The Delaware River Watershed Initiative (DRWI): More To Come In Phase 2

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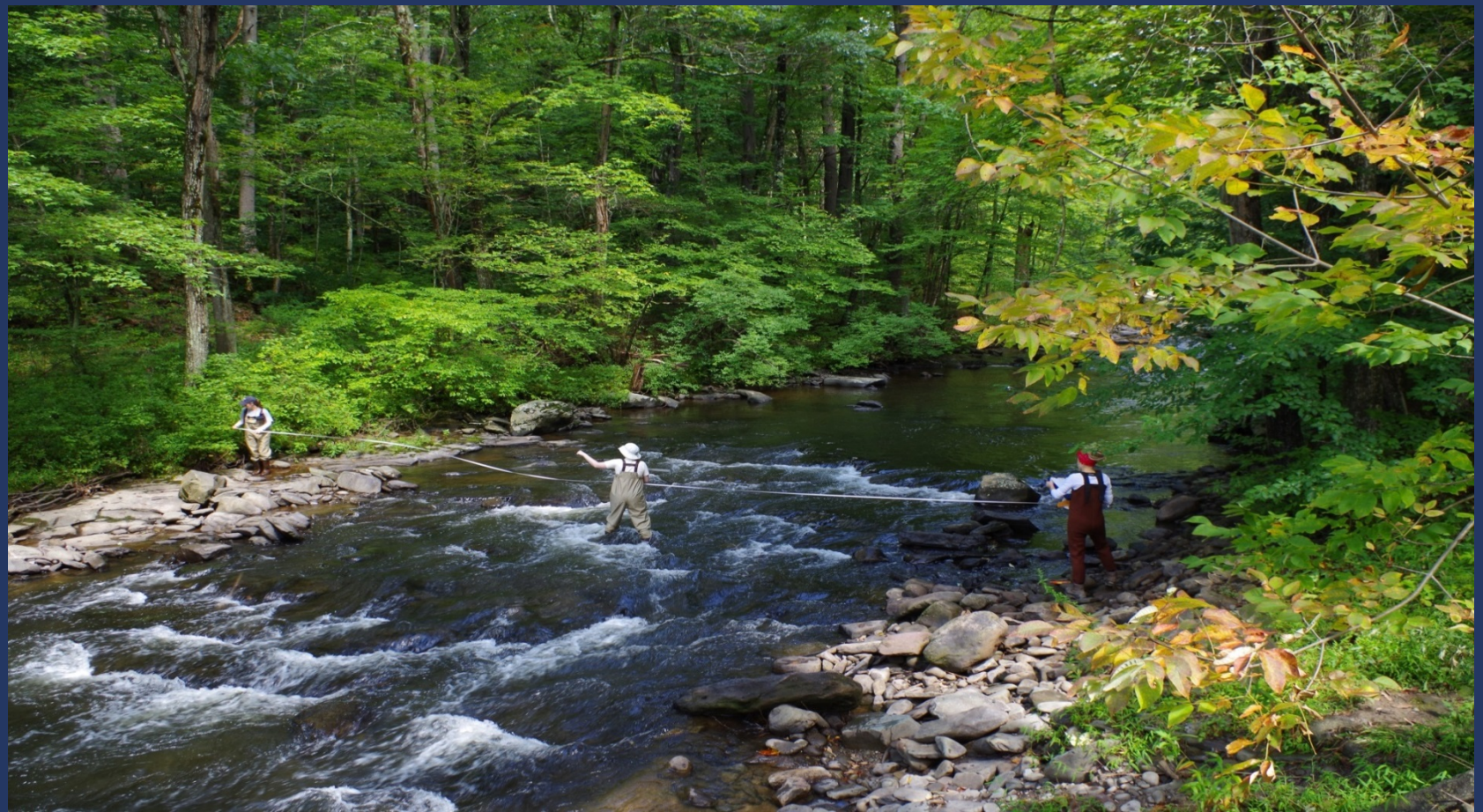
THINGS TO THINK ABOUT……

- **Are these issues that you are dealing with?**
- **Are there water quality problems upstream of your property or intake that are out of your control?**
- **Are there potential NGO partners in your watershed or jurisdiction?**
- **Is this a way to build local support?**
- **How could this help me?**

GOAL: “Watersheds That Provide High Quality Water in Sufficient Quantity To Support Healthy Natural and Human Communities”



Monitoring partners

Non-profits, Local Government, Universities



Upper Lehigh

Wildlands Conservancy
Moravian University

Poconos-Kittatinny

TNC (PA)
North Pocono CARE
Brodhead W.A.
East Stroudsburg Univ.

NJ Highlands

TNC (NJ)
Musconetcong W.A.
Wallkill River W'shed Mgmt. Group

Middle Schuylkill

Schuylkill Action Network
Miller Environmental
Stroud Water Research Center
Berks County Conservancy

Citizen Scientists

Students
Volunteers

Philadelphia

Tookany-Tacony Frankford W'shed Partnership
Wissahickon Valley W.A.
Lower Merion Conservancy
Pennypack Ecological Restoration Trust
Friends of the Poquessing
Villanova Univ. & Temple Univ.

Schuylkill Highlands

Green Valleys Association
French & Pickering Creeks Cons. Trust
Hay Creek W.A.
Berks County Conservancy
Chester County Water Resources Auth.
Stroud Water Research Center

Kirkwood-Cohansey

Association of NJ Env. Commissions
NJ Audubon
Pinelands Preservation Alliance

Brandywine-Christina

Stroud Water Research Center

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ON-THE GROUND PROJECTS

- **Over $40M/ 3 yrs – for DRWI Phase 1**

- **Preservation/Protection**
  - 12,200 acres of forested lands protected
  - 3:1 match; $4MM leveraged to $37MM
  - Open Space Institute

- **Restoration**
  - 5,767 acres of Ag & Suburban lands restored
  - 1:1 match; $4MM leveraged $8.5MM
  - Nat'l Fish and Wildlife Foundation (NFWF)

MONITORING & ASSESSMENT

- Goal: Monitor water quality and aquatic ecosystems to assess progress toward DRWI goals, inform restoration and protection actions and engage local stakeholders

