

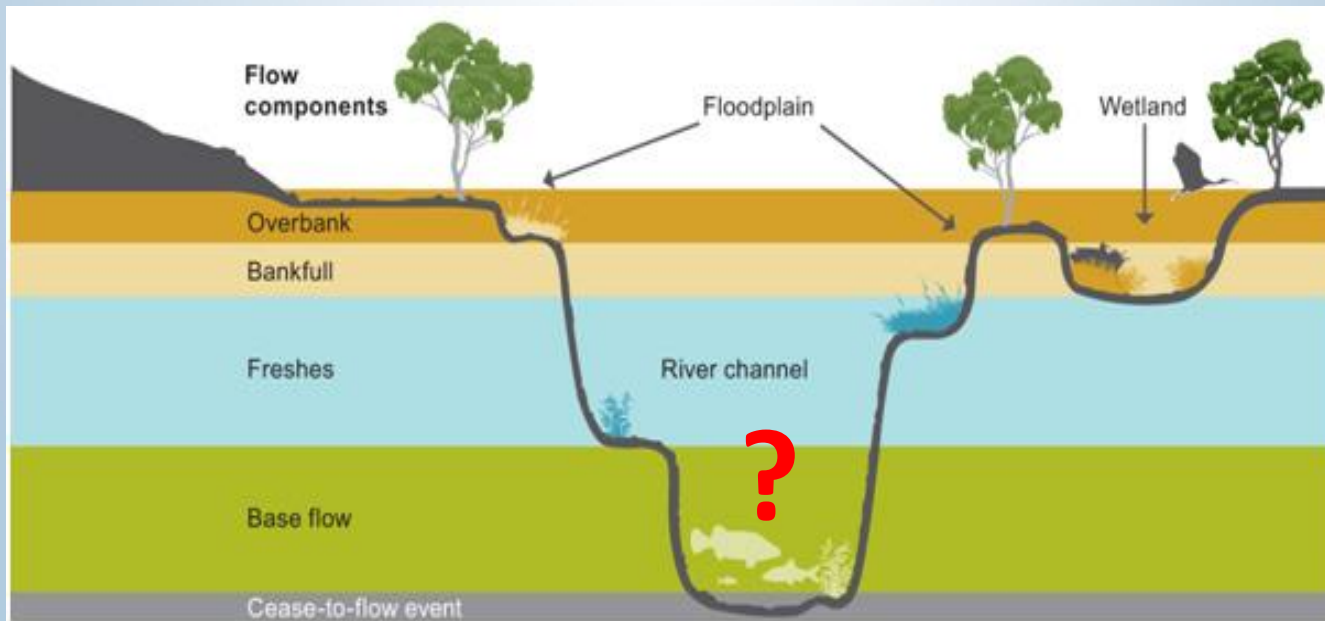
A scenic view of a rocky river flowing through a lush green forest. The river is filled with numerous large, flat, grey rocks of various sizes. The water is a murky, brownish-green color. The banks are covered in dense green vegetation, including tall grasses and shrubs. The background is a thick forest of tall trees with green foliage.

CUMULATIVE WATER USE & AVAILABILITY STUDY

May 17, 2016

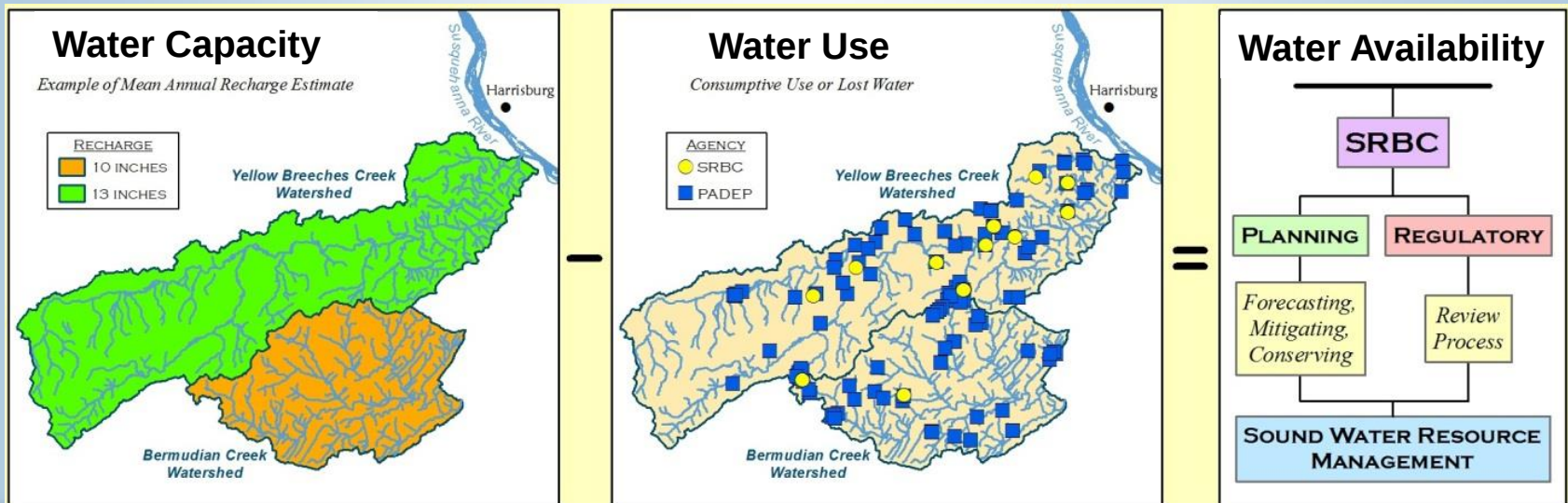
Purpose

Comprehensively evaluate cumulative **water use**, determine **water capacity** sustainably available, and assess resultant **water availability** for Basin watersheds to inform planning and regulatory decision making



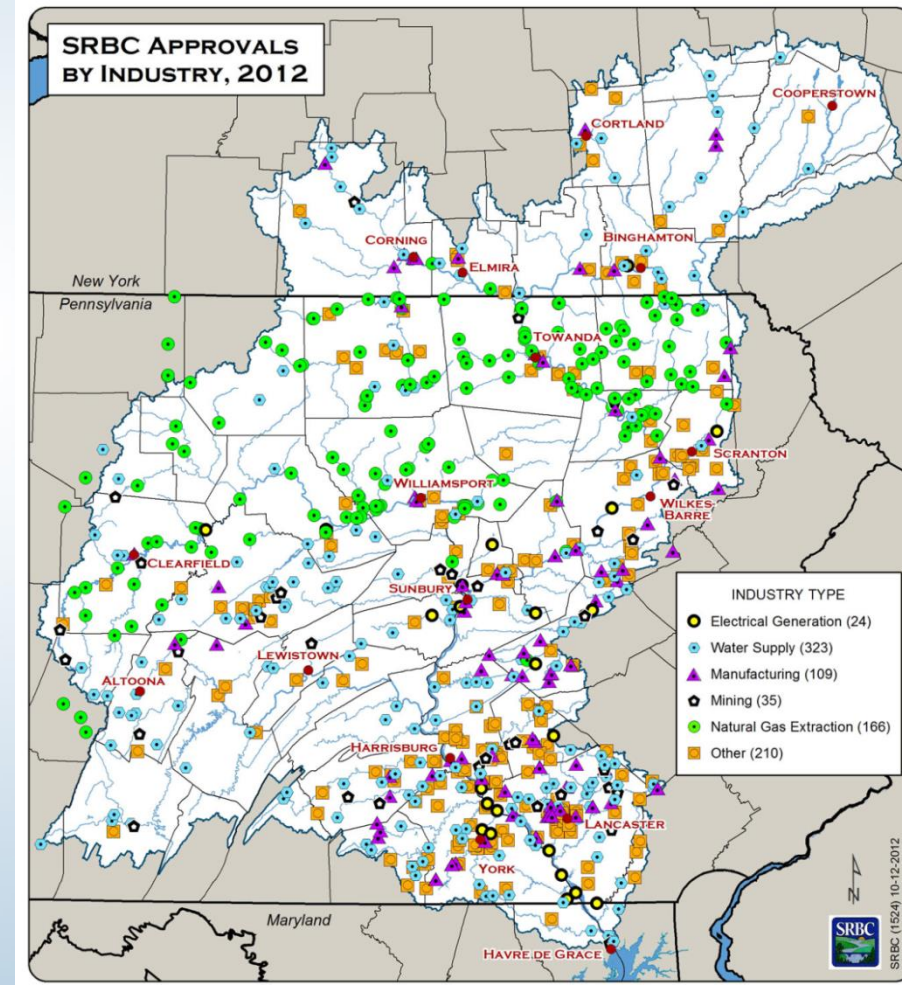
Scope

1. Quantify consumptive water use
2. Determine water capacity & availability
3. Develop GIS-based tool
4. Consider management measures

