

DRBC Case Study: Southeastern PA Groundwater Protected Area

Lafayette College

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Acknowledgements:

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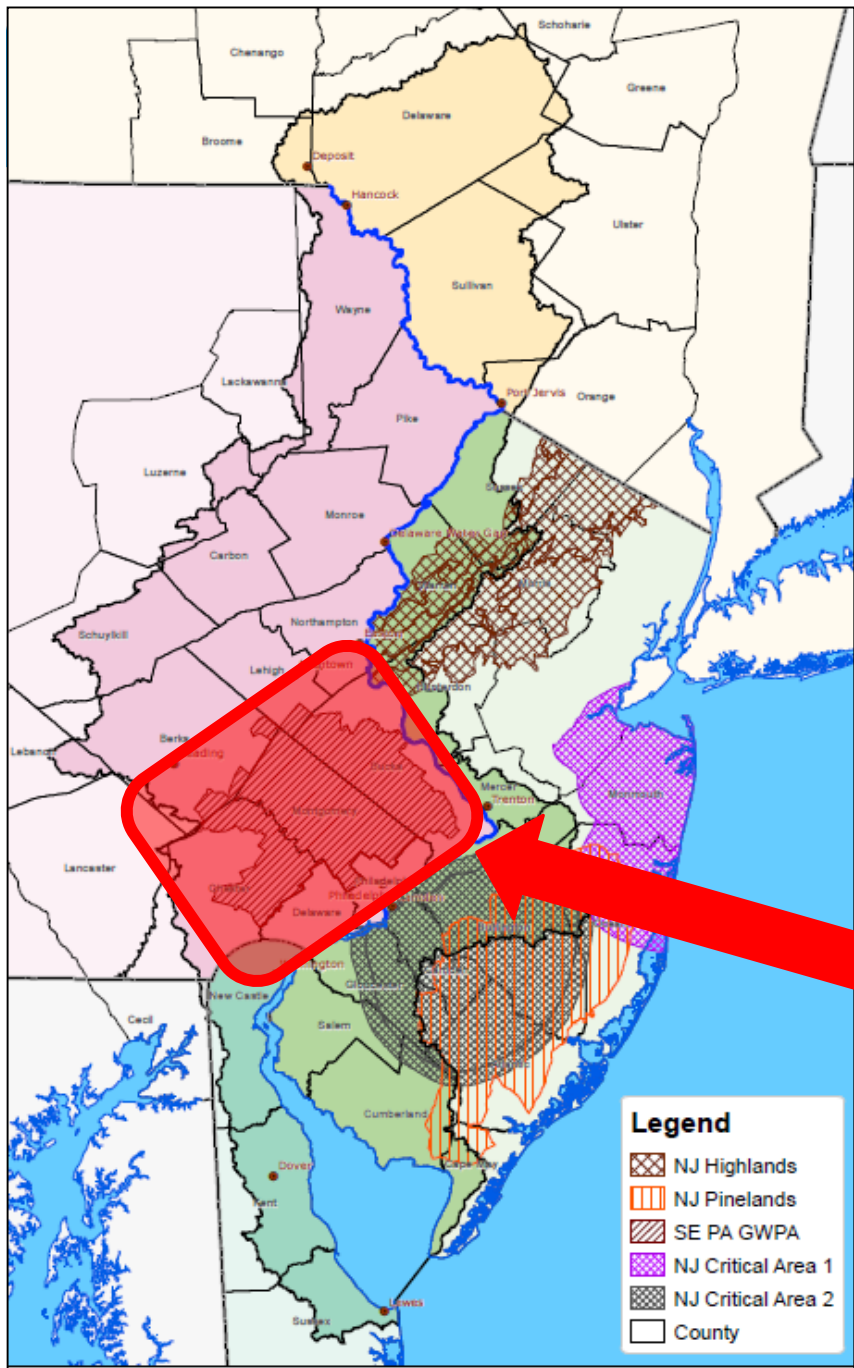


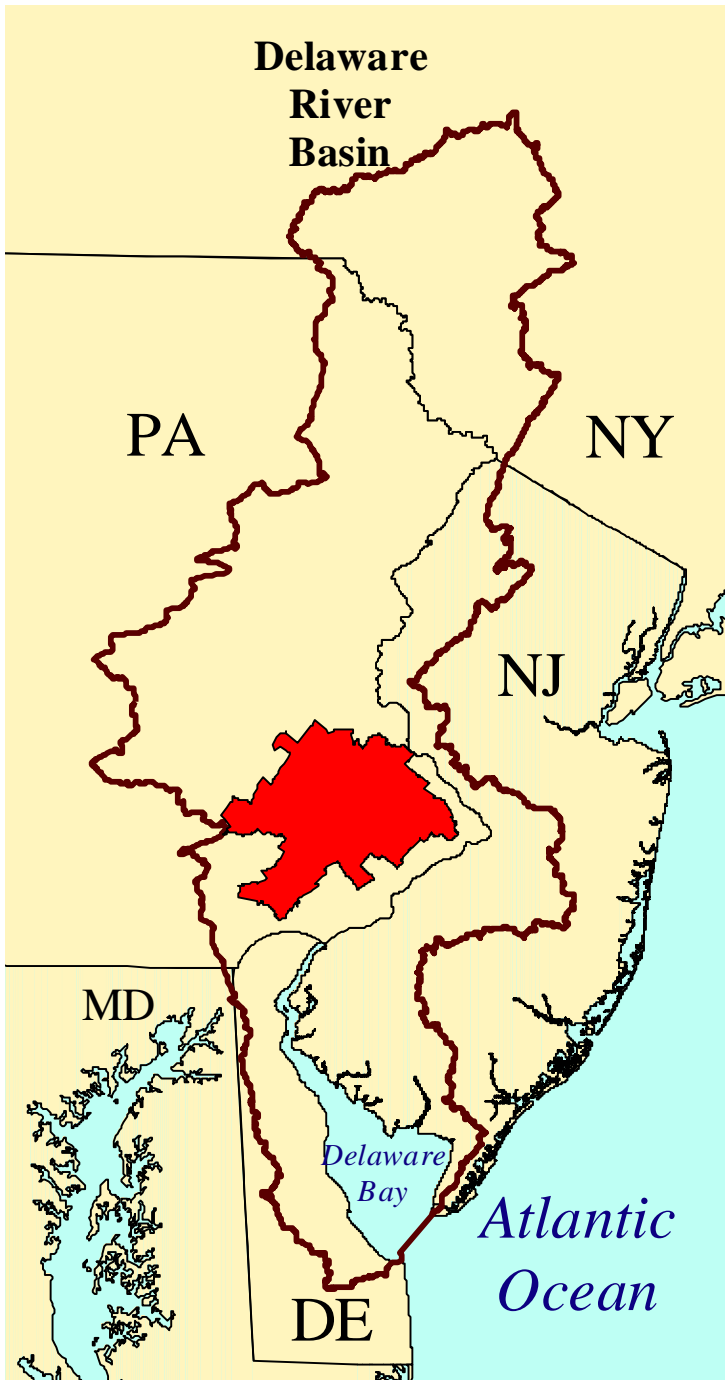
Newtown Artesian Well. Credit: Bob Damiani

