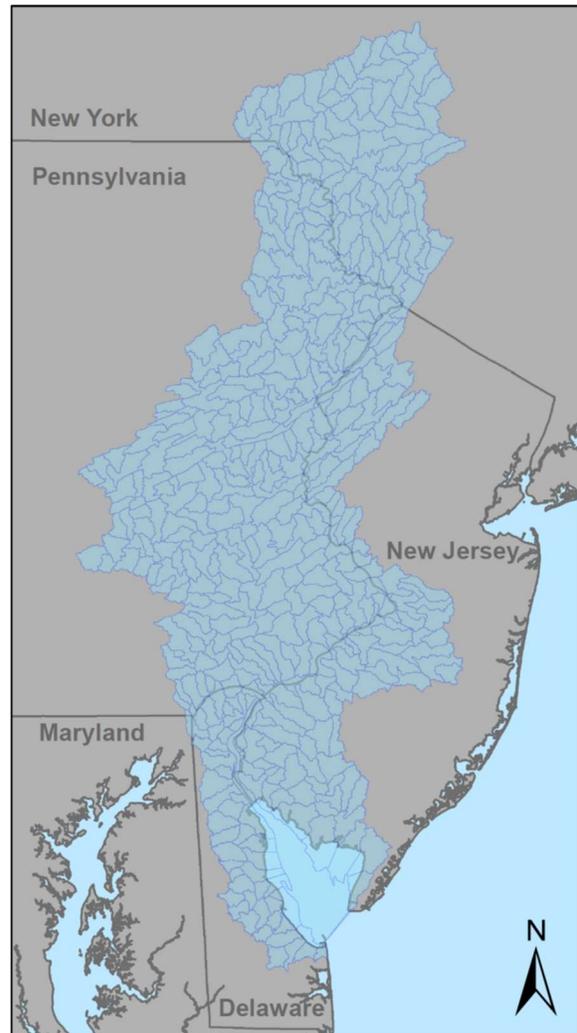


Estimating Public Investments in Landscape Preservation and Water Quality Best Management Practices in the Delaware River Basin



Rutgers, The State University of New Jersey

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The team thanks Amanda Parker and Kevin Keys for their tireless (and often frustrating) work in contacting governmental agencies at all levels to identify and access budget and expenditure data. Gathering information of this type during a pandemic that closed all government offices was beyond difficult, but they managed to achieve valuable results. Amanda Parker also compiled demographic data and prepared all GIS outputs. Sara Malone had primary responsibility for developing the database structure and input of data. Karen O'Neill conducted and evaluated the interviews. Kevin Keys programmed a Qualtrics survey for expert panel members to supplement the in-person interviews. Dan Van Abs served as overall project coordinator and conducted the geographic and equity evaluations. All were involved in project development, planning, implementation and lead report writing. All Rutgers team members contributed to this report.

Expert Panel

The Rutgers team was very fortunate to have expert assistance in framing the project and reviewing the draft report from the following individuals:

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- Margaret Waldock, Executive Director, Duke Farms Foundation (formerly with the Geraldine R. Dodge Foundation)

The panel worked with the Rutgers team through the project and provided great input, insights and assistance. We gratefully acknowledge their help and note that any remaining methodological issues are not the fault of the expert panel!

Disclaimer

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Project Purpose and Overview

The Delaware River Basin is a watershed spanning 13,539 square miles including the 782 square-mile Delaware Bay, encompassing portions of four states and all or part of 42 counties and 868 municipalities, and is the longest undammed river east of the Mississippi River.¹ The Delaware River and its tributaries are vital water supplies for New York City, Philadelphia and small urban, suburban and rural areas. This area of only 0.4% of the nation's land area provides all or a significant portion of the water supplies for 4% of the nation's population, roughly 13 million people. In addition, the Basin includes large areas of agriculture within Delaware, New Jersey and Pennsylvania, along with Delaware and Broome Counties in New York. The Basin also has extensive forested areas, especially in the northern areas, that provide ecological and water resources to the benefit of Basin residents and others. Much of the upper Delaware River (north of Trenton) is included within the National Wild and Scenic Rivers System, as are tributaries such as the Musconetcong River in New Jersey. Upper Basin streams include world-class trout fishing and excellent water quality. The estuarine sections of the Delaware River and Delaware Bay and their tidal tributaries are part of the National Estuary Program. The Delaware Estuary also includes shipping ports important to the area.

The William Penn Foundation began its Watershed Protection Program in 2013, funding projects in constituency building, watershed-wide science and advocacy, and targeted watershed preservation and restoration projects. Their intent is “to create the long-term conditions – the practices, policies, and public engagement — that will ensure the Delaware River Watershed supports aquatic life and recreation in and on the water.” As part of this effort, the Foundation supports “efforts to secure concentrated forest protection, agricultural restoration, and stormwater solutions that maintain and improve stream health in targeted sub-watersheds; robust and sustained regulatory protections and funding; and equitable and widespread public access to and engagement with our rivers and streams.”² Total funding allocated for these projects is approximately \$347 million over the eight-year period (2013-2020).

The William Penn Foundation has consistently encouraged other entities such as governments and non-profit organizations to fund or collaboratively fund similar projects. As part of this effort, the Foundation released a Request for Proposals in late 2019 to understand recent status and trends regarding governmental budget allocations and expenditures for the protection and restoration of lands in the Basin, and for the implementation of Best Management Practices (BMPs) to improve water quality, including specifically stormwater BMPs. Specifically, the Foundation sought “a rigorous and transparent methodology for consistently estimating the amount of public funding – federal, state, county, and municipal – allocated for the protection and restoration of Delaware River watershed landscapes.” Recognizing that compilation of this information would be challenging, they also wanted to “understand limitations related to existing data and together can navigate the necessary tradeoffs to generate useful estimates for monitoring public funding.” The RfP focused on land protection, land

¹ Delaware River Basin Commission. Basin Information. Available from: <https://www.state.nj.us/drbc/basin/>.

² William Penn Foundation. Watershed Protection. Available from: <https://williampennfoundation.org/what-we-fund-watershed-protection>.

restoration, and agricultural best management practices.³ A team from Rutgers-The State University of New Jersey was selected to develop the initial database and assessment for the period 2014 through 2019.

This effort represents the first project-level compilation of expenditures attempted in the Basin, and to our knowledge for any large river basin in the nation. It builds on prior compilations of program-level budgets, including a study for the William Penn Foundation from the University of Delaware Water Resources Center. A literature search found only one project that was comparable in scope to this effort, in the Chesapeake Bay region, which is heavily funded by special Clean Water Act appropriations from the federal government; total federal and state spending for water quality improvements in the Chesapeake Bay Basin are roughly \$450 million and \$1 billion per year, respectively.⁴ However, the Chesapeake Bay Program accounting focuses on federal and state funds,⁵ while this Delaware River Basin project also includes funding from county and municipal governments and special governmental agencies such as conservation districts.

The project did not track expenditures in response to permit requirements (e.g., development mitigation, wastewater treatment plant upgrades, NJ CSO NJPDES permit requirements), judicial consent orders (e.g., JCOs requiring implementation of Combined Sewer Overflow Long Term Control Plans), or hazardous site cleanup mandates (e.g., Superfund, RCRA, equivalent state programs). The project focus is on watershed improvements not associated with regulatory programs. In addition, park improvements not associated with the targeted functions (e.g., visitor services, playgrounds, athletic fields) are also not included.

The project resulting in this report involved five major components:

- **Creation of a database** that allows identification of a full range of potential government funding sources and recipients of government funds, along with committed/expended funds for all governmental entities that provided information, with funded projects where available; where project funding is from multiple sources, this is tracked where provided. The database also includes detailed information regarding agency contacts for those governmental entities that provided data, and information regarding agencies that either verified expenditures for these purposes or did not respond to multiple attempts at contact. Where projects include sufficient geographic references, the database allows for geographic analysis of expenditure patterns through use of a geographic information system (GIS). Finally, although data collection focused on government sources of funding, the database allows for collection of projects funded by other sources, such as foundations and non-profit organizations, which is especially useful to this project where such funds were used to match government funds. The database therefore does not present a comprehensive collection of funding outside the government.

³ While the focus of the project is on water quality protection and restoration, many of these projects will have ancillary benefits for mitigating future water supply and flooding stresses. However, these benefits were not the project focus and no projects that were solely for water supply and flooding purposes have been included.

⁴ Chesapeake Progress. "Funding." Available from: <https://www.chesapeakeprogress.com/?/funding>. The largest federal expenditures are from the U.S. Environmental Protection Agency (most of which is for grants-in-aid to state governments) and the U.S. Department of Agriculture (primarily to fund easements and financial assistance to landowners for conservation practices). Maryland provides the largest share of state funds, followed by Virginia.

⁵ Public Law 113–273 (2014) 128 STAT. 2967, "Chesapeake Bay Accountability and Recovery Act of 2014".

- **Interviews and surveys of experts** from a wide range of non-profit organizations and governmental agencies to ascertain their perspectives on the nature, trends and equity of government budgets and expenditures for these purposes.
- **Evaluation of expenditures** relative to demographic, regional and environmental factors where feasible, to determine the extent to which the geographic distribution of expenditures matched environmental needs and demographic equity considerations.
- **Recommendations for database expansion** into future years and incorporating additional potential data sources. Included in this section is an evaluation of how governmental data systems and availability constrain the success of a project that seeks to aggregate data from a wide variety of data sources that were not designed for this purpose.
- **Recommendations for using the project results to drive decisions** that can increase the effectiveness, cohesiveness and equity of government funding.

The project is in support of the William Penn Foundation's Watershed Protection program, which addresses the entire Basin. The information has been generated in as granular level as feasible to allow evaluation of how expenditures related to a variety of demographic, environmental and governmental factors. This report provides the final project methodology and all major findings and recommendations. The database itself was provided separately to the William Penn Foundation.

Executive Summary

This section provides an overview of results from the data acquisition and expert practitioner interview and survey process, along with a summary of recommendations for improving future database efforts and for using the results to improve protection and restoration of the Delaware River Basin related to these programs. Details are provided in sections following this summary.

The project was successful in constructing a comprehensive database structure that can be expanded as needed to address additional funding sources, project categories and years. Data were gathered from many government and non-governmental entities, though data are deficient for some key government programs due to lack of responses during the COVID-19 pandemic. Therefore, the project undercounts government expenditures to an unknown but significant amount, given that missing data include federal programs for agricultural BMP implementation, several Pennsylvania land preservation and water quality restoration programs, and most municipalities. Analysis of the resulting data provide valuable insights to the existing governmental programs and their implementation within the Delaware River Basin. Interviews and expert panel surveys provided considerable insight to the status and issues regarding available funding programs and their implementation.

Project Funding and Expenditures

The project expenditure database developed for this report is capable of tracking expenditures from a wide variety of federal, state, interstate regional, intrastate regional, county, municipal and utility authority entities, in addition to non-governmental entities. Of these, the database includes input from six federal agencies, 14 state agencies, 23 counties and county soil conservation districts, 10 municipalities and four non-governmental organizations. These data sources are listed in **Table C-1** of [Appendix C](#).

More than \$900 million of relevant projects were reported as occurring in six years (2014-2019) within the Delaware River Basin, with the amount by funding level (e.g., federal, state, county, municipal) as shown on **Table 1**. Of reported total funding, \$825 million (91%), is from governments, the primary project focus.⁶ This total represents an average of \$137 million per year, or roughly \$16 per Basin resident, but with a significant state government increase in FY2019.

Of these, by far the largest share of reported funding for expenditures is from state governments, nearly three-fifths of the total. County governments are 17% of the reported total, and the federal government roughly 6%. Municipal governments located within the Basin comprised only 2% of reported funding, but few municipalities responded to inquiries; the actual spending is certainly higher but variable depending on local priorities and revenues. A distinctive feature in this watershed is spending by New York City, which is not located within the watershed, but which draws much of its drinking water supply from the Delaware Basin. New York City contributed 5%, primarily through its filtration avoidance program in the Delaware System.

Local governments do provide or arrange some portion of matching funds required by many state and federal programs. Likewise, some state and county expenditures originate from federal funding programs, such as the Land and Water Conservation Fund or Clean Water Act grants, or from state

⁶ While non-governmental funding was not a project focus, much governmental funding requires matching funds, and so the non-governmental funds can be a critical factor in the allocation of governmental funds.

programs to counties and municipalities; information was often but not always available to track these transfers. This effect will be of less importance for federal expenditures, which as noted are relatively small and, in some cases (e.g., funding for agricultural operations), will be directly provided to landowners rather than channeled through states or local governments. However, state grants to local governments are large, primarily for land preservation. To avoid double-counting, project expenditures were compared during the data analysis to identify projects that had been reported by two or more entities, and any duplication was eliminated. In other cases, a higher-level agency may have reported a general funding level but not project-specific expenditures, while a recipient reported the project information. The database is project-focused; it would not include the general funding information, only the project expenditures, and therefore would not report duplicate information.

As discussed more fully in the following sections, many entities were not responsive to inquiries; it is not feasible to provide a definitive estimate for the missing expenditures, but certainly more government funds were expended than reported. This issue is discussed in more detail in [Missing Data](#).