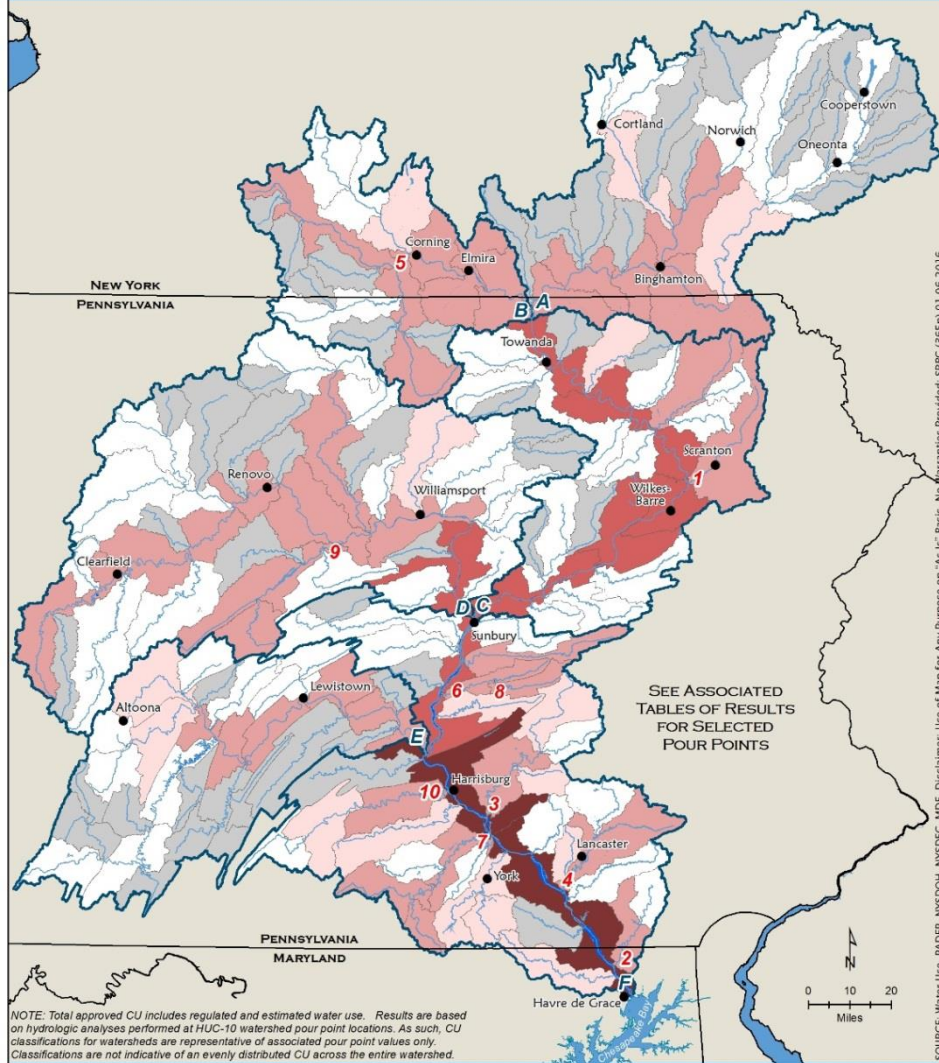


Water Use Assessment

- Commission & state records
- CU & withdrawal x CU factors
- Approved & reported CU
- Estimated unregulated CU
- Projected 2030 CU



TOTAL 2014 APPROVED CONSUMPTIVE USE BY HUC-10 WATERSHED IN THE SUSQUEHANNA RIVER BASIN

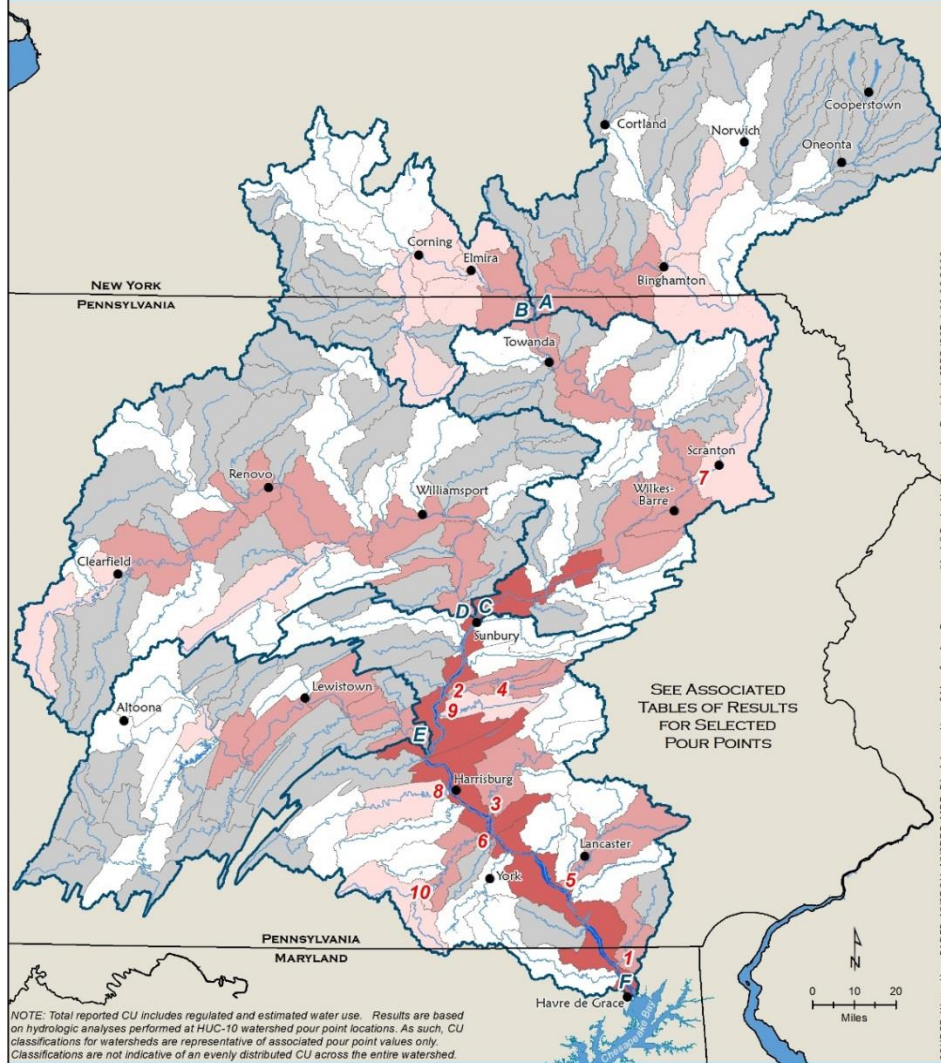


SOURCE: Water Use, PADEP, NYSDOH, NYSDOC, MDE. Disclaimer: Use of Map for Any Purpose on "As Is" Basis. No Warranties Provided. SRBC (SRBC) 01-05-2016

Approved Consumptive Water Use in Million Gallons per Day (MGD)



TOTAL 2014 REPORTED CONSUMPTIVE USE BY HUC-10 WATERSHED IN THE SUSQUEHANNA RIVER BASIN



SOURCE: Water Use, PADEP, NYSDOH, NYSDOC, MDE. Disclaimer: Use of Map for Any Purpose on "As Is" Basis. No Warranties Provided. SRBC (SRBC) 01-05-2016

Reported Consumptive Water Use in Million Gallons per Day (MGD)

