Water Management Advisory Committee Update on Ecological Flow Recommendations for the Delaware River Basin

(TNC Study)

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Recent History of Ecological Flow Policy in the DRB

- 2002-2003 WMAC Subcommittee & SEF
  - SEF subsequently focused on Upper Basin Reservoirs
- 2009 DRBC staff regulation initiative
  - in response to anticipated influx of new SWWDs in headwaters of basin
  - feedback was a need for scientific basis for future policy
- 2010 TNC Study for SRBC (DRBC staff participation)
- 2011-2013 TNC Study for DRBC **= Step 1 in the current process,** scientific basis for ***future*** policy initiative
- 2014-? Policy Development

DRB Study Background

- numerical stream quality objectives for the protection of human health and aquatic life based on the consecutive 7-day flow with a 10-year recurrence interval ("the Q7-10")

- accordingly, the Commission requires pass-by flow restrictions and conservation releases based on the Q7-10;

- scientific understanding of the relationship of streamflows to aquatic health has evolved to suggest that the Q7-10 may not provide adequate protection for the aquatic life of streams and rivers

- the Commission recognizes that a study of ecological flow requirements specific to the Delaware River Basin is needed in order for the Commission to effectively **manage** and **plan** to meet **future water needs** in the Basin

Ecological Limits of Hydrologic Alteration

- The Ecological Limits of Hydrologic Alteration (ELOHA, Poff et al. 2010)
- A framework for assessing environmental flow needs over broad geographic areas when site-specific studies cannot be conducted for all rivers

DRB Study Background

On 9/21/2011 – DRBC Commissioners adopt Resolution No. 2011-11.

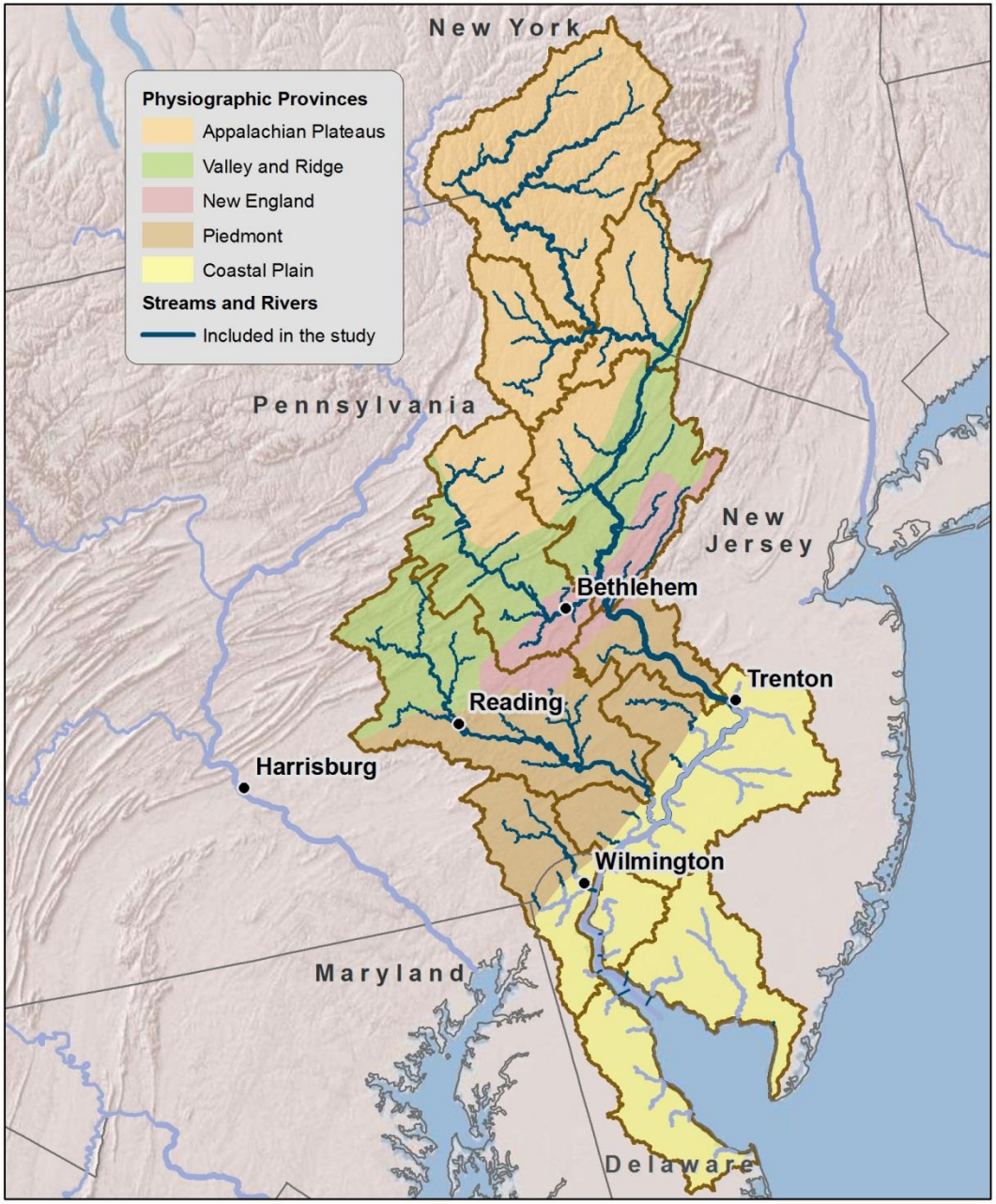
"..for a study of instream flow needs to protect key ecological communities for the range of habitats in the Delaware Basin."