- 300 Monitoring Sites
    - Academy, Stroud, Cluster Teams

- Delaware Basin Data Management System
    - 3 Tiers of Data Quality

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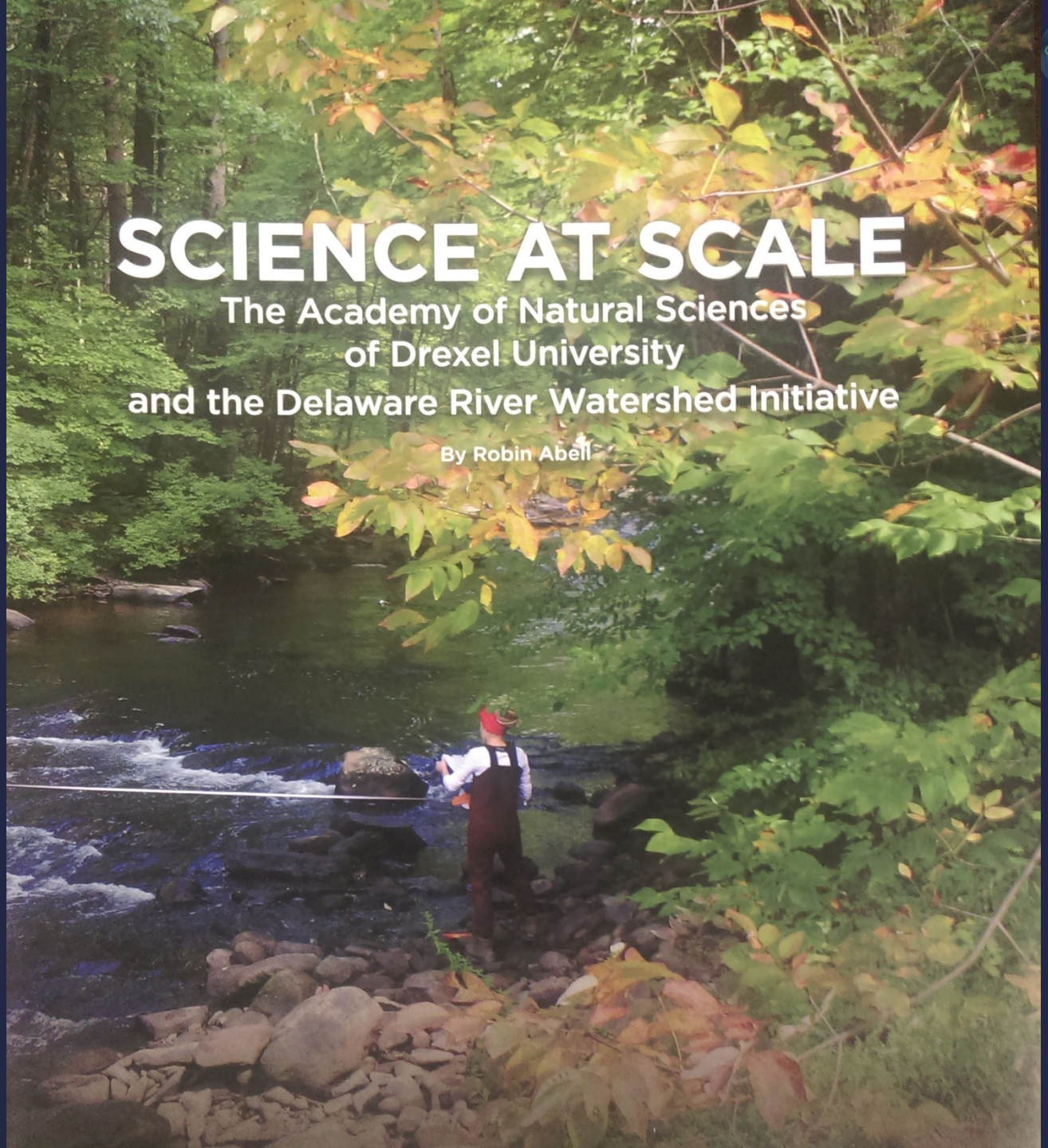

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UNDERLYING QUESTIONS

How are in-stream ecosystems responding to on-the-ground actions?

Which indicators best respond to current stressors and conditions, as well as changes in water (and ecosystem) quality over time?

How can monitoring results inform the DRWI and similar work in the future?

Monitoring Overview

275 taxa

46 species

347* taxa

Monitoring Site Stats

- ✓ 35 Integrative Sites: **fish, algae, macroinvertebrates, habitat, salamanders, water chemistry** (4x/yr)
- ✓ 77 Project Sites (algae, macroinvertebrates, habitat & water)
- ✓ 24 Fish Project Sites
- ✓ 15 Lentic macroinvertebrate sites
- ✓ 15 Salamander Sites
- ✓ 4 Stormwater Sites

Summary of Three Tiers

Tier	Chemistry	Chemistry Lab	Macroinver-tebrate Sampling, ID level	Fish Sampling	Habitat Assessment	Algae
I	ANS or other designated lab, YSI sonde	Low detection levels	Surber sampler Genus/ species	Quantitative, multiple pass depletion sampling	EPA WSA, Habitat Index, Riparian Index	Multi-habitat (SWAMP Protocol)
2	Hach kit or other kit, YSI designated lab	Higher detection levels	Kick net Family	Single-pass, presence/	Habitat Index	None
3	Hach kit or other chemistry kit	No laboratory analysis	Kick nets Family, order	None	None	None

