

# Natural Gas Development in the Delaware River Basin

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# Delaware River Basin



# Delaware River Basin Facts

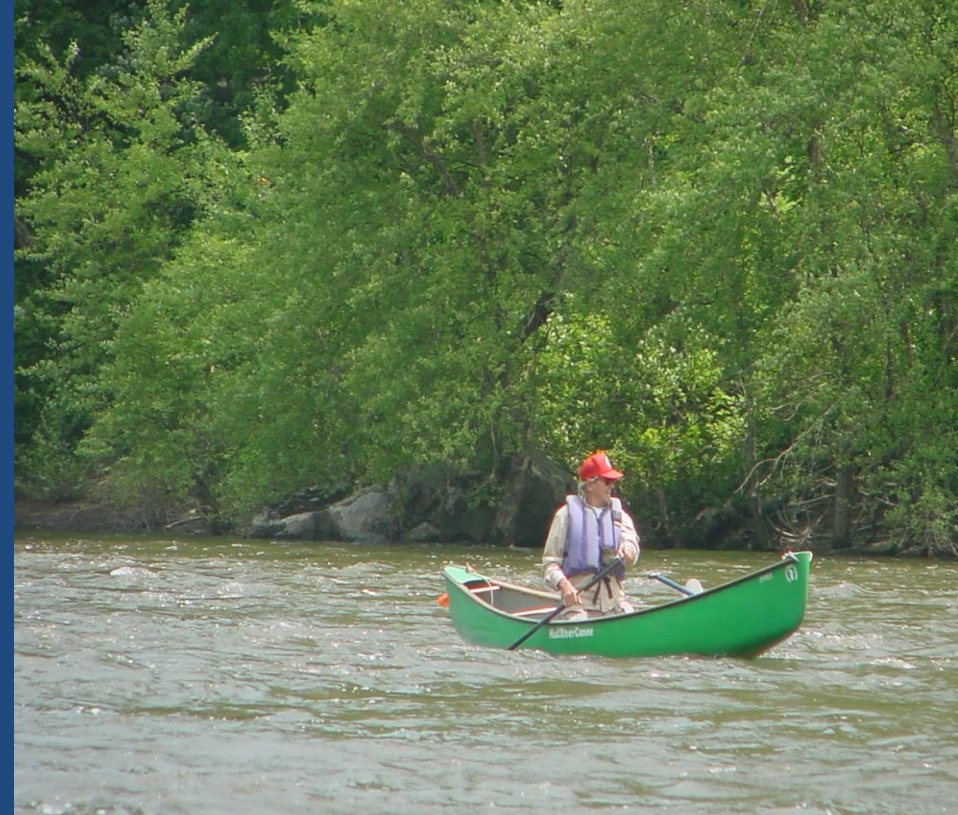
- ❑ Over 15 million people (about 5% of the U.S. population) rely on the waters of the basin for water supply
- ❑ Drains 13,539 mi<sup>2</sup>
- ❑ Daily water withdrawal in the DRB = 8.7 BGD

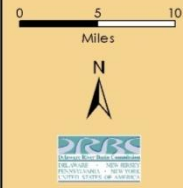


# Delaware River

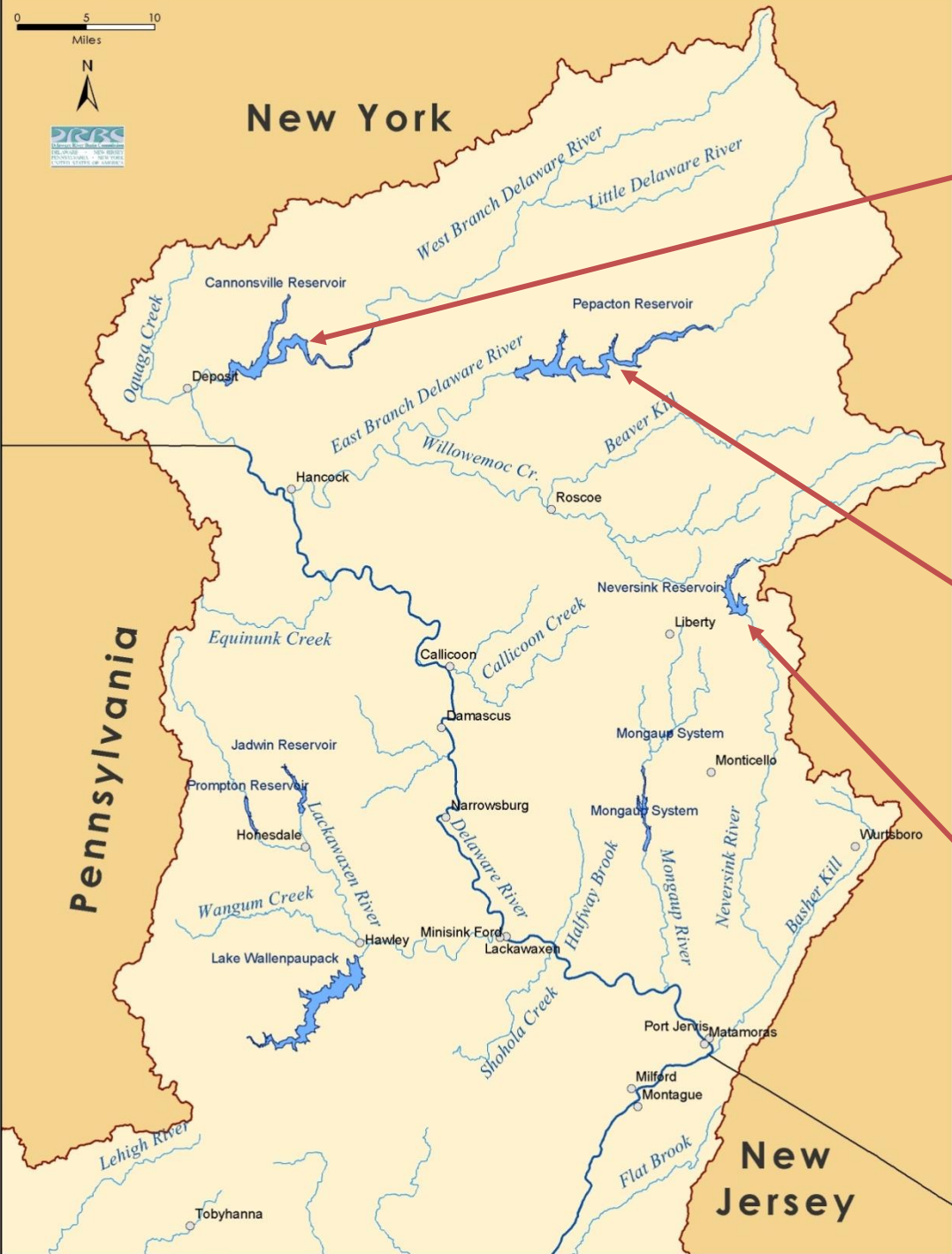
**Longest Undammed River  
East of the Mississippi**

**330 miles**





# New York



Photos Courtesy NYC DEP

## Delaware River Port Complex – Largest Fresh Water Port



# Delaware River Basin Commission



# DRBC's Charge

- Manage water resources w/out regard for political boundaries
- Regulate water quantity (equitably allocate, maintain streamflow) and water quality
- Plan and Develop (e.g., Basin Plan 2004; State of the Basin Report 2008; stored water)
- Coordinate between federal, state & local governments and private entities w/ role in managing water resources
- Educate the Basin community about water resources
- **Forum for adaptive management**