Funder Type	FY2014	FY2015	FY2016	FY2017	FY2018	FY2019	Total	Share
Federal	\$6,131,651	\$4,496,872	\$7,141,583	\$13,941,187	\$11,949,492	\$9,785,547	\$53,446,331	5.90%
State	\$72,813,817	\$68,409,485	\$71,976,249	\$64,564,733	\$99,596,986	\$142,772,788	\$520,134,060	57.38%
Intrastate Reg'l County	\$3,409,583	\$3,086,319	\$2,341,335	\$3,000,174	\$7,655,256	\$8,645,746	\$28,138,413	3.10%
Basin Municipal	\$1,676,962	\$1,456,899	\$2,469,812	\$2,799,558	\$5,513,456	\$4,707,190	\$18,623,879	2.05%
New York City	\$8,721,247	\$8,547,722	\$6,852,189	\$10,376,362	\$4,312,376	\$8,217,637	\$47,027,533	5.19%
Utility Authority	\$270,442	\$7,583	\$21,171	\$85,082	\$13,498	\$201,110	\$598,886	0.07%
TOTAL GOVT	\$124,833,490	\$115,080,920	\$112,619,612	\$115,750,764	\$154,062,839	\$203,014,189	\$825,361,817	91.05%
Foundations	\$2,326,741	\$2,710,123	\$2,064,550	\$2,266,371	\$5,838,889	\$5,554,827	\$20,761,501	2.29%
Non-profit	\$4,655,025	\$3,128,028	\$4,724,800	\$6,789,161	\$11,257,314	\$8,320,500	\$38,874,828	4.29%
Academic	\$3,439	\$2,006			\$122,468	\$15,000	\$142,912	0.02%
Unknown	\$4,848,795	\$1,114,593	\$1,642,030	\$3,151,878	\$317,000	\$10,284,952	\$21,359,248	2.36%
TOTAL OTHER	\$11,834,000	\$6,954,750	\$8,431,380	\$12,207,410	\$17,535,671	\$24,175,279	\$81,138,489	8.95%
Grand Total	\$136,667,490	\$122,035,671	\$121,050,993	\$127,958,174	\$171,598,511	\$227,189,469	\$906,500,307	100%

Of the total state government funding, nearly \$500 million in project funds (91%) were reported from two states, New Jersey and Pennsylvania, with New Jersey reporting \$282 million and Pennsylvania reporting \$193 million. These two states comprise nearly three-quarters of the Basin, with 50.3% for Pennsylvania and 23.3% for New Jersey,⁷ indicating that reported New Jersey expenditures per square mile are much higher than in Pennsylvania. However, as noted, several major Pennsylvania programs did not provide data. Reported expenditures in Delaware (with 7.9% of the Basin area) are far higher than for the State of New York (with 18.5% of the Basin area) at \$37.5 million and \$7.3 million, respectively. New York State therefore reported far lower total expenditures per square mile than Delaware; this may be due to the relatively undeveloped nature of that area and its limited population. New York State expenditures do not include expenditures by New York City for protection of its Catskill-Delaware reservoir system, which are part of the municipal accounting.

While **Table 1** shows the source of funds, a different approach is an analysis of what entities expend the funds (regardless of funding source) to preserve land or restore water resources. **Table 2** shows that counties and municipalities play a much larger role in implementation than in funding, as shown by the differences between the two tables. State governments are the other major player.

⁷ See Delaware River Basin Commission, "Basin Information", at <https://nj.gov/drbc/basin/>.

Implementing Entity	FY2014	FY2015	FY2016	FY2017	FY2018	FY2019	Total
Federal Government	\$985,769	\$2,724,801	\$3,359,343	\$10,936,001	\$6,973,353	\$4,952,410	\$29,931,677
State Government	\$4,228,605	\$4,398,414	\$10,200,870	\$5,467,673	\$20,538,846	\$1,910,661	\$126,745,070
State Special Agency				\$839,910			\$839,910
County Government	\$66,563,589	\$60,131,459	\$50,204,484	\$46,071,602	\$59,707,356	\$62,472,130	\$345,150,620
Municipal Government	\$48,452,024	\$40,484,384	\$47,060,611	\$50,249,762	\$51,918,759	\$54,073,570	\$292,239,111
Non-profit	\$700,000	\$6,195,428	\$1,096,557	\$4,259,347	\$14,431,442	\$8,374,170	\$35,056,944
Foundations	\$11,790,575	\$5,997,894	\$7,340,280	\$6,836,712	\$15,609,961	\$13,285,958	\$60,861,381
Academic				\$1,000,000	\$1,000,000		\$2,000,000
Unknown	\$1,002,529	\$44,937	\$1,000,000	\$712,500	\$233,900	\$182,450	\$3,176,316
Utility Authority	\$2,944,400	\$2,058,355	\$788,846	\$1,584,665	\$1,184,892	\$1,938,120	\$10,499,278
Grand Total	\$136,667,490	\$122,035,671	\$121,050,993	\$127,958,174	\$171,598,511	\$227,189,469	\$906,500,307

A significant point from this table is that municipalities are reported as representing a much larger share of expenditures in **Table 2** than in **Table 1**, an increase of over 4 times (\$292 million versus \$66 million including New York City). This indicates that municipalities are very successful at gaining funds from other sources (e.g., federal, state and county governments).

Finally, the project expenditures were assessed by project type, as shown in **Table 3**. Land preservation for open space and agriculture comprise 75% of all reported expenditures, with agricultural preservation being greater than open space preservation. The Basin states, and especially New Jersey and Pennsylvania, have a long history of land preservation programs as a way of preserving agricultural landscapes, farming as a business, and natural resources, as well as to shape future development patterns. Programs other than land preservation are much smaller but are significant, focused on agricultural best management practices, stream restoration and stormwater management. Still, there is an enormous difference in expenditures for protection versus restoration. We know from state water quality inventory reports that a very large number of surface waters violate surface water quality standards and show evidence of ecosystem damage, and yet these purposes are far less funded.

Given that these land preservation and water quality restoration programs are primarily oriented to rural or exurban regions, this table shows that most of the money is going to non-urban areas. No other project type exceeds 6% of reported expenditures. As with funding, New Jersey and Pennsylvania are the primary location of expenditures. These findings corroborate information from the expert practitioner interviews, which noted that most programs were created for specific purposes (e.g., supporting farmers or purchasing open space in relatively intact ecosystems) and did not purposefully include or exclude equity considerations.

Project Type	FY2014	FY2015	FY2016	FY2017	FY2018	FY2019	Total
Agricultural BMPs	\$5,139,111	\$5,836,510	\$6,900,511	\$10,418,743	\$13,236,344	\$10,941,037	\$52,472,257
Lake Restoration			\$123,910		\$22,096	\$206,880	\$352,886
Multiple Categories	\$374,364	\$173,170	\$216,100	\$210,738	\$3,393,400	\$47,500,040	\$51,867,812
Preservation-Open Space	\$56,267,950	\$48,450,426	\$47,691,378	\$49,473,996	\$44,254,540	\$51,799,000	\$297,937,290
Preservation-Agriculture	\$61,556,508	\$49,760,940	\$51,543,499	\$53,574,220	\$75,939,387	\$91,471,305	\$383,845,858
Riparian Buffers, etc.	\$4,517,038	\$4,528,756	\$5,880,184	\$1,394,458	\$12,188,267	\$7,134,270	\$35,642,973
Stormwater Mgt-Green	\$2,621,796	\$6,859,351	\$4,635,035	\$7,076,909	\$3,293,776	\$6,543,359	\$31,030,225
Stormwater Mgt-Traditional	\$6,170,412	\$6,425,051	\$4,039,286	\$5,789,147	\$18,590,441	\$10,330,595	\$51,344,932
Wetlands Restoration	\$20,312	\$1,468	\$20,428	\$19,500	\$21,594	\$370,790	\$454,092
Unknown			\$661	\$462	\$658,665	\$892,193	\$1,551,981
Grand Total	\$136,667,490	\$122,035,671	\$121,050,993	\$127,958,174	\$171,598,511	\$227,189,469	\$906,500,307

General geographic references were provided for nearly all projects, but relatively few projects had references to the municipal or watershed level, limiting the opportunities to evaluate project distributions based on geography. The results are shown in **Table 4**. The lack of specific geographic referents made it difficult to evaluate expenditures by watershed, subwatershed or even municipality.

Table 4: Project Identification by Geographic Referents	
Location Identifiers	% of total projects with Identifier
County name	97.8%
Municipal name	36.1%
HUC 12 (watershed)	47.8%
HUC 14 (subwatershed)	0.0%
Block/Lot	0.1%
Latitude/Longitude	2.7%
Tax Parcel	1.7%

The section on [Project Expenditure Results and Findings](#) provides more detailed findings and an assessment of how expenditures may reflect equitable or inequitable funding. The analysis indicates a rough proportionality of average household income (HHI) and total county HHI (a measure of county financial capacity) to project expenditures, and of high poverty to lack of such expenditures. However, other factors are also important, as the relationship is not tight. Project expenditures did not show a strong relationship to poverty levels (% below National Poverty Level) except above the 15% level.

Complete data on funding sources, projects and project types are presented in the data tables provided separately to the Foundation.

Missing Data

While many agencies and organizations provided expenditure data or confirmed that they did not have expenditures (or in some cases did have expenditures but did not have information about them), some critical agencies did not respond to inquiries or declined the request for information for various reasons. Complicating this task was the ongoing COVID-19 health emergency, which taxed agency staff and limited some of their access to data. Key missing programs on the federal and state levels are listed in **Table C-2** in [Appendix C](#). However, it appears that project expenditures were reported for most major federal funding sources in at least one of the four states and often more, providing a partial sense of federal expenditures. The major areas of concern involve some programs in the USDA Natural Resource Conservation Service (e.g., the Environmental Quality Incentive Program), the U.S. Environmental Protection Agency (e.g., the Section 319 nonpoint source pollution control grant program), and the National Park Service (e.g., the Land and Water Conservation Fund programs). Several substantial state programs also did not provide data, most notably in Pennsylvania. Very few municipalities and counties provided data, representing a major challenge for future efforts. The lack of local funding data is notable because several respondents to interviews and surveys mentioned these local sources as critical for the Basin. To assess what might be missing from normal budgeted programs (i.e., rather than sporadic expenditures), an analysis of federal budgets plus expert panel input indicates that the missing expenditures could exceed \$15 million annually for the U.S. Department of Agriculture (primarily the Environmental Quality Incentive Program), \$5-10 million annually for the U.S. Department of Interior (primarily land acquisition support but also fish and wildlife restoration projects), and some millions of dollars annually for land acquisition from the Pennsylvania Department of Conservation and Natural Resources. We are unable to provide similar assessments to estimate the data missing from localities

because their funding for conservation can come from sources not readily identified in their budgets. Additional analysis is provided in the [Project Expenditure Results and Findings: Missing Data](#).

Expert Practitioner Interviews

Members of the expert panel for this project completed online surveys, while 17 additional expert practitioners were interviewed in person, via video links.⁸ Experts explained how the structures and aims of existing programs affect the ways advocates and local governments work within the Basin. Unlike the federal Chesapeake Bay Program or Great Lakes Initiative, the Delaware River Basin has no overarching, dominant federal program and stream of funding to drive results. As the funding data demonstrate, a few federal and state programs dominate the pool of government funding, especially those for farmland and open space acquisition in New Jersey and Pennsylvania. Each program was created for a targeted purpose and has eligibility requirements that limit where funds can go. Several respondents explained that the major federal and state funding programs aimed to protect resources and did not integrate social equity criteria into their decision-making processes.

Interview Respondent

WE HAVEN'T SEEN A SHIFT AGAIN—AT LEAST A DISCERNIBLE ONE THAT I'M AWARE OF ANY WAY-- TOWARDS STRONGER PRIORITIZATION FOR THE RESOURCES IN AND AROUND URBAN AREAS THAT HAVE OBVIOUSLY UNIQUE WATER QUALITY ISSUES AND OPPORTUNITIES

Respondents describe taking advantage of major funding programs when possible, pursuing other funding sources when their projects were not eligible for such funds, and seeking new partners when funds dried up or changed their focus. As a result, expert practitioners described the Delaware River Basin as a watershed managed through a patchwork of conservation regimes. One result reported by respondents is the inefficiency of splicing together funding resources, tracking changes in funders' priorities, and learning new grant application procedures for each type of project, especially where projects incorporate elements of multiple funding priorities (e.g., land preservation that includes restoration costs; agricultural preservation that include non-agricultural lands). Respondents to surveys and interviews reported that the need to patch together various sources of funds was especially onerous to localities lacking a robust tax base that would allow them to act quickly on opportunities. Potential sources for matching funds often have different deadlines that make it impossible to make matches in time.

Respondents said that success at acquiring project funds for nonprofits or local governments depends on meeting statutory and regulatory criteria, access to data and engineering studies, the capacity to write grant applications, the availability of likely partners, the ability to find matching funds, the proven capacity to manage projects, and local sentiment about conservation. These conditions and capabilities vary across the Basin. Nearly all respondents commented that, coupled with the region's legacy of spatial segregation by race and wealth, funding for conservation is uneven, both geographically and demographically. More detailed information on the results is available in the section on [Interviews and Surveys of Key Experts](#).

⁸ All individual results are confidential, in compliance with Rutgers IRB requirements.

Recommendations: Database Management

The results to date provide a detailed view of project expenditures across many government and other funding sources. However, the database has remaining gaps and will lose relevance over time if not extended beyond the year 2019. Therefore, the Rutgers team recommends a biennial update process. Given the different fiscal years used by federal, state and local governments, arranging the project by academic year (July 1 through June 30) will allow for collection of the appropriate data from all entities. AY 2021-2022 would be used to backfill missing data in the 2014-2019 database, with priority given to funding sources that are likely the largest, and to create a revised methodology for work in AY2022-2023, when data for the fiscal years 2020 and 2021 would be added to the database. This biennial process would continue for as long as needed by the William Penn Foundation. The focus would be on better understanding of federal and state agency budgets and how they relate to project expenditure data, improved funding and expenditure data acquisition, continued data quality and completeness evaluation, and more comprehensive data analysis. Partnerships are needed with funding agencies to reduce the level of effort necessary to gather and incorporate new data sets into the database.

We recommend the expansion of targeted expenditures to better reflect the environmental objectives of the project. This project did not include several categories of government expenditures that should be considered because their intent is to improve water quality that has been damaged by legacy conditions. As in the current project, mitigation efforts that offset new water quality threats (e.g., development permit requirements) should not be included, nor would normal operation and maintenance or rehabilitation of existing facilities or best management practices (BMPs). The recommended new categories include:

- Wastewater treatment plant upgrades required for restoration of a previously impaired water through a Clean Water Act requirement such as a TMDL (total maximum daily load), WQBEL (water quality-based effluent limit) or CSO long term control plan.
- Stream restoration best management practices and stormwater management upgrades required for restoration of a previously impaired water through a Clean Water Act requirement such as a NPDES MS4 (municipal separate storm sewer system) permit, TMDL or CSO long term control plan.
- Stream restoration BMPs implemented through a Natural Resources Damage payment required by federal or state agencies.

