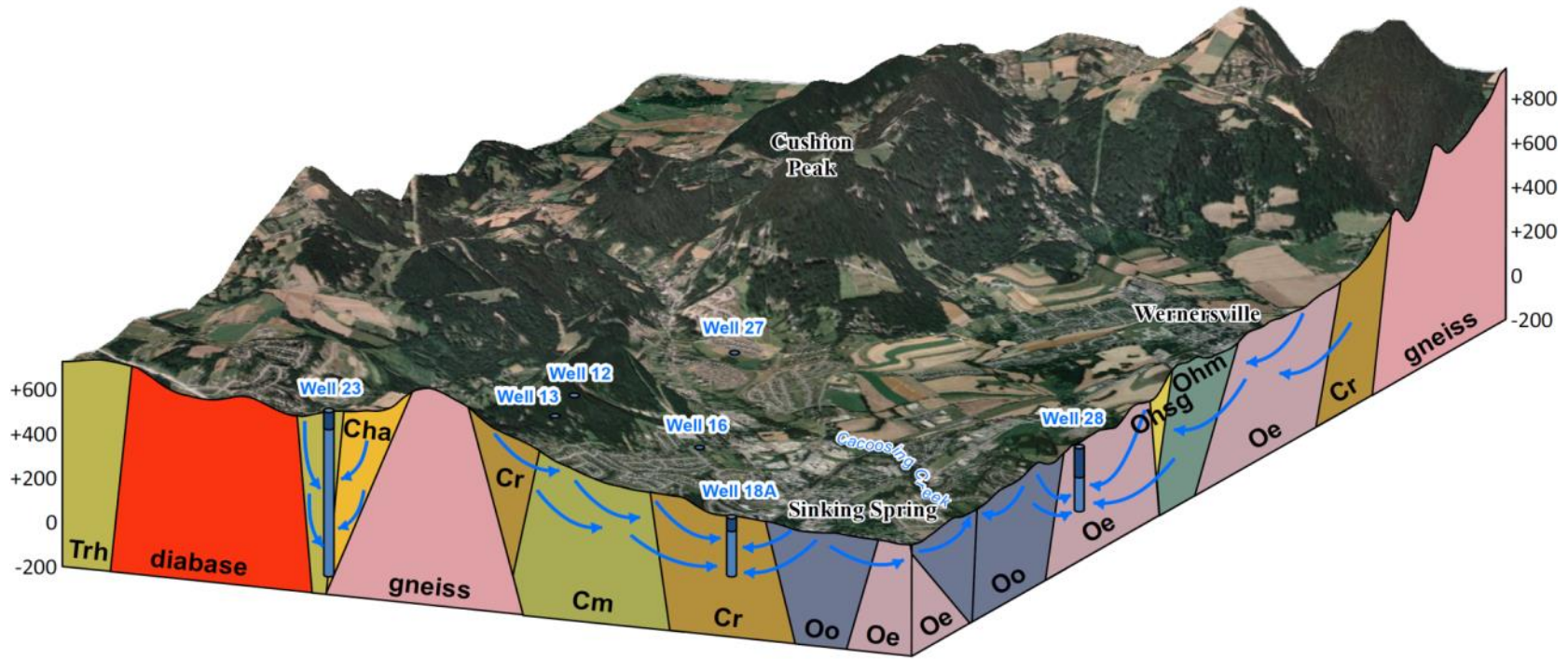
Wellhead Protection Zones

Zone II – capture zone
(TOT <10 years)

Zone I – 100-400 ft
around the wells

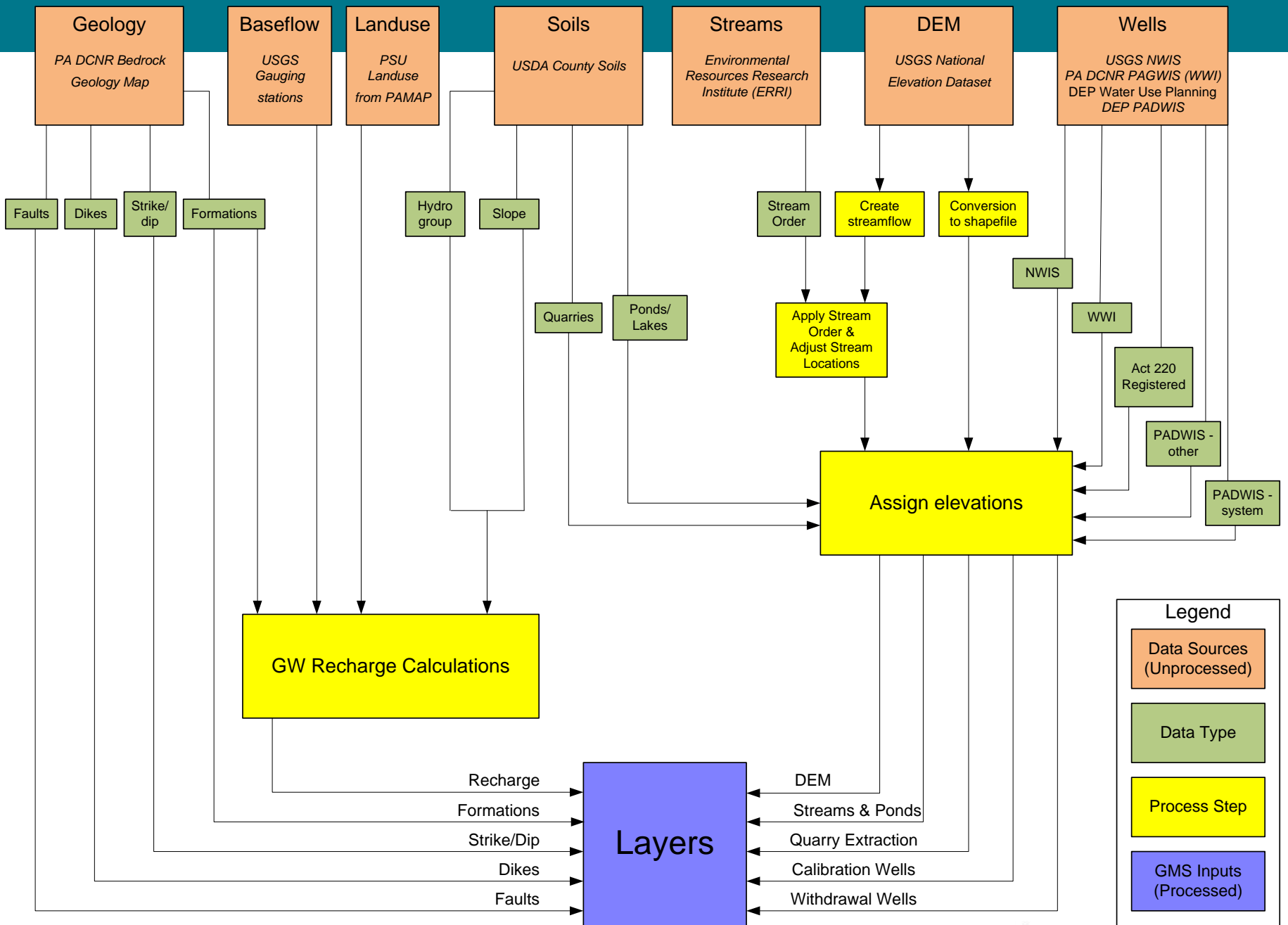


Zone III –
contribution zone



Groundwater Flow

- In groundwater modeling, geology, water movement, and land formations (geography) are used to simulate water flow.



Groundwater Flow

- The protection zones are based on calculated, simulated, or otherwise inferred groundwater flow to the wells



Potential Sources of Contamination (PSOC)



SWPTAP Year 1

- Spotts, Stevens and McCoy, the PA Rural Water Association, and the Water Resources Education Network were also contracted as partners for the program
- 26 Source Water Protection Plans were in progress in 5 of 6 DEP Regions
- Moon Township in Allegheny County was first system registered for the program.



Moon Township Municipal Authority

SWPTAP Year 5

- By the end of Year 5, 108 community water systems had entered the program, and 3 small systems (<500 population)
- 2.4 Million people were served by a system with a source water protection plan.



Pennsylvania American Water – New Castle

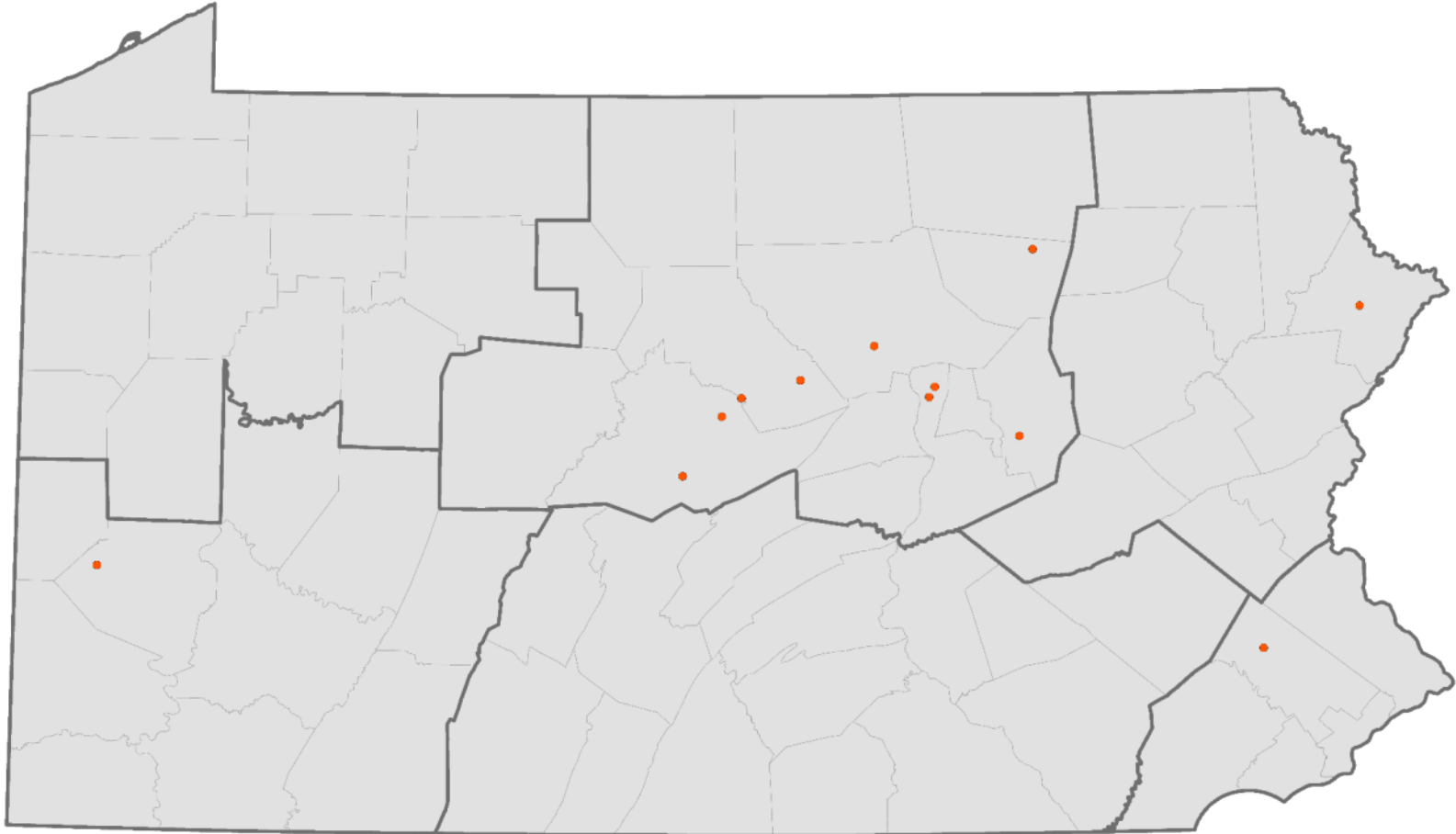
SWPTAP Round 2

- This second round started seeing changes and big improvements as this voluntary program gained speed.
- Source Water Protection and contamination incidents were widely reported in the news.
- By end of Year 10, Over 300 systems and 3.9 Million people under a Source Water Protection Plan.