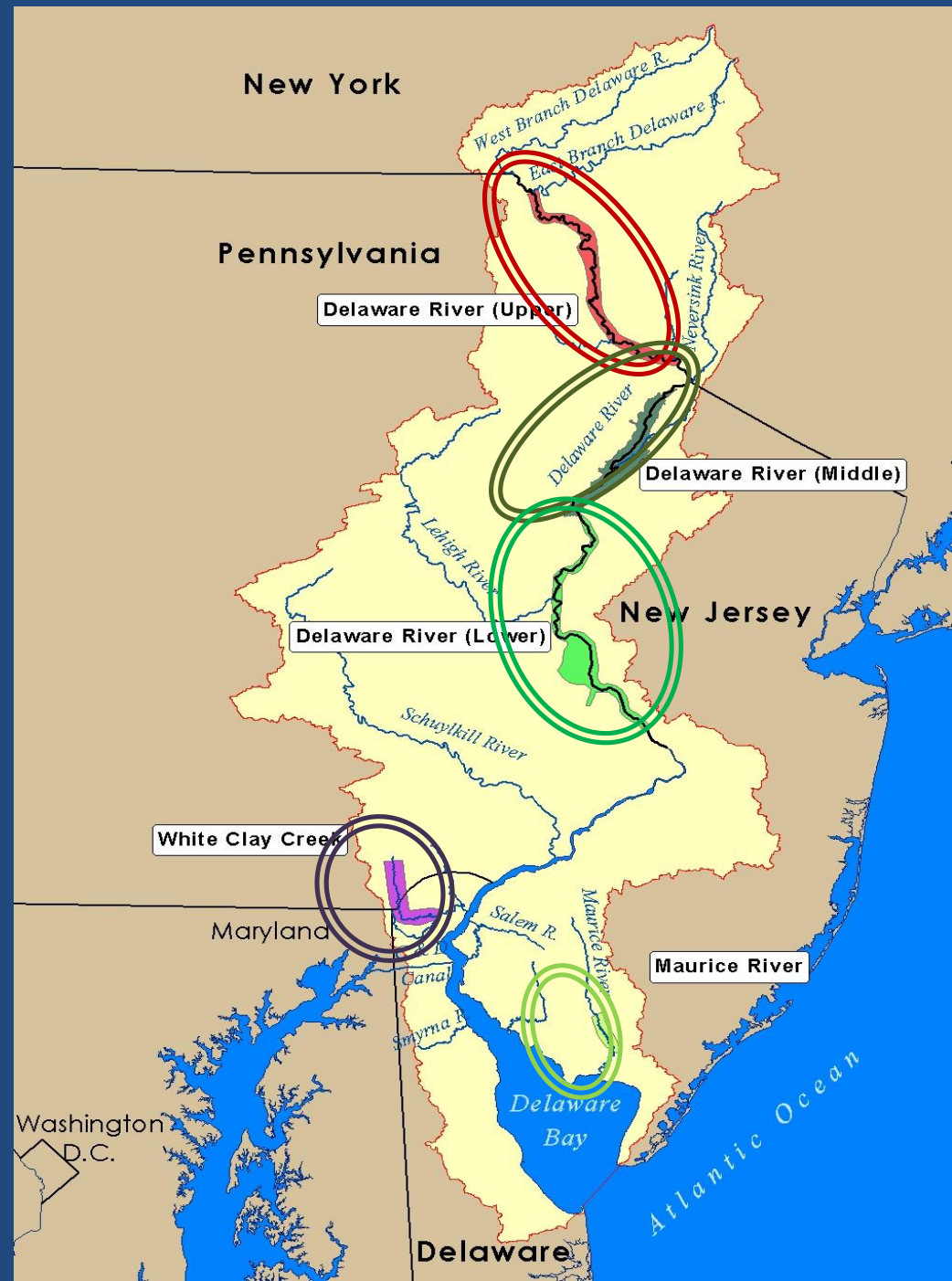


# DRBC Value Added

- Manages the watershed holistically
- Provides a voice for individual states and federal agencies on use of the shared resources
- Evaluates benefits and costs of any proposals to all parts of the basin
- Fills in gaps where states do not have authority (water withdrawal)
- Creates a uniform baseline of regulations for the shared waters
- Cost effective allocation of funds

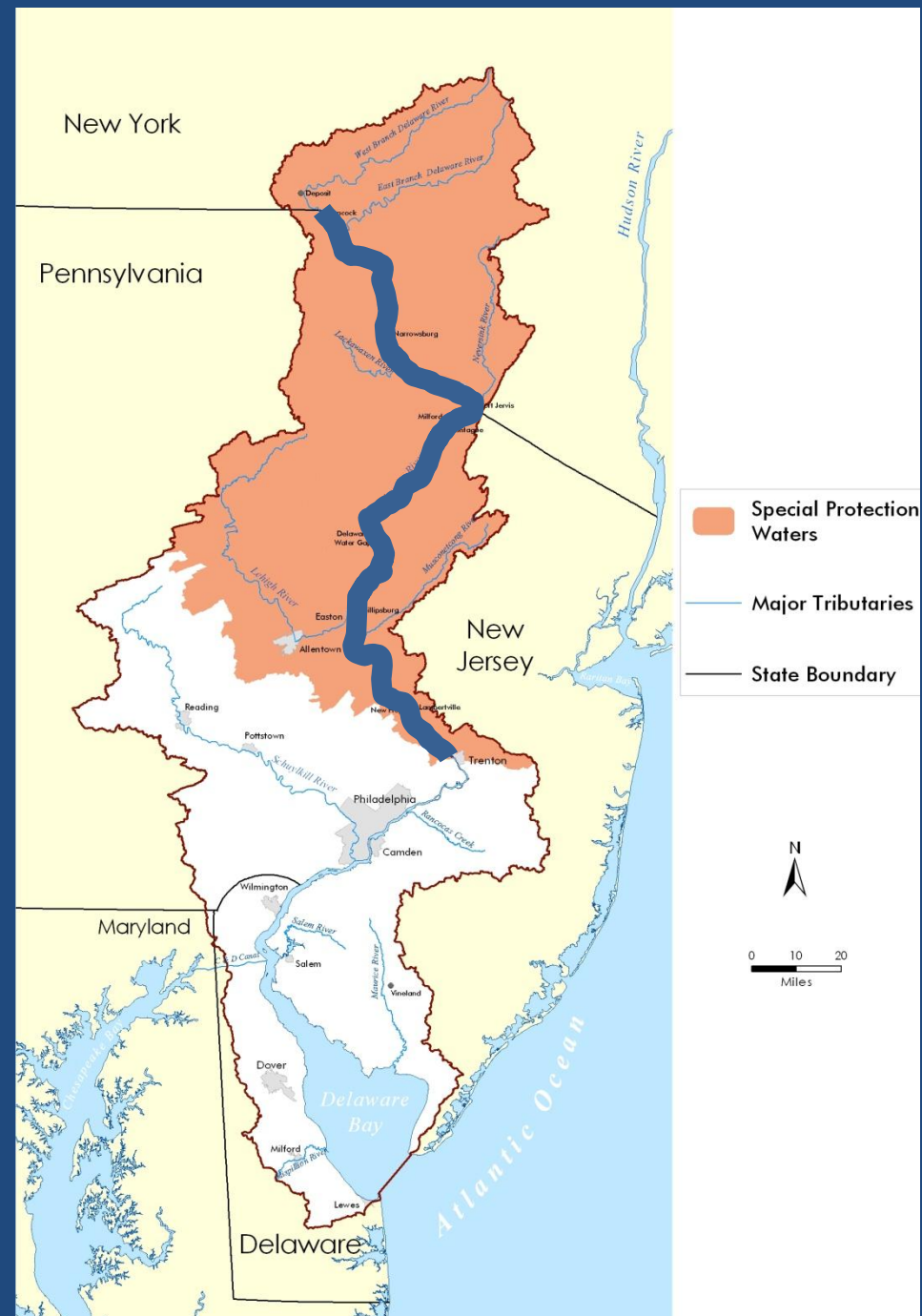
# Outstanding Regional Resource

- Undammed River
- Exceptional water quality
- High ecological diversity
- ~75% of the non-tidal river is part of the National Wild and Scenic Rivers System