Task 1 – Form Project team & hold orientation meeting
Task 2 – Orientation & Flow Hypotheses workshop (#1)
Task 3 – Literature Review
Task 4 – Hydrologic Characterization
Task 5 – Draft flow recommendations & workshop (#2)
Task 6 – Evaluation of water management scenarios
Task 7 – Draft Summary Report
Task 8 – Final Report

Project Area

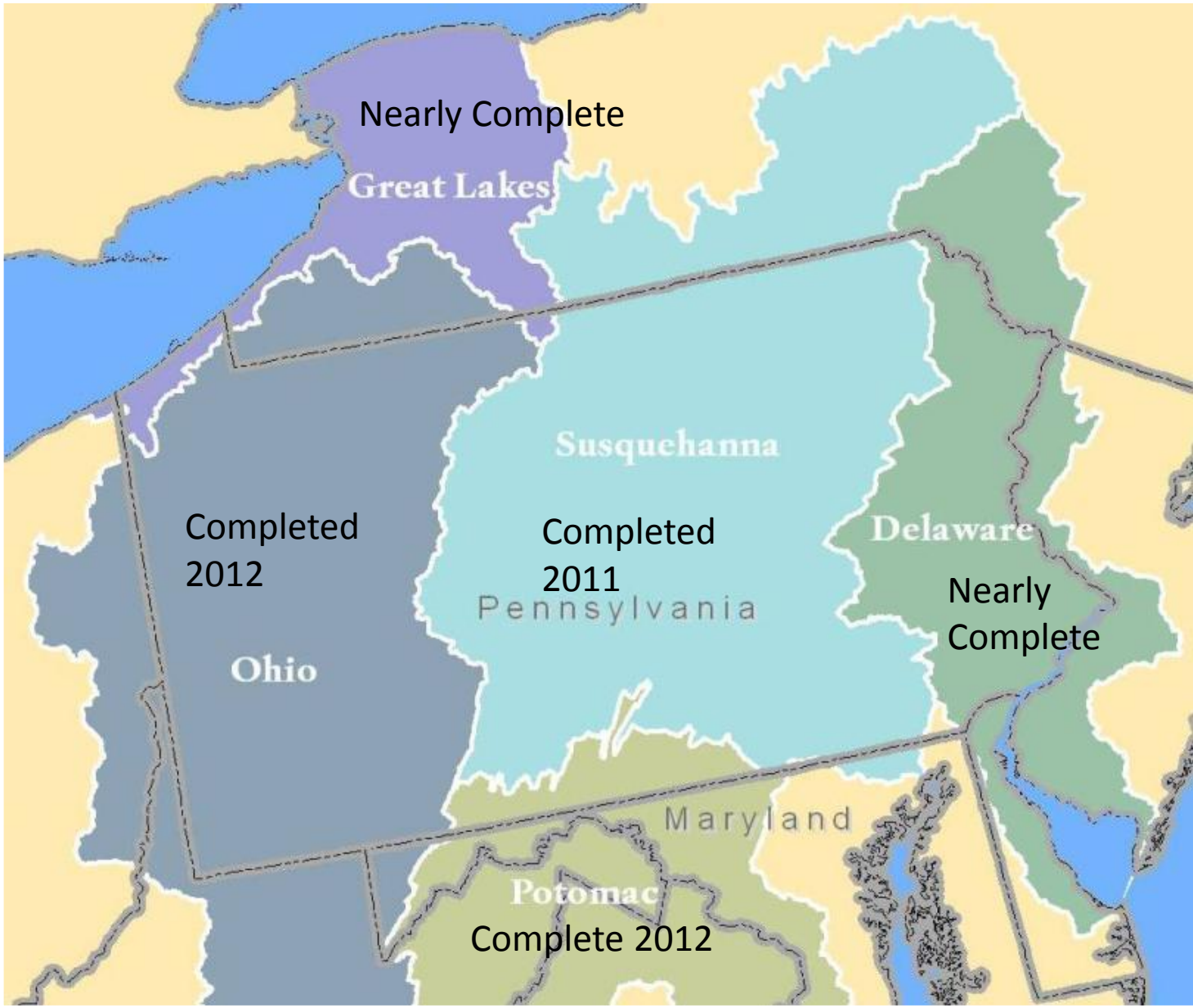
All **tributary rivers and streams** in the Appalachian Plateau, Ridge and Valley, New England, and Piedmont Physiographic Provinces.