Special Groundwater Management Areas of the Delaware River Basin

Usually created to respond to historical issues related to groundwater withdrawals or water resource features of high value.

Southeastern Pennsylvania
Groundwater Protected Area





Southeastern Pennsylvania Groundwater Protected Area

GWPA established in 1980 Due to...

- Increasing population and demand of groundwater resources in southeastern Pennsylvania
- More frequent interference and conflicts among users of the same groundwater resource
- Lowering water levels in streams
- Low recharge rates of the bedrock geology

Key GWPA Dates and Resolutions

- **October 8, 1980: Resolution No. 80-18**
Delineated and declared GWPA in SEPA pursuant to Article 10 of the Compact
- **December 16, 1980: Resolution No. 80-27**
Included additional townships in Chester (East and West Bradford) & Lehigh (Lower Milford) Counties
- **December 22, 1980: Cooperative Agreement with PA**
Commission primary responsibility of oversight of the GWPA
- **January 1, 1981: GWPA Regulations Effective**
- **June 25, 1986: Resolution No. 86-13**
Required groundwater withdrawal metering, recording and reporting to PADEP
- **January 28, 1998: Resolution No. 98-1**
Established numerical withdrawal limits for subbasins – 14 Neshaminy subbasins first
- **June 23, 1999: Resolution No. 99-11**
Established numerical withdrawal limits for subbasins for the remaining 62 Subbasins

Intent of SEPA GWPA Program

Protect groundwater resources by effectively managing water withdrawals to:

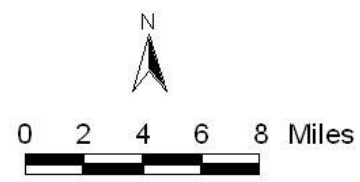
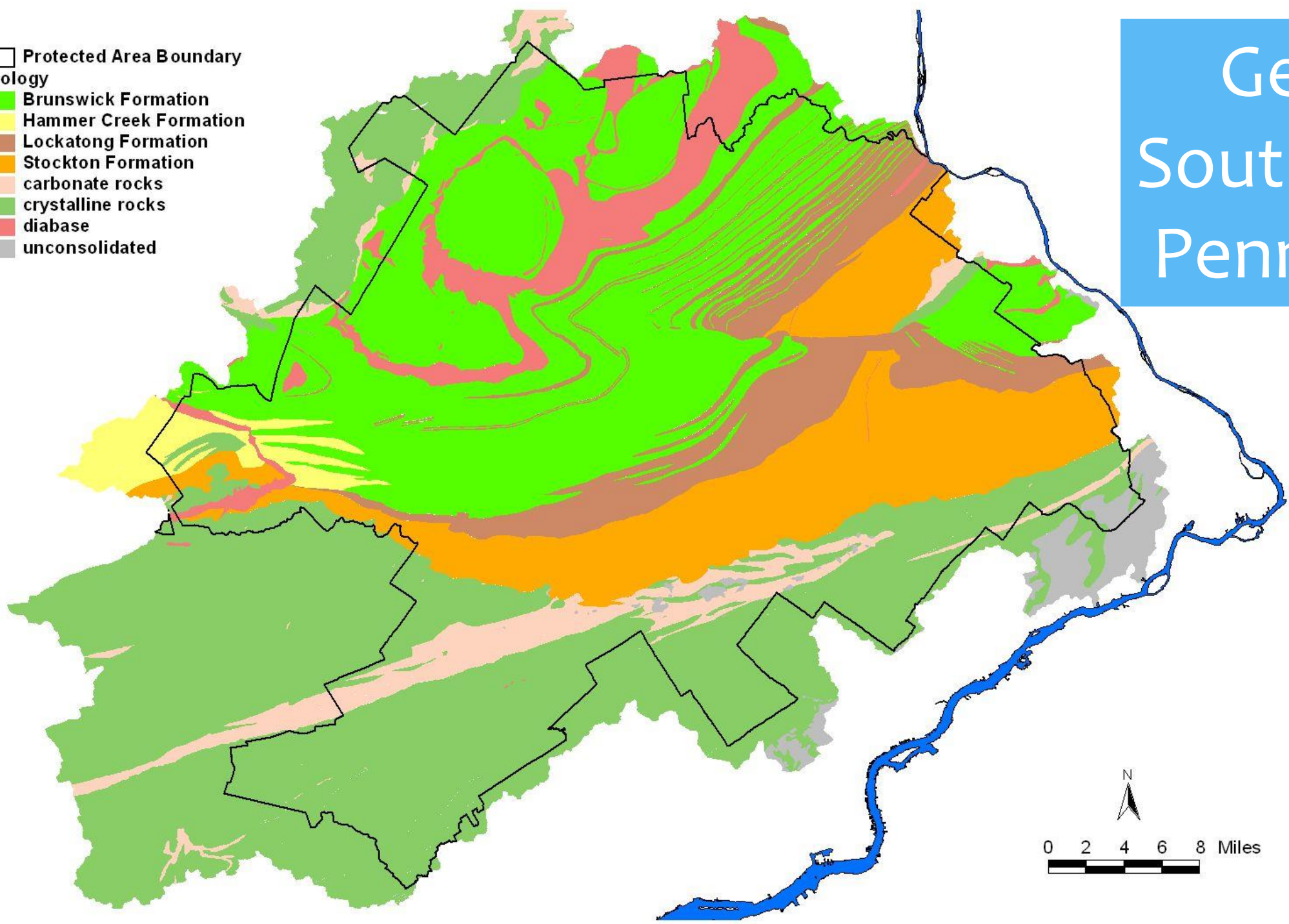
- Prevent the long-term depletion of groundwater
- Protect stream flow during drought conditions
- Protect the rights of present and future users
- Acquire additional information to more accurately plan and manage water resources
- Encourage water conservation