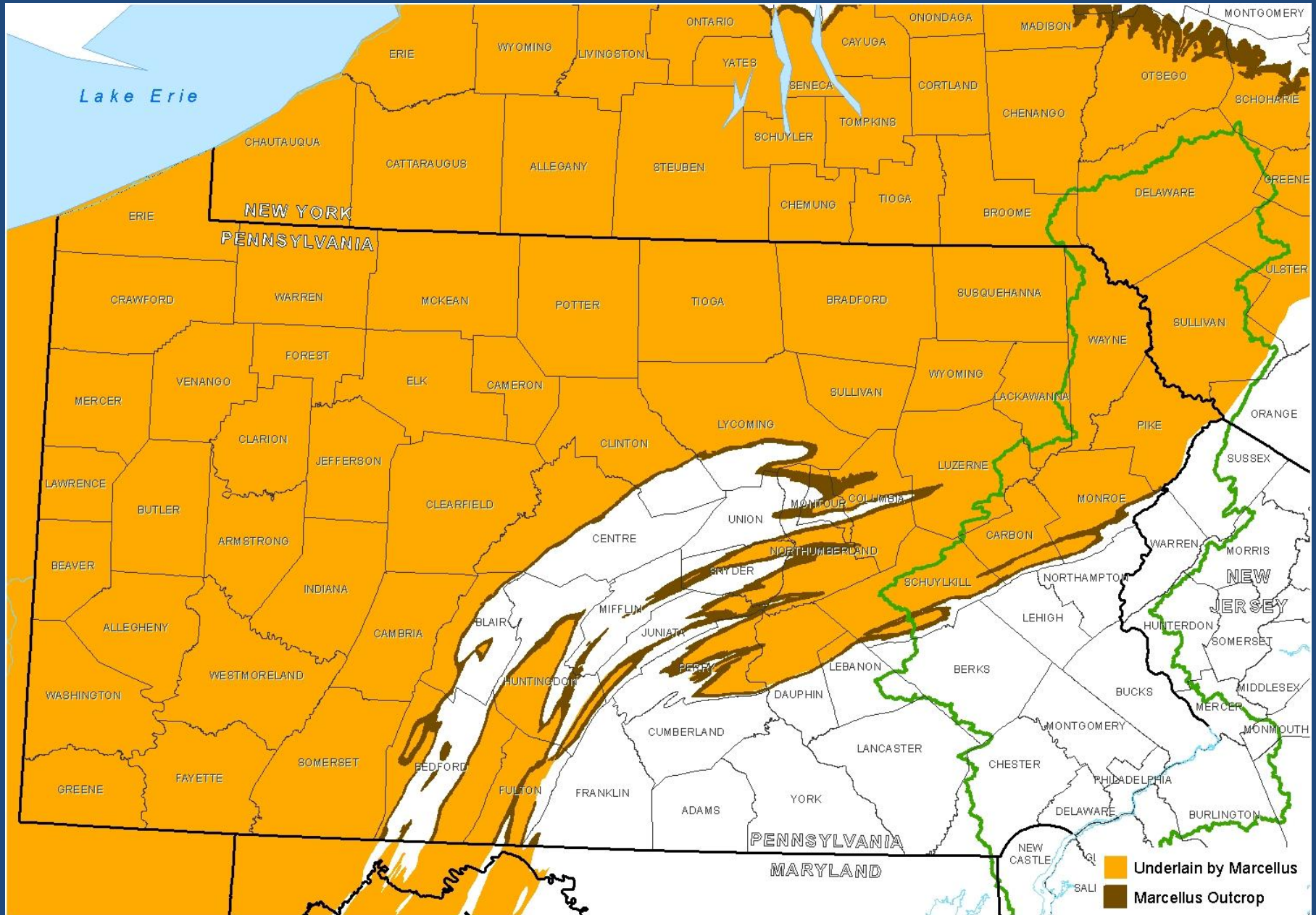
# Water Quality

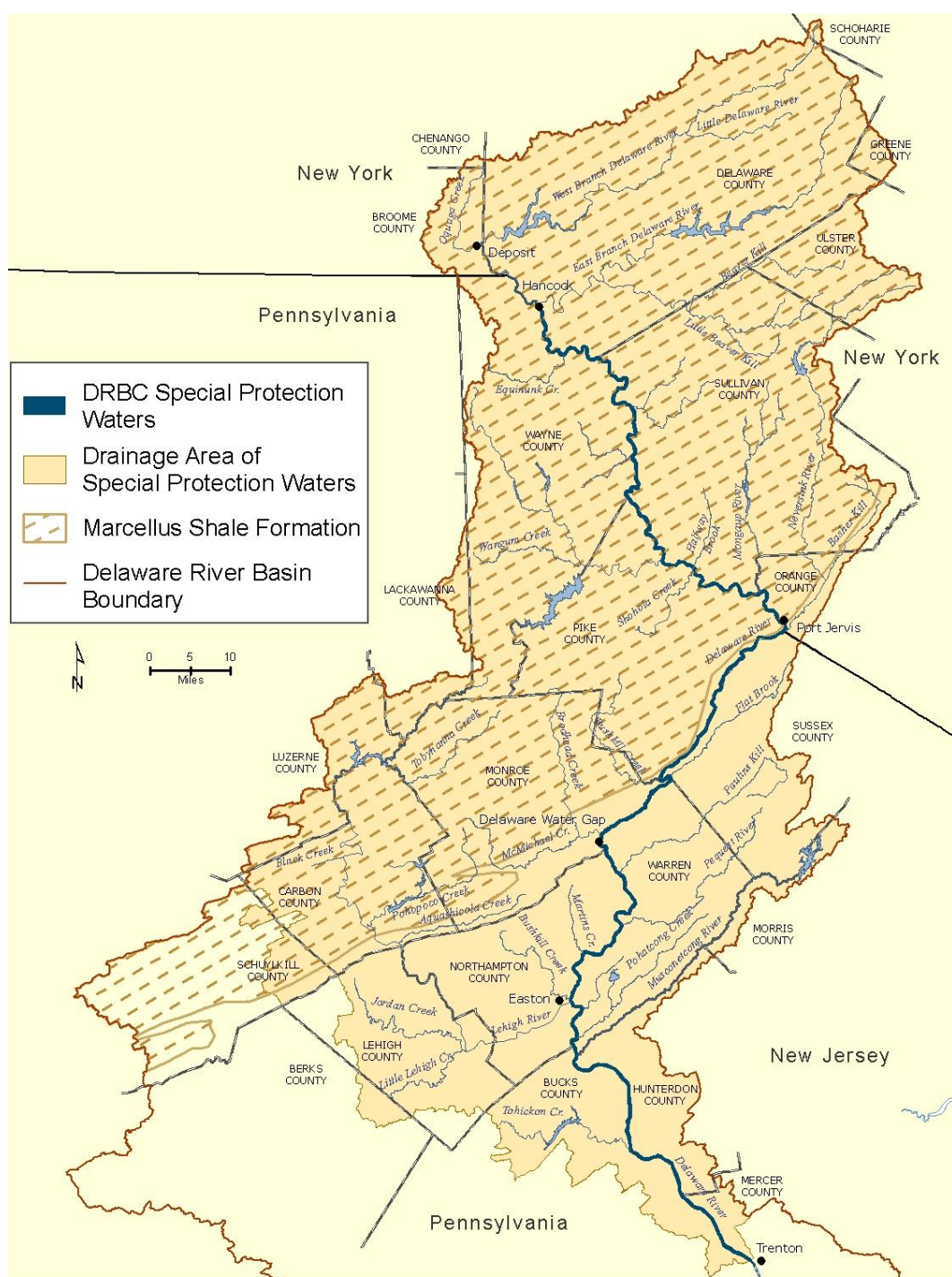
- ❑ Federal Wild and Scenic River Designation –  $\frac{3}{4}$  of non-tidal river
- ❑ Total non-tidal river and its watershed designated DRBC Special Protection Waters
- ❑ Mainstem = longest stretch of anti-degradation waters in U.S.
- ❑ No measurable change in water quality





