DRWI
DATA, GIS, & Modeling
Work Group

dvrpc

April 2, 2019
DVRPC
Philadelphia, PA

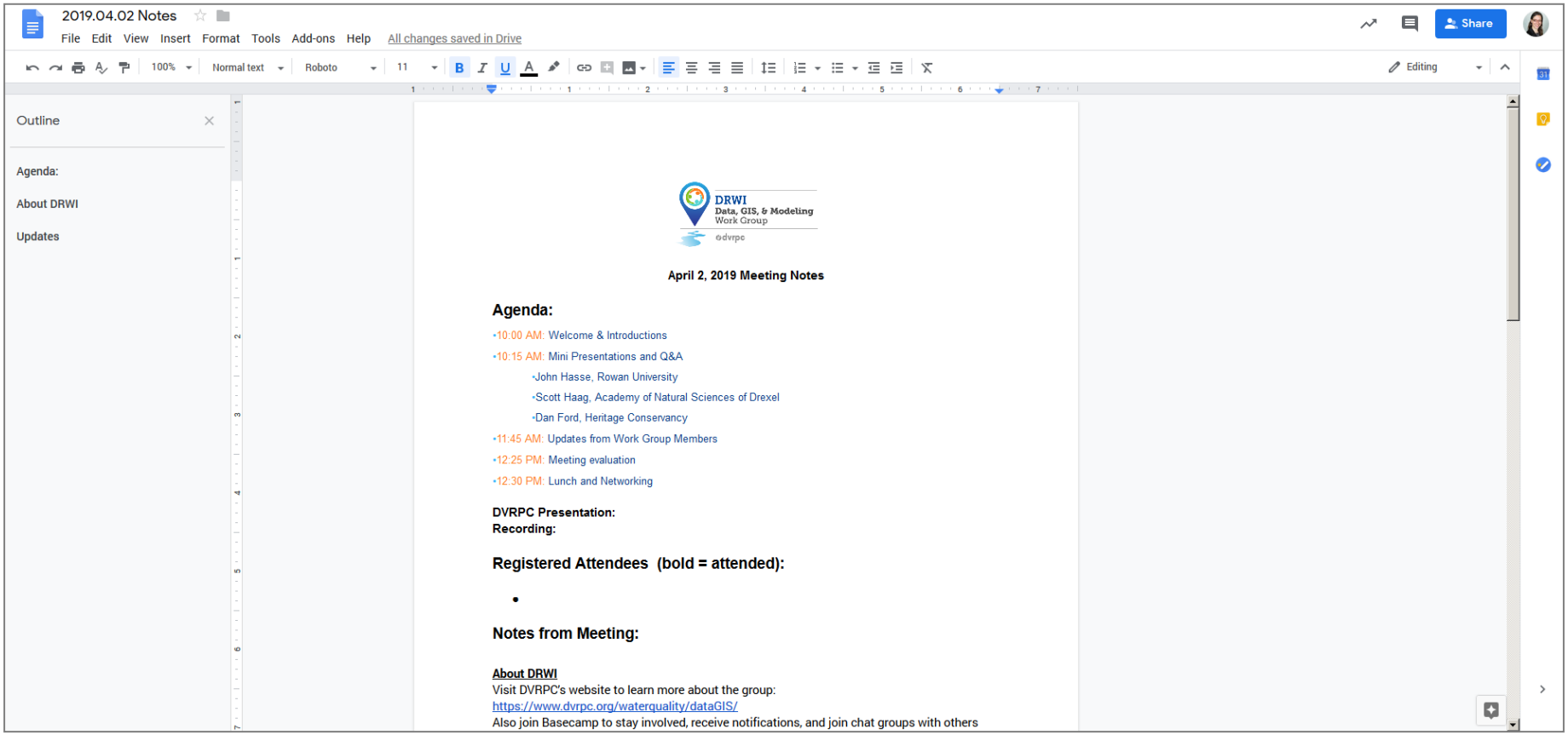
WiFi Password:
Connections2045

Agenda

- 10:00 AM: Welcome & Introductions
- 10:15 AM: Mini Presentations and Q&A
- 11:45 AM: Updates from Work Group Members
- 12:25 PM: Meeting evaluation
- 12:30 PM: Lunch and Networking

Help Us Take Notes Today

goo.gl/A27mmQ



Welcome & Introductions

What is the DRWI Data, GIS, and Modeling Work Group?

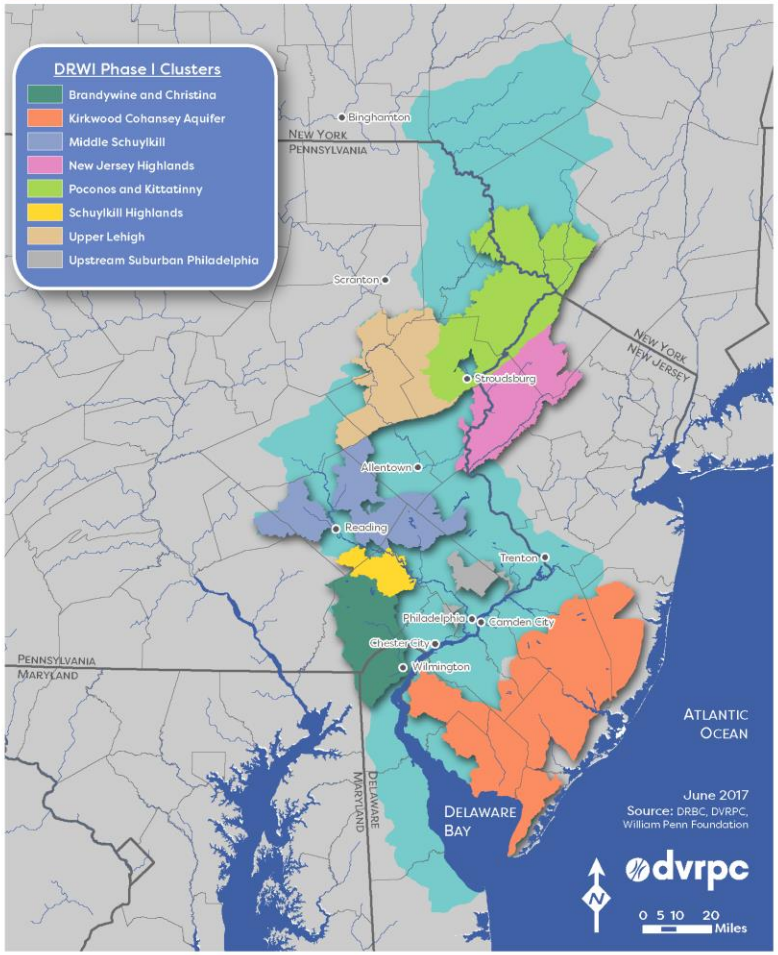
DRWI
DATA, GIS, & Modeling
Work Group

dvrpc

Delaware River Watershed Initiative (DRWI)

www.4states1source.org

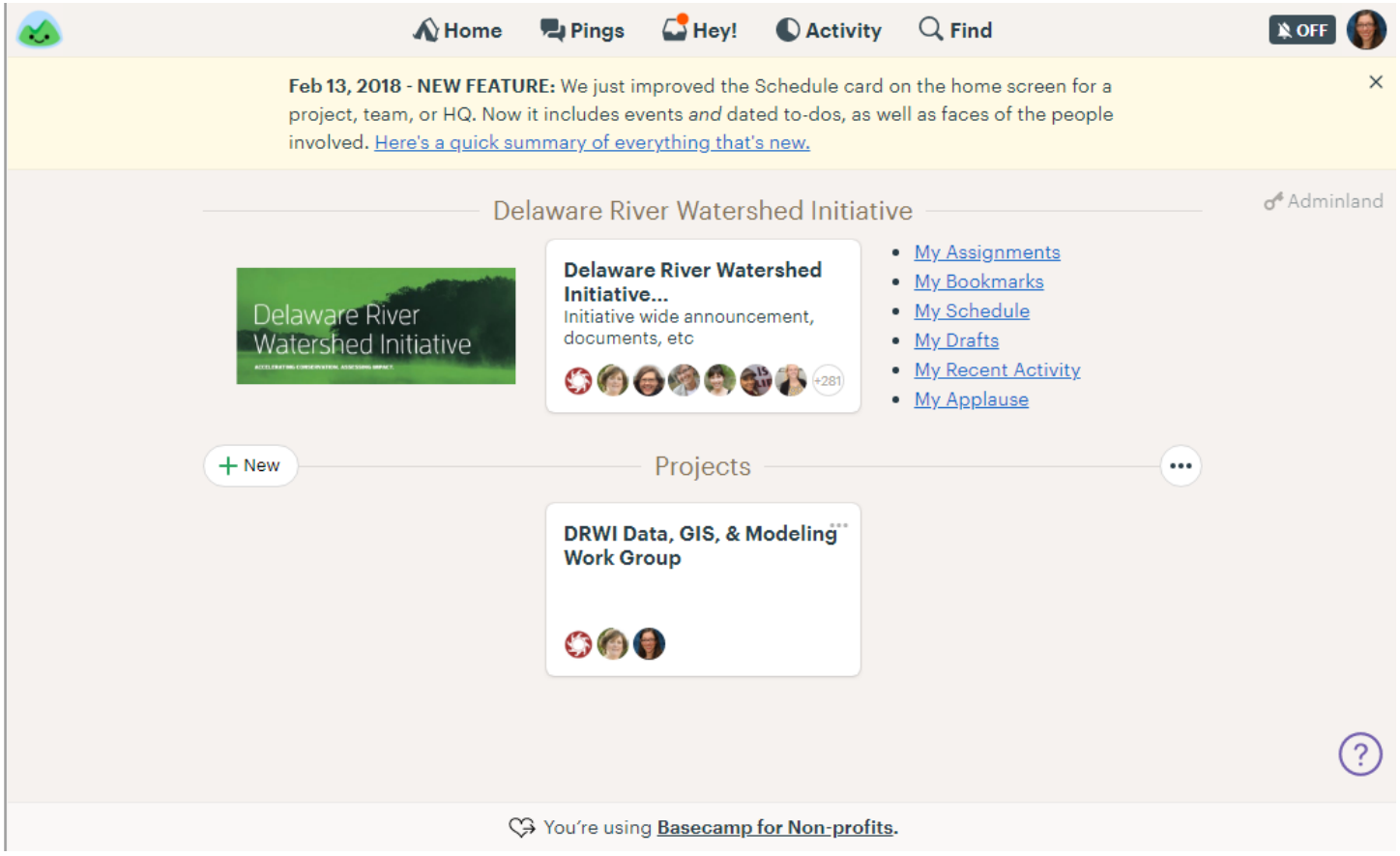
MAP: WILLIAM PENN FOUNDATION'S CLUSTERS



https://www.dvrpc.org/waterquality/DataGIS/

Basecamp

www.basecamp.com



Introductions

- Your Name
- Your Title
- Your Organization

Speaker Twitter Handles

- @AcadNatSci
- @RowanUniversity
- @shippensburgU
- @HConservancy
- @PaMAGIC
- @USGS
- @stroudcenter

- @DVRPC
- #4states1source

Scott Haag

The Academy of Natural Sciences of DREXEL UNIVERSITY

Scott Haag, MS
Section Leader
Environmental Data Science Section
Patrick Center for Environmental Research

The Academy of
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of DREXEL UNIVERSITY

- Models nutrient yields and concentrations through out the DRB
- Created with data from multiple sources
  - Mapshed developed by Dr. Barry Evans
  - NHDPlus
  - National Land Cover Database
  - NPDES point sources
- Models at reach-scale:
  - Mean annual loads & in-stream concentrations - TN, TP & TSS
  - Ability to Produce Clean and Abundant Water – score aggregating local landscape features

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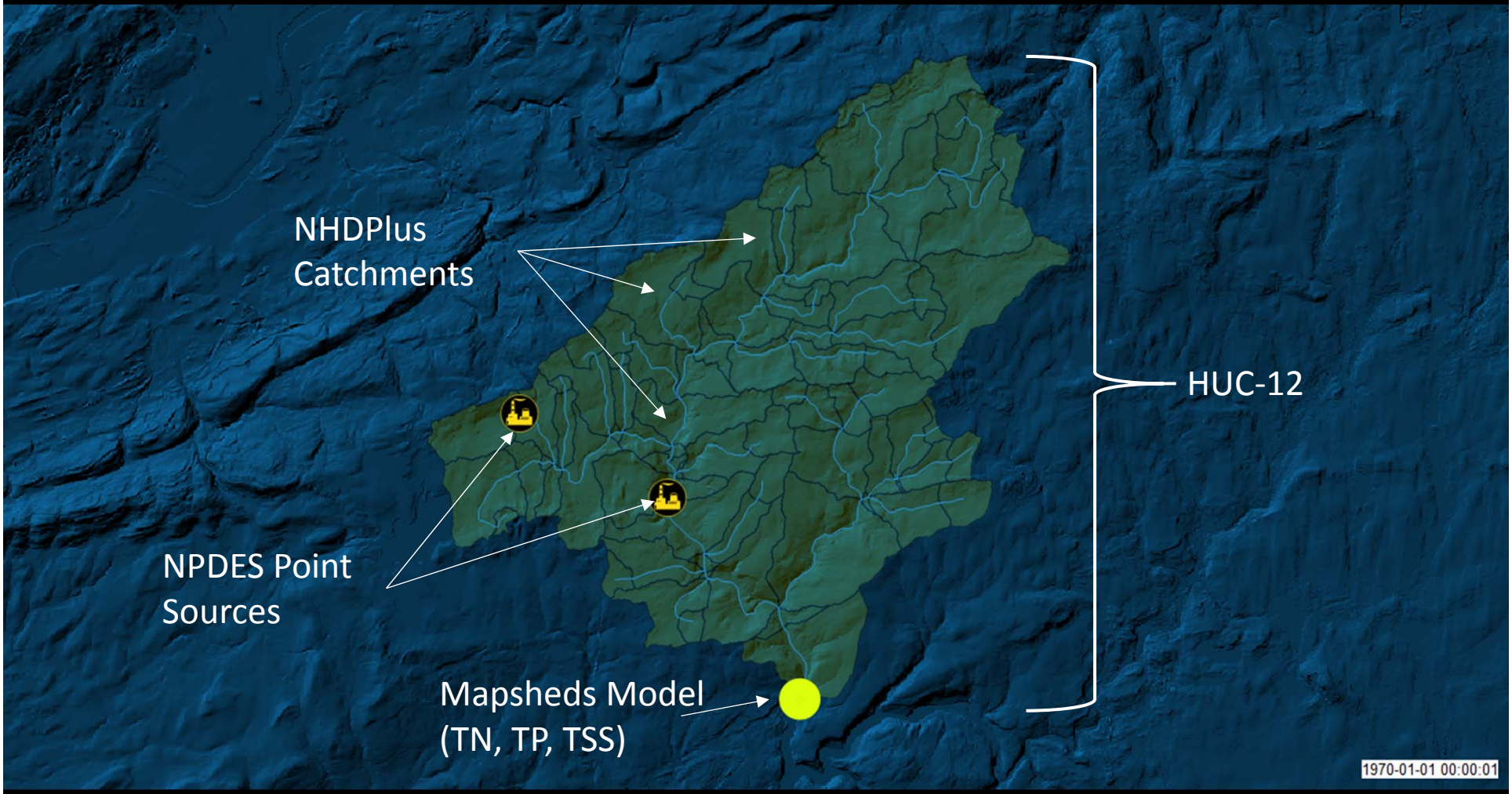
Stream Reach Assessment Tool



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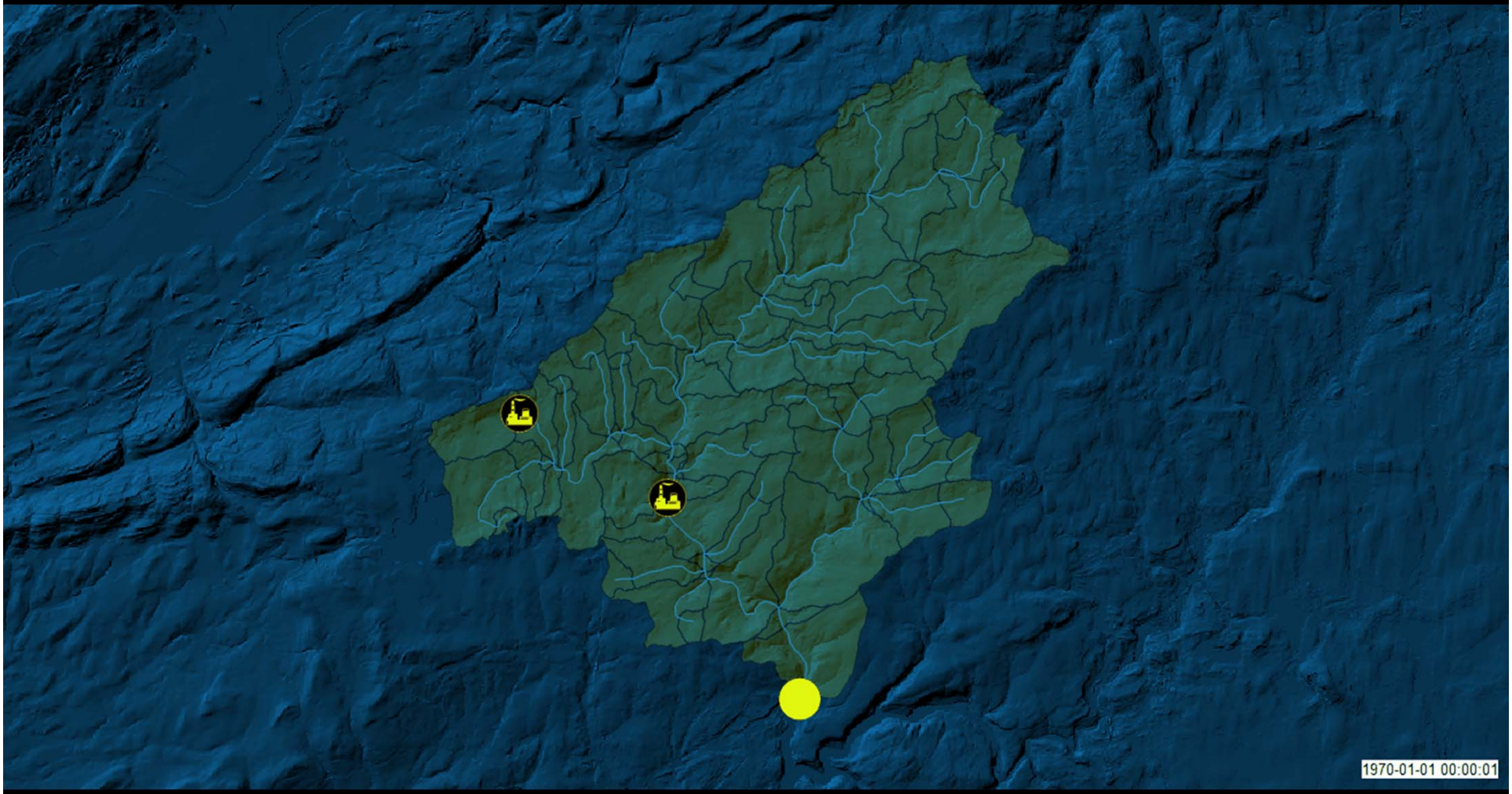
Stream Reach Assessment Tool



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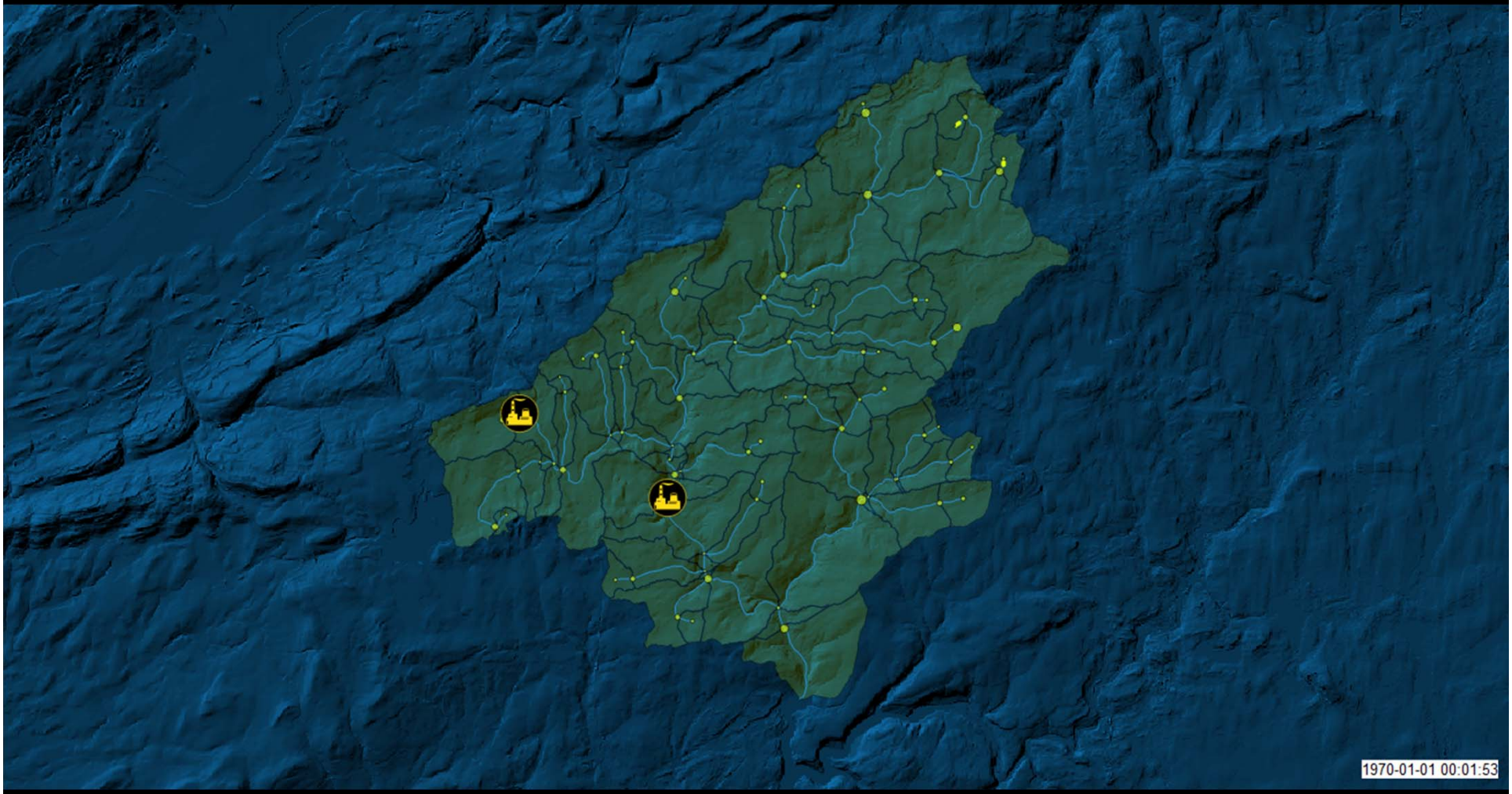

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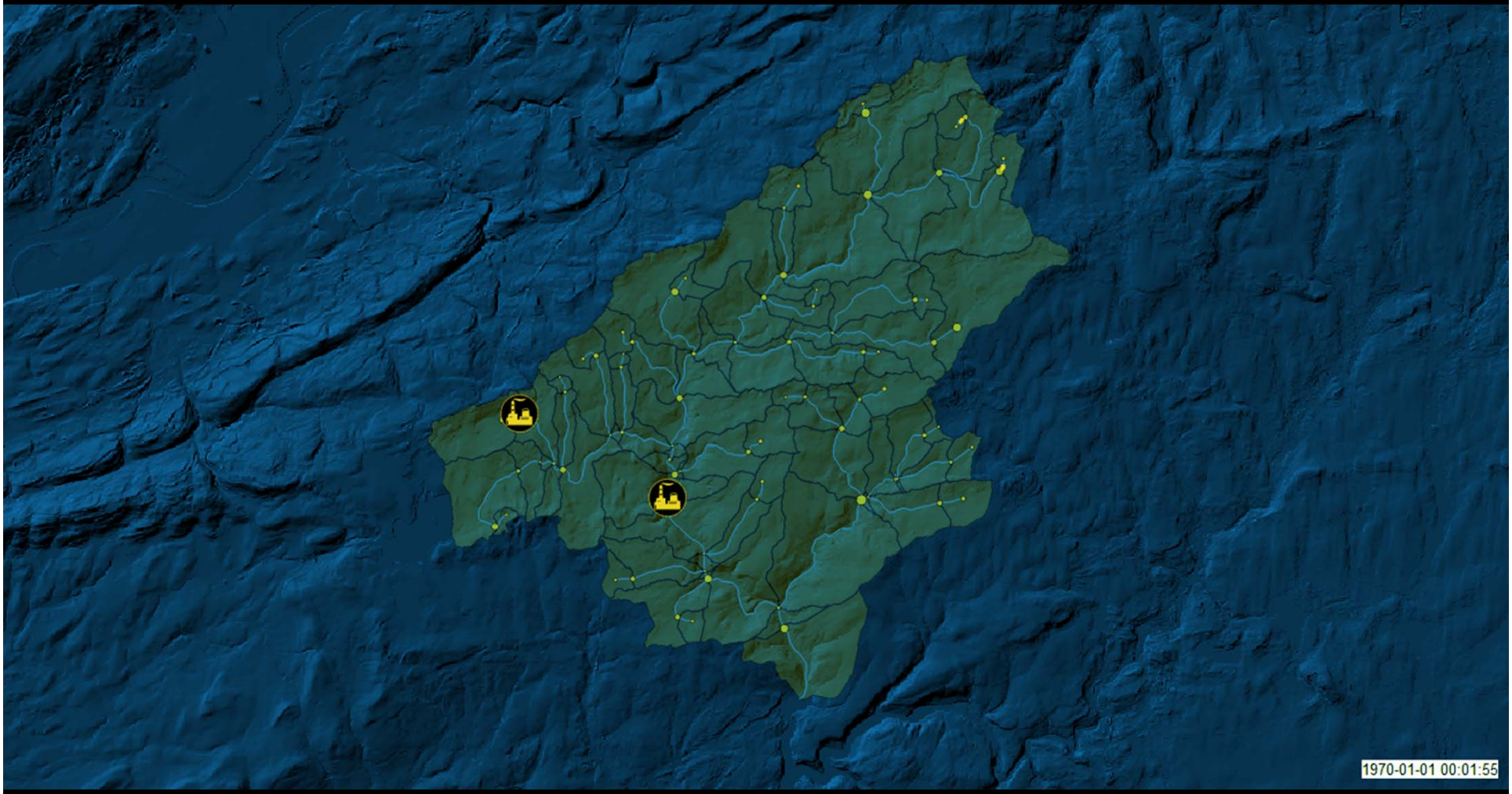