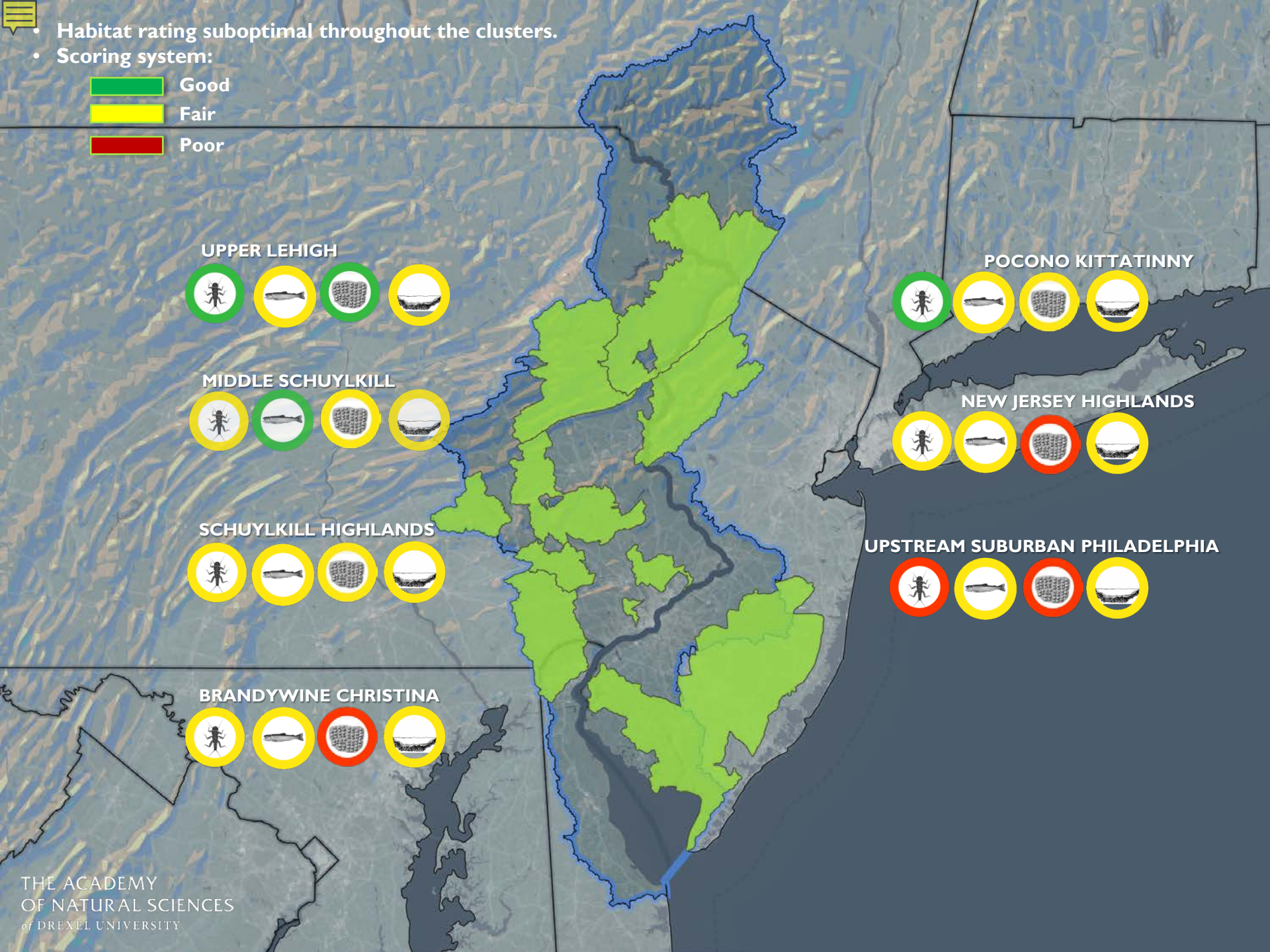
Outreach and Data Quality

TRAINED VOLUNTEERS, QA/QC

Numerous, Enthusiastic

ANY VOLUNTEERS, NO QA/QC

- Habitat rating suboptimal throughout the clusters.
- Scoring system:
  - Good
  - Fair
  - Poor



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INFORMATION PERSPECTIVES

All Levels

RESEARCH AGENDA TO FILL THE GAPS

- Research Re-Granting Program
  - $4M of $5M – Delaware Watershed Research Fund – 10 research teams
  - $200K of $300K – Drexel Watershed Consortium – 4 teams
- Addressing Critical Questions
  - Ecological Targets for Conservation Workgroup
  - Forest Metrics Workgroup
- Connecting Scientists with Practitioners

Mapping & Tools for DRB

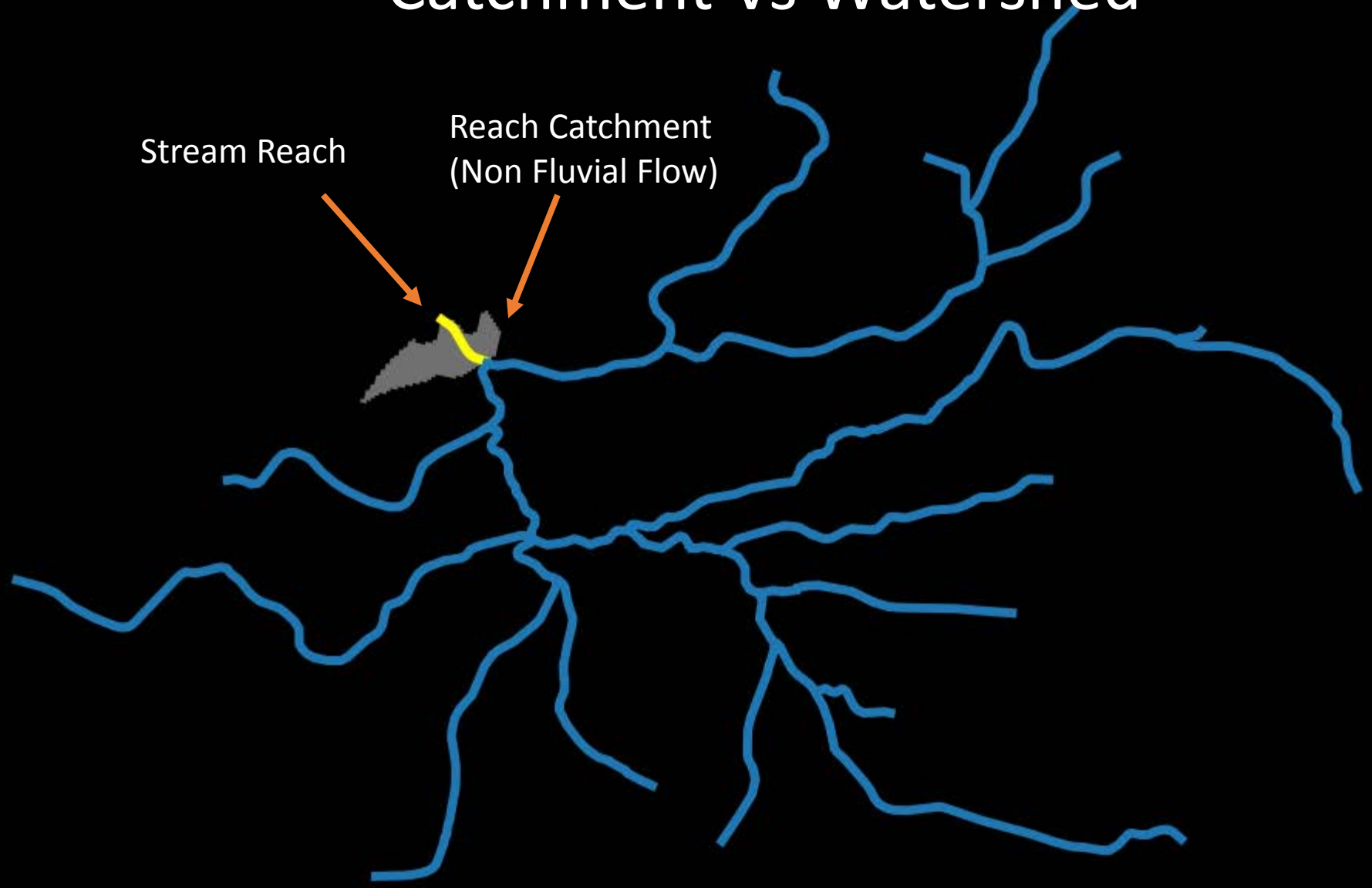
- UVM – NLCD (USGS Nat'l Land Cover Dataset) plus LIDAR
  - 1 meter resolution
  - 7 land use categories
- Shippensburg University & USGS
  - Sleuth Model and local input
  - Land Use Change Forecasts
- ANS & PennState
  - Stream Reach Assessment Tool (SRAT)