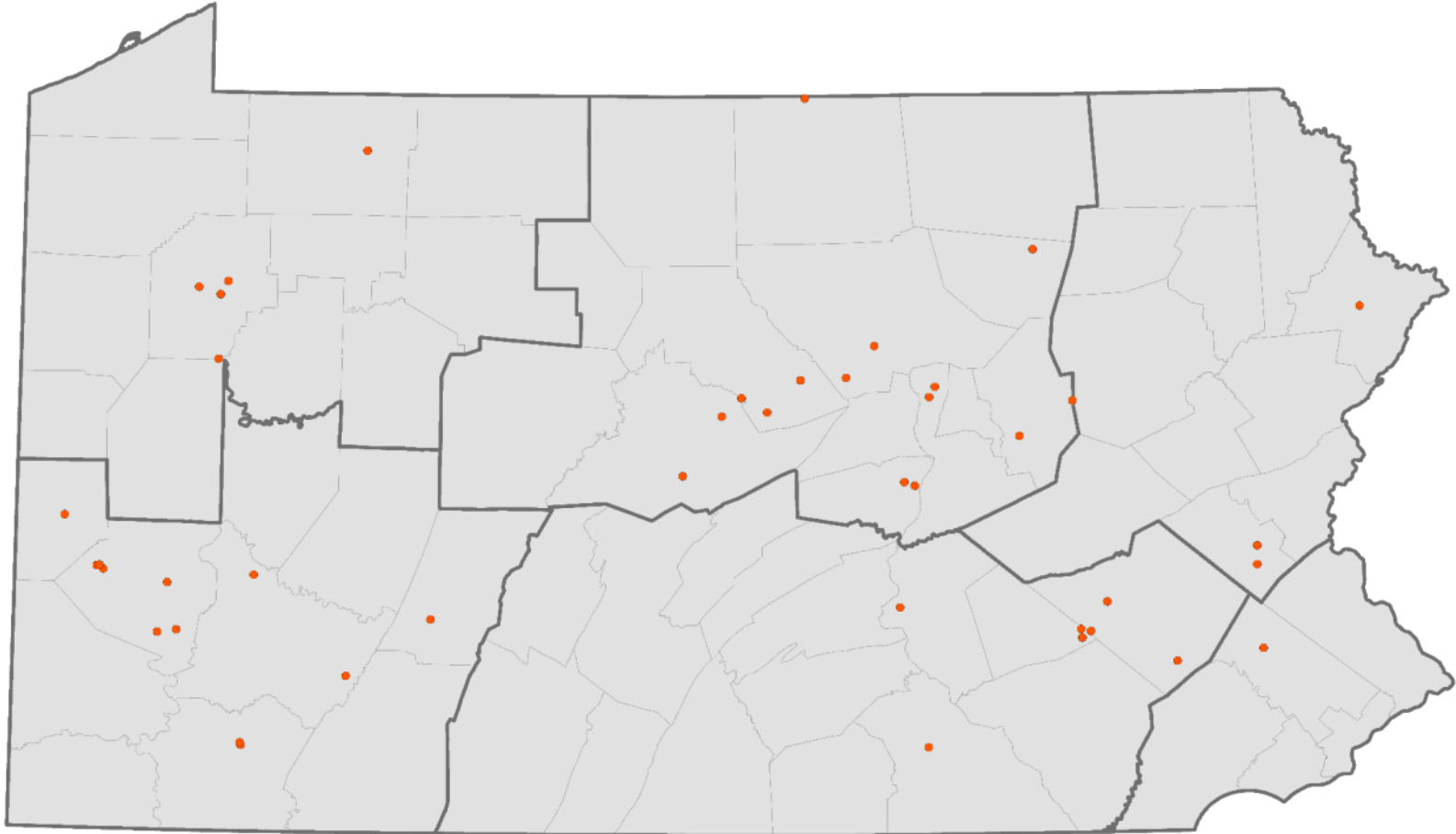


Appalachian Utilities, Inc.