Non-tidal **mainstem** Delaware River as far downstream as Trenton.



Regional TNC Ecological Flow Studies

Develop science based flow recommendations based on existing information that are useful to waster managers.



DRB Study Technical Advisors*

Primarily aquatic resources professionals

- TNC Staff
- DRBC Staff
- PADEP
- NYSDEC
- NJDEP
- DNREC
- PAFBC
- USACOE
- USGS - PA
- ANSP
- USGS - NJ
- Stroud
- NPS
- PDE
- PWD
- USFWS
- EPA
- American Rivers
- Temple
- BCCC
- EcoAnalysts
- UPENN
- DRKN
- UDEL

** Invited to participate and received project updates & associated project materials*

DRB Study Timeline

- 9/21/2011 – Commissioners adopt Resolution No. 2011-11.
- 9/2012 – Workshop #1 (Branchville, NJ)
- 3/2013 – Workshop #2 (Bangor, PA)
- 9/2013 – Workshop #3 (DRBC offices)
- 11/2013 – Draft Report / Recommendations
- 12/2013 – Final Report / Recommendations

DRB Study Questions

- What are the variety of hydroecological settings in the basin?
- Within each setting (type), how do flow conditions affect species and ecological processes throughout the year?
- What range of flows would protect these species and ecological processes?

Which species are sensitive to changes in streamflow?

