EPA National Training Workshop, June 22, 2023

Advancing Water Quality Through Land Protection: Lessons from the Delaware River Watershed Initiative

Abigail Weinberg, Open Space Institute

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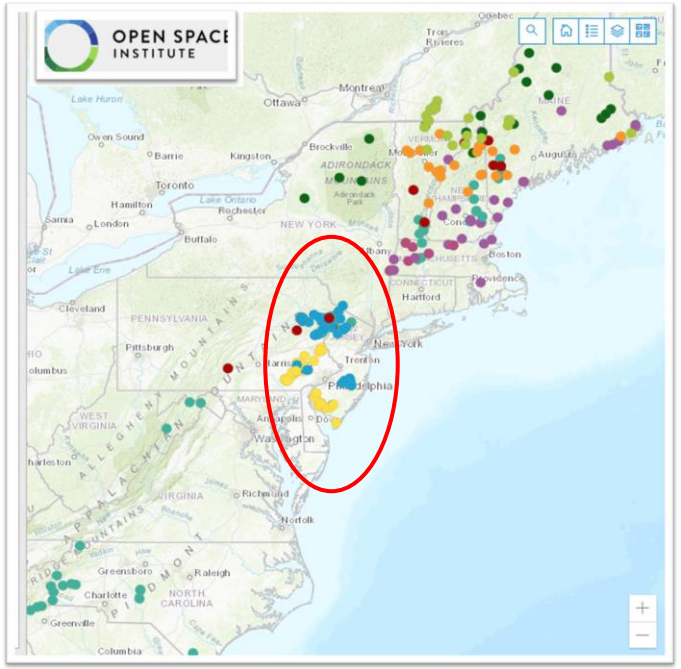
Direct land protection for clean water, climate resilience, and healthy communities.



$50 million in **grants** for 260 land protection projects conserving 2 m acres

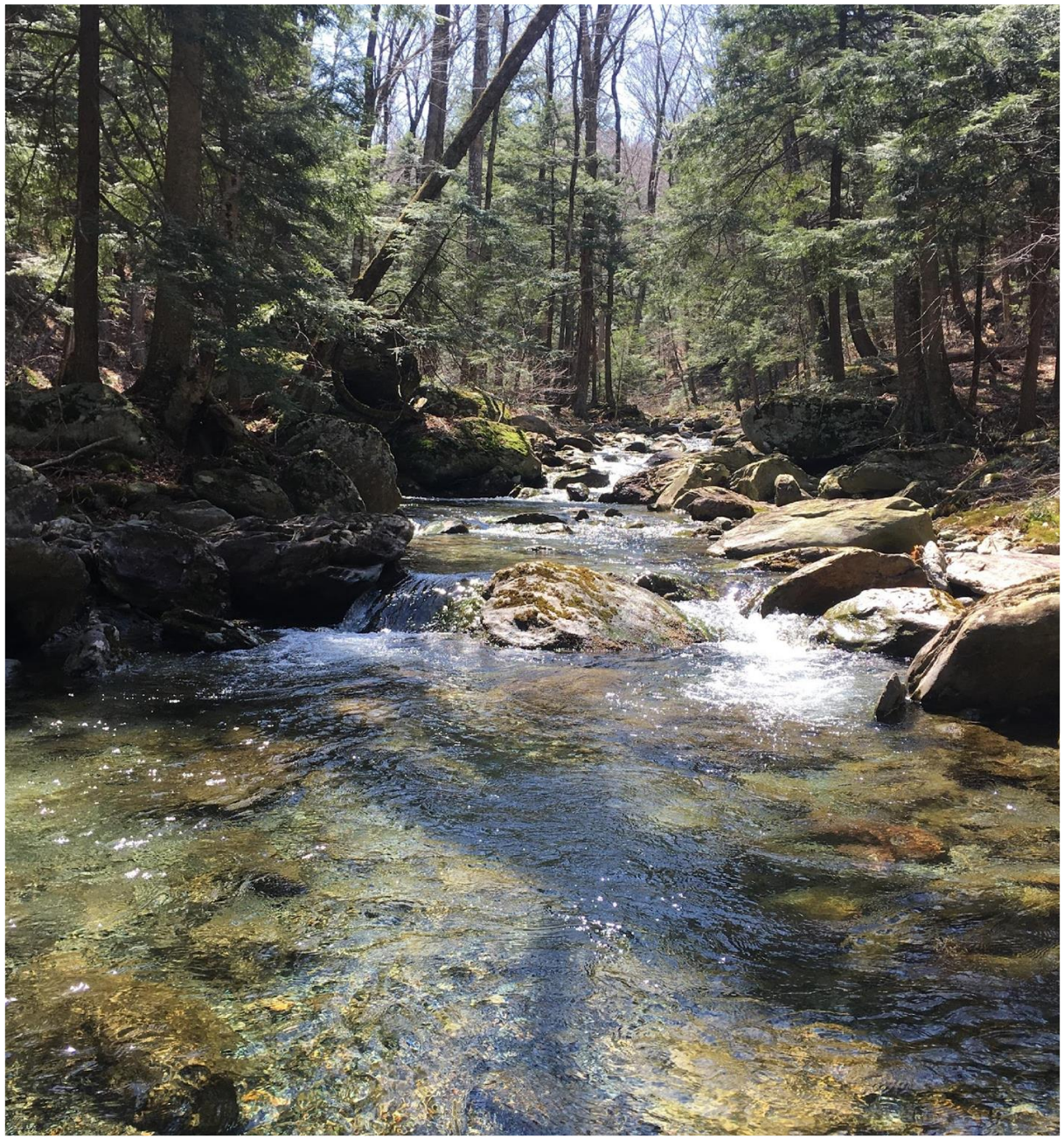
Nearly $1 million to integrate science into 80 **conservation plans** covering all or part of 19 states

EPA 2022 Vision Watershed Protection: Minimizing or avoiding water quality degradation to currently healthy waters

OSI Land Protection: Permanent, legal protections that prevent development & minimize loss of forest cover (i.e. easement or fee purchase by a qualified owner)

What I'll Cover

- Delaware River Watershed Initiative
- Targeting Land Protection
- Assessing Impact
- Reflections & Discussion



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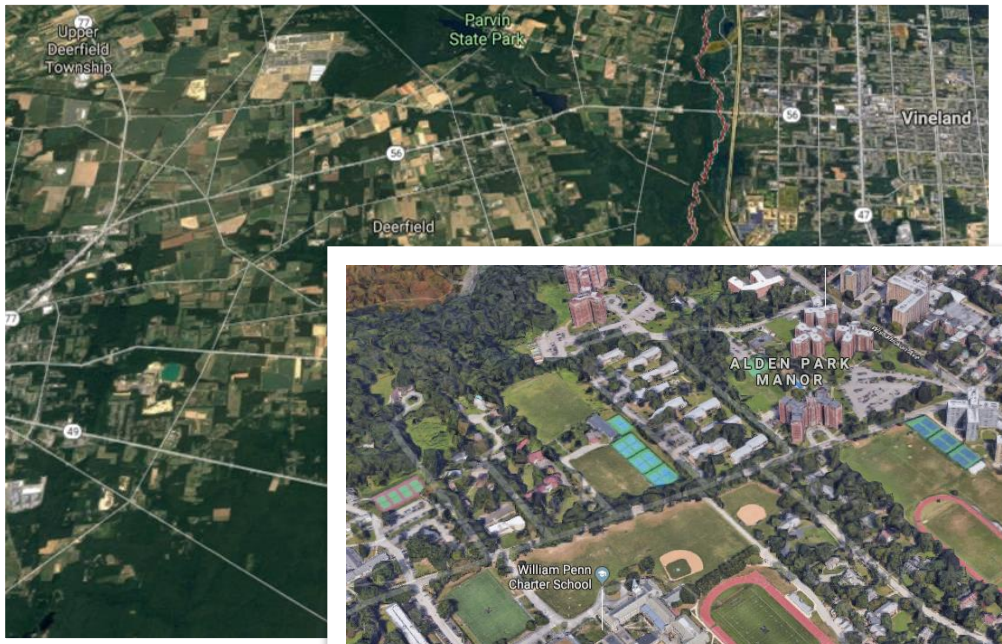

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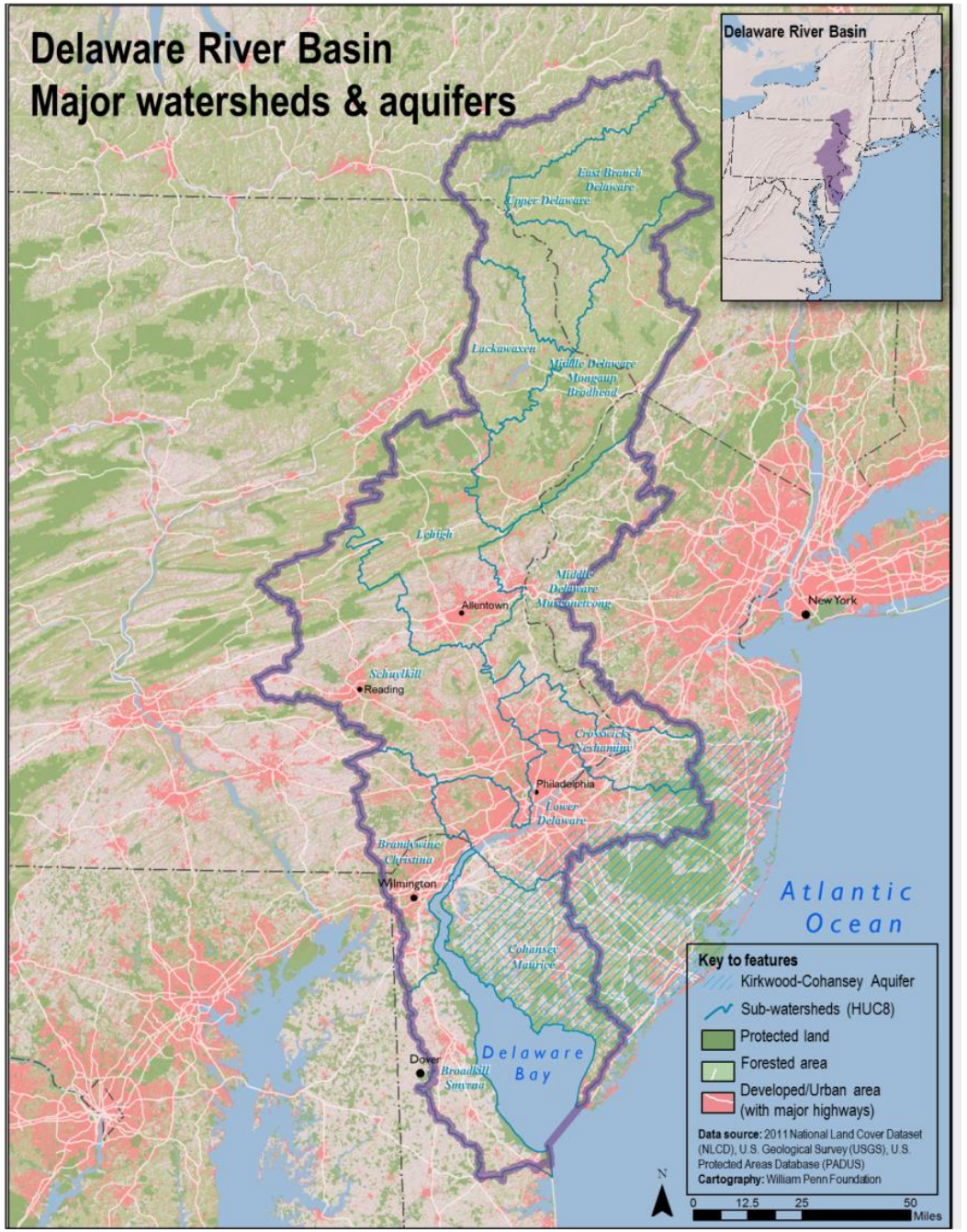