While non-governmental funding was not a project focus, much governmental funding requires matching funds, and so the non-governmental funds can be a critical factor in the allocation of governmental funds. Carbon offset funds, mitigation funds, non-governmental Natural Resource Damage projects and other non-governmental resources can be important adjuncts to government funding. Therefore, the Rutgers team recommends expansion of the database effort to incorporate non-governmental funds, especially where they are linked to governmental expenditures.

Finally, we recommend periodic interviews of expert practitioners, perhaps every two years, to identify changes in perceptions regarding funding programs, project expenditures and equity considerations. One expert panel member commented that setting a regular schedule of review of spending and practitioner perceptions could also help assess the effects of watershed-wide efforts by the William Penn Foundation or other initiatives.

Recommendations: Policy Implications

The information developed for this project provides a very useful perspective on programs and expenditures. It also indicates that governments and non-profit organizations are often quite provincial, focused on their geographic area, needs and expertise, with much less focus on the Basin or even large watersheds. The only regional organization with responsibilities for the full Basin, the Delaware River Basin Commission, is much less of a dominant player in the Basin than in its early years, because the various state and federal programs have developed expertise and program funding that do not require DRBC direction, guidance or oversight. Only where the DRBC can provide policy solutions that state agencies cannot (e.g., regarding the impacts of multiple states on the mainstem Delaware River) does the DRBC still play a major role. The Delaware Estuary Program, administered through the Partnership for the Delaware Estuary, provides an important platform for collaboration, but it has no regulatory authority and its funding is limited. The Delaware River Basin vies for national attention with many other regions and initiatives that have commanded far more funding, such as for the Chesapeake Bay Program, the Great Lakes Initiative and the Colorado River Basin. Even within the four Basin states, the Basin must compete with other regions for attention, including the Chesapeake and Great Lakes.

The question is what could drive more efforts and funding to address issues with benefits both to the Basin as a whole and to more localized resources, from tributary rivers to individual municipalities. The section on [Recommendations for Use of the Report](#) suggests three long-term drivers for increased efforts in the Basin. It then provides suggestions for more immediate efforts.

The long-term drivers for a federal and state focus on the following:

- **Climate Change Impacts on Flooding and Drought:** Climate change can alter the underlying assumptions regarding the frequency and severity of floods and droughts. The challenge will be relating conservation and restoration programs to these issues, as land preservation, stream restoration and land stewardship are rarely seen in this context.
- **Sea Level Rise and the Salt Front:** The Basin's water supply management scheme is based on assumptions regarding the location of the salt front in the tidal Delaware River. Sea level rise in this century will force a modification of all models and agreements, as saline waters push upstream.
- **Clean Water Act Implementation:** Water quality standards are still being violated in many parts of the Basin, especially in tributaries throughout the suburban and exurban regions due to municipal stormwater systems and nonpoint source pollution. The Clean Water Act could force major changes regarding nutrients and bacteria. The Delaware River is largely the sum of its tributaries, and so improvement in the tributaries – certainly useful for local watershed conditions – will also improve the Delaware River and Bay.

In the immediate future, the following three funding sources could provide significant benefits to the Basin.

- **Great American Outdoors Act of 2020:** This new law fully funds the Land and Water Conservation Fund (LWCF) at \$900 million per year. The revitalized LWCF provides a great opportunity to draw more federal funds into the region. A doubling of LWCF funds would be the minimum target.

- **National Water Quality Initiative, Source Water Protection:** The U.S. Department of Agriculture’s Natural Resource Conservation Service (NRCS) implements the NWQI, which includes source water protection projects for public water supplies (both ground and surface water), in collaboration with the public water systems. A focused project in agricultural watersheds that feed public water supplies could be a valuable way of increasing federal investment in the Basin.
- **Stormwater Utilities:** Stormwater utilities are fee-based enterprise funds that focus on the operations, management, maintenance, repair, rehabilitation and upgrading of municipal stormwater systems, including both combined sewers and separate systems. A collaborative effort could create a peer-to-peer mentoring program for municipalities that are good prospects for a stormwater utility, with support from municipalities that already have stormwater utilities.

Interview Respondent

FOR A POORER MUNICIPALITY, THEY TYPICALLY HAVE MORE CONSTRAINED RESOURCES AND STAFF TIMES TO PURSUE FUNDING, TO BE AWARE OF FUNDING, AND TO MANAGE THE REPORTING THAT GOES ALONG WITH THAT FUNDING

Finally, continued development, dissemination and technical assistance regarding the use of basin-wide information on a broad range of water supply, water quality, flood and ecological issues can help build a sense of common interests within the Delaware River Basin. Even if different players focus on their local concerns, a perception of common interests and needs should in turn improve federal, state and local government attention and funding for the Basin.

Project Methodology

The project methodology was developed in consultation with William Penn Foundation staff and an expert panel as listed in the Acknowledgements section (page iii), which included members from governmental, non-governmental and academic entities. The project is focused primarily on acquisition, management and interpretation of project expenditure data using government funds, but also includes acquisition of projects that depend on other funding sources, often as match to government grants. The methodology also includes a brief literature search and an extensive interview process for expert practitioners to assess the extent to which expert perceptions reflect actual expenditure data, and to understand their perspectives on the current status, trends and equity of funding programs.

The project area is the entire Delaware River Basin (DRB) in the states of New York, Pennsylvania, New Jersey and Delaware. Using available geographic and demographic information, the project identified relevant jurisdictional boundaries (e.g., state, county, municipal) and watersheds (HUC12) to determine what jurisdictions are partially or entirely within the DRB and the various subwatersheds thereof, and to what extent. This information was linked to the database file through GIS intersection. Finally, demographic information (e.g., population, household incomes) was added to the database for each census tract in the DRB. The following data sources were used.

The methodology for the database includes identification of project categories, funding sources and funding types (e.g., general revenue versus bonds). The database structure was developed to allow a sorting of analysis of data across these parameters and by year. Based on these initial steps, the project team sought data from the relevant governmental sources and also from non-governmental entities that make extensive use of government funds. The detailed Project Methodology is provided in [Appendix A](#), and consists of the following steps.

A LITERATURE SEARCH was conducted across a variety of databases related to funding for projects related to watershed conservation, restoration, and resiliency, and background research on watershed management approaches. The primary purpose of the literature search was to identify similar compilations of regional expenditures for environmental purposes, and especially watershed management programs, that could provide lessons for the construction of a relational database and compilation of relevant data.

INTERVIEW KEY EXPERTS from state agencies, local governments and the non-governmental sector who work within or lead programs that directly affect water resources in the Basin. The team selected experts with knowledge of programs across the Basin, experts from agricultural and natural resources programs, and experts with experience across agencies at each level of government, nongovernmental organizations, and firms. We sought the perceptions of experts familiar with one or more of the major programs that funds water quality improvements in the Delaware River Basin. Each interview was conducted through conversations online due to pandemic restrictions, using a protocol approved through the Rutgers Institutional Review Board (IRB). In addition, the expert panel answered the same questions using an online Qualtrics survey, again in accordance with an IRB-approved protocol.

CREATION OF A DATABASE STRUCTURE. The initial structure was created using a combination of known fields that store and allow for search queries and relational database analysis, in support of the project. As initial funding and project data were gathered, the database structure was modified to ensure that all critical information could be loaded and searched. The following steps were used in database structure

development. The database was built to accommodate expenditure data from 2014 through 2020. Because fiscal years differ between federal, state and local governments, the database stores data using the last year of the fiscal year (e.g., Federal Fiscal Year 2018 is stored as 2018).

IDENTIFICATION OF NEARLY 1,000 GOVERNMENTAL ENTITIES at the federal, state, regional, county and municipal levels that are located or have active programs partially or entirely within the Delaware River Basin, using a spreadsheet that incorporated available information on funding programs and sources (e.g., land preservation, best management practices, stream restoration) where a single governmental entity has more than one program. A 2016 University of Delaware report previously developed for the William Penn Foundation⁹ was used as one source of information on existing entities and programs. The spreadsheet includes contact information, request status, data availability (Yes/No) and data collection status. Initial inquiries to New Jersey agencies plus on-line search for all readily available data were used to test the process.

IDENTIFY THE MAJOR CATEGORIES OF FUNDING PROGRAMS AND ASSOCIATED AGENCIES at the federal, state and local level, as targets for data requests. There are nearly 900 counties and municipalities in the Basin, which were identified and contacted. In addition, while non-governmental funding as a standalone funding source and as a matching source is mentioned by respondents to the survey or in interviews, it was not a direct target of the project. These entities are discussed further in [Appendix B: Potential Project Implementation Entities](#).

ALL RELEVANT GOVERNMENTAL ENTITIES RECEIVED DATA REQUESTS. The data inquiry and collection process took place from April to September 2020, entirely within the SARS-CoV-2 pandemic period. In a few cases, online data were available, but this was rare. The primary objective of the project is a compilation of project expenditures by relevant implementing entities. Identifying funding expenditures involved a top-down approach (i.e., contacting the governmental entities discussed under Funding Sources, above) and a bottom-up approach (i.e., identifying funding sources based on project reporting and grant match information by implementing entities, including non-government entities). In some cases, funds are provided by a higher level of government to a lower, and then passed on from that receiving agency to other entities that implement projects. This movement of funds through multiple levels (federal to grantee to sub-grantee or contractor) and the requirements for sub-grantees to provide matching funds complicate the understanding of expenditures, potentially resulting in double-counting (where multiple entities identify expenditure of the same funds) or missing expenditures. The project team engaged in quality assurance to identify where multiple funding sources were used and to avoid double-counting, but in some cases, the necessary documentation for this purpose was not available.

MANAGEMENT OF RESPONSES. In each case where a responsive contact was achieved, the database identifies where data were:

- **Determined to not exist.** The agency confirmed that they neither budgeted nor expended funds relevant to this project.
- **Determined to exist and provided.** Agency staff were able to access and provide the necessary information for these inquiries.

⁹ Water Resource Center. 2016. Survey of Investment in the Delaware River Watershed (draft). University of Delaware on behalf of the William Penn Foundation.

- **Determined to exist but currently unavailable.** In some cases, the agency staff did not have full access to in-office computer systems and files, making it difficult or impossible to respond to the data requests. For those agencies with data access, in some cases the staff lacked sufficient time to compile and provide the data due to furloughs, shifts in work assignments, etc. Data also may exist in hard-copy storage, requiring physical access to file storage and significant time commitments for compilation.

AGGREGATION AND REPORTING OF DATABASE RESULTS. The primary purpose of the project is to assess annual government expenditures as described above, including status and trends over the initial 2014-2019 period, and the extent to which available information allows or limits this assessment. The second purpose is to understand the expenditure patterns of these funds, by funding source, project sponsor and affected populations. In addition to the tabular results, narrative discussions will be provided, including maps where relevant. This project report discusses data gaps and identifies methods for improving the database over time.

ASSESSMENT OF HOW KNOWN EXPENDITURES REFLECT EQUITY and other considerations. A primary question is how the term “equity” should be applied in the analysis. Rutgers evaluates how project expenditures relate to the following factors.

- **Governmental capacity.** The extent to which governmental capacity affects the types of funding used for watershed projects, the level of expenditures and the types of projects. With a universe of only four state governments, each of which has major areas outside of the Basin, an analysis of state financial capacity was not deemed useful. The limited geographic locations for projects did not support an evaluation at the municipal level. For counties, a relative ranking of capacity to generate government revenue uses the following metrics drawn from U.S. Bureau of the Census:
 - a. **Aggregate annual household income at the jurisdictional level.**
 - b. **The percentage of households at or below the national poverty level.**
- **Geographic and demographic equity.** Equity can be defined in many ways, including equity of process (freedom from bias or favoritism) and equity of results. The latter can be applied going forward, so that new decisions are equitable, or it can be applied comprehensively to both the future and the results of the past, which can require redressing past inequities where the past has result in currently inequitable conditions. Of the available approaches to evaluating this concept for which relevant data are available, the following approaches were selected:
 - a. **Distributional equity by jurisdiction:** Federal and state funding per capita by county, relative to jurisdiction government capacity.
 - b. **Distributional equity by household income:** Federal and state funding per capita by county, relative to average household income.
 - c. **Distributional equity by poverty concentration:** Federal and state funding per capita compared to percentage of populations with income below the National Poverty Level by county.

Overview of Relevant Literature

A total of 37 publications about funding for water quality conservation and restoration were identified through the literature survey. Unfortunately, few were directly relevant and only 20 publications offered relevant insights. Additional sources about general watershed management approaches were also consulted to augment the survey.

Using watershed boundaries to organize decisions about resources is a longstanding idea in the United States. A project that considers watershed processes would assess how conditions in one area of a physical drainage basin affect conditions in other areas. Additional elements have been integrated into some watershed projects, such as creating and sharing scientific information about the basin's ecosystems and social conditions, building mechanisms or incentives for decision-making across jurisdictions, involving interested and affected parties in decision-making, setting rules for disagreement and collaboration, and building institutions that can adapt policies as conditions change (Sabatier et al., 2005). These additional elements can enable institutional learning and adaptive management by generating baseline studies of watershed conditions, monitoring how conditions change in response to new stressors or to policies intended to mitigate conditions, reconvening decision-makers as needed, and adjusting policies to better pursue their stated environmental and social goals (Jenkins and Sabatier, 1993; Sabatier, 1993).

While few projects pursue all these elements of scientific research and institution building, many projects pursue some of them. Large projects have been directed by the federal government, ranging from the Tennessee Valley Authority to projects for specific resources on federal lands in the western states (O'Neill, 2002; Fleeger & Becker, 2008). Smaller programs and projects have been dominated by officials at all various levels of government or by individuals and nongovernmental organizations (e.g., Hardy, 2010).