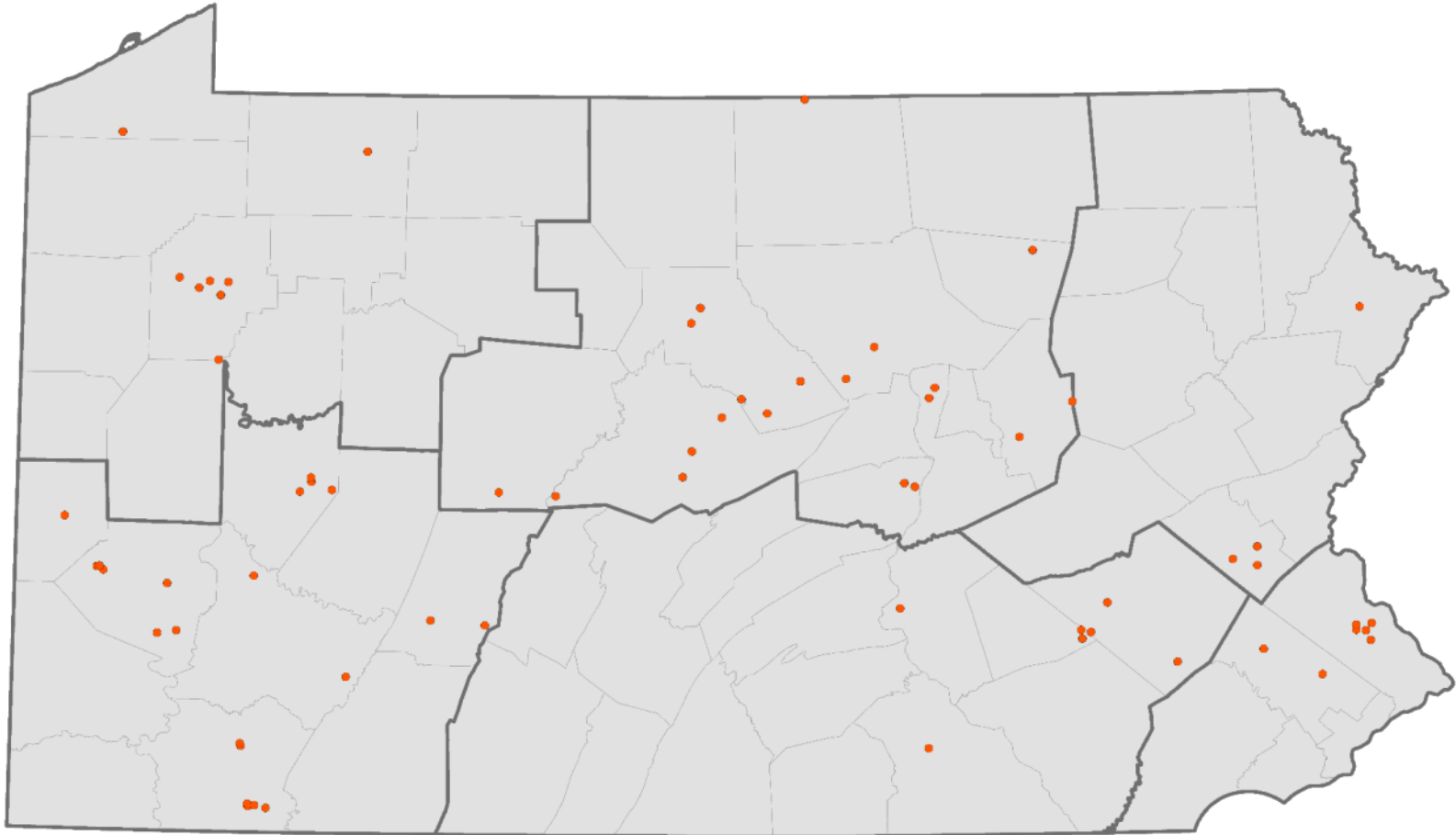
SWPTAP Projects – Year 1



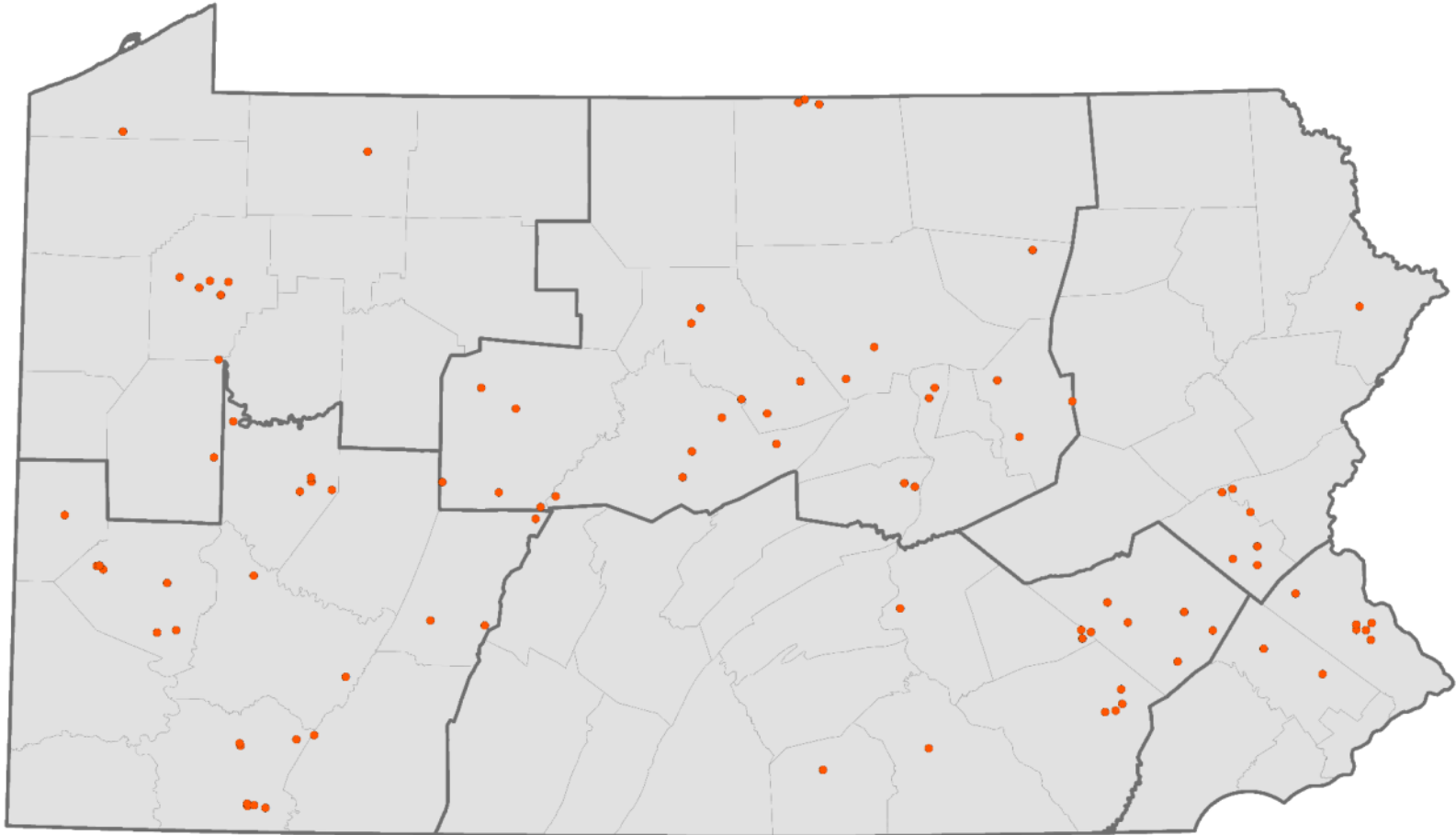
SWPTAP Projects – Year 2



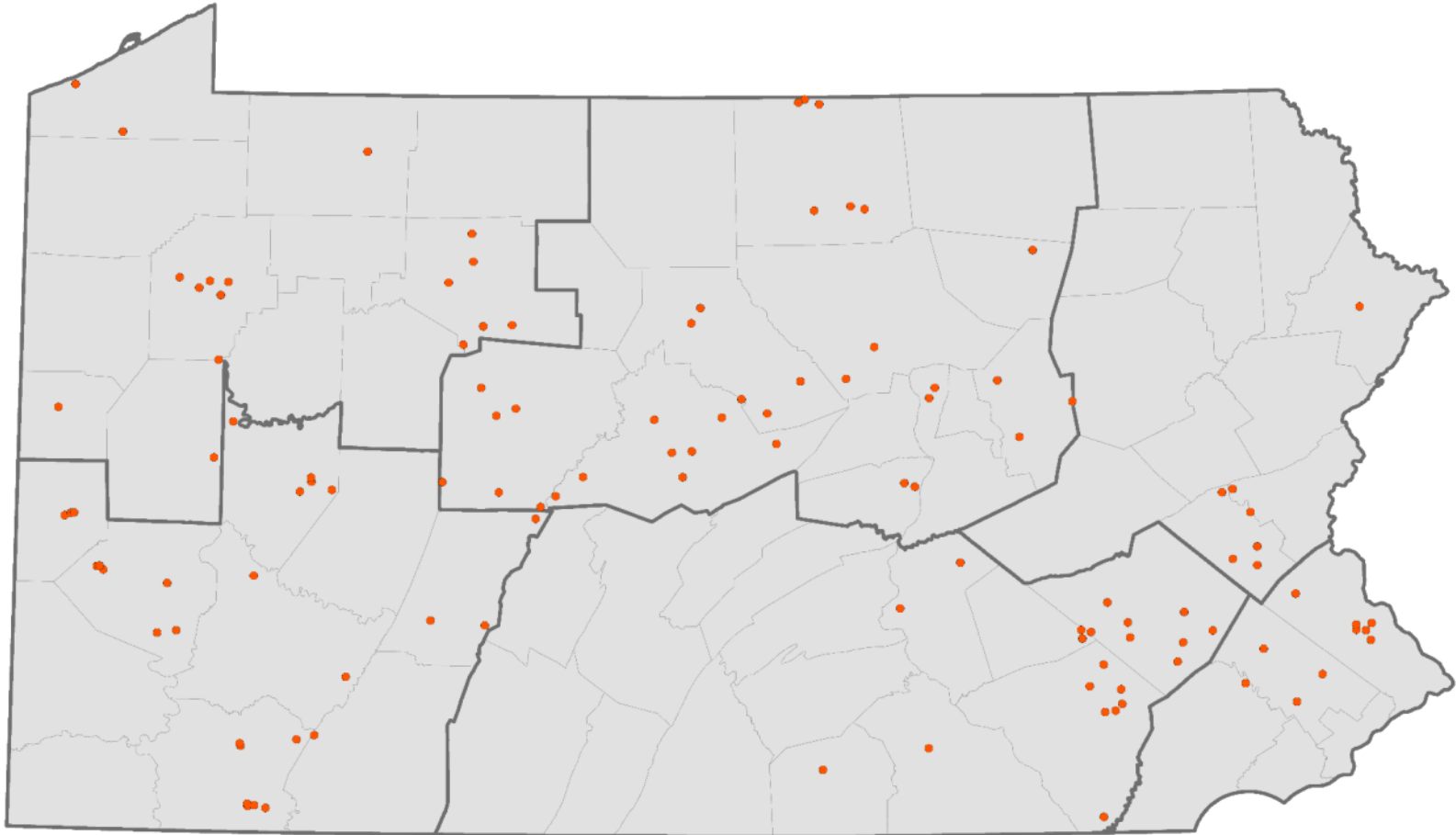
SWPTAP Projects – Year 3



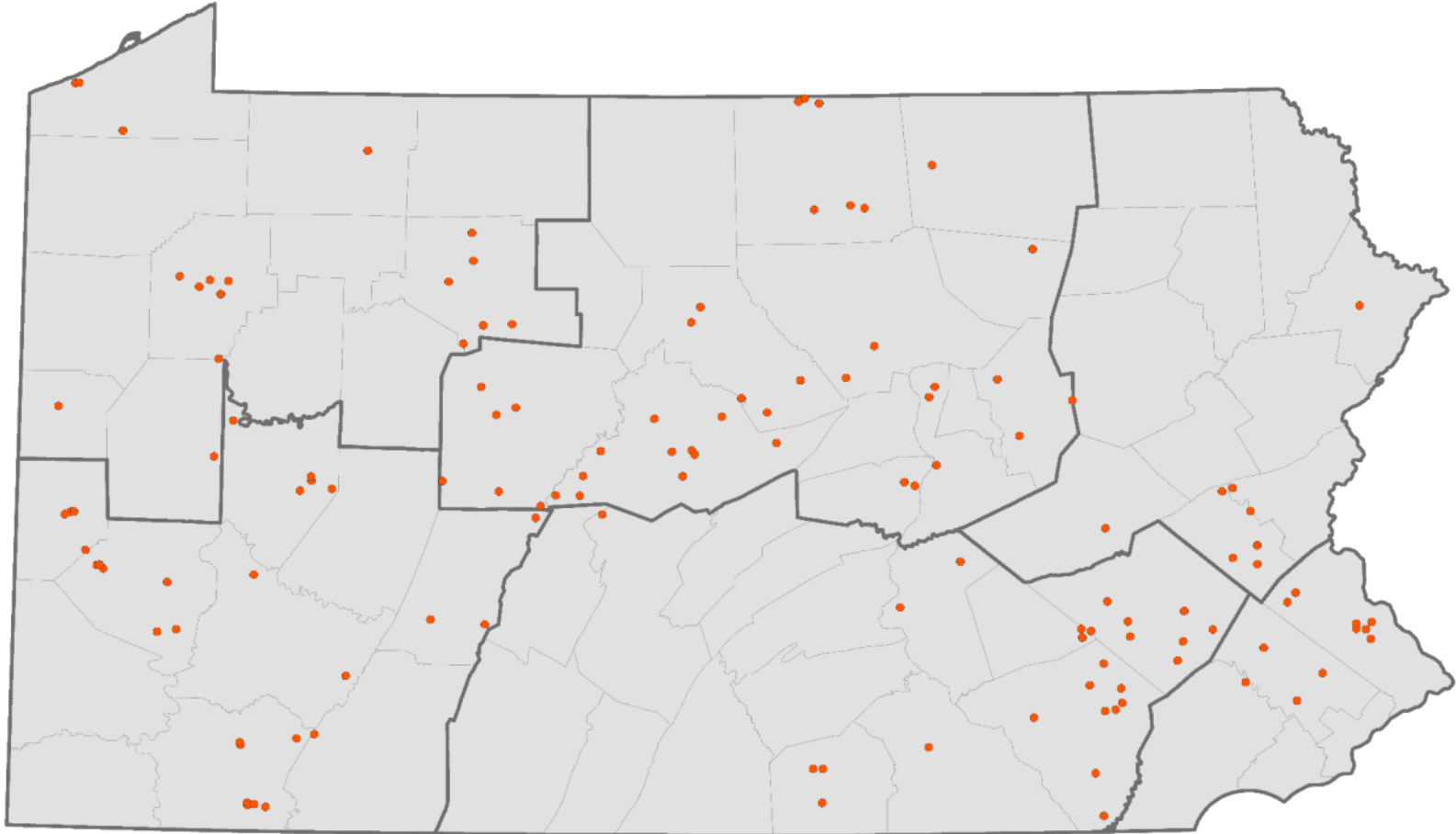
SWPTAP Projects – Year 4



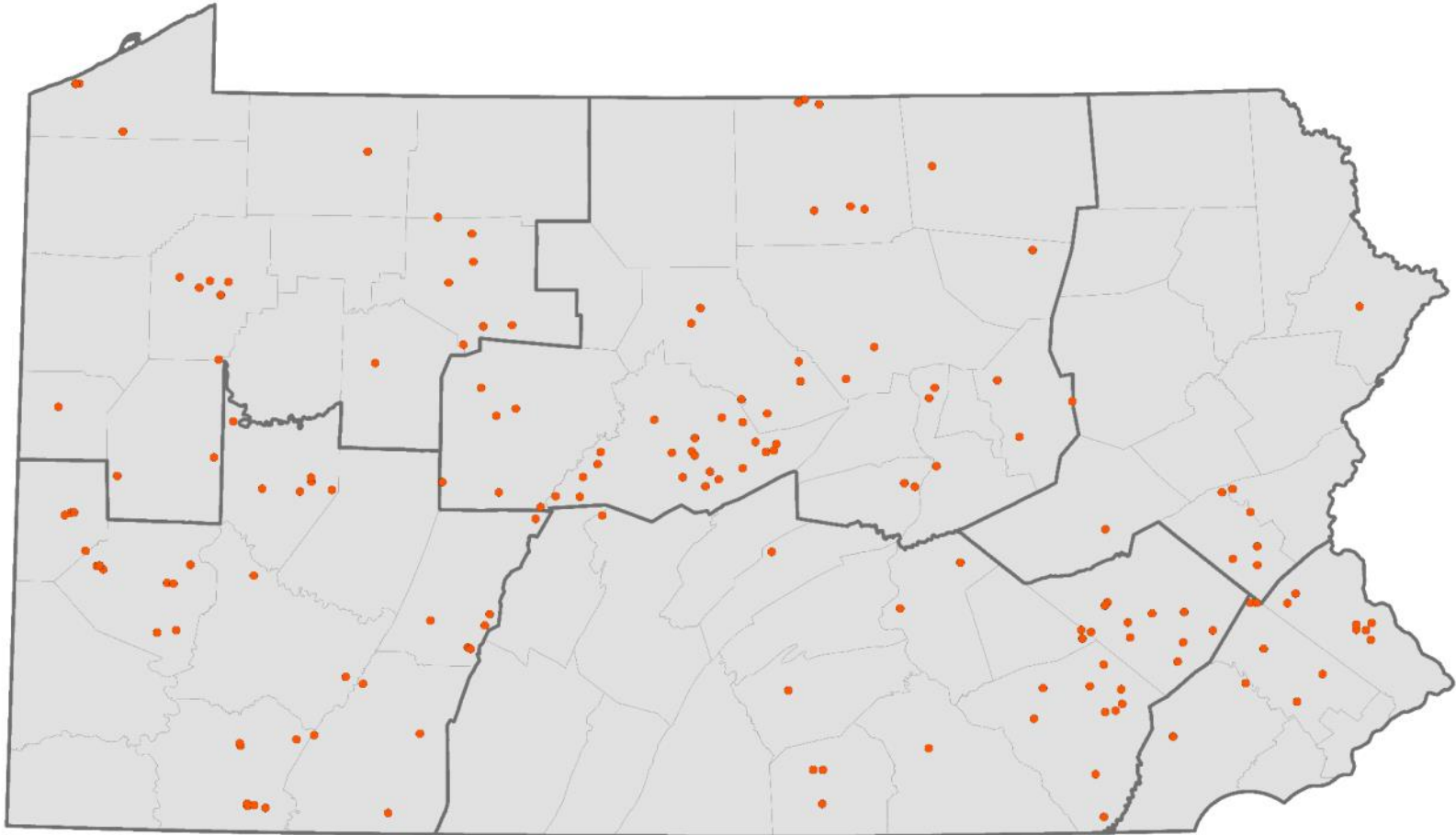
SWPTAP Projects – Year 5



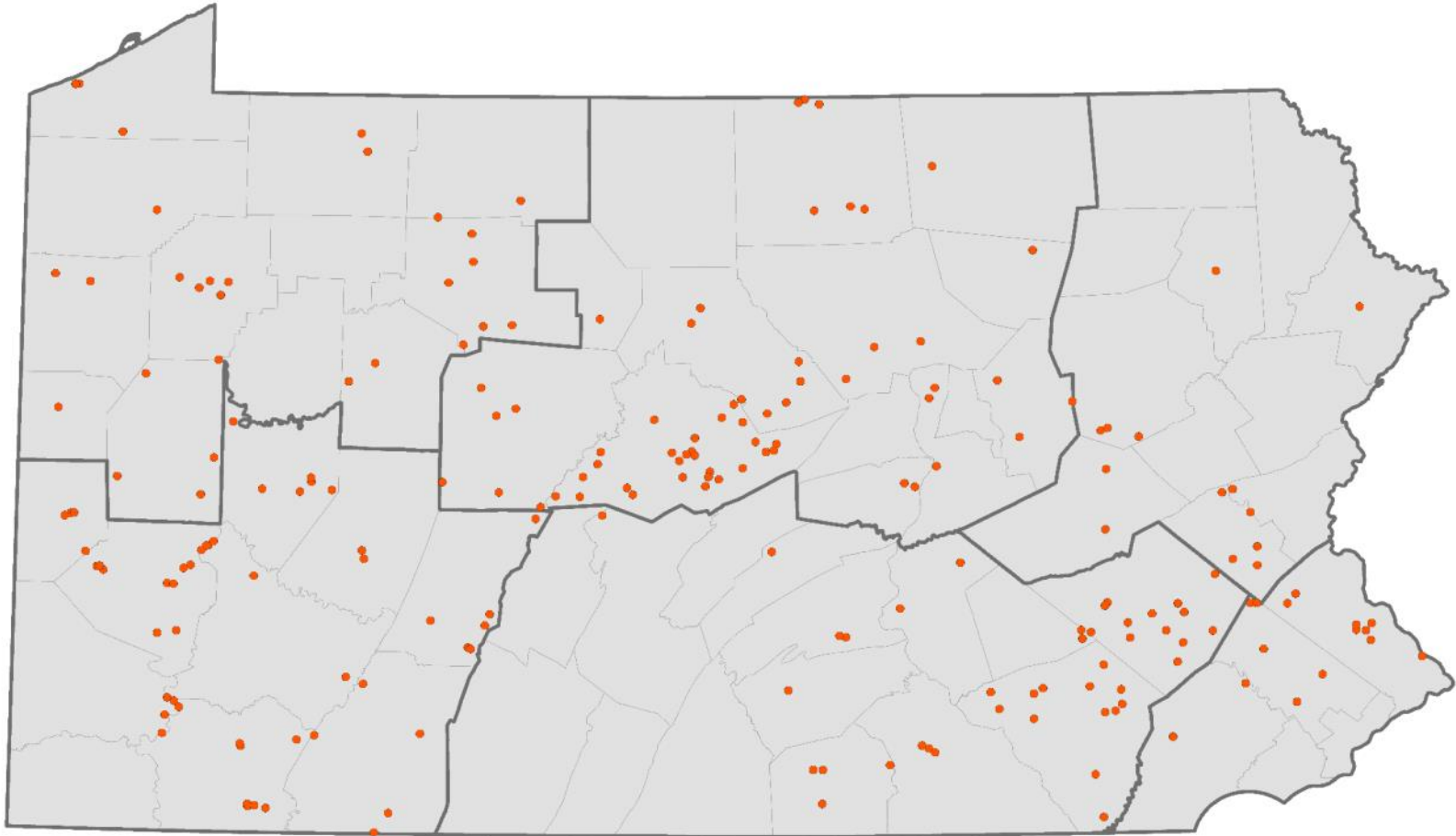
SWPTAP Projects – Year 6



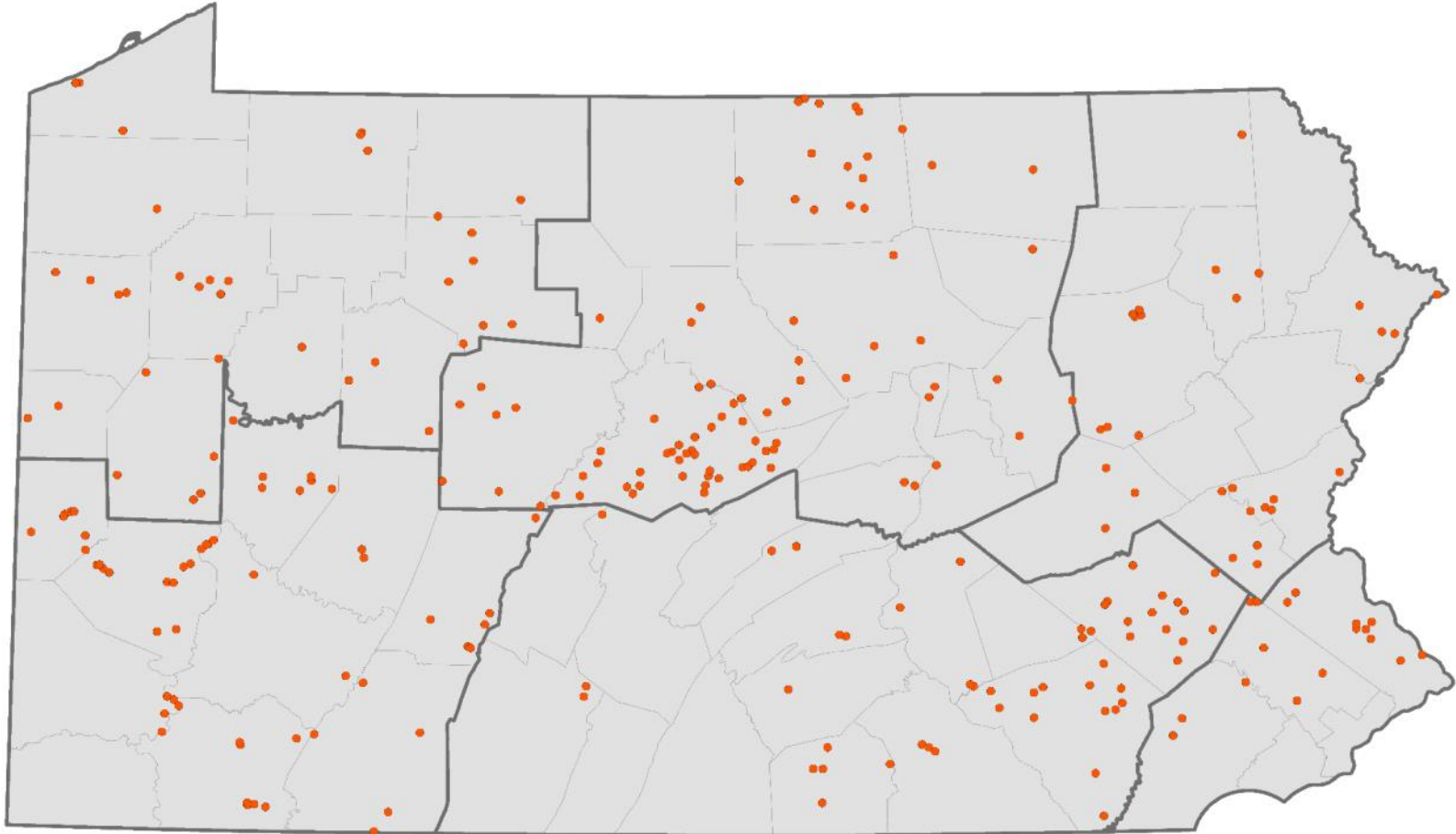