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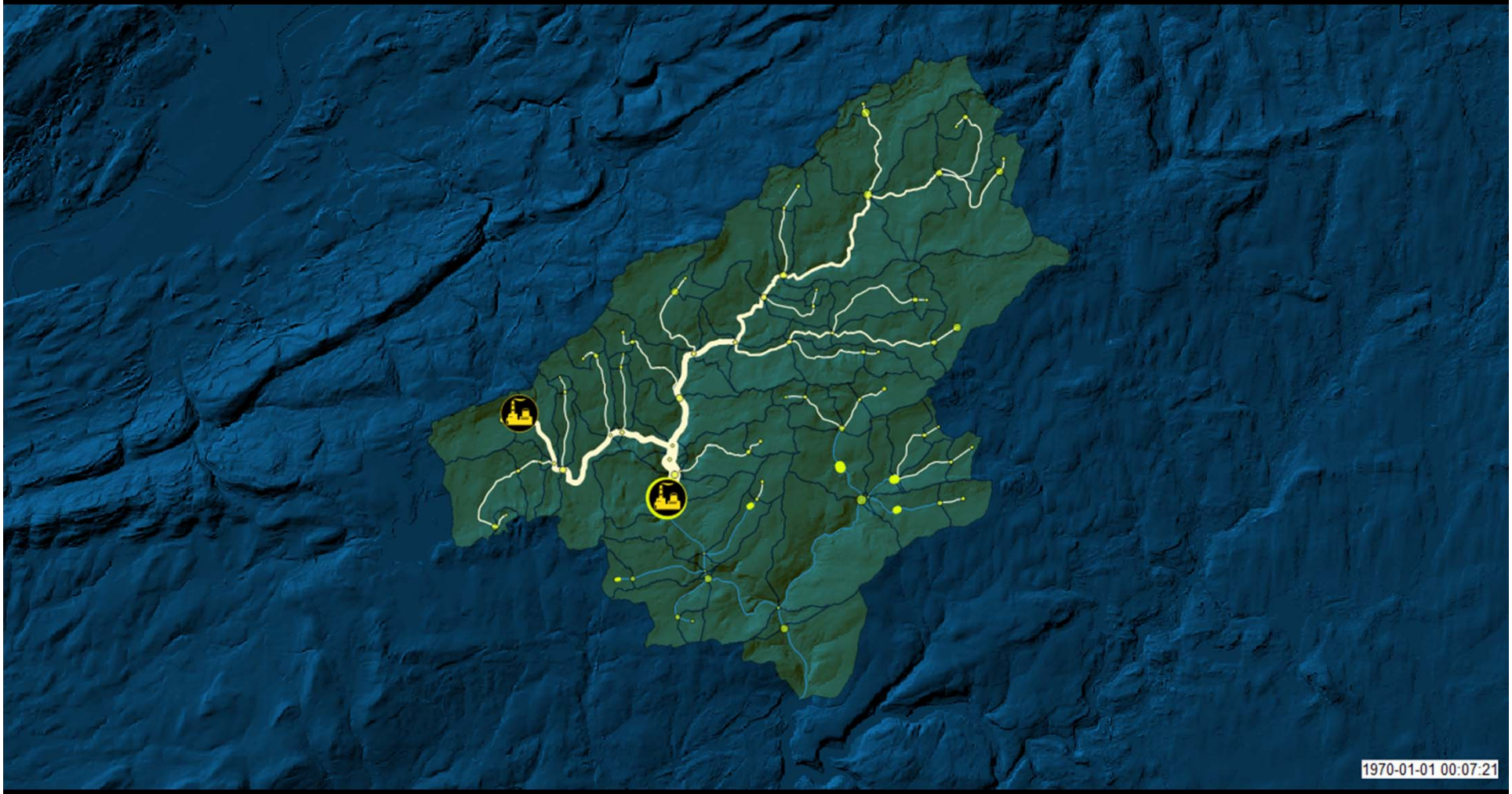

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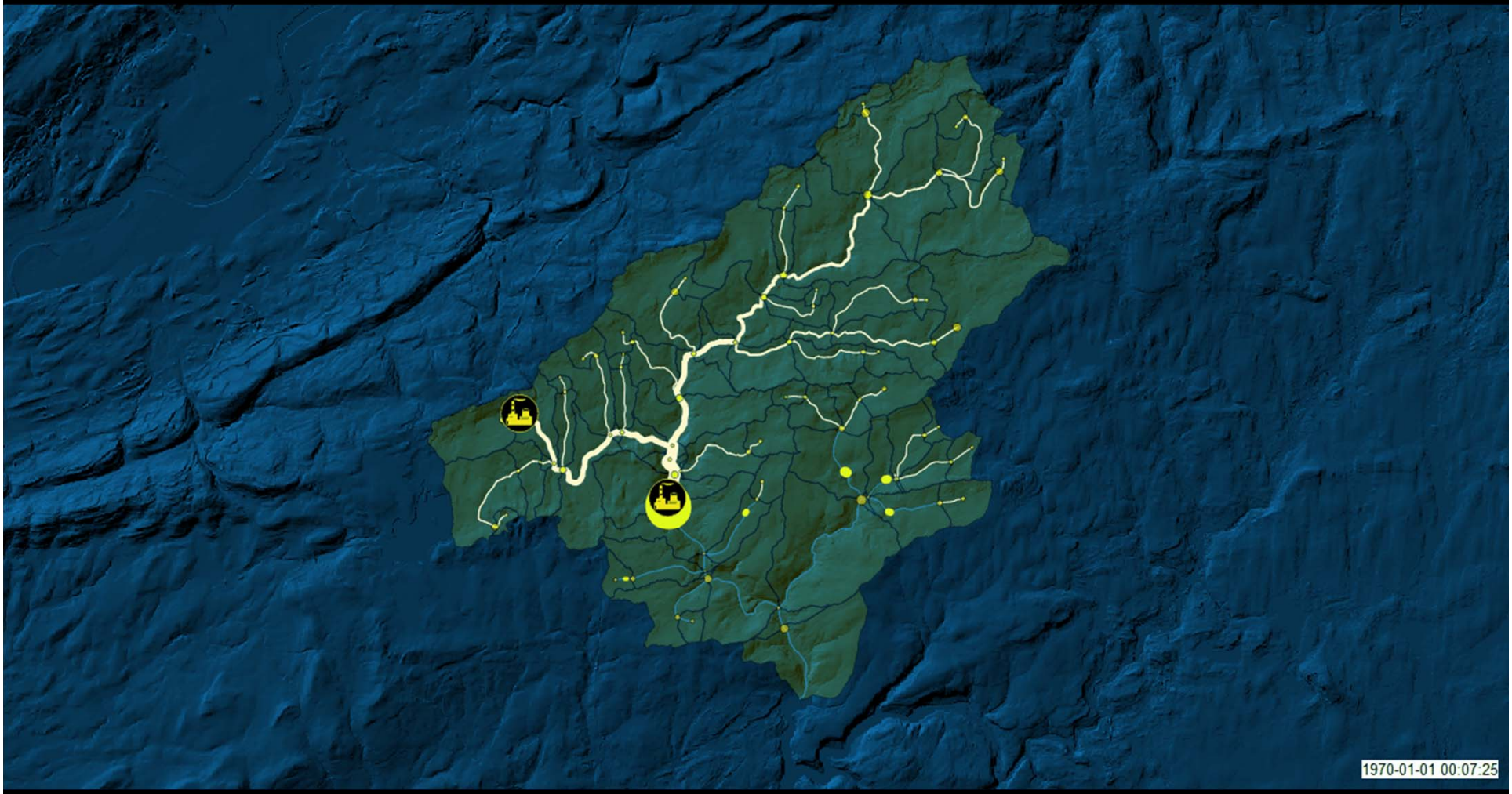

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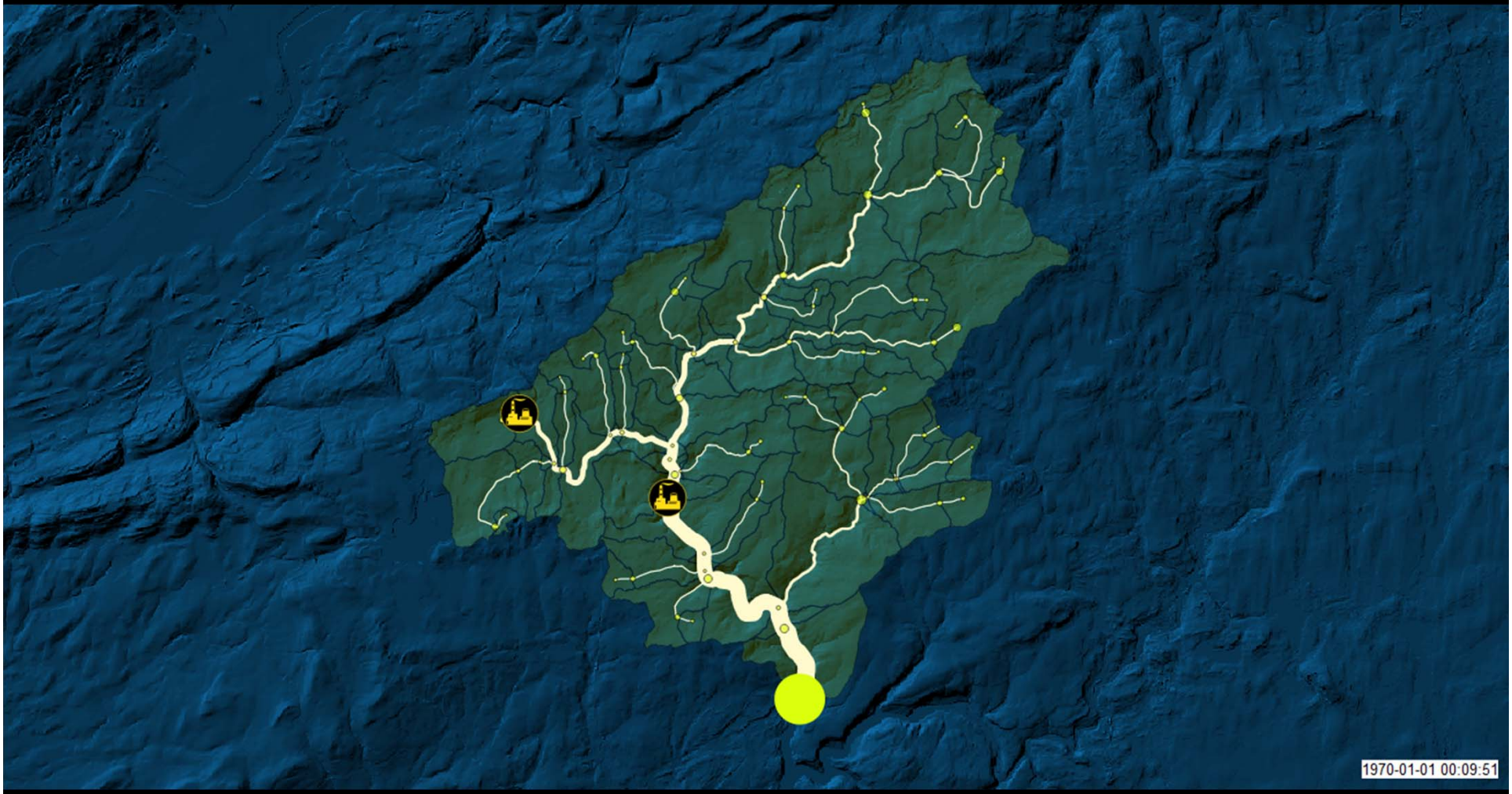

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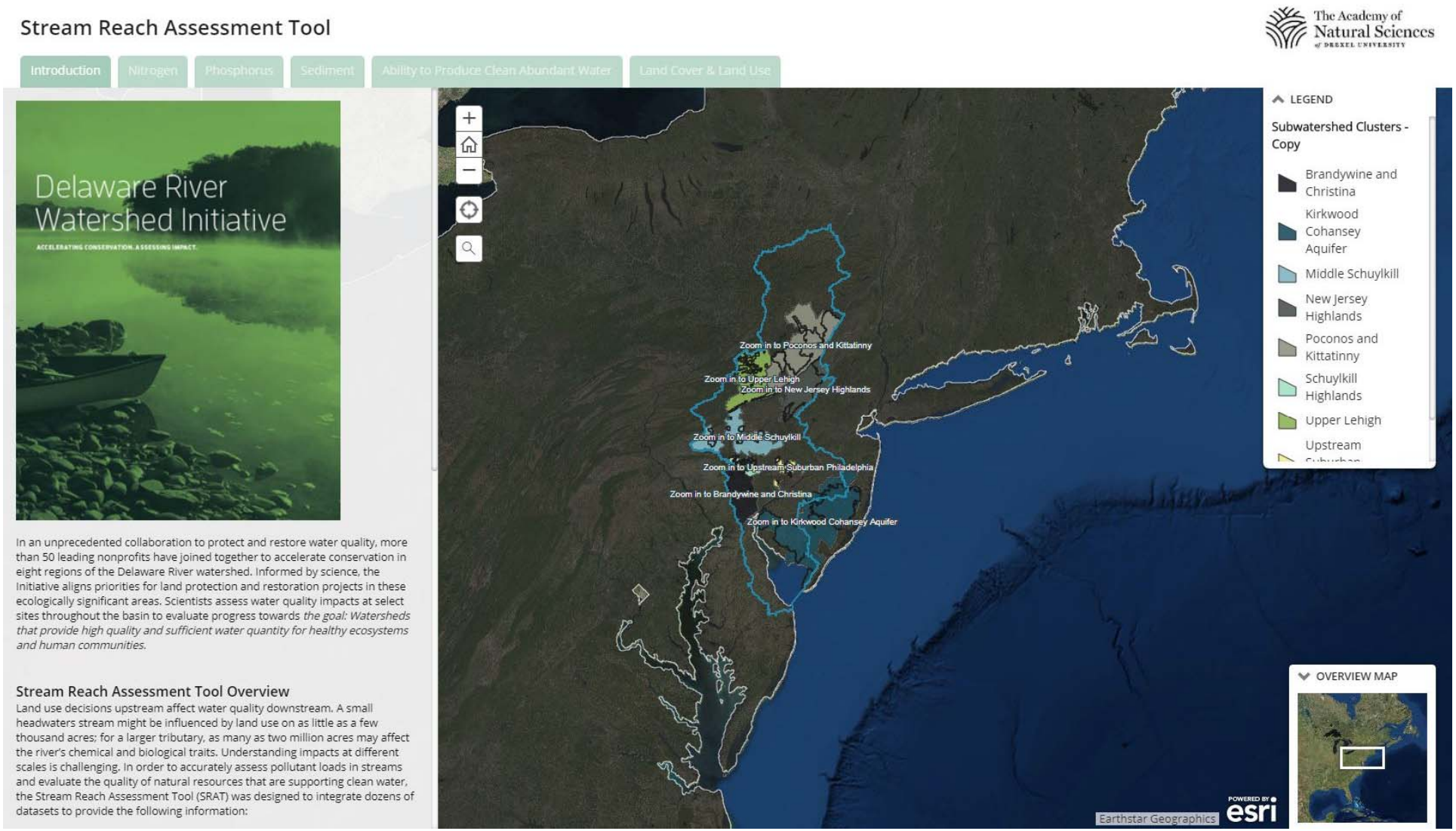
www.streamreachtools.org



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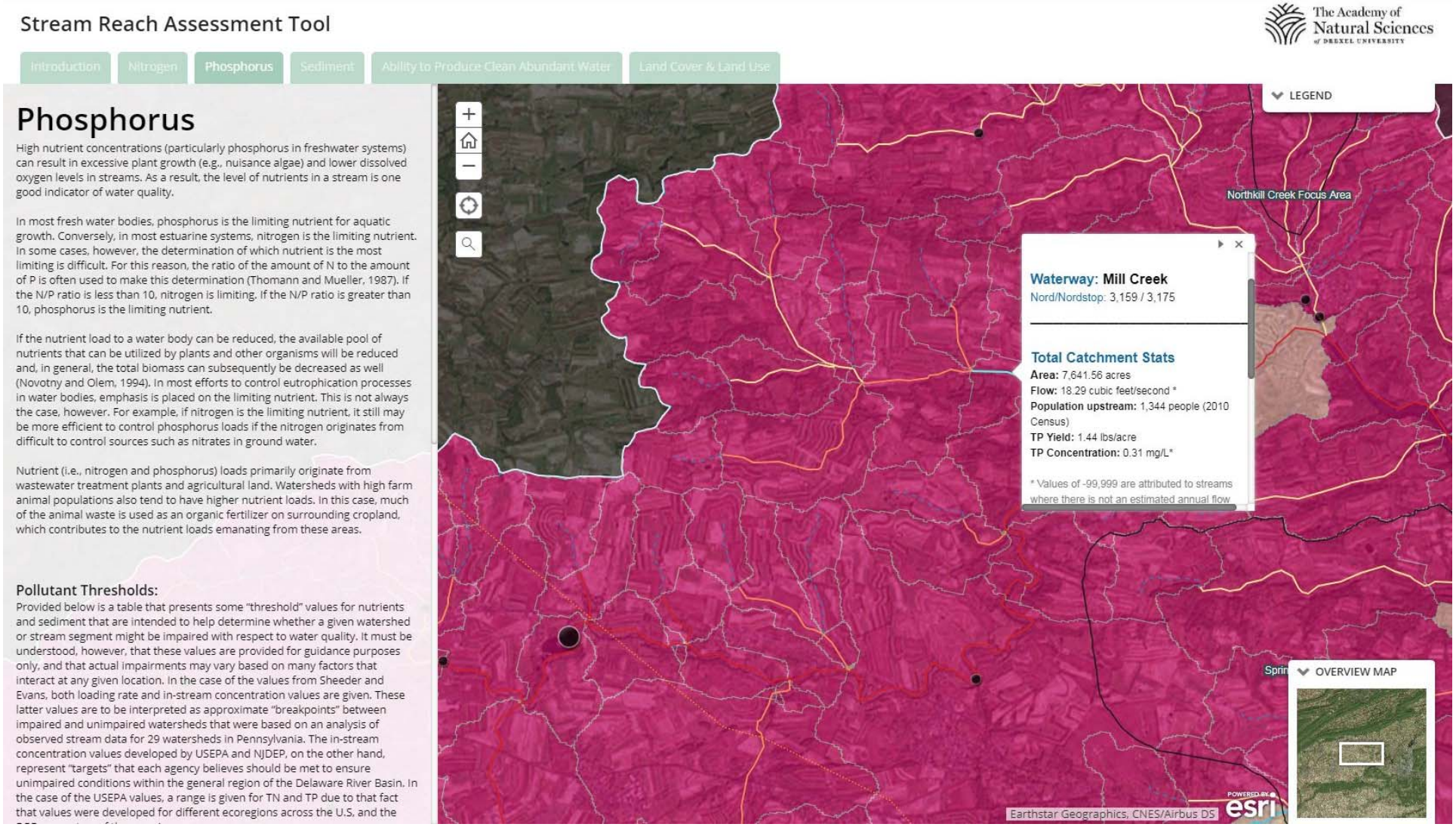


www.streamreachtools.org/

Stream Reach Assessment Tool

The Academy of Natural Sciences of Drexel University

Introduction | Nitrogen | Phosphorus | **Sediment** | Ability to Produce Clean Abundant Water | Land Cover & Land Use

represent "targets" that each agency believes should be met to ensure unimpaired conditions within the general region of the Delaware River Basin. In the case of the USEPA values, a range is given for TN and TP due to that fact that values were developed for different ecoregions across the U.S, and the DRB covers two of these regions.

From the table, it can be seen that a threshold value of 0.1 mg/l seems appropriate for TP. Although the values range considerably for TN, it should be noted, as described earlier, that the value for TP is usually more important due to the fact that it is the limiting nutrient for most streams in the Delaware River Basin. In the case of TSS, NJDEP has set different threshold values for TSS depending upon whether the streams do or do not support trout.

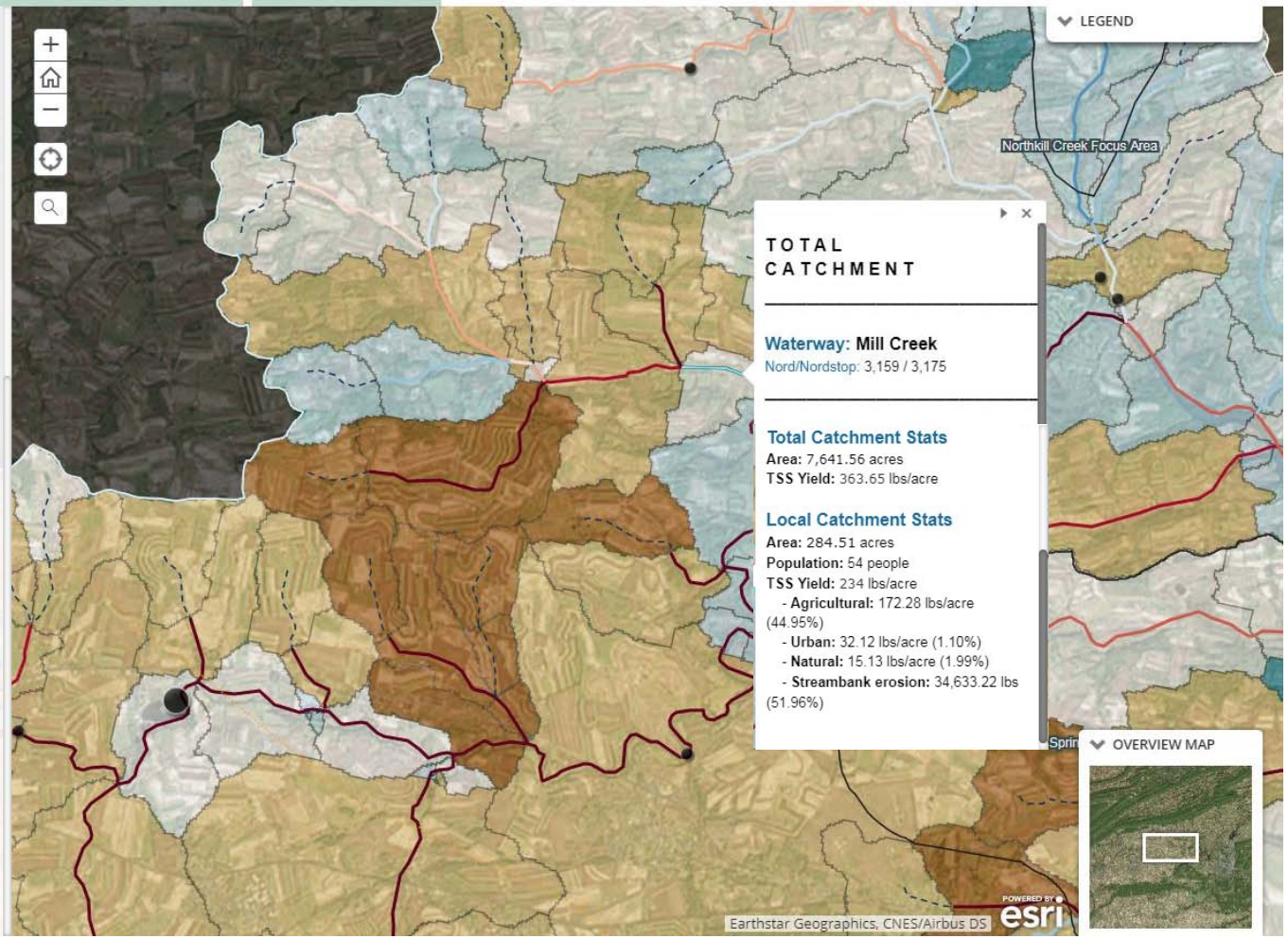
Yields and Concentration Thresholds:

	TN	TP	TSS
Sheeder and Evans	13.0 kg/ha (14.6 lb/ac)	0.30 kg/ha (0.34 lb/ac)	785 kg/ha (882 lb/ac)
Sheeder and Evans	3.0 mg/L	0.07 mg/L	197 mg/L
USEPA	0.07-1.0 mg/L	0.006 - 0.1 mg/L	---
NJDEP	10.0 mg/L	0.1 mg/L	25 - 40 mg/L (trout vs. non trout)

*Note the actual nitrogen values given in Sheeder and Evans are for inorganic N only, and are lower than those shown in the table above. The ones shown above have been adjusted upwards to account for organic N as well. Also note that the TN values for NJDEP are for nitrate-N only. In this case, the value appears to be based on the national 10 mg/l drinking water standard rather than ecological or nutrient enrichment factors.