Building institutions to manage complex aims like these requires funding, but few studies have investigated status and trends in governmental budget allocations and expenditures for the protection and restoration of natural resources. One notable exception is the Chesapeake Bay Program (discussed further below), where Congress mandated an ongoing accounting through the Chesapeake Bay Accountability and Recovery Act (CBARA) of 2014.¹⁰ Previous work regarding governmental funding for natural resources protection and restoration has focused on four main themes: government capacity and collaborative governance, projects, public preference and community engagement, and funding sources.

Studying funded programs in the United States is also complicated by the dispersal of funds and responsibilities across the federal system and between government and nongovernmental sectors. Challenges with water resource restoration are threefold: piecemeal restoration efforts, no national measurement standards for project effectiveness, and no national tracking system (Palmer & Allan 2006). These three conditions are connected to government capacity. Historically, considerable natural resource funding has come from the federal government, some of which has been allocated to state and local governments nationally or in response to Congressional mandates to address certain environmental issues (e.g., the Great Lakes and Chesapeake initiatives). Federal capacity for on-the-

¹⁰ S.1000 - Chesapeake Bay Accountability and Recovery Act of 2014. Available from: <https://www.congress.gov/bill/113th-congress/senate-bill/1000>.

ground implementation is limited for most agencies; as a result, they may rely on lower levels of government to carry out the tasks to implement projects. This approach is problematic at a local level because local government officials have historically been focused on community expectations, community resources, and community problems. As long as their constituents are satisfied, there is little incentive to build increased capacity for issues such as downstream water quality (Gargan 1981). This is especially problematic when dealing with issues that do not end at a political boundary. Research has shown that it is imperative for local governments to consider addressing environmental issues in collaboration with other local jurisdictions, local organizations, and state-level actors due to the multidimensional nature of these problems (Larson et al. 2017). In response, as a result of federal environmental regulations, there has been a significant increase in the interaction between municipal officials, county officials, and state officials. It is the interaction between these actors that has driven the environmental policy process (Weiland 1998). The key to successful water resource restoration is institutional readiness, or the ability of all levels of government be aware of and willing to participate with other actors in collaborative governance (Nelson 1998).

The next theme found in the literature was the description of recent endeavors to capture stream and river restoration efforts. Castillo, Kaplan, and Mossa (2016) investigated the stream restoration efforts throughout Florida in an important study that recognizes that there has been little effort in large scale summarizing of restoration projects throughout the U.S. and little research has focused on Florida. This study aimed at creating a Florida Stream Restoration Database (FSRD) that would be able to capture information on project type, location, completion date, and costs. The FSRD will categorize projects by restoration type, across specified geographic regions, to provide insight into the diversity of initiatives across Florida, the restorations need in Florida, and from where the funding for this work is coming (Castillo, Kaplan, & Mossa 2016). However, this study has yet to produce a useable database available publicly.

A second major effort to capture restoration work across a large area was done for tributaries of the Chesapeake Bay. The Chesapeake Bay is the largest estuary in the U.S. and since 1990 has had the most stream restoration projects per mile across the entire U.S., driven by regulatory water quality objectives. This study created the first comprehensive database of river and stream restoration projects in the Chesapeake Bay Watershed (CBW) and captures over 4700 projects (Hassett, et al. 2005). Since 2015, the federal partnership involved in the Chesapeake Bay Program have been tracking expenditures in response to federal law. Total federal and state spending for water quality improvements in the Chesapeake Bay Basin are roughly \$450 million and \$1 billion per year, respectively.¹¹ However, as with previous efforts, and similar to the difficulties encountered throughout our work, the CWB database lacks complete data on project costs and funders of projects, and the spending analysis includes both project and operational costs.¹² It is clear that previous research has aimed at capturing data for entire watersheds, however, there has been little success in compiling a comprehensive database.

¹¹ Chesapeake Progress. "Funding." Available from: <https://www.chesapeakeprogress.com/?/funding>. The largest federal expenditures are from the U.S. Environmental Protection Agency (most of which is for grants-in-aid to state governments) and the U.S. Department of Agriculture (primarily to fund easements and financial assistance to landowners for conservation practices). Maryland provides the largest share of state funds, followed by Virginia.

¹² Project costs include all expenditures related to the project, including staff, consulting, contracting, land costs, construction, etc. Operational costs are the routine costs of an organization or entity that are not directly connected to a specific project, including parks operations, administration, etc.

Much research has focused on public preference for watershed management priorities. Public perception of natural resource management plays an important role in the ability of government to raise and allocate funds for this work. Johnston, Swallow, and Weaver (1999) found that willingness to pay for watershed management was highly contingent on the faith of the public in institutions to use funding as they claim they will. Funding sources investigated in this study included taxes, bond issues, and earmarked contributions. The researchers found that for there to be public buy-in for watershed management funders, it was essential that there are guarantees (constitutionally) that funding is being used, and used efficiently, for its intended purposes (Johnston, Swallow, & Weaver 1999). Furthermore, it has been demonstrated that willingness to pay for environmental efforts has more support when existing tax dollars are reallocated rather than the creation of new taxes to conserve natural resources (Swallow & McGonagle 2006).

Public preference for the type of natural resource protection and restoration has also been a widely studied area. Researchers in Delaware found that preference for farmland preservation exceeded that of open space preservation and growth control because the public believed agricultural farmland preservation protects the rural way of life (Duke & Aull-Hyde 2002). Ultimately, for successful natural resource conservation and restoration, engaging the public is imperative. Top-down approaches to watershed management have proven to be ineffective and often result in limited benefit and low survival of projects (Koontz & Sen 2013).

Creating tools that engage community members and stakeholder groups has been an effective tool to promote watershed protection and restoration. Watershed Restoration and Protection Strategy (WRAPS) is used in Kansas as a planning and management framework. It engages stakeholders at four key areas of watershed management: (1) the identification of restoration and protection needs; (2) the establishment of management goals; (3) the creation of cost-effective solutions to achieve the goals; and (4) the implementation of the plans. WRAPS brings together stakeholders across many groups, including government officials at federal, state, and local levels, interested residents, and agricultural producers (Williams et al. 2012) This approach demonstrated the effectiveness of a collaborative strategy to protect and restore watersheds in a coalition building approach rather than the traditional top-down approach. When the public is effectively engaged and have their interests taken into consideration, environmental initiatives have been overwhelmingly approved. In 1996, voters across the U.S. approved over \$4 billion for parks, water quality, and other environmental proposals (Warson 1996). This shows that there has been historical support for environmental protection and restoration, but it is crucial that public preference and community engagement are a part of the decision-making process.

Arguably funding is the most important factor for natural resource protection and restoration and much research has focused on where funding comes from and potential alternative funding mechanisms. Funding for water conservation programs in recent history has been dedicated through grant programs that aim at conserving water resources and the preservation of land (Fleming & Hall 2000, Talberth et al. 2015). However, there has still been a deficit in capital that is directed toward environmental conservation efforts. Not only has there been a lack of capital, but researchers indicate that the available funding has also often been misallocated and rarely accounts for the environmental services that can be provided through investment (Kaiser 2015). It is also recognized that governments are subsidizing agricultural best management practices (BMPs), however, once again these funds have not been leveraged to best incorporate environmental benefits (Talberth et al. 2015). In both cases, the

researchers indicate that expenditures are made with the assumption of environmental services benefits (e.g., clean water) but without an explicit justification of those benefits or the cost-benefit ratio.

Finding alternative sources of funding for natural resource protection and restoration will be imperative going forward. One proposed mechanism for funding is a pay-for-performance program. Talberth et al. (2015) found that by incentivizing BMP's related to performance-based nutrient reduction outcomes, costs to subsidize these efforts could be reduced by over 50%. In Connecticut, watershed management is being integrated into transportation planning to offset the stresses that are incurred on the natural environment from infrastructure development. This has resulted in the development of a river trail system plan for the Pequonnock River that has leveraged transportation funding to incorporate design elements such as permeable material for trail surfaces, removal of non-native and invasive plants, as well as the restoration and repair of riparian buffers (Sloan & Bidolli 2014).

Jiang and Swallow (2017) recommend the use of environmental impact fees (EIFs) as a tool to finance conservation efforts. Similar to development impact fees, which are used to fund local infrastructure such as schools, sewage systems, and the over development of urban sprawl, EIFs could be used as a resource to finance conservation. Jiang and Swallow (2017) suggest that EIFs could fund pollution purification, flood mitigation, green space or wildlife habitat networks, among other green initiatives. Finally, Lin and Ueta (2012) recognize that whatever one community does will ultimately affect the communities downstream. They suggest that communities work collaboratively to create funding mechanisms for watershed services where upstream communities engage in activities that promote land and water conservation, while downstream communities help provide the payments for the benefits derived from upstream efforts (Lin & Ueta 2012). Ultimately, it is important that there is new investment in conservation efforts, and it is essential that governments, businesses, and capital markets treat investments in natural resources as a long-term stock that will help create an economy that is sustainable, equitable, and more efficient (Kaiser 2015).

The literature on the statuses and trends in governmental budget allocations and expenditures for the protection and restoration of natural resources is limited. Efforts have been made to quantify and catalogue these data; however, this has resulted in limited success and has not achieved the granularity needed to fully understand from where funding is coming, how it is being distributed, and who is using it. Our study will add to the previous attempts to address this topic and can provide a framework for future research to be conducted.

Delaware River Basin Implications

In summary, the literature search identified some work on specific funding mechanisms and general theory, but the only program with a (moderately) successful data base development process has been in the Chesapeake Bay watershed, where the need for project tracking is driven by a statutory mandate and a regulatory agenda under the Clean Water Act to improve water quality in a manner that uses both point source controls (e.g., wastewater treatment plant upgrades) and nonpoint source controls (e.g., agricultural best management practices, riparian buffers). No similar water quality agenda or regulatory driver exists in the Delaware River Basin; most water quality regulations focus on point sources. A notable exception is in the New York City reservoir watersheds, where both point and nonpoint sources are addressed to meet a specific water quality objective.

The other major approach, collaborative watershed management, has been used in a few watersheds, usually where regulations are not available to address major problems, such as runoff from farms. These efforts have generally been built from the top down or from the bottom up. Collaborative management is unusual in watersheds as diverse in land use and as heavily populated as the Delaware Basin.

Whether a watershed management is initiated through regulations directly, through practical problem solving, or a combination of both, these efforts need scientific data and institutions to manage communications and adaptive learning. Data about funding such as that included in this report can help build the sort of institutional capacity described in the watershed management literature.

Interviews and Surveys of Key Experts

We asked Delaware Basin experts about government funding for land acquisition and watershed restoration to learn what they know about government funding and what they think about the way funding is distributed. There were no overtly false statements about funding. Comments from experts affirm some of the top findings from the funding data, including the dominance of farm programs and the common requirements for and wide use of matching funds, though information received for the database often lacked detailed data on matching funds. Most respondents stated they lacked full knowledge of funds spent in the Basin and would benefit from the funding data collected by the project. Respondents reported their perceptions about equity in funding, based on their own areas of policy expertise, but most stated that without data about funding of all types, they felt unqualified to comment decisively about equity in funding. They described the Basin's institutions as not aiming to coordinate water quality improvements across geographic areas or across lands of different kinds. Each program has its own rationale and criteria for funding.

Experts explained how the structures and aims of existing programs affect the ways advocates and local governments work within the Basin. Consistent with the funding data presented in [Project Expenditure Results and Findings](#), experts reported that a few federal and state programs dominate the pool of government funding for the Basin at that level. Respondents expressed that each program was created for a targeted purpose and has eligibility requirements that limit where funds can go. Several respondents explained that the major federal and state funding programs aimed to protect land, soil and environmental resources and did not integrate social equity criteria into their decision-making processes. Some also stated that social equity criteria might be expressed in funding programs in environmental or other agencies that target contaminated sites or city planning.

Respondents describe taking advantage of major funding programs when possible, pursuing other funding sources when their projects were not eligible for such funds, and seeking new partners when funds dried up or changed their focus. Under this practical approach, federal, state, and local funding could become coordinated at the project level when a funding source required matching funds. However, each program demanding a match has its own criteria, and so projects have not yielded a Basin-wide set of criteria or aims for conservation.

As a result, experts described the Delaware Basin as having a patchwork of conservation regimes that have little relationship to one another or to any unified set of watershed-based water conservation or water quality objectives. Programs funded by the Farm Bill to support the production of crops for the market stand apart from programs for wildlife conservation or non-farmland preservation. Also, the regulatory and institutional arrangements described by experts result in a set of policy regimes defined by geographic region, as detailed below.

Only a few expert-practitioners expressed a desire for greater coordination across the Basin, although many stated that current arrangements limit their ability to work collaboratively to address needs. Respondents who reflected about the patchwork pattern of funding and policy stated that it results from the Basin's low political profile relative to other watersheds and rivers in the region. Respondents who work on policy advocacy and lobbying at the federal or state levels were focused on sustaining or increasing funding totals, not on creating institutions for top-down integrated watershed management. Respondents who implement projects at the local level were absorbed with piecing together funding sources, not on creating bottom-up participatory institutions for integrated watershed management.

The most ambitious elements of participatory watershed management planning discussed in the research literature therefore did not emerge as aims for the experts consulted in this study.

Overview of Interviews and Process

Members of the expert panel completed online surveys (see [Appendix E](#) for the online survey questions) and other experts were interviewed (see [Appendix D](#) for the interview survey questions). Experts were asked about their perceptions about the availability of funding, changes in funding patterns, and equity in funding. From the expert panel, surveys were taken between October and November 2020. Among other experts, 17 remote (online) interviews were completed, from August to November 2020. The interviews and questionnaires were conducted in accordance with Rutgers Institutional Review Board procedures and methodology approval.

