The William Penn Foundation

• Private family foundation based in Philadelphia since 1945
  – OUR MISSION is to close the achievement gap for low-income children, ensure a sustainable environment, foster creativity that enhances civic life, and advance philanthropy in the Philadelphia region

• ~$2B in assets translating to ~$90M/year in grants:
  – Education: “Great Learning"
  – Art: “Creative Communities”
  – Environment : “Watershed Protection”

• www.williampennfoundation.org
Delaware River Watershed
... an extraordinary resource

• Spans 13,500 sq. miles

• Provides drinking water for over 15 million people

• Sustains a $25 billion economy

• Supports globally rare species & habitats

• Offers abundant recreation
Goal: By 2023, drive measurable improvement in the quality of the Delaware River watershed so there is a sustainable supply of clean water for ecological health and human consumption, enjoyment, and economic opportunity.

Delaware River watershed, 13,500 square miles

Regional trail network and environmental centers, 750 trail miles

Eight targeted areas critical to watershed health, 25% of the basin

Support Watershed-wide Research, Policy, and Practice

Engage and Activate Regional Trails and Centers

Protect and Restore Places of Ecological Significance: includes the Delaware River Watershed Initiative

Ongoing and integrated data collection and communication
William Penn Foundation
HUC 12 Watersheds
within Delaware Basin

Key to Features
- HUC 12 Watersheds
- Delaware River Basin

Catchments
Two or more catchments form sub-watersheds. A group of sub-watersheds form a watershed. A group of watersheds form a basin.

Rainfall
Overland flow
Infiltration

Underground rivers and groundwater

River
Focusing in on specific targets

• Subset of watershed stressors essential to water quality and quantity
  – Forest fragmentation and loss in headwaters
  – Stormwater run-off
  – Agricultural run-off
  – Aquifer depletion

• Subset of conservation opportunities defined by:
  – Potential for Significant Impact
  – Urgency to Act
  – Organization Capacity
  – Cost Efficiency
  – Ability to Measure Impact
Reaching out and forging strong partnerships
Currently partnering with 119 organizations through active grants

Supporting well over 150 organizations including our partners’ partners
Implementation

- **$15MM for operational**
  - Supporting over 50 organizations
- **$3MM for monitoring**
  - Maintaining or collecting data from over 300 stream monitoring and water quality sampling sites
- **$7MM for restoration**
  - Received 16 protection applications totaling $5.8MM in round one. Approved 9 projects worth $2.0MM to protect 7,267 acres of forest
- **$10 for protection**
  - Received 30 restoration applications totaling over $6MM in round one. Awarded $2.4MM to 14 organizations for work in 19 priority locations
Constant feedback and adaptation

- Addressing teaming dynamics and facilitation needs
- Pursuing outreach and long-term funding strategy
- Ongoing monitoring, reassessment to adapt investments
Challenges of scale and impact

- Scale of the basin (8 million acres $10^6$)
- Scale of the Cluster (500,000 acres $10^4$)
- Scale of the HUC12 (20,000 acres $10^3$)
- Scale of the project site (4 acres $10^0$)

• Communicating lessons-learned across Clusters and building a basin-wide narrative
• Assessing methods, e.g., stormwater infiltration vs. stream corridor restoration
• Requires careful selection of project sites and developing relevant monitoring plans
• Data-sharing and collaboration tools
Ongoing monitoring
Combining data from different sources with different monitoring protocols
• Good spatial distribution, variable temporal
• Objectives of monitoring, protocols
  – un-/impaired vs. fine-scale change
• Methods and indicators for maximum capacity to detect changes in short- and long-term
  – Progressive changes in ecosystems due to conservation, lag time

Building database for our research questions, making it available to others
Monitoring & Assessment

- Fish
- Macroinvertebrates (Stroud & ANS)
- Algae
- Water chemistry
- Storm sampling
- Edge-of-field
- Emerging contaminants

- Scale of projects, scale of effects
- Climate change impacts?
ANS & “Cluster” Team Monitoring

Sampling
• 2013-2014 Baseline
  – Integrated Cluster-Scale
  – “Before,” “Control,” “Impact” Project Scale Sampling
  – In-house Software for Site Selection
• Ongoing Monitoring After Project Completion (“After, “Control,” “Impact”)

“Cluster” Team Monitoring Plans
– Planning
– Support
– QA
Integrative and Project Monitoring Sites
Monitored by ANS, Stroud, “Cluster” teams
Stream Hiker: Modeling Template

Variables are calculated for Riparian and Drainage Areas at Reach and Network Scales
Climate & environmental variables
Landscape variables
Stream Hiker

Network routing enables analysis of variable correlation at different scales
Spatial configurations of variables within the stream network
Extrapolation to unmonitored streams
Climate change
Monitoring & Models in DRWI

• Connecting models and monitoring in clusters for watershed-wide understanding of water quality and ecosystem integrity

• Conservation action effects on stream ecosystem: IBI development & ecosystem response research
  – Beyond water chemistry

• Use model output to inform monitoring/project planning
  – Target monitoring locations where higher sample size will increase power of models
  – Feedback to conservation practice planning (location and/or type for greatest impact)
Monitoring, Models & Scale in DRWI

- ArcSWAT: process-based, for whole Delaware River Basin, daily time step
- Mapsheds: loads HUC12, process-based
- SPARROW: loads, stream segments, statistical
- StreamHiker: reach-scale (flexible/ user-specified), framework for developing statistical models (temperature, biological metrics, etc.)
- Temple & Villanova Stormwater Control Measure models (Pixel/parcel scale, “microwatershed”)

Data & Collaboration

How can our data compilation benefit others?
• User & use of models, data

Shared Research Agenda
• Steering Committee Meetings: Building collaborations, aligning partners
• Integrated, multi-disciplinary research agenda supporting ecological protection and restoration:
  “In-stream” researchers
  Land-water interface researchers
  Modelers
Macroinvertebrates and “clusters”
Fish assemblages and “clusters”
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ANS Water Quality Monitoring for the Delaware River Watershed Initiative: https://ansdu.maps.arcgis.com/home/
Twitter: @ANSStreamTeam
Website: http://ansp.org/research/environmental-research/projects/watershed-protection-program/