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Delaware River Watershed Initiative

Top-down Planning for Priority Regions

Science screen – Led by Academy of Natural Science

Science-based focus areas

Key data:
- Physical
- Biological
- Development trends
- Protected lands
- Ground water

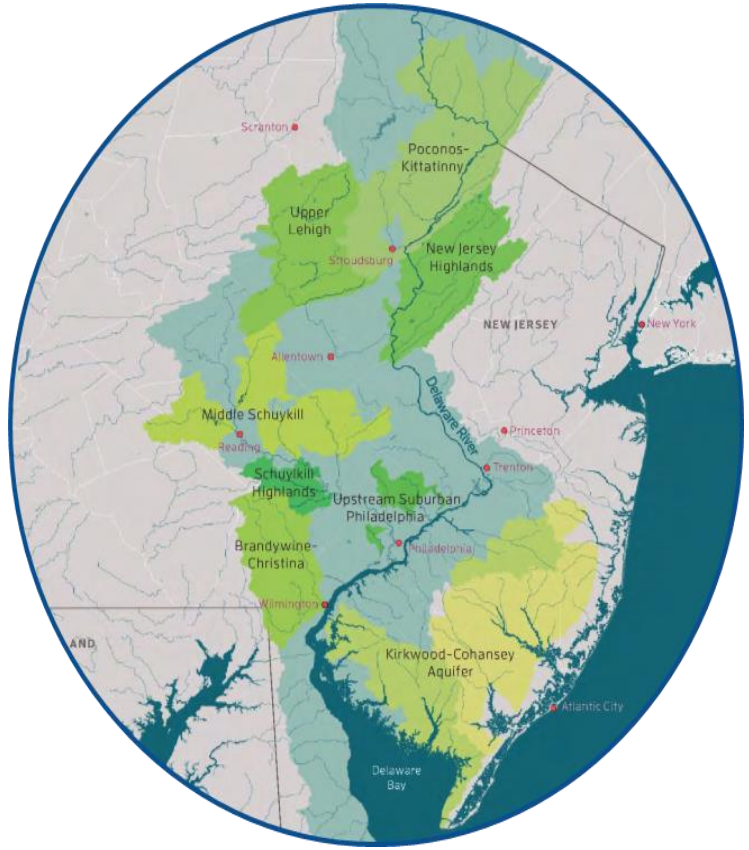
Ranking of watersheds by conservation / restoration need

Feasibility Screen – Led by Open Space Institute in consultation with ANS and key experts

Capacity
- Organizations
- Track Records

Impact/investment
- Urgency
- Leverage
- Feasibility

Measurability
- Indicators
- Monitoring
- Measures



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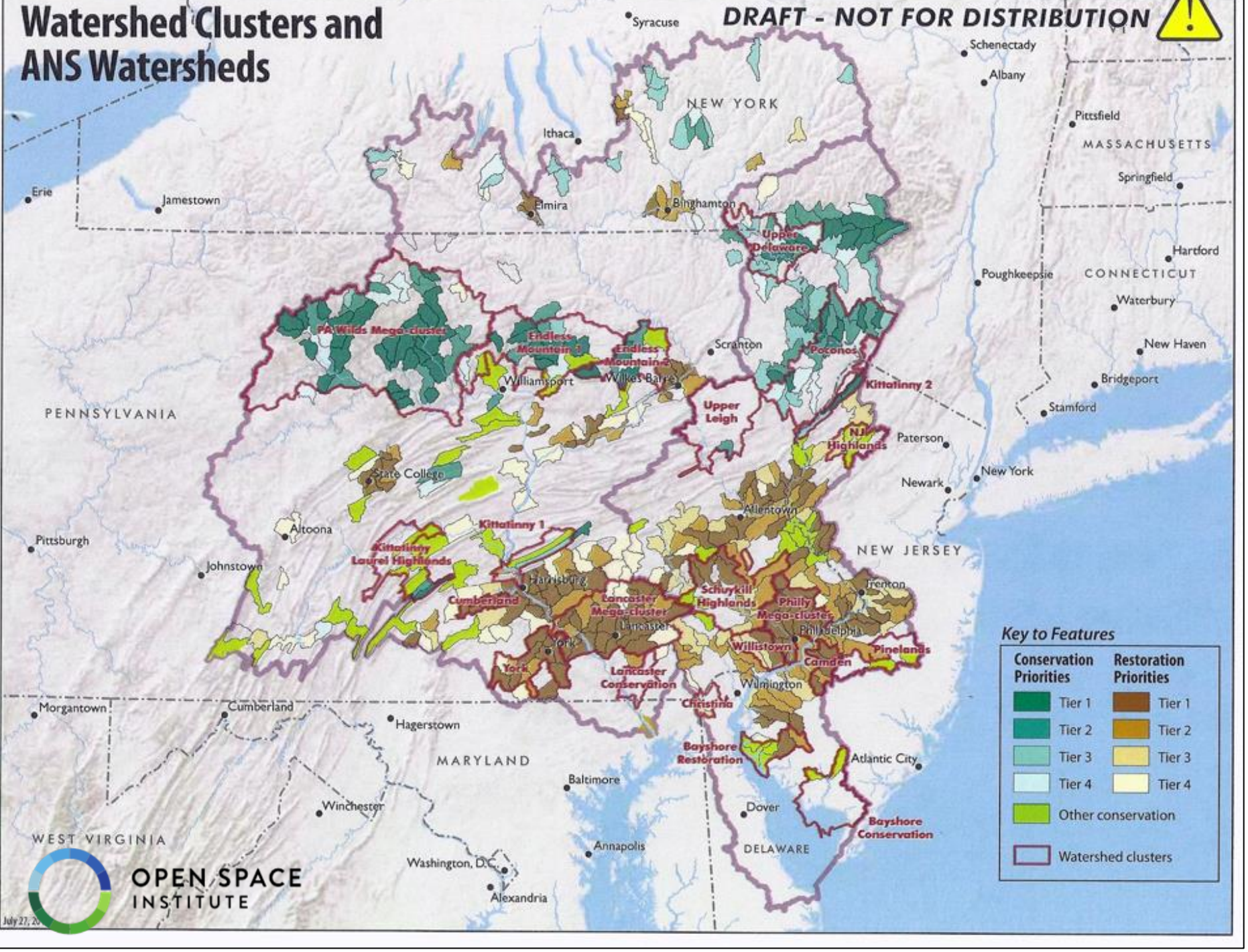

Data Inputs

- Impaired streams
- Stream designations
- Riparian zones
- Forest & wetlands
- Impervious surface
- Development and
- Agriculture

DRWI

THE ACADEMY OF NATURAL SCIENCES of DREXEL UNIVERSITY

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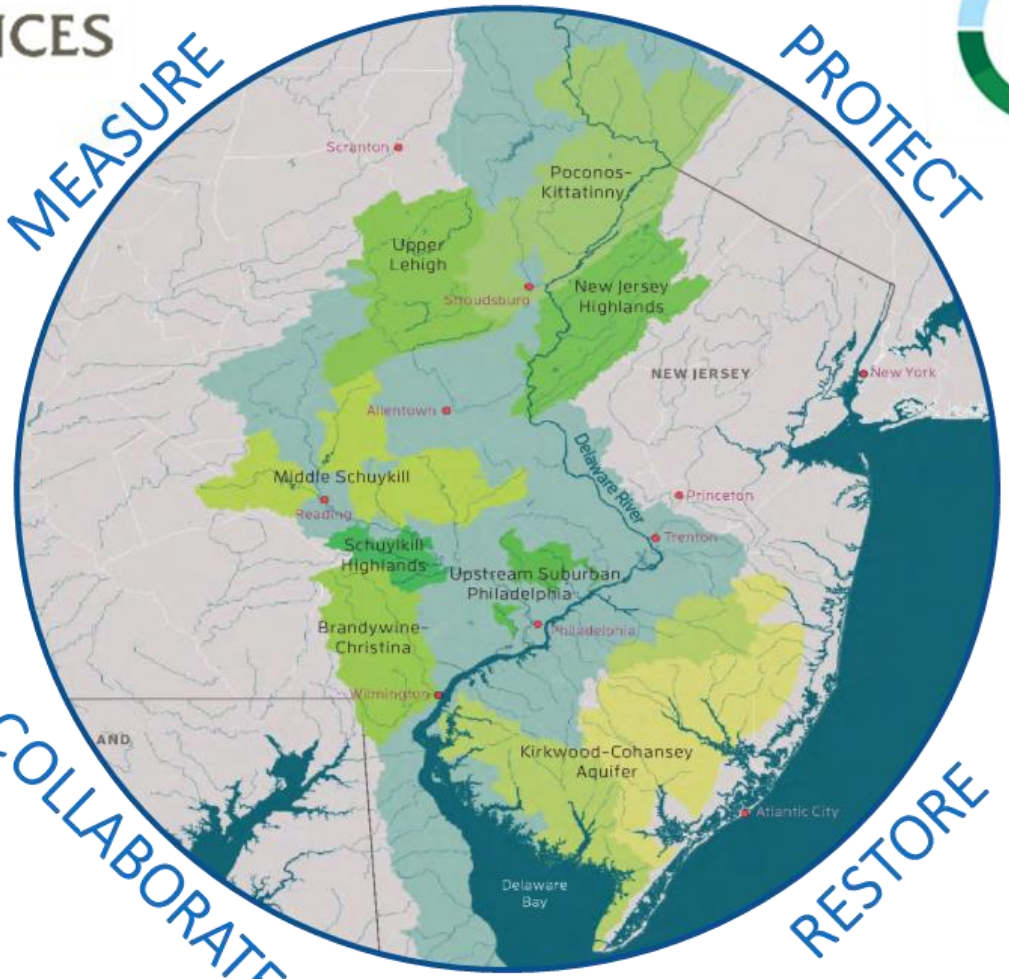

Institute for Conservation LEADERSHIP

NATIONAL FISH AND WILDLIFE FOUNDATION NFWF

Each cluster of sub-watersheds comprises 3-11 on-the-ground conservation organizations (45 total) that are actively implementing a shared restoration and/or protection plan.