Fishes

Mussels

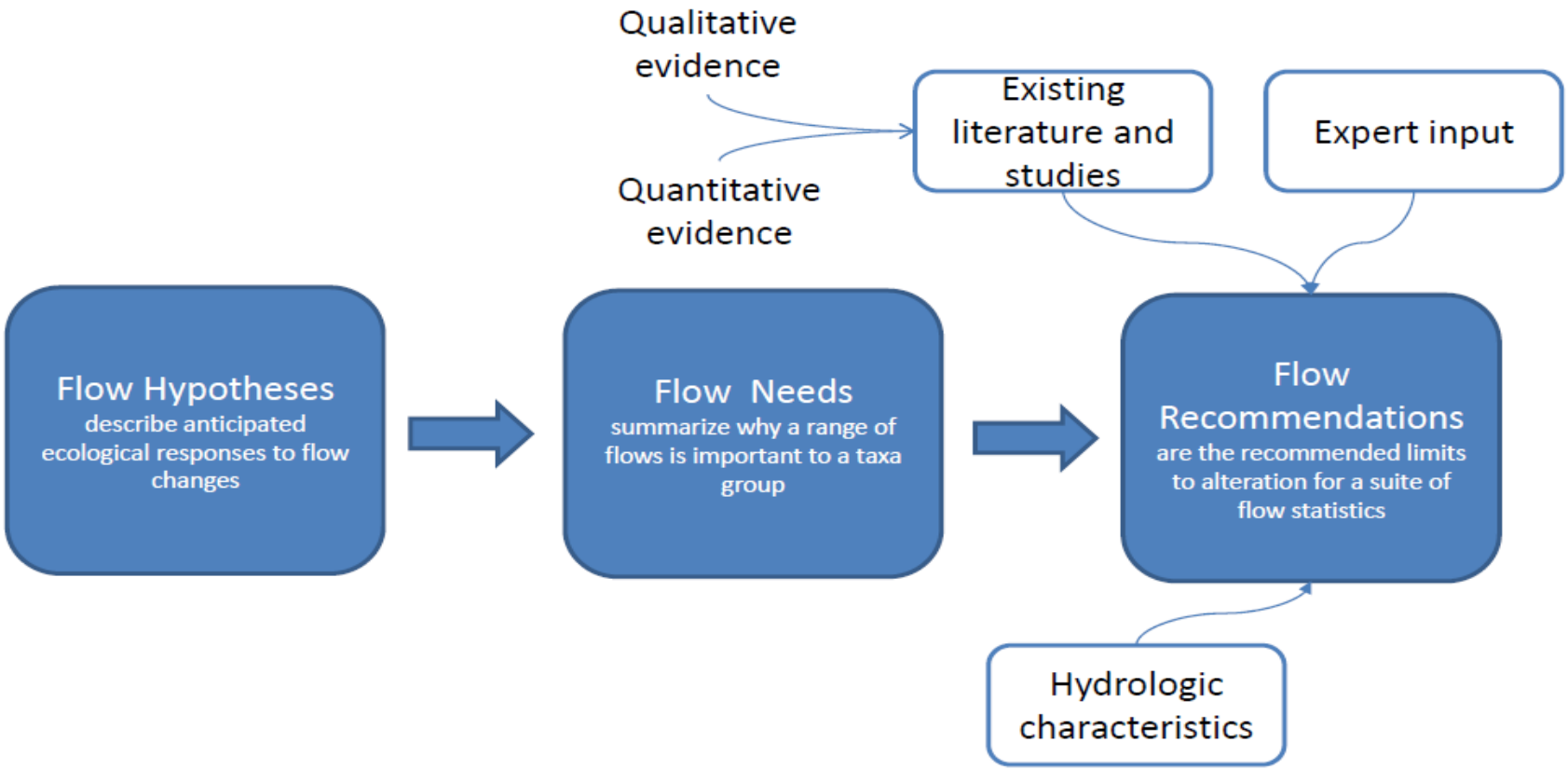
Reptiles and Amphibians

Floodplain and Aquatic Vegetation

Birds and Mammals

Aquatic Insects and Crayfish