Potential interviewees were identified by members of the expert panel, William Penn Foundation staff, and the Rutgers project team. The team selected candidates from this list, aiming to reach experts with knowledge of programs across the Basin, experts from agricultural and natural resources programs, and experts with experience across agencies at each level of government, nongovernmental organizations, and firms. Nonrespondents were contacted again, and other candidates were recruited, to capture this range of perspectives.

We sought the perceptions of experts familiar with one or more of the major programs that funds water quality improvements in the Delaware River Basin. Interviewees and survey respondents included government experts who implement federal and state water resource and agriculture programs, state government experts in agencies' environmental justice initiatives, experts working on private sector conservation projects, and leaders from regional and site-specific nongovernmental organizations. Most were in leadership positions within their agencies and organizations. Because the region has a long history of policy innovation in water management, nearly all of the interviewees had experience or knowledge beyond their current job. Interviewees provided information about funding for water quality in Delaware, New Jersey, New York, and Pennsylvania states, covering the range of funding programs at the federal, state, and local levels in those states. They characterized funding available for the Basin's major cities, suburban areas, and rural areas and addressed all major resource programs and agricultural programs. Summary results are discussed in the following sections, while detailed responses to the interview and survey questions are provided in [Appendix F: Interview Results](#). The detailed responses are not interpreted; they represent notations on the direct responses.

One Watershed, Defined by Uncoordinated Conservation Systems

As described by respondents, the Delaware River Basin lacks a distinctive cultural or historical identity that could build public support for protecting the Basin as a whole. Its waters drain from remote sections of upstate New York, past Philadelphia and Camden, and through to the Delaware Bay, each with its own environmental and social conditions. One interviewee called Delaware River Basin the "poor sister" of the great waters because it does not have a dedicated funding program like those for the Great Lakes, the Chesapeake, and the Hudson River.

Only one respondent sketched the possibility that advocates could push for a federal or multistate planning program that could improve on the current patchwork arrangements. When asked about government funding, several respondents stated that it is important to recognize coordinating and staffing functions and not simply grants or loans for specific projects. These respondents pointed to the

U.S. Geological Survey, the Delaware River Basin Commission (DRBC), state government agencies, and the William Penn Foundation for promoting information exchange across states and localities in the Basin. One expert panel member commenting on this report stated that the Basin is among regions most highly monitored by the USGS. Another panel member noted that funding for specific projects give opportunities for “ribbon cutting” and may be more attractive for government funding sources than providing ongoing funds to the coordinating role of the multistate DRBC.

Respondents involved in direct policy advocacy did note recent federal initiatives, including the Highlands Conservation Act and the Delaware Basin Restoration Program (representing between \$10 and \$20 million per year in funding, depending on funding allocations). These provide funds for some of the Basin’s areas but are not designed to coordinate watershed management. All interviewees expressed the need for more funding at all levels of government. One interviewee noted that conservation spending by state agencies and local governments makes the funding base for the Delaware Basin much more diversified than that available for New England, which relies almost entirely on federal funding. Data we collected affirms that state funding is the largest source of state funding across the Basin. Although few local governments provided funding information, expert respondents reported local governments with dedicated funds (e.g., open space taxes) are important as a ready source of matching funds. With little high-level governmental guidance or technical assistance, respondents who implement conservation projects described working largely on their own to approach funding sources.

As a result, the watershed has a set of uncoordinated conservation regimes. Respondents said that gaining funds depends on statutory and regulatory criteria, access to data and engineering studies, the capacity to win and manage grants, the availability of likely partners, the ability to find matching funds, and local sentiment about conservation. These conditions vary across the Basin, resulting in geographically distinctive ways of raising government funding and geographically uneven access to funding. Nearly all respondents commented that, coupled with the region’s legacy of spatial segregation by race and wealth, funding for conservation is uneven, both geographically and demographically. Their explanations for that unevenness differed. The following geographically based regimes for water quality emerged from interview transcriptions or survey responses and are consistent with data we collected about funding; they are based on general geographic areas rather than specific watersheds or political boundaries. **Figure 1** shows the general outlines of these areas. We did not aim to calculate the actual distribution of government funds across these geographic regimes, which are not formal boundaries.

- **Upstate New York, above the Catskills reservoirs for New York City’s water supply:**

Under one of the country’s most important waivers of federal surface water and drinking water filtration rules, this portion of the Delaware watershed receives much more conservation funding per acre than other portions do, according to respondents; all of it comes from New York City. By paying to set aside land and restore waterways in the Catskills area northwest of the City, respondents noted that New York City can avoid spending billions on water filtration treatment it would otherwise be required to install at its drinking water plants. New York state’s health department renewed its guidance in a 2020 Filtration Avoidance Determination (FAD), reinforcing the requirement that the City continue to conserve lands in this watershed. New York state provides little direct funding in this region. The reported data confirmed this perception, with nearly 100% of all project funding in this area coming from New York City.

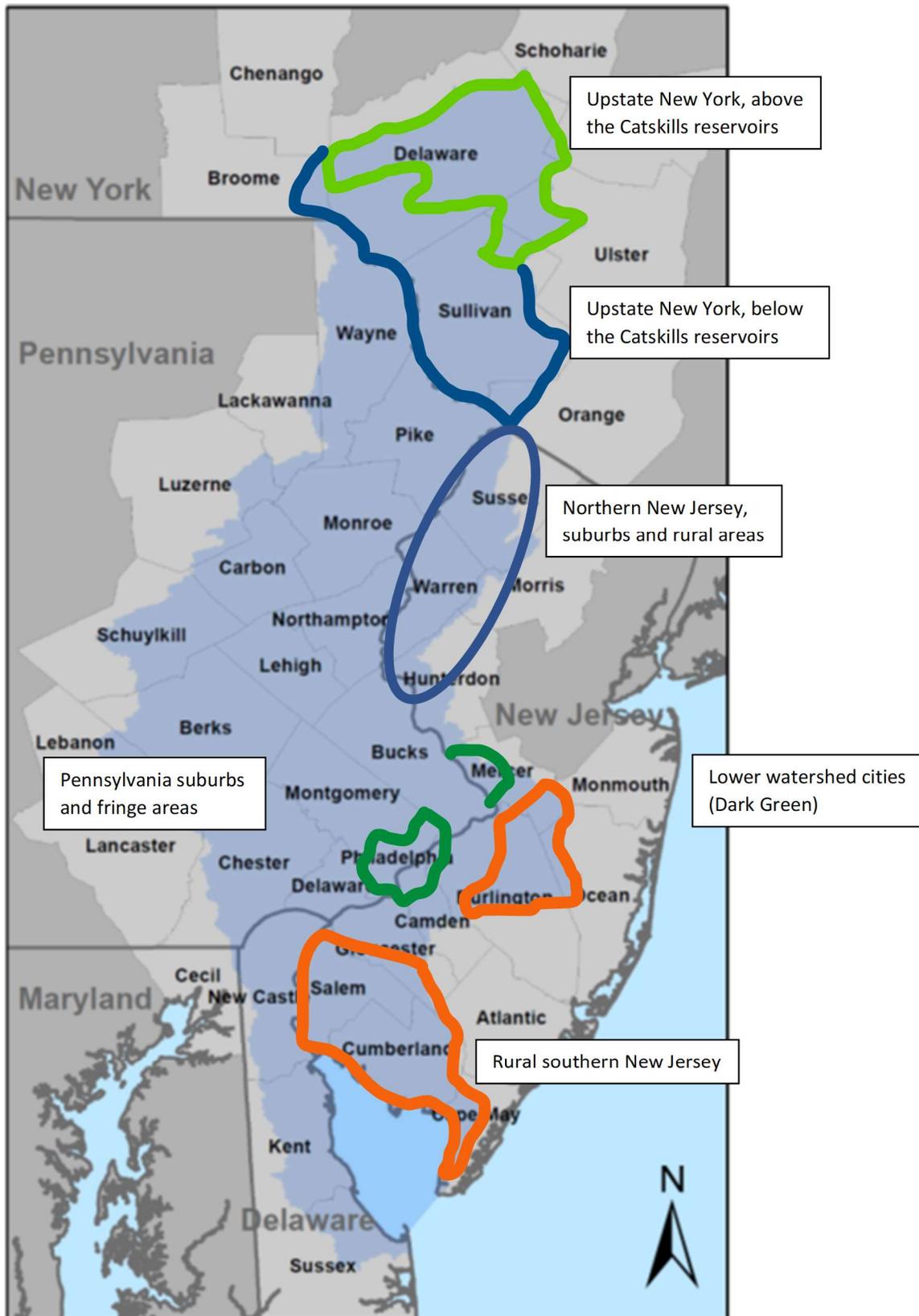


Figure 1. General Geographic Areas Identified from Interviews (not precise)

Reflecting on the influence of economic trends, respondents reported that New York City stepped up land purchases in this area when land values fell after the 2008 economic crisis, but that by 2014, values had rebounded. Land costs, and recommendations by an advisory report from the National Academy of Sciences, led the City to shift more resources toward stewardship and restoration of the lands it already owns or manages under conservation easements on private lands. Experts stated that land purchasing will likely continue but that scientifically informed projects for efforts such as streambank restoration and septic and sewer system upgrades will likely be a growing proportion of the City's spending in the coming years. One member of the expert panel commenting on this report noted that many of the City's stewardship and restoration efforts have been implemented through collaborations with nonprofit organizations, reflecting some of the methods and aims of watershed management discussed in the research literature. For instance, a respondent to the study stated that the City depends almost entirely on an agricultural advisory council to consider and fund projects affecting farms.

Respondents characterized the Catskills rural area as being far from urban areas, majority White, and with a low household income level relative to other parts of the Basin. Experts remarked that many residents and town officials view New York City's purchases and upgrades (e.g., grants to improve septic systems) as intrusive. Some prefer to keep private land unrestricted and available for development, to boost local economies and to resist control from governments outside the local watershed. Some local officials in this area have tried to block New York City's efforts to acquire lands from private sellers, according to respondents. During the COVID emergency, New York City residents who moved to the watershed changed the politics of some communities. It is not clear whether this will permanently shift local politics toward supporting New York City's conservation efforts.

- **Upstate New York, below the Catskills reservoirs:**

Unlike the area above New York City's reservoirs, the conservation regime in this and the other areas described below is based on competing for funds from government sources with suitable eligibility requirements. Experts reported that this area receives no direct funding from New York City (apart from one grant for the Port Jervis wastewater treatment plant, as ordered by the Supreme Court). The Delaware River Basin Restoration Act is now a major source of federal funding for this region, and several New York state resource programs provide smaller amounts. One expert panel member reviewing this report commented that this area forms a portion of the headwaters of the Basin and so is critical to the overall quality of water resources. It recently became more feasible for project organizers in this area to meet the matching funding requirements of federal programs. New York City and managers of several federal programs agreed that projects below the reservoirs could meet their matching requirements by listing funds New York City spent on projects above the reservoirs, because both sections are part of the same larger watershed. Conservation in the area below the reservoirs focuses on acquiring lands with high quality ecological functions, not on restoration projects. This area has noted trout fishing streams.

Experts pointed out that although the areas above and below the reservoirs have similar demographics and similar ecological conditions and problems, they have very different access to

resources that could address those problems. One respondent noted that government conservation is perhaps even less welcome in many of these localities than it is above the reservoirs, because people below the reservoirs cannot benefit from spending by New York City to boost access to recreation. Some farmers in the area below the reservoirs, who do not have the option of selling to New York City, view selling their farm to a developer as their best option for retirement, a stance that has produced scattered housing subdivisions amidst farms.

- **Rural Pennsylvania:**

Without special allocations such as those available to the Chesapeake Bay, rural areas of Pennsylvania in the Delaware Basin compete against other rural areas in the state for a limited set of federal and state funds, according to experts from that state. Observing that there are more applications to general NRCS farm funding pools from the Chesapeake than from the Delaware Basin, one respondent suggested that the Chesapeake program may have broader effects, encouraging Chesapeake farmers to apply for a wide range of government programs. Several experts noted that the pressure to implement water quality regulations in the Chesapeake watershed creates incentives for state officials and federal agricultural officials to direct farmers in that watershed to conservation programs. Such pressure does not exist for the farm areas in the Delaware Basin. Some US Fish and Wildlife Service funding is available in the Delaware Basin areas of rural Pennsylvania, including a wildlife refuge (Cherry Valley) established in the 2010s. The Pennsylvania Department of Conservation and Natural Resources provides funds from the state legislature (e.g., Keystone Recreation, Park and Conservation Fund; Environmental Stewardship Fund) that advocates have managed to sustain in recent years.

Respondents discussed their strategies for conservation in the face of limited local support for conservation. These rural areas are majority White, and they vary in income levels. Some rural localities and counties with established open space programs recently turned away from purchasing open spaces for non-farmland purposes. Respondents reported that support for farmlands was politically popular in these rural areas. The ability to readily match local funds to federal programs also gave them a financial incentive to direct open space funds toward farms. Respondents reported their anecdotal impressions about changes in local funding. For instance, one locality passed a referendum against open space acquisition, and in other localities, newly elected officials decided against floating bonds that had been approved. Some municipalities cut their own open space purchases when their counties stopped providing matching funds.

For land acquisition of non-farmlands, projects often are clustered in wealthier rural areas. Experts throughout the Basin commented that preservation in wealthy communities tended to support the viewsheds of residential areas. In addition, direct land donations usually came from families who sought to benefit their own communities. This pattern reflects longstanding concerns within the natural resource community, echoed by many respondents to this report, that conservation has historically sustained the quality of life of communities that already have high-quality living conditions.

