MAPAIS PROPOSAL COVER SHEET

February 28, 2025

Project Title: Community Empowered Volunteer Monitors Help Educate By Flotilla & Land to Disseminate BMPs During Popular Summer Boat Launch Season Along Wild & Scenic Delaware River

Grant Period: October 1, 2025 to September 31, 2026

Requested Funding: $8,371

Principal Investigator:	Erik Silldorff, PhD
Institution and Unit:	Delaware Riverkeeper Network
Telephone:	215-369-1188 x112
Address:	925 Canal St., Suite 3701; Bristol, PA 19007
Email:	erik@delawareriverkeeper.org

ERIK SILLDORFF, RESTORATION DIRECTOR

(signature, name, and title of person authorized to submit grant on behalf of organization)

Project Title: **Community Empowered Volunteer Monitors Help Educate By Flotilla & Land to Disseminate BMPs During Popular Summer Boat Launch Season Along Wild & Scenic Delaware River**

Project Summary

While the Delaware River above its tidewaters maintains high water quality and ecological integrity, invasive species threaten this Wild & Scenic River, from snakeheads to invasive crayfish to mud snails. The base of the food web now also faces the threat of invasion and ecological displacement as *Hydrilla verticillata* expands out of the estuary and moves into upper areas of the basin, threatening the aquatic plant community dominated by native groups such as *Elodea*, *Heteranthera*, and *Vallisneria*. For this project, DRN will educate and empower, a corps of volunteer monitors to help survey a 15 mile stretch of the Wild & Scenic Delaware River (using kayaks, snorkels, and visual assessment methods). We will then empower these trained volunteer monitors to outreach with families of all ages coming to enjoy the River and launching at high traffic access points during the summer months. We will hold a series of "pop up education good steward events" timed with optimal summer and fall weather to engage recreation users that frequent this beautiful 15 mile stretch of River. We will have simple handouts to provide for regular users developed by agencies. From our 20 plus years experience at these launches, we know that the multi-generational audiences visiting these high traffic areas are not the likely suspects to show up for our existing aquatic workshops and volunteer monitor sessions. Methods will incorporate engaging ways to involve and educate in a casual setting. In this effort we will share BMPs needed to control the spread of invasive hitch hikers and cover good citizen stewardship.

Project Narrative

Project Description & Results Expected

While the Delaware River above its tidewaters maintains high water quality and ecological integrity, invasive species threaten this Wild & Scenic River, from snakeheads to invasive crayfish to mud snails. The base of the food web now also faces the threat of invasion and ecological displacement as *Hydrilla verticillata* expands out of the estuary and moves into upper areas of the basin, threatening the aquatic plant community dominated by native groups such as *Elodea*, *Heteranthera*, and *Vallisneria*. The DRBC's recent State of the Basin 2025 report highlights the threat of invasive species, with declining trends noted in both the 2019 and 2025 reports.

The USEPA has recently completed general surveys of SAV (submerged aquatic vegetation) in the tidal Delaware River (2017,2018,2019, although the focus of this EPA work was not plant identification. The highly invasive aquatic plant, *Hydrilla,* was noted in the tidal reach and is present in brackish water areas of the estuary– for example it has been observed near the Delaware City Refinery. More concerning is work through the New Jersey Water Supply Authority where *Hydrilla* has moved out of tidal areas and has become common in the D&R Canal (Solitude Lake Management, 2016). The Georgia Early Detection and Distribution Maps (EDD Maps) includes only 5 verified observations of *Hydrilla* in Bucks Co and all localized in Lake Nockamixon and impounded Haycock Creek observed in 1998, 2010, 2012, and 2016 (by Princeton Hydro, Morris Arboretum, PA Native Plant Society, the PADEP and USGS) but data available is spotty. There are currently no documented observations for *Hydrilla* in Northampton Co, Hunterdon Co, Warren Co, Monroe Co, or Pike Counties. Furthermore, the SAV studies in the 2025 basin report are the first year SAVs are included in this report; it is an emerging and much needed area of further research, monitoring and documentation. At the same time, our agency colleagues and federal scientists and partners are experiencing challenges with federal funding, which could jeopardize important work that has only begun. We are hoping our ability to help at this unprecedented time this coming summer into next year may keep important science and monitoring work moving forward while detecting any early infestations of *Hydrilla* so it can be readily documented, mapped and eradicated to ensure native diversity of eel grass, *Podostemum* and other native SAVs can thrive.