WILLIAM PENN FOUNDATION

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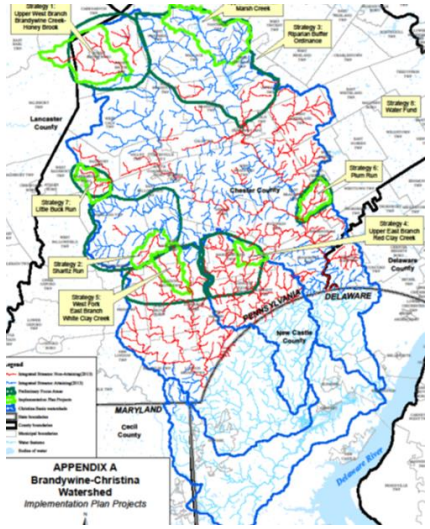
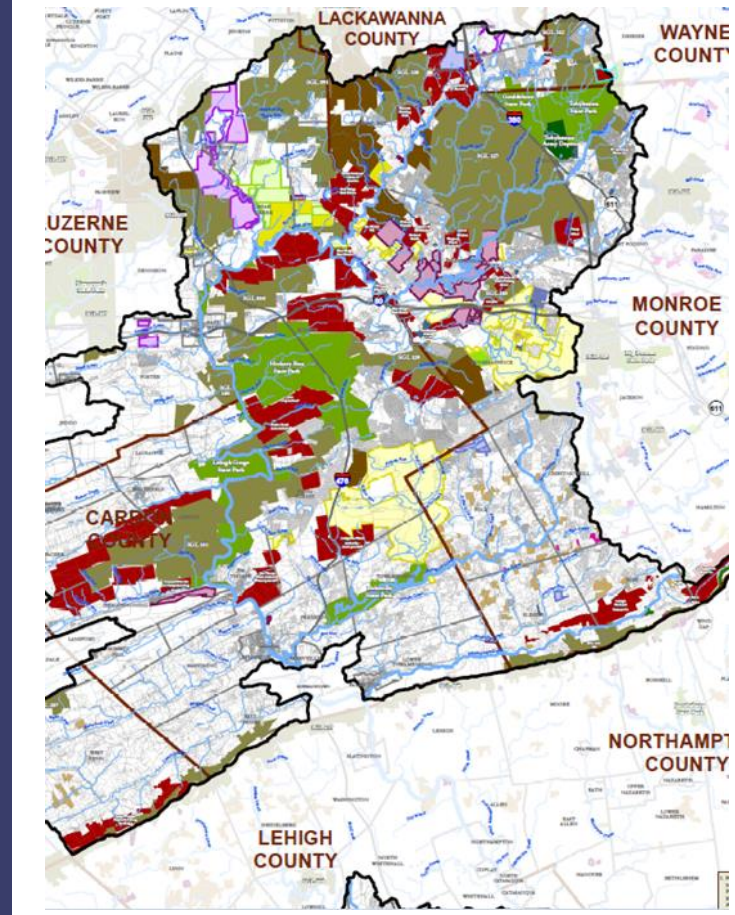
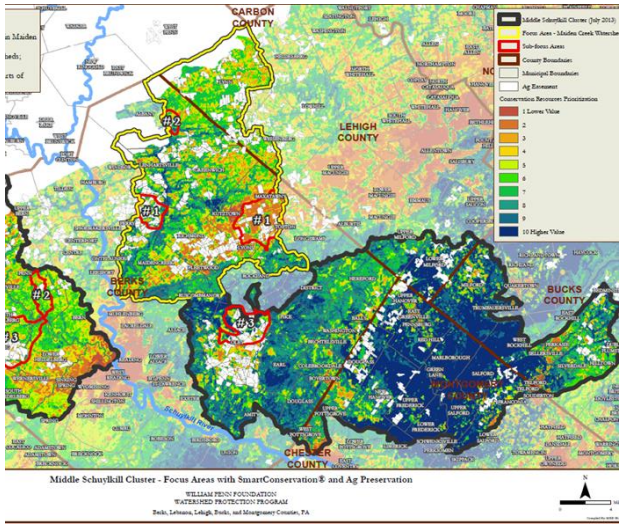
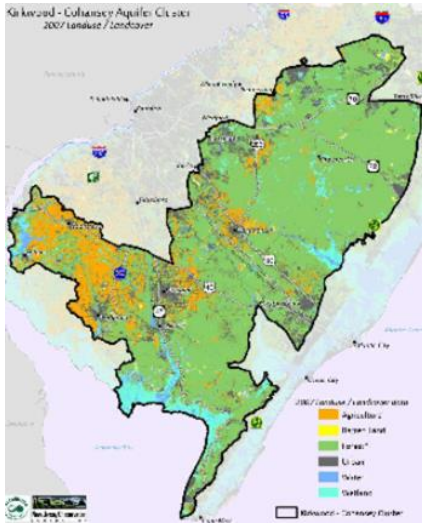
Delaware River Watershed Initiative

Bottom-up Planning for Implementation Sites



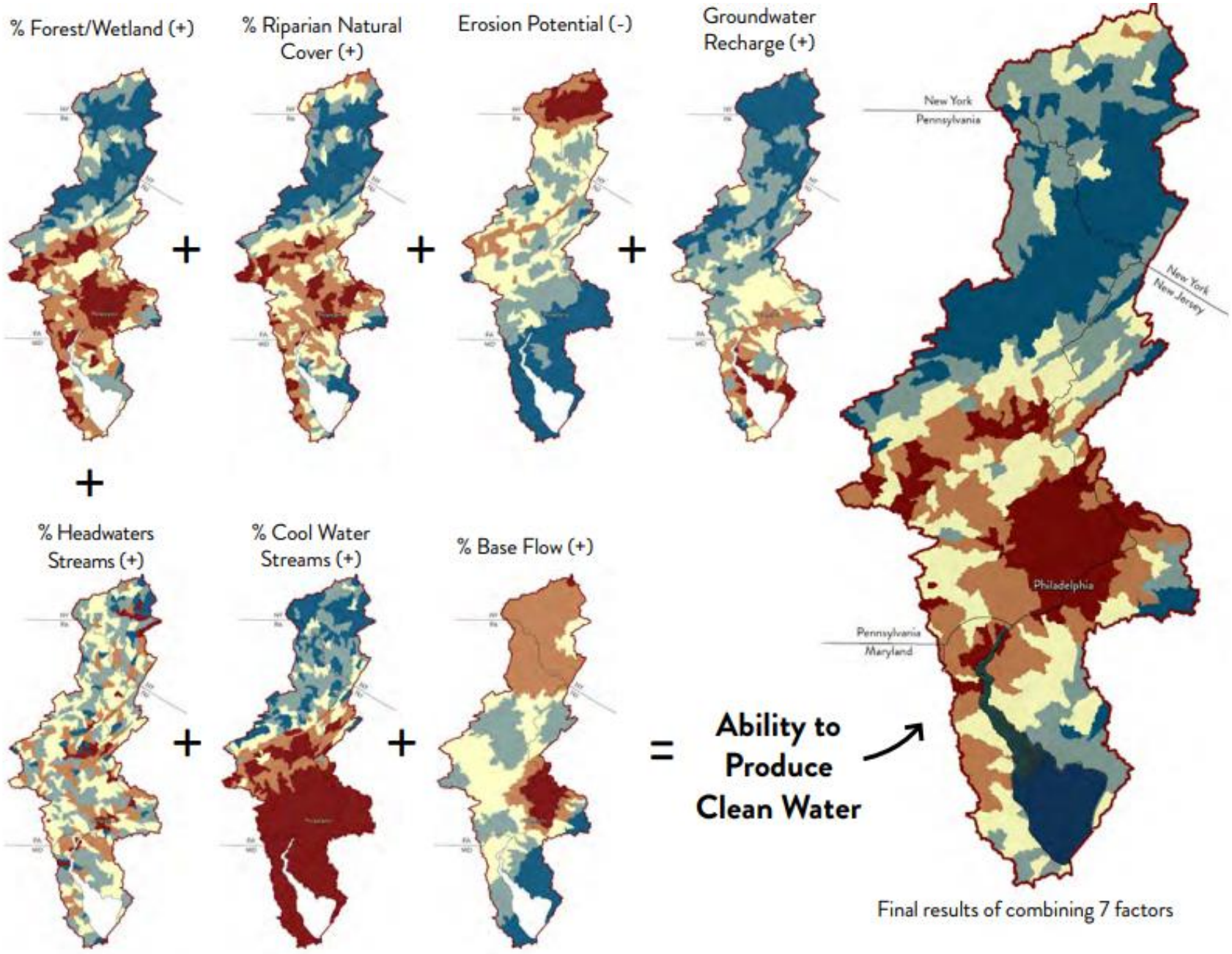






Watershed Selection Criteria *Evaluating Watershed Condition and Key Threats to Water Quality at the HUC12-scale*				Protection Project Selection Criteria *Evaluating the Size, Condition, and Extent of Key Ecosystems looked to preserving Water Quality*						
WATERSHED CONDITION Targeting high to moderately-high quality watersheds where conservation can make a difference Includes headwater and riparian corridor ecosystems *(Percent Impervious Cover)*	FLOODPLAIN CONDITION Targeting high-quality floodplains Includes small and mainstem rivers *Percent Impervious Cover)*	DEVELOPMENT POTENTIAL Projected Impervious Cover for the HUC12 *(Percent Impervious Cover)*	WATERSHED RANK	PARCEL SIZE *(acreage)*	PARCEL CONDITION *(Forest/ Impervious Cover)*	HABITAT CONDITION Provides habitat for species of concern *(Heritage?)*	AQUATIC CONDITION Preserves portion of the EV, HQ, Brook or Wild Trout Stream System *Percent of stream preserved by property)*	ABUNDANCE OF WETLAND ECOSYSTEMS *(acreage & percent of property in wetlands)*	ABUNDANCE OF RIPARIAN & FLOODPLAIN ECOSYSTEMS *(acreage & percent of property in riparian or floodplain areas) (use NHD Plus, ARA)*	PROJECT RANK
Identifying Headwaters and Floodplains of Significance				A Comparison to other Science-Based, Water Resource Prioritizations			OVERALL WATER QUALITY RANK			
HEADWATER CONSERVATION Collection of Projects and existing Protected Lands combine to conserve extensive Headwater Regions of Key HUC12s *(acres)*	FLOODPLAIN CONSERVATION Protects floodplains along major rivers of Cluster *(feet of river frontage)*	FLOODPLAIN CONNECTIVITY Collection of Projects and existing Protected Lands conserve significant extent of floodplains along Major Rivers of Cluster	HEADWATER AND FLOODPLAINS OF SIGNIFICANCE RANK	Identified by Academy of Natural Sciences Cluster Ranking (IC, Wetlands, Forests, Ag)	Identified by Common Water's Priority Area	Identified by Aquatic Resiliency Analysis (under development)				
EVALUATING PROJECT CONSTRAINTS AND OPPORTUNITIES										