SWPTAP Projects – Year 7



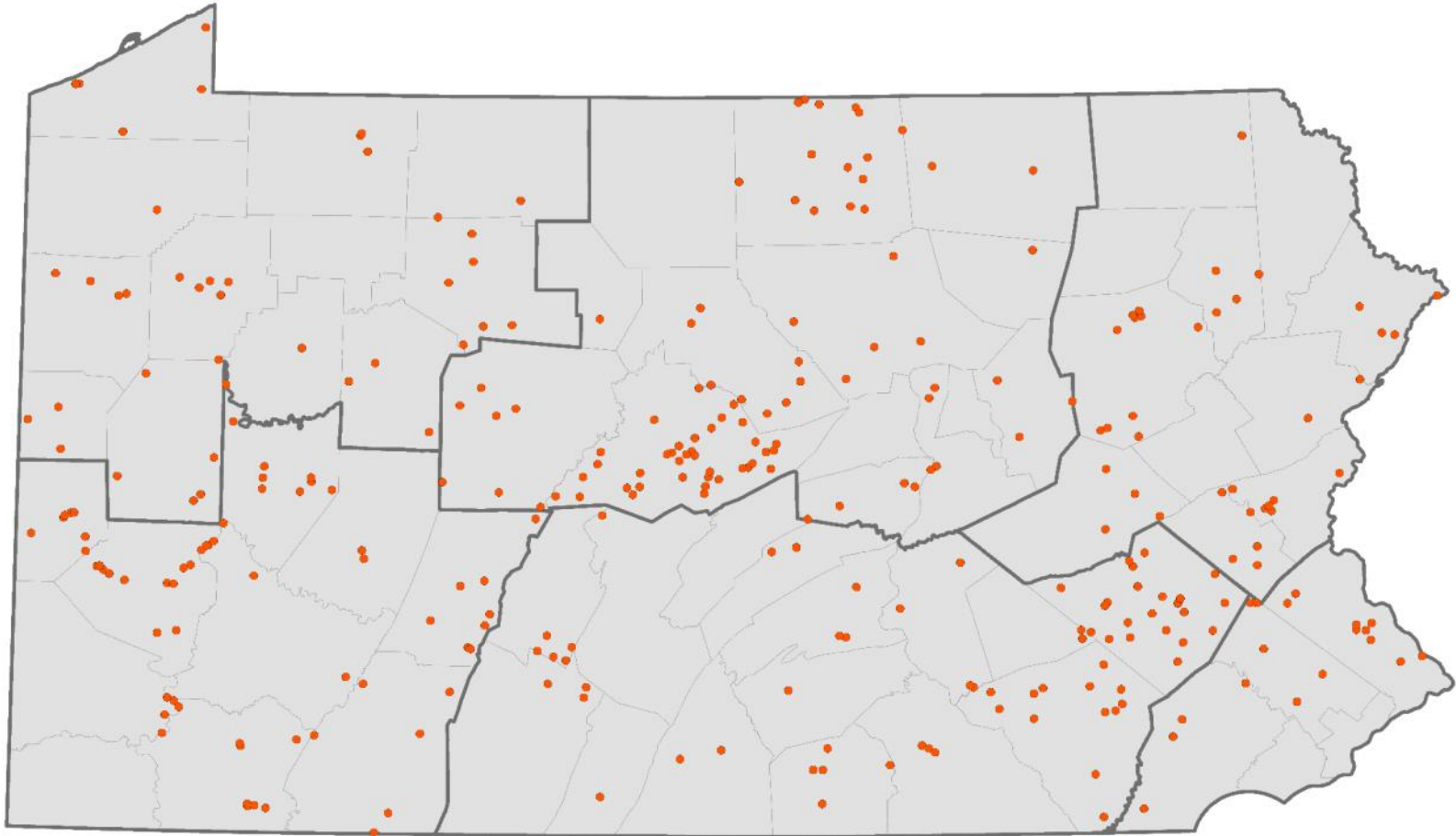
SWPTAP Projects – Year 8



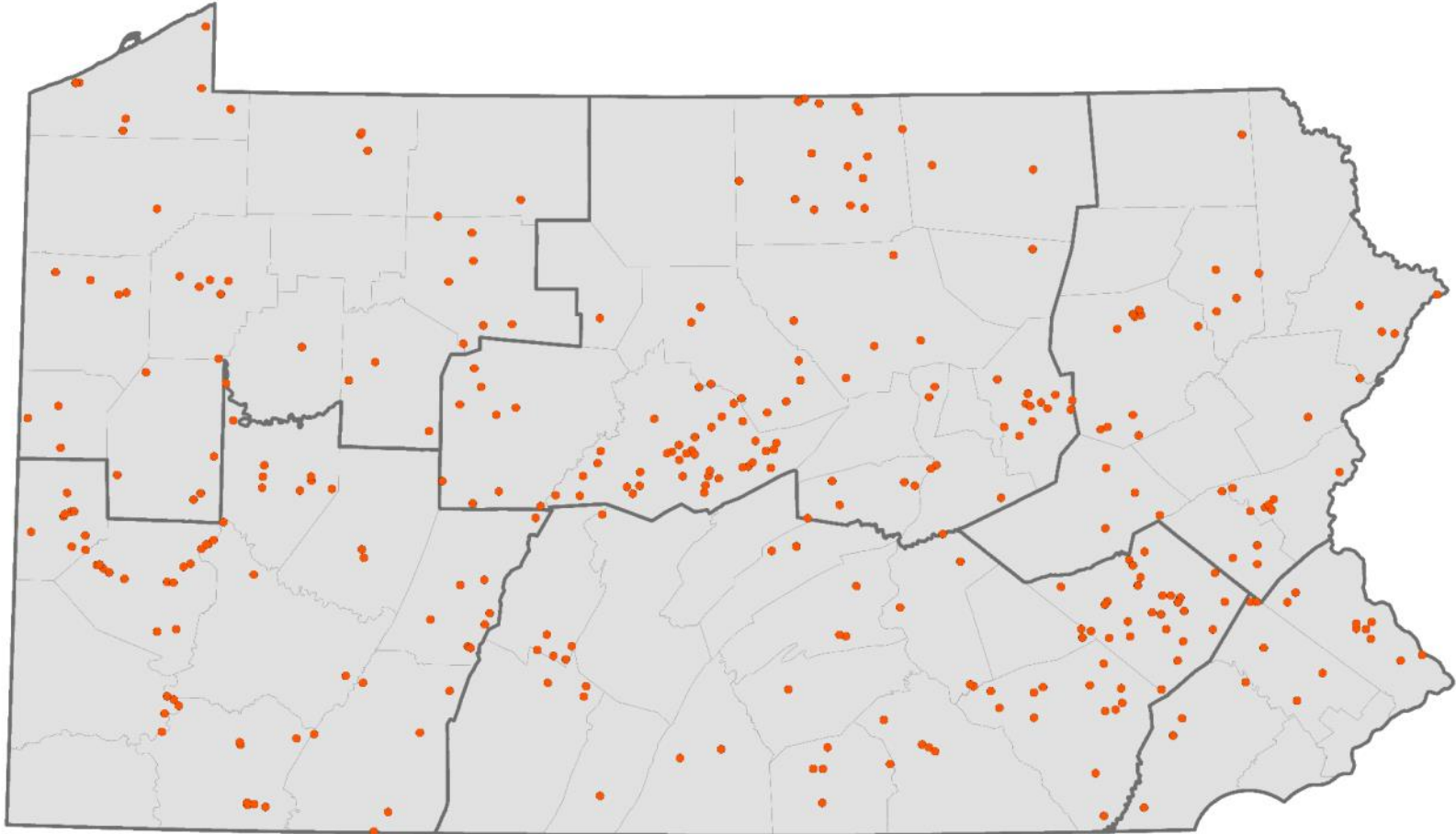
SWPTAP Projects – Year 9



SWPTAP Projects – Year 10



SWPTAP Projects – Year 11



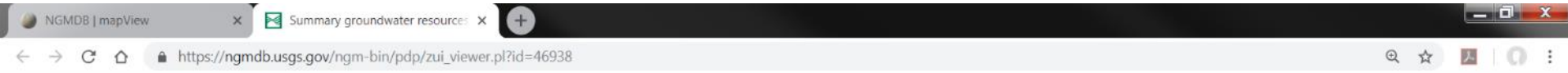
New Technologies in Source Water Protection

- Increased availability of online resources
- Field data collected through mobile GIS applications
- Database management through operation dashboards