Delaware River Basin Commission
DELAWARE • NEW JERSEY
PENNSYLVANIA • NEW YORK
UNITED STATES OF AMERICA

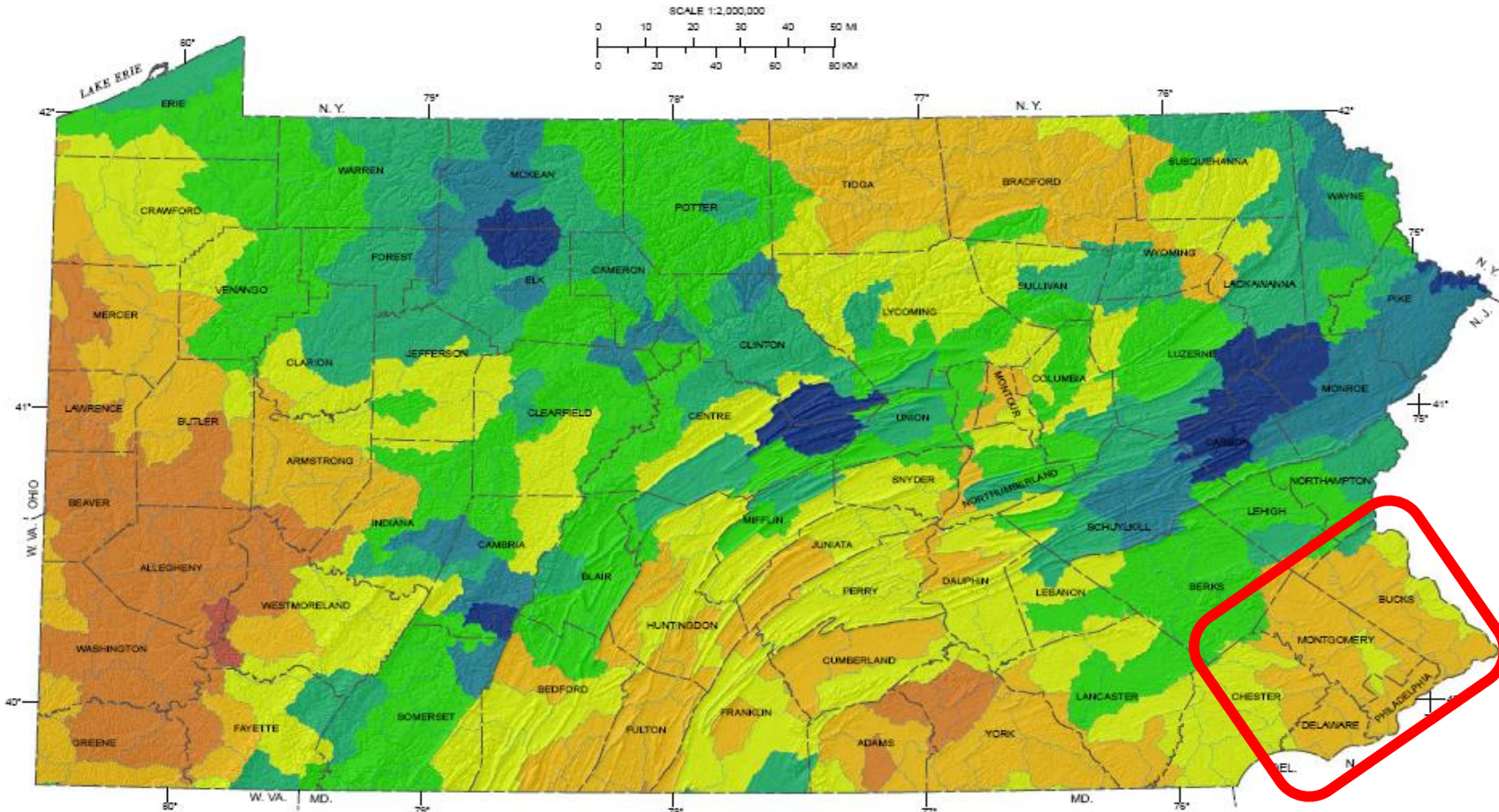
Geology of Southeastern Pennsylvania

- Protected Area Boundary
- Geology
 - Brunswick Formation
 - Hammer Creek Formation
 - Lockatong Formation
 - Stockton Formation
 - carbonate rocks
 - crystalline rocks
 - diabase
 - unconsolidated