# Marcellus Shale, Delaware Basin Boundary





# Marcellus Shale and Special Protection Waters

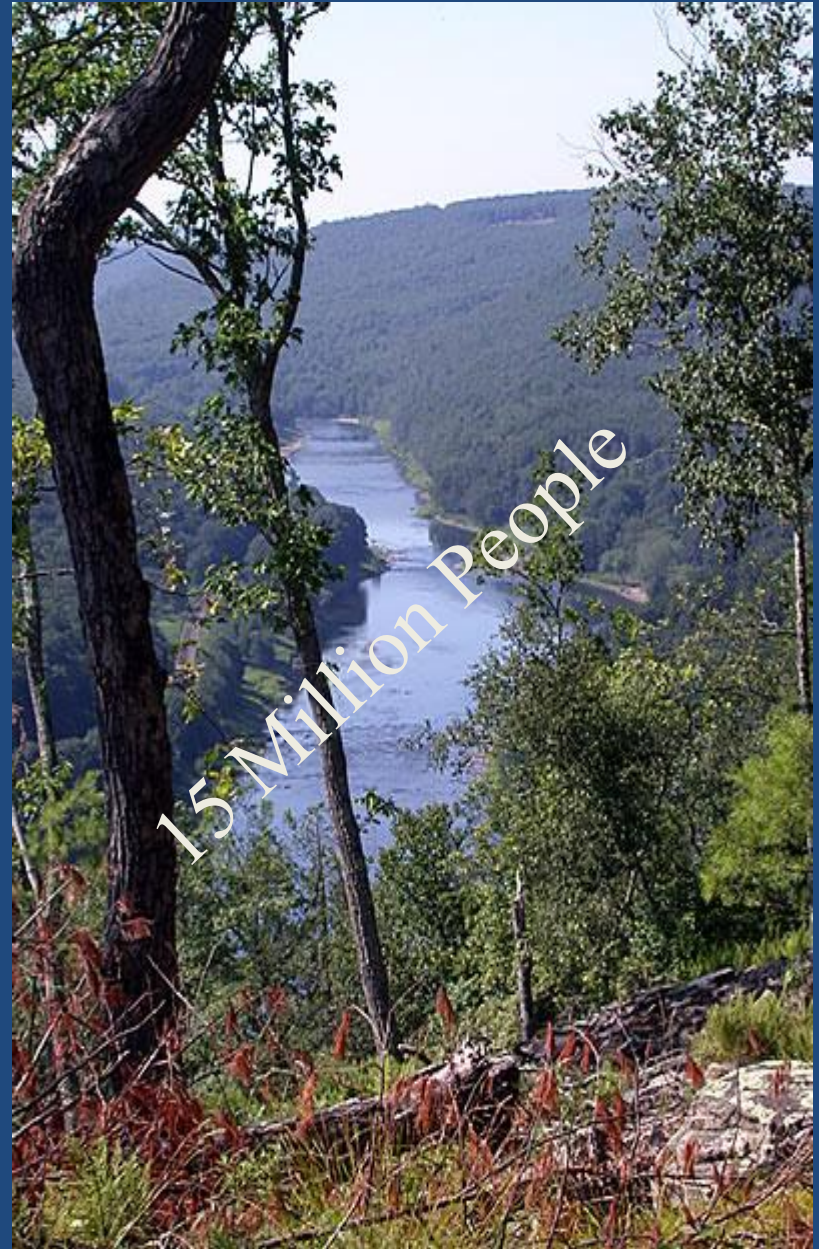
36% (4,937 mi<sup>2</sup>) of the Delaware Basin is underlain by the Marcellus Shale

# Two Value Sets

- NG – national, state, local value
  - security, economy
- Environment and Community
  - Sensitive Environments
  - Major Water Supply
  - Tourism Economic Base
  - Very different environment for TX, OK, etc.

# Vulnerability of Headwaters

- Headwaters are the most sensitive areas of a watershed
- Existing contiguous forest is critical to water quantity and quality
- Philadelphia Source Water Protection Analysis
  - #1 – Change in Delaware River Headwaters





# Regulation Development

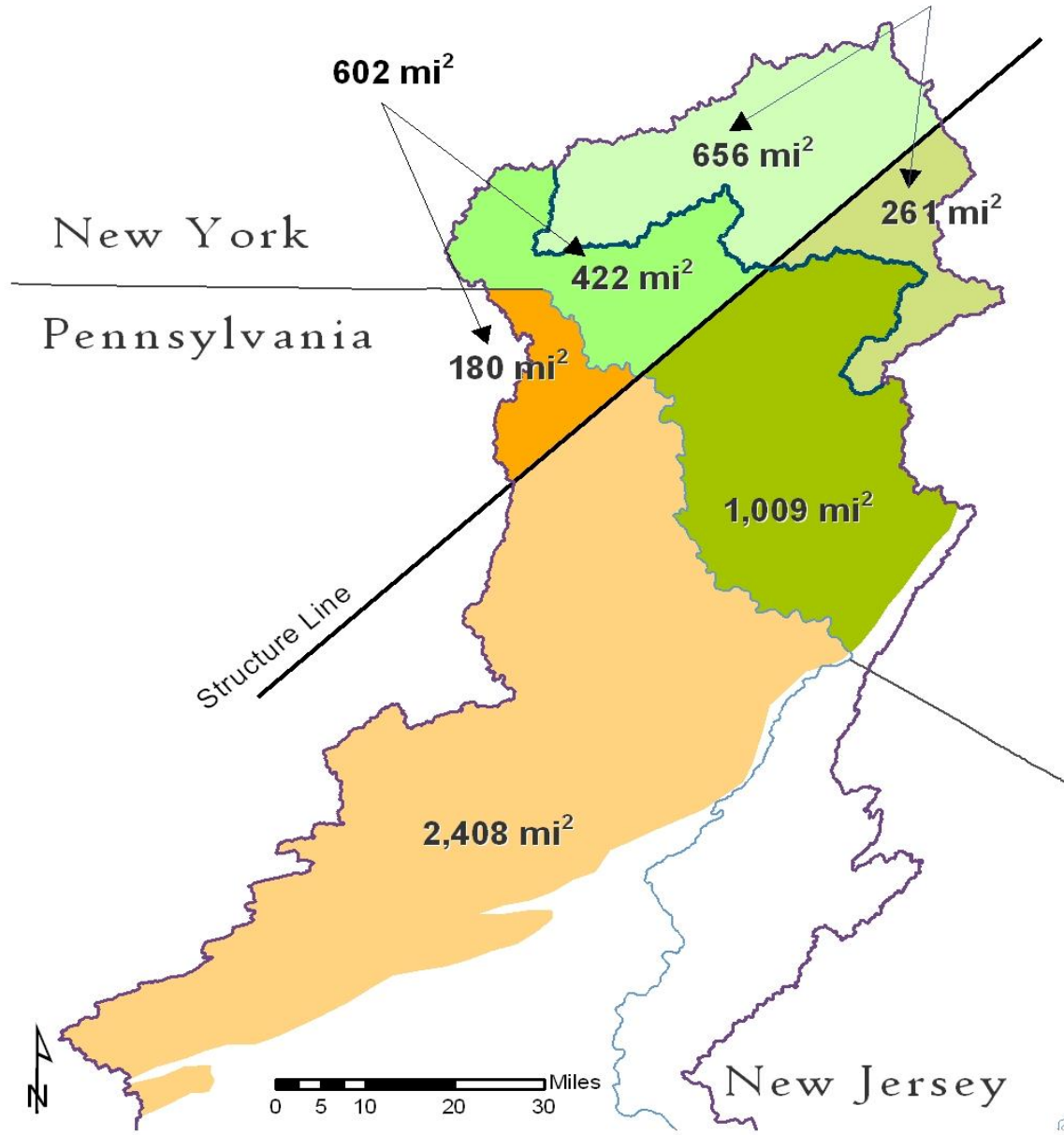
- May, 2010 - Commissioners requested staff to develop draft regulations
- December, 2010 – Draft Regulations Posted
  - Started Public Review process with hearings
- April, 2011 – Comment period Closed –
  - 69,000 comments
- Latest Version of Regulations
  - posted November, 2011