Sources:

Sheeder, S.A., Evans, B.M., 2004. Estimating nutrient and sediment threshold criteria for biological impairment in Pennsylvania watersheds. J. Am.Water Res. Assoc. 40, 881–888.



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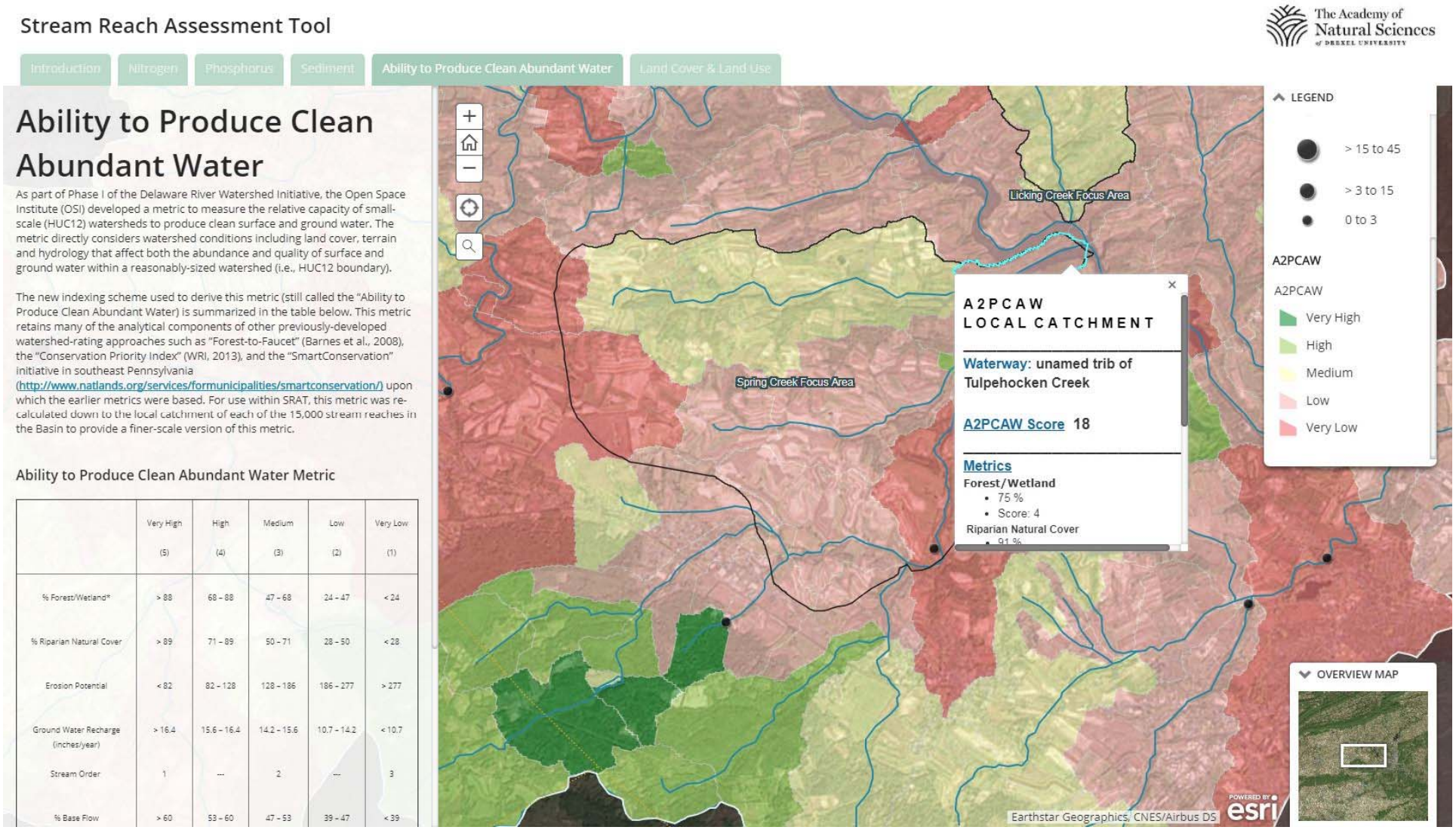
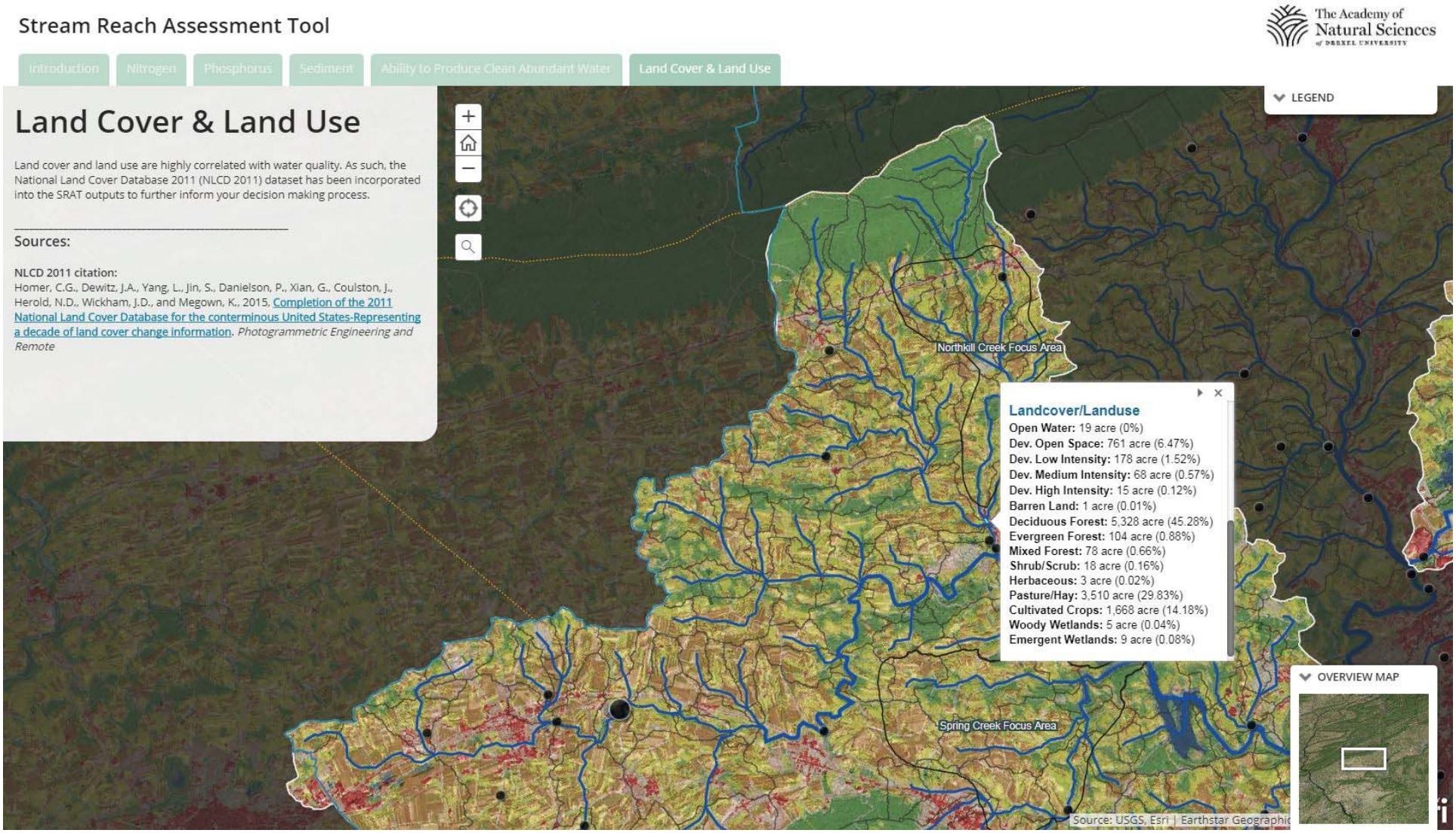


	Very High (5)	High (4)	Medium (3)	Low (2)	Very Low (1)
% Forest/Wetland*	> 88	68 – 88	47 – 68	24 – 47	< 24
% Riparian Natural Cover	> 89	71 – 89	50 – 71	28 – 50	< 28
Erosion Potential	< 82	82 – 128	128 – 186	186 – 277	> 277
Ground Water Recharge (inches/year)	> 16.4	15.6 – 16.4	14.2 – 15.6	10.7 – 14.2	< 10.7
Stream Order	1	---	2	---	3
% Base Flow	> 60	53 – 60	47 – 53	39 – 47	< 39

www.streamreachtools.org



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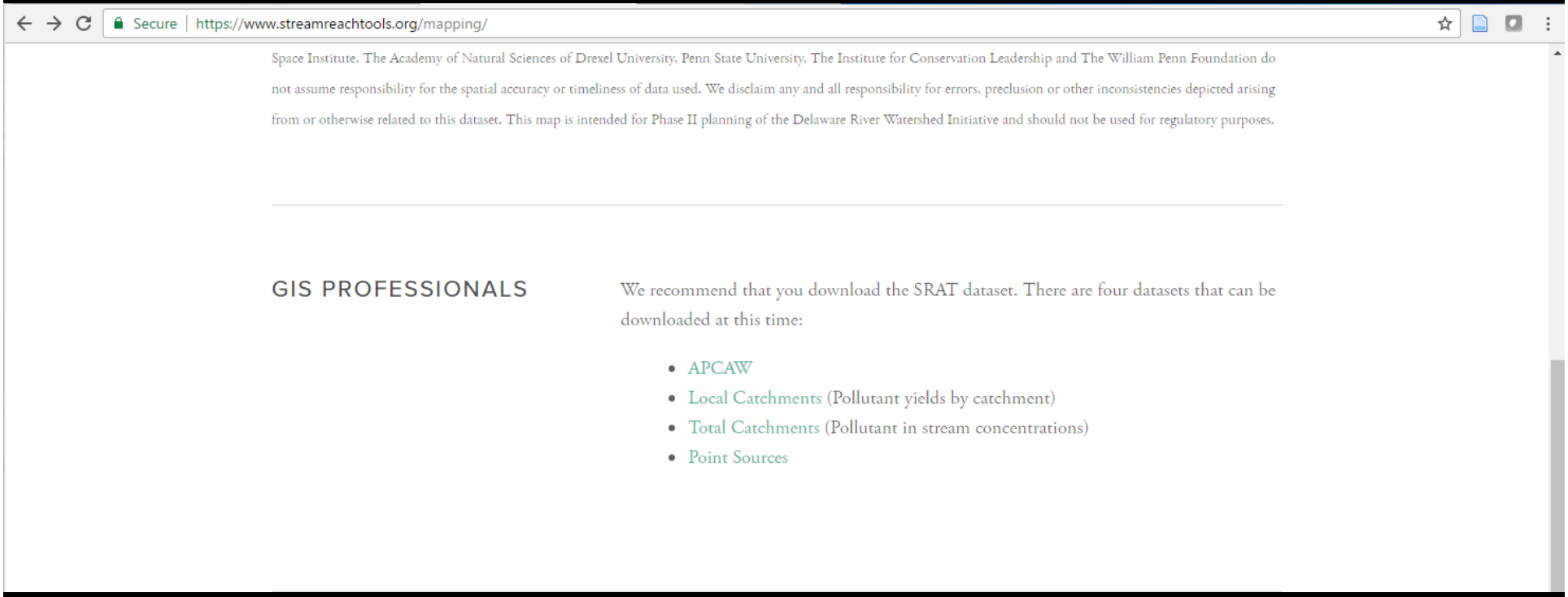

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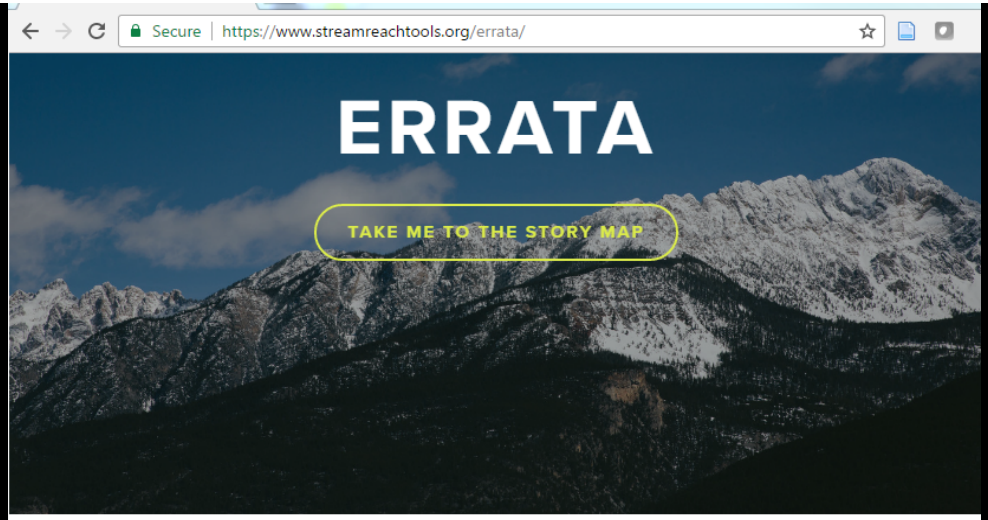


February 21, 2017

Errata #2
Updates by Cluster

KIRKWOOD COHANSEY AQUIFER

ADDITIONS:

- We have added Total and Local Catchment data to the SRAT Story Map with a build-out of this data within the Nitrogen, Phosphorus, Sediment and Land Cover & Land Use tabs.

NEW JERSEY HIGHLANDS

MODIFICATIONS:

- Permitnum: NJ0024716 - PHILLIPSBURG TOWN STP - Facility with outfall on Lopatcong Creek moved to Delaware River.
- All non-sewage treatment plants point sources had there TN and TP concentrations adjusted in the New Jersey Highlands. The default/proxy values previously used were changed to the average TN (7.175 mg/l) and TP (1.259 mg/l) concentrations across the basin for non-sewage treatment plants. This modification was made by the request of New Jersey Highland cluster representatives.

Claire Jantz

Center for Land Use and Sustainability
SHIPPENSBURG UNIVERSITY

Data sets and tools from Shippensburg University

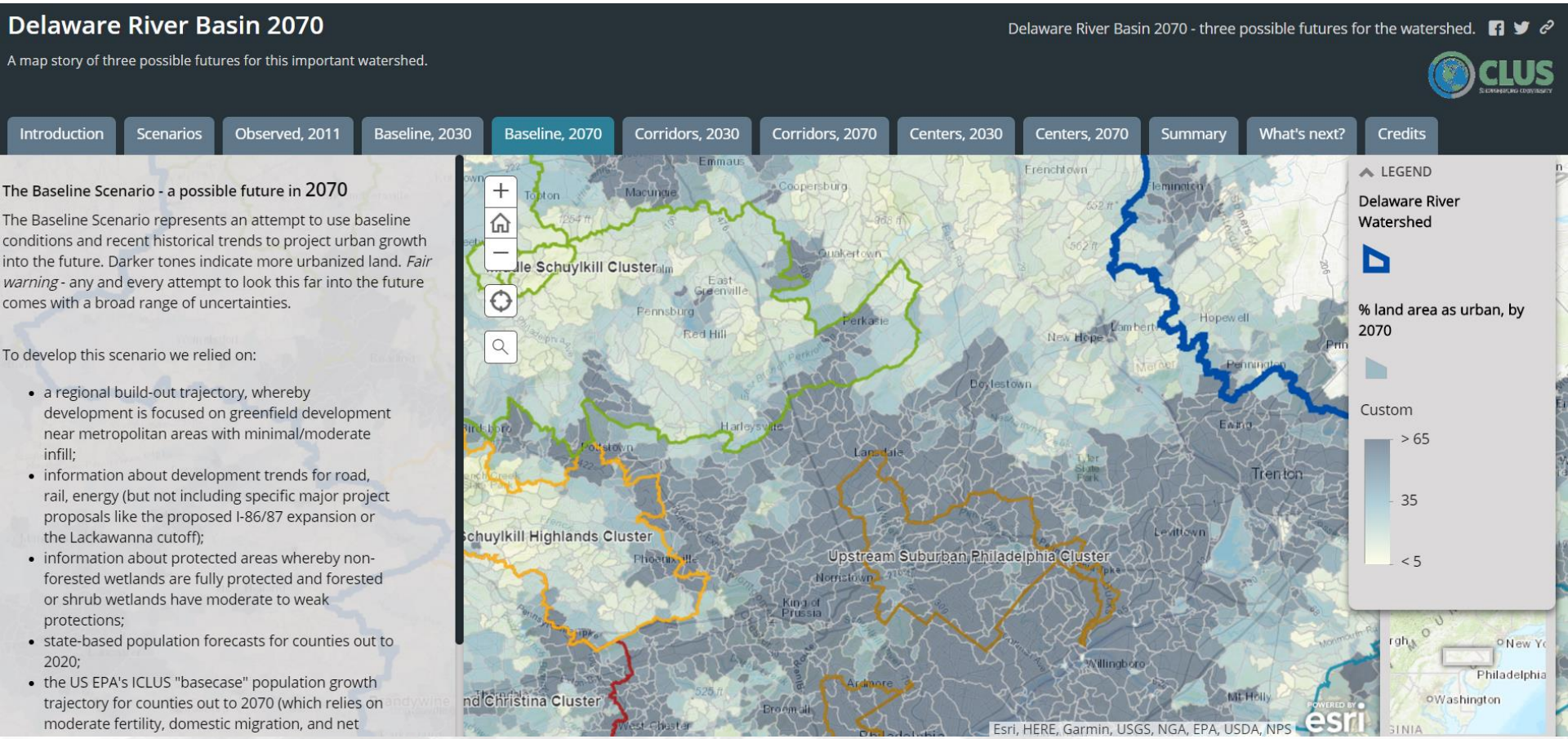
Dr. Claire Jantz

cajant@ship.edu

Center for Land Use and Sustainability
SHIPPENSBURG UNIVERSITY

https://drbproject.org/
https://centerforlanduse.org/

DRB 2070: https://drbproject.org/products/



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Coming soon: DRB 2100

Two scenarios of the future

CORRIDORS

CENTERS

Center for Land Use and Sustainability
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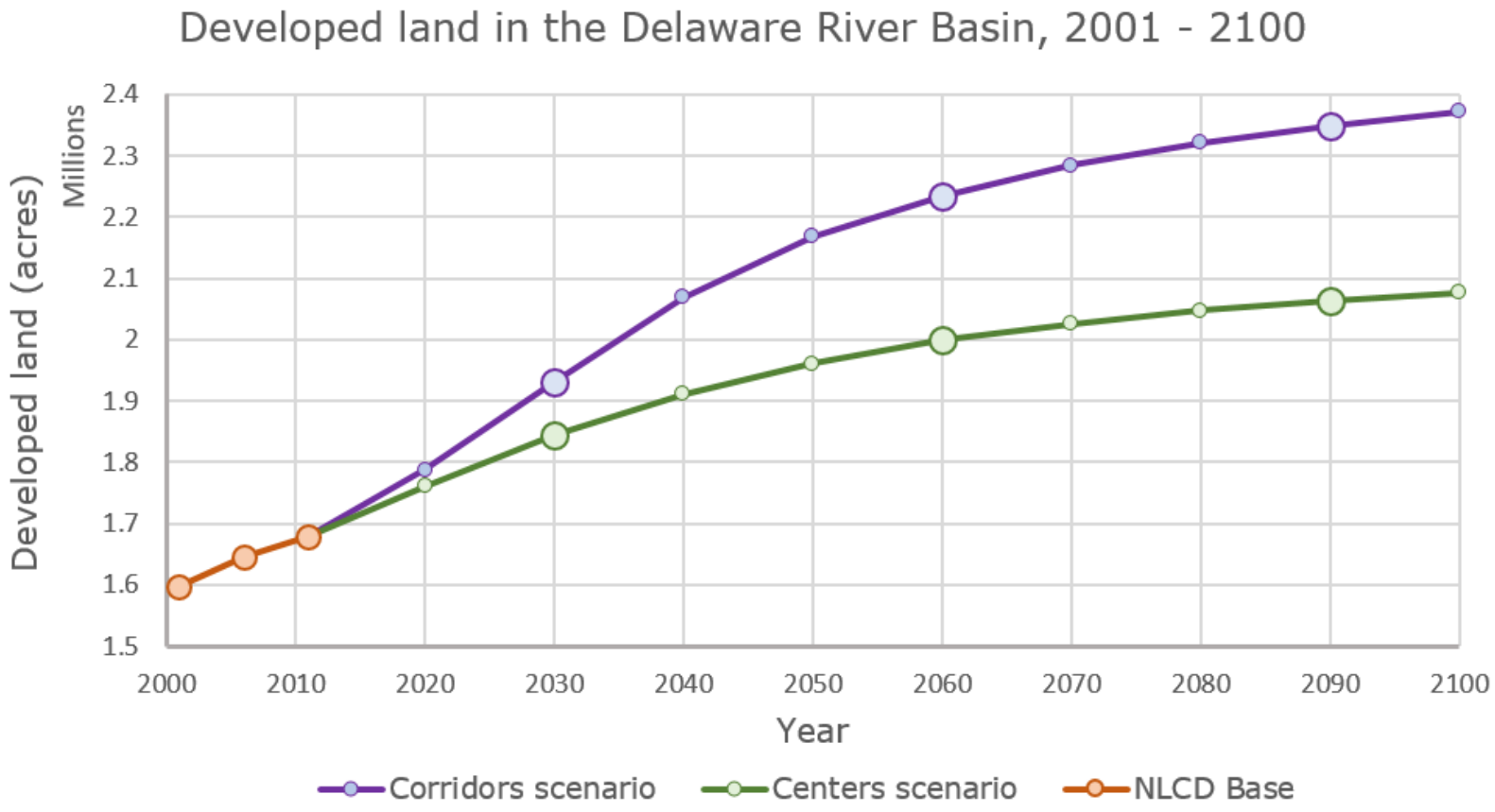
Basin-wide projected growth



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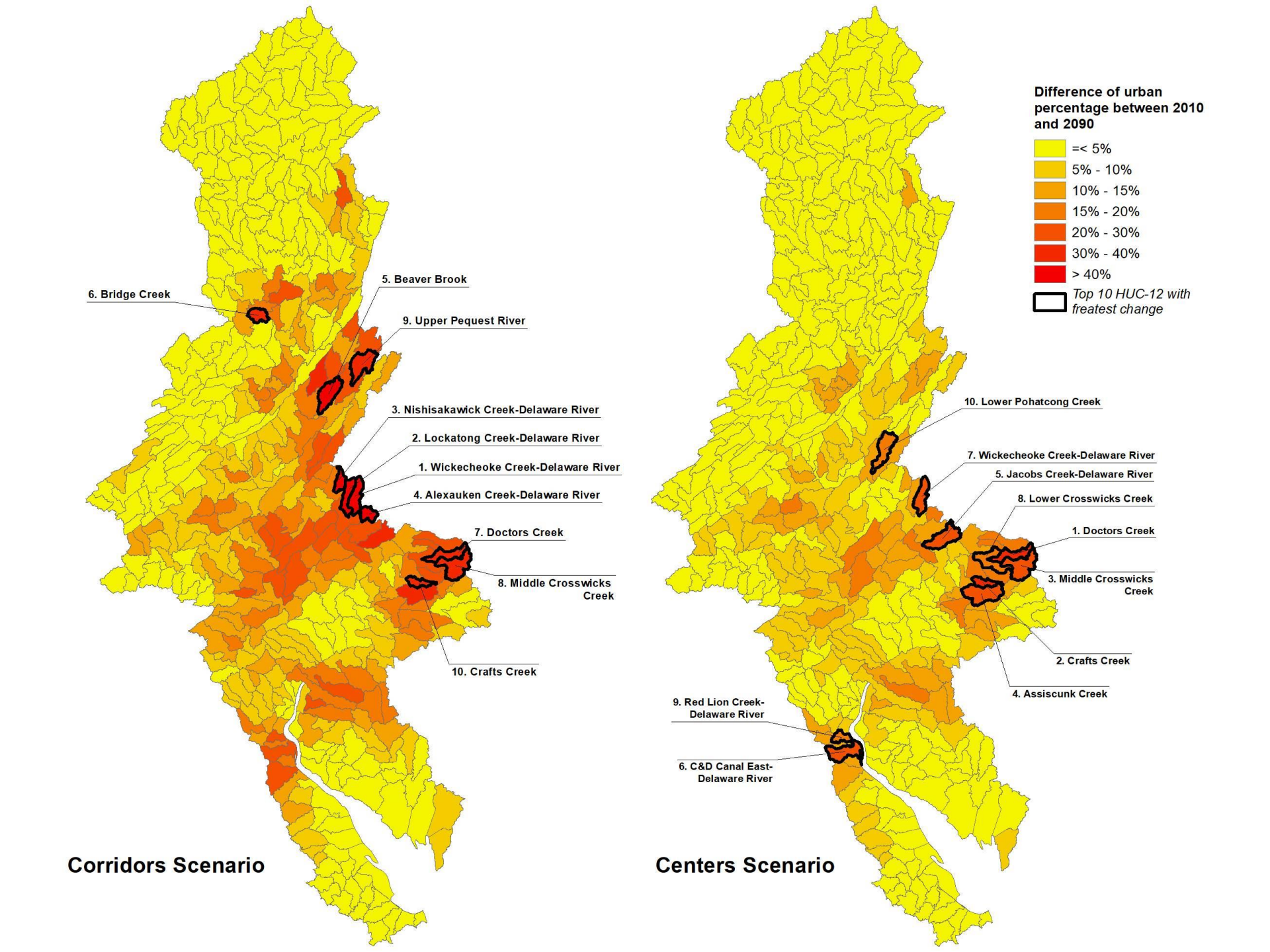
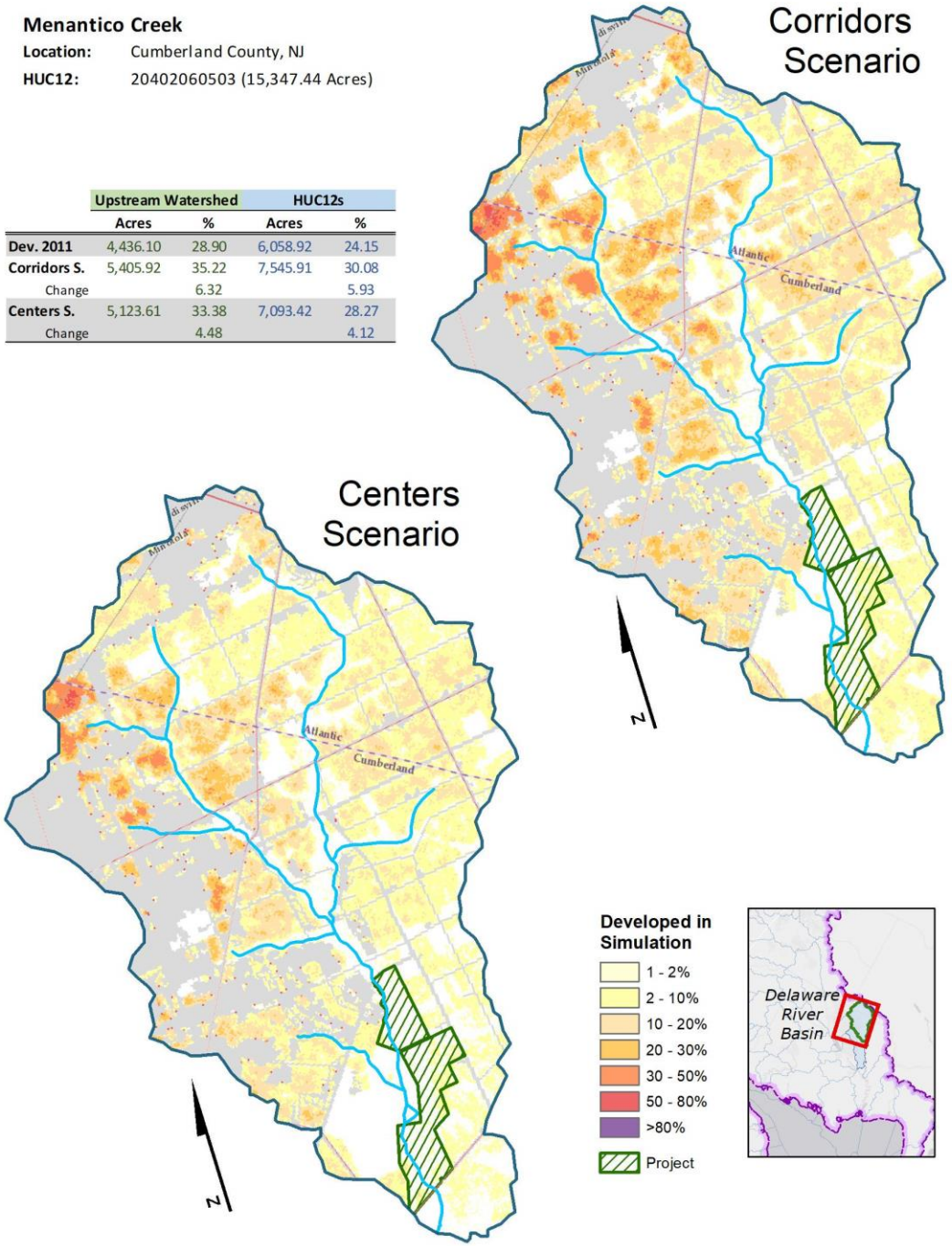