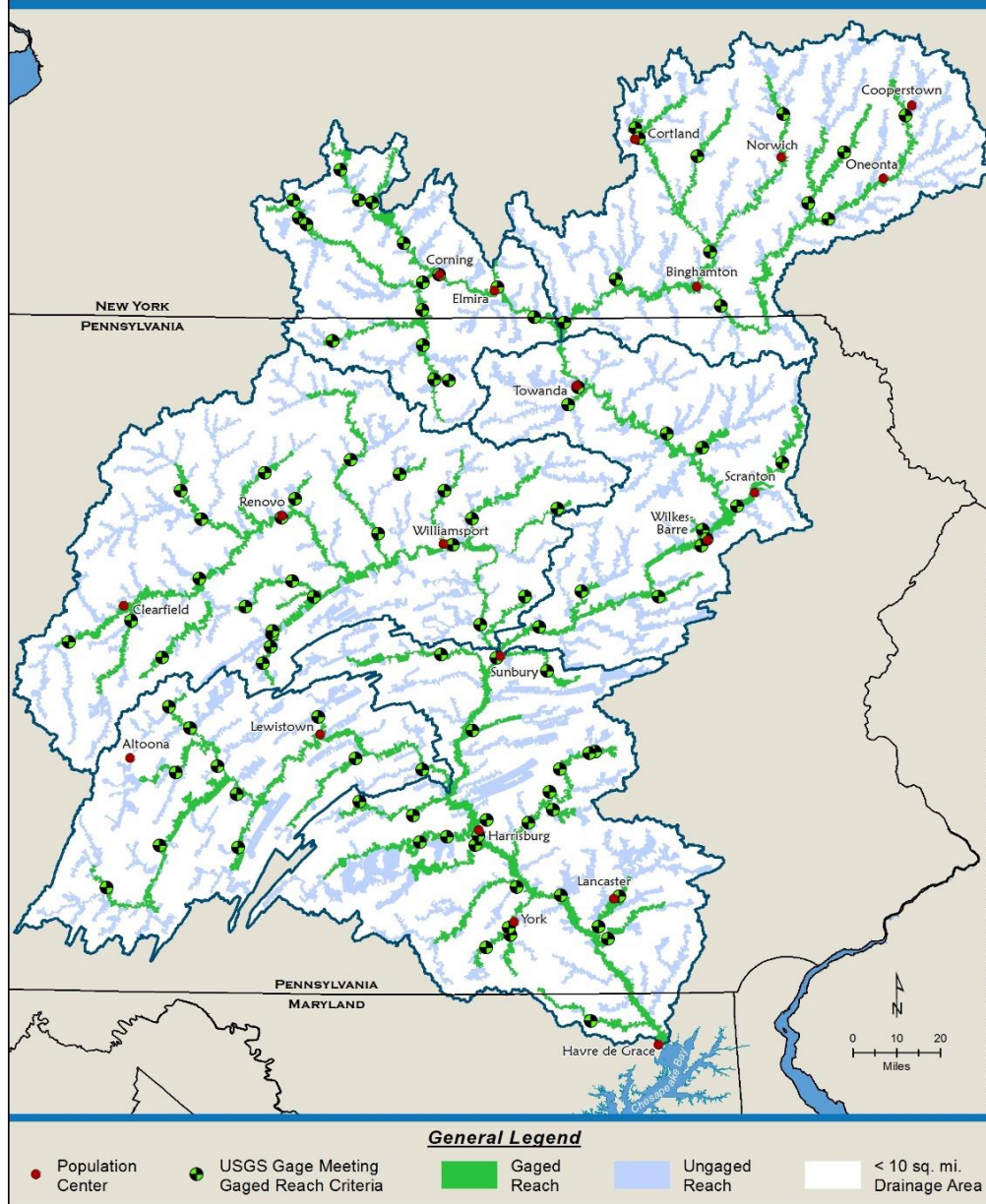


Water Use Findings

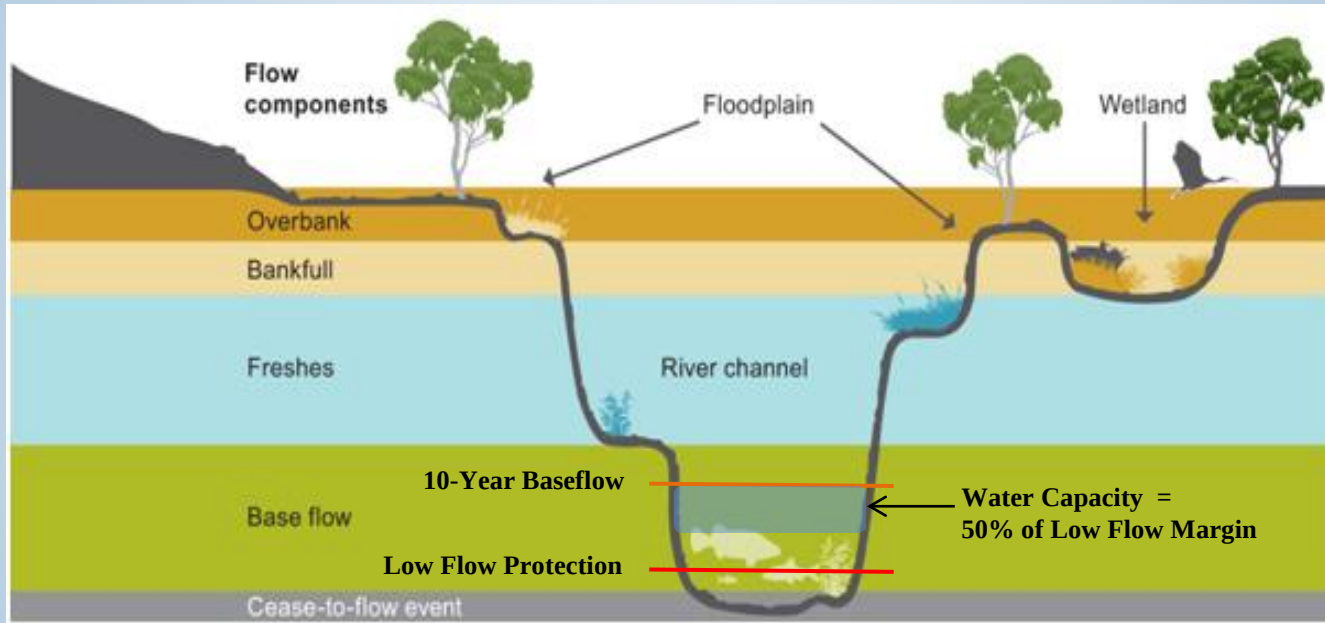
- Approved/reported CU dominated by public water supply (PWS) (47%/31%) & electric power generation (21%/30%)
 - Includes PWS diversions (e.g. Baltimore = 250 mgd)
- Approved & reported CU by natural gas industry estimated at 116 mgd (12%) and 27 mgd (9%), respectively
- Reported CU significantly (~35%) less than approved CU
 - Seasonal & intermittent uses (e.g. natural gas industry)
- For 126 of 170 (74%) watersheds approved CU was <10 mgd

Hydrologic Analyses

- Leverage gage network to extent reasonable.
- Use regression equations for ungaged reaches.
- Analysis limited to watersheds $>10 \text{ mi}^2$

