



2015 Annual Report

In Support of Maintaining and Restoring Water Resources

Prepared by Claire Jantz and Antonia Price

EXECUTIVE SUMMARY

We report progress to date on the WPF-funded project, “A land cover mapping, modeling, and monitoring system for the Delaware River Basin in support of maintaining and restoring water resources.” In this executive summary, we highlight major project management milestones and our key accomplishments. We also present a summary of challenges and obstacles encountered, modifications to the original scope of work, a description of unintended outcomes, and lessons learned so far. Following the executive summary is a detailed description of the progress made on each milestone and activity outlined in the original award agreement.

Some clarifying points:

- *We use the terms ‘DRB’ and ‘basin’ to refer to the Delaware River watershed basin, and we use the term ‘AOI’, short for area-of-interest, to refer to the 43-county region that completely covers the DRB.*
- *Regular text outlines the language used in the original award agreement, while italics indicate current progress and comments. Grant activities in gray text were not addressed during year one of the project.*

Project Management Milestones:

- *At Shippensburg University (SU), Alfonso Yañez Morillo (Research Analyst) and Antonia Price (Project Coordinator) were both hired during the 4th month of the project.*
- *By the 6th month of the project, we agreed on the data development leads for key project components and reached an agreement with PASDA (The Pennsylvania Spatial Data Clearinghouse) to distribute final data products to the public free of charge.*
- *Developed outreach strategy by month 6 and began reaching out to county GIS coordinators to request data. Outreach strategy includes email, website, social media, and an e-newsletter.*
- *In-person and web-based research team meetings were held in months 1, 2, 5, 7, 11, and 12. Future meetings will be scheduled quarterly.*

Key accomplishments to date:

- *Our outreach plan is being successfully implemented.*
 - *Project website is available online (<http://drbproject.org/>). Project is housed through the Center for Land Use and Sustainability (<http://centerforlanduse.org/>) at Shippensburg University. Updates are also shared via Twitter (<https://twitter.com/ShipCLUS>) and Facebook (<https://www.facebook.com/ShipCLUS>).*
 - *Two e-newsletters containing project updates was sent during months 8 and 10. The mailing list currently has more than 80 subscribers. Future e-newsletters will be sent during months 13, 16, 19, and 22.*

- *Our project was featured in the September DRWI newsletter, in an online blog (<http://paenvironmentdaily.blogspot.com/2015/10/delaware-river-watershed-land-use.html>), and in mailings from the Coalition for the Delaware Watershed.*
- *SU and USGS have completed analyses of land use and land cover change for the AOI, along with analyses of socio-economic descriptors of the AOI and the DRB (i.e. employment hotspots, economic characterization, population and housing unit trends). These results have been presented at workshops and shared with the steering committee.*
- *Through a related project, UVM has completed state-wide tree cover datasets for Pennsylvania and Delaware. The Pennsylvania state-wide product is available via PASDA, was featured in our e-newsletter, and information about it was shared with our partners. The Delaware state-wide product is available via Delaware's state GIS clearinghouse.*

Challenges and obstacles encountered:

- *At SU, USGS, and UVM, our planned timelines were delayed by institutional contracting procedures, which slowed the processing of our prime and sub-contract awards, and which delayed the effective project start by nearly 4 months.*
- *We have also experienced some unexpected delays while acquiring data as responses and response times have varied widely from GIS departments among the 43 counties in the AOI.*
- *While we will aim to keep on schedule, we anticipate requesting a no-cost extension on this project due to delays in start time and unanticipated obstacles regarding data acquisition.*

Modifications to the original scope of work:

- *UVM, the Chesapeake Bay Program/USGS, and the Chesapeake Conservancy are undertaking a similar high resolution, land cover mapping of the entire Chesapeake Bay Watershed. This initiative includes an expanded set of land cover classes including emergent wetlands, scrub/shrub, and impervious surfaces under tree canopy. Given that many counties intersect both the Delaware River Basin and the Chesapeake Bay Watershed, we have decided to expand the land cover classes mapped within the Delaware River Basin to produce a pair of consistent data products that are comparable across the entire length of the shared watershed boundary.*

Unintended outcomes:

- *This project has emphasized the need for basin-wide data sharing and data storage protocols. We are pursuing the development of a cyber infrastructure grant with The Academy of Natural Sciences to address data sharing and integration in the long-term. Learning about the needs and interests of other organizations in establishing infrastructure will help prevent the duplication of efforts, enable collaboration, and lead to the long-term success of this project*
- *The Center for Land Use and Sustainability at Shippensburg University recently joined the Coalition for the Delaware River Watershed. Learning about and making many other partnerships and networks will help spread the word about our project, and add credibility*
- *This project has demonstrated our capacity for research, which was recently been recognized by Shippensburg University. This recognition prompted us to renew the Center for Land Use and Sustainability (CLUS), with institutional support. By connecting our project to the CLUS, we have an identifiable brand for our project and team. We are also able to reach a wider audience and rely on existing networks inside and outside the university.*

Lessons learned so far:

- *Because of the relatively short time frame for a project of this scope we have been concerned about our ability to disseminate final products effectively. This was a concern raised independently by participants in both of the workshops we have had to date. On the one hand, multiple DRWI projects speak to the success and interest of multiple groups for the fate of the Delaware River Basin. On the other hand, we are concerned that stakeholders are beginning to express “start up fatigue,” where many projects are announced and launched, but the final results are not effectively communicated back to the stakeholders. One workshop participant specifically requested that we report back instead of immediately moving on to a next project. It is extremely important for us to develop a strong dissemination strategy for this project, and to collaborate with others to develop effective outreach and dissemination strategies for the DRWI as a whole.*
- *We are learning that to model land use change effectively and realistically out to 2070, we will need to explicitly consider climate change impacts (i.e. sea-level rise, increase in inland and coastal flooding). To keep to our project scope, we are focused on existing data sets that can be used as a proxy for some of the potential impacts, but the need for Basin-wide and Basin-specific climate impact modeling has become apparent.*

MILESTONE 1

Throughout the project, target End-User Community informed and engaged in LiDAR collection, land cover and growth model development activities; End User Advisory Groups actively engaged in production, review, feedback and refinement of all project deliverables.

Activities:

1.1: With WPF/DRWI Coordinating Committee, identify Target and Steering Committee end-users.

Target End-Users represent a potentially large and broad group of scientists and conservation practitioners who are identified as potential users. Steering Committee users are committed users who have a vested interest in the project outcomes for specific scientific or conservation applications. (months 1-2)

- *A Target End User contact list was started during month 3 of the project. Including county GIS coordinators, this list currently has over 100 individuals.*
- *Steering Committee members were finalized during month 7 of the project. See Appendix 1 for a list of the 18 members and 3 back-ups members.*

1.2: Conduct at least 4 Target End-User and 6 Steering Committee meetings over the project period

- *Target End-User Meetings have been held in Philadelphia, PA (month 10) and Narrowsburg, NY (month 11). Future meetings are scheduled in Reading, PA, Washington, NJ, and Dover, DE (month 13). See Appendix 2 for a list of workshop participants.*
- *Two Steering Committee Meetings have been held via webinar (months 8 and 11). Future meetings will be held every three months (months 14, 17, 20, and 23). Meeting minutes can be found online: <http://drbproject.org/documents/steering-committee/>*

1.3: Present mapping and modeling plans and receive feedback (months 2-12)

- *Project scope for mapping and modeling work has been presented to the Steering Committee (month 8). Project timelines have been presented to workshop groups (months 10 and 11).*

1.4: Interview key Target End Users and Steering Committee users re: participation in Long Term Monitoring and Modeling (months 2-12)

- *Discussion has begun with Target End Users and Steering Committee users regarding long-term participation and needs. Formal surveys are not yet in place.*

- 1.5: Present basin-wide high resolution land cover; get feedback (months 13-24)
- 1.6: Present basin-wide calibrated and validated CBLCM model; get feedback (months 4-9)
- *Data preparation is near completion for the SLEUTH and CBLCM models.*
- 1.7: Solicit feedback on land use/land cover change scenarios (months 6-12)
- *We are in the process of collecting information through our Target End-User Workshops. All information is shared with our Target End-User and Steering Committee Groups, and will be used to develop land use/land cover change scenarios.*
- 1.8: Present; get feedback on land use/land cover change forecasts (months 9-15)
- 1.9: Present; get feedback on long term monitoring and modeling draft plan (months 12-18)
- 1.10: Present results of Feasibility Study for long term monitoring and modeling plan to WPF/DRWI Coordinating Committee (months 18-24)

MILESTONE 2

By December 2016, new high-resolution land cover produced, sustainably-housed and available to Target End User Community for ongoing use.