MEAN ANNUAL GROUNDWATER-RECHARGE
 ESTIMATES OF PENNSYLVANIA WATERSHEDS,
 1971 - 2000

COMMONWEALTH OF PENNSYLVANIA
 DEPARTMENT OF
 CONSERVATION AND NATURAL RESOURCES
 BUREAU OF TOPOGRAPHIC AND GEOLOGIC SURVEY
 www.dcnr.state.pa.us/topogeo



Southeastern
 Pennsylvania
 Groundwater
 Protected Area

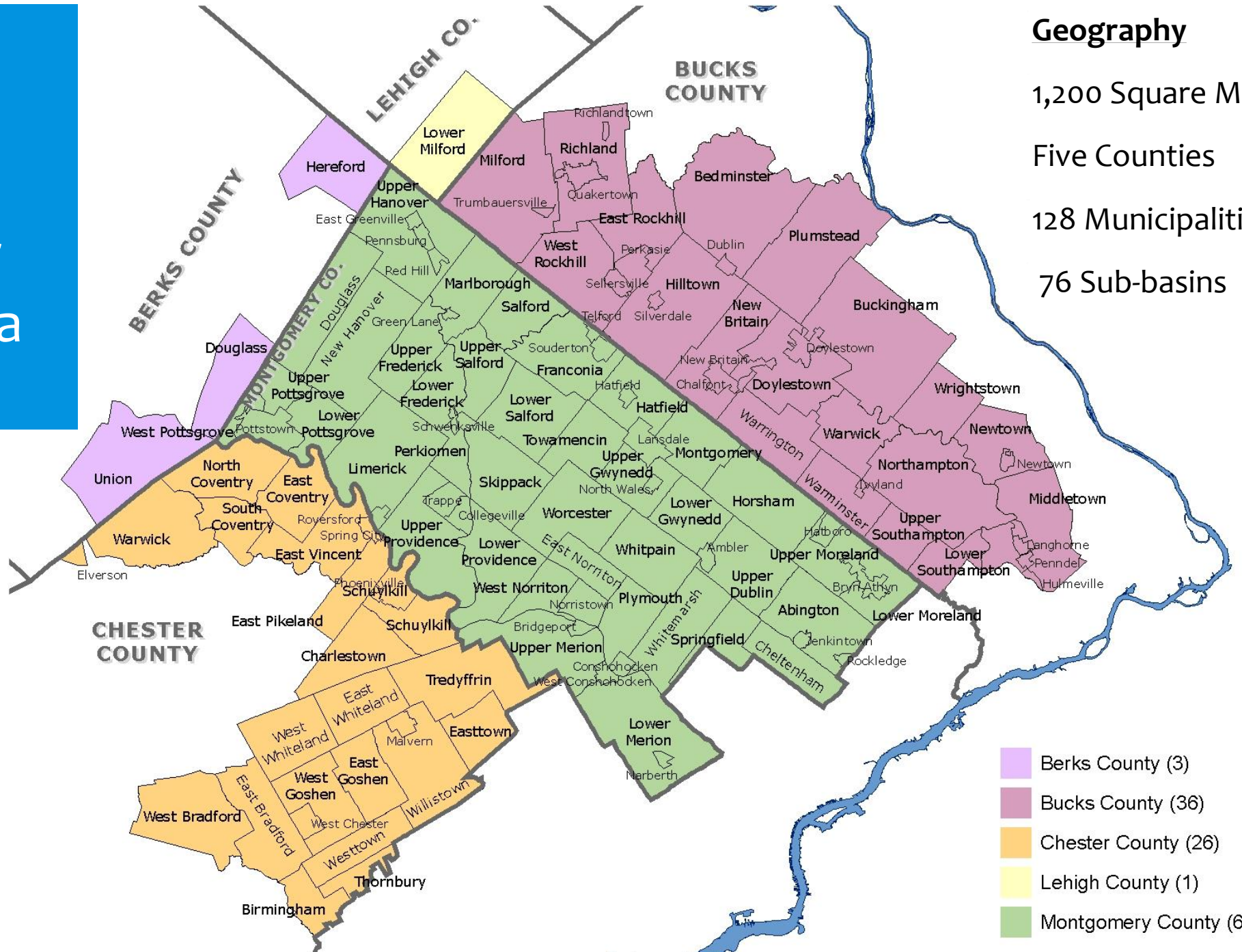


Reese, S. O., and Risser, D. W., 2010, Summary of groundwater-recharge estimates for Pennsylvania: Pennsylvania Geological Survey, 4 ser., Water Resource Report 70, 18 p., 6 plates, scale 1:2,000,000, Portable Document Format (PDF).

Southeastern Pennsylvania Groundwater Protected Area

* Regulations apply to municipal boundary

* Between 1990-2013 total withdrawals were reduced by approximately 8.5 billion gallons or 23.4 million gallons a day