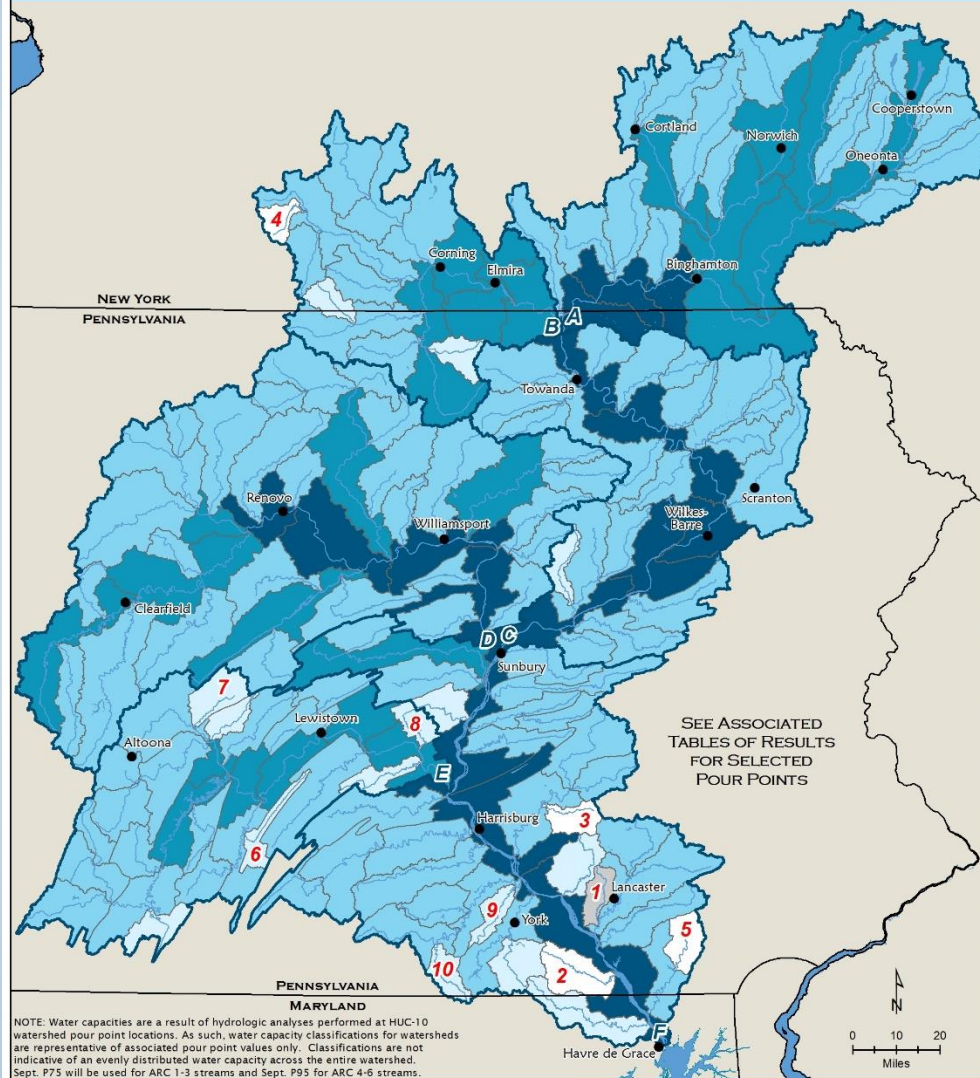


Defining Water Capacity



- Manage for sustainability during 1-in-10 year drought.
- Minimum flow set aside for ecosystem needs.
- Apply safety factor to account for uncertainty & emergencies.

WATER CAPACITY EXPRESSED AS 50 PERCENT OF 10-YEAR BASEFLOW MINUS SEPTEMBER P75/P95 FLOW BY HUC-10 WATERSHED IN THE SUSQUEHANNA RIVER BASIN



NOTE: Water capacities are a result of hydrologic analyses performed at HUC-10 watershed pour point locations. As such, water capacity classifications for watersheds are representative of associated pour point values only. Classifications are not indicative of an evenly distributed water capacity across the entire watershed. Sept. P75 will be used for ARC 1-3 streams and Sept. P95 for ARC 4-6 streams.

Water Capacity in Million Gallons per Day (MGD)

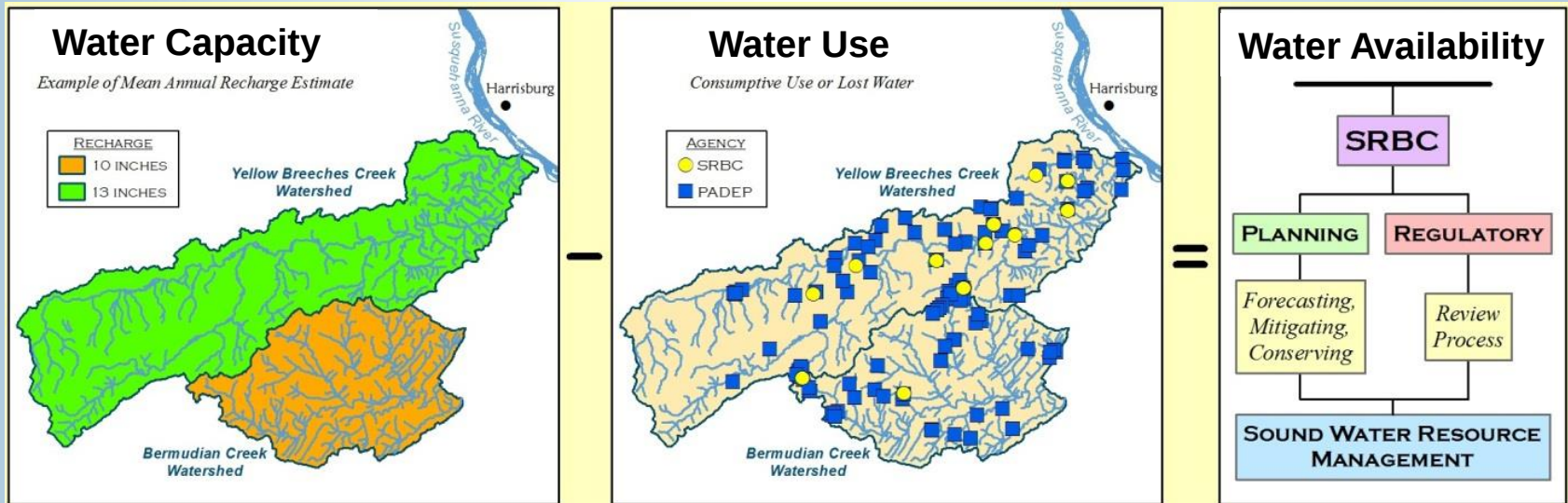


Water Capacity Findings

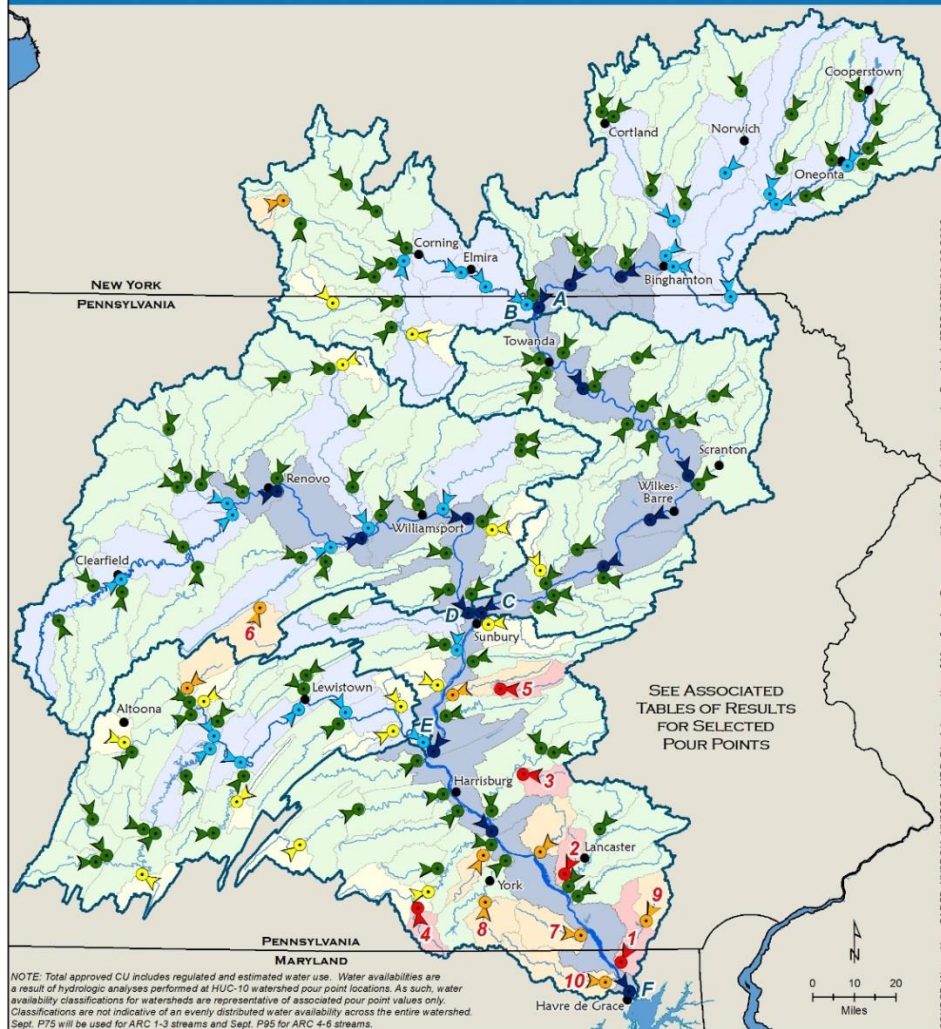
- Water capacity greatest for watersheds traversed by mainstem rivers & major tributaries.
- Water capacity >10 mgd for 150 of 170 (88%) watersheds.
 - 2014 Reported CU for TMI = 13.7 mgd
- Lowest water capacities in smaller, headwater watersheds generally <100 mi²
- Majority of watersheds with lowest water capacity located in Lower Susquehanna subbasin.