Ability to Produce Clean Abundant Water



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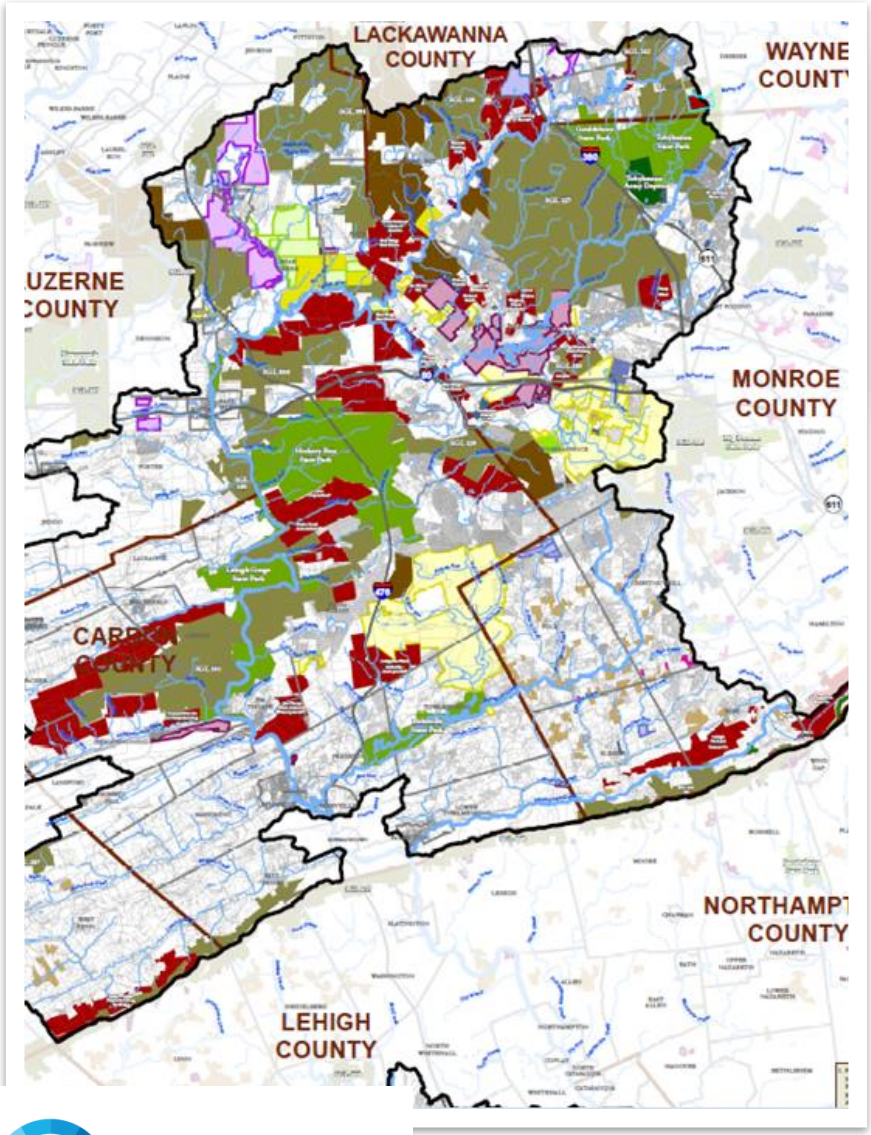

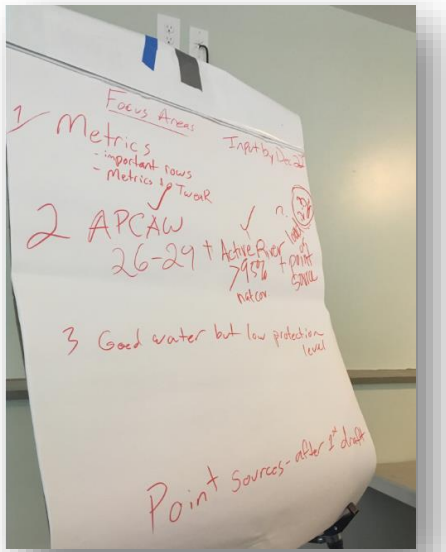

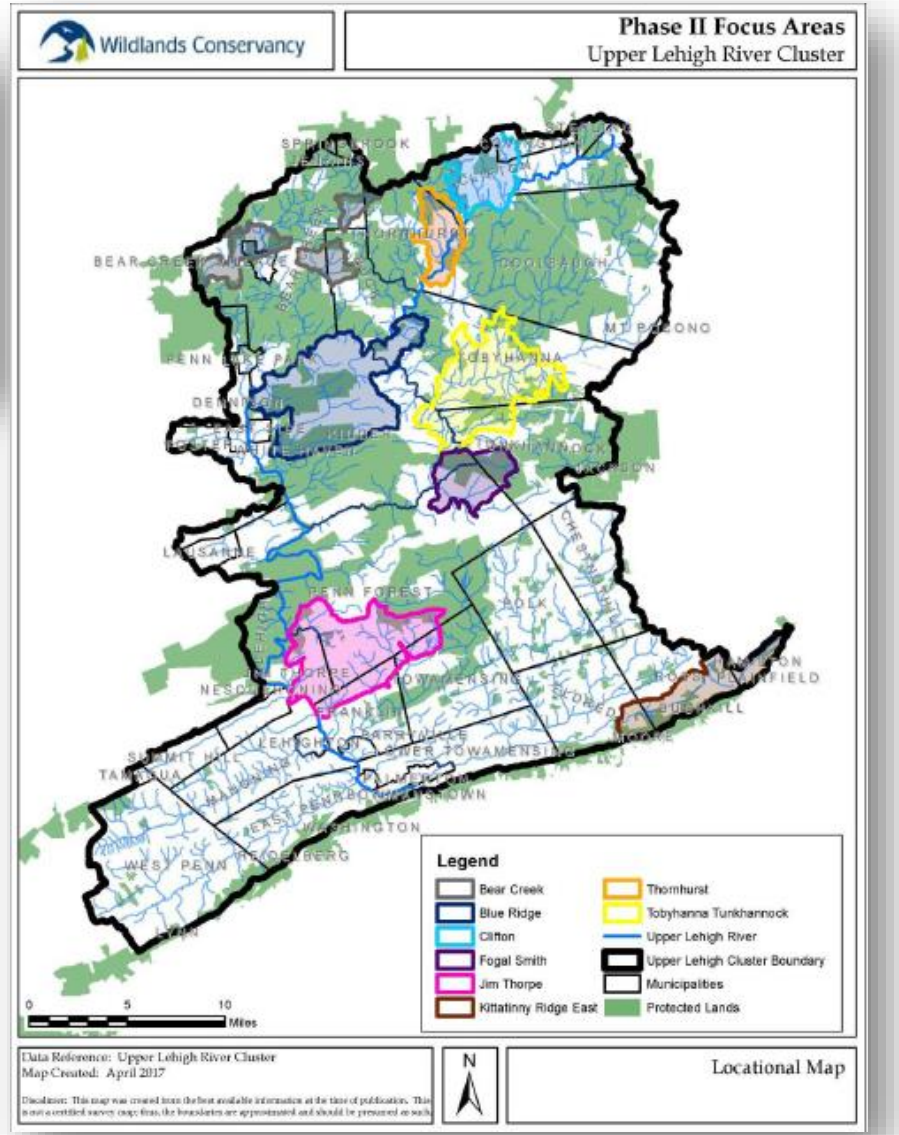

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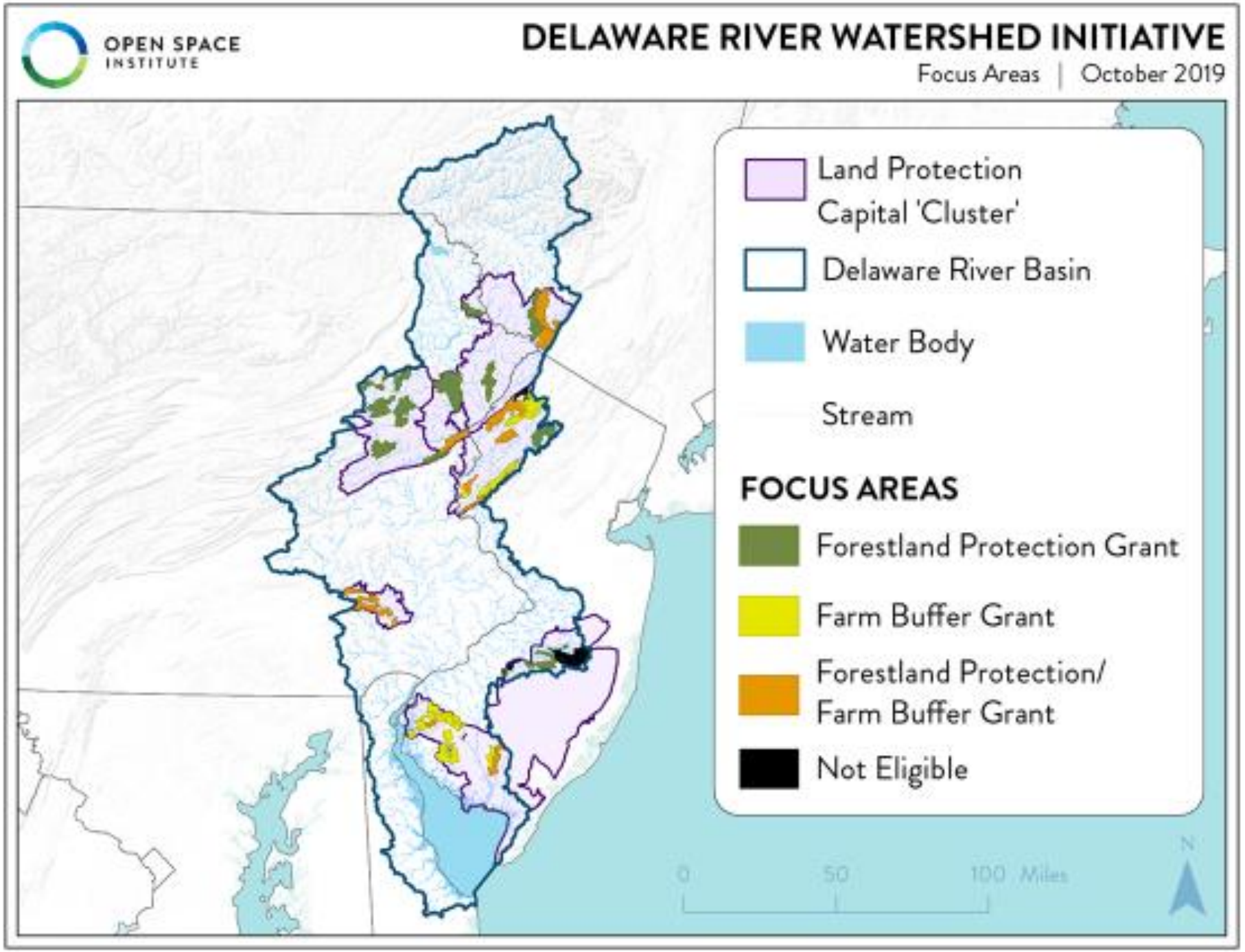
Geographic Targets for Protection & Restoration Strategies