Online GIS Resources

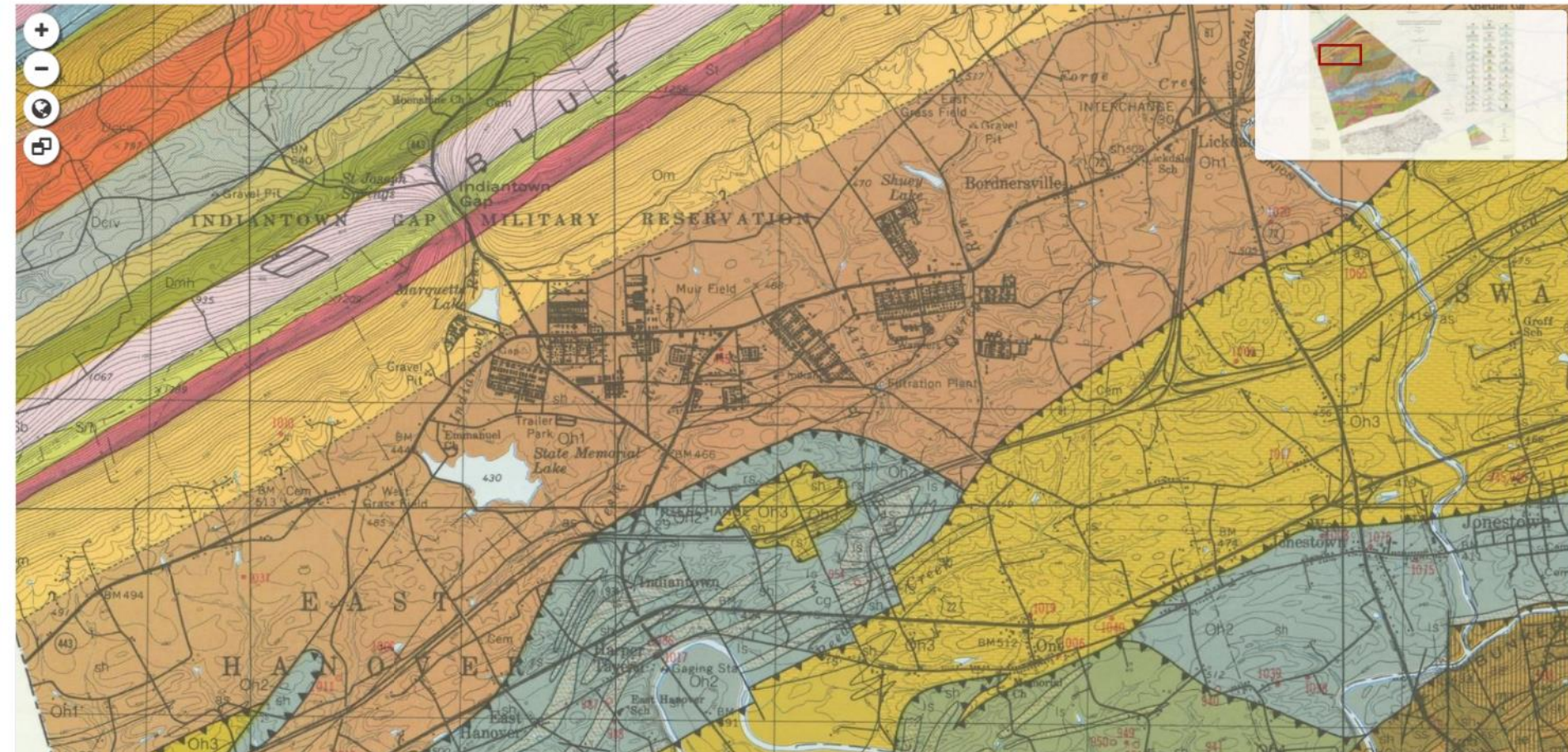
- Geologic Maps
 - NGMDB: USGS AASG mapView
- Soil Maps
 - NRCS Web Soil Survey
- High Resolution imagery
 - nearmap.com
- Elevation data
 - LiDAR data
- Stream flow
 - USGS StreamStats
- Parcels
 - County GIS Departments
- Land Cover
 - Chesapeake Conservancy Land Cover Data Project
- Drinking Water Mapping Application to Protect Source Waters
 - EPA DWMAPS

The National Geologic Map Database



National Geologic Map Database Preview

Royer, D.W., 1983, *Summary groundwater resources of Lebanon County, Pennsylvania*: Pennsylvania Geological Survey, Water Resource Report 55, scale 1:50,000
Plate 1: Geologic map of the Lebanon County, Pennsylvania, showing the locations of wells and springs — Image provided by Pennsylvania Geological Survey



NRCS Web Soil Survey



Description – Hydrologic Soil Group

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

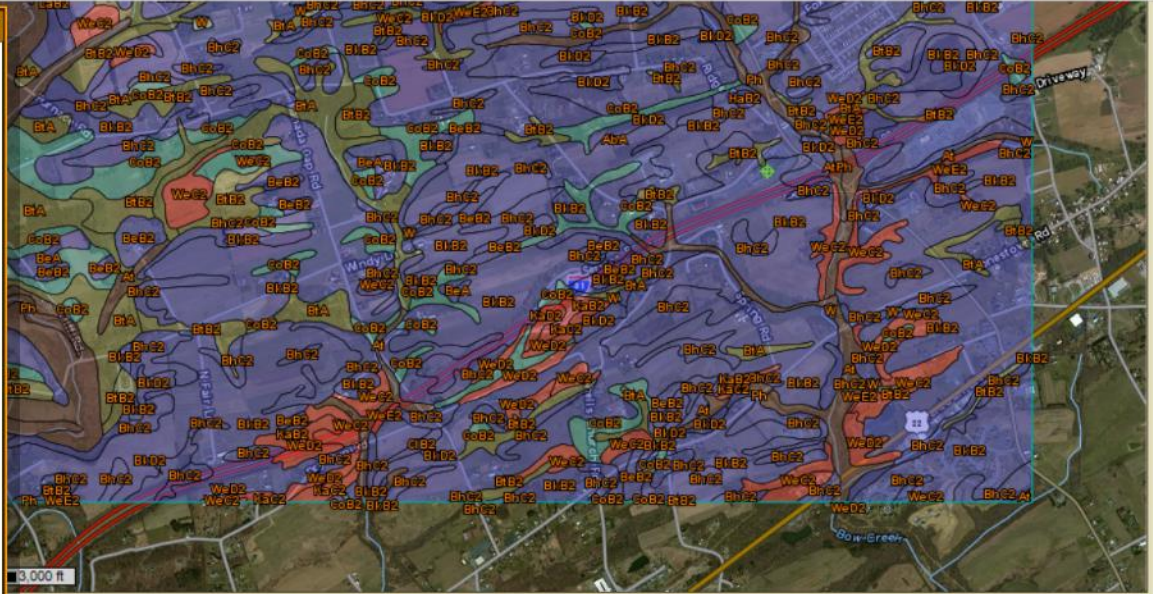
Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

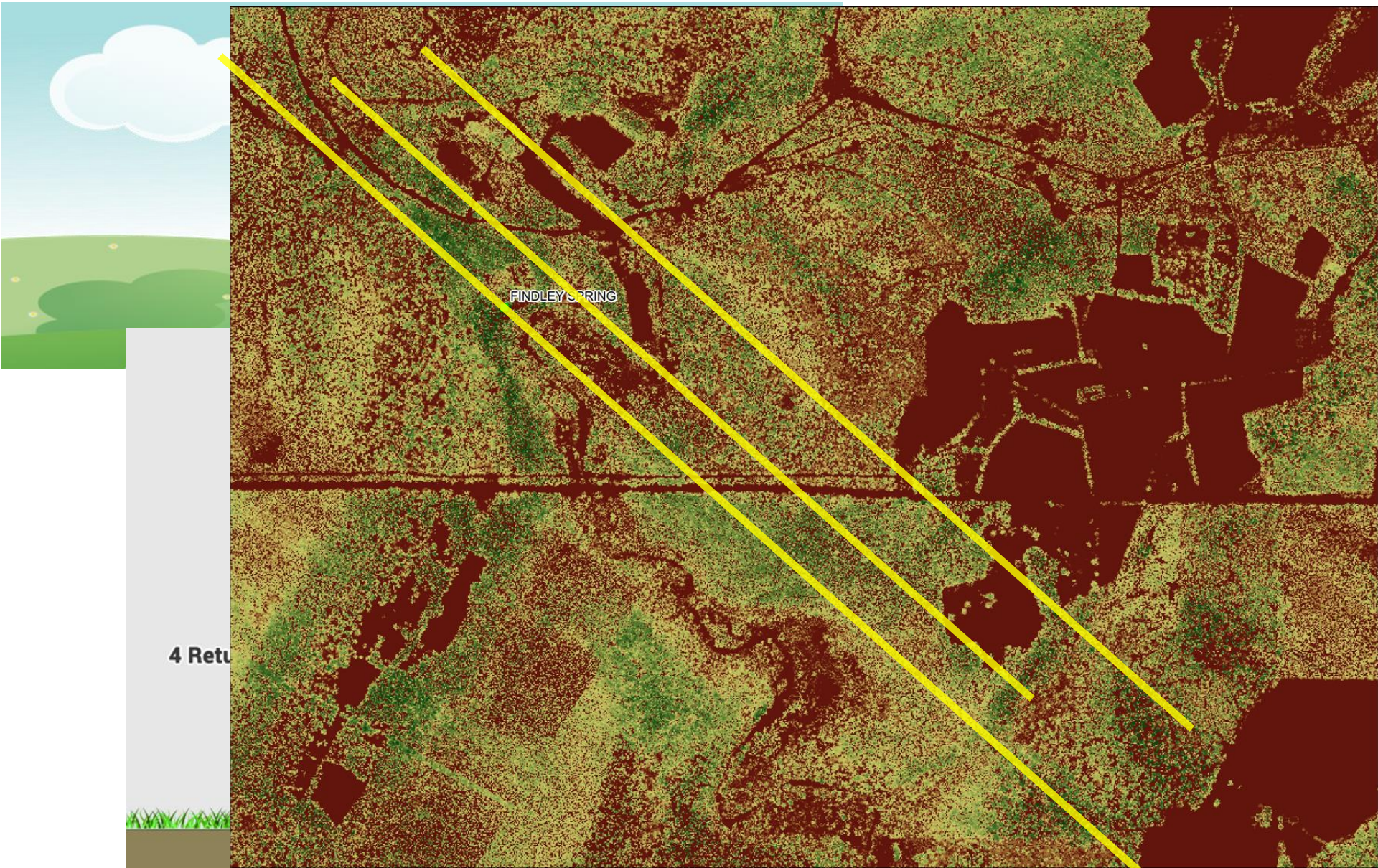


View Description		View Rating		Layer	Attribute Name	Attribute Value
Map Unit Name				Location	Latitude, Longitude	40.38016°, -76.66472°
Parent Material Name				Area of Interest (AOI)	Area (acres in this part)	4,578
Representative Slope					AoiID	4069850
Soil Slippage Potential				Soil Rating Polygons	Soil Ratings Value	B
Unified Soil Classification (Surface)					Map Unit Name	Berks shaly silt loam, 3 to 8 percent slopes, moderately eroded
Water Features					Map Unit Symbol	BkB2
					National Map Unit Symbol	I4n0
					ThematicMapID	2249125
					thematic map (Web Mercator)	(link)
					thematic data (Web Mercator)	(link)
				Aerial Photography	Date(s) Photographed	Aug 23, 2013—Feb 22, 2017

High Resolution Imagery



LiDAR Data



StreamStats

The screenshot displays the StreamStats web application interface. On the left, a sidebar contains navigation options: 'SELECT A STATE / REGION' (Pennsylvania), 'IDENTIFY A STUDY AREA' (Basin Delineated), 'SELECT SCENARIOS', 'BUILD A REPORT' (Report Built), and 'Show Basin Characteristics'. Below this, it lists 'Select available reports to display' with 'Basin Characteristics Report' and 'Scenario Flow Reports' checked. A 'Continue' button is visible at the bottom of the sidebar. The main content area is divided into three sections: 'Basin Characteristics', 'Base Flow Statistics Parameters', and 'Base Flow Statistics Flow Report'. The 'Basin Characteristics' section contains a table with 4 rows. The 'Base Flow Statistics Parameters' section contains a table with 6 rows. The 'Base Flow Statistics Flow Report' section contains a table with 4 rows. On the right, a map shows the study area with a 'Layers' panel overlaying it, showing 'Base Maps', 'Application Layers', 'PA Map Layers' (checked), and 'National Layers' (checked). The map includes labels for roads like 'Fox Run Rd' and 'Grantville'.

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	3.13	square miles
PRECIP	Mean Annual Precipitation	43	inches
CARBON	Percentage of area of carbonate rock	5	percent
FOREST	Percentage of area covered by forest	41	percent
URBAN	Percentage of basin with urban development	6	percent

Base Flow Statistics Parameters [Statewide Mean and Base Flow]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	3.13	square miles	2.26	1720
PRECIP	Mean Annual Precipitation	43	inches	33.1	50.4
CARBON	Percent Carbonate	5	percent	0	99
FOREST	Percent Forest	41	percent	5.1	100
URBAN	Percent Urban	6	percent	0	89

Base Flow Statistics Flow Report [Statewide Mean and Base Flow]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SE	SEp
Base Flow 10 Year Recurrence Interval	1.56	ft ³ /s	21	21
Base Flow 25 Year Recurrence Interval	1.36	ft ³ /s	21	21
Base Flow 50 Year Recurrence Interval	1.25	ft ³ /s	23	23

Base Flow Statistics Citations

[Stuckey, M.H., 2006, Low-flow, base-flow, and mean-flow regression equations for Pennsylvania streams: U.S. Geological Survey Scientific Investigations Report 2006-5130, 84 p.](#)

POWERED BY WIM

Parcels

PA County Parcel Viewer Availability

Not secure | ssm.maps.arcgis.com/apps/webappviewer/index.html?id=7efcc2476ccb4ccdb4f1c9f2822772ed

PA County Parcel Viewer Availability

Find address or place

Map showing Pennsylvania County Parcel Viewer Availability. The map displays county boundaries and availability status. Major cities and towns are labeled, including Erie, Youngstown, State College, Harrisburg, and Philadelphia. The map also shows major highways and geographical features like Lake Erie and the Delaware Water Gap National Recreation Area.