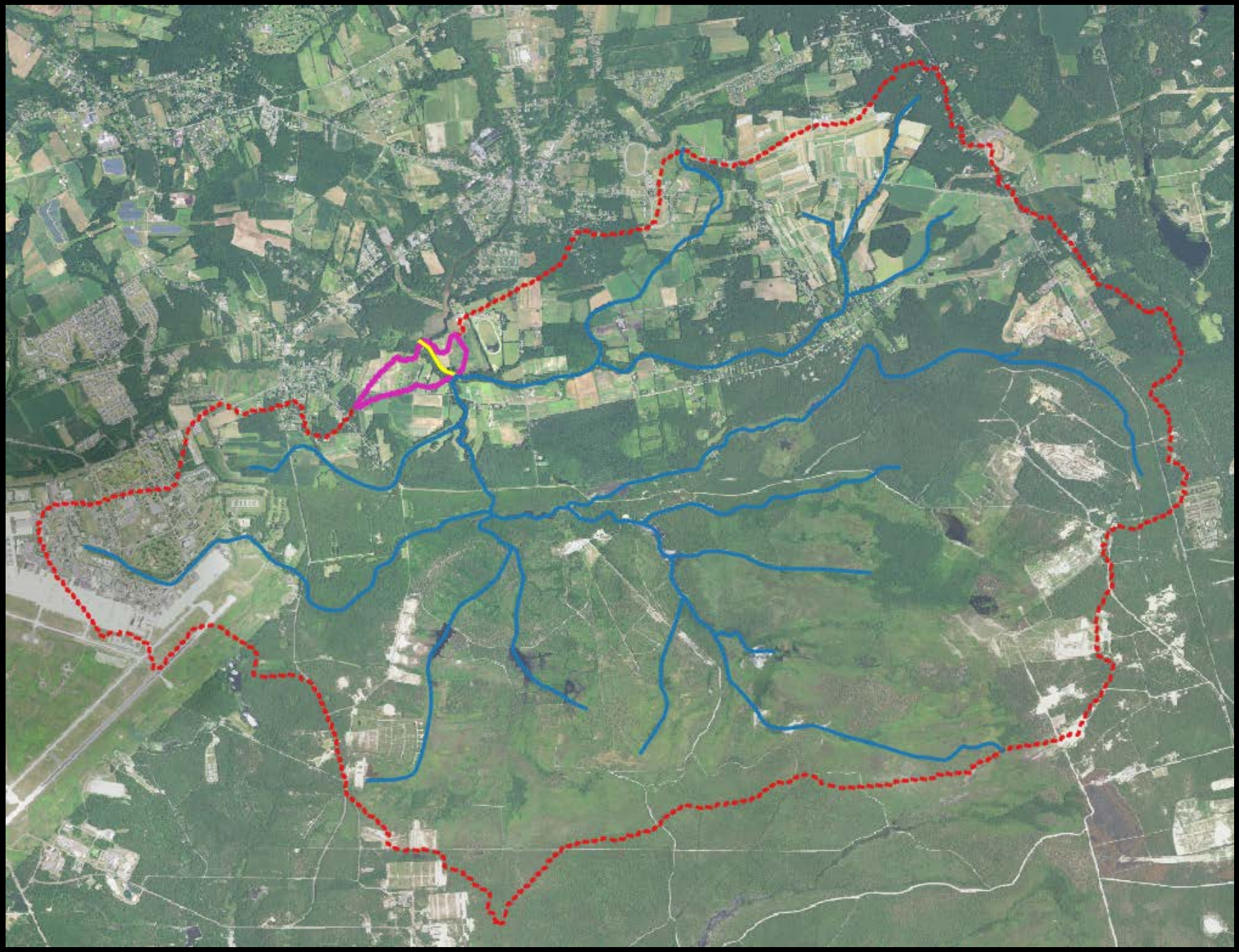
MODELING TOOLS FOR SELECTION OF SITES

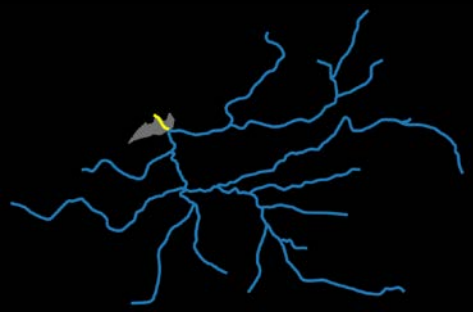
- **SRAT – one sq. mile watersheds, land use impacts /direct runoff/ upstream influence. Used to prioritize watersheds for action**

- **WikiWatersheds – User friendly, focus on specific watershed, input different alternatives for site restoration. (e.g. - Difference in a 30 or 100 ft. forested buffer)**