Difference of urban percentage between 2010 and 2090
=< 5%
5% - 10%
10% - 15%
15% - 20%
20% - 30%
30% - 40%
> 40%
Top 10 HUC-12 with freatest change
6. Bridge Creek
5. Beaver Brook
9. Upper Pequest River
3. Nishisakawick Creek-Delaware River
2. Lockatong Creek-Delaware River
1. Wickecheoke Creek-Delaware River
4. Alexauken Creek-Delaware River
7. Doctors Creek
8. Middle Crosswicks Creek
10. Crafts Creek
Corridors Scenario
10. Lower Pohatcong Creek
7. Wickecheoke Creek-Delaware River
5. Jacobs Creek-Delaware River
8. Lower Crosswicks Creek
1. Doctors Creek
3. Middle Crosswicks Creek
2. Crafts Creek
4. Assiscunk Creek
9. Red Lion Creek-Delaware River
6. C&D Canal East-Delaware River
Centers Scenario

Menantico Creek

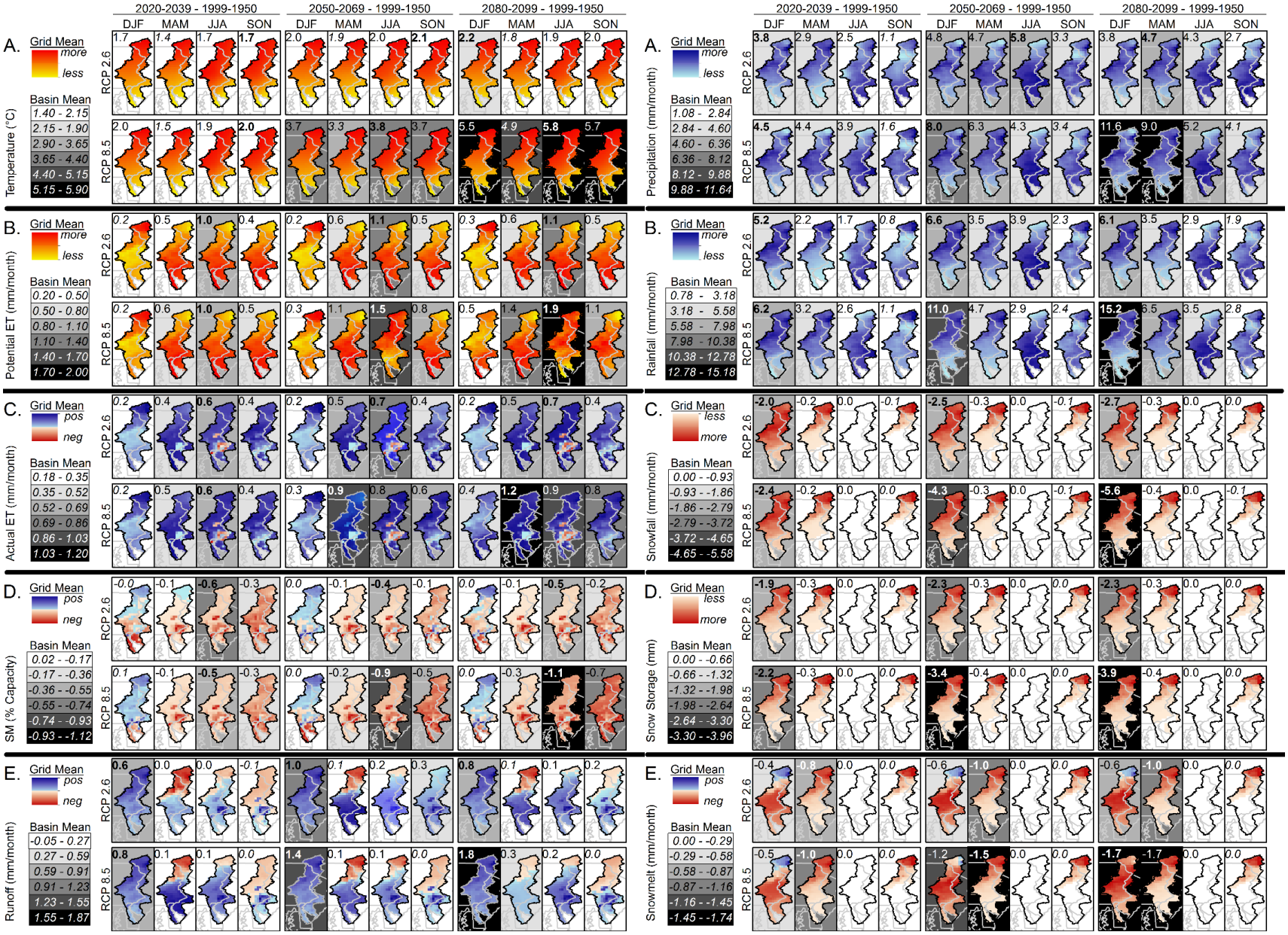
Location: Cumberland County, NJ

HUC12: 20402060503 (15,347.44 Acres)

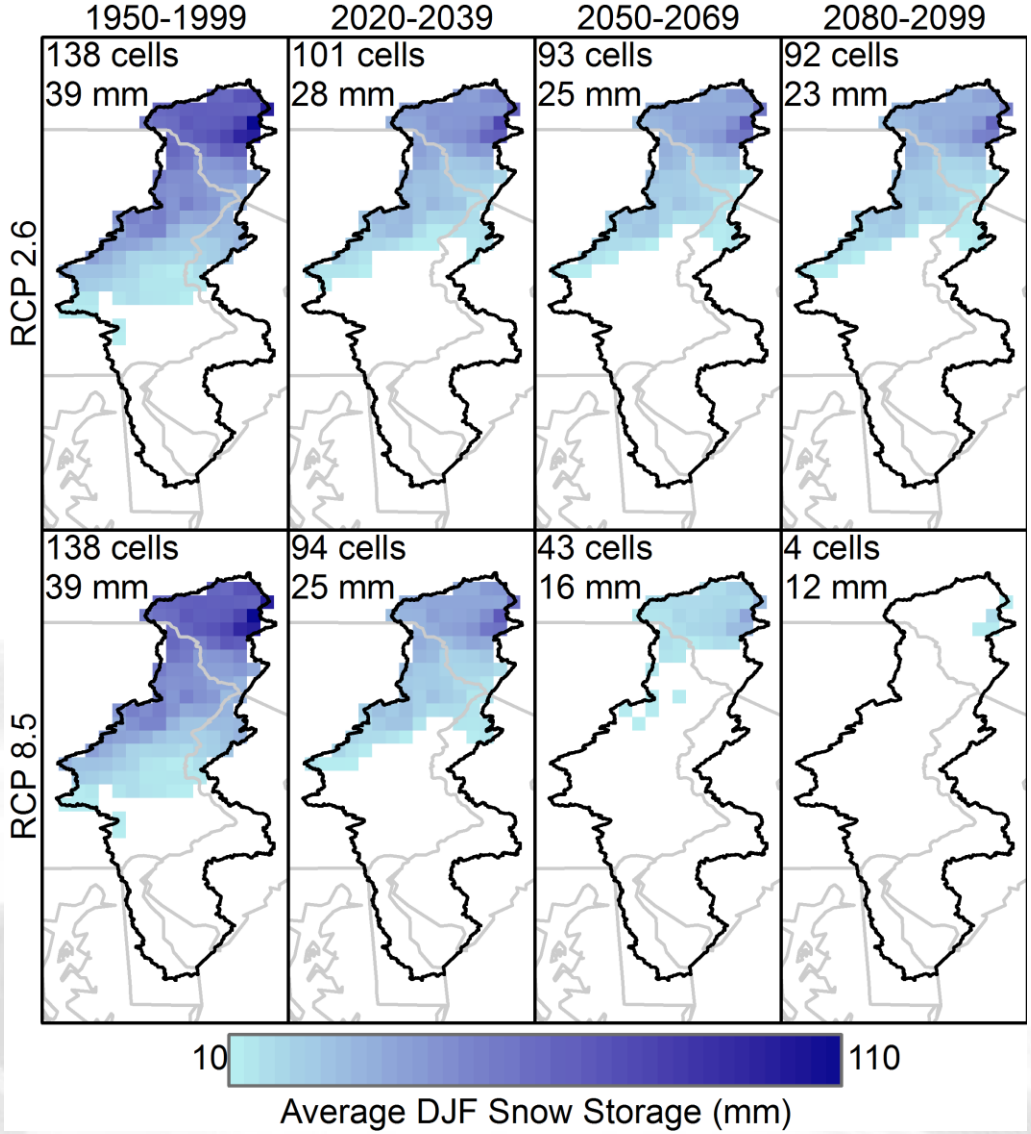
	Upstream Watershed		HUC12s	
	Acres	%	Acres	%
Dev. 2011	4,436.10	28.90	6,058.92	24.15
Corridors S.	5,405.92	35.22	7,545.91	30.08
Change		6.32		5.93
Centers S.	5,123.61	33.38	7,093.42	28.27
Change		4.48		4.12



Future Hydroclimatology



Modeled DJF Snow Cover > 10 mm



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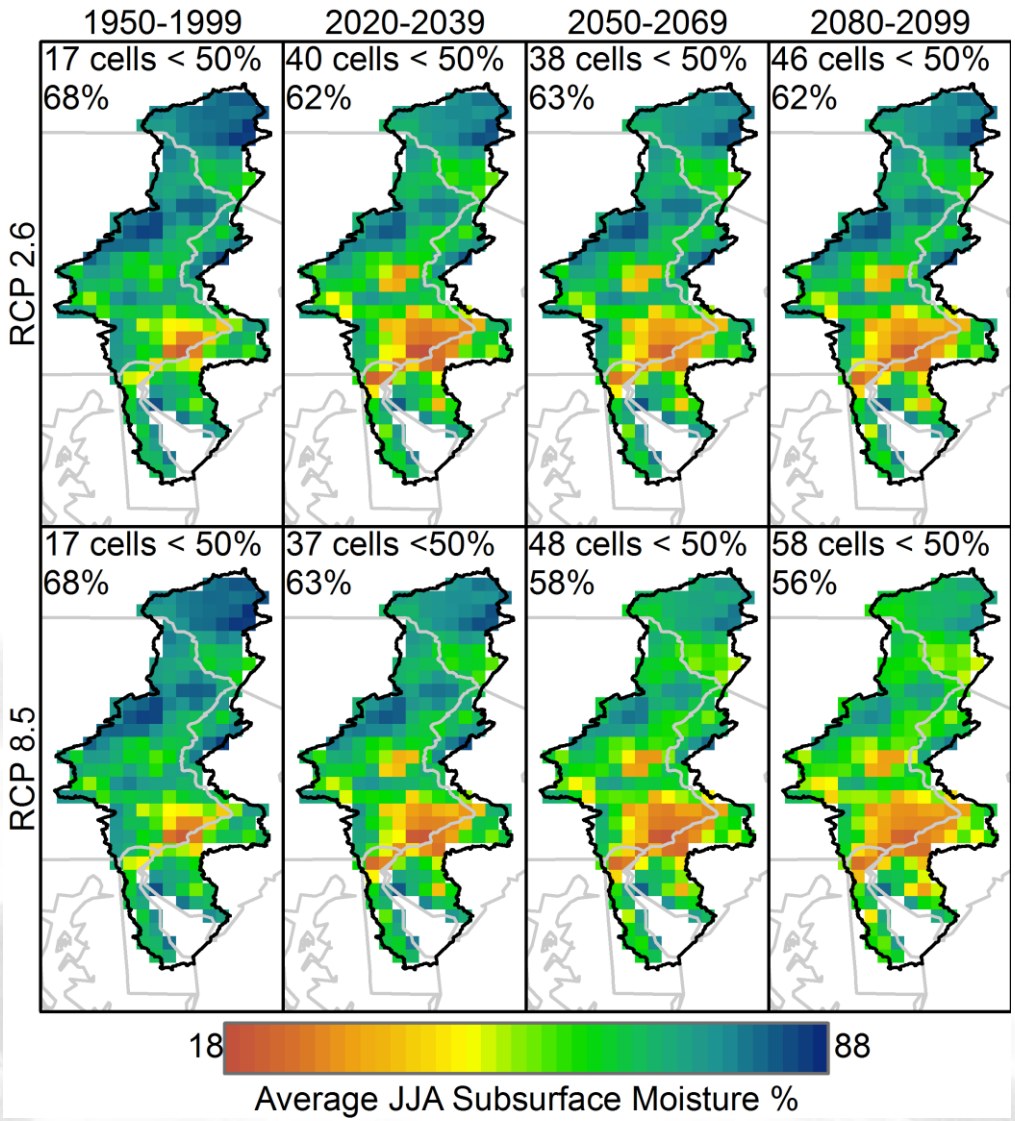
Modeled JJA Subsurface Moisture



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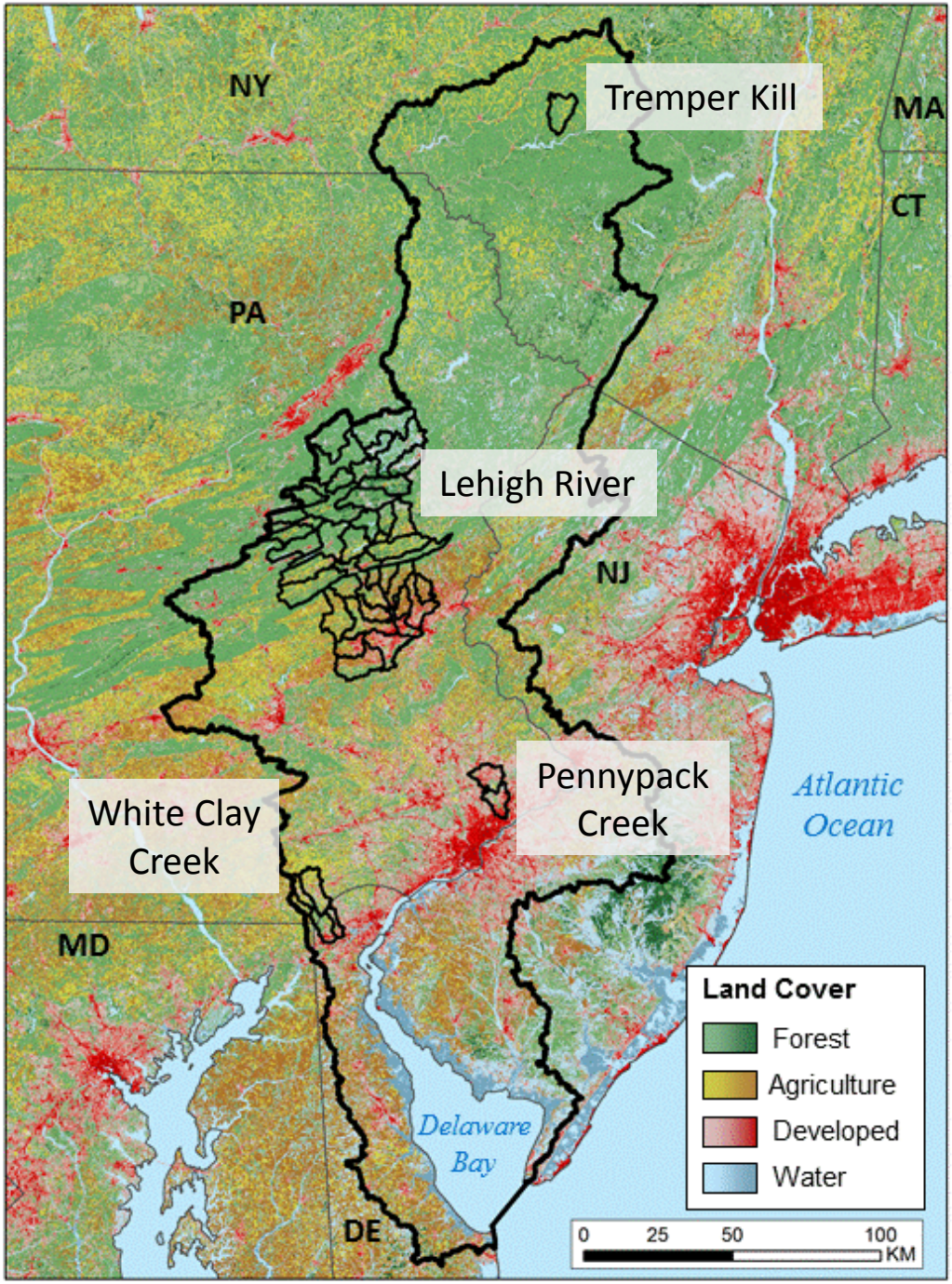
Impact of Changing Climate and Land Cover on Floods: Delaware River Basin

Case Study Watersheds

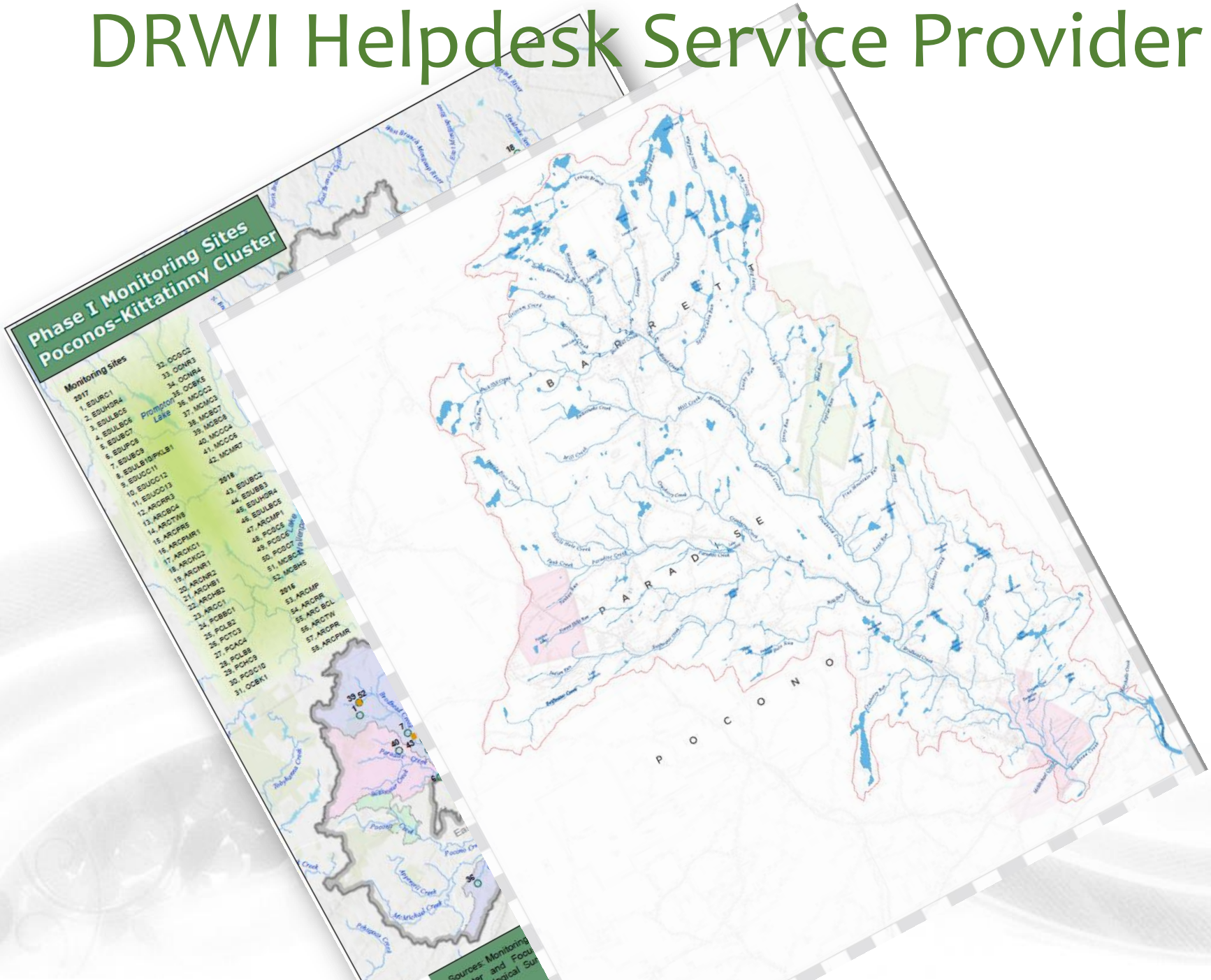
Flood modeling

Tremper Kill near Andes, NY	86 km^2
Pennypack Creek at Philadelphia, PA	129 km^2
White Clay Creek near Newark, DE	231 km^2
Lehigh River at Walnutport, PA	2303 km^2
Lehigh River at Bethlehem, PA	3313 km^2



Tree species and climate change

DRWI Helpdesk Service Provider



Thank you!