With *Hydrilla*'s unique tolerance for brackish water, conductivity and higher salt concentrations are known to help spread invasive *Hydrilla* into other areas. With increasing salinity from road salt impacts, changes in landscape with massive warehouse expansion in the Lehigh river watershed with large parking lots requiring winter icing treatments replacing forests and often glacial till soils, we are seeing changes in salinity that may make conditions ripe for the spread of *Hydrilla* already found below head of tide. Furthermore, climate change impacts and extreme weather patterns projected and already occurring may also lead to increased salinity via drought conditions. Existing volunteer monitors and USGS gage stations already indicate observations of very low baseflow or nonexistent baseflow from freshwater headwater

tributary streams, adding to less freshwater baseflows for dilution. DRN and our trained volunteer monitors have documented increased salinity using DIY sensors and hand held Lamotte meters in the past 10 plus years, working side by side with Rutgers University, Stroud Water Research Center, USGS and others.

With these continuing invasive spread threats and predicted changes from climate, salinity, and landscape impacts, DRN proposes to expand on the ground field truthing in the non tidal section of the Lower Delaware using trained volunteer monitors accompanied by DRN scientists. We will specifically focus on the main stem from Easton PA (RM 183.5) downstream to Upper Black Eddy PA (RM 168). This survey area of 15 miles is a focus for 2025 monitoring for *Podostemum* – a native plant which DRN has made ground-breaking discoveries in the 2024 field season using trained volunteer monitors under the supervision of Dr. Silldorff.

By adding *Hydrilla* to our planned 2025 surveys and 2026 surveys, we will help better document spread and help educate more recreation users. It is important to note that one of the two actions and needs listed in the DRBC report is to 1) initiate monitoring of SAV in the non-tidal Delaware River to track changes in SAV beds and 2) continue monitoring SAV in the estuary to develop long term dataset for trend analysis. Our proposal will directly assist with the first action item and build on our success with SAV flotilla surveys in 2024. Another key education action item outlined in the State of the Basin plan that DRN would address: informing citizens of invasive species found within the Basin and how to properly handle the spread of such species during and after recreating.

DRN will hold three trainings (at Ralph Stover State Park) and five paddle flotillas with trained volunteer monitors accompanied by Dr. Erik Silldorff and staff scientists to determine presence or absence of the plant in a 15 mile area of the Lower Delaware River. DRN will focus on outreach and engaging volunteer monitors to ID and to assess the presence or absence of *Hydrilla verticillate*. A training will be held that covers the negative impacts of this invasive plant on water quality and habitat, assess native look alikes *(Elodea*) as to avoid misidentification, and review and cover recommendations to limit the spread of this invasive aquatic plant using BMPs for recreation users. We will acquire, utilize, and disseminate existing handouts and laminated guides developed by Sea Grant, USGS, EPA, DCNR, and PAFBC to best utilize existing resources. We will cover and share online mapping resources (i.e. NJ Wildlife Tracker, iNaturalist) that volunteers can access to assess other findings beyond our flotillas. We will request that volunteers provide us with additional citing information in an effort to possibly ID other infestations elsewhere. Citings not accompanied by DRN staff will include QAQC to ensure documentation is verified.