Watershed “Clusters” & Focus areas



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OSI Delaware River Watershed Protection Fund

1. Watershed context
2. Water resources & stewardship
3. Risk of conversion

To date:
65 approved grants protecting
27,000 acres of natural land
15,000 acres of headwaters
135 miles of stream bank

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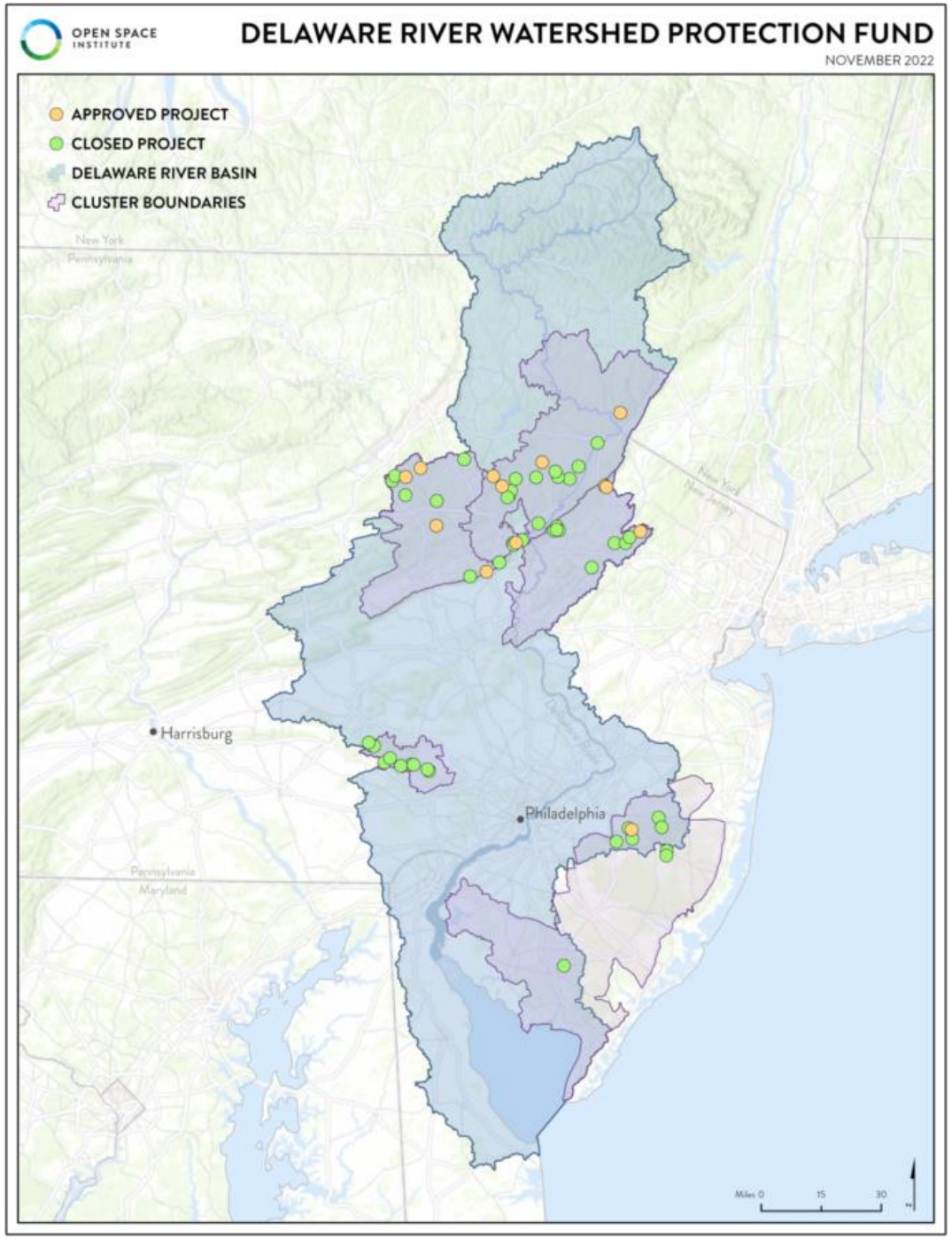

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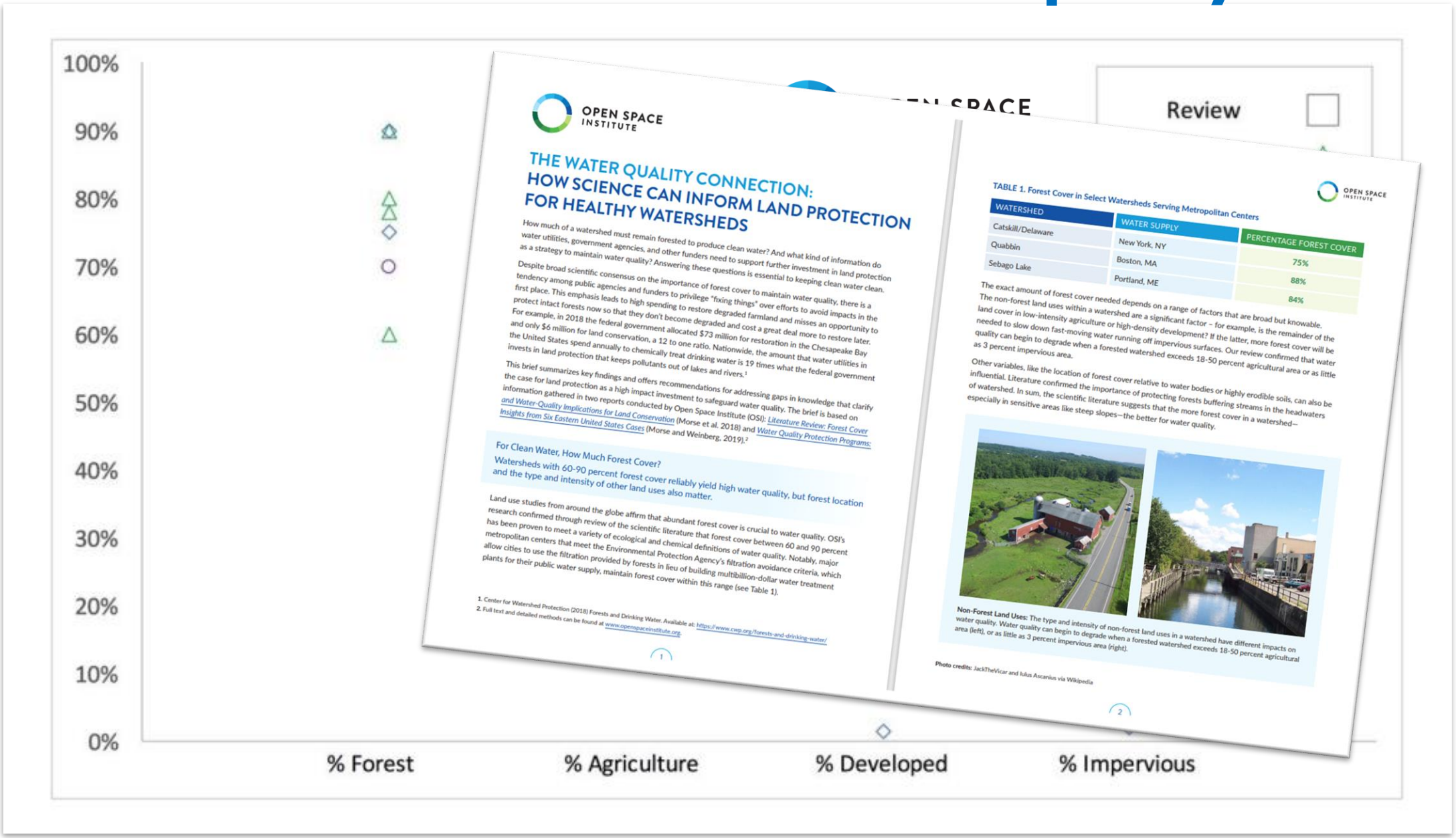
Assessing Impact

Lit Review: Forest Cover vs. Water quality



Research: Assess Water Quality Impacts

Land Protection

Leadership

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Peter Howell
Abigail Weinberg
Hallie Schwab