Activities:

- 2.1: Identify and collect relevant local digital data sets through End-Users. (months 1-6)
- *We have an agreement in place with PASDA to freely distribute Basin-wide data sets.*
 - *We have reached out to each of the GIS offices in the 43 counties that intersect the DRB, and continue to wait for responses from the majority of counties.*
- 2.2: Data prep and processing (months 3-18)
- *High-resolution leaf-on and leaf-off imagery has been obtained for the entirety of the AOI and prepped for analysis.*
 - *LiDAR has been obtained for the Delaware, Pennsylvania, and selected areas within New Jersey and New York. All available LiDAR has been prepared for analysis. We expect LiDAR datasets that cover the remaining gaps in New Jersey and New York to be delivered in early 2016.*
 - *Other supporting datasets provided by state and county organizations have been prepared for analysis.*
 - *Land cover for the Delaware section is scheduled for release in December 2016. The Pennsylvania section is scheduled for release in January 2016. Providing the missing LiDAR datasets are delivered on time we expect to release the New Jersey and New York sections in February 2016. These will constitute initial releases of the land cover dataset to facilitate the development of the land use/cover change model. We expect a secondary release, which incorporates a more detailed round of manual corrections to be released in May 2016.*
- 2.3: Data accuracy assessment and metadata production (months 18-20)
- *We have developed the accuracy assessment protocols, choosing to mimic those being used for the Chesapeake Bay Watershed land cover project.*
- 2.4: Land cover summarization (months 20-24).

MILESTONE 3

By June 2016, land use/cover change modeling complete with minimum 10-year increments over a 30-year horizon. Results sustainably-housed and available to Target End User Community for ongoing use.

Activities:

- 3.1: Assemble required GIS data and complete model calibration and validation (months 1-6)

- *We have met with the USGS group to plan our work with the CBLCM (month 5)*
 - *We have done some refining of the SLEUTH model to prepare for this analysis*
 - *The required GIS data is mostly assembled for SLEUTH and CBLCM, but we have not started model calibration and validation*
- 3.2: Develop initial land use/cover change forecast (months 4-9)
- *Some work has been done to develop the initial land use/land cover change scenarios*
- 3.3: Generate finalized future land use/cover change scenarios (months 9-18)

MILESTONE 4

By December 2016, long term monitoring and modeling feasibility study completed and summary report presented to WPF/DRWI Coordinating Committee.

Activities:

- 4.1: Interview staff at state mapping offices, identify frequency of LiDAR mapping (months 1-6)
- *In conjunction with our Steering Committee, we are developing a survey to assess the future needs of our Target End Users including LiDAR mapping, high-resolution land cover, modeling tools, and interest in long-term participation (below).*
 - *With DRWI researchers at ANS, we are exploring how the DRWI can participate in the National Map 3D Elevation Project (<http://nationalmap.gov/3DEP/>), a USGS program that coordinates and partially funds the production of LiDAR acquisition and mapping efforts.*
- 4.2: Interview Target End Users re: needs for ongoing high-resolution land cover; modeling interface and tools (months 1-12)
- 4.3: Interview Target End Users re: participation interest in long term monitoring plan (months 1-12)
- 4.4: Develop draft long term monitoring and modeling plan and budget (months 10-18)
- 4.5: Prepare final plan and feasibility report (16-24)