Map controls: Home, Refresh, Zoom In, Zoom Out, Full Screen, Close

Scale: 30mi

Coordinates: -81.377 42.478 Degrees

Powered by Esri

HERE, Garmin, FAO, USGS, EPA, NPS | Centre County Government, Esri, HERE, Garmin, FAO, METI/NASA, US...

Chesapeake Conservancy Land Cover Data Project

Chesapeake Bay Phase 6 Land Use Viewer

USGS Home
Contact USGS
Search USGS

Map Layers

Overlays

Phase 6 Land Use Datasets

Phase 6 Future Land Use

Click on the layer name to get information about the layer

Historic Trends Scenario 2025

Commercial	Residential	Mixed
Forest	Scrub	Farmland
Barren	Water	Wetlands
Developed Open Space	Low-Intensity Developed	Med-Intensity Developed
High-Intensity Developed	No Data	

Current Zoning Scenario 2025

Commercial	Residential	Mixed
Forest	Scrub	Farmland
Barren	Water	Wetlands
Developed Open Space	Low-Intensity Developed	Med-Intensity Developed
High-Intensity Developed	No Data	

Land Use/Land Cover 2013

Forest	Scrub	Farmland
Barren	Water	Wetlands
Developed		

Residential Suitability (Historic Trends)

Base Map

Data and Metadata Download

Submit Comments to USGS

500 m

Overlay Opacity: 100%

EPA DWMAPS

U.S. EPA DWMAPS

Search Address, Place, or Lat/Long

Nearby Discharges

Search an address or locate on map

436-698 Station Rd, Grantville, Penns

Show results within 2 Miles

0 30

NPDES Permitted Facilities that Discharg...

Facility Discharging to Surface W...	0.22 mi
Facility Discharging to Surface Water	0.23 mi
Facility Discharging to Surface Water	0.28 mi
Facility Discharging to Surface Water	0.36 mi
Facility Discharging to Surface Water	0.36 mi
Facility Discharging to Surface Water	0.37 mi
Facility Discharging to Surface Water	0.51 mi

Grantville

East Hanover Twp

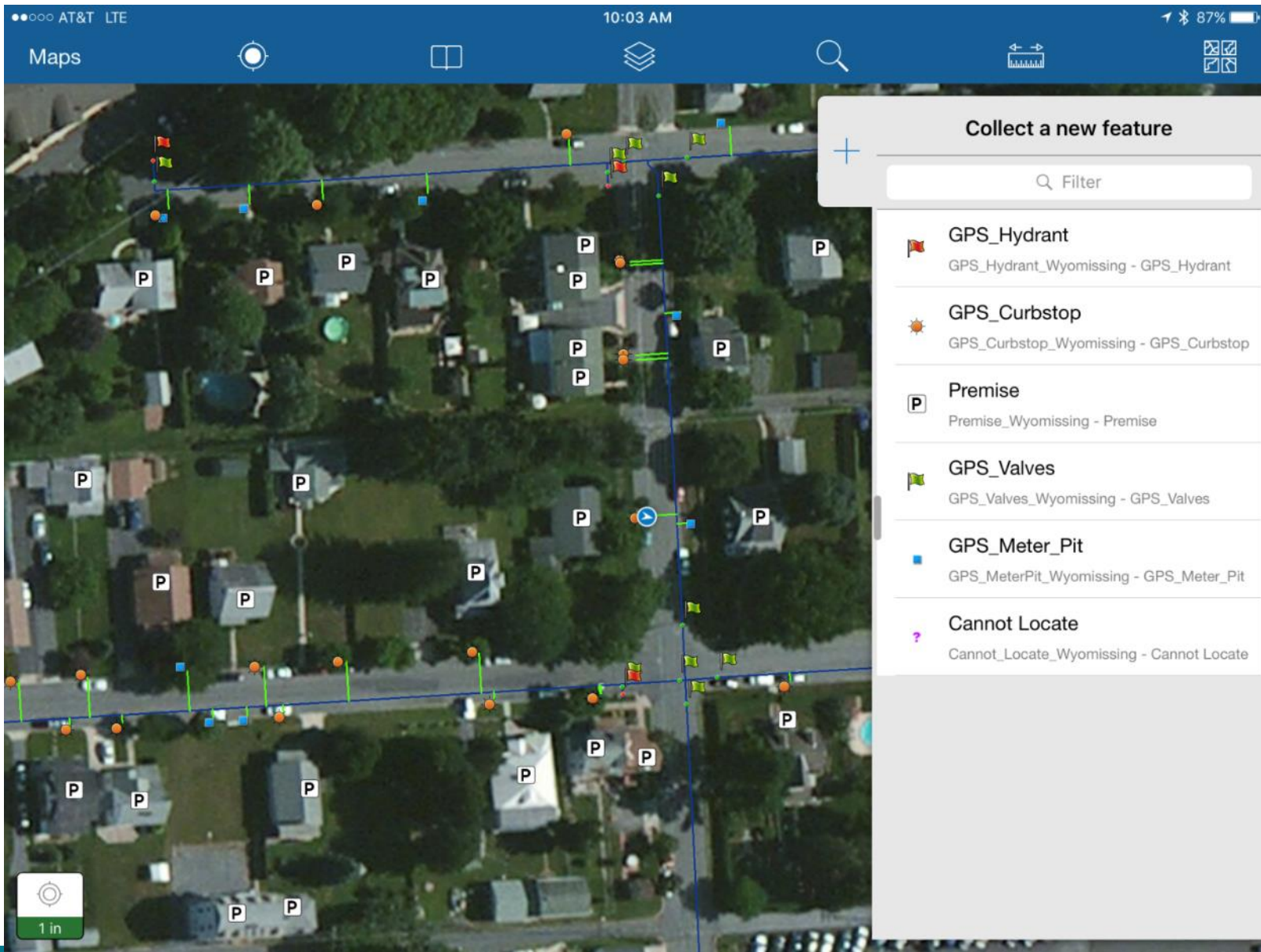
Manada Creek

Dauphin County, Esri, HERE, Garmin, USGS, NGA, EPA, USDA, NPS

Mobile GIS Applications

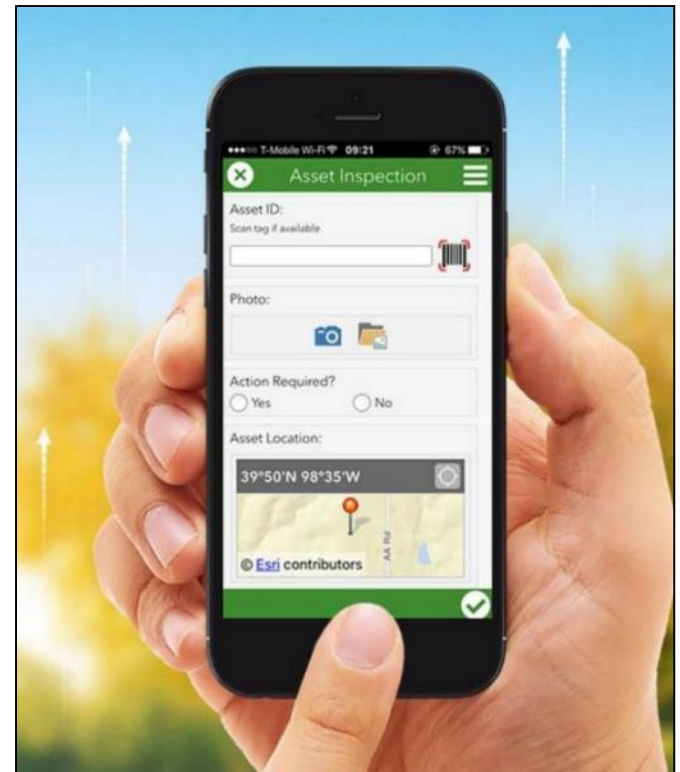
- Field data capture
 - Source location/verification
- Potential Source of Contamination (PSOCs)
 - Field verification
- Crowd Sourcing
 - Example from NJDEP

Field Data Collection



Database Population

- Field personnel can add attribute data to GIS database
 - Attribute tables in web maps
 - In the field or in the office
 - Form-based survey applications
 - Survey123 for ArcGIS



PSOC Field Verification

Home ▾ PS PSOC 5030011 [✎](#)

New Map ▾ Create Presentation [↔](#) SSM ▾

[Details](#) [Add ▾](#) [Edit](#) [Basemap](#) [Analysis](#)

[Save ▾](#) [Share](#) [Print ▾](#) [Directions](#) [Measure](#) [Bookmarks](#)

Add Features

PSOC Notes - Points

[Stickpin](#) [Pushpin](#) [Cross](#)

PSOC Notes - Text

[Text](#)

PSOC Notes - Lines

[Line](#) [Freehand Line](#)

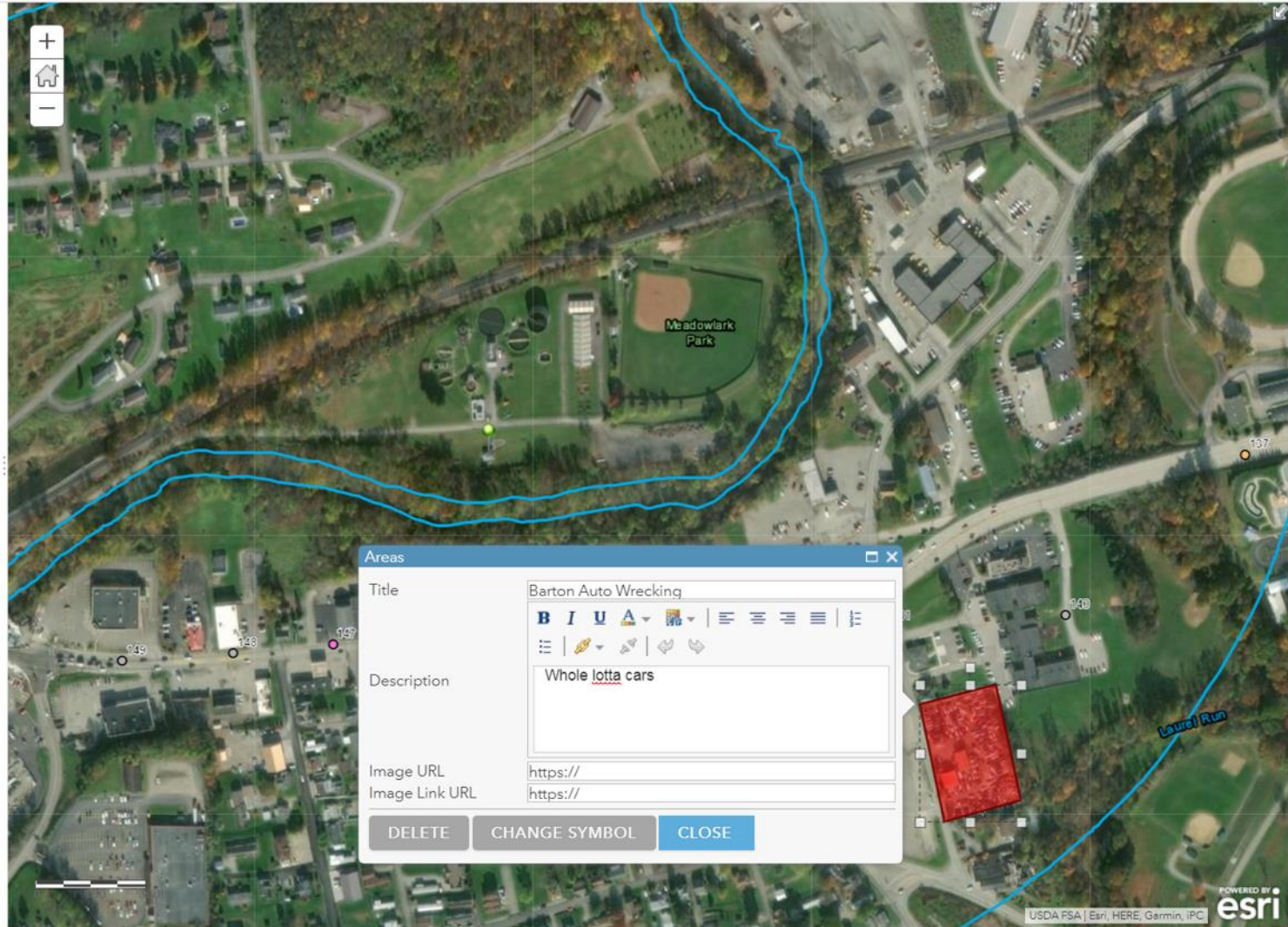
PSOC Notes - Areas

[Area](#) [Triangle](#) [Rectangle](#)

[Left Arrow](#) [Right Arrow](#) [Ellipse](#)

[Up Arrow](#) [Down Arrow](#) [Circle](#)

[Freehand Area](#)



Areas

Title: Barton Auto Wrecking

Description: Whole lotta cars

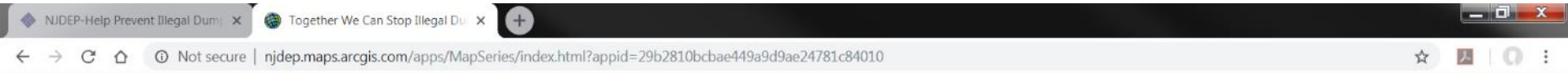
Image URL: <https://>

Image Link URL: <https://>

[DELETE](#) [CHANGE SYMBOL](#) [CLOSE](#)

[UNDO](#) [REDO](#)

Crowd Sourcing Applications



Together We Can Stop Illegal Dumping in New Jersey!

