Susquehanna University and the PFBC Unassessed Waters Initiative in the Susquehanna Basin 2011-2015

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Mike Bilger
Pennsylvania Streams

All streams of PA have a designated use

- Huge resource
- 8,011 named tributaries: 37,386 total miles
- 54,714 un-named tributaries: 45,900 total miles
  Total: 62,725 streams, 83,286 miles

Use determined by DEP

- Wetlands located in or along floodplain of wild trout streams protected as Exceptional Value Wetlands.
Pennsylvania Streams

Lack of assessment of tributary streams
- 52% of named, 2% of un-named tributaries sampled

Inadequate water quality protection
- Unassessed waters likely contain trout

Potential for expansion of wild trout waters
Goal
Proactively identify and properly classify the most at-risk streams which support naturally reproducing trout populations in order to protect, conserve and enhance those waters as wild trout streams.
PFBC Unassessed Waters Initiative

Unassessed Waters Initiative Partners

Allegheny College
Clarion University
Western Pennsylvania Conservancy
Duquesne University
California University of Pennsylvania
Indiana University of Pennsylvania
Penn State University
Juniata College
Trout Unlimited
Lock Haven University
Lycoming College
Bucknell University
Susquehanna University
Loyalsock Creek Watershed Association
Keystone College
Kings College
Mansfield University
Methodology

Targeted Watersheds and GPS points given by PFBC to cooperators.

**Basic data**
Physical data
Water chemistry data
Fisheries data

**Additional Data**
Aquatic macroinvertebrates
Water chemistry analysis
Trout diets
Algal scrapings
Extent of Unassessed Waters beginning of 2009

From: R. Weber, PFBC

Surveyed Sections

Unassessed Sections
Extent of Unassessed Waters beginning of 2015

From: R. Weber, PFBC
Unassessed Waters Sampled by PFBC and Partners 2010 - 2015

- PFBC = 1,814 waters
- Partners = 3,141 waters
Unassessed waters sampled by Susquehanna University 2011-2015
## Unassessed Waters Initiative
### Number of Tributaries Sampled

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Streams sampled</td>
<td>303</td>
<td>742</td>
<td>868</td>
<td>1090</td>
<td>1060</td>
<td>892</td>
</tr>
<tr>
<td>% Wild Trout</td>
<td>54%</td>
<td>55%</td>
<td>52%</td>
<td>38%</td>
<td>48%</td>
<td>40%</td>
</tr>
<tr>
<td>By partners</td>
<td>86</td>
<td>437</td>
<td>606</td>
<td>766</td>
<td>724</td>
<td>522</td>
</tr>
<tr>
<td>(28%)</td>
<td>(59%)</td>
<td>(70%)</td>
<td>(70%)</td>
<td>(68%)</td>
<td>(59%)</td>
<td></td>
</tr>
<tr>
<td>By Susquehanna U</td>
<td>n/a</td>
<td>83</td>
<td>66</td>
<td>192</td>
<td>172</td>
<td>104</td>
</tr>
<tr>
<td>(11%)</td>
<td>(8%)</td>
<td>(18%)</td>
<td>(16%)</td>
<td>(12%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**6 Year Total** – 4,955 tributaries Sampled

Since 2010, 667 new tributaries added to the wild trout list (1,741 miles)

From: R. Weber, PFBC
Susquehanna University
Unassessed Waters Sampled 2011-2015

Presence of trout

Total N = 617

N= 320
N= 194
N= 103

Dry  Trout Present  No trout

N= 320
N= 194
N= 103
Locations of trout species (brook and brown) found in unassessed waters sampled from 2011-2015.
Susquehanna University
Unassessed Waters Sampled 2011-2015

Trout Species

Total N = 320

N= 101
Only Brook Trout

N= 192
Only Brown Trout

N= 27
Brook + Brown
Susquehanna University
Unassessed Waters Sampled 2011-2015

Temperature

YOY Brook Trout Density /m²

Temperature °C

R² = 0.0088
Susquehanna University
Unassessed Waters Sampled 2011-2015

Temperature

Adult Brook Trout Density /m² vs. Temperature °C

R² = 0.0232
Susquehanna University
Unassessed Waters Sampled 2011-2015

YOY Brook Trout Density / m² vs. pH
Susquehanna University
Unassessed Waters Sampled 2011-2015

Conductivity

Conductivity (uhmos)

Adult Brook Trout Density /m²
Susquehanna University
Unassessed Waters Sampled 2011-2015

Alkalinity

Brook Trout Density /m²

R² = 0.0216

Alkalinity (mg/L)
Susquehanna University
Unassessed Waters Sampled 2011-2015

Alkalinity

$R^2 = 0.0075$

YOY Brook Trout Density / m$^2$

Alkalinity (mg/L)
Susquehanna University
Unassessed Waters Sampled 2011-2015

Alkalinity

![Graph showing the relationship between Alkalinity (mg/L) and Adult Brook Trout Density/m². The graph includes a scatter plot with a trend line and an R² value of 0.0299.](image-url)
Brook Trout Density / m² vs. Average Wetted Width (m)

R² = 0.0056
PFBC Wild trout listing procedures

Step 1. Considered for inclusion (listed publicly)
- Updated every month or so

Step 2. Officially proposed (listed publicly)
- Submitted quarterly by PFBC staff to PFBC commissioners

Step 3. Reviewed by PFBC Commissioners at quarterly meeting

Step 4. Officially added to the wild trout list (listed publicly)
- Managed by PFBC
- Use maintained by PA DEP
Since 2010, 667 new streams went thru process and have been added to the wild trout list.

- 48 streams sampled by SU of the 667 streams (7.2%) added to wild trout waters list over last 5 years.

Currently 630 streams are on the considered for inclusion list (Step 1).

- 146 streams sampled by SU are of the 630 streams (23.2%) considered for inclusion.

Currently 99 streams are on the new officially proposed list submitted for quarterly meeting on 3/30/2016 (Step 2).

- 0 streams sampled by SU of the 99 streams
351 of the 617 streams sampled by SU were un-named tributaries.

Previous lack of assessment of this important aquatic habitat.

Over 53,000 un-named tributaries left to assess across PA
Un-named tributaries
Susquehanna University
Un-named Tributaries Sampled 2011-2015

Un-named Tributaries Presence of Trout

Total N = 351

- N = 154 (Trout Present)
- N = 119
- N = 78 (No trout)

Dry  Trout Present  No trout
Susquehanna University
Un-named tributaries Sampled 2011-2015

Trout Species

Total N = 154

N = 101

N = 47

N = 6

- Only Brook Trout
- Only Brown Trout
- Brook + Brown

N = 101

N = 47

N = 6

Total N = 154
Results

Un-named tributaries are important habitat for brook trout.
- 42% of UNT contained brook trout

High quality brook trout streams may exist at high levels in Un-named tributaries across landscape.

Brook Trout Densities
Average 0.16 /m$^2$
Range 0.01/m$^2$ to 1.29/m$^2$
Modeling/ Tool for prediction of brook trout in Un-named tributaries

Is there a way to predict probability of occurrence of brook trout in the 53,000+ Un-named tributaries left?
- Approximately 20% are dry, gullies, lack flow
- Many located outside native range of trout

Combine sampling data plus other aspects using GIS at stream reach
- Geology
- Land Cover
- Slope
- Aspect
- Watershed Size
- Length of Un-named tributaries
Acknowledgments

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- Foundation for Pennsylvania Watersheds
- Degenstein Foundation
- Loyalsock Creek Watershed Association
- Dwight Lewis Lumber Company
- Landowners
Questions