Defining Water Availability

Water Capacity – Water Use (CU) = Water Availability



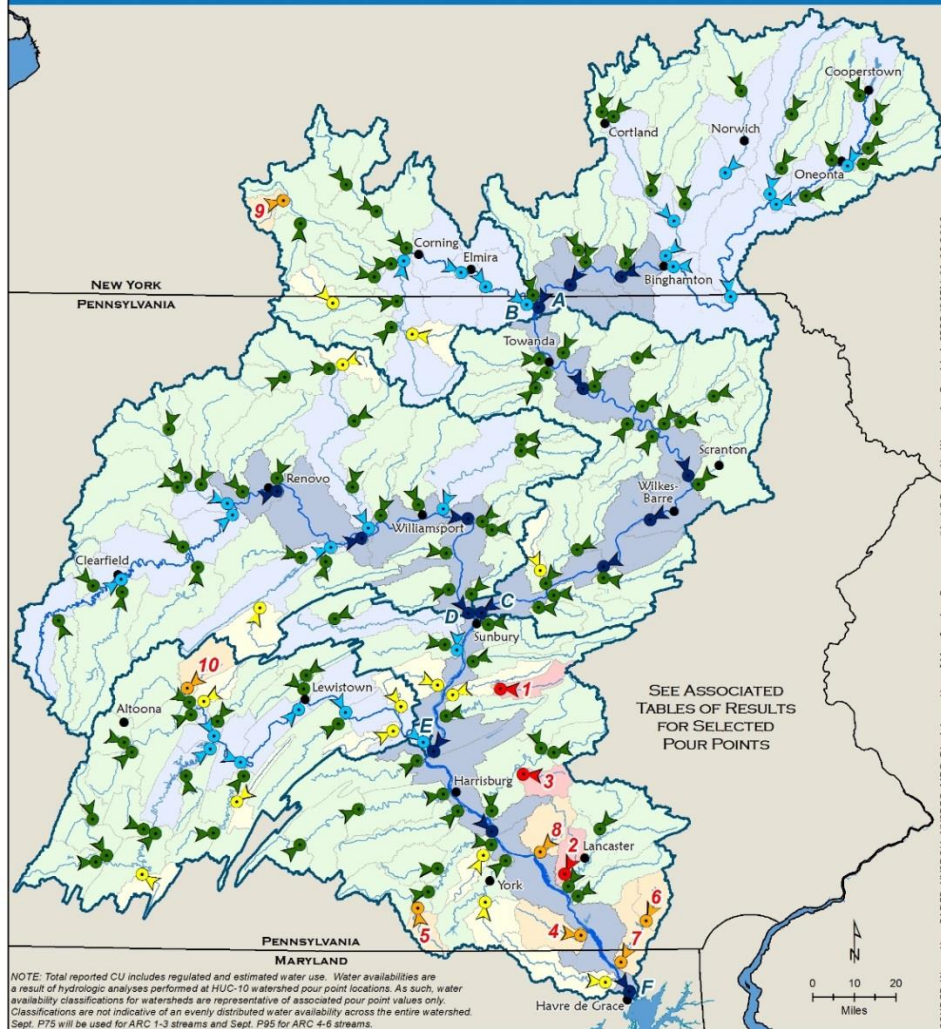
**WATER AVAILABILITY EXPRESSED AS 50% OF 10-YEAR BASEFLOW
MINUS SEPTEMBER P75/P95 FLOW
MINUS TOTAL 2014 APPROVED CONSUMPTIVE USE
BY HUC-10 WATERSHED IN THE SUSQUEHANNA RIVER BASIN**



Water Availability in Million Gallons per Day (MGD)



**WATER AVAILABILITY EXPRESSED AS 50% OF 10-YEAR BASEFLOW
MINUS SEPTEMBER P75/P95 FLOW
MINUS TOTAL 2014 REPORTED CONSUMPTIVE USE
BY HUC-10 WATERSHED IN THE SUSQUEHANNA RIVER BASIN**

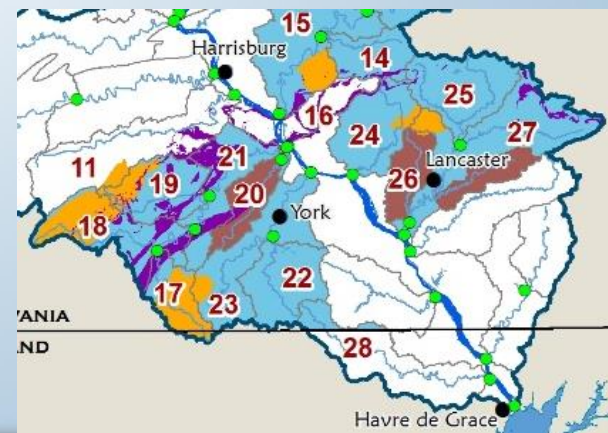


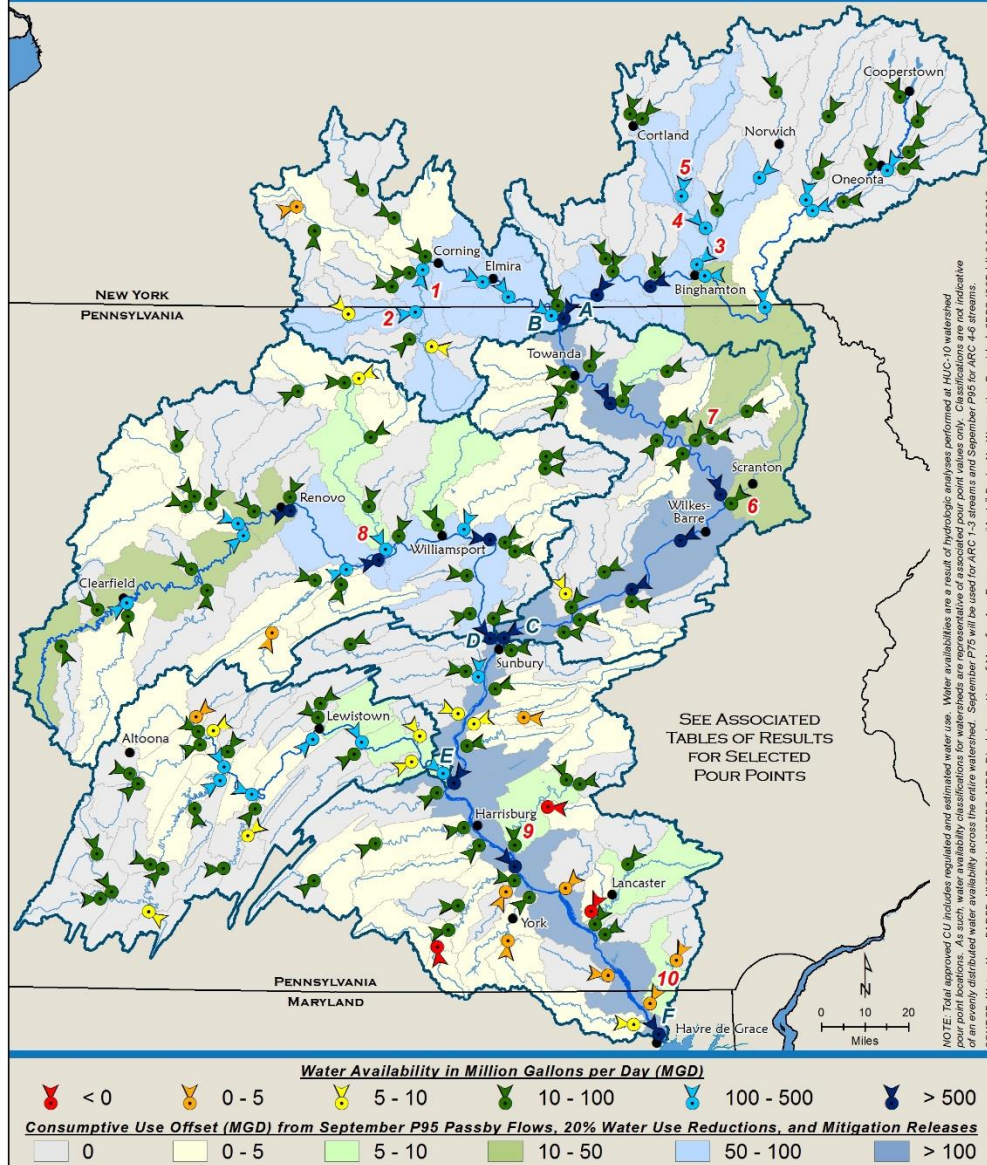
Water Availability in Million Gallons per Day (MGD)