# Concerns

1. Water Withdrawals, Use, and Tracking
2. Well Pads and Ancillary Infrastructure
3. Wastewater Tracking and Disposal



# AREA ESTIMATES



PA 2588 miles<sup>2</sup>

NY 2348 miles<sup>2</sup>

NYC Watershed 917 miles<sup>2</sup>

Structure Line

# Water Withdrawals and Use



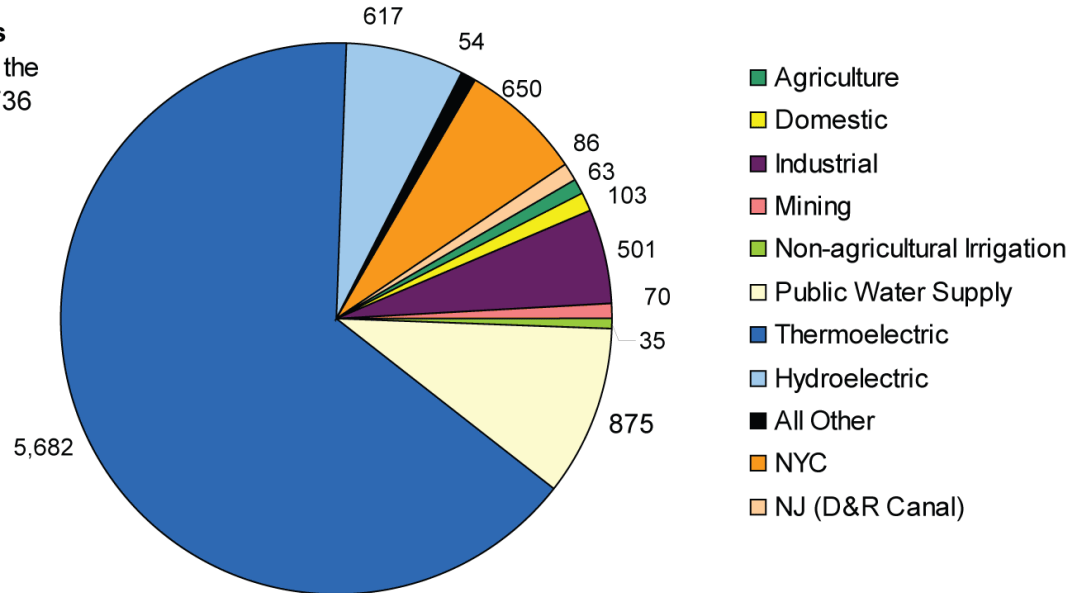
## Projected Needs Over 10-20 Years:

- 5 million gallons per horizontal well stimulated
- 24-90 BG w/ no recycling
- 21-77 BG – assuming 95% reuse of initial flowback water
- Limerick Generating Station  
56 MGD; 1.74 BG/month

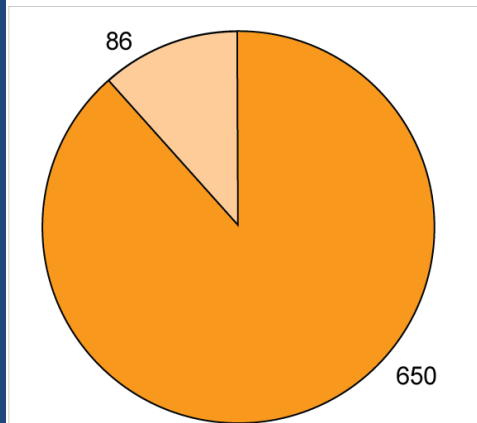
# Basin water usage

## Daily Water Withdrawals, Exports and Consumptive Use in the Delaware River Basin

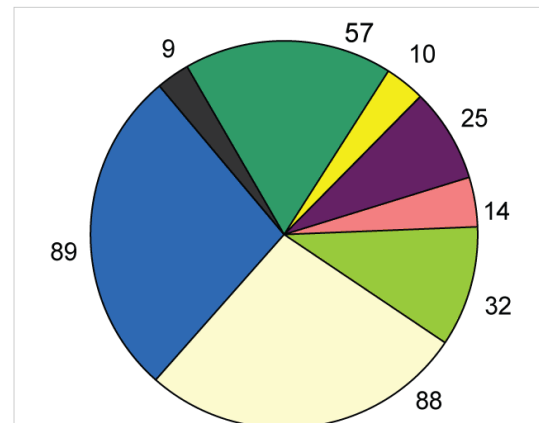
**Total Water Withdrawals**  
(ground and surface) from the Delaware River Basin: 8,736 mgd



Major **Exports** from the Delaware River Basin: 736 mgd



**Consumptive Use** in the the Delaware River Basin: 324 mgd



Pie chart values in mgd  
(million gallons per day)

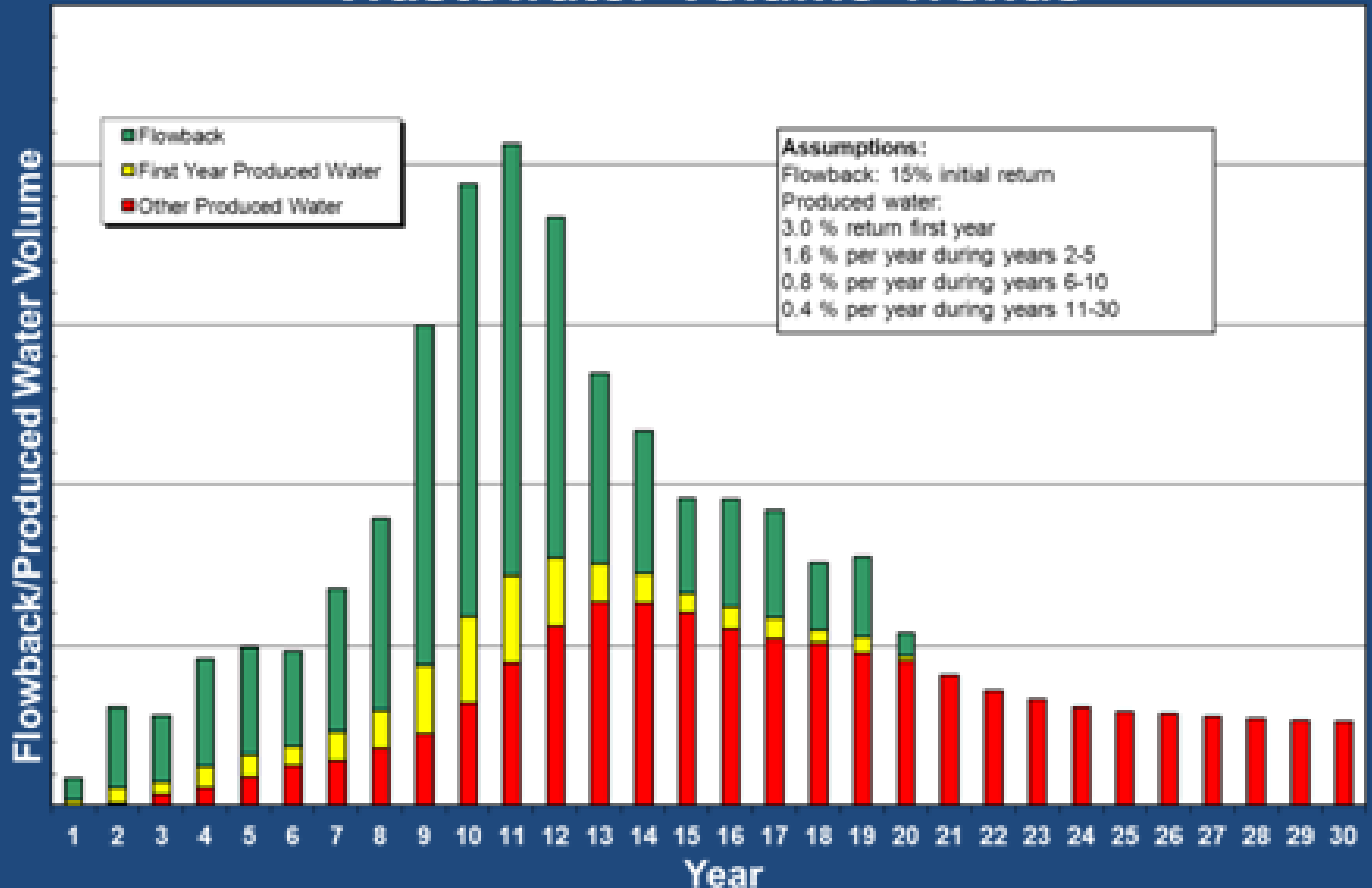
# Wastewater Disposal

## Wastewater “Treatment” & Disposal

- Initial Flowback –  
15% of frac volume  
= 0.75 MG per well
- 3.6 - 14 BG over 10-  
20 years
- Treatment capacity  
and capability  
currently lacking