Catchment Vs Watershed







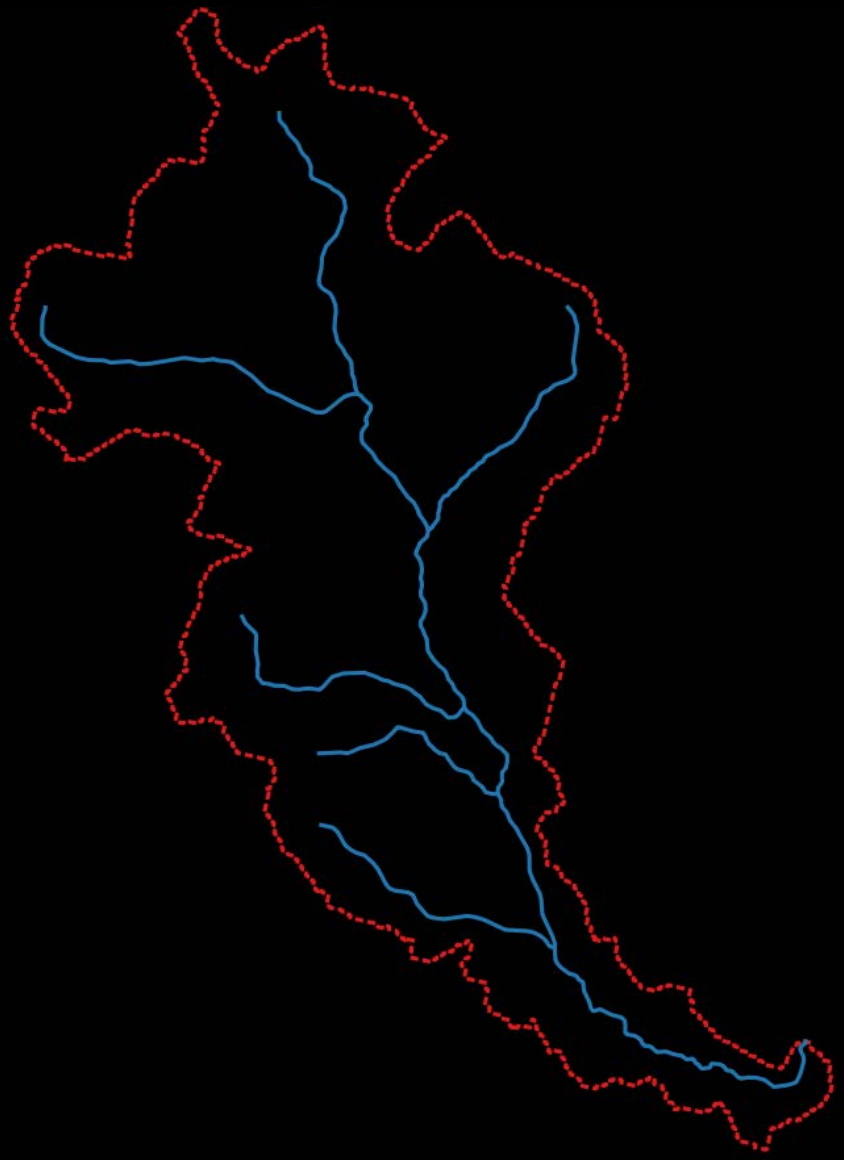
Estimated TP mg/l
0.18

		Catchment	%	In Watershed	%
	ID	5279			
	Area (Sq Miles)	0.157	100.00%	25.897	100.00%
Land Cover 2011	Open Water	0.000	0.0%	0.18	0.7%
	Developed Open Space	0.000	0.0%	1.17	4.5%
	Developed Low Intensity	0.003	2.0%	0.74	2.9%
	Developed Med Intensity	0.000	0.0%	0.51	2.0%
	Developed High Intensity	0.000	0.0%	0.30	1.1%
	Barren Land	0.000	0.0%	0.72	2.8%
	Forest Deciduous	0.001	0.4%	2.02	7.8%
	Forest Evergreen	0.000	0.0%	1.43	5.5%
	Forest Mixed	0.000	0.0%	0.28	1.1%
	Shrub Scrub	0.001	0.4%	0.84	3.2%
	Herbaceous	0.003	1.8%	0.61	2.4%
	Hay Pasture	0.045	28.5%	0.53	2.0%
	Cultivated Crop	0.079	50.4%	3.30	12.7%
	Woody Wetlands	0.026	16.6%	13.17	50.8%
	Emergent Woody Wetlands	0.000	0.0%	0.10	0.4%
	Population 2010	12		1,845	
TN	Non-Point (Kg/Yr)	779		51,192	
	Ag Total	731	94%	25,573	50%
	Animals	24	3%	879	2%
	surface and groundwater	707	91%	24,694	48%
	Urban Total	9	1%	7,018	14%
	Natural Land	37	5%	17,412	34%
	Riparian	1	0%	1,189	2%
	Point Sources Total	0		0	
TP	Non-Point (Kg/Yr)	20		1,501	
	Ag Total	19	95%	692	46%
	Animals	5	25%	178	12%
	surface and groundwater	14	70%	514	34%
	Urban Total	0	0%	257	17%
	Natural Land	1	5%	268	18%
	Riparian	0	0%	284	19%
	Point Sources Total	0		0	