Contact us: clus@ship.edu

https://drbproject.org/
https://centerforlanduse.org/

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Shippensburg University

@ShipCLUS /ShipCLUS

John Hasse, Ph.D., AICP

Rowan University

Dan Ford

HERITAGE CONSERVANCY

LAND TRUST DATA MGMT

managing complex property data for a conservation organization

Dan Ford, Heritage Conservancy
dford@heritageconservancy.org

Outline

1. Introduction
2. SaaS product selection
3. Defining a spatial database structure
4. Next steps

Introduction

Heritage Conservancy

- Mission is to preserve and protect our natural and historic heritage
- Accredited Land Trust serving Bucks and Montgomery counties
- Facilitated the preservation of nearly 15,000 acres of open space, farmland, wildlife habitat, and important watershed areas to date

Introduction

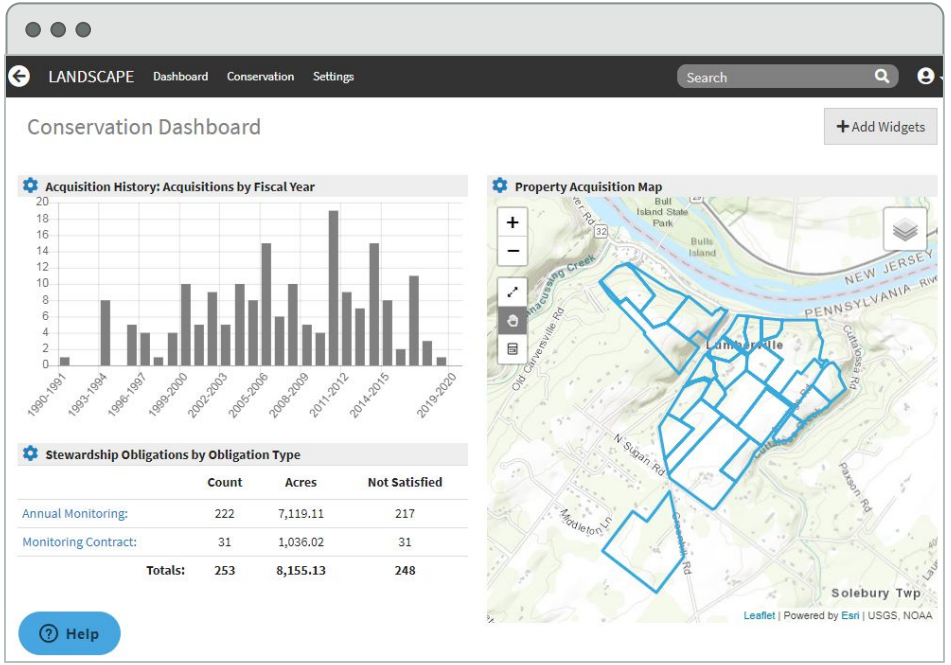
Complex data management scenario

- 65 years of property data
- Includes legal documents, pictures, reports, landowner information, spatial data, and more
- Data requires regular updates
- Multiple users access data for many different reasons

SaaS product selection

Research

- Identify areas where a SaaS solution could improve accuracy and efficiency
- Focus on end users and desired results
- Define list of potential products



SaaS product selection

Evaluate current processes: workflows

- General
  - data collection
  - data processing [and analysis]
  - data management
- Some types
  - Acquisition
    - fee simple
    - conservation easements
    - facade easements
  - Stewardship
    - monitoring
    - property maintenance
    - conservation projects

Evaluate current processes: directory structure

- Local server with word processing documents, spreadsheets, PDFs, images for all property acquisitions
- Spatial data stored on separate server
  - separate project folders
  - data sources vary
    - parcel boundaries from local government vs property boundaries georeferenced to site plans

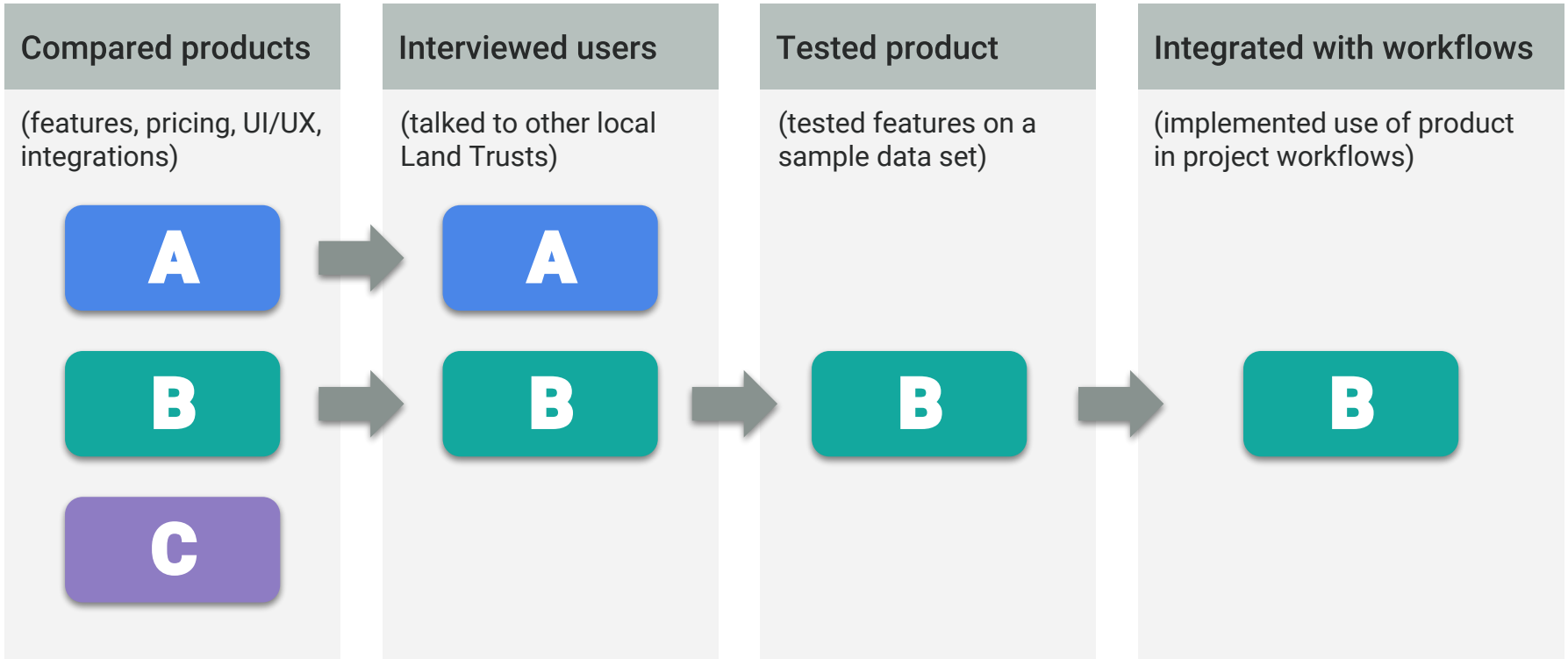
SaaS product selection

Required features

- ☑ Display complex property database on a clean UI
- ☑ Enable interaction with database for different types of users
- ☑ Have reporting features that can be customized for different needs
- ☑ Integrate seamlessly with spatial data file types
- \+ Include functionality for project and task management, specifically for stewardship activities like monitoring visits
- \+ Ability to integrate with mobile data collection software

SaaS product selection

Process



Current setup

- Directory of source data and project-specific data
- Property data organized in tabular and spatial data formats on multiple servers
- Multiple “master” documents over the years

Defining a spatial database structure

Mimicking the SaaS database structure

- Condense “master” documents
  - Maintain series of spreadsheets, organized by topic
  - Maintain spatial data feature classes
- Create Geodatabase
  - One-to-many relationships between feature classes and tabular data; use related tables to associate property information with spatial data

X:\Data\Heritage_Conservancy\HC_PropertyData.gdb

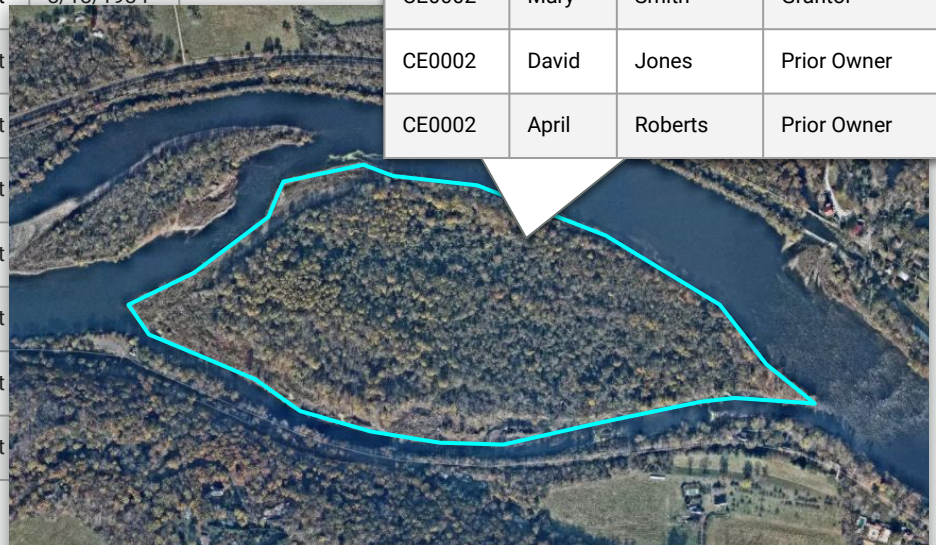
```
├── PropertyData
│   ├── TractBoundaries.shp
│   ├── AcquisitionBoundaries.shp
│   └── AcquisitionAreaTypes.shp
├── AffiliateInfo.csv
├── ConservationValues.csv
├── ContactInfo.csv
├── MonitoringVisits.csv
└── Annotations
```

Defining a spatial database structure

Mimicking the SaaS database structure

TractId	Tract Local Jurisdiction	AcqId	Property Interest	AcqDate
CE0001	Upper Southampton	CE0001	Conservation Easement	9/6/1973
CE0002	Solebury Township	CE0002	Conservation Easement	9/22/1983
CE0003	Langhorne Manor Borough	CE0003	Conservation Easement	8/18/1984
CE0004-01	Hilltown Township	CE0004	Conservation Easement	
CE0004-02	Hilltown Township	CE0004	Conservation Easement	
CE0004-03	Hilltown Township	CE0004	Conservation Easement	
CE0004-04	Hilltown Township	CE0004	Conservation Easement	
CE0004-05	Hilltown Township	CE0004	Conservation Easement	
CE0004-06	Hilltown Township	CE0004	Conservation Easement	
CE0004-07	Hilltown Township	CE0004	Conservation Easement	

TractId	FName	LName	Role
CE0002	John	Doe	Current Owner
CE0002	Mary	Smith	Grantor
CE0002	David	Jones	Prior Owner
CE0002	April	Roberts	Prior Owner



Next steps

Moving forward

- This whole process informed our project workflows moving-forward
  - Request spatial data from surveyor/engineer
  - Collect field data via mobile app
  - Add new property acquisition data to SaaS product and Geodatabase
- Digital stewardship
  - Apply stewardship best practices to data management

LAND TRUST DATA MGMT

managing complex property data for a conservation organization

Dan Ford, Heritage Conservancy
dford@heritageconservancy.org

Eric Jespersen

PA MAGIC
MAPPING & GEOGRAPHIC INFORMATION CONSORTIUM

https://pamagic.org/

PA Hydrography Modernization

Status and Plans

April 2, 2019

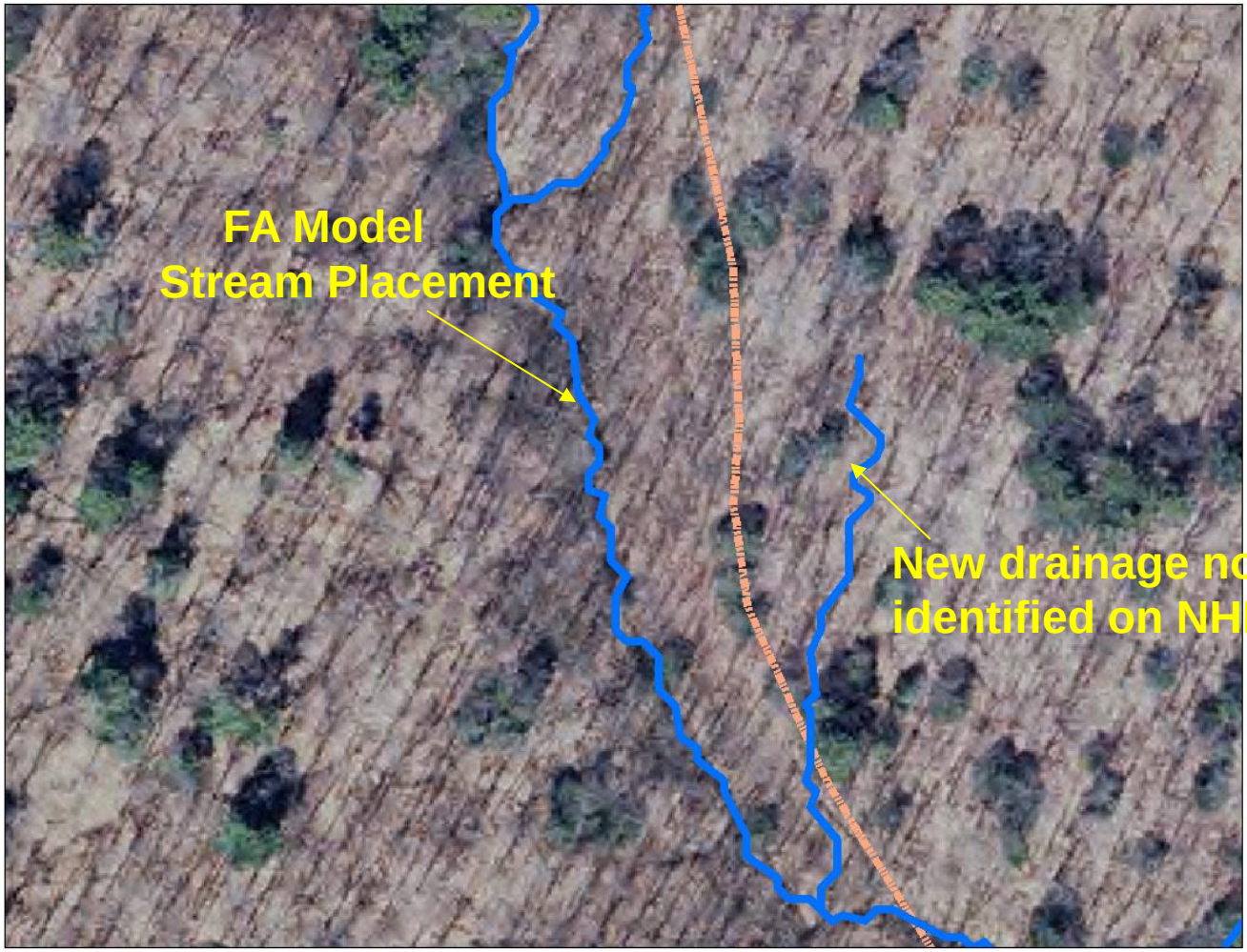
Eric Jespersen

PA MAGIC
MAPPING & GEOGRAPHIC INFORMATION CONSORTIUM

PaMAGIC VISION (Since 1996)

"The Citizens of Pennsylvania will have a coordinated, flexible and integrated geographical information infrastructure to support better decision making and more efficient use of limited resources."

Compatible with Current Mapping Standards



What **was** the Plan?

- Spring 2013 → Concept Development
- Autumn 2013 → Concept Promotion/**Champion Development**/ **Partner Recruitment**
- Spring 2014→ Project Definition/Initial Funding/Partner Recruitment
- Autumn 2014 → Pilot Data Development/Funding Consolidation
- 2015 – 2018 → Data Production/Quality Control/Application Development

Water Data Initiative

Started - Spring 2013

Publicized first – December 2013

Budget Workshop – December 2014

MS4 Sessions; Lancaster – October 2014-May 2015

Lancaster NHD Support **Pilot** – October 2015-June 2016

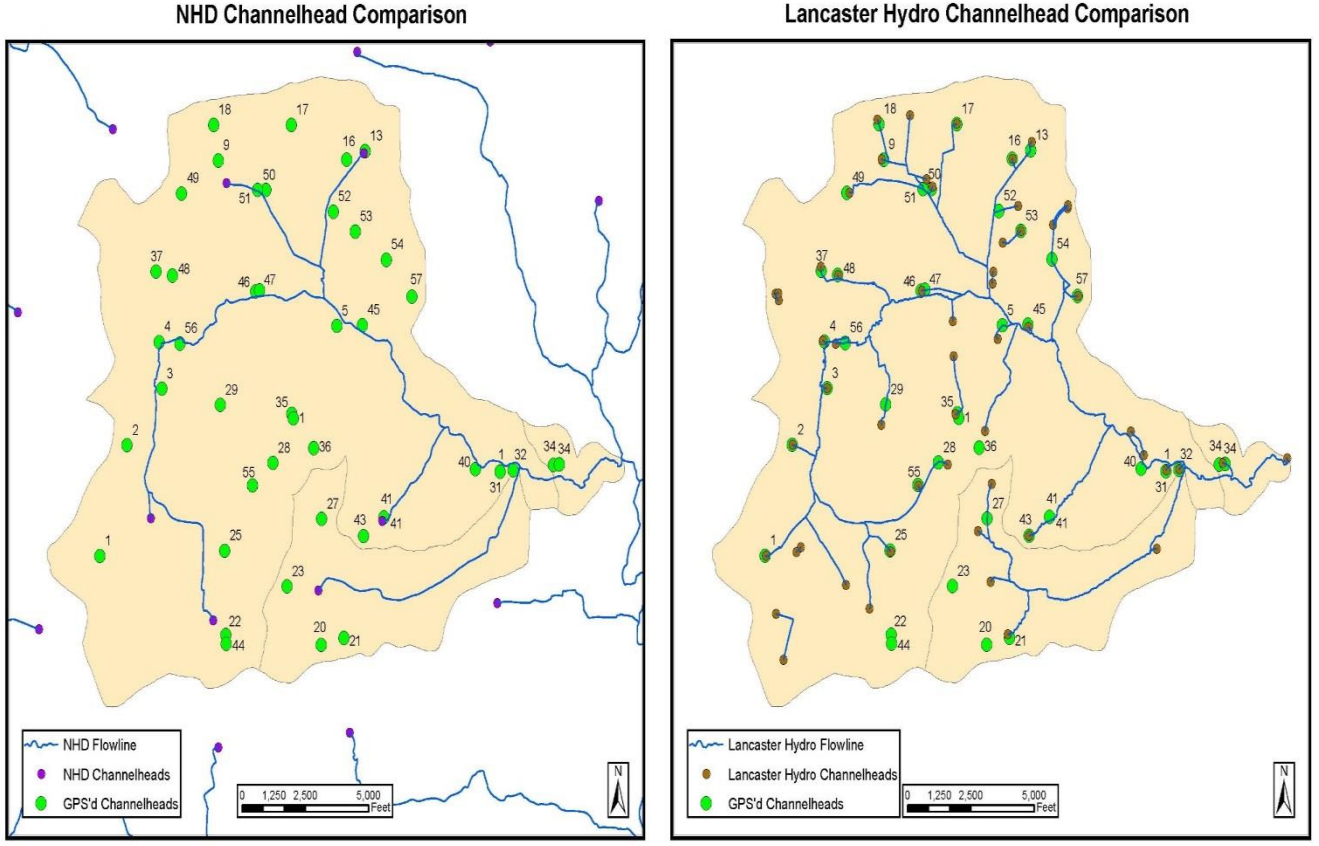
Data Maintenance Workshop – January 2016

Lidar Workshop – January 2017

Data Model and Planning Workshop– January 2018

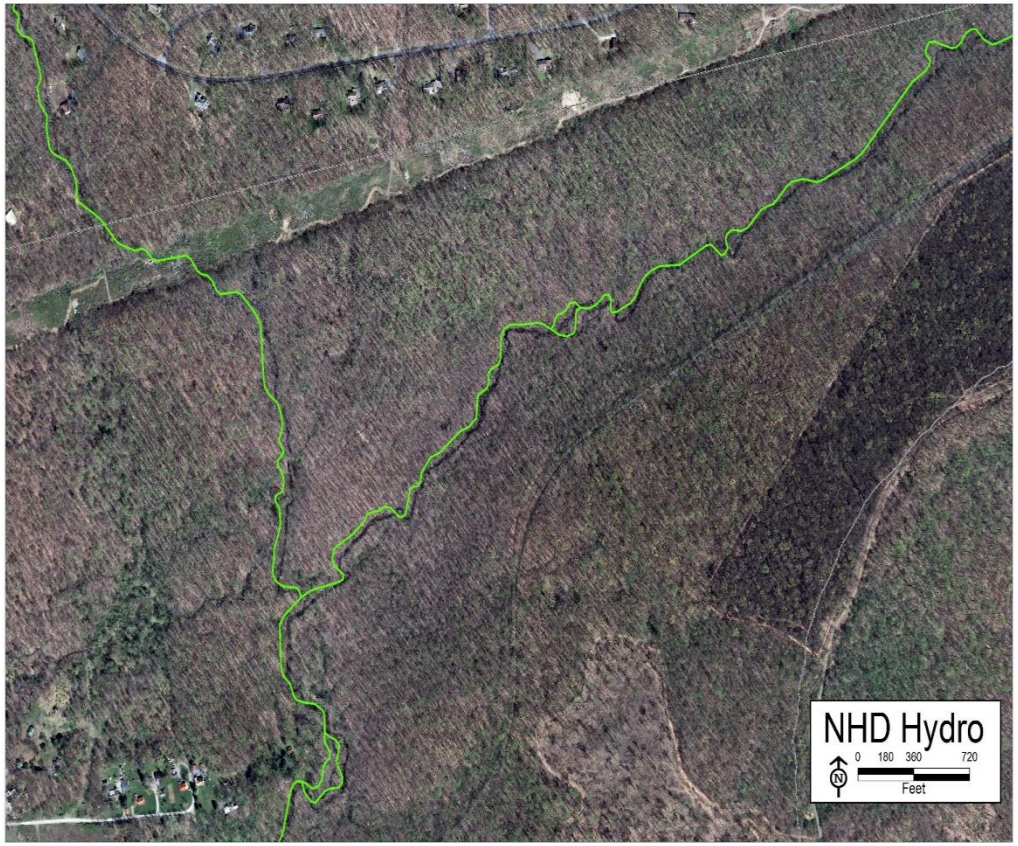
Accelerating the Plan Workshop – January 2019