New Jersey Department of Environmental Protection

- Welcome
- Fines \$50,000 +
- Fines \$49,999 - \$15,001
- Fines \$15,000 - \$2,500
- Fines \$2,499 - \$1,001
- Fines \$1,000 - \$1
- PVSC

NJ Illegal Dumping Cases \$2,499 - \$1,001

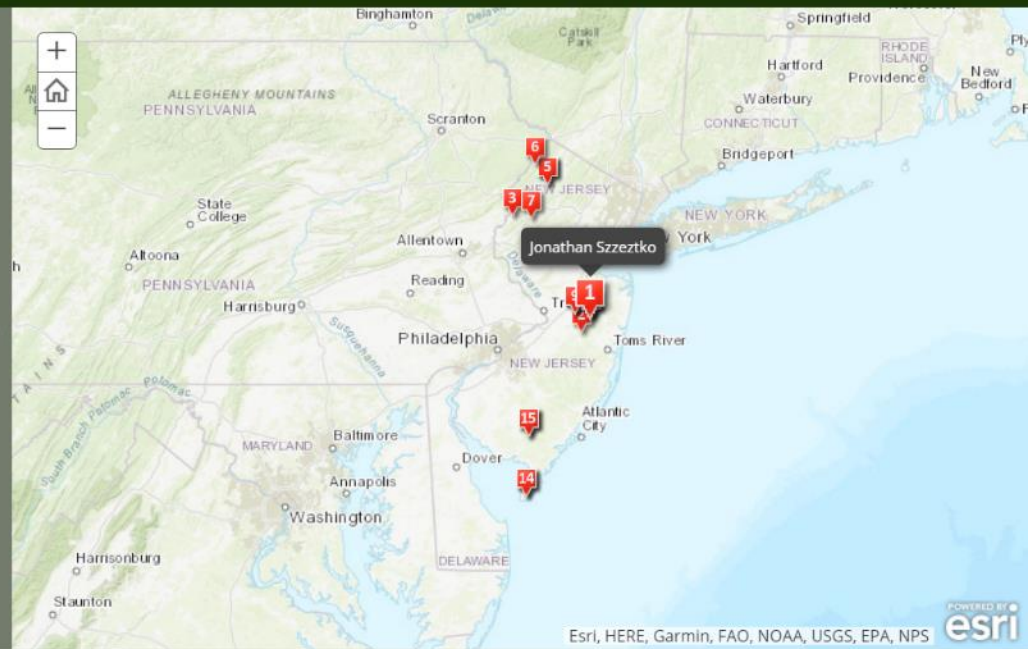
Click on the photos below or on the map for information on Illegal Dumping Cases

Jonathan Szeszko
Guilty
Maximum Fine \$1,500

John Szeszko, 19, of Jackson has been charged with discarding refuse in a State Wildlife Management Area. That penalty carries a fine of up to \$1,500 and restitution for cost of cleanup. Szeszko was also charged with illegal solid waste disposal, which bears a minimum penalty of \$2,500. The summonses were issued after discovery of a large household debris pile found dumped at Turkey Swamp Wildlife Management Area in Freehold Township. The case was investigated by Arthur Zanfani of DEP's Compliance & Enforcement and Conservation Officer Jean Mutone.

Before **After**

Jonathan Szeszko Turkey Swamp



Powered by Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NPS

1 Jonathan Szeszko

2 Robert E. Davis

3 Scott M. Sukennikoff

4 Joseph Maio

5 Thomas E. Ziniewicz

6 Jordan L. Schindler

7 Joshua F. Ganter

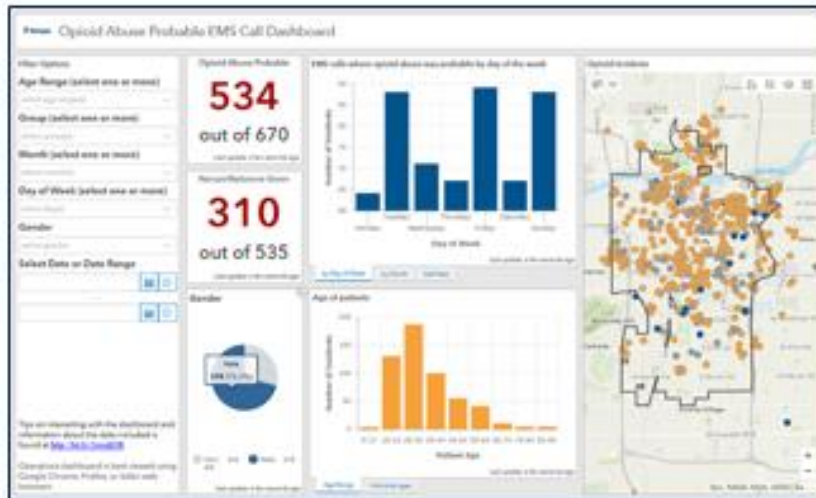
8 Christopher Both

9 Adam Klein

Operations Dashboard



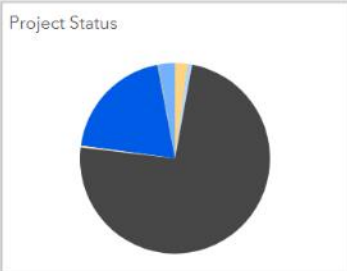
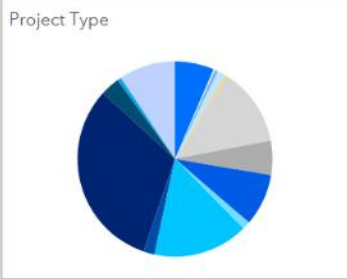
Operations Dashboard for ArcGIS



Source Water Protection Program Status

SWP Master Project Status - October 2018

DEP Region

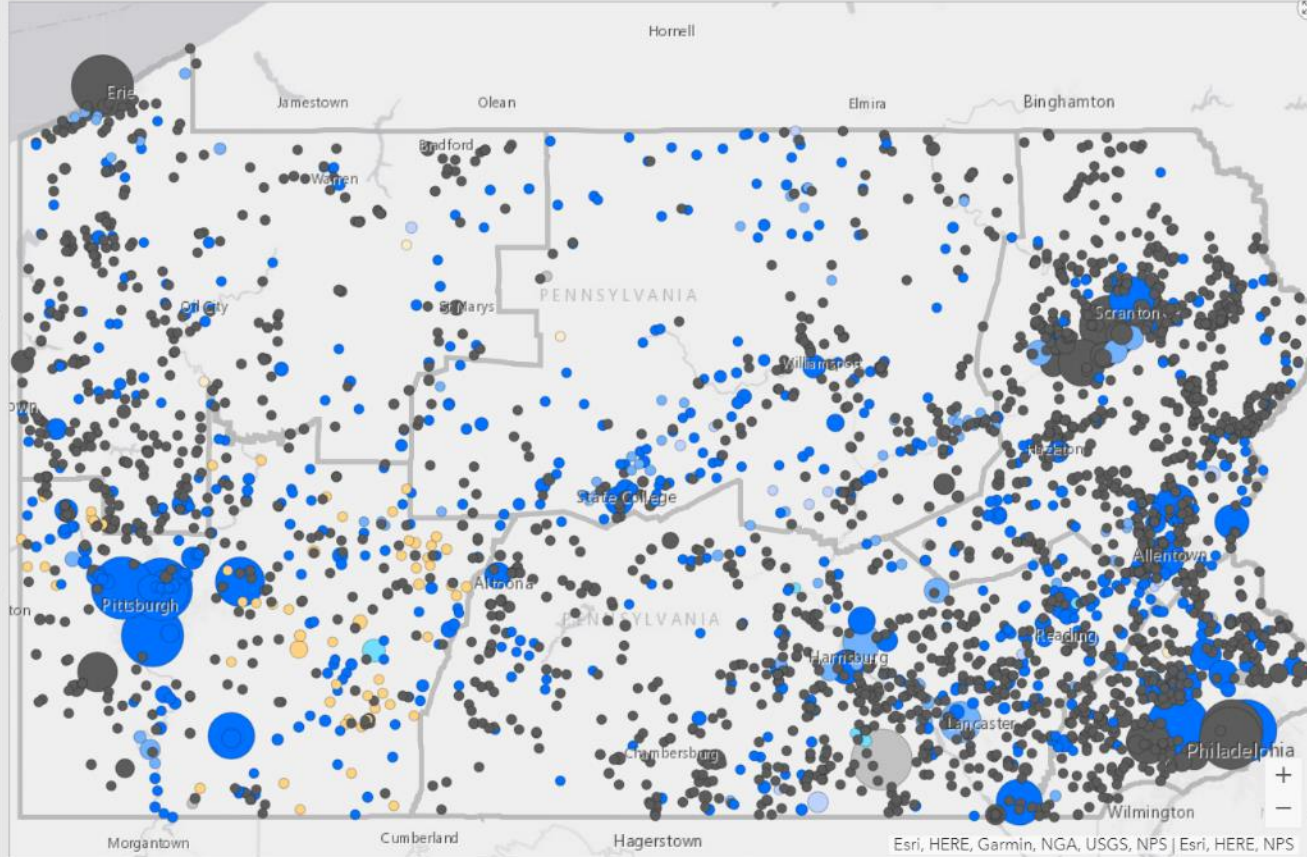


Community Water Systems

2,898

Population Served

14,179,998



Community Water Systems

ACTIVITYTRACKING

- Completed
- In Progress
- In Queue
- Project Pending
- On Hold
- Unknown
- Expired
- No SWP Activity