Geography

1,200 Square Miles

Five Counties

128 Municipalities

76 Sub-basins

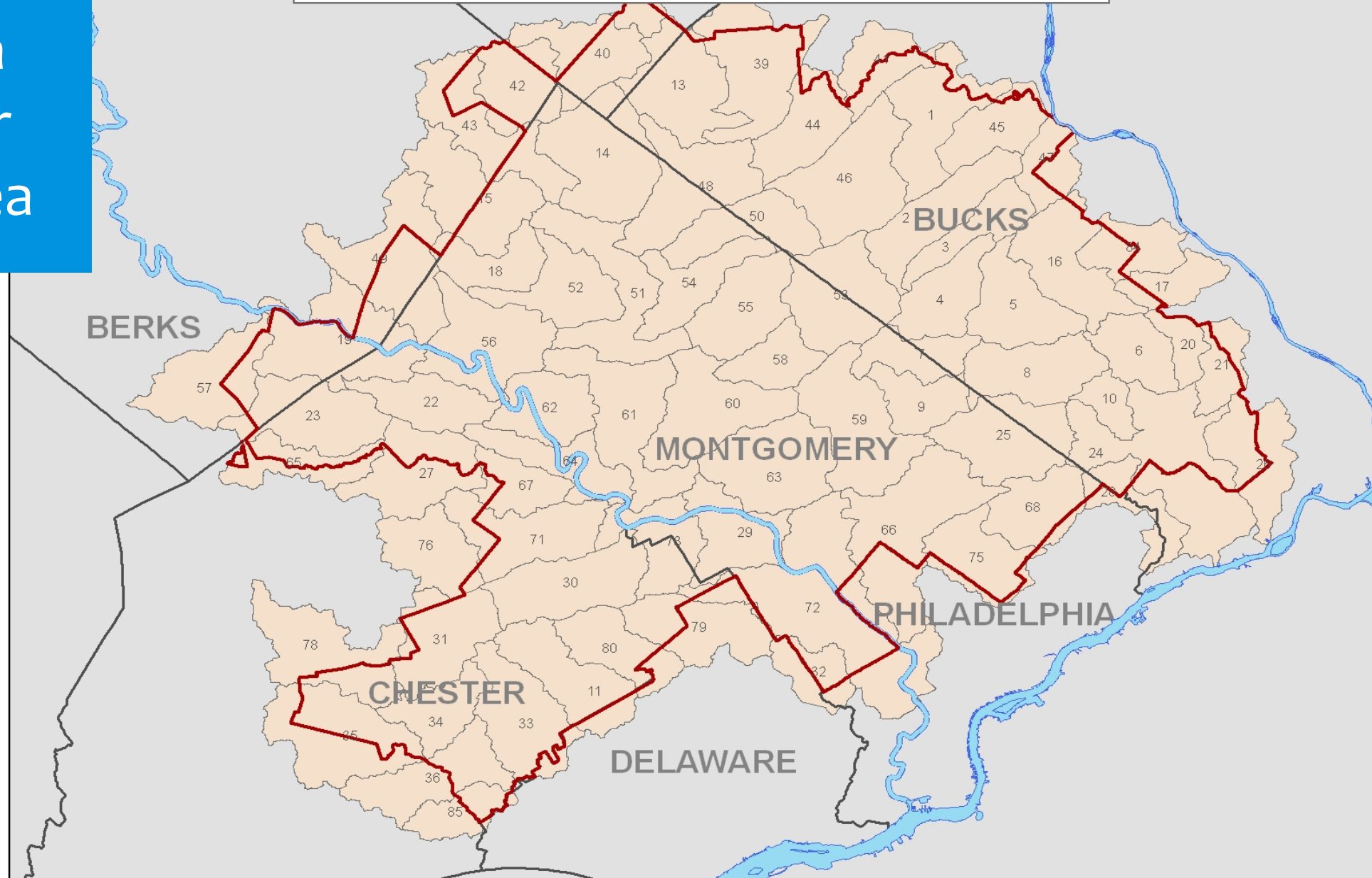
- Berks County (3)
- Bucks County (36)
- Chester County (26)
- Lehigh County (1)
- Montgomery County (62)

Special Requirements

- Permits required for withdrawals in excess of 10,000 gpd for any 30-day period, Dockets required for withdrawals in excess of 100,000 gpd for any 30-day period
- Advance notice of exploratory drilling – 30 days
- Hydrogeological report - 48 hour pumping test and monitoring of wells and surface water bodies
- Well registration, metering, and reporting
- Conservation requirements
- **Compliance with subbasin withdrawal limits**