- **Pennsylvania suburbs and fringe areas:**

Some of the expert respondents for this study noted that political support for conservation is high in most of the Basin's suburban areas but that criteria for major conservation funding programs tend to exclude more developed suburban areas. Landscapes in the suburbs have developed unevenly, with developers assembling large parcels by buying individual farms. This resulted in a leapfrog development pattern of undeveloped areas interspersed with development. Federal and state conservation programs for non-farmlands typically give priority for buying plots or easements on plots that are large or are adjacent to other protected lands, conditions that are not typical of the suburbs. Respondents working to conserve land in these areas reported using ad hoc sets of funding sources. Suburban fringe areas with wealthy residents support local open space funds but tend to rely on bequests or other donations from individuals to organize conservation projects. Conservation in these areas is opportunistic. One interviewee stated that in suburban and fringe areas, preserving a farm plot along a highway could boost local political support and contributions for conservation, even though that plot might not rank highly for its environmental qualities when compared to some plots in rural areas.

Some localities in this region are wealthy and White and favor conservation, in part to sustain property values for residential plots. Other localities are poorer and White, and many lack resident support for open space funding. Areas near Philadelphia are somewhat more diverse racially and economically. Conservation in these suburbs faces some of the same barriers faced by major cities, as described below.

- **Lower watershed cities, including Philadelphia, Camden, and Trenton**

Many respondents noted that funding programs for environmental projects in cities overlap little with the preservation programs used in less-developed suburban and rural areas. The database results confirm that most programs are focused on non-urban areas. Funding programs from natural resources programs seek areas with highly functioning ecosystems and so rarely fund projects in cities. Respondents working in cities explained a series of connected problems. Although many urban riverfront areas support ecological functions that could be improved, cities often lack the scientific data to demonstrate that. Some city sites are eligible for environmental restoration projects or recreation projects, but nearly all sites have at least minor amounts of contamination, such as ordinary construction debris, that requires remediation before restoration can proceed. There are no ready sources of federal or state funds for remediation of such routine conditions (i.e., most remedial projects rely on regulatory or court-ordered action by responsible parties, actions normally reserved for large or heavily contaminated sites). Some federal or state funds are available to retrofit or mitigate combined sewer overflow (CSO) systems present in some cities. Matching is a problem because generally cities that have experienced disinvestment seek bonds or loans only when they need emergency repairs to their water and wastewater systems. Getting matching funds therefore often requires coordinating between two or more federal or state environmental programs with different timelines and different criteria. Philadelphia is an exception in installing urban green infrastructure as part of its effort to comply with USEPA surface water rules and judicial consent order for CSO abatement. Many respondents mentioned that the costs of land conservation in

cities is much higher than in rural areas. Respondents reported little coordination between cities and their nearby areas.

Respondents indicated that city residents generally favor conservation but have little to show for that support within their own city borders. The regions of New Jersey and Pennsylvania within the Delaware Basin are residentially segregated by race and income. African Americans and people of color are concentrated in Philadelphia and its nearby suburbs and municipalities, Camden, and Trenton, which have burdens of heavy industrial uses, active and historic. The legacy of racial discrimination means that African Americans and people of color are less likely than Whites to have access to parks and other green spaces. The results of conservation efforts can also have unintended effects. Several respondents felt that public access to waterways could increase public awareness and support for water quality improvements. However, one interviewee worried that building access points to waterways also encourages subsistence fishers to take fish that the state lists as unsafe to eat in any quantity from urban sections of the river. One expert panel member reviewing this report noted the related point that green investments of any kind can yield gentrification that could displace current residents.

- **Northern New Jersey, suburbs and rural areas**

This area, including both the Valley & Ridge and Highlands geophysical provinces, has pockets of significant development but also large rural areas. Many large state and federal preserved areas already exist, along with extensive areas of farms and forests. Respondents explained that projects in the Delaware Basin area in North Jersey are eligible for several sources of funding unavailable to South Jersey, such as the federal Highlands Conservation Act funds and Forest Legacy Program funds. State programs that are available throughout the state include the Green Acres program for non-farmlands and State Agriculture Development Committee funds for farmland easements (both funds are part of the Garden State Preservation Trust). The northern portion of the Basin includes one tributary to the Delaware where restoration projects are eligible for funds from the New Jersey Water Supply Authority, a state agency that protects source waters and reservoirs for a portion of the state's water supply, including the Delaware & Raritan Canal.

Experts contrasted the wealth and landscapes of the two sections of New Jersey in the Delaware Basin. This part of North Jersey is wealthier than many areas of South Jersey, and more of the northern municipalities and counties have created funds for open space purchases, for both farmlands and non-farmlands. Localities in rural and suburban North Jersey that have these funds are mostly White. Interviewees explained that as in Pennsylvania, wealthier residential communities in New Jersey are more likely than poorer communities to receive land from individual donors, more likely to seek federal or state conservation funds, and more likely to provide matching funds from their own open space accounts, in part to protect residential property values.

- **Rural southern New Jersey**

Respondents described the areas of South Jersey outside of the Camden metropolitan area (which includes the developed western parts of Gloucester, Camden and Burlington County) as largely rural. Together, the northern and southern portions of New Jersey within the Delaware

Basin are the state’s key agricultural region. Experts noted the Delaware Basin accordingly receives nearly all federal and state agricultural funding granted in New Jersey. Respondents mentioned that there are fewer efforts in South Jersey than in North Jersey to organize non-farmland preservation. (However, we note that ongoing preservation projects in the Pinelands and Delaware Bayshore areas have been funded in part with Green Acres grants.)

The portions of South Jersey in the Delaware Basin are more racially and ethnically diverse than the portions of North Jersey are. Residents in South Jersey have lower average incomes relative to the rest of the state and have not generated large local funds for either farmland or non-farmland open space conservation. Interviewees did not mention the same level of political resistance to land conservation within this rural region that others reported for New York or Pennsylvania. This may be in part because South Jersey is a downstream area. Conservationists have tended to focus their most intensive land acquisition efforts in upstream headwaters areas in the other states. Also, funding data collected by this project show that agricultural preservation is common in this region and generally is supported by municipalities and counties.

Perceptions Regarding Conservation Trends and Equity

In addition to characterizing the funding regimes they experienced, experts discussed current trends in funding and their perceptions about funding equity (see [Appendix D](#) for the survey questions). Many also expressed concern that demographic inequities in funding were well known but that discussion about these inequities has just begun in the region. Several respondents who had spent years working to conserve land with relatively intact ecological functions expressed that such purchases were still urgently needed. These respondents also discussed initiatives to address environmental justice, including their own work to influence criteria used for the new Delaware Basin Restoration Program or to promote and apply for programs that give additional points toward conservation near dense settlements. The feeling overall was that new programs and policies would be needed to extend funding to sites that may not meet strict environmental criteria, rather than pushing existing funding away from the current resource priorities, and that funding overall should be increased.

Interview Respondent

I THINK IT'S TRUE THAT WE SPEND...A HIGHER PROPORTION OR A HIGHER RATIO OF THE DOLLARS IN PLACES WHERE THERE ARE FEW PEOPLE...THAN...WHERE THERE ARE LOTS OF PEOPLE.

Availability of funding

Respondents’ perceptions about the quantity of funding in recent years and about the importance of individual funding programs were consistent with the data we gathered from funding sources, although their knowledge often was limited to the programs they directly worked with. Those who advocate for federal funding were pleased with recent and coming increases in funding, especially with the Great American Outdoors Act, which created a permanent funding source for the Land and Water Conservation Fund.

Experts who administer funds or implement projects spoke with protectiveness and praise for state and local programs, knowing about the efforts needed to sustain appropriations. They acknowledged that their value for some of these funding sources isn’t necessarily because they are the largest (a point confirmed by the funding data we collected), but that these sources have been reliable over the years. Respondents reported that the steadiest sources of funding were from New York City for its drinking

water sources; from state natural resource funds in Pennsylvania, New Jersey, and Delaware; and from localities with dedicated open space funds. Reports about local funding for open space were mixed, with remarks that some localities had recently created new funds while others had cancelled or reduced their funds.

Changes in funding priorities and eligibility

Interviews may be the best source of information about trends in funding priorities. Trends are not readily analyzed from the data we gathered about funding, because details for project purposes were often not included in our data sources. Respondents reported ongoing adjustments to the aims of some funds but no dominant trends in funding priorities.

Respondents reported two important recent changes to farm programs. Before the study period for this report, federal farmland programs opened eligibility to farmers with low or no income from the farm (i.e., subsistence farmers) and ended eligibility for farmers with very high incomes. Also, a notable opportunity for water quality improvements is the provision in the 2018 Farm Bill that ten percent of the NRCS's conservation funding be directed toward source water protection.

For non-farmland funding, New York City funds and programs in a few other areas had shifted some funds toward restoration or stewardship of land already acquired. In part this is because land values have largely recovered since the 2008 recession, making acquisition more costly, but restoration was also emphasized in a scientific review of New York City's program. Several respondents noted the challenges of managing land once it is acquired. One particularly worried that small land trusts may have trouble sustaining their work over time and that deeding such lands to county governments would lend to more permanent legal protection. Many experts favored recent state efforts to encourage local stormwater plans but reported that few localities were following through. Climate change and recreation are other criteria being integrated into state programs. Only one respondent noted that equity concerns were being integrated into ratings for projects, with settlement density near a project yielding points toward a successful state grant application in New Jersey.

A few respondents mentioned that major farm programs are an awkward fit for the land uses that dominate the Basin. Conservation of farms in this region is more costly than in the Midwest. Land values are high in the Basin, and although farms are much smaller here, costs for administering grants are similar, no matter what a farm's size is. More concerning for attracting farmland preservation funding is that the dominant land cover in our region is forest, not agriculture. Most of the forests in the Basin are held privately, but funds available for private forested lands are limited. In addition, respondents mentioned that many agricultural practices are exempt from Clean Water Act permit requirements, because they are nonpoint sources, meaning that major sources of pollution flow downstream to communities held to water quality standards, where the communities are unable to reduce those upstream sources.

Matching funds requirements

Most projects require patching together funding, according to respondents who implement projects, no matter whether a funding agency requires such matches. Matching was reported as a high barrier for poor rural communities and for urban areas where the costs are high, due to the need to address legacy pollution in nearly any site before restoration can begin. Many respondents mentioned the William Penn Foundation's Delaware River Watershed Initiative Clusters as creating clear priorities and

opportunities for matching funds in the cluster areas. Another notable change in matching was the agreement from several federal programs allowing spending by New York City above its reservoirs to be counted as matching funds for projects below the reservoirs.

Perceptions about why local government provide conservation funding

Funding from municipalities and counties was viewed by experts as a key element of conservation in the Basin but one that results in uneven conservation efforts. Mandates were viewed as important only to the largest cities affected by Basin policies, Philadelphia and New York, because the federal government has pressed them to meet requirements under the Clean Water Act and Safe Drinking Water Act. Experts reported that few municipalities were attempting to comply with Clean Water Act requirements for stormwater. The governing capacity of localities was viewed as very important, determined primarily by the tax base, however experts said that local political views about conservation spending were even more important.

Perceptions about equity in funding

Respondents were concerned about equity in funding because inequities can reduce public support for environmental actions and because inequities burden rural and urban poor and members of minority groups disproportionately. Many respondents commented that resource programs have been designed for preserving resources, not for social equity. As one respondent commented, environmental and farm programs have inequitable results because they exist within an inequitable society.

The inequity in funding mentioned most often is that sites likely to rank high in ecological conditions prioritized by non-farmland conservation programs are concentrated in rural, upstream areas. The country's history of discrimination has led to patterns of segregation by race and class that in this Basin has resulted in upstream rural and exurban areas being mostly White. (Farm programs distribute funds to downstream as well as upstream areas, but again, most farmers are White.) Nearly all respondents mentioned that protections of upstream lands benefit all in the watershed, but many mentioned that the benefits may not be perceived by people living downstream. One respondent added that

downstream cities would also need local projects to address contamination and flooding problems that cannot be solved by upstream conservation. A few respondents said that equity could be addressed within a program (e.g., designated funding pools for beginning farmers within many agricultural programs) or could be addressed by other funding programs.

Interview Respondent

...AN EAR OF CORN DOESN'T CARE WHETHER OR NOT 1000 PEOPLE A DAY DRIVE PAST IT AND SEE THE PRESERVED SIGN. THE FUNDERS CARE, AND THE COMMUNITY CARES... THE PROTECTION OF HIGHLY VISIBLE PROPERTIES HAVE A BENEFIT ABOVE THE CONSERVATION VALUES IN THAT THEY HELP PROMOTE THE PROGRAM AND THE COMMUNITY FEELING THAT LAND IS BEING PROTECTED.

Social structures and technical barriers make it difficult for funding programs to address inequities. For instance, farm programs typically rank highly productive soils as most worthy, and therefore favor farmers able to buy the most expensive lands. Likewise, residential communities with natural amenities and conservation funds are likely to be wealthy. Gaining funding from grant programs was widely reported as difficult for under-resourced communities, where the local governments are unlikely to be

able to track funding opportunities, fund engineers to do the necessary preliminary studies, or provide their own matching funds.

In commenting on their wishes for conservation, experts' answers reflected the diversity of land uses and the diversity of people in the Basin. For instance, several respondents who work primarily in urban setting expressed interest in expanding farm programs for cities and suburbs. Other respondents favored more flexible conservation criteria for plots that had forests and agricultural uses.

Conclusions from interviews and surveys

In summary, respondents describe a Basin with a combination of significant opportunities and multiple challenges for the funding and implementation of conservation priorities for land preservation (i.e., open space and farmland) and resource management (e.g., farmland and open space stewardship, stream and riparian restoration, nonpoint source pollution control). Funding sources evolve as political priorities change. Respondents mentioned that a few localities have cut open space funding, a process we were unable to trace with data, given the low response rate of municipalities and counties. Many of them worried that COVID-19 could lead to budget cutbacks by states and localities. This observation may prove incorrect, given higher state tax revenues than many expected during the pandemic and new federal stimulus funds granted after the interviews and surveys were collected. However, they also discussed that the need for outdoor recreation became more apparent during the pandemic. They also pointed to revenue streams that will likely be permanent, including decisions to dedicate funding streams for state programs and new sources of federal funding. Institutional capacity is a major

constraint on action, especially at the local government (i.e., municipality and county) and non-profit organization levels. Only a handful of funding programs help under-resourced applicants by imposing minimal paperwork burdens or by providing application support. And even when such programs are available, applicants may have trouble finding matching funds or providing

up-front project support (e.g., engineering studies). Equitable protection and benefits to Basin populations generally are not deliberately addressed in funding priorities, and in some cases funding is inherently inequitable; dense concentrations of threatened and endangered species will not be found in cities, for example. There may be an even greater divergence between the haves and have-nots among localities after the pandemic. However, respondents did identify opportunities for better addressing and making a case for more equitable approaches to funding.