Pathway to Recommendation Development



Draft DRB Stream Classifications

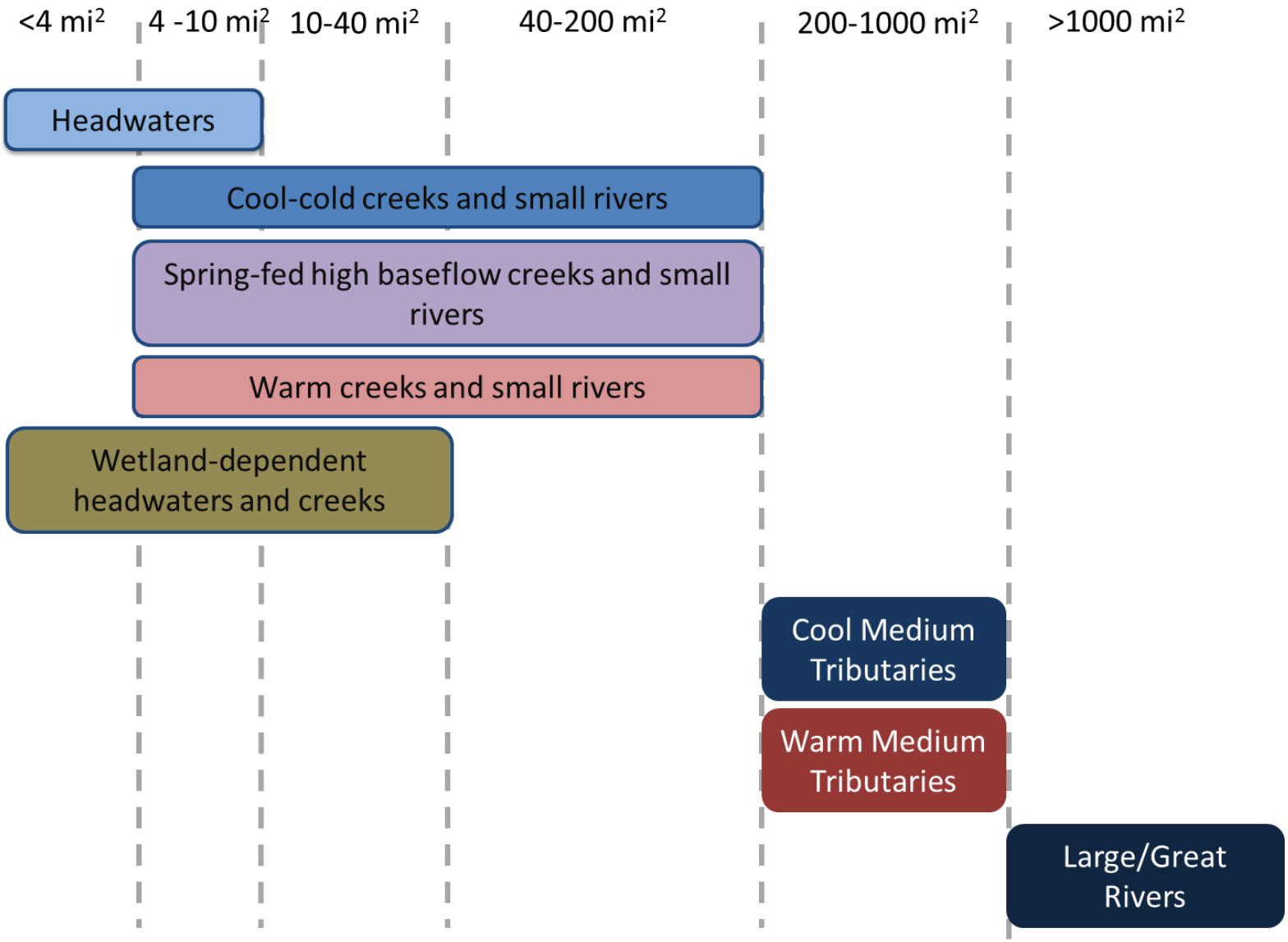
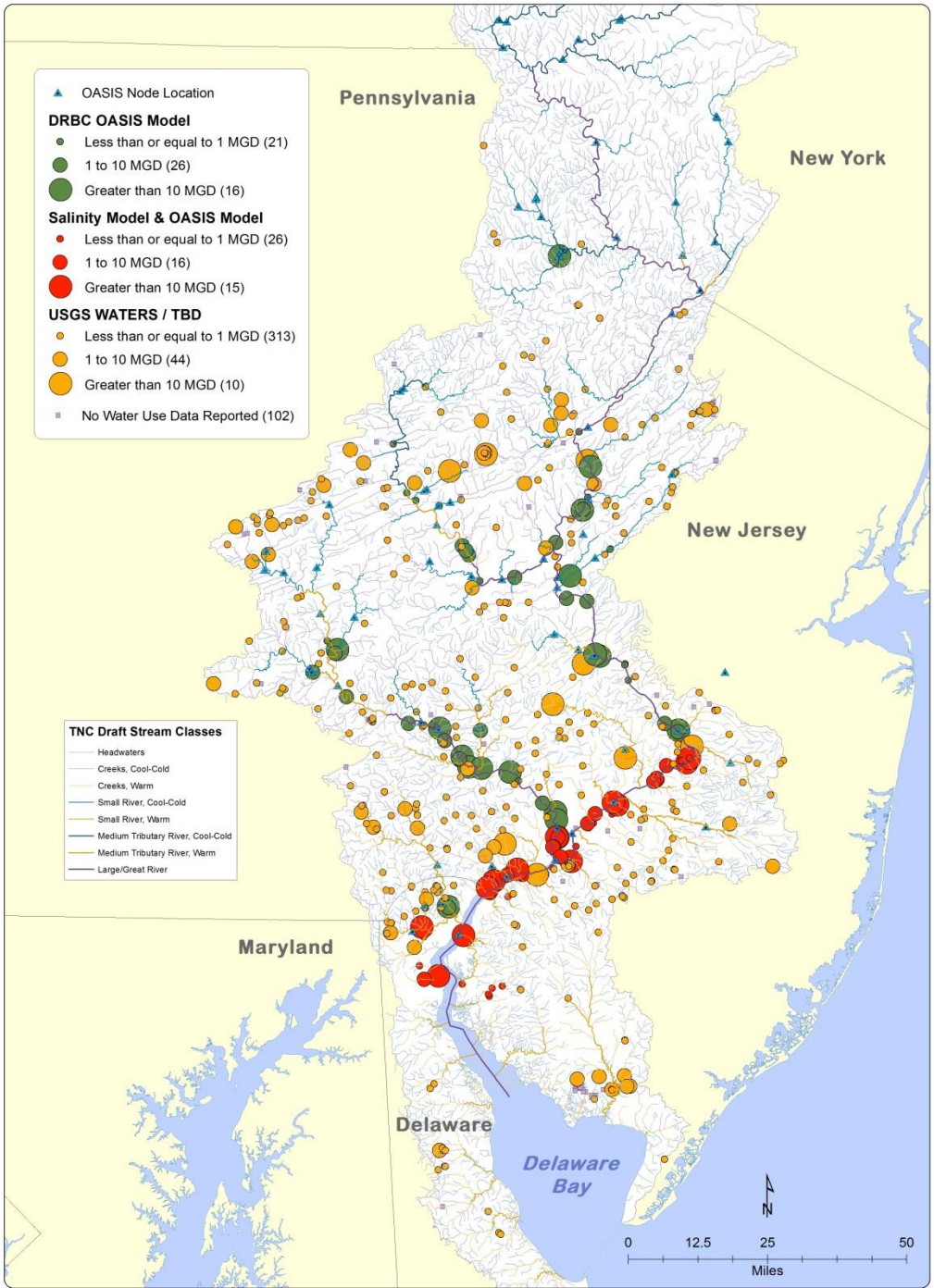