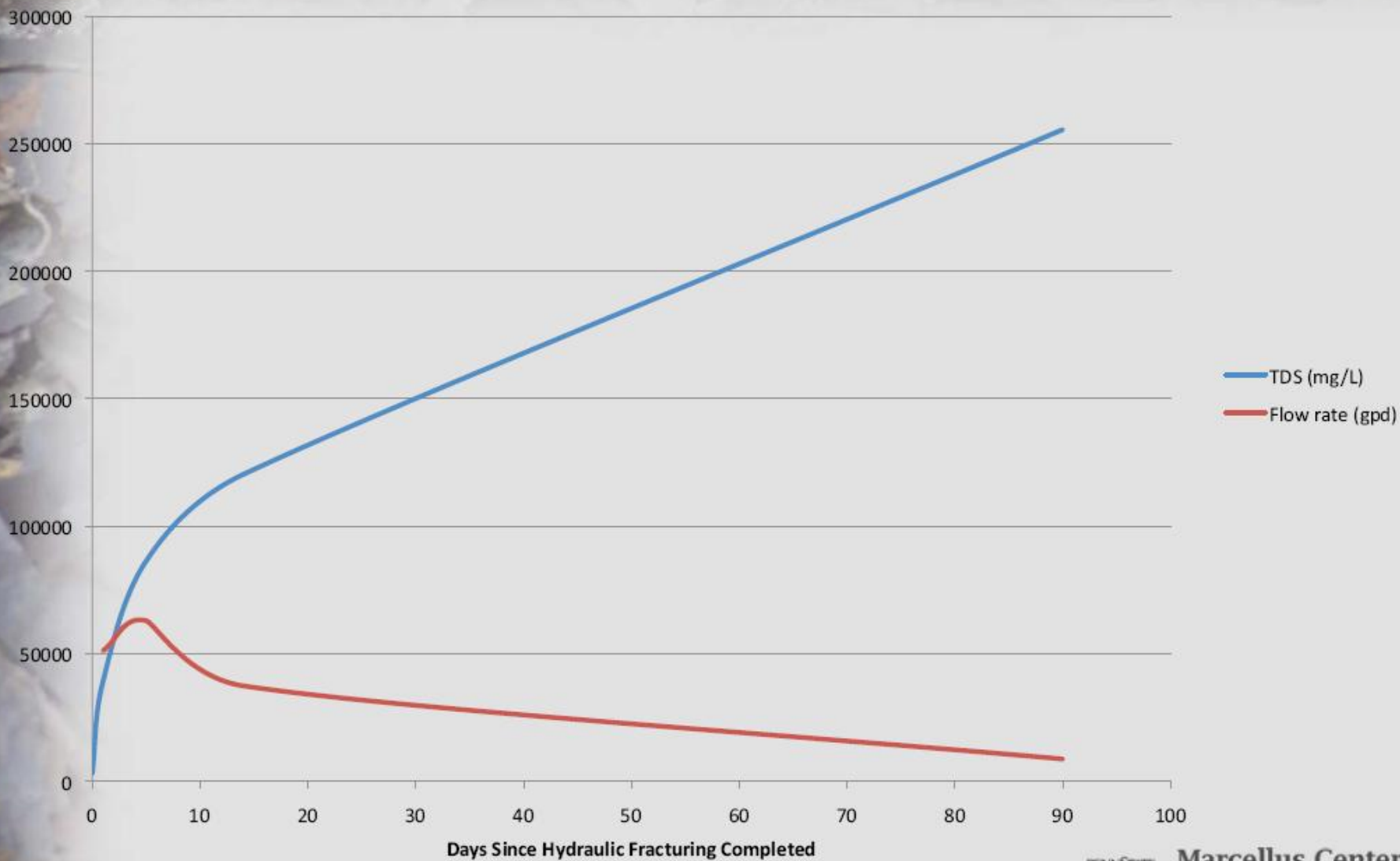


# Wastewater Volume Trends



# Flowback Water Quality Trends

## Average Flowback TDS Concentration and Discharge Rate vs. Time





# Article 7 Natural Gas Rule Strategy

## 1. WATER WITHDRAWAL & USE

- Protect surface and groundwater supplies
- Preserve ecological flows
- Ensure assimilative capacity for discharges
- Monitoring, Tracking & Reporting Source & Usage
- Manage Wastewater Storage & Discharge



## 2. NATURAL GAS DEVELOPMENT PLANS

- Evaluates alternatives to minimize Impacts
- Siting/setback Limits
- Mitigation of unavoidable impacts
- Financial assurance requirements

## 3. WASTEWATER TREATMENT & DISCHARGE

- Protect receiving water bodies
- Track wastewater production, reuse, and disposal
- Ensure adequate treatment is available for expected waste stream

# ARTICLE 7 NATURAL GAS RULE

## FOCUS OF RULE

- CONSOLIDATES REQUIREMENTS INTO ONE ARTICLE
- COMPLEMENTS NY/PA NATURAL GAS PROGRAMS
- RELIES ON NY/PA PROGRAMS AND EXPERTISE TO REGULATE WELL CONSTRUCTION AND OPERATIONS
- APPLIES TO ALL NATURAL GAS WELLS & FORMATIONS
- INCLUDES FINANCIAL ASSURANCE REQUIREMENTS