Flotilla Survey Details/Logistics/Safety

For each survey trip, paddlers will either paddle rental kayaks / canoes, or paddle their own boats, with shuttles provided by DRN to the put-in locations. DRN will lead these trips using

staff trained by the National Canoe Safety Patrol to ensure safety and cohesion of the paddling group throughout the day. DRN has conducted similar safety trainings and has trained safety staff and for this project we may also engage additional NCSP safeties to participate and learn. Scientific surveys will be led by Dr. Erik Silldorff, a PhD aquatic ecologist who has spent over 20 years documenting the distribution and abundance of Podostemum in the Delaware River and the region while also scanning for *Hydrilla*. Throughout the paddle day, the team will land along the shoreline within targeted habitats (coarse-substrate riffles and runs), and conduct rigorous surveys for Podostemum and Hydrilla using wading and snorkeling techniques, documenting locations with GPS and entering data into survey data forms.

Based on flotilla run of the river results and findings conducted in the summer and fall of 2025, we will deploy trained volunteers to conduct spot checks at freshwater access landings and access points to help educate and outreach to recreation users at these high traffic access points. These hot spot surveys would be timed when recreationists may be in high number in order to disseminate information to users. We will share existing invasive species guides and BMP tips to amplify and communicate the harms of invasive species to river users in an interactive and casual way. We will also conduct a series of pop up events with DRN staff.

Benefits or Results Expected

This volunteer monitor project will help document and pinpoint the presence / absence of *Hydrilla* infestations for this 15mile stretch that has not been to our knowledge, surveyed before and share BMPs with recreation users. This could help, if found, trigger important early eradication of the species to ensure it does not spread or compete with other native SAVs.

This project will educate and train at least 52 volunteer monitors to participate in the workshop and 5 flotillas and these volunteers will continue to share their knowledge and targeted survey recon at hot spot access points. We have observed this phenomenon with all of our volunteer monitors who have assisted DRN over its 30 year citizen monitoring history.

Outreach & Dissemination

Our results will be shared with our volunteer monitor network, and our 26,000 and growing membership. We will disseminate information thru the various professional and amateur mapping tools and we will also share information in our DRN newsletter. We will share results with recreational users to help better educate and stop the spread of invasive species inadvertently from movement of boats, waders and other equipment. We will use existing agency guides and color laminated charts to help with ID and share good BMP practices. Volunteers visiting access points during the recreation season of the summer and fall of 2025 into the spring of 2026 will be conducted to engage recreation users in a casual setting – we envision reaching at least 300 recreation users during these surveys, spot checks and through social media.

We will use our existing DRN publicity and outreach tools to amplify findings and the threat of invasive species. We will involve press and local youtube channels and our regional Riverwatch which is broadcast on regional TV networks. We will share information through our various professional and volunteer monitoring (i.e. C-SAW service providers, monitoring technical committees, nationwide volunteer monitoring network, CRISP, NJWW Network, etc.).

Project Timeline

July and August 2025 – in person trainings for volunteer monitors (2 total in 2025) will commence at Ralph Stover State Park

July and August 2025 --- Four flotilla volunteer monitor trips and hands on field trainings will occur in the summer of 2025 including weekends or week days based on recruitment of our volunteer monitors and monitoring conditions when turbidity of water is low and visibility and weather is good for observations.

Fall 2025, Spring 2026, Summer 2026 – outreach by trained volunteer monitors at recreation area hotspots/boat launches to share info on invasives species and BMPs to limit aquatic invasive spread (fully this proposal)

Spring/Summer 2026 - data dissemination to agencies and databases including attending and sharing at a MAPAIS meeting to present results and at other workshops and regional roundtables (i.e. 2026 Watershed Congress & the National Volunteer Monitoring Conference)

July 2026 – in person education training for volunteer monitors (1 total in 2026)

July/August 2026 - Surveys/Hot Spot Education & Outreach at Popular Boat Launch Sites

August 2026 - Two Pop Up Education Co-Surveys with DRN Staff at Hot Spot Boat Launch Sites (based on weather and anticipated high boat traffic)

September 2026 -- Final Reporting

Previous MAPAIS funding

DRN received MAPAIS funding in 2022 with a grant period of Sept 1 2022 – August 31, 2023 in the amount of $12,817. Our work was led by Dr. Erik Silldorff who will lead this effort. Mr Byron Riggins was also engaged in this effort who now works for EPA. The title of the effort was Ecosystem Experiment to Evaluate the Return of American Eels for Controlling Invasive Crayfish & Restoring Ecological Structure in Streams and Rivers.