Field Validation



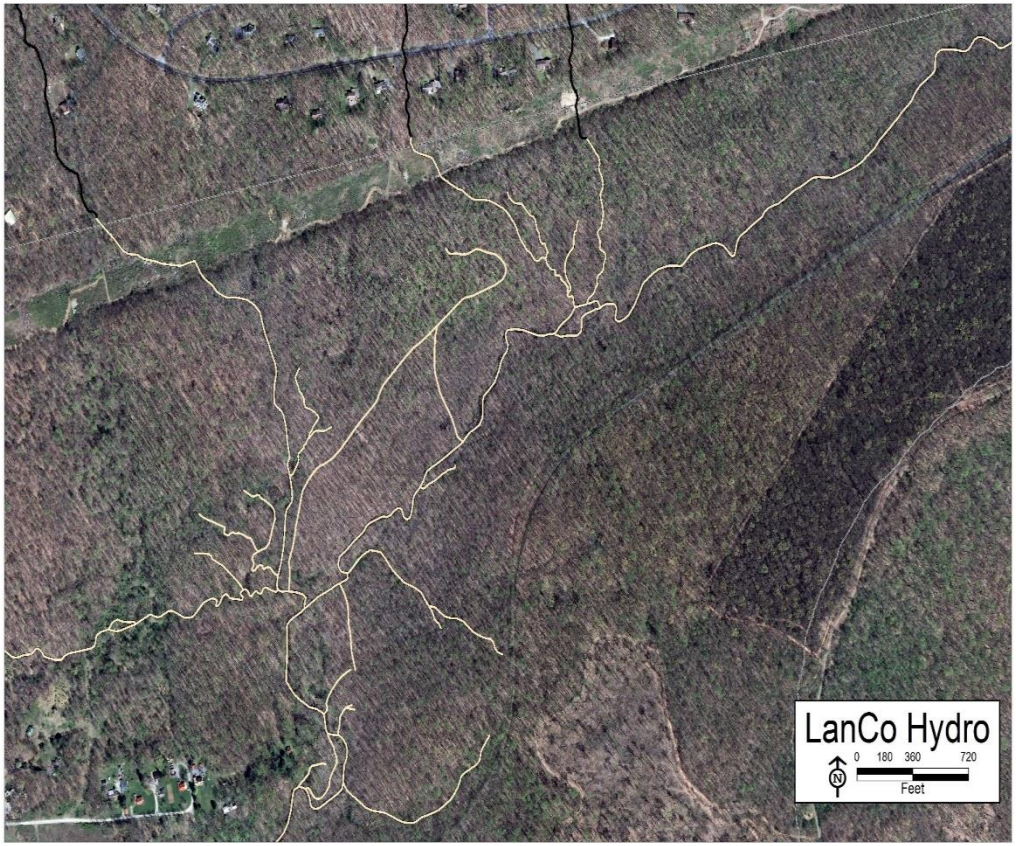
Lancaster County NHD Support Pilot

Chiques - NHD



Lancaster County NHD Support Pilot

Chiques – Original County Hydro

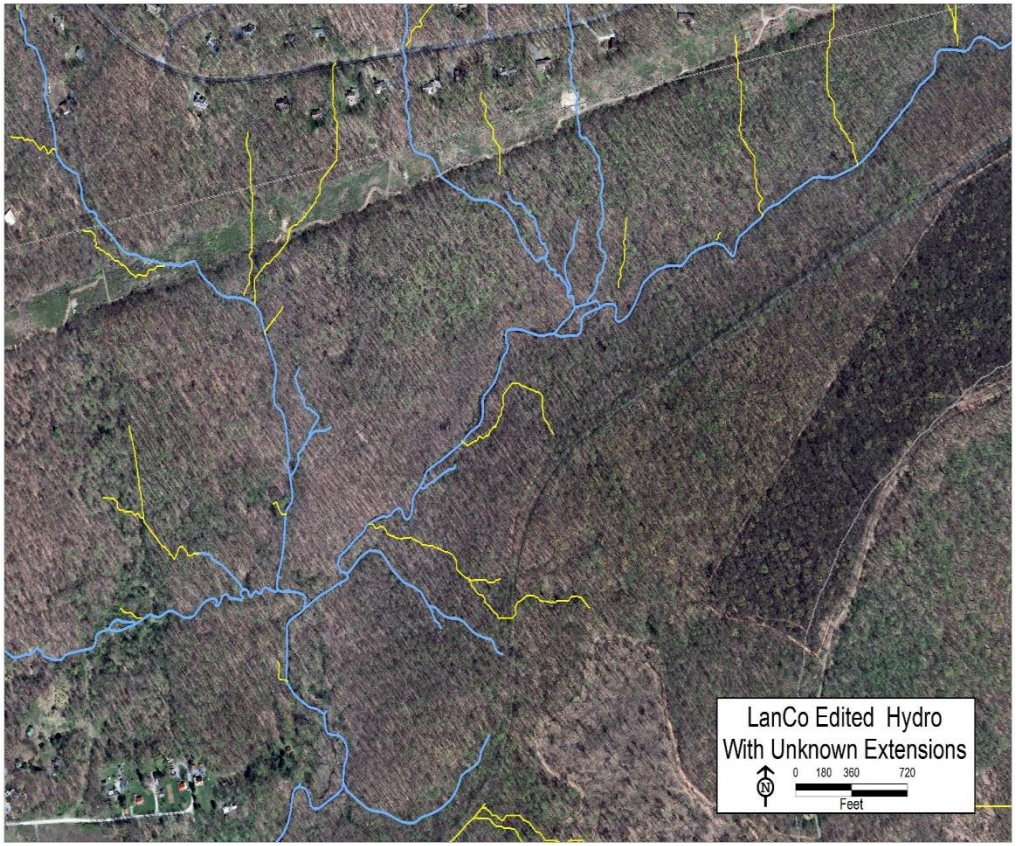


Lancaster County NHD Support Pilot

Chiques – Edited County Hydro

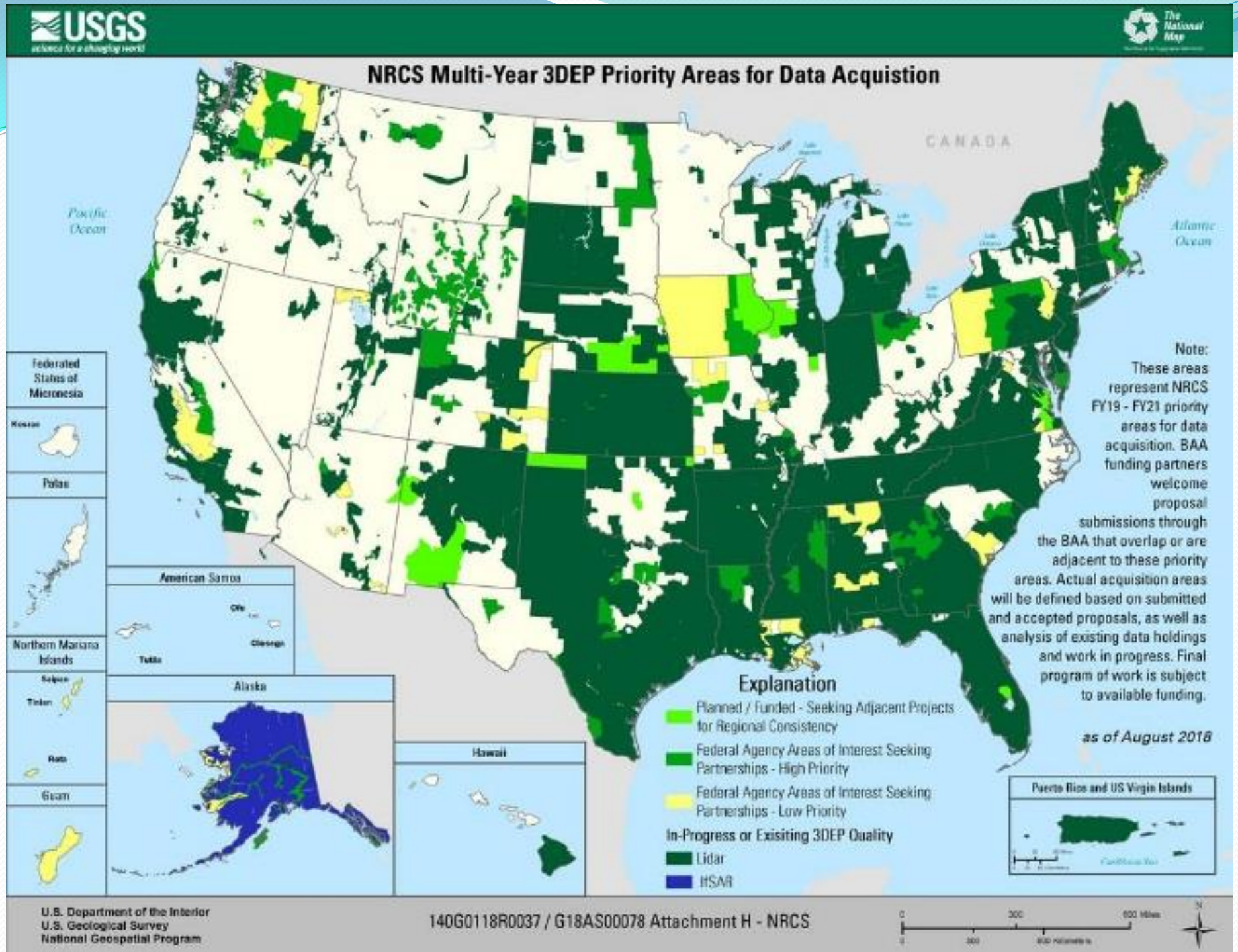
Lancaster County NHD Support Pilot

Chiques – County Hydro w/ Headwater Swales



QL2 vs. QL3 Workshop January 2017

- **PAMAP lidar is rapidly becoming outdated, *and hydrography is not the only application*.**
  - **i.e. - Get QL2**
- There is real monetary support if the State has a plan/program
- There is real technical support across the nation
  - **-but we can still make our own path**
- We have enough existing QL2 to take the next steps


USGS
science for a changing world
The National Map
NRCS Multi-Year 3DEP Priority Areas for Data Acquistion
CANADA
Pacific Ocean
Atlantic Ocean
Federated States of Micronesia
Palau
American Samoa
Northern Mariana Islands
Alaska
Hawaii
Guam
Puerto Rico and US Virgin Islands
Note: These areas represent NRCS FY19 - FY21 priority areas for data acquisition. BAA funding partners welcome proposal submissions through the BAA that overlap or are adjacent to these priority areas. Actual acquisition areas will be defined based on submitted and accepted proposals, as well as anelysis of existing data holdings and work in progress. Final program of work is subject to available funding.
as of August 2018
Explanation
Planned / Funded - Seeking Adjacent Projects for Regional Consistency
Federal Agency Areas of Interest Seeking Partnerships - High Priority
Federal Agency Areas of Interest Seeking Partnerships - Low Priority
In-Progress or Exisiting 3DEP Quality
Lidar
IfSAR
U.S. Department of the Interior
U.S. Geological Survey
National Geospatial Program
140G0118R0037 / G18AS00078 Attachment H - NRCS
0
300
600 Miles
N

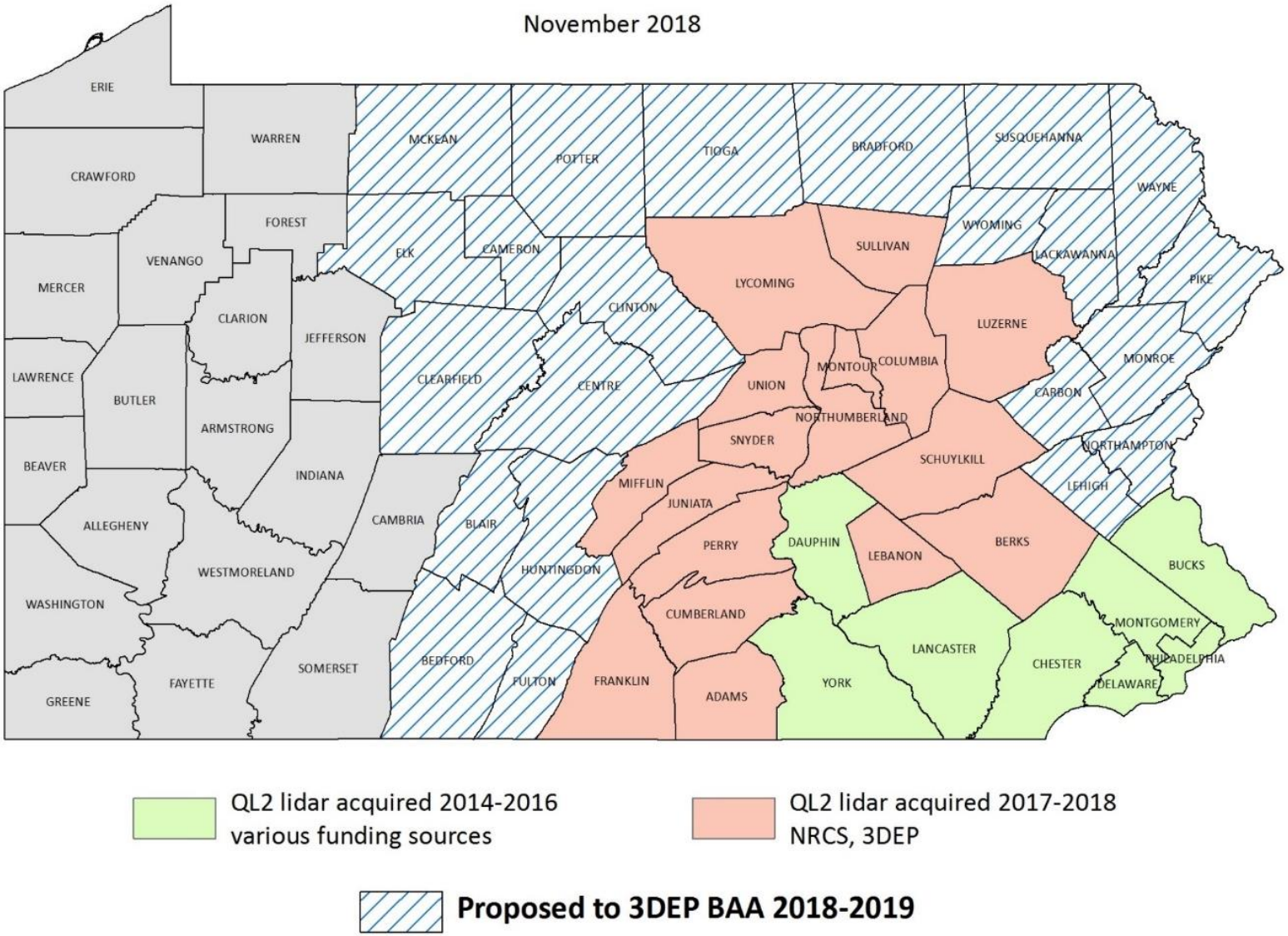
USGS 3DEP Grant Application 2018-2019

- Application made November 9, 2019
- Lead author is DCNR TopoGeo
- In-state funding $2.15M
  - DCNR $500K
  - DEP $500K
  - PEMA $500K
  - SRBC $50K
  - PTC $200K
  - DOT $400K

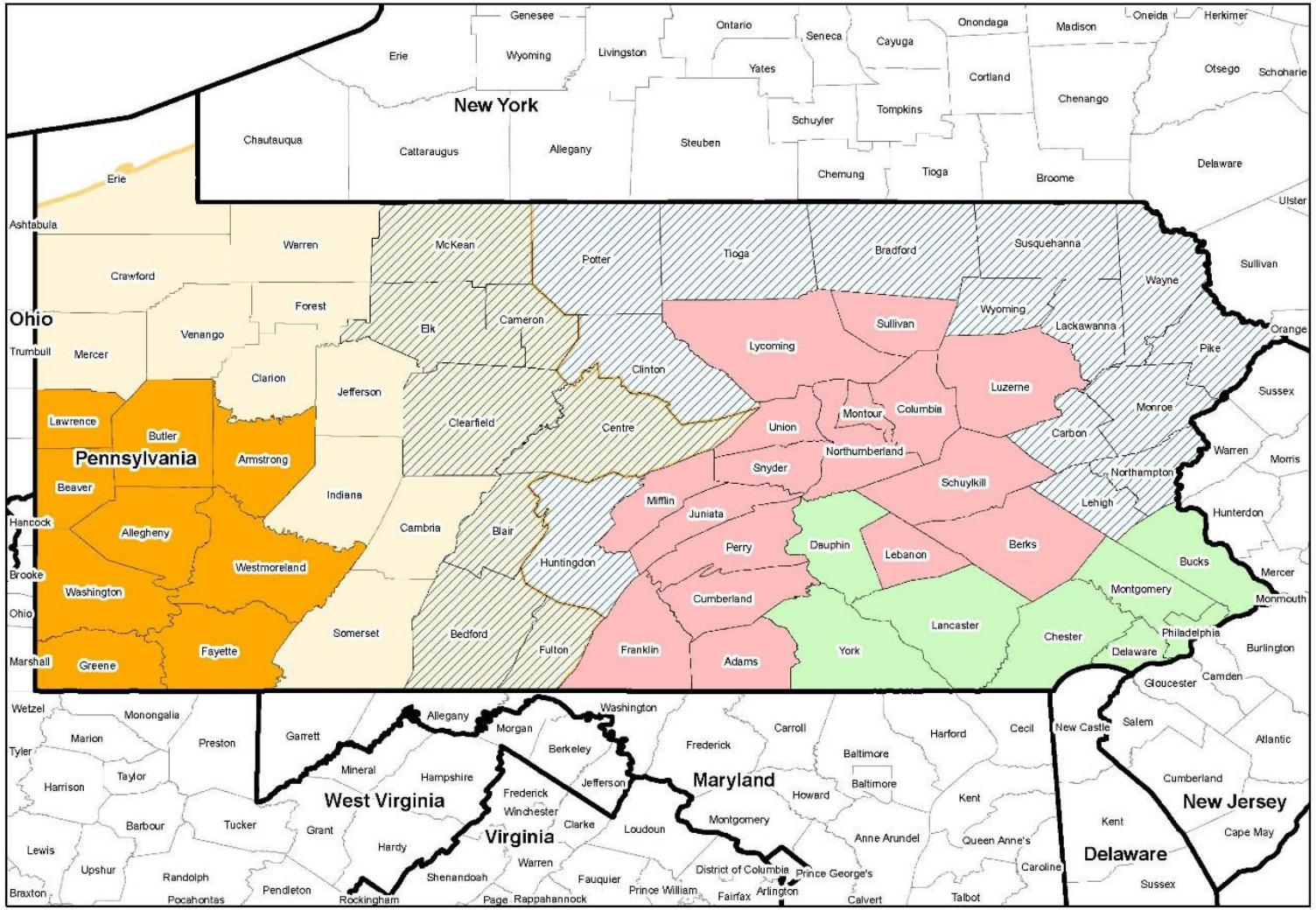
Hydrography Applications

- Chesapeake Bay Program agricultural assessments and technical assistance by NRCS
- Riparian Buffer program development and execution by DCNR
- Identification and mitigation of localized flood hazards by PEMA and FEMA
- Clear connection of MS4 stormwater control measures to natural drainage
- Integration of headwaters and wetlands with modernized hydrography

Proposed Acquisition of Quality Level 2 (QL2) Lidar Data



PA LiDAR 3DEP QL2 Aquisition



Accelerate the Plan
January 2019

Senior Geologic Scientist, DCNR

The Bureau of Topographic and Geologic Survey, Geologic and Geographic Information Services Division is looking for a ***responsible individual to lead Pennsylvania's effort to develop a modern, local resolution, digital hydrography dataset for Pennsylvania****. If you enjoy working with geographic information systems (GIS) and other software programs to answer geospatial, geological, and topographical questions, BTGS may have a position of interest to you.*

PaMAGIC/DCNR 2018-2019 Priorities

- Data Model Design
- Standard Minimum Process
  - Lancaster County Stream network – Lisa M.
  - CBP Methodology – David S. and Matt B.
- Statewide Steering
  - October 2018 Meeting – Eric J.
- Detailing Plans…

Program Management

- Overall Leadership and Promotion- DCNR and PaMAGIC
- Data Stewardship- PA Topographic and Geologic Survey
  - DCNR provide basic stream network and reference framework
  - Federal, state and local government programs connect their data to that framework
  - Public and private money in concert

Program Management

- **Localized Leadership and Cost Sharing by River Basin**- distinct data development, funding and scheduling plans in each river basin (schedule partially dictated by lidar data availability).
  - Susquehanna Basin
  - Delaware Basin
  - Ohio Basin

Data Development

- Lidar Standard- QL2 or better and less than five years old
- Flowpath derivations by standard minimum process to yield PA stream centerline 3D data model
- Network Standard- derived in modified HUC 12 watersheds, not political boundaries

Data Development

- Derivation- includes visual QC against imagery < than five years old
- Validation against local and state agency cartographic quality data
- Incentivized Local Involvement- data sharing and field QC needed
  - County, foundation and university involvement welcome

Data Development

- An iterative process, and expected normal sequences include:
  - Level 1 - Natural perennial and intermittent watercourses (and including some engineered), NHD waterbodies integrated, all vectors 3D
  - Level 2 – All cartographic and network functionality supported, channelheads further defined by field checks, additional waterbodies added, suitable for logical connections of wetlands and stormwater systems
  - Level 3 - NHD and WBD Integration

- Expect regional differences!

Data Structure

- Minimalistic attribute and metadata including only:
  - Processing settings (auto-generated)
  - Qualifiers
    - Production Schema:
    - Dissemination Schema:
- Upstream limit of inclusion qualifications (TBD)
  - Determine specific ***accumulation criteria***
  - ***Minimum accumulation?***
    - ***Visible water?***
    - ***Regional or physiographic variables?***
  - Field-verified channel heads ***Citizen Science?***

Data Maintenance and Use

- Annual network update only needed to address:
  - Cataclysmic changes
  - Major land development
  - Data problems reported by related database managers
- Partner system
  - needed for reporting of changes
  - designed from the outset of flowpath creation
- Regional differences expected

Proposed 2019 Goals

- Hire a senior-level geologist to lead the hydrography program at BGS
- Regional Steering Teams in place
- Statewide QL2 Lidar Funding assured and Sequencing complete

Lidar Working Group

- *Working toward acquiring new LiDAR for the state, and planning for future data management and maintenance*
  - *Short and long-term planning (data refresh cycle)*
  - *Application Sharing Networks*
    - Basic data management and pre-processing
    - Vegetation
    - Hydrography
    - Structure/infrastructure
    - Topography and surfaces

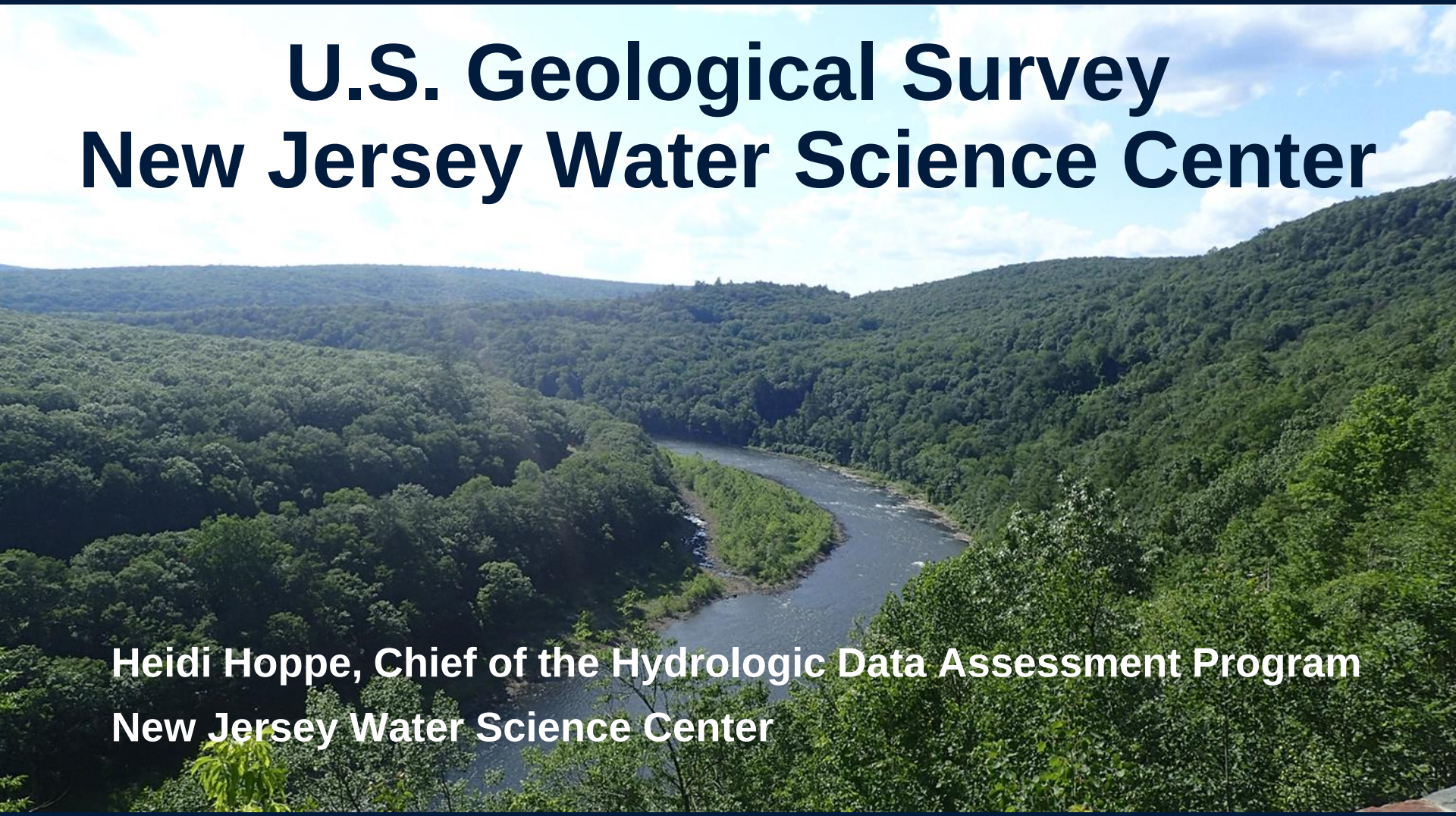
https://www.srbc.net/pennsylvania-lidar-working-group/index.html

Heidi Hoppe

* U.S. Geological Survey
* NJ Water Science Center
* https://www.usgs.gov/centers/nj-water/

USGS
science for a changing world

U.S. Geological Survey
New Jersey Water Science Center



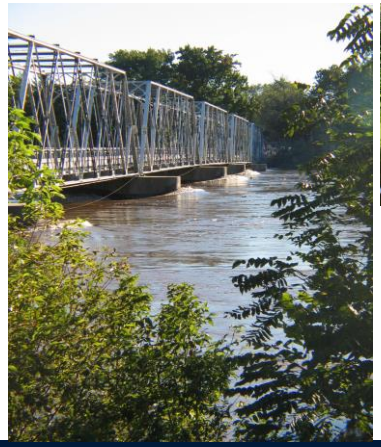
Heidi Hoppe, Chief of the Hydrologic Data Assessment Program

New Jersey Water Science Center

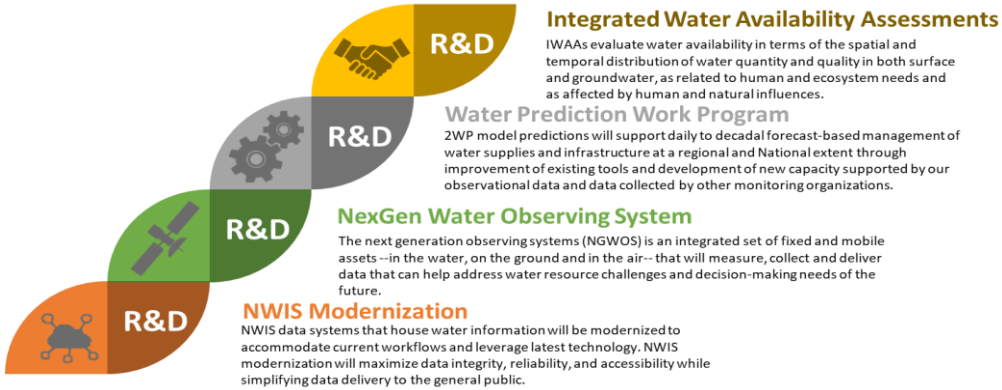
U.S. Geological Survey

Water Resources Mission Area

- Water is one of seven science mission areas of the USGS
- Water's mission is to collect and disseminate reliable, impartial, and timely information that is needed to understand the Nation's water resources.
- Water information is fundamental to national and local economic well-being, protection of life and property, and effective management of the Nation’s water resources.
- The USGS works with partners to monitor, assess, conduct targeted research, and deliver information on a wide range of water resources and conditions including streamflow, groundwater, water quality, and water use and availability.