Sampling

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www.stroudcenter.org

John Jackson

The Academy of Natural Sciences of DREXEL UNIVERSITY

Dave Keller, Marie Kurz
Timothy McGuire

Modeling

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SHIPPENSBURG UNIVERSITY

Claire Jantz
Tim Hawkins

LimnoTech
Water | Scientists
Environment | Engineers

Anthony Aufdenkampe
Caitlin Lulay,
Sarah Jordan

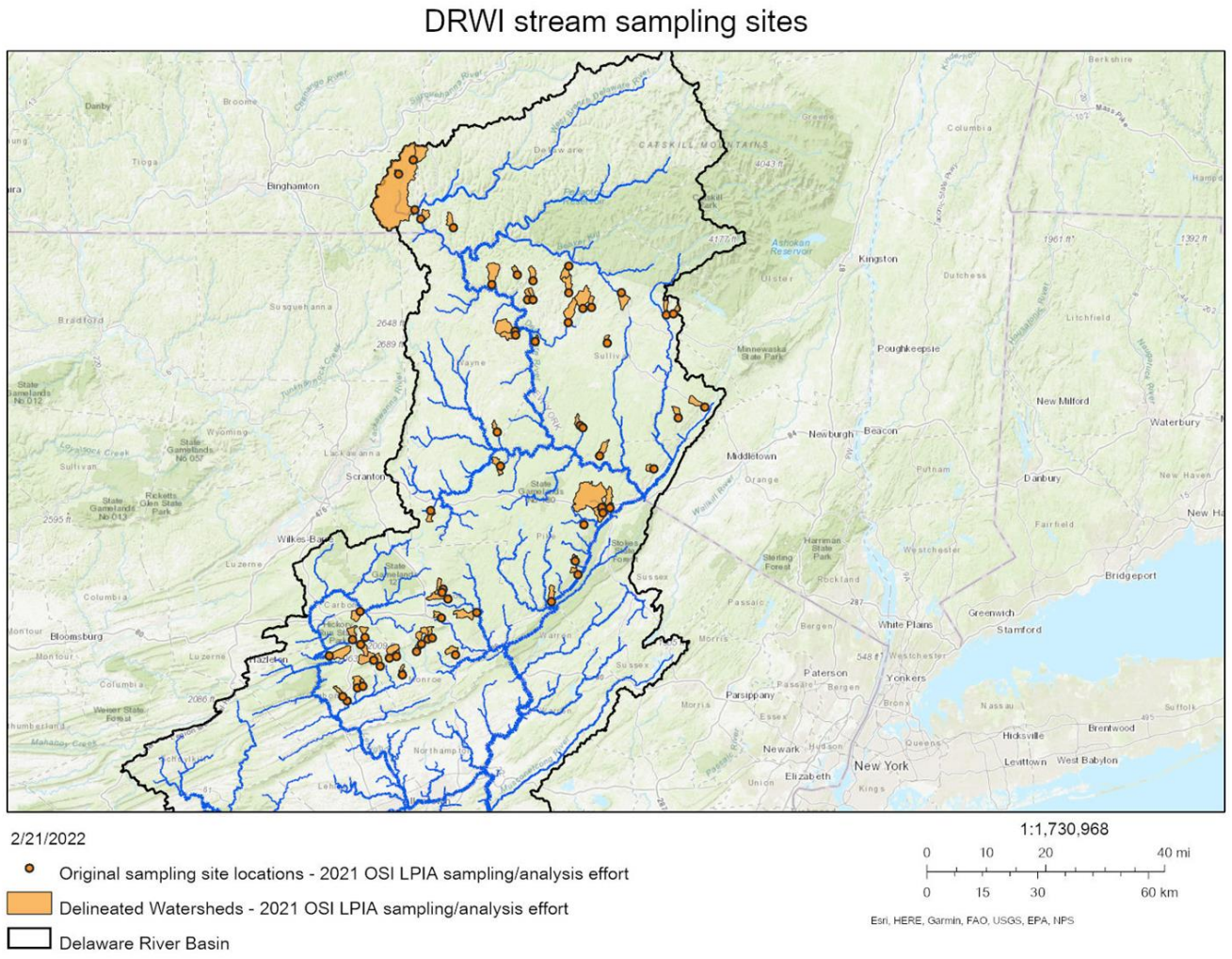
azavea

Our Overarching Question

What percentage of forest cover is needed in a watershed in order to maintain high water quality and ecosystem integrity?

- What is **high** water quality and **high** ecosystem integrity? (not a regulatory standard)

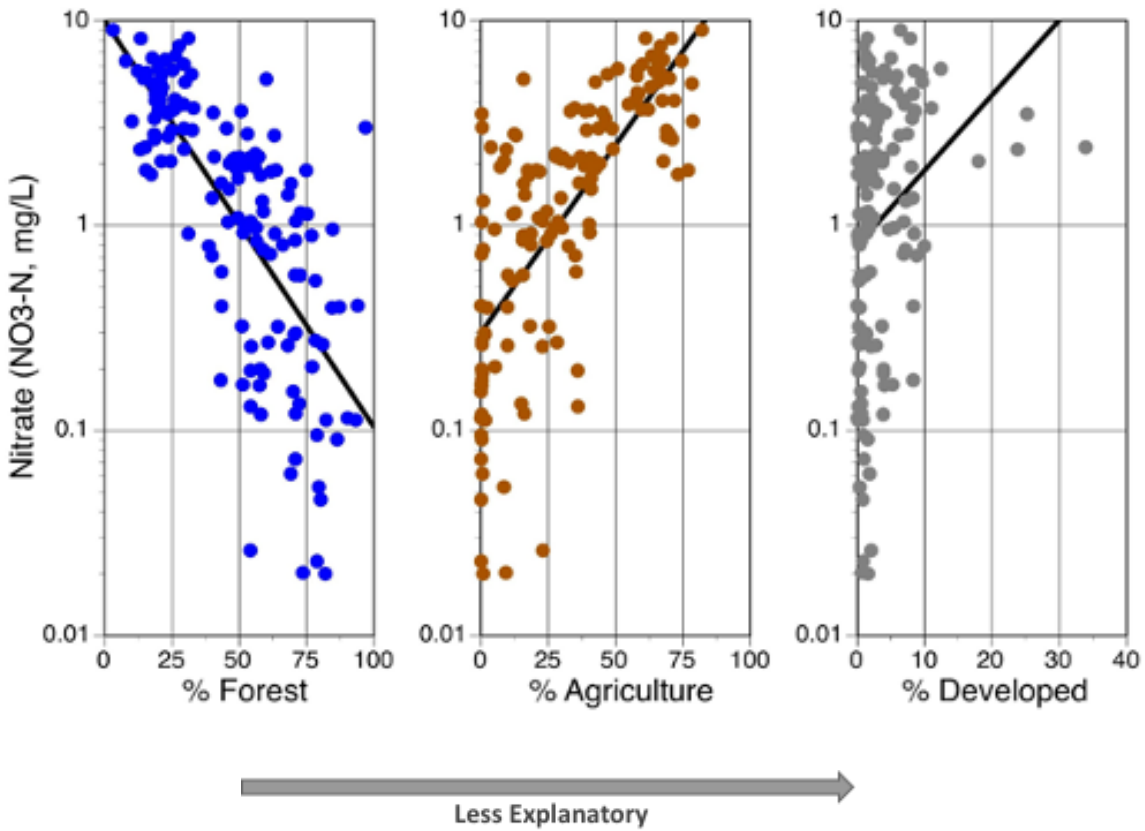
Sampling Sites



Controls

- One Ecoregion (Northern Glaciated Allegheny Plateau)
- Well forested (Forest Cover > 50%)
- Small watersheds (700-4000 acres)
- Limit wetland influence (<10% wetlands watershed, <2% wetlands local)
- No point sources

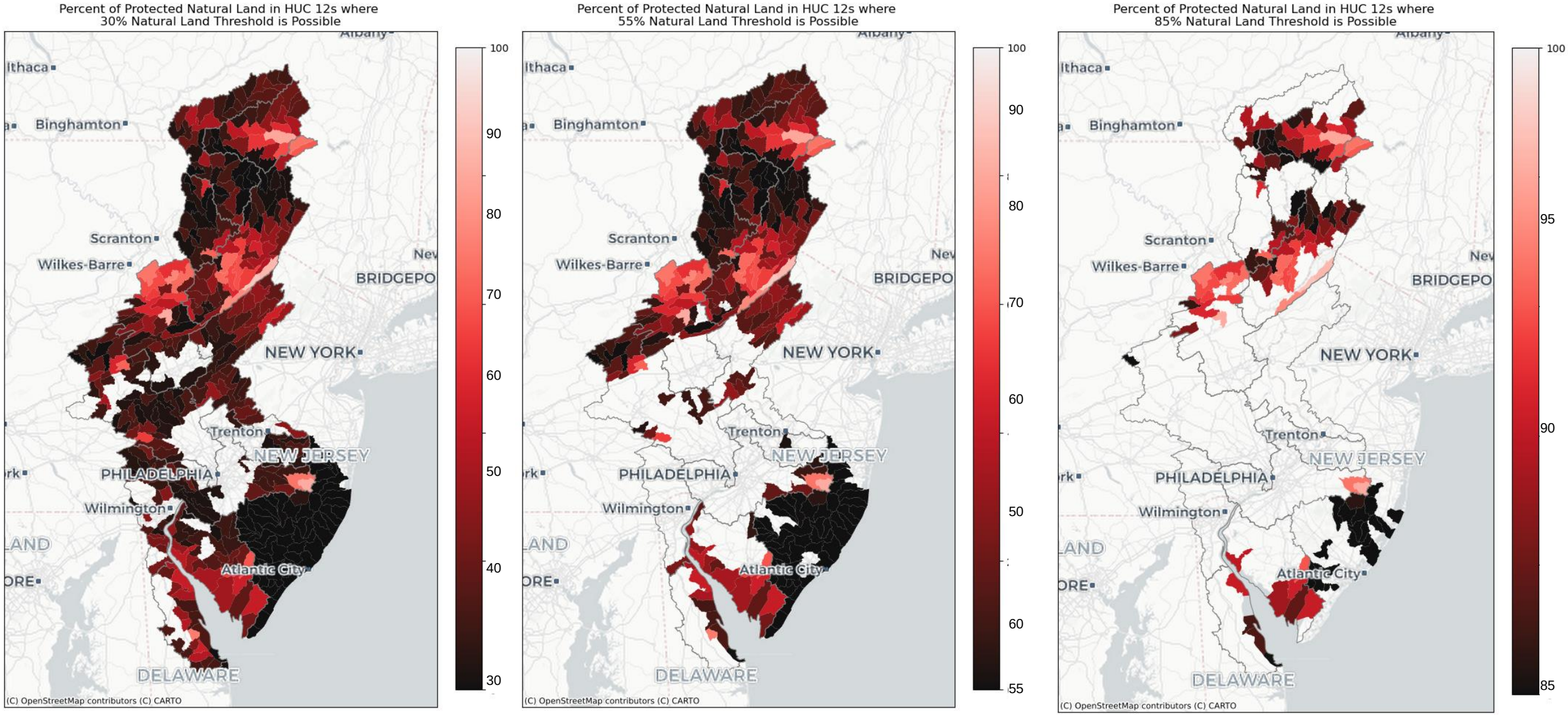
Sampling: Results (includes previous sampling)



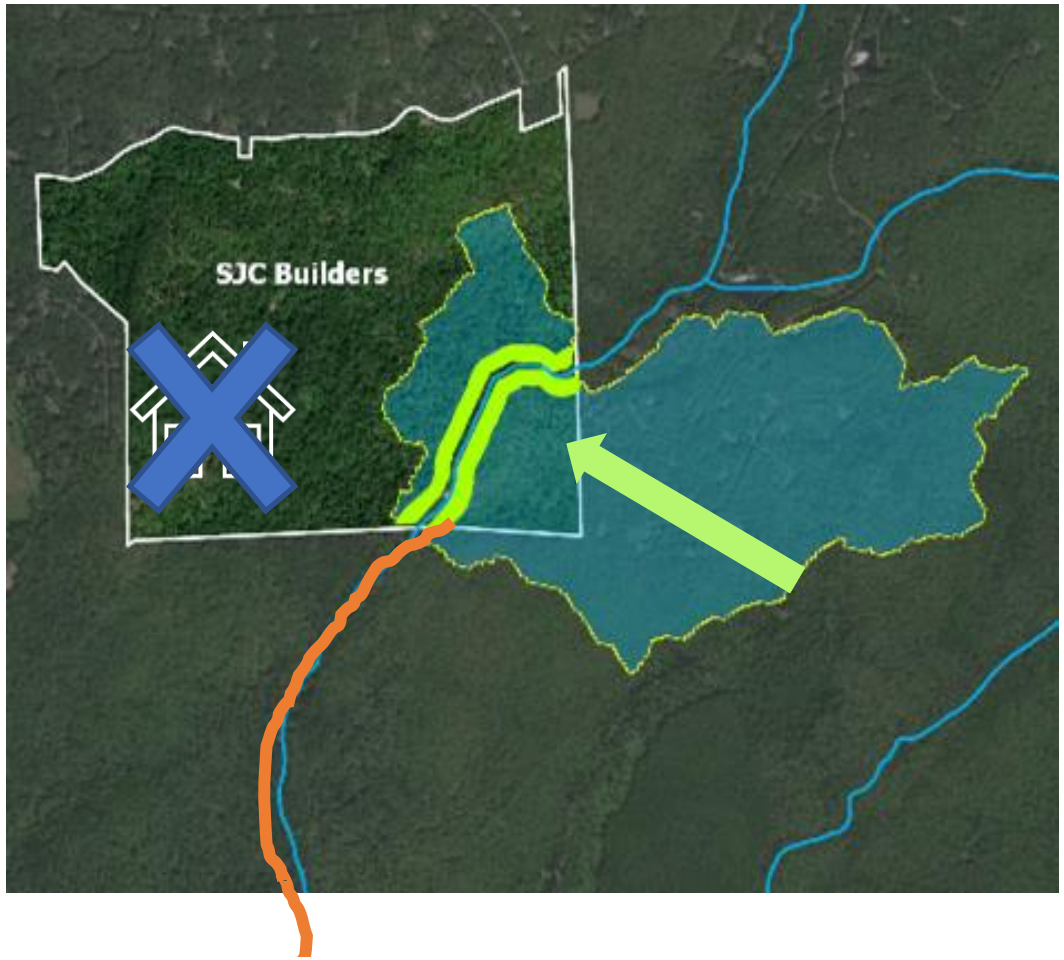
For chemistry and macroinvertebrates:

- Forest cover (%) was generally the best predictor of water quality (nutrients) and stream condition (macroinvertebrates).
- Watershed land cover is more predictive than riparian or local site land cover.
- Above 85% forest, no detectable impacts; between 70% and 85% limited detectable impacts for macroinvertebrates
- Between 50-70% forest, nutrients and major ions are elevated and statistically relatable to human influences

Future Opportunity: HUC12s With Sufficient Natural Land



Modeling: Approaches



65 projects evaluated for:

1. Avoided Land Use Change
2. Downstream Benefit
3. Riparian Buffer Benefit

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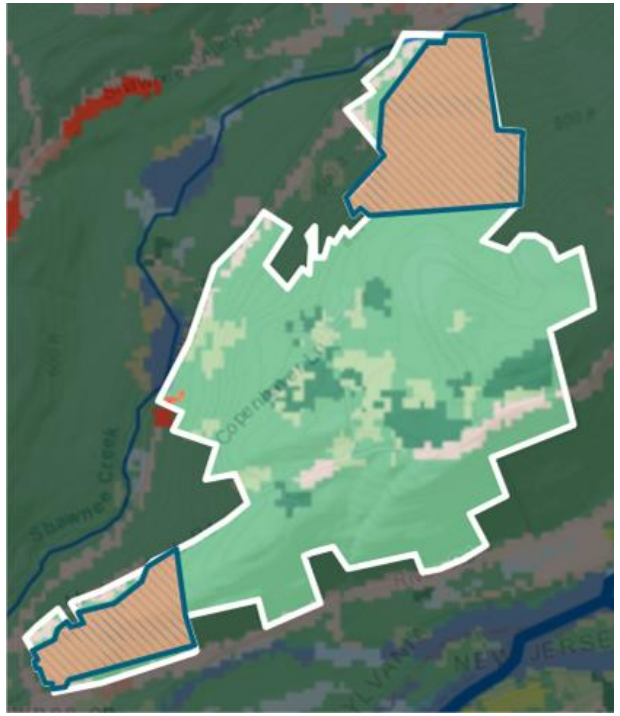
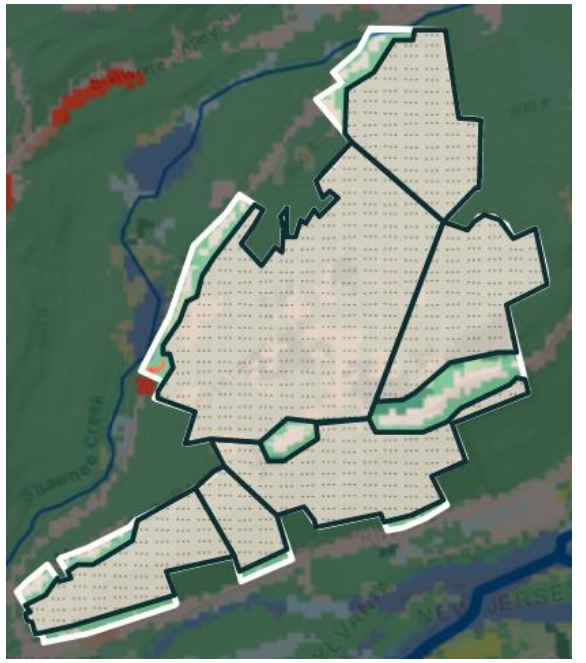
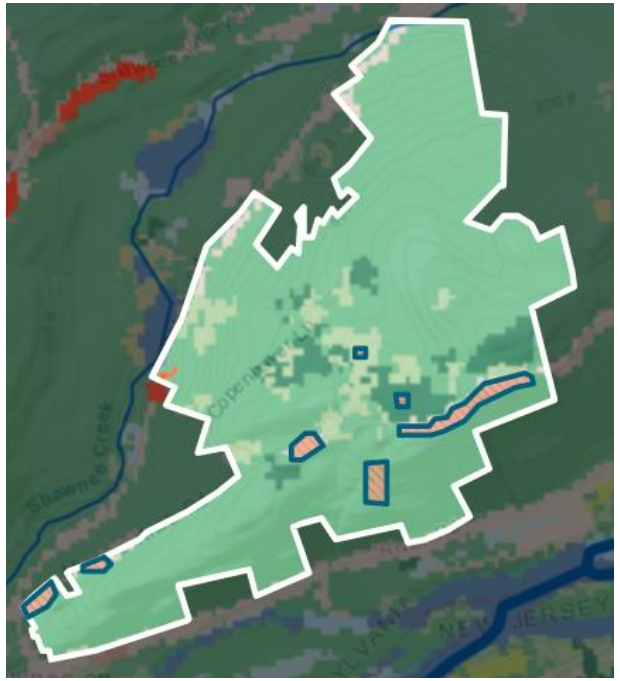
Avoided Land Use Change Scenarios



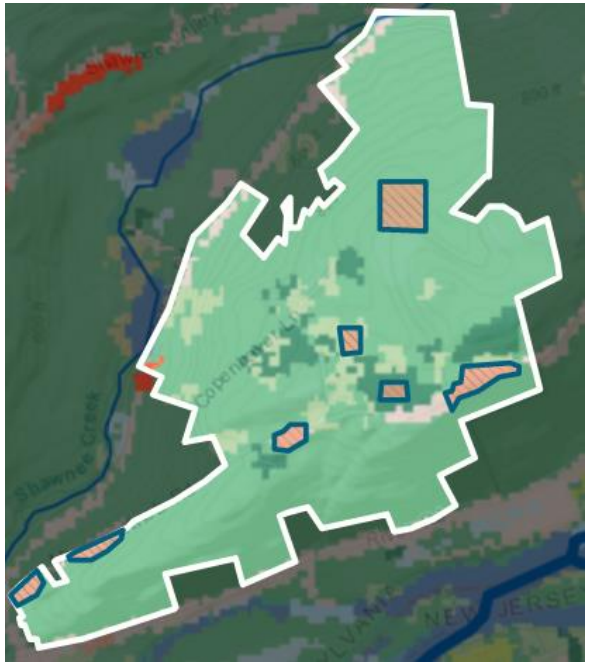
Professional Judgement of Development Threat



Low density development



Modeled Development, Centers 2100

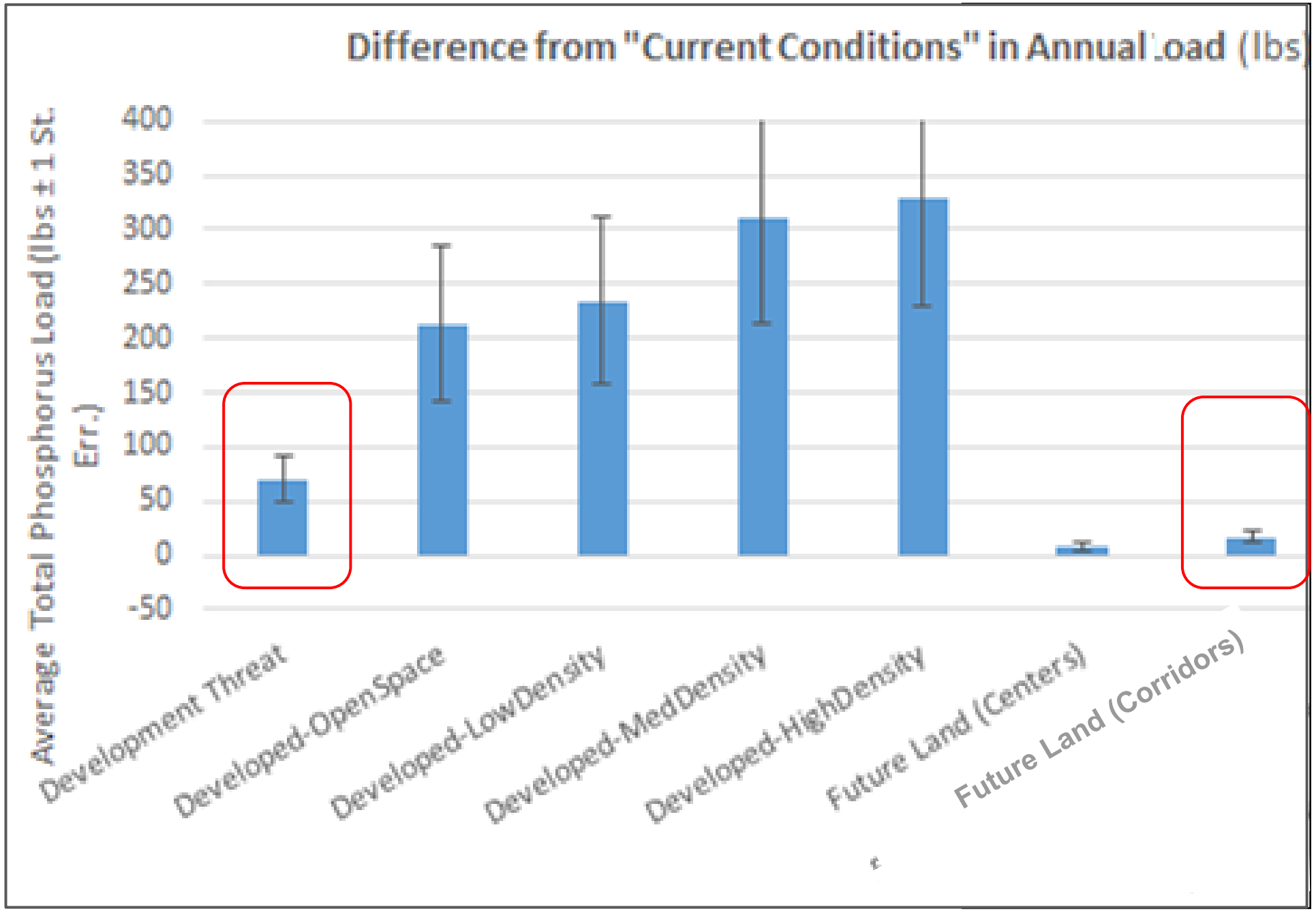


Modeled Development, Sprawl 2100

Future Loads Avoided

Parcel averages of estimated avoided phosphorus loads (average lbs/year)