Appendix 1- Steering Committee List

Member	Title	Organization
Claire Jantz	<i>Lead Investigator</i>	Shippensburg University, Geography and Earth Science
Scott Drzyzga	<i>Co-investigator</i>	Shippensburg University, Geography and Earth Science
Jarlath O’Neil-Dunne	<i>Co-investigator</i>	University of Vermont, Spatial Analysis Laboratory
Peter Claggett	<i>Co-investigator</i>	US Geological Survey, Chesapeake Bay Program
Clare Billett	<i>Project Sponsor</i>	William Penn Foundation, Watershed Protection
Robert Cheetham	<i>President/CEO</i>	Azavea
Chad Pindar*	<i>Supervisor</i>	Delaware River Basin Commission, Watershed Planning and Compliance
Jessica Rittler Sanchez*	<i>Basin Planner</i>	Delaware River Basin Commission, Planning and Information Technology
Karen Reavy	<i>GIS Coordinator</i>	Delaware River Basin Commission, Planning and Information Technology
Carol Collier	<i>Senior Advisor</i>	Academy of Natural Sciences, Delaware River Watershed Initiative, Watershed Management and Policy
Scott Haag	<i>Database Administrator</i>	Academy of Natural Sciences, Delaware River Watershed Initiative
Chris Linn	<i>Manager</i>	Delaware Valley Regional Planning Commission, Office of Environmental Planning
Kathy Commisso	<i>GIS Specialist</i>	National Parks Service, Delaware Water Gap National Recreation Area
Kristina Heister	<i>Superintendent</i>	National Parks Service, Upper Delaware Scenic and Recreational River
Jamie Myers*	<i>Biologist</i>	National Parks Service, Upper Delaware Scenic and Recreational River
Megan Boatright	<i>Manager</i>	Natural Lands Trust, GIS and Cartography Services
Diane Rosencrance	<i>Senior Director</i>	Natural Lands Trust, Landscape Planning
Abigail Weinberg	<i>Director of Research</i>	Open Space Institute
Barry Evans	<i>Senior Research Associate</i>	Penn State University, GIS Support Center
Stephanie Pendergrass Dalke	<i>Project Director</i>	Pinchot Institute for Conservation/ Common Waters Partnership
Charles Dow	<i>Director</i>	Stroud Water Research Center, Information Services
Sarah Johnson	<i>Conservation GIS Analyst</i>	The Nature Conservancy (PA), Freshwater Conservation Team
Eric Olsen	<i>Project Director</i>	The Nature Conservancy (NJ), Delaware River and Bay Whole System
Su Fanok	<i>Senior Conservation Scientist</i>	The Nature Conservancy (PA), Freshwater Conservation Team
Kathy Klein	<i>President</i>	Water Resources Association of the Delaware River Basin

** Alternative member for organization*

Appendix 2- Workshop Attendees

This lists indicates the 2015 workshop attendees in Philadelphia, PA (P) or Narrowsburg, NY (N).

Attendee	Title	Organization	P/N
Carol Collier*	Senior Advisor, Watershed Management and Policy	Academy of Natural Sciences of Drexel University	P
Scott Haag*	Database Manager	Academy of Natural Sciences of Drexel University	P
Lin Perez	GIS Manager and Stormwater Specialist	Academy of Natural Sciences of Drexel University	P
Paul Faeth	Director, Energy, Water and Climate	CNA	P
Kim Beidler	Director	Coalition for the Delaware River Watershed	P
Karen Reavy	GIS Specialist	Delaware River Basin Commission	P
Fred Stein	Citizen Action Coordinator	Delaware Riverkeeper Network	P
Patty Elkis	Director, Division of Planning	Delaware Valley Regional Planning Commission	P
Katie Bartolotta	Southeastern PA Outreach Coordinator	PennFuture	P
Charles Dow*	Director of Information Services	Stroud Water Research Center	P
John Jackson	Senior Research Scientist	Stroud Water Research Center	P
Buck Moorhead	Partner	Building Consensus for Sustainability	P/N
Jeff Dexter	Township Supervisor	Damascus Township	N
Tyson Robb	Environmental Planner Technician	Delaware County Planning	N
Bethany Keene	Outreach Coordinator	Delaware Highlands Conservancy	N
Jim Serio	Broker	James Serio Real Estate	N
Carla Hahn	Park Ranger, Management	National Park Service	N
Kristina Heister*	Superintendent	National Park Service	N
Jamie Myers*	Biologist	National Park Service	N
Eric Roberts	Assistant Steward	Orange County Land Trust	N
Steve Schwartz	PKC Cluster Coordinator	Pinchot Institute for Conservation	N
Freda Eisenberg	Commissioner	Sullivan County Division of Planning and Environmental Management	N
Tina Spangler	Board Member	Town of Tusten ZBA	N
Ed Jackson	Chairman	Tusten Planning Board	N
Travis O'Dell	Resource Specialist	Upper Delaware Council	N
Cindy Odell	Secretary	Upper Delaware Council	N
Laurie Ramie	Executive Director	Upper Delaware Council	N
Autumn Sylvester	Agricultural Resource Specialist	County of Sussex	N

** Steering Committee Member*