Water Availability Findings

- Water capacity for most Basin watersheds adequate to satisfy existing/projected CU and avoid water availability conflicts.
- Water availability >10 mgd for 141 of 170 (83%) watersheds.
 - 2014 reported CU for TMI = 13.7 mgd
- Majority of watersheds with lowest water availability located in Lower Susquehanna subbasin.





Management Measures

- Water use reductions
- Passby flows
- Conservation releases
- CU mitigation releases

Products

1. Technical report

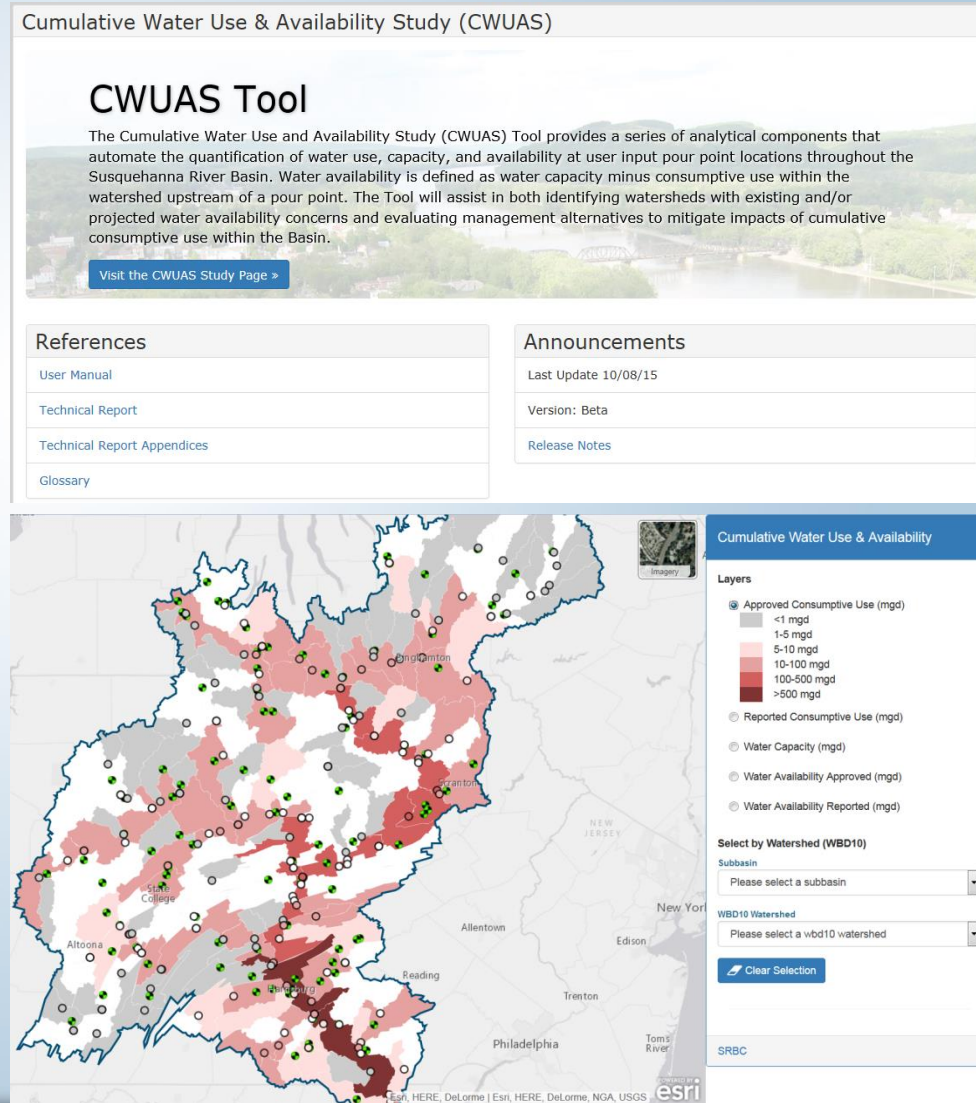
- With executive summary

2. Interactive GIS-based assessment tool

- For Commission staff and member jurisdictions

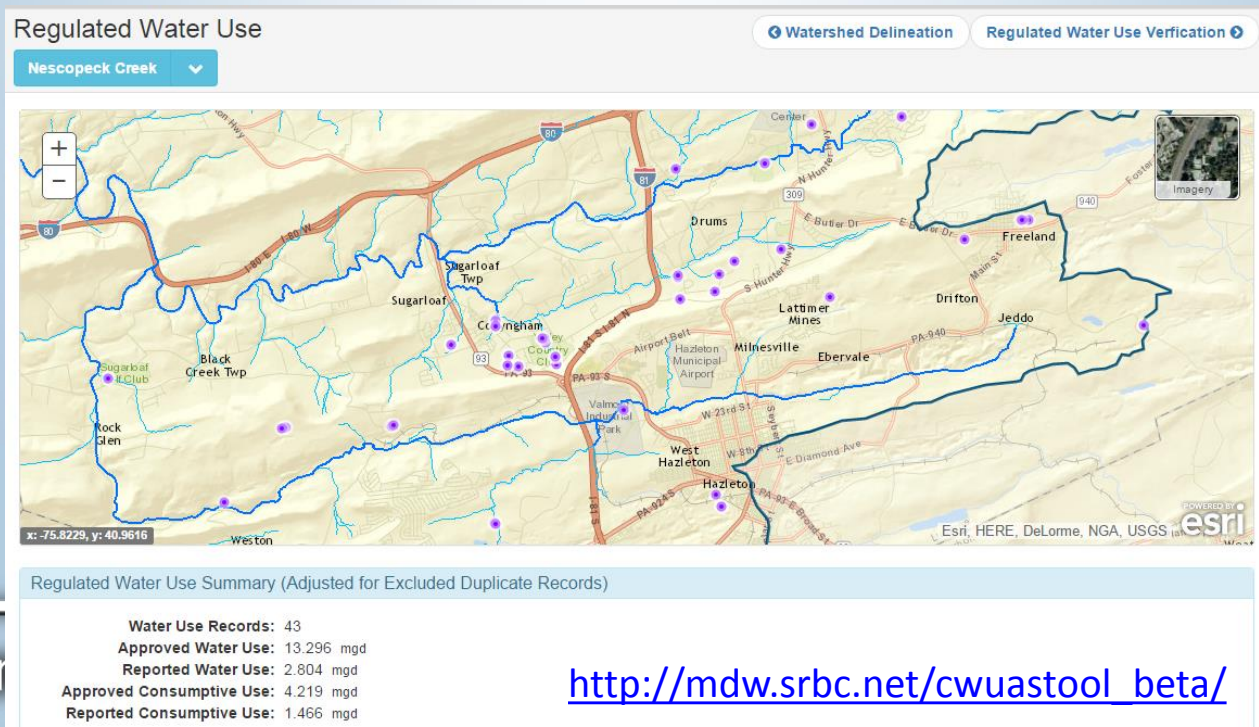