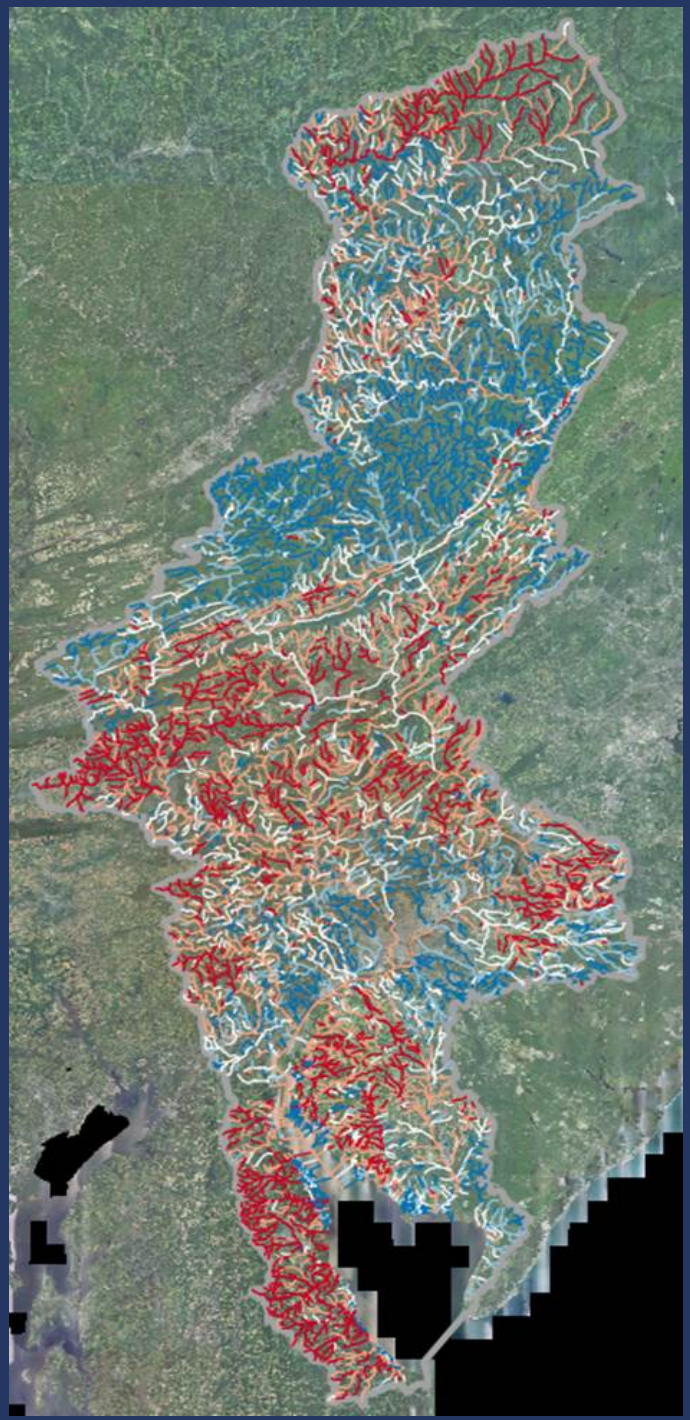
Example Mixed Urban, Point, and Ag

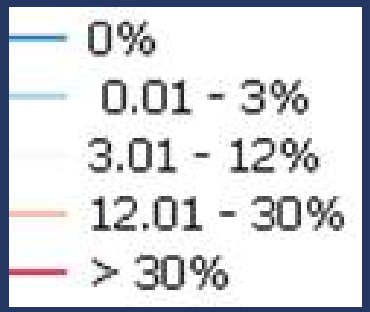
Estimated TN MG/L
22.5

Estimated TP MG/L
1.1

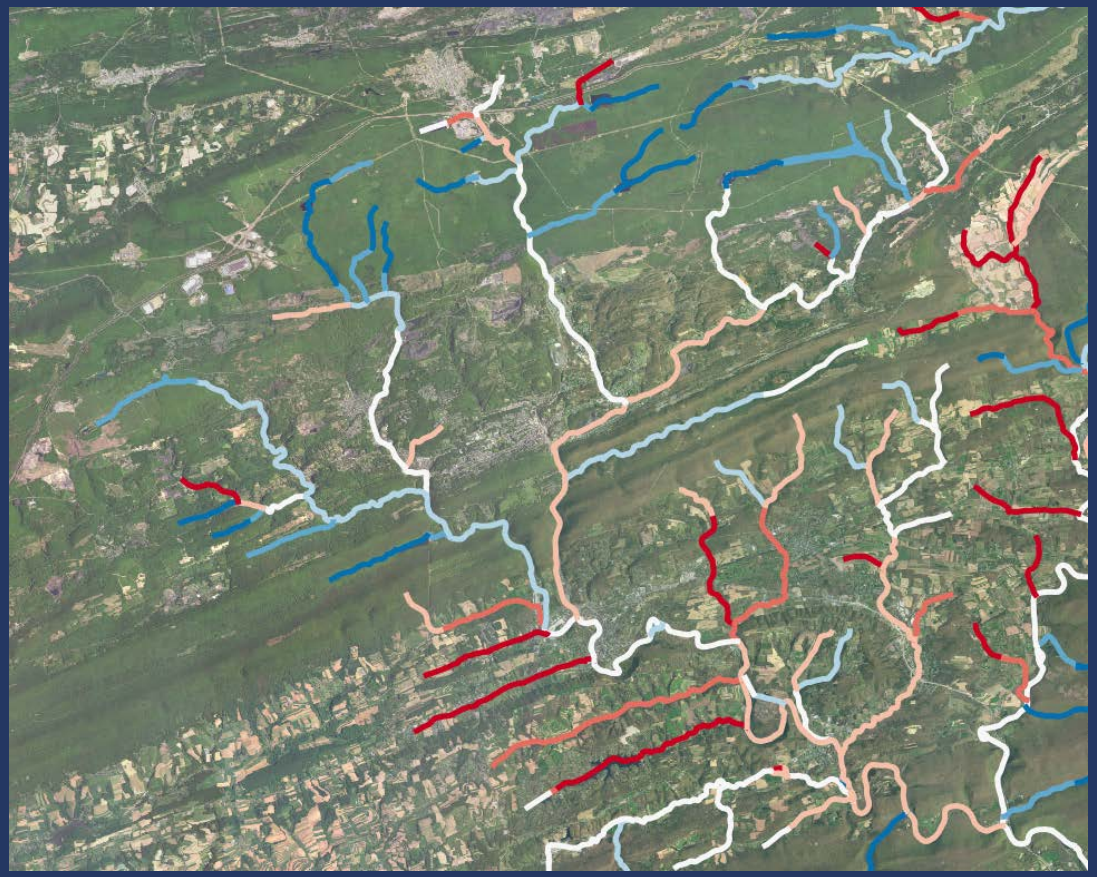


		Catchment	%	In Watershed	%
	ID	2488			
	Area (Sq Miles)	1.362	100.00%	14.404	100.00%
Land Cover 2011	Open Water	0.000	*0.0%*	0.01	*0.1%*
	Developed Open Space	0.259	*19.0%*	1.81	*12.6%*
	Developed Low Intensity	0.173	*12.7%*	0.90	*6.2%*
	Developed Med Intensity	0.049	*3.6%*	0.58	*4.0%*
	Developed High Intensity	0.032	*2.4%*	0.23	*1.6%*
	Barren Land	0.000	*0.0%*	0.23	*1.6%*
	Forest Deciduous	0.119	*8.8%*	4.64	*32.2%*
	Forest Evergreen	0.000	*0.0%*	0.01	*0.0%*
	Forest Mixed	0.002	*0.2%*	0.06	*0.4%*
	Shrub Scrub	0.120	*8.8%*	1.49	*10.3%*
	Herbaceous	0.014	*1.0%*	0.09	*0.6%*
	Hay Pasture	0.275	*20.2%*	1.73	*12.0%*
	Cultivated Crop	0.260	*19.1%*	2.15	*14.9%*
	Woody Wetlands	0.058	*4.2%*	0.46	*3.2%*
	Emergent Woody Wetlands	0.000	*0.0%*	0.02	*0.1%*
	Population 2010	1,359		8,433	
TN	**Non-Point (Kg/Yr)**	4,323		35,067	
	Ag Total	2,767	*64%*	20,695	*59%*
	Animals	190	*4%*	1,390	*4%*
	surface and groundwater	2,577	*60%*	19,305	*55%*
	Urban Total	1,175	*27%*	8,251	*24%*
	Natural Land	245	*6%*	5,123	*15%*
	Riparian	136	*3%*	998	*3%*
	Point Sources Total	48,054		48,828	
TP	**Non-Point (Kg/Yr)**	275		2,141	
	Ag Total	183	*67%*	1,403	*66%*
	Animals	54	*20%*	395	*18%*
	surface and groundwater	129	*47%*	1,008	*47%*
	Urban Total	36	*13%*	270	*13%*
	Natural Land	4	*1%*	82	*4%*
	Riparian	53	*19%*	386	*18%*
	Point Sources Total	2,023		2,046	