Southeastern Pennsylvania Groundwater Protected Area

**Southeastern Pennsylvania Groundwater Protected Area:
Municipal Boundary (Red) and 76 Subbasins**

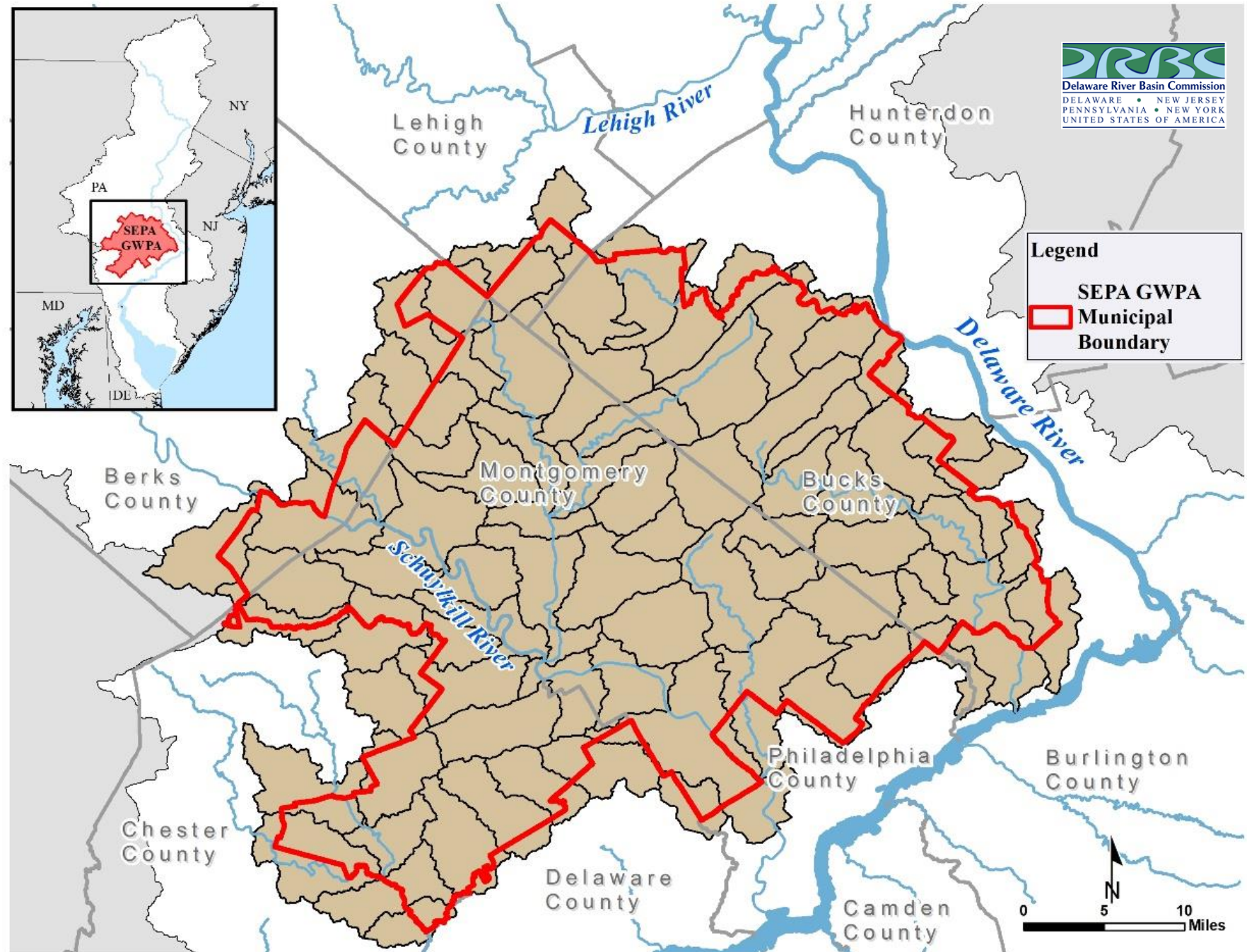


76 subbasins associated by municipality and consisting of all of Montgomery and also parts of Berks, Bucks, Chester, and Lehigh Counties.

76 assessment units.

Southeastern Pennsylvania Groundwater Protected Area

- * Each subbasin contains an annual withdrawal limit
- * Withdrawals limits established in 1998, 1999
- * Withdrawal limit = 1-year-in-25 average annual baseflow
- * Potentially stressed = >75% of withdrawal limit



Water-Use Analysis Program for the
Neshaminy Creek Basin, Bucks and
Montgomery Counties, Pennsylvania