Interview Respondent

THERE'S A LOT OF DIFFICULTY IN DETERMINING EQUITY...BUT IT IS HARD TO DISCUSS THESE ISSUES REGARDING THE ENVIRONMENT BECAUSE YOU HAVE THE PHYSICAL ELEMENTS THAT MIGHT STRUCTURE A PROGRAM AND THE HUMAN ELEMENTS. THAT IS, THERE MAY BE CRITERIA FOR ENVIRONMENTAL CONDITIONS THAT ARE SET AS A PRIORITY THAT MAY NOT RESULT IN SOMETHING EQUITABLE FOR DIFFERENT GROUPS OF PEOPLE.

Project Expenditure Results and Findings

This section summarizes the expenditure data results and analysis. Because various entities use different fiscal years (calendar, federal, mid-year), all expenditures were logged based on the fiscal year of the reporting entity. While this will result in some mismatch of timelines for any one calendar year, the effect is muted when evaluated over a multi-year time frame.

The project expenditure database compiled for this report includes input from 59 entities, comprising five federal agencies (in some cases with multiple state or regional offices per agency), 15 state agencies, 23 counties and county soil conservation districts, 11 municipalities and five non-governmental organizations. These entities are listed in [Appendix C](#). In addition, some county and especially municipal governments reported that they had no expenditures in the relevant project categories. (The following section discusses government entities that did not report data.)

Over \$900 million of relevant projects were reported during the six years, of which \$825 million (91%) were funded by governments, as shown on **Table 5**. Of these, by far the largest share of reported funding is from state governments, nearly three-fifths of the total. County governments are 17% of the reported total, the federal government is 6%, and municipal governments within the Basin represent only 2% of reported funding, while New York City contributed 5% of the total. The Utility Authority row addresses all types of municipal, county and regional utility authorities, which are established by governments as authorized by state laws.

Non-governmental funders are more limited, at 7% of the reported total, which reflects the project purpose of tracking government expenditures. The Unknown row reflects data provided that had sufficient project data but did not clearly identify the funding source. Wherever possible, the database tracks the original source of funding, to avoid double-counting (e.g., when a state agency reports open space funding that is provided to a local government and also reported by them). The intent is to identify both the source of funds and the entity that ultimately spent the funds on a project.

Funder Type	FY2014	FY2015	FY2016	FY2017	FY2018	FY2019	Total	Share
Federal	\$6,131,651	\$4,496,872	\$7,141,583	\$13,941,187	\$11,949,492	\$9,785,547	\$53,446,331	5.90%
State	\$72,813,817	\$68,409,485	\$71,976,249	\$64,564,733	\$99,596,986	\$142,772,788	\$520,134,060	57.38%
Intrastate								
Regional	\$3,409,583	\$3,086,319	\$2,341,335	\$3,000,174	\$7,655,256	\$8,645,746	\$28,138,413	3.10%
County	\$31,809,788	\$29,076,040	\$21,817,273	\$20,983,668	\$25,021,775	\$28,684,171	\$157,392,715	17.36%
Basin Municipal	\$1,676,962	\$1,456,899	\$2,469,812	\$2,799,558	\$5,513,456	\$4,707,190	\$18,623,879	2.05%
New York City	\$8,721,247	\$8,547,722	\$6,852,189	\$10,376,362	\$4,312,376	\$8,217,637	\$47,027,533	5.19%
Utility Authority	\$270,442	\$7,583	\$21,171	\$85,082	\$13,498	\$201,110	\$598,886	0.07%
TOTAL GOVT	\$124,833,490	\$115,080,920	\$112,619,612	\$115,750,764	\$154,062,839	\$203,014,189	\$825,361,817	91.05%
Foundations	\$2,326,741	\$2,710,123	\$2,064,550	\$2,266,371	\$5,838,889	\$5,554,827	\$20,761,501	2.29%
Non-profit	\$4,655,025	\$3,128,028	\$4,724,800	\$6,789,161	\$11,257,314	\$8,320,500	\$38,874,828	4.29%
Academic	\$3,439	\$2,006			\$122,468	\$15,000	\$142,912	0.02%
Unknown	\$4,848,795	\$1,114,593	\$1,642,030	\$3,151,878	\$317,000	\$10,284,952	\$21,359,248	2.36%
TOTAL OTHER	\$11,834,000	\$6,954,750	\$8,431,380	\$12,207,410	\$17,535,671	\$24,175,279	\$81,138,489	8.95%
Grand Total	\$136,667,490	\$122,035,671	\$121,050,993	\$127,958,174	\$171,598,511	\$227,189,469	\$906,500,307	100%

Total reported funding declined significantly from FY2014 to FY2015, and then regained ground by FY2017. FY2018 and FY2019 represent major jumps, so that FY2019 funding is 78% (\$99 million) higher than FY2017 despite a decrease in federal funds; more than three-quarters of that jump (\$78 million) is in the state government line.

Another way of viewing these funding sources is by their primary location. **Table 6** shows these results. Other than Federal agencies, only one entity, a non-profit organization, is listed under DC (District of Columbia). As shown, New Jersey and Pennsylvania are the base for the largest reported expenditures. Delaware and New Jersey drive the FY2019 increase.

Location	FY2014	FY2015	FY2016	FY2017	FY2018	FY2019	Total
DC					\$551,570	\$224,754	\$776,324
DE	\$4,473,478	\$4,097,134	\$6,658,501	\$5,608,033	\$5,983,586	\$23,748,224	\$50,568,957
Federal	\$6,131,651	\$4,496,872	\$7,141,583	\$13,941,187	\$11,949,492	\$9,785,547	\$53,446,331
NJ	\$61,989,950	\$52,792,284	\$51,958,060	\$37,134,974	\$69,897,449	\$105,901,407	\$379,674,124
NY	\$8,848,543	\$10,198,975	\$7,609,239	\$11,605,557	\$9,957,651	\$8,917,288	\$57,137,253
PA	\$50,375,074	\$49,335,813	\$46,041,580	\$56,516,544	\$72,941,762	\$68,327,296	\$343,538,069
Unknown	\$4,848,795	\$1,114,593	\$1,642,030	\$3,151,878	\$317,000	\$10,284,952	\$21,359,248
Grand Total	\$136,667,490	\$122,035,671	\$121,050,993	\$127,958,174	\$171,598,511	\$227,189,469	\$906,500,307

A third way to view the results is by project implementer. In this case, the funding is reported by the entity that expends funds on projects to preserve land or restore water resources; those funds may come from internal resources (at which point they would also be part of the equivalent line in **Table 5**), or they may receive funds from other entities. For example, the federal government often provides grants to other entities, such as states, and so the database shows that more money comes from the federal government (**Table 5**) than is spent directly on projects by the federal government. **Table 7** shows the results. Note especially that counties and municipalities play a much larger role in project implementation expenditures (\$637 million reported) than in funding (\$223 million reported), as shown by the differences between the two tables. State governments are the other major player in project implementation, but still provide considerable funding to others (e.g., counties, municipalities, non-government organizations) for project implementation. The large jump in State Government project expenditures from FY2018 to FY2019 is based entirely on reporting from New Jersey (a \$48 million increase) and Delaware (a \$13.5 million increase).

Implementing Entity	FY2014	FY2015	FY2016	FY2017	FY2018	FY2019	Total
Federal Government	\$985,769	\$2,724,801	\$3,359,343	\$10,936,001	\$6,973,353	\$4,952,410	\$29,931,677
State Government	\$4,228,605	\$4,398,414	\$10,200,870	\$5,467,673	\$20,538,846	\$81,910,661	\$126,745,070
State Special Agency				\$839,910			\$839,910
County Government	\$66,563,589	\$60,131,459	\$50,204,484	\$46,071,602	\$59,707,356	\$62,472,130	\$345,150,620
Municipal Government	\$48,452,024	\$40,484,384	\$47,060,611	\$50,249,762	\$51,918,759	\$54,073,570	\$292,239,111
Non-profit	\$700,000	\$6,195,428	\$1,096,557	\$4,259,347	\$14,431,442	\$8,374,170	\$35,056,944
Foundations	\$11,790,575	\$5,997,894	\$7,340,280	\$6,836,712	\$15,609,961	\$13,285,958	\$60,861,381
Academic				\$1,000,000	\$1,000,000		\$2,000,000
Unknown	\$1,002,529	\$44,937	\$1,000,000	\$712,500	\$233,900	\$182,450	\$3,176,316
Utility Authority	\$2,944,400	\$2,058,355	\$788,846	\$1,584,665	\$1,184,892	\$1,938,120	\$10,499,278
Grand Total	\$136,667,490	\$122,035,671	\$121,050,993	\$127,958,174	\$171,598,511	\$227,189,469	\$906,500,307

One critical point is that the database was developed based on reported project expenditures, which are distinct from overall program funding (budgets). A good example is the Environmental Protection Agency, which provides funds to the region through Section 319(h) and National Estuary Program (NEP) grants. Most funding flows through state agencies or NEP organizations (i.e., Partnership for the Delaware Estuary), which in turn may sub-grant funds to other entities for project implementation. This movement of funds through multiple levels (federal to grantee to sub-grantee or contractor) complicates the understanding of expenditures, potentially resulting in double-counting (where multiple

entities identify expenditure of the same funds) or missing expenditures. The project team engaged in quality assurance to avoid double-counting, but in some cases, expenditures were not reported, resulting in an undercount of funding to the Basin.

A fourth way to view the results is by project type. The database reflects reported project expenditures and then compiles that information upward into funding types (shown above) and project types. **Table 8** shows the results by project type (see also **Tables 10 through 12** for federal and state details). Of great importance here is the overwhelming dominance of land preservation (open space and agriculture) as expenditures, comprising 75% of all reported expenditures. Given that these programs are primarily oriented to rural or exurban regions, this table shows that most of the money is going to non-urban areas. No other single project type exceeds 6% of reported expenditures. However, we do see an enormous jump in projects that address multiple categories of project types (e.g., land preservation plus stream restoration) in FY2019. This more than 10-fold jump is based on project data, but it deserves attention to determine whether it reflects a trend to more innovative projects or a trend toward more innovative descriptions of standard projects. In other words, are the projects truly changing or are they being described differently to attract attention or funding? It may be difficult to parse out the relative expenditures on each project type for multi-category projects, but with such an increase, an effort should be made to determine the dominant project type for all major projects, at least.

The remaining variations can have multiple causes. In some cases, such as stormwater projects, a single major project can cause a one-year jump. Funding sources may increase or decrease as bond issues or legislative authorizations change. The normal flow of project approvals may cause annual amounts to change significantly depending on which project come to fruition in any one year. For this reason, multi-year rolling averages should also be used to assess long-term trends, as the database is extended.

Project Type	FY2014	FY2015	FY2016	FY2017	FY2018	FY2019	Total
Agricultural BMPs	\$5,139,111	\$5,836,510	\$6,900,511	\$10,418,743	\$13,236,344	\$10,941,037	\$52,472,257
Lake Restoration			\$123,910		\$22,096	\$206,880	\$352,886
Multiple Categories	\$374,364	\$173,170	\$216,100	\$210,738	\$3,393,400	\$47,500,040	\$51,867,812
Preservation-Open Space	\$56,267,950	\$48,450,426	\$47,691,378	\$49,473,996	\$44,254,540	51798999.76	\$297,937,290
Preservation-Agriculture	\$61,556,508	\$49,760,940	\$51,543,499	\$53,574,220	\$75,939,387	\$91,471,305	\$383,845,858
Riparian Buffers, etc.	\$4,517,038	\$4,528,756	\$5,880,184	\$1,394,458	\$12,188,267	\$7,134,270	\$35,642,973
Stormwater Mgt-Green	\$2,621,796	\$6,859,351	\$4,635,035	\$7,076,909	\$3,293,776	\$6,543,359	\$31,030,225
Stormwater Mgt-Traditional	\$6,170,412	\$6,425,051	\$4,039,286	\$5,789,147	\$18,590,441	10330595	\$51,344,932
Wetlands Restoration			\$661	\$462	\$658,665	\$892,193	\$1,551,981
Unknown	\$20,312	\$1,468	\$20,428	\$19,500	\$21,594	\$370,790	\$454,092
Grand Total	\$136,667,490	\$122,035,671	\$121,050,993	\$127,958,174	\$171,598,511	\$227,189,469	\$906,500,307

Finally, we can also view expenditures by where the money was spent on projects, providing a comparison to the location of funding entities. **Table 9** provides this overview. Again, New Jersey and Pennsylvania are by far the largest locations for expenditures. The smallest location, Maryland, has a small part of the Christina River watershed, a tributary to the Delaware Bay.

State	FY2014	FY2015	FY2016	FY2017	FY2018	FY2019	Total
DE	\$7,110,478	\$6,825,776	\$10,255,196	\$12,940,960	\$12,584,902	\$27,143,549	\$76,860,861
MD			\$1,161		\$1,738	\$5,363	\$8,262
NJ	\$69,992,831	\$56,858,861	\$58,063,188	\$42,910,567	\$78,226,136	\$112,652,099	\$418,703,683
NY	\$8,721,247	\$10,084,151	\$7,134,668	\$11,560,299	\$10,368,309	\$11,114,533	\$58,983,206
PA	\$50,842,934	\$48,266,883	\$45,596,778	\$60,546,348	\$69,617,509	\$75,774,977	\$350,645,429
Multi-state					\$799,917	\$498,948	\$1,298,865
Grand Total	\$136,667,490	\$122,035,671	\$121,050,993	\$127,958,174	\$171,598,511	\$227,189,469	\$906,500,307

Missing Data

The primary caveat to these summaries is that the project team is aware of funding sources that were not reported by their managing agencies for a variety of reasons, including insufficient staff time, lack of access to office databases or to hard copy in inaccessible offices, or lack of response to inquiries. The team was least successful getting data from municipal and county governments and federal agencies. State agencies were more likely to have a provide data, but not uniformly. Our focus was on government funding, and so in some cases, foundation funding (including that from the William Penn Foundation) was identified only if an entity included specific mention of such grants in their project data. In some cases, funding from specific sources were reported by entities other than those sources (e.g., NRCS expenditures being reported by a non-governmental organization).