3. Interactive web map

- For projects, consultants, NGOs, academia, and the public



GIS-based Assessment Tool

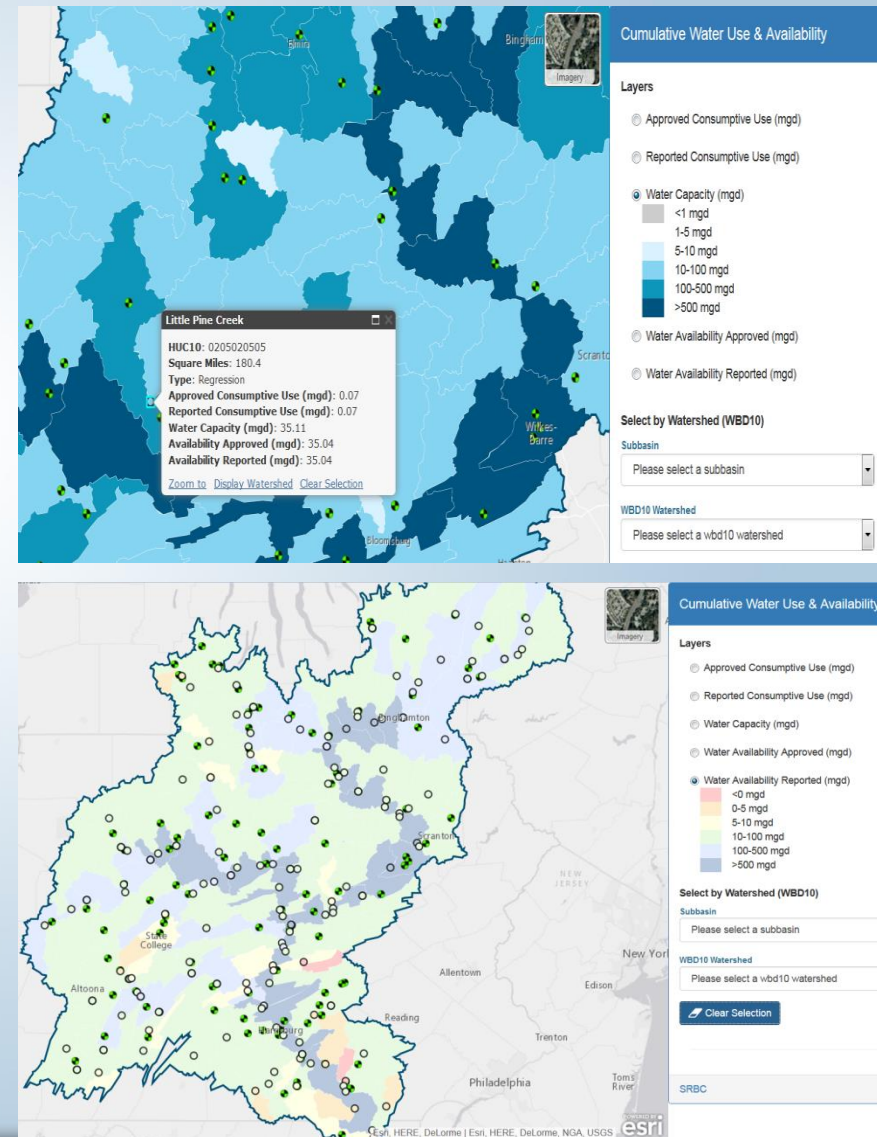
- Watershed delineation
- Water use tabulation: regulated, estimated, and projected
- Gage & regression based streamflow statistics
- Water capacity – water use = water availability
- Management measures : passby flows, CU mitigation, etc.



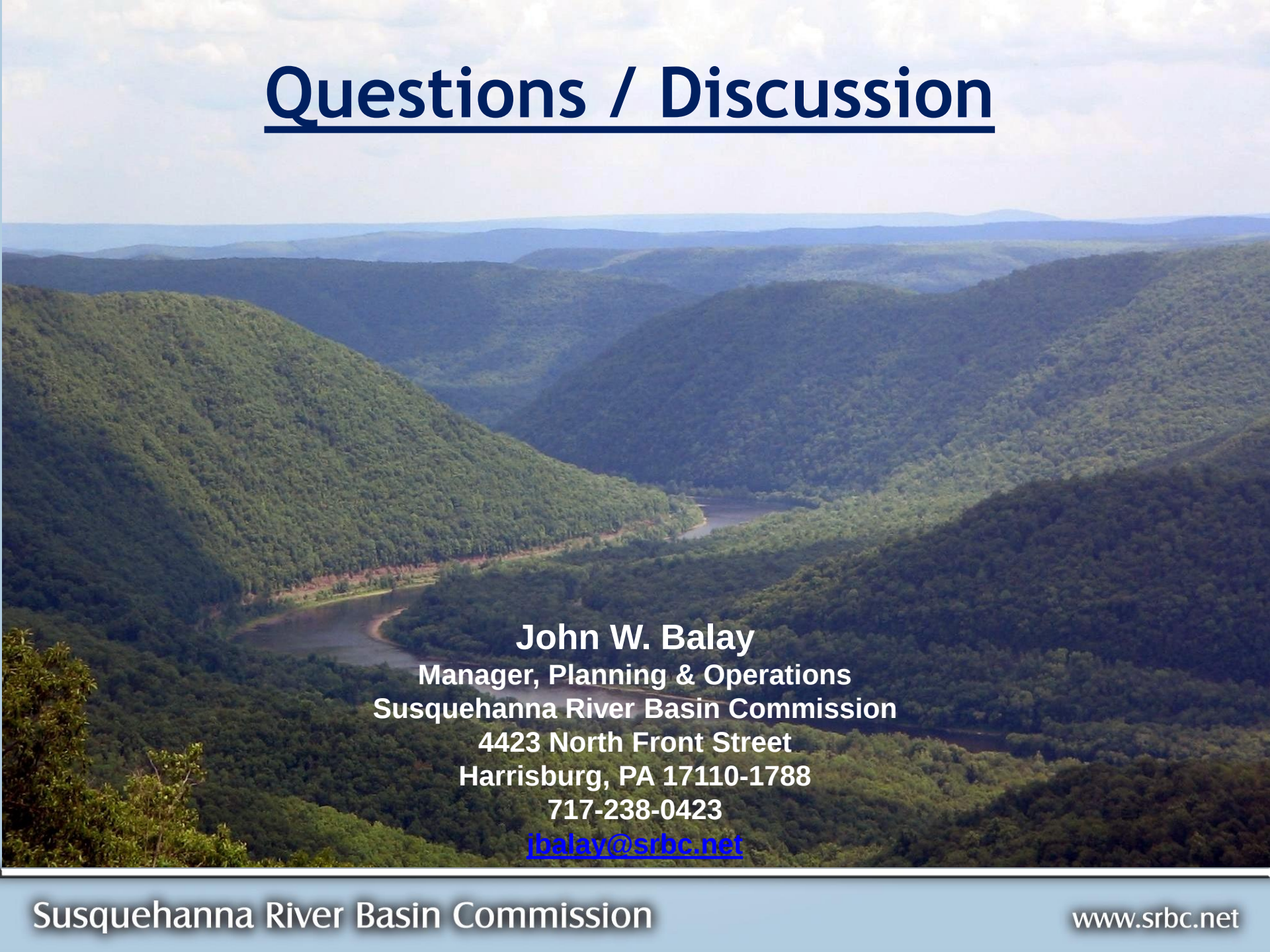
Interactive Web Map

- Base map, approved/reported CU, water capacity, water availability with approved/reported CU
- Toggle on/off layers, zoom to watershed, identify watershed attributes & results
- Results summarized at HUC-10 watershed scale