Project Budget

Delaware Riverkeeper Network

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Project Budget

Expense Categories	This Request
Salary	$4,340
Fringe / Benefits	$1,519
Permanent Equipment	$0
Expendable Supplies & Equipment	$720
Travel	$700
Publication & Documentation	$0
Indirect Costs *(15% de minimus rate)*	$1,092
Total Project Expenses	**$8,371**
Project Match	
National Park Foundation	$19,910
Volunteer in-kind time	$17,950
Total Project Match	**$37,860**

Budget Justification

MAPAIS funding will support training and outreach to the public and volunteers about invasive species in the Lower Delaware Basin. Salary costs will cover DRN staff time to delivery training and outreach, as well as the preparation of materials for these training sessions (DRN does not disclose individual salary information). Fringe benefits are included at the DRN standard rate of 35%, and the de minimus indirect rate of 15% was used for this proposal. Travel expenses will cover mileage to training sessions and volunteer events. Expendable supplies and equipment will pay for reproduction of training materials and supplies for volunteers.

ERIK L. SILLDORFF

215.369.1188 x112 (office) erik@delawareriverkeeper.org

PROFESSIONAL

DELAWARE RIVERKEEPER NETWORK - Bristol, PA 2017-present

Restoration Director & Senior Scientist

Advance water quality and ecological restoration throughout the Delaware watershed through holistic programs and projects to restore stream, riparian, and wetland structure and function. Advocate for the protection of intact ecosystems, and lead efforts to restore ecological integrity to areas impacted by human use and development. Partner with citizens, watershed groups, academic partners, and various levels of government to identify problems and advance solutions that sustain both our ecological and human communities and environments.

BUCKS COUNTY COMMUNITY COLLEGE - Newtown, PA 2016-2017

Statistics Faculty

Instruct undergraduate students in basic and applied concepts of mathematical statistics, including descriptive statistics, confidence intervals, hypothesis testing, analysis of variance, and simple linear regression.

DELAWARE RIVER BASIN COMMISSION - West Trenton, NJ 2006-2016

Senior Aquatic Biologist

Senior scientist & statistician in diverse scientific and policy arenas. Range of specialties: estuarine eutrophication - ecological & instream flows - regulatory biocriteria development - fish hypoxia tolerance - aquatic insect taxonomy - antidegradation - Marcellus Shale impacts - water quality monitoring – ecological assessments.

PRINCETON HYDRO, LLC - RINGOES, NJ 2003-2006

Senior Scientist

Project manager and technical specialist for aquatic ecology program for streams, lakes, rivers & wetlands.

ACADEMY OF NATURAL SCIENCES - PHILADELPHIA, PA 1992-1996

Staff Scientist II

Stream ecologist conducting integrated ecological assessments for rivers throughout the United States.

ACADEMIC

UNIVERSITY OF CALIFORNIA, SANTA BARBARA

M.A. in Applied Statistics – 2002 Primary Statistical Languages: S-Plus, SAS

Ph.D. in Ecology - 2003 Dissertation: "Stream Invertebrate Responses to Trout Introductions: Results from Large-Scale Studies in the Central Sierra Nevada and Yosemite National Park"

CORNELL UNIVERSITY

B.S. in Natural Resources with Honors and Distinction - 1992

PUBLICATIONS & TECHNICAL REPORTS *(selected)*

van Rossum, M.K, E.L. Silldorff, K. Manahan, A. van Rossum, D. Grable. 2024. Delaware Riverkeeper Network scientific & legal comment on "Water Quality Standards to Protect Aquatic Life in the Delaware River, Docket ID No. EPA-HQ-OW-2023-0222." available at https://drive.google.com/file/d/1Q0C10Dl4C-9Palj26PHmNMwVMOsjrX9A/view