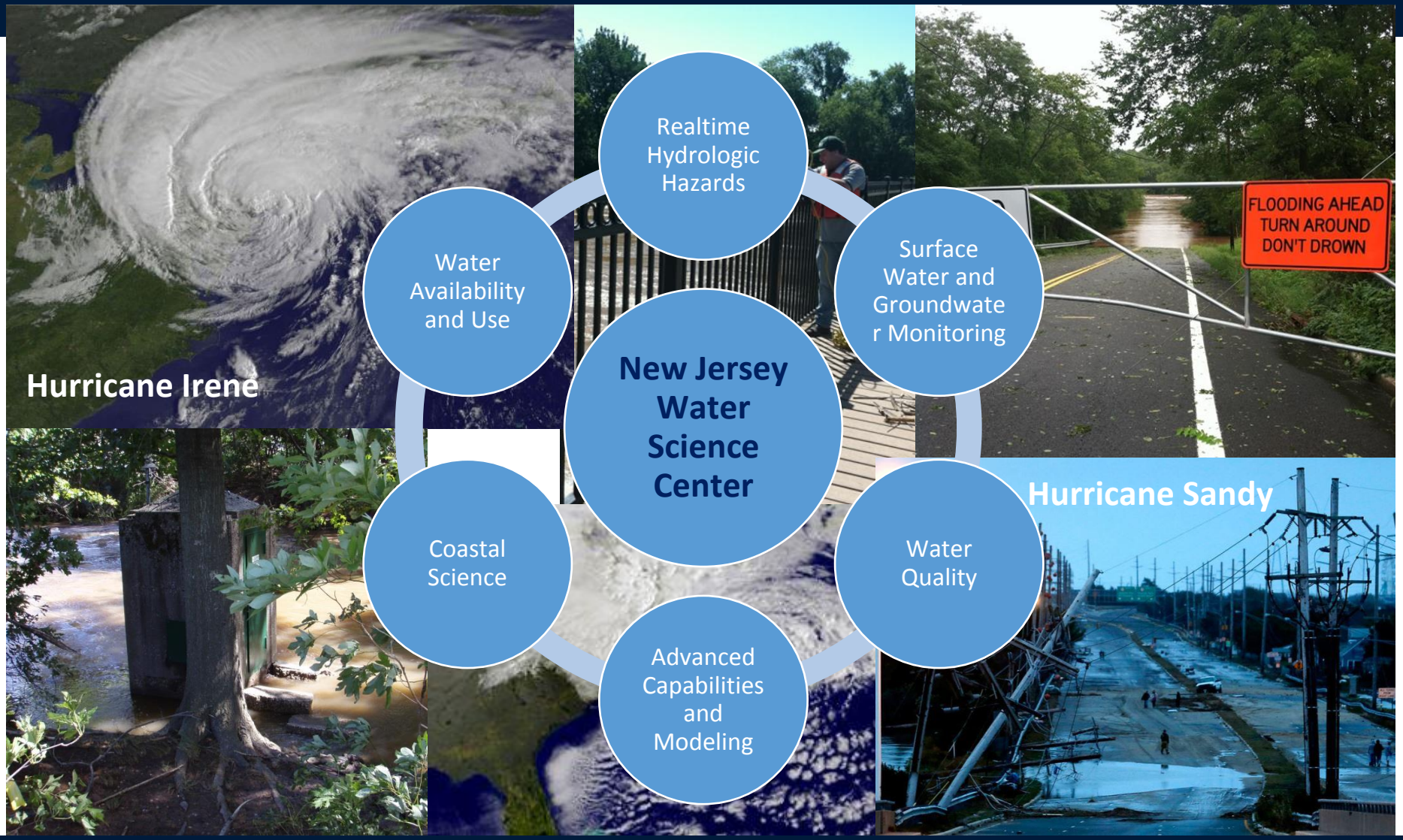


Water Mission Area Priorities



USGS

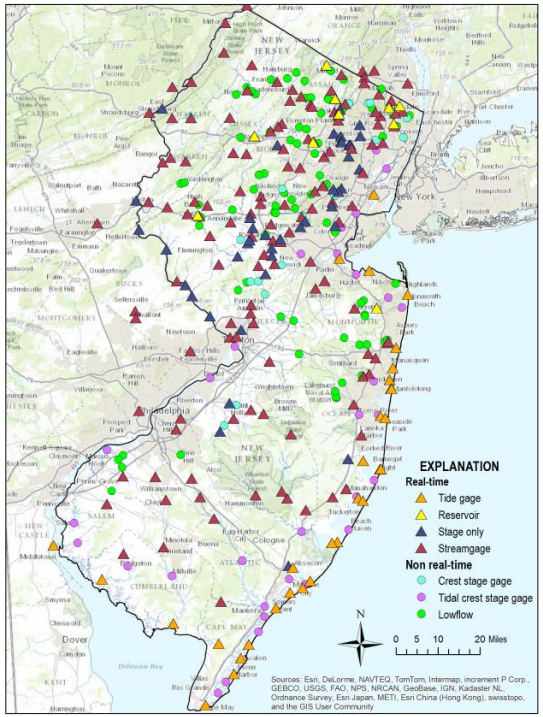
U.S. Geological Survey
New Jersey Water Science Center



USGS

Surface Water Networks

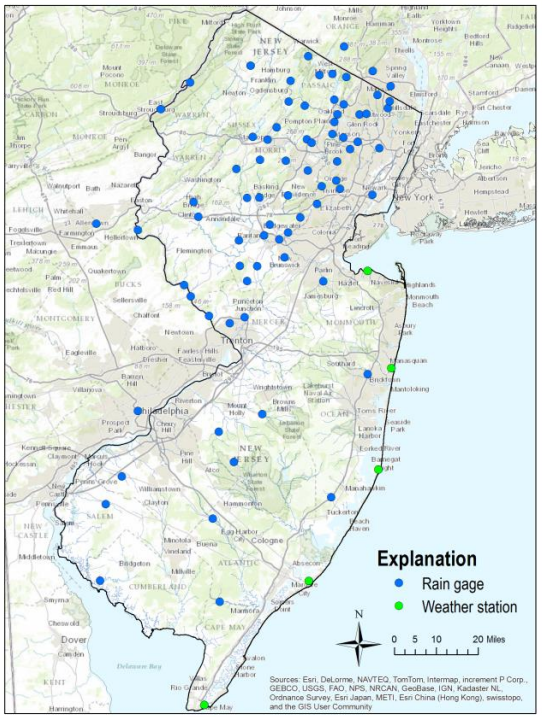
Surface Water & Tide



Real-Time SW Networks
- 116 Continuous-Record Discharge Gages
- 42 Continuous-Record Stage Gages
- 9 Continuous-Reservoir Elevation Gages
- 25 Continuous-Record Tide Elevation Gages

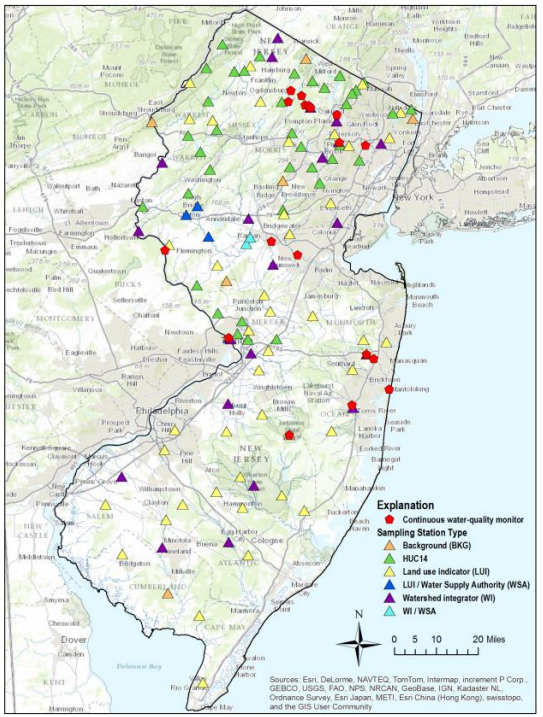
Non Real-Time SW Networks
- 17 Crest-Stage Gages
- 32 Tidal Crest-Stage Gages
- 96 Low-Flow Discharge Measurement Sites

Rain & Weather Network



Real-time Precipitation and Weather Network
- 76 Rain Gages
- 25 Coastal Weather Stations (rain, wind, BP, AT, RH)

Surface-Water Quality Monitoring



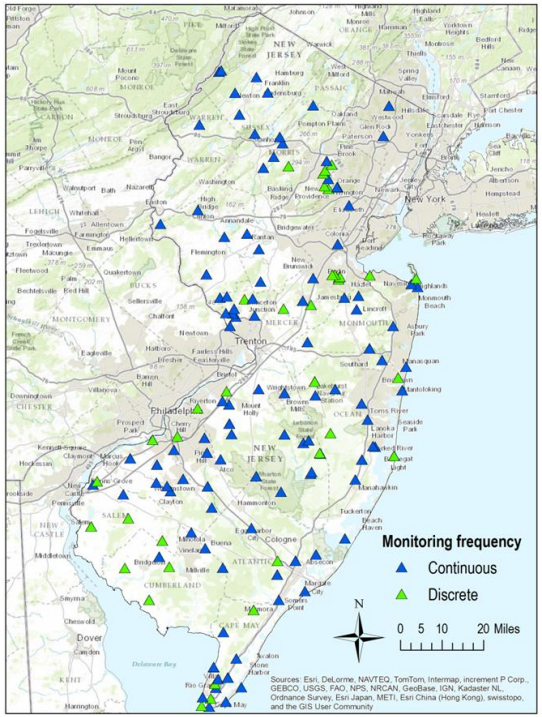
Continuous Water-Quality Monitors
- 11 Long-term Monitors

Water-Quality Sampling Sites (all sampled quarterly)
- 123 sites in the NJDEP/USGS ASWQMN Coop Network
  - 7 Background
  - 50 Probabilistic sites
  - 23 Watershed integrator sites
  - 43 Land use indicator sites
- 2 NJWSA Coop Sites
- 1 DRBC Coop Site

USGS

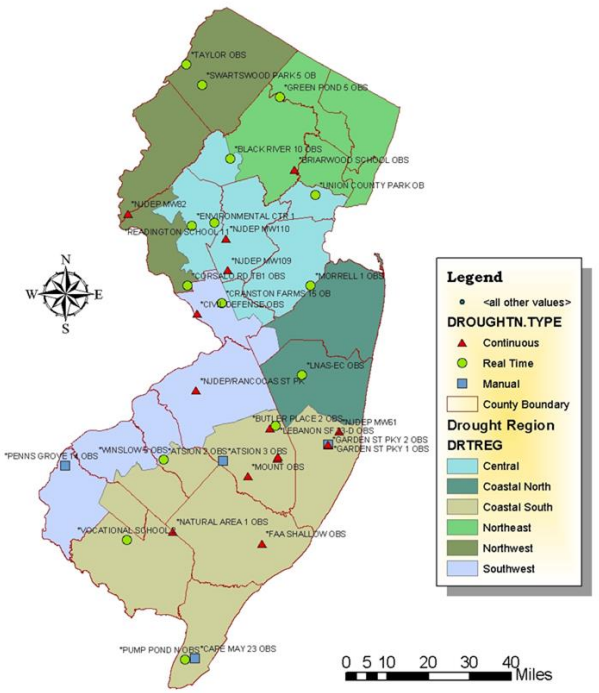
Groundwater Networks

Groundwater Level Observation Network



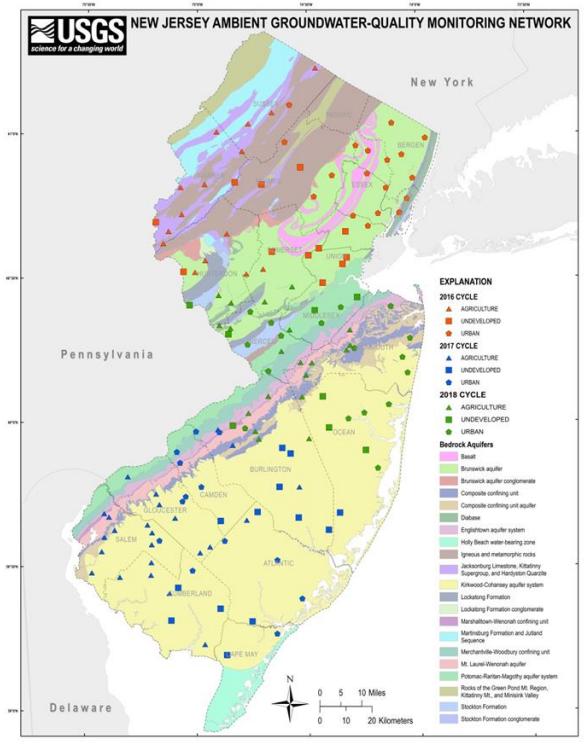
GW Networks
- 22 Real-time Continuous-Record Wells
- 108 Continuous-Record Wells
- 47 Manual Wells

Drought Network



NJ Drought Monitoring Network
- NJDEP uses 4 indicators to evaluate status of water supply and hydrogeologic conditions
  - Streamflow at key gages
  - Groundwater levels in shallow wells
  - Water levels in water-supply reservoirs
  - Precipitation

Groundwater Quality Monitoring



Water-Quality Sampling Sites
- 150 wells in the NJDEP/USGS AGWQMN Coop Network
  - Wells selected by dominant land use targeting nonpoint source pollution
    - Agricultural
    - Undeveloped
    - Urban
  - Wells sampled on 3-year cycle (50 wells / year)

NJWSC Hydrologic Data Assessment Program Capabilities

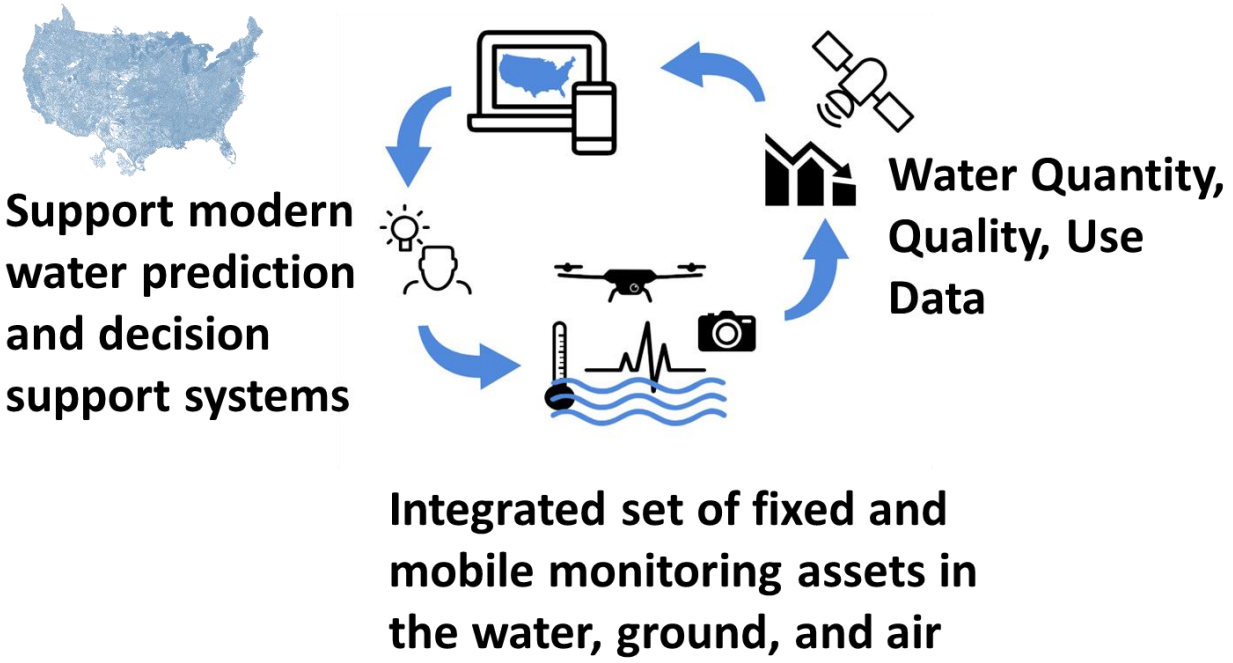
- **Coastal Monitoring**
  - NOS National Water Level Observation Network (NWLON) Standard Tidal monitoring
  - Surge, Wave and Tide Hydroynamics Network
  - Coastal Inundation Modeling & Mapping
- **Watercraft Work and Training**
  - NJWSC currently maintains a contingent of well-maintained watercraft
    - Water-Quality and Suspended-Sediment Sampling from Boats on Large River with D95 & D96 samplers
  - NJWSC is a USGS Regional Watercraft Safety Training Center
- **Bathymetry Work (reservoirs)**
- **Low Flow Monitoring & Analysis**
- **Deep well pumping and sampling**

NJWSC Hydrologic Data Assessment Program Capabilities

- **Surveying Work**
  - GNSS Work
  - High-Water Mark Flagging and Surveying for indirects
- **Bridge Scour Monitoring & Counter Measure Assessment**
- **HEC-RAS**
  - Flood Inundation Mapping
  - Modeling flows
- **Real-time Harmful Algal Bloom (HABs) Monitoring**
- **Contaminants of Emerging Concerns sampling**
  - Microplastics
  - Endocrine Disrupting Compounds
  - Pharmaceuticals/Personal Care Products
  - Glyphosate…

Next Generation Watershed Observing System (NGWOS)

An opportunity to develop an integrated water observing system to support innovative modern water prediction and decision support systems in a nationally important, complex interstate river system.

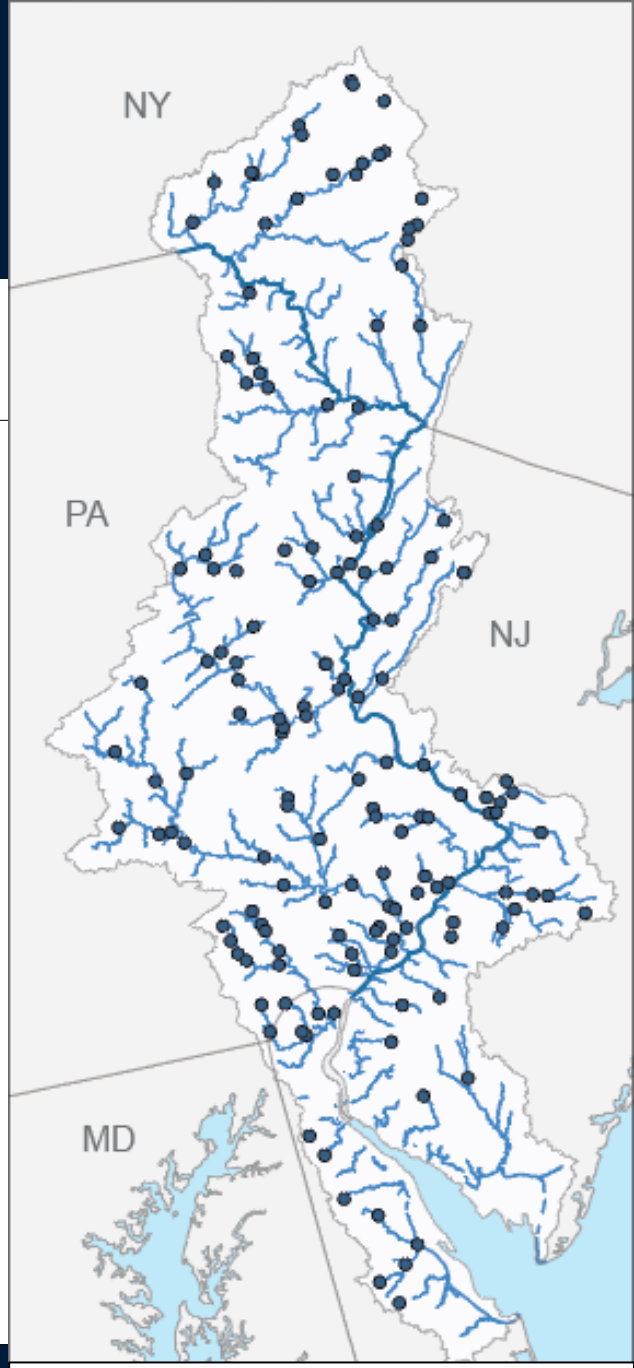


NGWOS Delaware River Basin Pilot

…an integrated water observing system to support innovative modern water prediction and decision support systems.

The Delaware River Basin

- Ecologically diverse and critical to the regional and national economy;
- Provides drinking water to over 15 million people;
- Long history of innovative, regional solutions to insure the long-term sustainability of this treasured resource.



Existing Streamgages

USGS

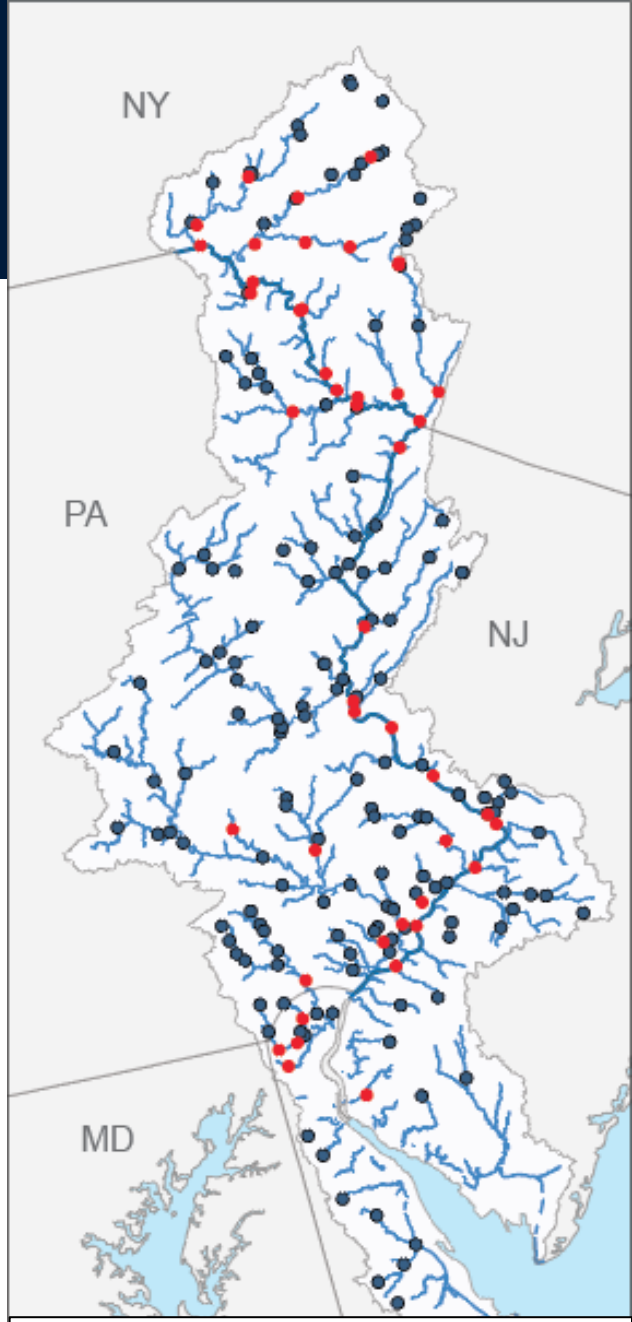
NGWOS Delaware River Basin Pilot – FY18

New Gages

- 17 new streamgages to fill critical gaps

Enhancements to the Water Monitoring Network

- Upgrades at 28 streamgages (new DCPs, Iridium communication, etc)
- Addition of water temperature monitoring (36 sites) and conductance monitoring (10 sites) to support Fisheries and Water Prediction



USGS

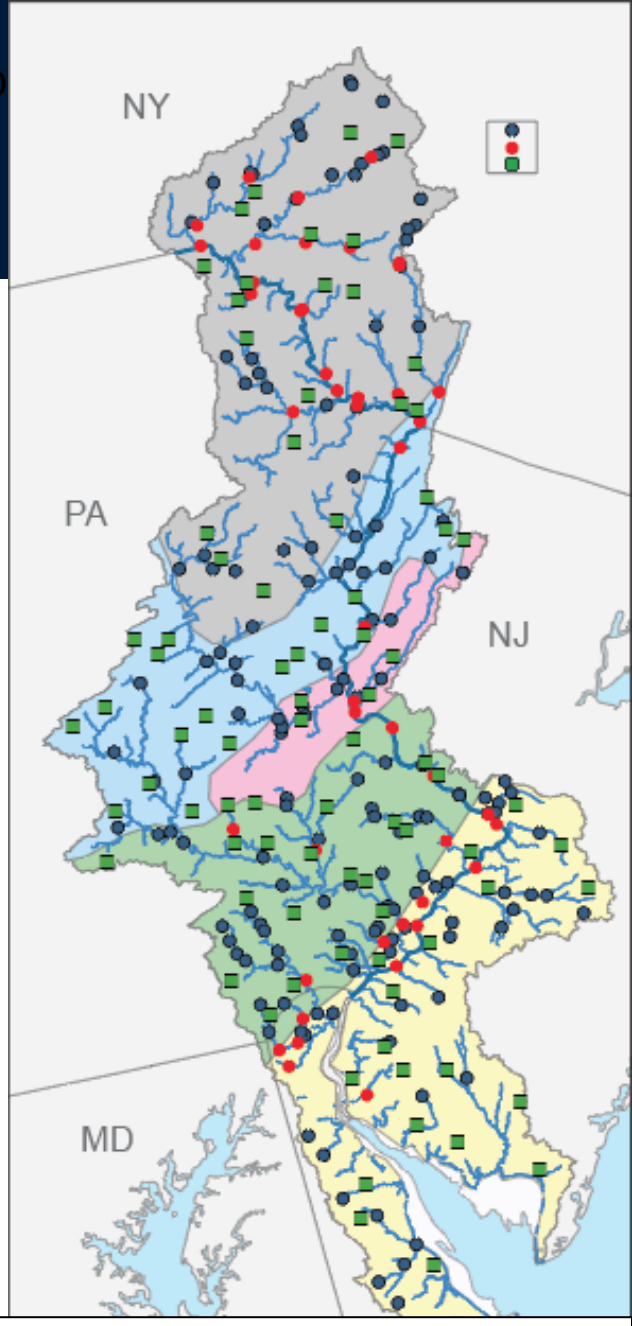
NGWOS Delaware River Basin Pilot – Proposed FY19

Enhanced Mainstem Monitoring

- Addition of temperature & salinity monitoring at more sites
- New communication platforms

Small Stream Monitoring

- About 50 new gages in areas in basins less than about 50 mi^2 to characterize hydrologic dynamics and improve hydrologic and ecologic models



Enhanced Streamgages in FY18
Proposed New Streamgages in FY19

USGS

NGWOS Delaware River Basin Pilot – Proposed FY19

Upper sub-basin

Additional monitoring on a limited scale

- SW/GW interactions
- Evapotranspiration
- Snowpack
- Soil Moisture
- Sensors for nutrients and suspended sediment
- Remote Sensing