<http://mdw.srbc.net/cwuasmap/>



Questions / Discussion



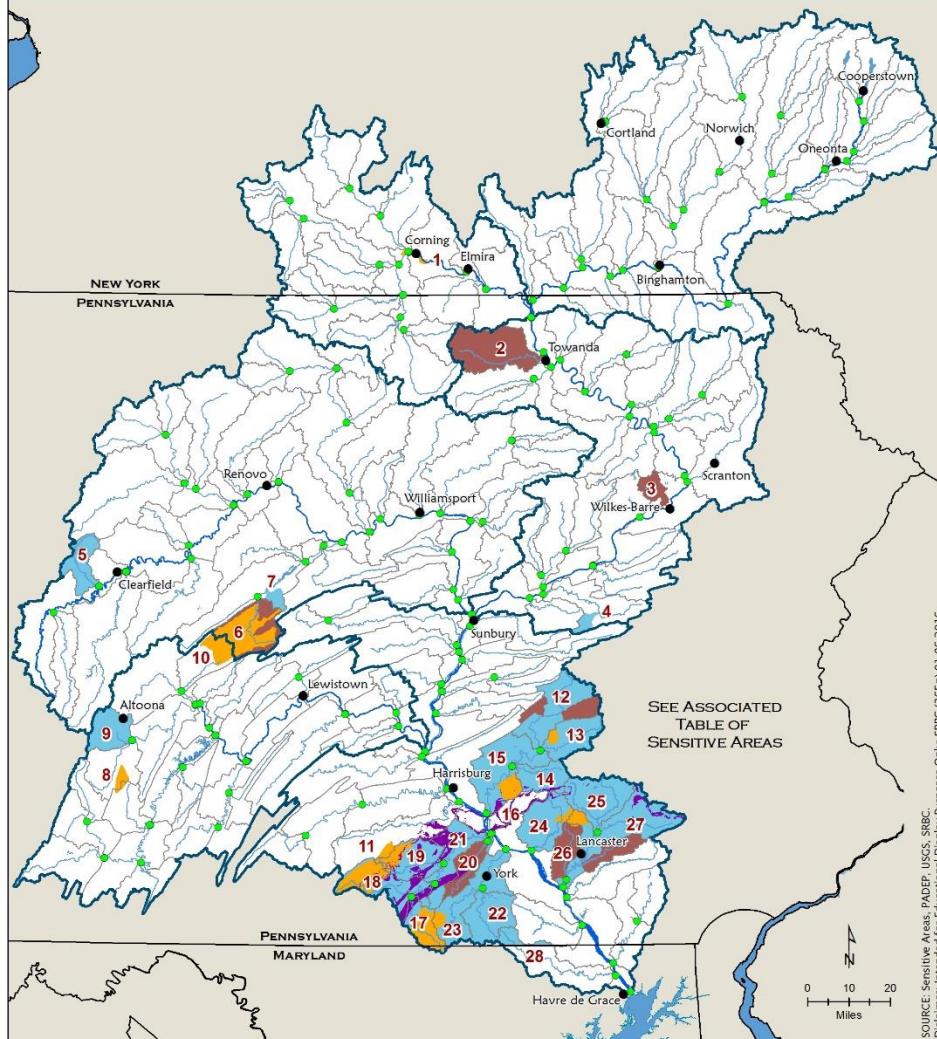
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Recommendations

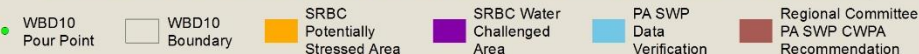
- Incorporate regulatory standards and practices that more closely align requested water use quantities with actual need.
- Verify low flow conditions via field investigations during drought events for watersheds with low water capacity and/or high CU.
- Conduct finer scale water budgets in partnership with local officials/stakeholders for watersheds with low water availability.
- Based on verifications and finer scale analyses, identify additional management actions or planning efforts needed.
- Promote protection, mitigation, and enhancement measures in watersheds with limited water availability.

Potential Utilization

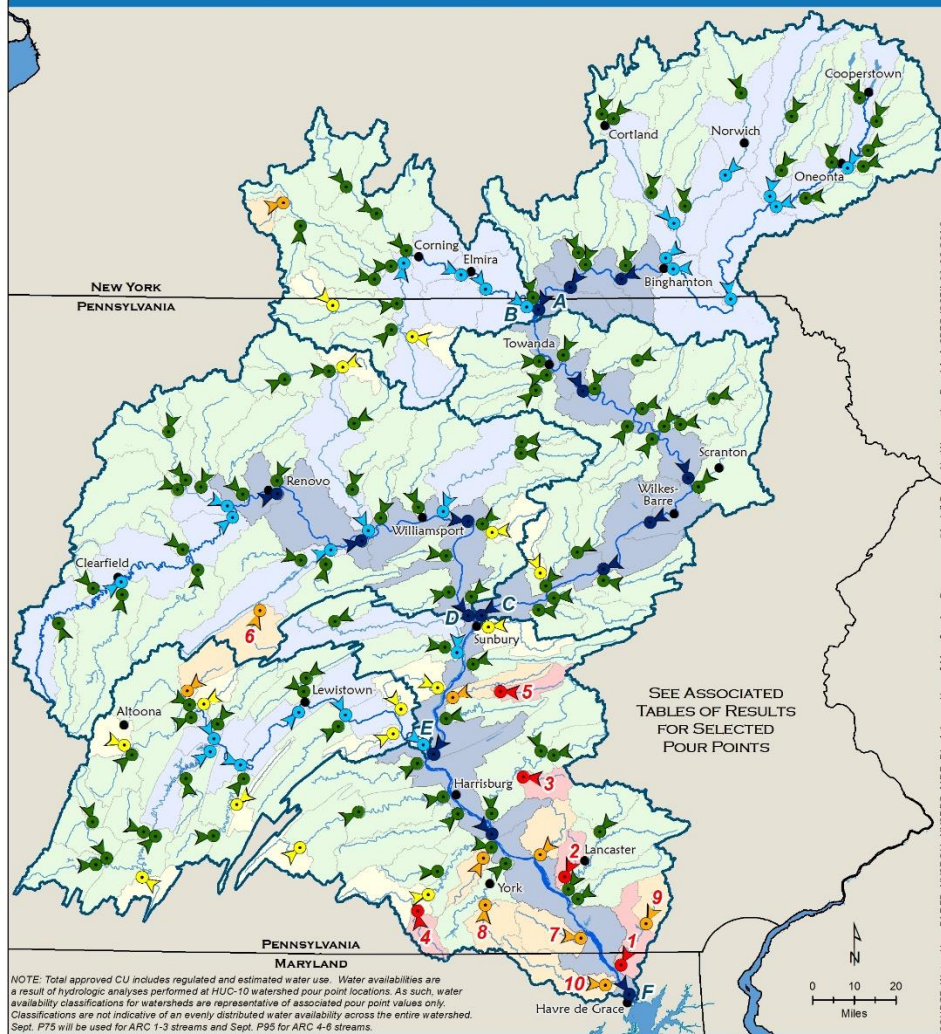
- Standardize cumulative water use assessment for Commission's Low Flow Protection Policy.
- Screening tool for evaluating proposed water use quantities considering existing cumulative use.
- Inform designation of special protected areas.
(e.g. Potentially Stressed Areas, Water Challenged Areas, others)
- Inform consideration of grandfathered & exempt uses.
- Prioritize protection, mitigation, & enhancement efforts.



Sensitive Areas Identified by SRBC Groundwater Management Plan & PA State Water Plan

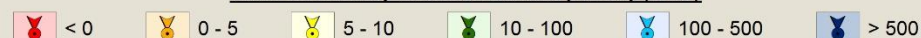


SOURCE: Sensitive Areas: PADEP, USGS, SRBC. Disclaimer: Intended for Educational Display Purposes Only. SRBC (965pl) 01-06-2016



NOTE: Total approved CU includes regulated and estimated water use. Water availabilities are a result of hydrologic analyses performed at HUC-10 watershed pour point locations. As such, water availability classifications for watersheds are representative of associated pour point values only. Classifications are not indicative of an evenly distributed water availability across the entire watershed. Sept. P75 will be used for ARC 1-3 streams and Sept. P95 for ARC 4-6 streams.

Water Availability in Million Gallons per Day (MGD)



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