Alkire, C., E.L.Silldorff, and S.Wang. 2020. Economic Value of Dissolved Oxygen Restoration in the Delaware Estuary. Report submitted to the Academy of Natural Sciences of Drexel University; December 2020; 91 pp. available at https://drive.google.com/file/d/1OrYeY29hbseLeA71mzLkz_eHHI35u-B2/view

Silldorff, E.L. 2020. "Testimony of Erik L. Silldorff, Ph.D., Restoration Director & Senior Scientist, Delaware Riverkeeper Network (Areas of Expertise: Aquatic Ecology, Freshwater Mussels,Ecological & Water Quality Assessment, Statistics) In the Matter of: Delaware River Basin Commission Docket D-2017-009-2, Delaware River Partners LLC, Gibbstown Logistics Center, Dock 2, Greenwich Township, Gloucester County, New Jersey; March 2, 2020"

Blakeslee, C.J., E.L. Silldorff, and H.S. Galbraith. 2018. Changes in freshwater mussel communities linked to legacy pollution in the lower Delaware River. Northeastern Naturalist 25(1): 101-116

Silldorff, E.L. 2015. Preliminary summary of point source nutrient data from the 2-year DRBC monitoring initiative. A report to the U.S. Environmental Protection Agency, Region 3, by the Delaware River basin Commission; West Trenton, NJ; December 2015; 35 pp.

Silldorff, E.L. 2015. Existing Use Evaluation for Zones 3, 4, & 5 of the Delaware Estuary *(March 24, 2015 draft report)*. Published online by the Delaware River Basin Commission; West Trenton, NJ, in September 2015. 162 pp. *{available online at http://www.nj.gov/drbc/library/documents/ExistingUseRpt_zones3-5_sept2015.pdf}*

Silldorff, E.L. and A. Swartz. 2014. Freshwater Mussel Community Composition and Relative Abundance in the Lower Delaware River. Published online by the Delaware River Basin Commission; West Trenton, NJ, in Dec. 2014. 44 pp. *{available online at www.nj.gov/drbc/library/documents/mussels-rpt_lower-del_dec2014.pdf}*

Silldorff, E.L. and M.M. Swann. 2013. Observational and Experimental Work with *Didymosphenia geminata* in the Lower Delaware River: A Report to the Pennsylvania SeaGrant – 2013. Final report submitted to Pennsylvania SeaGrant in December 2013. 42 pp. *{available online at http://seagrant.psu.edu/sites/default/files/Silldorf%20Final%20Report%20(2012-14).pdf}*

Silldorff, E.L. 2013. pH Criteria Revision Recommendations for the Interstate Waters of the Delaware River Basin: Basis & Background Document. Published online by the Delaware River Basin Commission; West Trenton, NJ, in Sept. 2013. 142 pp w/ appendices. *{available online at www.nj.gov/drbc/library/documents/basis-bkgd_rev-pHcriteria0313.pdf}*

Silldorff, E.L. 2010. "Testimony of Erik Silldorff, Ph.D., Aquatic Biologist, Delaware River Basin Commission (Areas of Expertise: Aquatic Ecology, Ecological & Water Quality Assessment, Statistics) In the Matter of Delaware River Basin Commission Adjudicatory Administrative Hearing on Natural Gas Exploratory Wells; November 23, 2010" *{available online at http://www.state.nj.us/drbc/library/documents/Silldorff.pdf}*

Silldorff, E.L. and R.L. Limbeck. 2009. Interim Methodology for Bioassessment of the Delaware River for the DRBC 2010 Integrated Assessment. Delaware River Basin Commission publication. 26 pp. *{available online at http://www.state.nj.us/drbc/library/documents/10IntegratedList/Bioassessment-draft-July2009rev.pdf}*

Herbst, D.B. and E.L. Silldorff. 2006. Comparison of the performance of different bioassessment methods: Similar evaluations of biotic integrity from separate programs and procedures. J.N. Am. Benthol. Soc. 25(2): 513-420.