U.S. GEOLOGICAL SURVEY

Water-Resources Investigations Report 96-4127

Prepared in cooperation with the
DELAWARE RIVER BASIN COMMISSION



Neshaminy Study
Report
Prepared By
U.S. Geological
Survey
Pennsylvania District

*Annual stream baseflow rates
based on rock type*



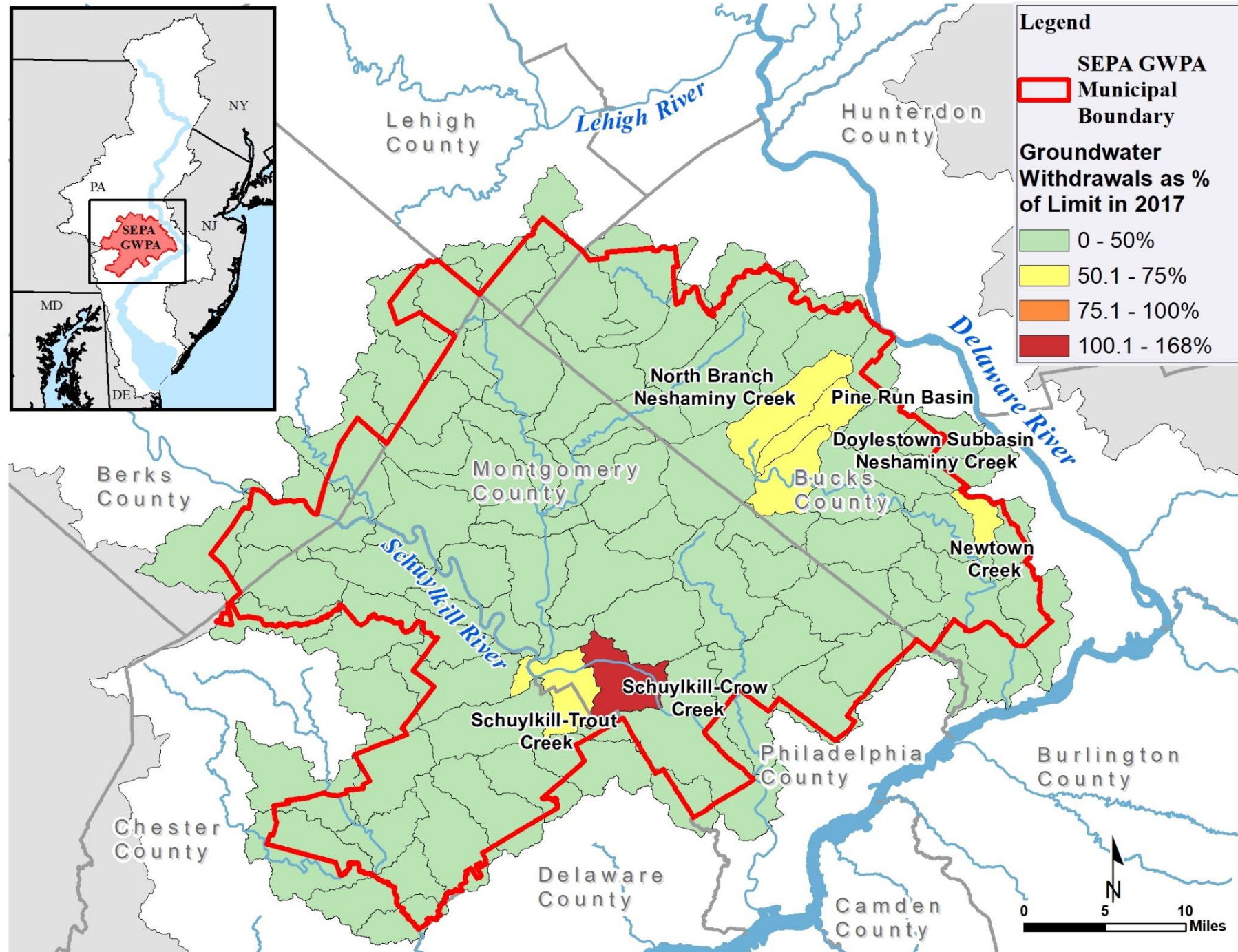
Resolutions Nos. 98-1 and 99-11

- Subbasin withdrawal limits were approved for the 76-subbasins based on the 1-in-25 year average annual baseflow rate (MGY)
 - Resolution No. 98-1 – 14 Neshaminy Subbasins
 - Resolution No. 99-11 – 62 Remaining Subbasins
- Each withdrawal limit was considered the target amount to ensure adequate streamflow in perennial streams and to minimize the overdraft of groundwater resources during times of drought

Program Metrics

- Each GWPA subbasin has a withdrawal limit defined in million gallons / year (mgy)
- Annual water use data is received from the Pennsylvania Department of Environmental Protection (PADEP)
- Commission maintains a current database of annual groundwater withdrawals for all subbasins
- Current determination based on actual use not allocation.

2017 Groundwater Percent Withdrawals Based on Withdrawal Limits



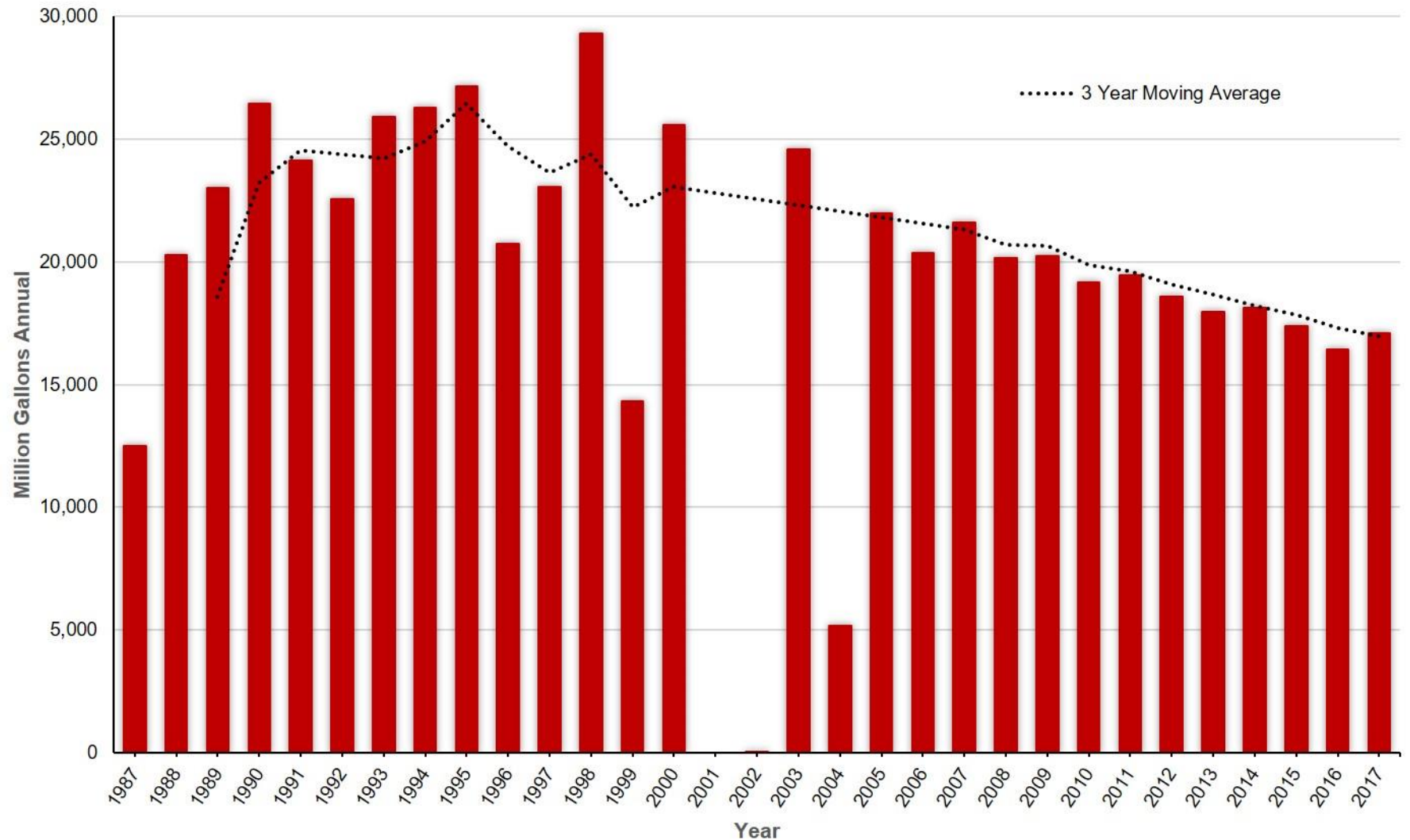
* Subbasin Names > 50% Withdrawal Limits

- * Schuylkill- Crow Creek (171%)
- * Pine Run Basin (64%)
- * North Branch Neshaminy Creek (63%)
- * Newtown Creek (63%)
- * Doylestown Subbasin Neshaminy Creek (63%)
- * Schuylkill-Trout Creek (53%)