Figure 6. Habitat types for the Delaware Ecosystem Flow Study. Within each size class, there are multiple types defined by temperature and flow stability. The Northeast Aquatic Habitat Classification System was used to define and map size classes.

http://rcngrants.org/content/northeastern-aquatic-habitat-classification-project

Surface Water Withdrawals Categorized by Model Domain



The Nature Conservancy
Protecting nature. Preserving life.™

How do flow conditions affect species?

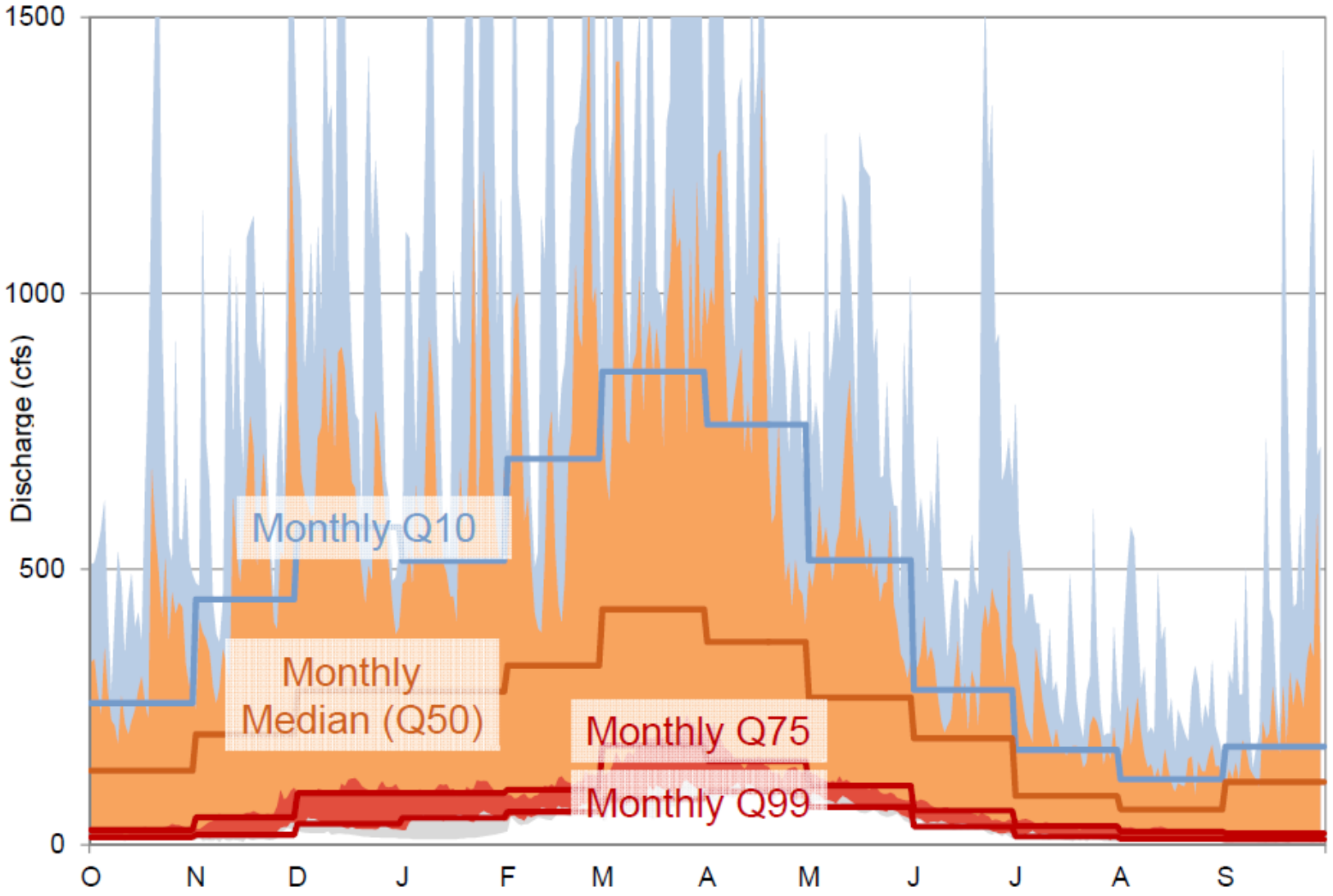
Example hypothesis

During the summer months, central stoneroller, longnose dace, margined madtom and fantail darter require flows that maintain swift to moderate current riffle/run habitats.