# ARTICLE 7 NATURAL GAS RULE

## **RULE INCLUDES:**

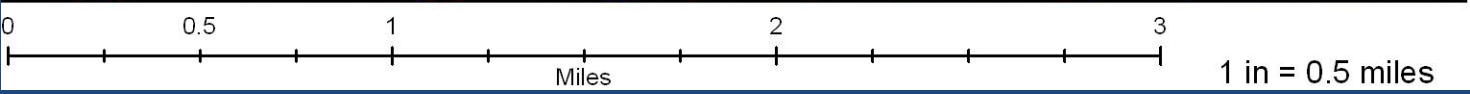
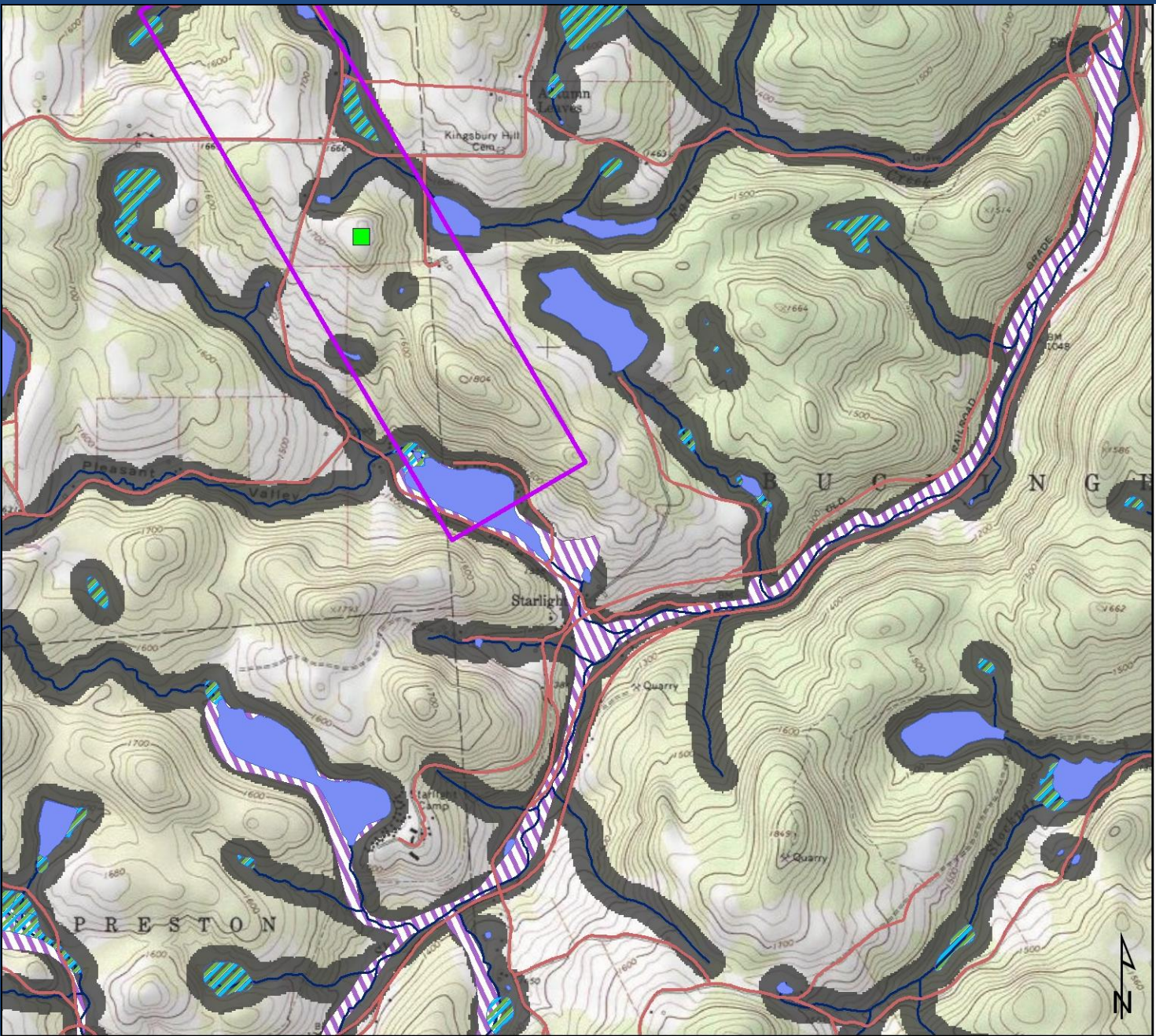
- 18 MONTH ADM. AND OPER. ASSESSMENT
  - Commissioners' Recommendations (6 MONTHS)
  - Bulk Water Use and Management Approvals (BWA) up to 300 wells until Commission approval to resume BWA
- DELEGATES SPECIFIC APPROVALS TO EXECUTIVE DIRECTOR (Approval by Delegated Authority (ADA))

# Natural Gas Development Plan

- Purpose – Reduce cumulative impacts; reduce NG development on landscapes important to water resources
- Review “multiple” pads/wells instead of individually
- Evaluate lease holdings (~ 10,000 - 50,000 acres), or smaller units based on location or timing
- Applicant to develop plan using mapping of constraints and developable areas provided by DRBC
- Optimize locations of proposed well pads and infrastructure and establish mitigation requirements.
- Not saying No, but trying to minimize development of lands most valuable to water resources.

### Legend

- Proposed Well Pad
- Expected Extraction Area
- Roads
- Lakes and Ponds
- NWI Wetlands
- Hydrology
- Floodplain
- 300' Hydro Buffer

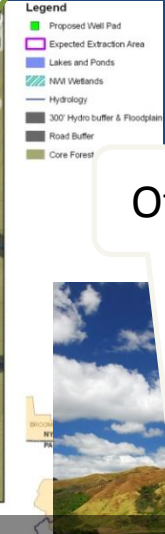
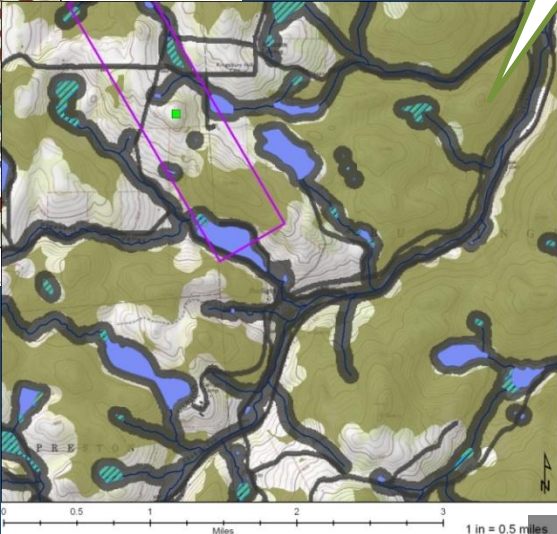
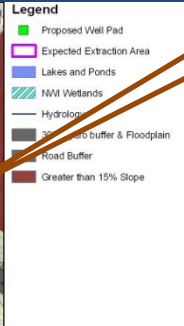
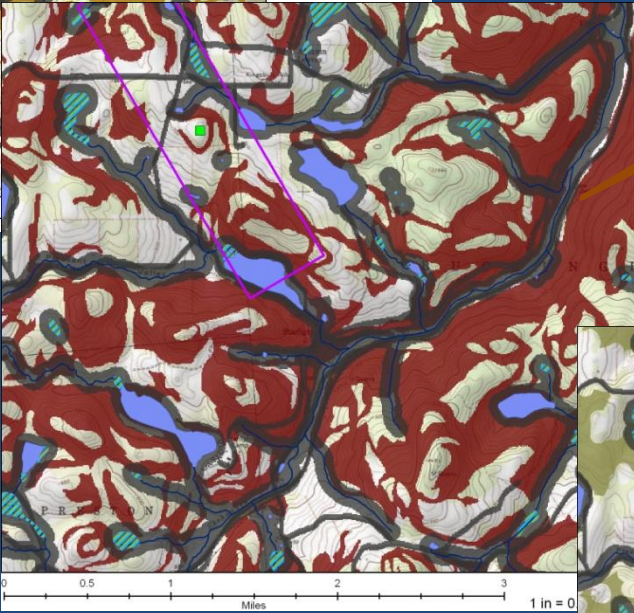
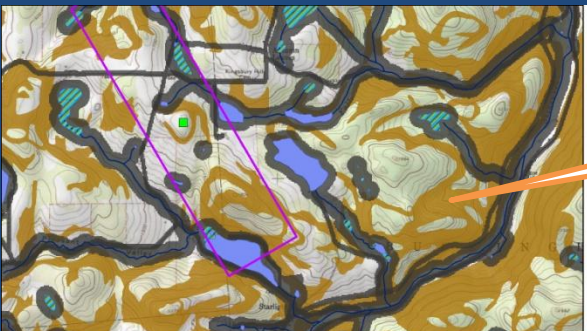