Each scenario shown at right

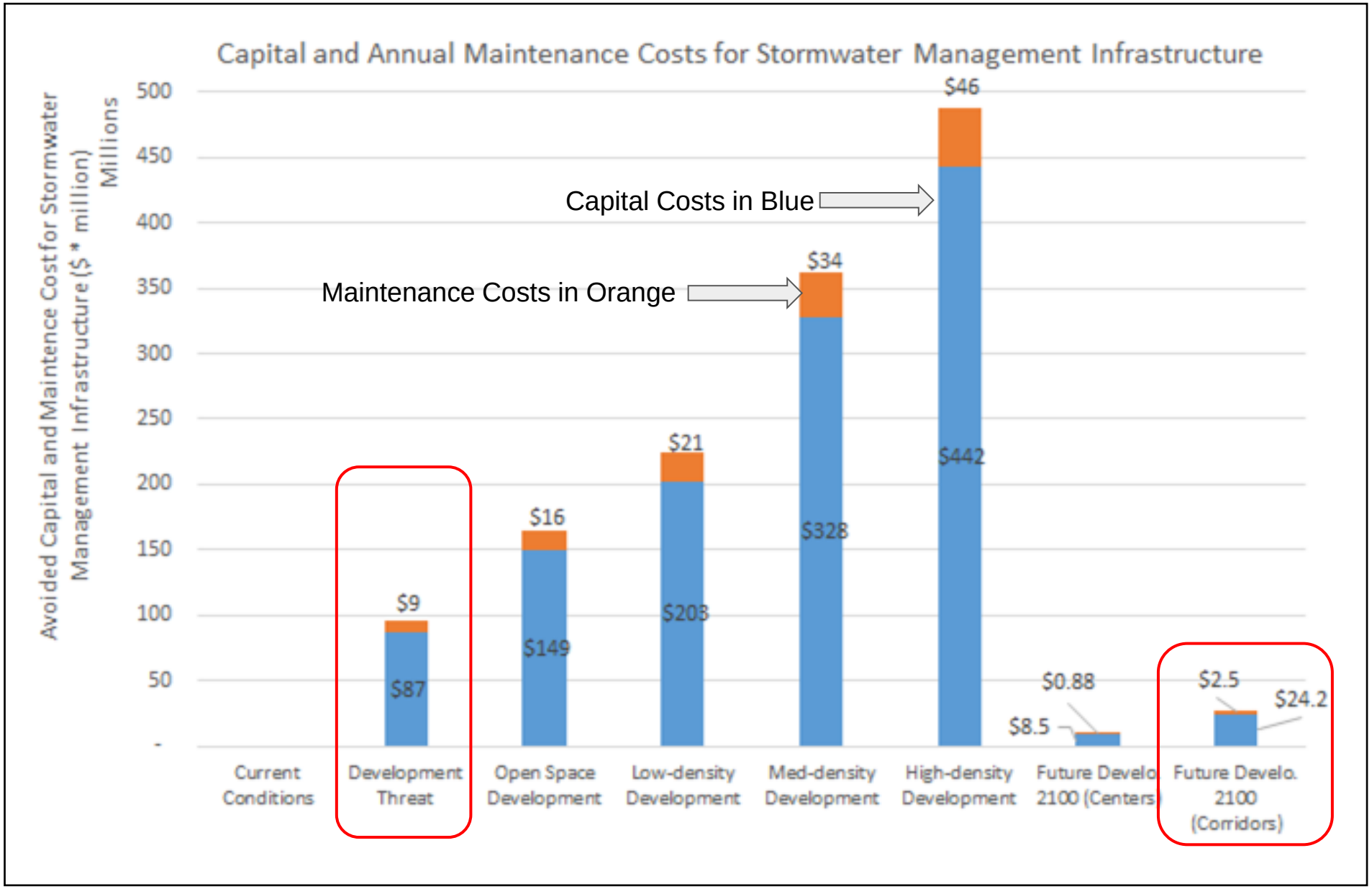


Stormwater Runoff

24 hr storm; 3.3 inches

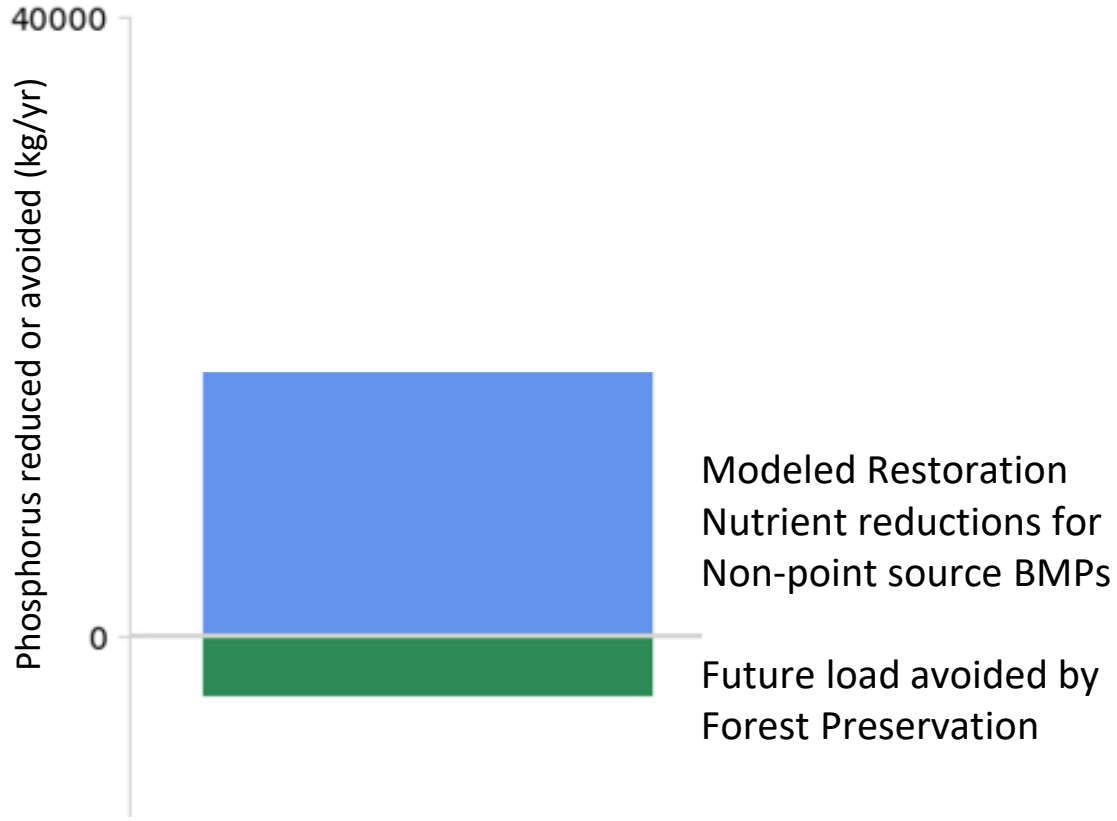
Sum of estimated costs for stormwater infrastructure for 51 projects

Each scenario shown at right



Modeling Comparison: Protection vs. Restoration

Phosphorus *Reduced* by Restoration (57,000 acres) and *Avoided* by Protection (35,000 acres)



- ~30-40 percent of projects are annual practices with annual costs and are susceptible to long term management changes
- Many suburban BMPs have maintenance and replacement lifespans
- There are potential annual maintenance expenses for all categories.

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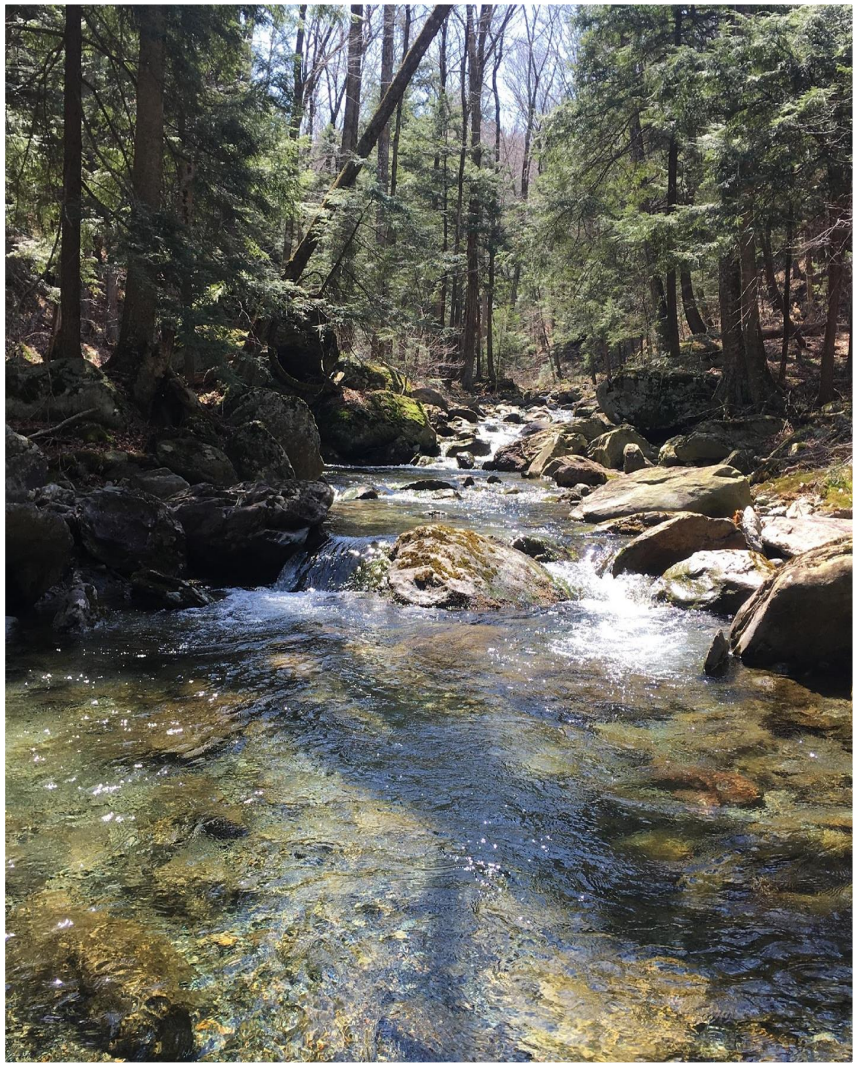
Reflections & Discussion

Reflections



- Without timescale of impact, pollutant loads avoided/filtered were modest compared to non-point source BMPs
- Best practices for implementing “avoided development” could help advance the field
- Avoided pollutants were greater in undeveloped headwaters than areas with higher projected development due to large parcels in headwaters
- A consistent standard for “clean waters” could help clarify where protection is an appropriate strategy
- Planning and assessment at the HUC 12 scale works well for implementation and assessing impact
- Clear goals for achieving “effectiveness” need to consider scale, available funds and timeline

Thank you!

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