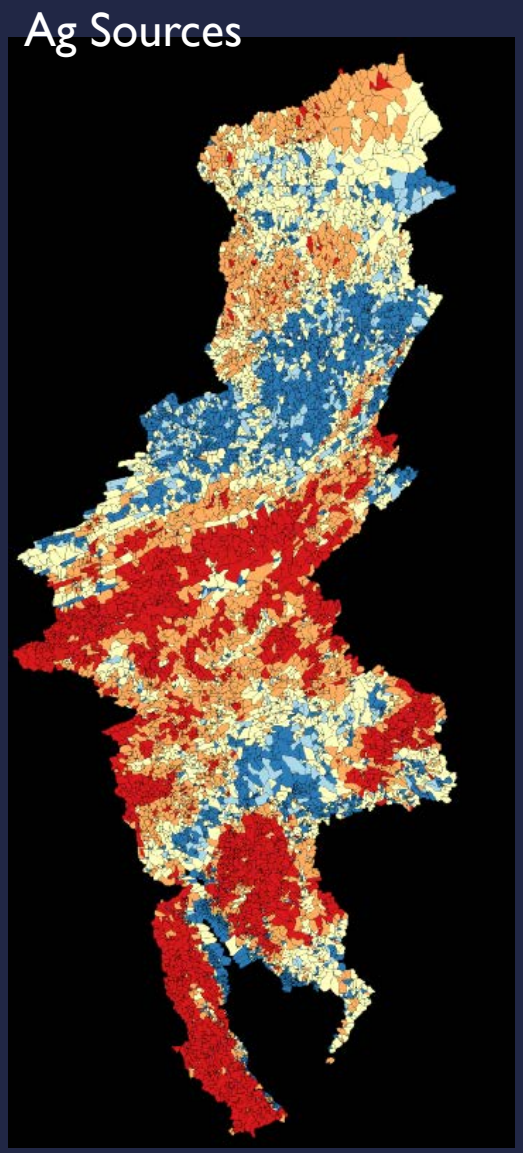


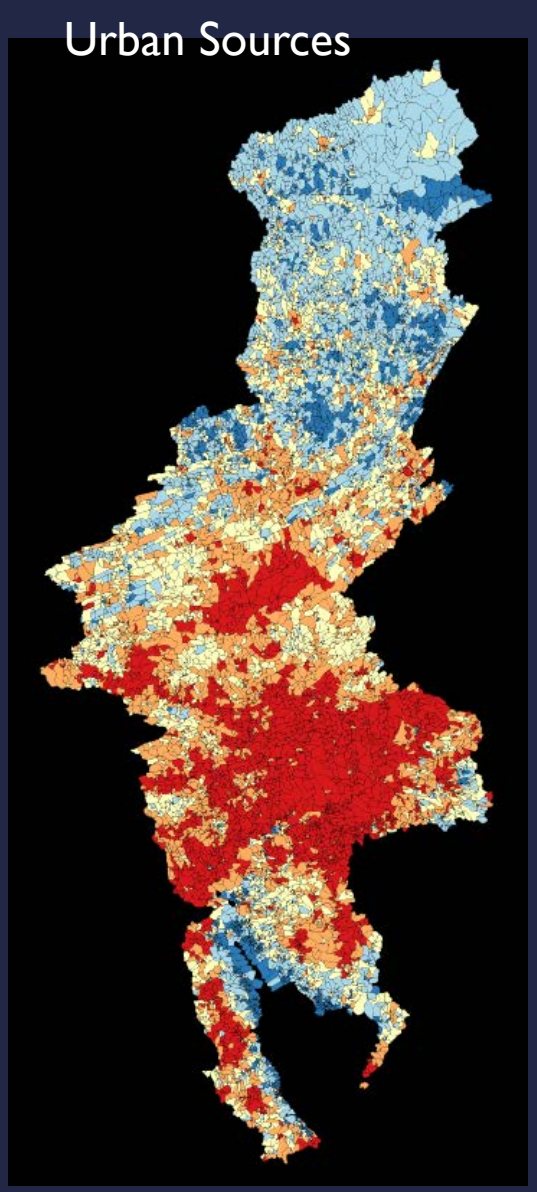


CUMULATIVE PERCENTAGE OF RIPARIAN AREAS IN AG



Total Nitrogen





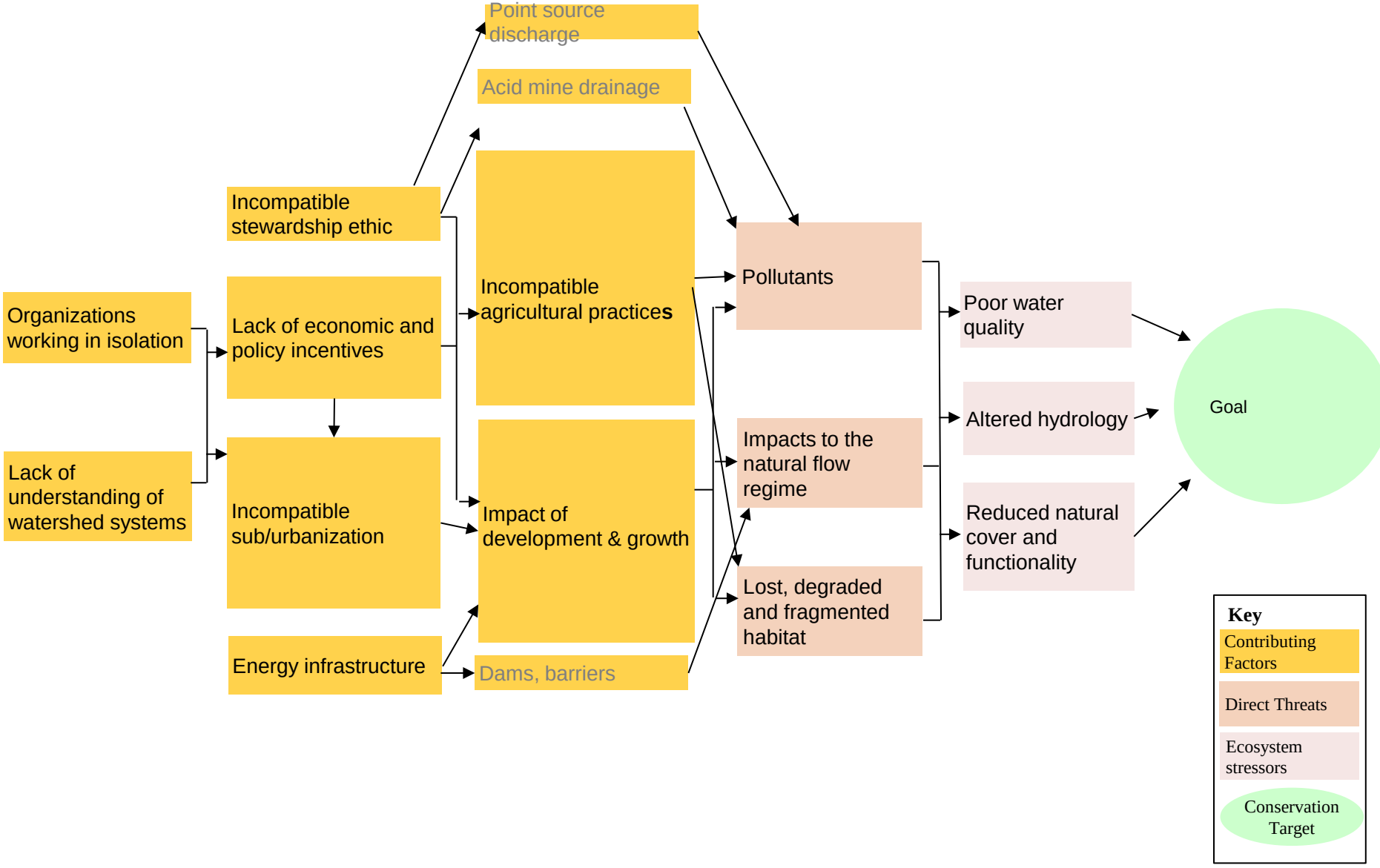
BUILDING DRWI PHASE 2

- **Lessons Learned from Phase I**
- **Capital and Complementary Strategies**
- **Moving from Opportunistic to More Data-derived Decisions**
- **Stronger Scientific Basis for Focus Area and Site Selection**
- **Restoration, Protection, Hybrid Clusters**
- **Added Accountability – Progress toward Goal**

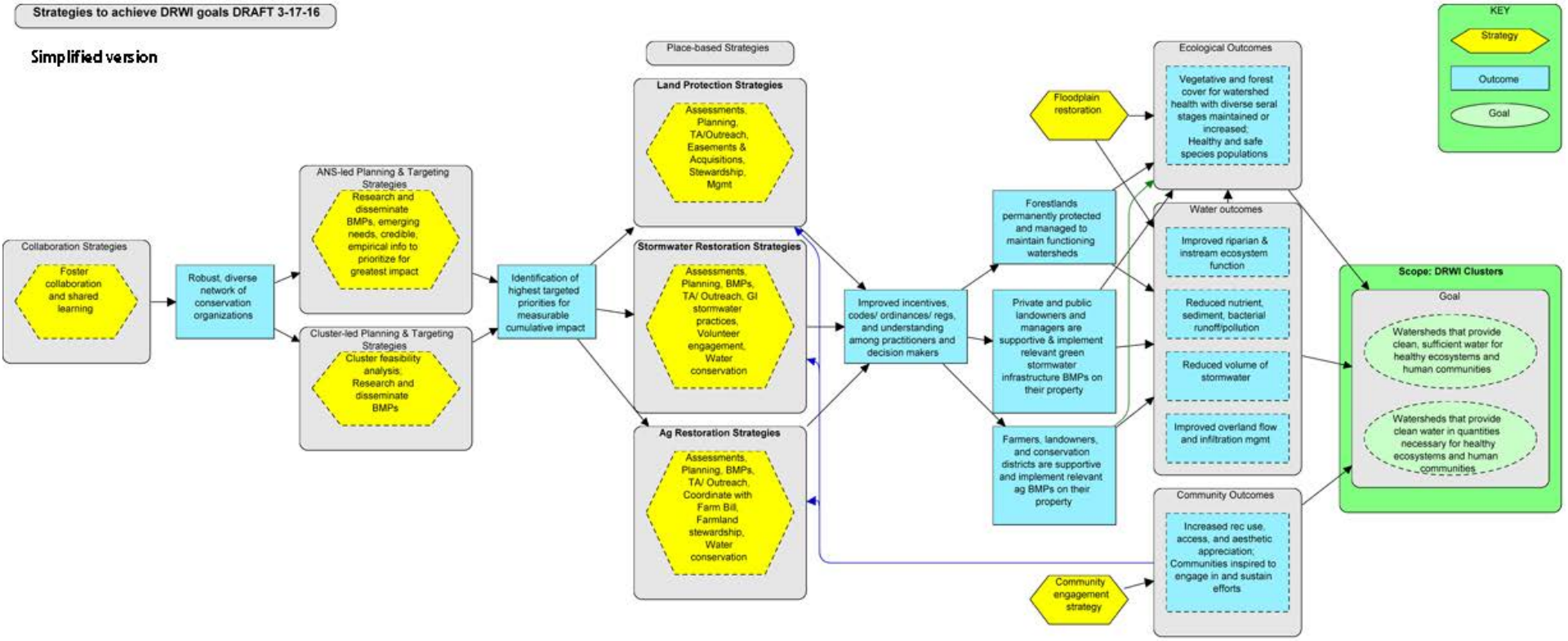
BUILDING DRWI PHASE 2

- **Theory of Change Analysis**
- Goals, Outcomes and Strategies
- **Metrics –**
  - Performance and Outcome
  - Timing and Tiers
- **Team Building – Outreach**
- **Coordination of Actions**
- **Hopefully 6 year effort (2018-2024)**

Threats Model



Goal, Outcomes & Strategies Model



SUMMARY……

- **Using local groups to address land-based problems**
- **Focus on local, backyard creek**
- **Targeted stressors and geographic areas**
- **Backbone of science**
- **Lucky to have input of**  **, but also brings more**  **into watershed**
- **Avoidance or alternative to TMDL**
- **Building**  **for local creeks and rivers**

Questions??

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