POP

- > 200,000
- 150,000
- 100,000
- 50,000
- < 100

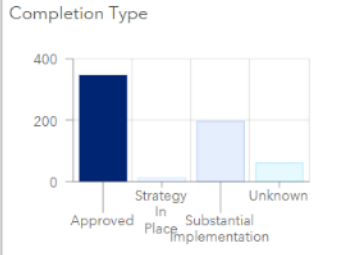
PADEP Regions



Approved Source Water Protection Plans

SWP Master Project Status - October 2018

DEP Region



Community Water Systems

345

Population Served

6,801,584

Community Water Systems

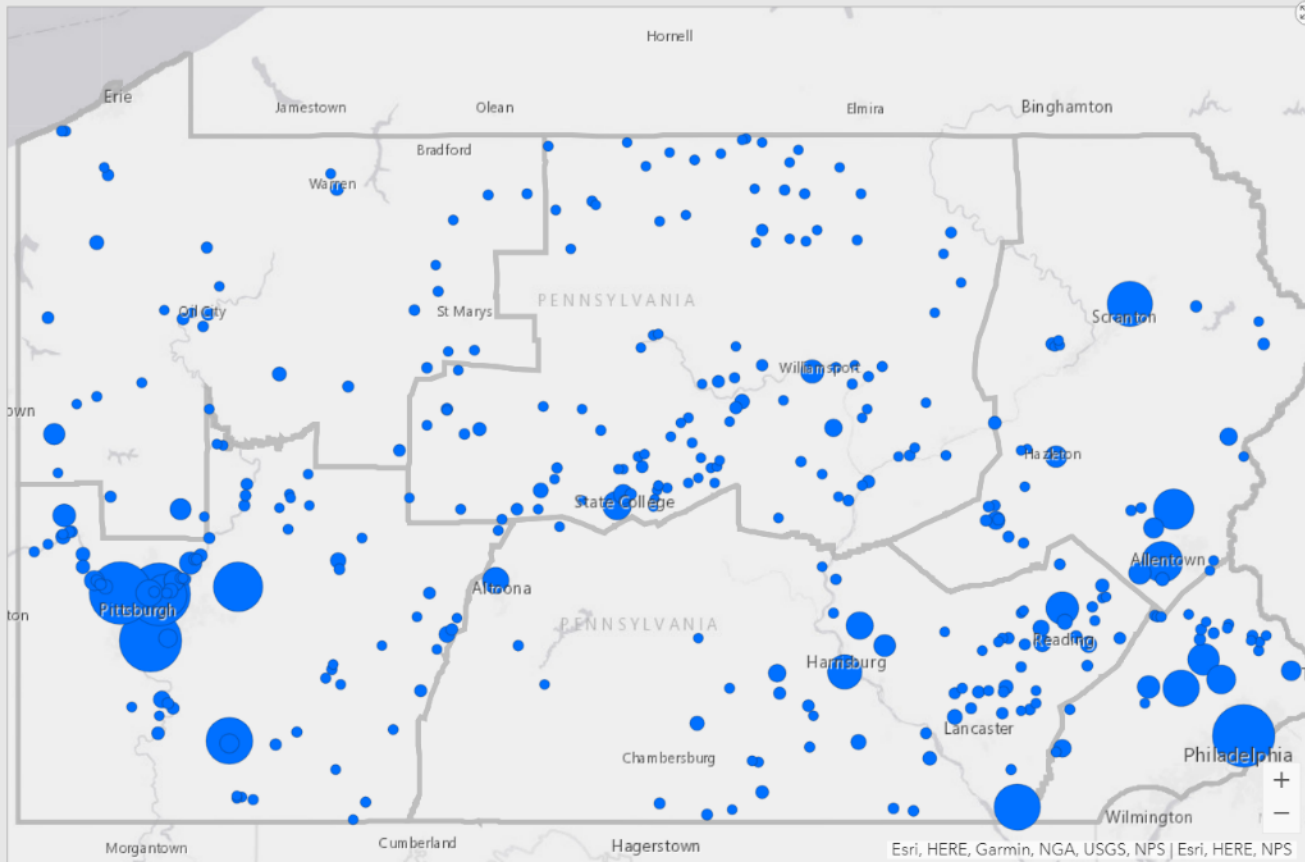
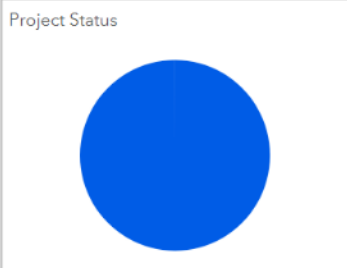
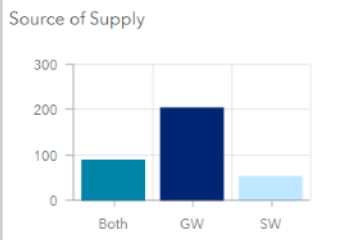
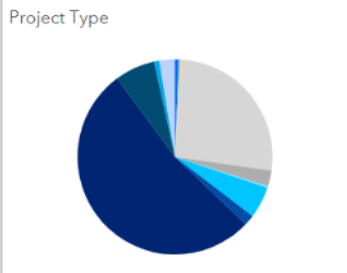
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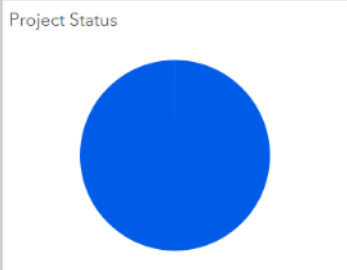
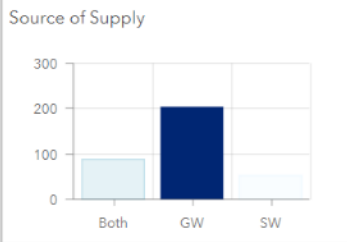
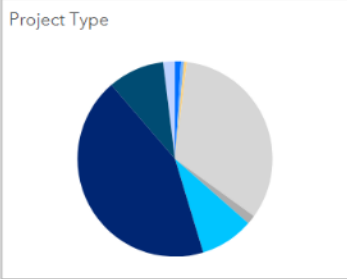
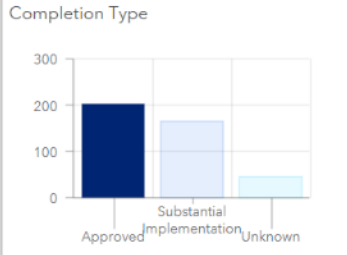
PADEP Regions



Approved Groundwater Source Water Protection Plans

SWP Master Project Status - October 2018

DEP Region

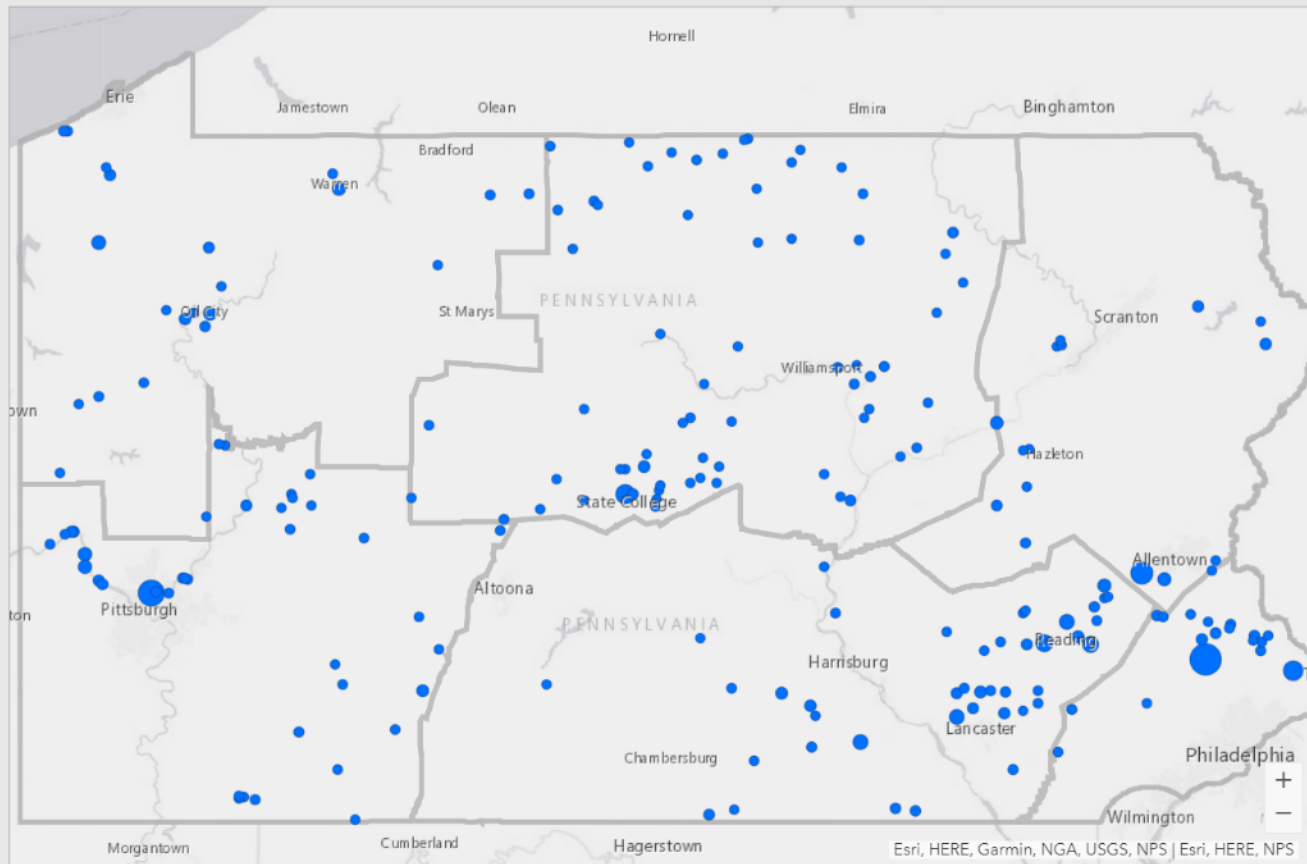


Community Water Systems

203

Population Served

900,092



Community Water Systems

ACTIVITYTRACKING

- Completed
- In Progress
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- On Hold
- Unknown
- Expired
- No SWP Activity

POP

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- 100,000
- 50,000
- < 100

PADEP Regions



Source Water Protection Status by County

SWP Master Project Status - October 2018

DEP Region

Community Water Systems

29

Population Served

160,889

Community Water Systems

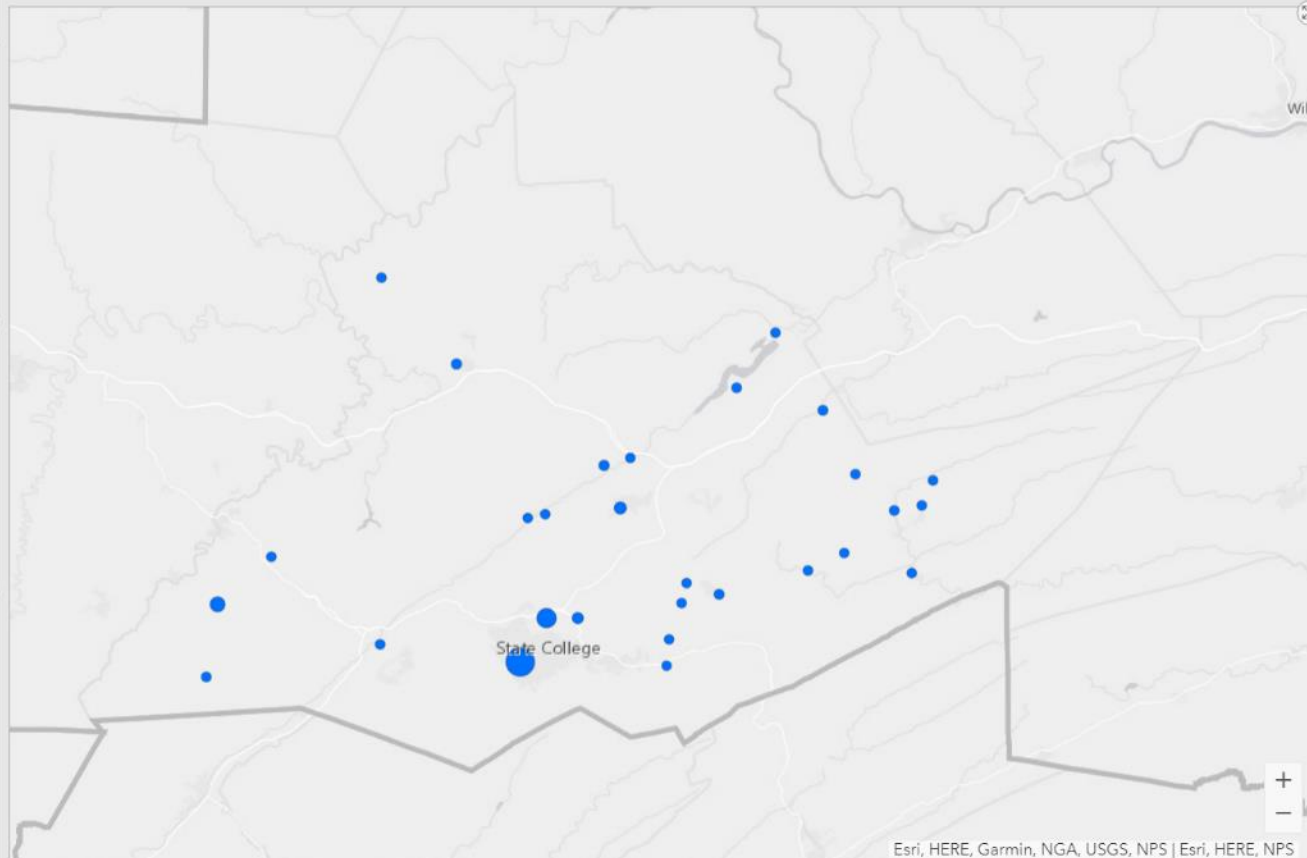
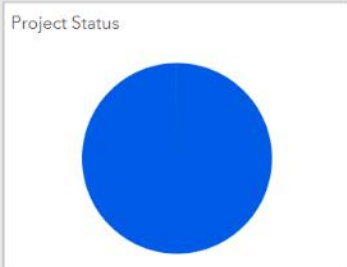
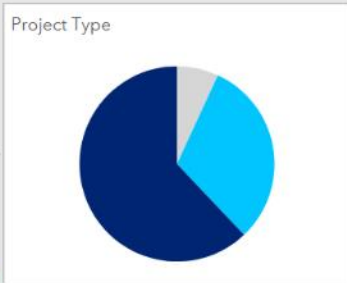
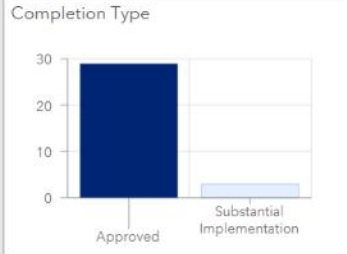
ACTIVITYTRACKING

- Completed
- In Progress
- In Queue
- Project Pending
- On Hold
- Unknown
- Expired
- No SWP Activity

POP

- > 200,000
- 150,000
- 100,000
- 50,000
- < 100

PADEP Regions





New Technologies in Source Water Protection

- Increased availability of online resources
- Field data collected through mobile applications
- Database management through operation dashboards

About the Speaker

Alfred C. Guiseppe, PG

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A graduate of Millersville University of Pennsylvania and the University of Wyoming, Mr. Guiseppe is the Director of the Water Resources Group at SSM and Manager of the GIS Department. Overseeing a staff of environmental scientists, Mr. Guiseppe manages various water resources-related projects including groundwater supply development, watershed management and source water protection.

In addition, Mr. Guiseppe is responsible for the management and development of GIS services and utility management.



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