If the magnitude of summer flows is reduced, available riffle habitat may be reduced limiting juvenile and adult growth.

Who What When Where Why/How

Flow Components and Flow Statistics



EPA's Biological Condition Gradient

Levels of Biological Condition

Natural structural, functional, and taxonomic integrity is preserved.

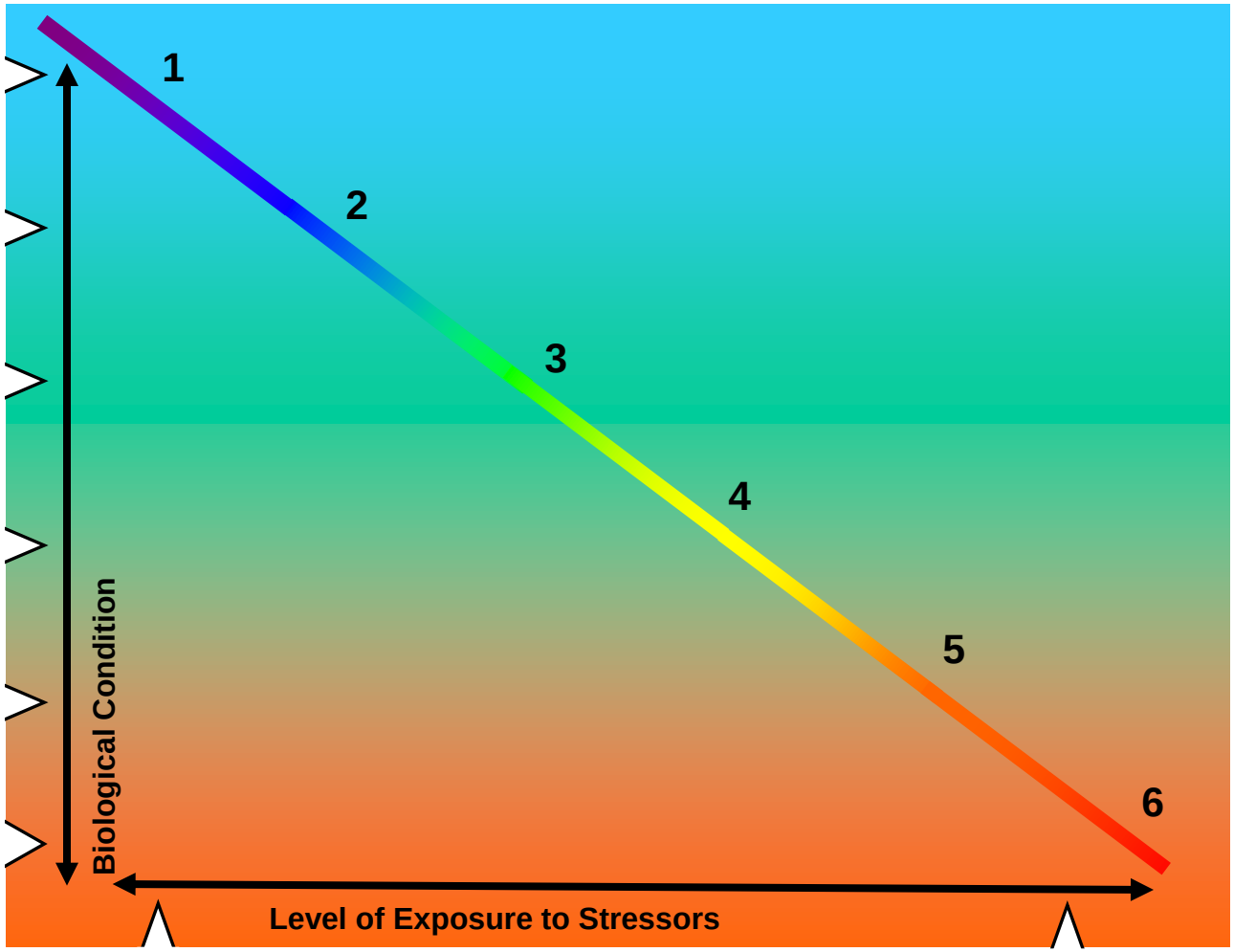
Structure & function similar to natural community with some additional taxa & biomass; ecosystem level functions are fully maintained.

Evident changes in structure due to loss of some rare native taxa; shifts in relative abundance; ecosystem level functions fully maintained.