Southeastern Pennsylvania Groundwater Protected Area

* Cumulative groundwater withdrawals from 1987-2017

* Reductions since 2000



Primary Drivers of Change

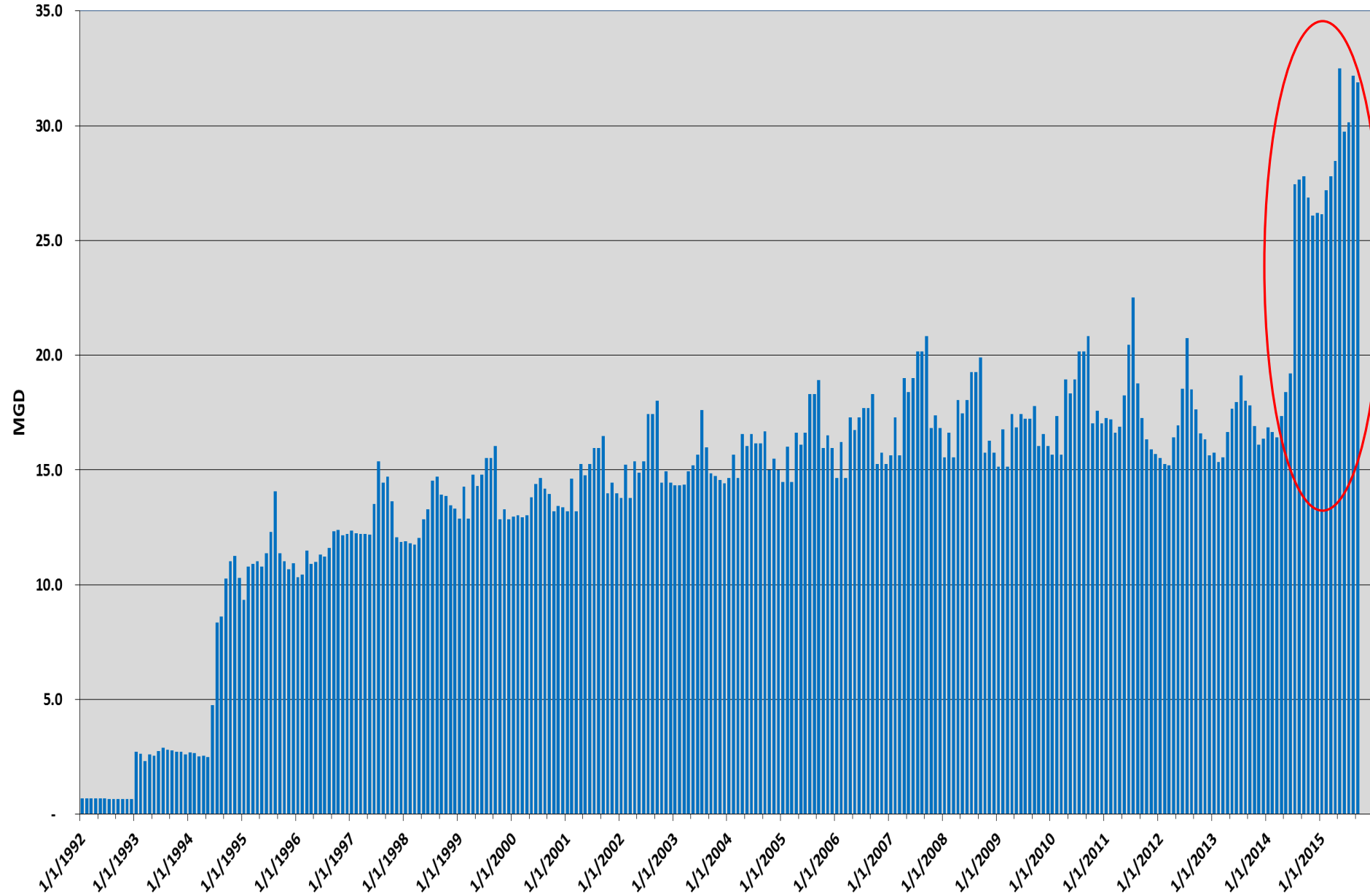
- * Conjunctive use
 - * Forest Park (Point Pleasant Pump) – Delaware River SWWD
 - * PA American Yardley – Delaware River SWWD
- * GW Contamination (PFAS/PFOA)
- * Quarry Withdrawals
- * Facility Closures
- * Data Categorization



Hanauer, David. Lake Galena. Digital image. *David's Photographic Tour of Bucks County, Pennsylvania*. N.p., n.d. Web. 16 Feb. 2016.
<<http://www.davidhanauer.com/buckscounty/newbritain/index.html>>.

Forest Park Water : Neshaminy Creek Intake - Monthly Withdrawals (MGD)

D-1965-076 CP-11 allocates 40 MGD from the Neshaminy Creek intake with a max of 39.5 MGD coming from the Delaware River and 0.5 MGD coming from the Neshaminy Creek drainage area.



GWPA Summary



Neshaminy Creek, courtesy of the PA Fish & Bat Commission

- * Total GWPA GW withdrawals declining
- * Majority of subbasins withdrawing below 50% of limit
- * Use reporting and withdrawal data has improved
- * Conjunctive use primary driver for GW declines
 - * Mainstem Delaware – reservoir contributions help drought resilience

GWPA Program Conclusions

- The SEPA GWPA is closely managed with regard to groundwater withdrawals, well interferences and water supply planning.
- Current methodology allows for the identification of subbasins which may exceed the potentially stressed or the maximum withdrawal limits.
- Allows staff to steer applicants away from potentially stressed subbasins when possible.
- Program successful!

Sustainable Groundwater Resources = Success

Online Plots of Groundwater Data from DRBC

SEPA-GWPA (John Yagecic)

<https://www.drbc.net/Sky/sepagwpa.htm>

SEPA-GWPA (Evan Kwityn)

https://evankwityn.shinyapps.io/Subbasin_SEPA_GWPA/