Monitoring Network Modernization

- New communication platforms
- Faster, adaptable, and interconnected; plug-n-play
- Continued R2O into NextGen technologies

NGWOS Delaware River Basin Pilot – Proposed FY19

Innovation Testing Sites

Operational testing at numerous sites

- Radars for water level and velocity
- Video images for water velocity

Technology testing at one mainstem & a couple of small stream sites

- Water-quality and sus. sediment sensors
- eDNA
- SW/GW interactions
- Radiometer – remote sensing calibration

NGWOS Delaware River Basin Pilot – Proposed FY20

Increased use of Sensors and Remote Sensing for water quality in streams and groundwater and water use monitoring

Continue ”Wiring the Network” (LoRa and other technologies) and investing in NextGen technologies

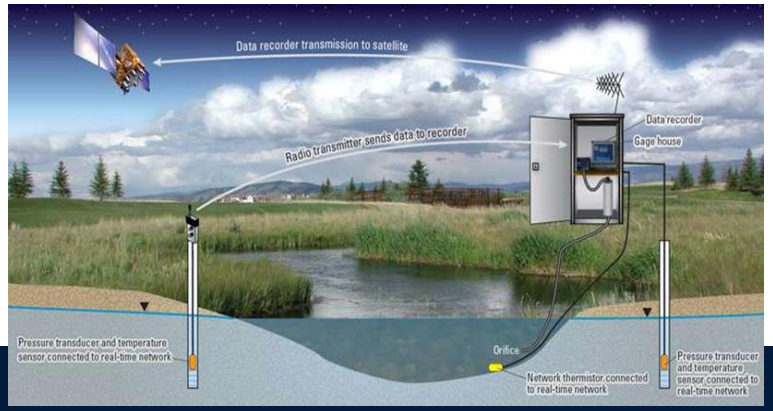
Expansion of SW/GW interactions to estimate baseflows

Link NGWOS water monitoring infrastructure with other monitoring needs (multiple our combined science capacities)

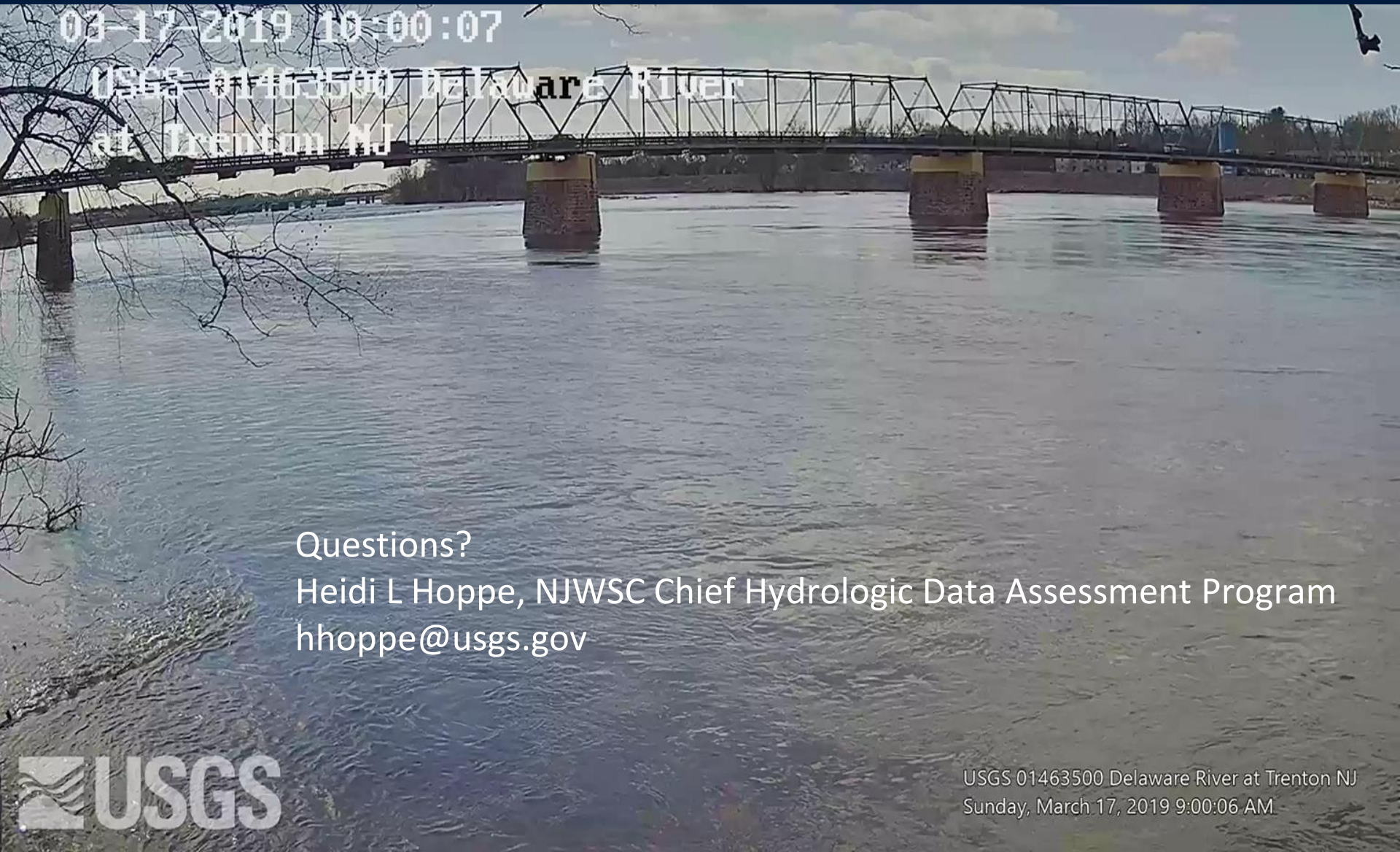
Next Generation Water Observing System (NGWOS)

When fully implemented, the USGS NGWOS will provide real-time field and remote-sensing data on:

- Streamflow;
- Water-cycle components (ET, snowpack, soil moisture);
- Broad suite of water-quality constituents;
- Connections between groundwater and surface water;
- Stream velocity distribution;
- Sediment transport; and
- Water use.



USGS Delaware River at Trenton



Questions?

Heidi L Hoppe, NJWSC Chief Hydrologic Data Assessment Program
hhoppe@usgs.gov

David Arscott, Ph.D.

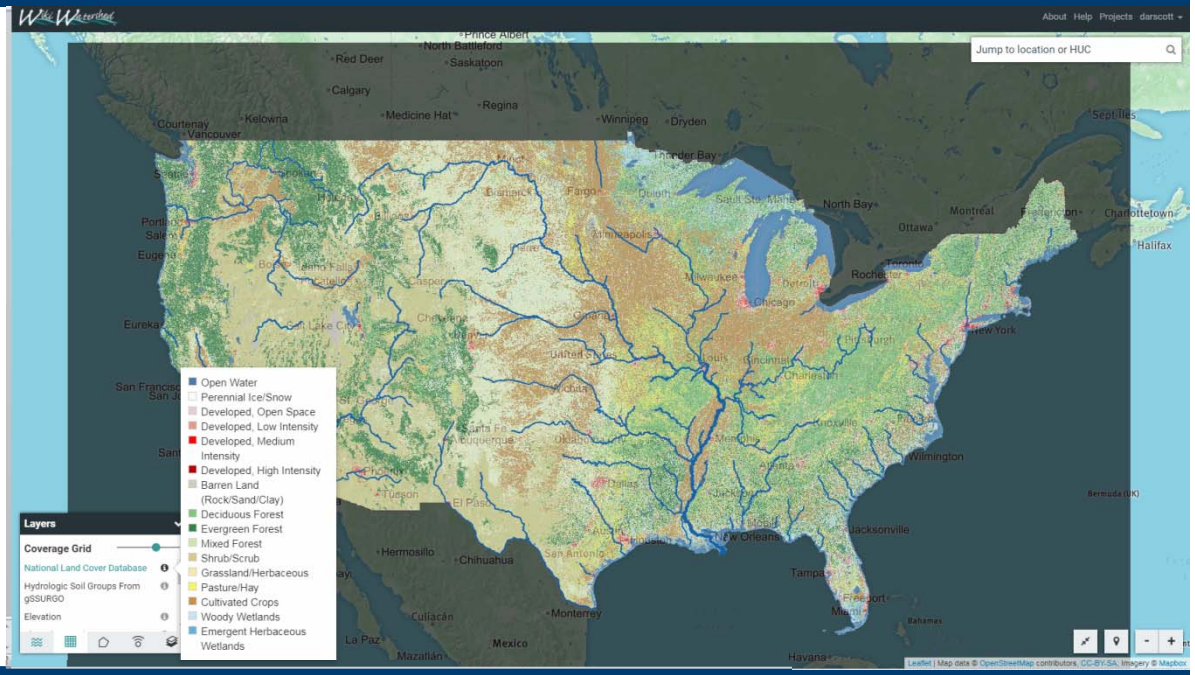
* President, Executive Director
* Stroud Water Research Center
* Avondale, PA

WikiWatershed®: An online toolkit for water resource managers, conservation practitioners, and municipal decision-makers

Dave Arscott
Matt Ehrhart, David Bressler

STROUD WATER RESEARCH CENTER

Development Team:
Drexel/ANS, LimnoTech, PSU, UW, USU, Azavea



WikiWatershed®

WikiWatershed®

Team Members

David Arscott, Steve Kerlin, Melinda Daniels,
Matt Ehrhart, Susan E. Gill (retired)

Anthony Aufdenkampe, LimnoTech
Barry Evans, Penn State U., Stroud Center
David Tarboton, Utah State U.
Jeffrey S. Horsburgh, Utah State U.
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Robert Cheetham, Azavea
Emilio Mayorga, U. Washington

Nanette Marcum-Dietrich, Millersville U.
Carolyn Staudt, Concord Consortium

STROUD WATER RESEARCH CENTER

LimnoTech Water Environment | Scientists Engineers

azavea

THE ACADEMY OF NATURAL SCIENCES of DREXEL UNIVERSITY

UNIVERSITY of WASHINGTON

UtahState University

Millersville University SEIZE THE OPPORTUNITY

The Concord Consortium

WikiWatershed®

Funding from:

- William Penn Foundation
- NSF DRK12 Grant No. DRL- 1418133 “Teaching Environmental Sustainability - Model My Watershed” 4-year Project
- Past NSF Grant: DRL #0929763
- Stroud Water Research Center
- Virginia Wellington Cabot Foundation
- The Dansko® Foundation
- Generous donations from Peter Kjellerup and Mandy Cabot

STROUD WATER RESEARCH CENTER

WILLIAM PENN FOUNDATION

NSF National Science Foundation WHERE DISCOVERIES BEGIN

WikiWatershed®

What is WikiWatershed®?

A web toolkit to support citizens, conservation practitioners, municipal decision-makers, researchers, educators, students to collaboratively advance knowledge and stewardship of our environment and fresh water.

Stroud Water Research Center 50 Years Est. 1967

WikiWatershed® *Current and Developing Resources*

Model My Watershed®– Watershed-modeling Web app to analyze real geo-data, model storms and compare conservation or development scenarios in your watershed.

Monitor My Watershed® –Web-based interactive map for discovery, visualization, and sharing of data and resources to assist monitoring using low-cost approaches.

- **Runoff Simulation**– Animated learning tool for Model My Watershed.
- **EnviroDIY™** – Community of do-it-yourself enthusiasts sharing open-source ideas for environmental science and monitoring.
- **Leaf Pack Network®** - International network of stream macroinvertebrate monitoring data and educational resources.
- **Water Quality App™** - Data collection tool for tablets and smartphones for chemical, physical, and macroinvertebrate monitoring data. Includes digital field guide for macroinvertebrates and learning tools for other measurements. Available from Google Play and iTunes.

STROUD WATER RESEARCH CENTER 50 YEARS Est. 1967

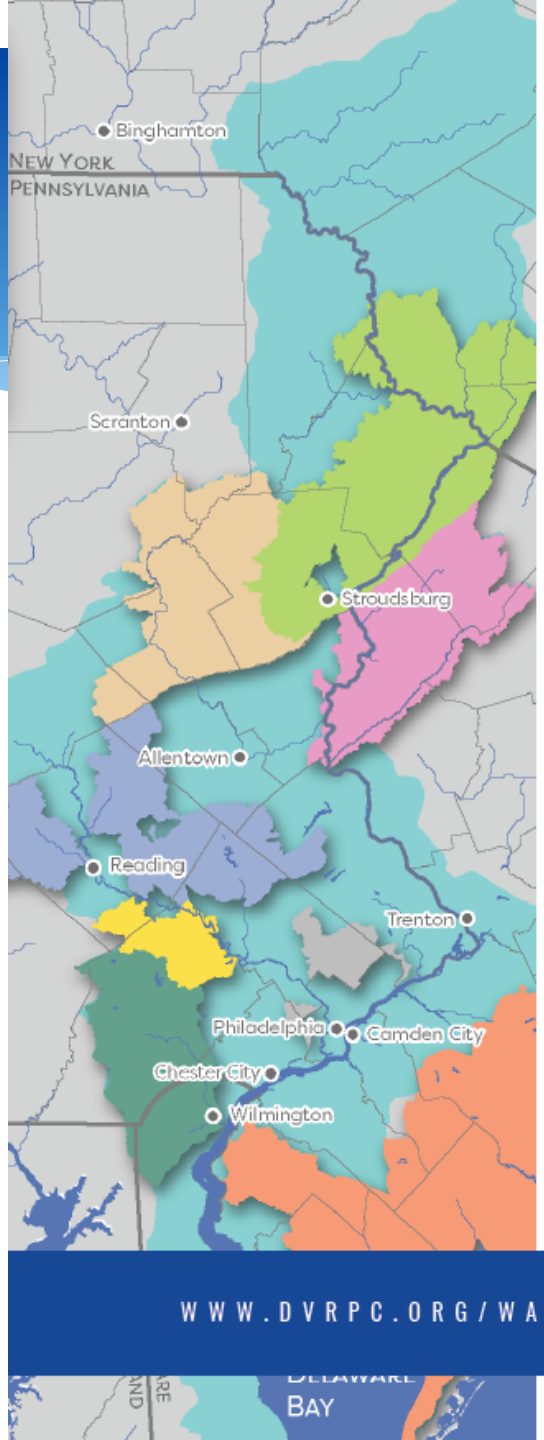
Updates from Work Group Members

Updates

- Anything you would like to share with the group?
  - Projects
  - Data Sets
  - Opportunities for Coordination
  - Questions / Something you need help with
  - Upcoming Events of Interest
  - Job Openings

Meeting Wrap Up & Evaluation

Help Desk



NEED MAPS, DATA, OR MODELING FOR YOUR DRWI EFFORTS?

The Help Desk is here to help!

Are you a nonprofit working to improve water quality in the Delaware River Watershed? Do you need maps, data, or help with Geographic Information Systems (GIS) and/or modeling?

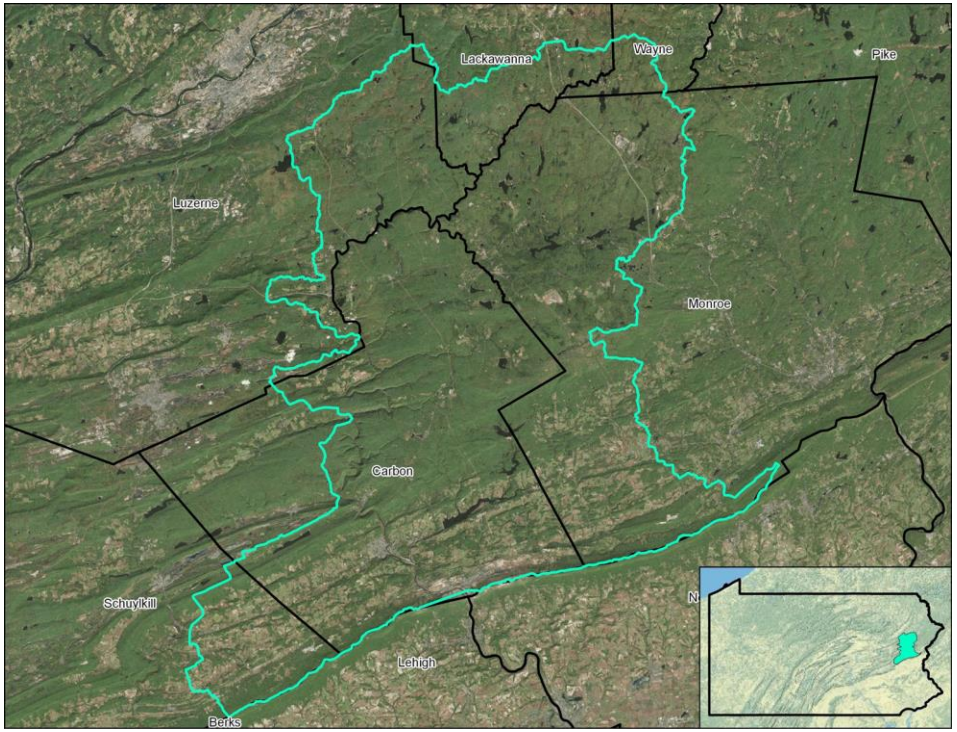
The DRWI Data, GIS, and Modeling Work Group's Help Desk is here for you! Simply submit your request via the Help Desk Request Form: www.dvrpc.org/waterquality/DataGIS.

There is no cost to you to receive these mapping services. The funding to cover these requests is provided by the William Penn Foundation as part of the Data, GIS, and Modeling Work Group funding.

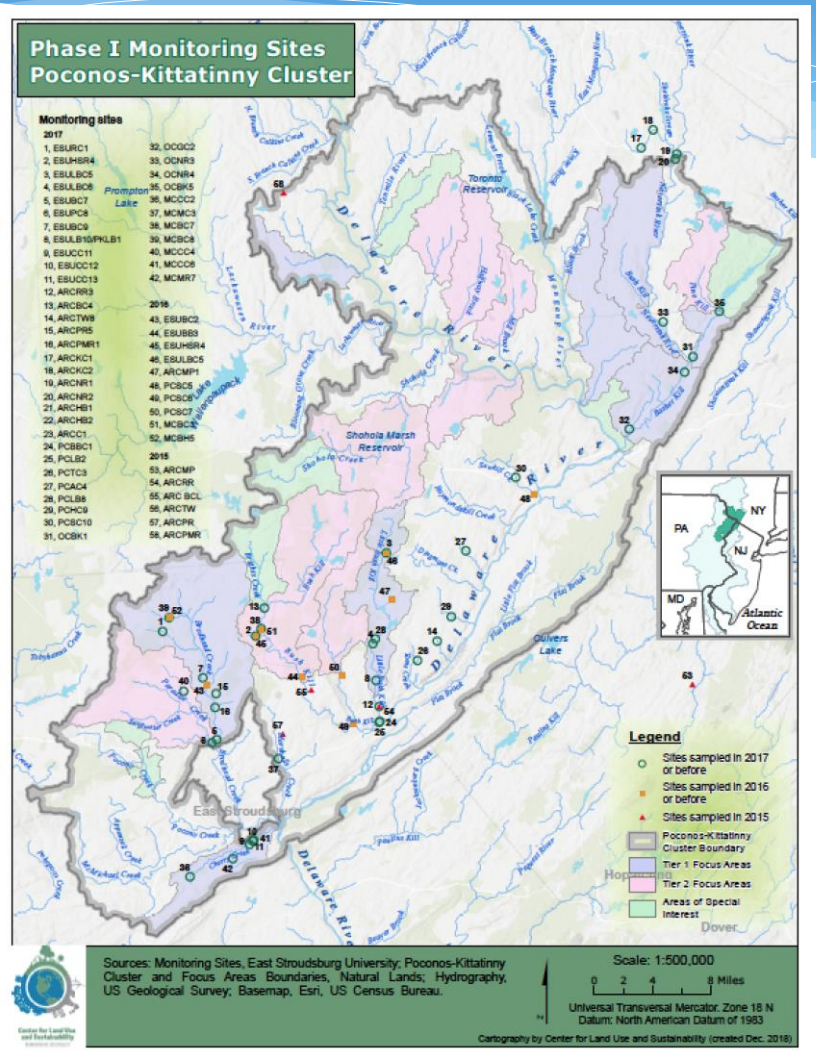
DRWI
Data, GIS, & Modeling
Work Group
dvrpc

WWW.DVRPC.ORG/WATERQUALITY/DATAGIS/

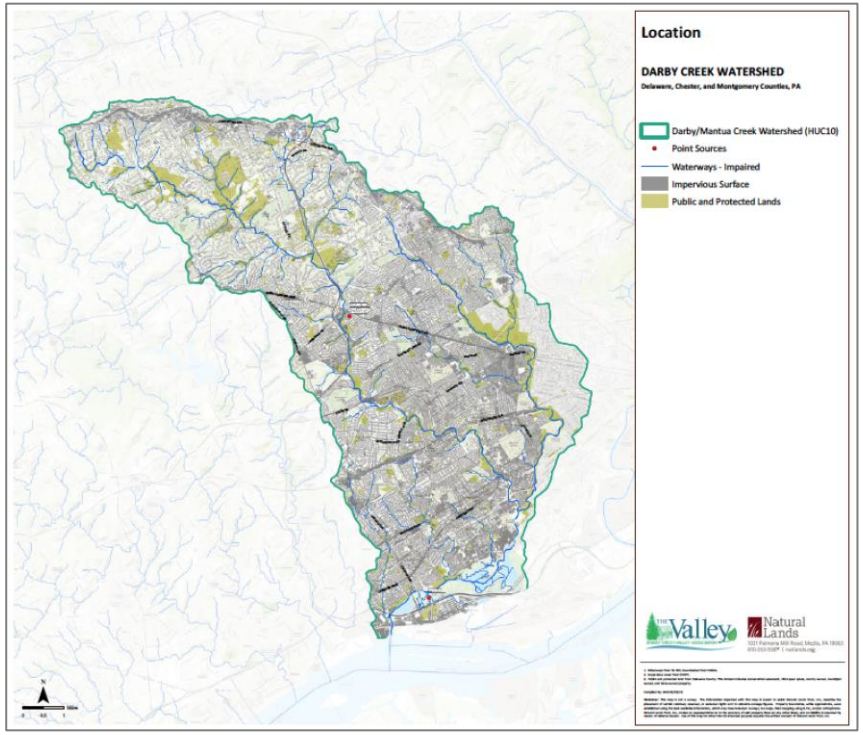
Client: Audubon Pennsylvania
Mapmaker: PALTA



Client: Poconos-Kittatinny Cluster
Mapmaker: Shippensburg



Client: Darby Creek Valley Association
Mapmaker: Natural Lands



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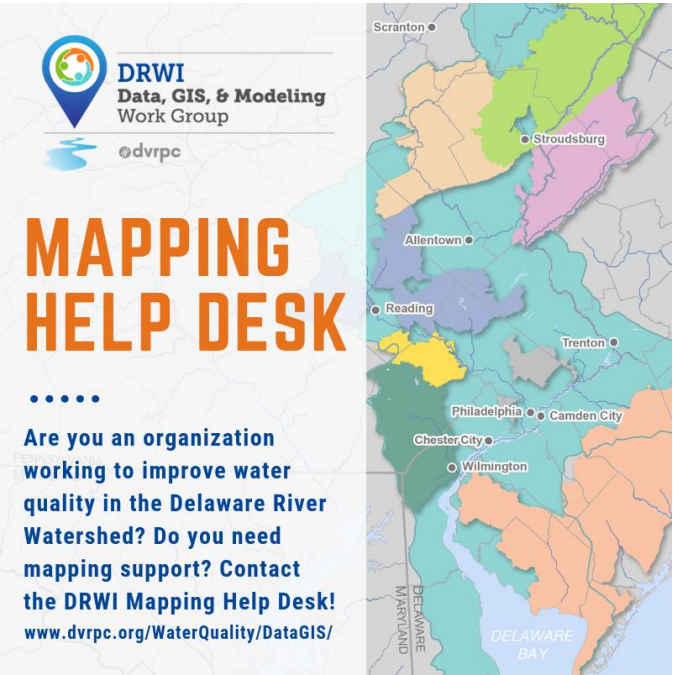
Mapmaker: Natural Lands

Spread the word about the Help Desk!

- https://www.dvrpc.org/waterquality/DataGIS/
- "Help Desk Request Form"



Upcoming Webinars

May 3, 2019: Storytelling with Maps

Meeting Evaluation

Evaluations

DRWI
DATA, GIS, & Modeling
Work Group
dvrpc

Meeting Date: April 9, 2018

Help us find out what worked and what didn't work about today's meeting

1. **Please rate the overall quality of the Work Group meeting.**

	1	2	3	4	5	
Low quality	○	○	○	○	○	High quality

2. **Was the Work Group meeting a good use of your time?**

	1	2	3	4	5	
Not a valuable use of my time	○	○	○	○	○	Excellent use of my time

3. **What did you like best about the Work Group meeting?**

4. **What could have been improved about the Work Group meeting?**

5. **Do you have suggestions for the Work Group that would help us achieve the group's objectives?**

6. **Would you be able to attend a Work Group meeting on the following dates?**
Check all that apply.

____ Monday, July 9, 2018
____ Friday, July 13, 2018
____ Monday, July 16, 2018
____ Monday, July 23, 2018
____ Tuesday, July 24, 2018
____ Tuesday, July 27, 2018

Please join us for lunch!

http://espressoandcream.com/2012/08/vegetarian-lasagna-with-goat-cheese-and-summer-squash.html

Thank you!

https://www.dvrpc.org/waterquality/DataGIS/

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215-238-2890