Moderate changes in structure due to replacement of sensitive ubiquitous taxa by more tolerant taxa; ecosystem functions largely maintained.

Sensitive taxa markedly diminished; conspicuously unbalanced distribution of major taxonomic groups; ecosystem function shows reduced complexity & redundancy.

Extreme changes in structure and ecosystem function; wholesale changes in taxonomic composition; extreme alterations from normal densities.

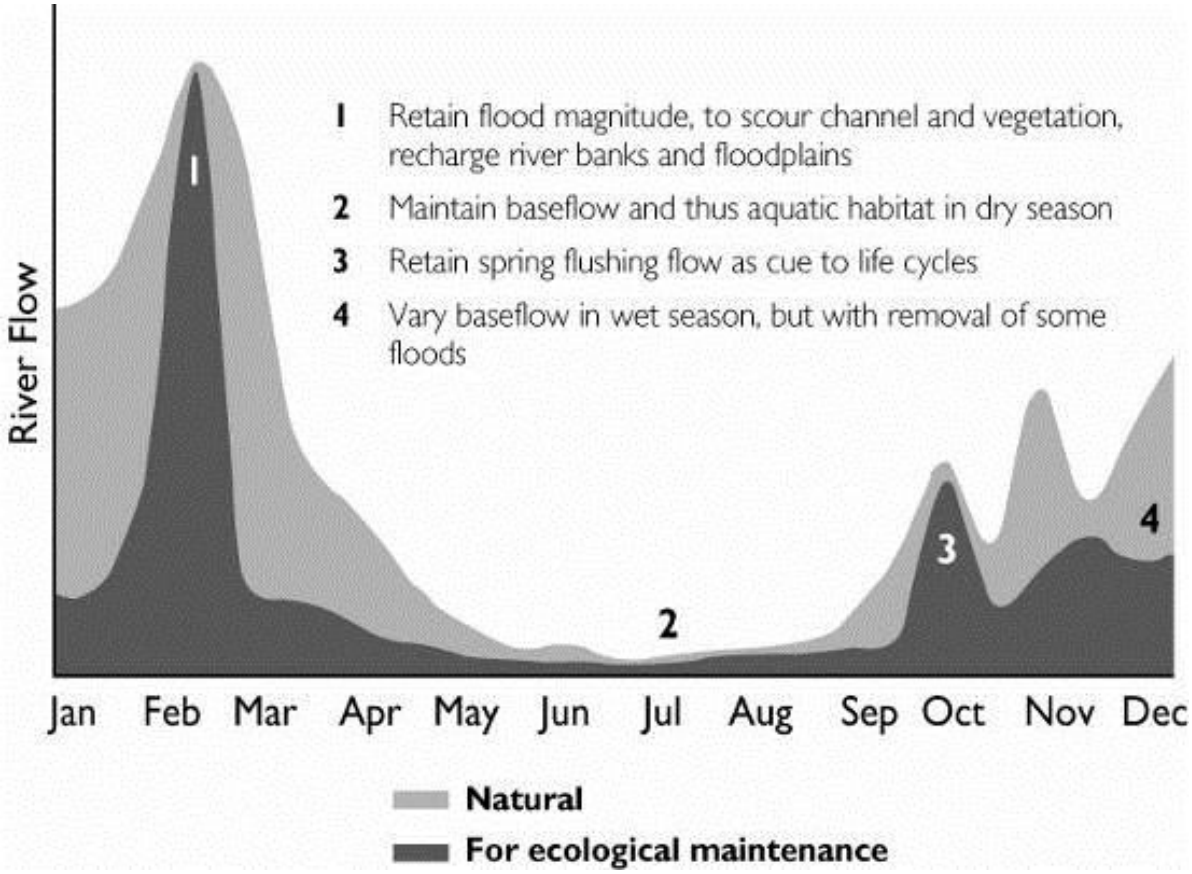


Watershed, habitat, flow regime and water chemistry as naturally occurs.

Chemistry, habitat, and/or flow regime severely altered from natural conditions.

TNC Environmental Flow Principles

- The goal is *not* to create optimal conditions for all species all of the time; rather, we want to create adequate conditions for all native species *enough* of the time.



Potential Applications of eFlow Recommendations

- Water Supply Planning (see 2060 plan)
- Pass-by requirements for SWWDs
- Conservation Releases for reservoirs
- Consumptive Use Mitigation Requirements (flow based triggers)
  - Exelon LGS & Schuylkill River flow at Pottstown
  - Merrill Creek Ownership Group (electric power producers) & Delaware River flow at Trenton
  - Several docket holders & Brandywine Creek at Chaddsford
- Assessment purposes