Highly Erodible Soils

Steep Slopes

Core Forest

Other Layers

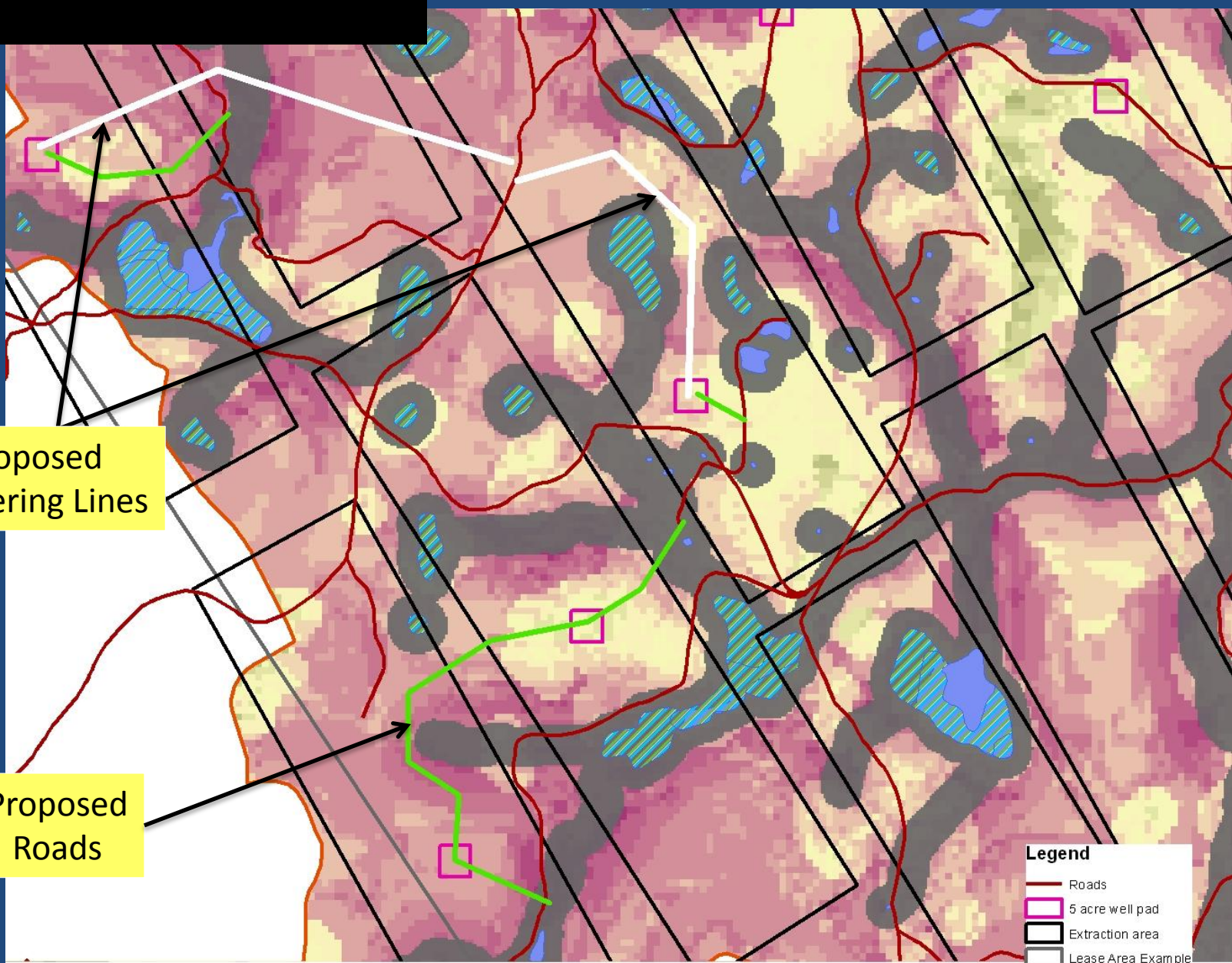
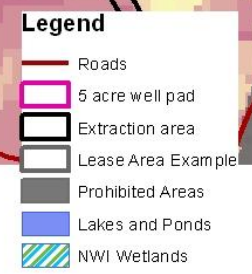
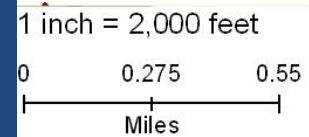


These layers are combined in GIS to create High Value Water Resource Landscape

Headwater Watersheds  
Hydric Soils  
Forested Riparian Corridor  
Reg. Resource Mgt. Area

Proposed  
Gathering Lines

Proposed  
Roads



# Working with Our Members

- PA has regulations, NY in the process
- Our regulations required to address concerns of all 4 states and federal gov't.
- Will work through AAs with PA and NY states to avoid duplication in implementation.



# DRBC Ambient Monitoring Framework for Natural Gas Development in the Delaware Basin



# DRBC Ambient Monitoring Framework for Natural Gas Development

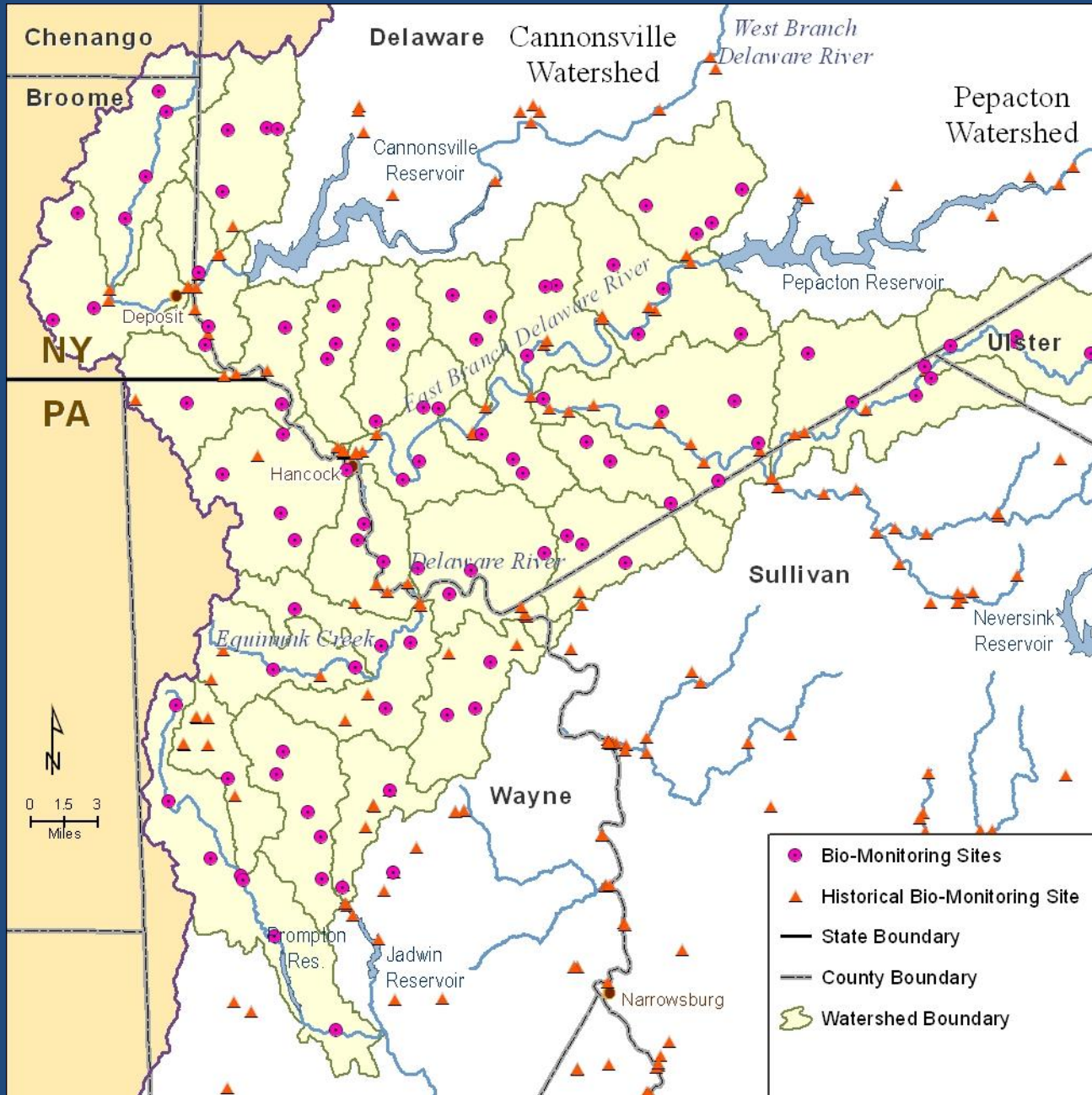
- DRBC Monitoring Activities
  - Biological Monitoring
  - HOBO Loggers
  - Reanalysis of archived samples
  - Toxicity Testing
- Partnerships

# Partnerships

- DRBC
- U.S. Geological Survey
- National Park Service
- PADEP
- NYSDEC
- Stroud University
- Dickinson University
- Delaware Riverkeeper Network
- Academy of Natural Sciences



# Wayne and Delaware County Sub-Watersheds for Spring / Summer 2011 Biomonitoring



# In Summary

- Natural gas play is significant and valuable
- Still many unknowns - environmental, community, infrastructure impacts.
- DRBC's interest is protection of water resources.
- Need to be cautious to protect the existing outstanding resources and economic future of the area.
- DRBC Regulatory Action – Draft Regulations – November 2011 Meeting Postponed
- Commissioners deciding on path forward.