To assess the extent to which these data gaps represent significant expenditures, federal budgets were evaluated to identify programs that could involve larger Basin expenditures. The Departments of Agriculture and Interior budgets have several large programs that are relevant to this project. These programs vary widely in how project funds are dispersed. Some require applications from landowners, such as for agricultural best management practices. Others are categorical state grants (allocated by formula rather than competitive proposals), such as Clean Water Act monitoring funds and fish and wildlife management programs, which are then expended by state agencies according to state priorities. Still others are competitive grants, such as the Forest Legacy Program, where expenditures can differ greatly from year to year based on whether a state applies for funding within the Basin and the application survives the competitive process.

There are major difficulties in making connections between federal budget summaries (as posted on agency web sites, which are very general and often do not indicate state-level allocations) and project expenditures. The database structure does allow for tracking of where federal funds flow through state agencies and other entities; however, in this case the federal funds were often reported by those receiving entities rather than by the federal agency itself. Despite the lack of federal agency reporting, it appears that project expenditures were reported for most major federal funding sources in at least one of the four states and often more, providing a partial sense of federal expenditures. The major areas of concern involve some programs in the USDA Natural Resource Conservation Service (e.g., the Environmental Quality Incentive Program (EQIP)), the U.S. Environmental Protection Agency (e.g., the Section 319 grant program), and the National Park Service (e.g., the Land and Water Conservation Fund programs). Of these, EQIP may represent the largest funding.¹³ The missing expenditures could exceed \$15 million annually for the U.S. Department of Agriculture (primarily the Environmental Quality

¹³ Information from the Farmland Protection Program of USDA was provided, representing roughly 1,700 small projects and \$16 million in project funds.

Incentive Program), \$5-10 million annually for the U.S. Department of Interior (primarily land acquisition support but also fish and wildlife restoration projects), and.

Many state agencies provided useful data for most programs (though we were less successful acquiring data from Pennsylvania, including what may be in the low millions of dollars annually for land acquisition from the Pennsylvania Department of Conservation and Natural Resources), as did many counties. However, we received data reflecting only a small portion of municipalities (approximately 60 of the more than 800, and not including the largest cities such as Philadelphia, Camden, Trenton and others) and often from non-municipal sources, showing the difficulty of gathering data from hundreds of small governments, many of which have little staff capacity due to small populations and tax capacity. As discussed above, municipalities represented a small share of reported self-funding (other than New York City) but a much larger share of reported total expenditures; some of these municipal expenditures were reported by other entities who were involved in cooperative projects with a municipality that provided matching funds. The acquisition of municipal funding data is a major challenge; additions could add significantly to the amount of reported self-funding, but it would have less of an impact on total municipal expenditures. In many cases, non-municipal agencies may report municipal spending that is tracked as matching funds to county or state grants. Where a state agency provided funding to a local government, the database can be used to track these expenditures and sources using either a top-down approach (i.e., state agency provides funding and expenditure data) or a bottom-up approach (i.e., local government reports receipt and expenditure of state funding). Where neither funding source nor recipient provided data, the expenditure is not in the database.

Federal Agencies, Programs and Expenditures

Federal government expenditures reported for the Delaware River Basin are shown in **Table 10**. The two primary agencies within the region are the Departments of Agriculture and the Interior. All other programs are small. Within Agriculture, the largest reported funding source was the Farmland Protection Program (\$21 million), for agricultural BMPs and preservation. The Forest Legacy Program (nearly \$4 million) was also significant, funding forest preservation. Within Interior, no single program reported funding more than roughly \$3 million over the six-year period, but several programs for wildlife, wetlands and species recovery came from that department. As noted, the U.S. Environmental Protection Agency did not provide data on funding for relevant projects. However, state agencies that receive the bulk of USEPA funds as categorical state grants did in some cases report expenditures from those funds.

	FY2014	FY2015	FY2016	FY2017	FY2018	FY2019	Total
Federal Government	\$6,131,651	\$4,496,872	\$7,141,583	\$13,941,187	\$11,949,492	\$9,785,547	\$53,446,331
Department of Agriculture	\$3,705,952	\$892,718	\$2,818,063	\$5,699,135	\$6,454,290	\$8,971,041	\$28,541,200
Department of Commerce	\$258,500	\$770,546	\$342,608	\$886,439	\$225,771	\$297,125	\$2,780,989
Department of Defense (not ACOE)	\$1,181,430			\$92,794	\$1,551,293	\$279,855	\$3,105,371
Army Corps of Engineers	\$985,769	\$82,330	\$151,930	\$182,926	\$63,648	\$194,154	\$1,660,757
Department of the Interior		\$2,326,505	\$3,828,982	\$7,079,893	\$3,654,489		\$16,889,869
Environmental Protection Agency		\$424,772				\$43,373	\$468,145

Table 11 provides a different perspective, showing federal programs and the types of projects they fund. Agricultural BMPs and land preservation (both open space and agriculture) are the largest project types.

Table 11: Project Amounts by Type of Federal Program and Type of Project									
	Ag BMPs	Open Space	Ag Pres	Riparian	Storm Water - Green	Storm Water - Traditional	Wetlands	Unknown	Total
Acid Mine Lands Pilot						\$2,200,000			\$2,200,000
Agricultural Conservation Easement Program			\$3,522,986						\$3,522,986
Conservation Reserve Program			\$171,607						\$171,607
Cooperative Endangered Species Fund		\$2,869,000							\$2,869,000
Delaware CZM		\$785,862							\$785,862
Delaware NERR		\$936,005							\$936,005
Emergency Watershed Protection Program								\$64,440	\$64,440
Farmland Protection Program	\$16,004,375		\$4,730,155	\$218,805			\$2,354		\$20,955,689
Federal Aid in Wildlife Restoration Act		\$3,063,530							\$3,063,530
Federal Coastal Wetlands		\$695,106							\$695,106
Federal Forest Legacy		\$3,826,477							\$3,826,477
National Coastal Wetlands Conservation Grant Program		\$3,936,489	\$731,399						\$4,667,888
NERRS PAC		\$848,810							\$848,810
Non Point Source Program Grants				\$468,145					\$468,145
North American Wetlands Conservation Act			\$384,345						\$384,345
Pennsylvania CZM		\$144,312			\$66,000				\$210,312
Readiness and Environmental Protection Initiative (REPI)		\$1,181,430	\$1,923,942						\$3,105,371
Recovery Land Acquisition Grants (RLAG)		\$1,960,000							\$1,960,000
Resilience Projects				\$1,050,000					\$1,050,000
Section 566 Regional Watershed Project				\$1,660,757					\$1,660,757
Grand Total	\$16,004,375	\$20,247,021	\$11,464,435	\$3,397,707	\$66,000	\$2,200,000	\$2,354	\$64,440	\$53,446,331

Given that many federal agencies did not provide data, the Rutgers team developed a general assessment of available agency budgets. [Appendix B](#) provides a summary of available information about federal program budgets, which provides a sense of what expenditures may have not been reported. As discussed there, some of the largest federal programs nationally are not major funding sources in the Delaware River Basin. Specifically, the Conservation Reserve Program (Agriculture) is a very large program nationally that is rarely used in Delaware, New Jersey and New York. While Pennsylvania does use the program, that is mostly in the Chesapeake Bay region. Using relative farmland in and out of the Basin for each state, the USDA Conservation Stewardship program may provide roughly \$2.6 million and the Environmental Quality Incentives Program roughly \$15 million annually to projects in the Delaware River Basin. These programs provide financial and technical assistance to landowners, and so the funds do not flow through state agencies as grants-in-aid. Not all these funds would be used for projects relevant to this project, as some would be used for agricultural management practices that are not related to water quality restoration. Even so, from the available data, it appears that major project expenditures from Department of Agriculture offices in the four states are missing from the database.

Within the Department of the Interior, the most directly related funding source is the Highlands Conservation Act, which provides roughly \$10 million per year to New Jersey, New York, Pennsylvania and Connecticut. Roughly \$8 million comes to the Delaware River Basin states, but parts of New Jersey and New York Highlands areas are outside of the Basin. Given that these funds are often passed through state land preservation agencies, reported expenditures reflect part and perhaps most of the budgeted funds. The Land & Water Conservation Fund is also a funding source for land preservation. However, the total allocations for the four Basin states were only \$5 million to \$11 million per year through FY2016 (no information was available from Interior for later years), and of that amount a large amount would likely be expended outside the Basin. As a result, land preservation funding of \$20 million over the six-year period is not far from what could be expected. Recent passage of the Great American Outdoors Act (PL 116-152) provides permanent authorization of the Land and Water Conservation Fund, providing \$900 million per year for conservation and recreation projects. Improvement in LWCF allocations to the Basin should be tracked over time to determine if passage of this law make a material difference in federal funding.

Many other Interior programs are focused on wildlife, fisheries and endangered species management, some (unknown from budget documents) portion of which is used for field projects rather than operating funds.

One question is whether the Basin is receiving an equitable share of these federal funds. Many of the federal programs are linked to agriculture and wildlife, where other regions of the country will absorb most of the funding. Many of the Department of Agriculture programs, for example, are not widely used within this Basin, most likely because these programs' focus is on crop types and large-scale agriculture operations that are not typical of the Basin. Elected officials from the Delaware Basin represent areas with diverse economies that do not depend heavily on resource extraction and so they have not set a priority on creating programs that would suit the Basin. A regionally appropriate conservation agenda for rural areas, for instance, would focus on conserving forests, according to several respondents to the surveys and interviews in this study. The ability of legislators to cut deals for programs tailored to the Basin is also limited, because while the Delaware River Basin is large from an eastern perspective, it is a

very small percentage of the nation. Few federal programs are deliberately focused on the Basin or a portion of it, such as the Highland Conservation Act. However, a small increase in the share of federal funding that is spent in the Delaware River Basin could represent a significant increase in Basin funds.

State Programs and Expenditures

State government expenditures reported for the Delaware River Basin are shown in **Table 12** by program from all four states. Lake, wetland and unknown projects have been grouped, as they total less than \$1 million over six years. As noted in the overview, open space and agricultural preservation are by far the largest expenditures, and New Jersey (Green Acres and Farmland Preservation Programs) and Pennsylvania (Farmland Preservation – CEPP) provide much of the reported expenditures. As discussed previously, many of these state expenditures are in the form of grants to other entities.

Table 12: State Project Amounts by Program and Type of Project									
	Ag BMPs	Multi-type	Open Space	Ag Pres	Riparian	Storm Water - Green	Storm Water - Traditional	Other	Total
DE Community Water Quality Improvement Grant					\$75,000			\$0	\$75,000
DE Open Space Program			\$20,278,101	\$3,251,760				\$0	\$23,529,861
DE Aglands Preservation and Planning				\$12,354,869				\$0	\$12,354,869
DE Redev't of Strategic Sites (NVF)			\$700,000					\$0	\$700,000
DE State Lodging Tax Fund			\$110,000					\$0	\$110,000
DNREC, Division of Fish & Wildlife			\$1,062,600					\$0	\$1,062,600
NJ 319(h) Program	\$700,500				\$1,918,937	\$2,953,800	\$800,000	\$0	\$6,373,237
NJ Cost Share Assistance to Farmers	\$148,528							\$0	\$148,528
NJ Farmland Preservation Program				\$90,809,338				\$0	\$90,809,338
NJ Green Acres			\$135,841,654	\$1,309,757				\$0	\$137,151,410
NJ Natural Resource Damages Settlement		\$47,000,000	\$300,000		\$8,721,650			\$510,683	\$56,532,333
NY WQ Improvement Program (WQIP)			\$5,044,306		\$1,271,387		\$1,018,745	\$0	\$7,334,438
PA 319(h) Program					\$98,000	\$554,449	\$141,100	\$65,428	\$858,977
PA Capability Enhancement Program					\$150,000			\$125,000	\$275,000

	Ag BMPs	Multi-type	Open Space	Ag Pres	Riparian	Storm Water - Green	Storm Water - Traditional	Other	Total
PA Community Conservation Partnership Program				\$1,500,000				\$0	\$1,500,000
PA Farmland Preservation - CEPP				\$142,834,374				\$0	\$142,834,374
PA Growing Greener I	\$2,393,869	\$753,634			\$3,248,942	\$2,610,305	\$1,627,557	\$235,260	\$10,869,567
PA State Parks			\$2,933,662					\$0	\$2,933,662
PennDOT					\$274,861			\$0	\$274,861
PENNVEST	\$9,237,989					\$7,732,567	\$14,960,431	\$0	\$31,930,987
Grand Total	\$12,485,886	\$47,753,634	\$167,323,876	\$243,097,062	\$15,764,777	\$13,851,121	\$18,921,333	\$936,372	\$520,134,060

County, Municipal and Utility Authority Expenditures

As discussed above, municipalities and utility authorities were not documented as major funding sources, with the notable exception of New York City, but county governments were, as shown in **Table 13**. Lake, wetland and unknown projects have been grouped, as they are minor expenditure categories. Unlike state government, where both open space and agricultural land preservation loom large, for county governments the largest focus by far is on agricultural land preservation, comprising over 83% of all county expenditures reported during the six-year period, with projects in roughly 40 counties (of 42 total) in all four states. Projects were reported in approximately 60 of the 838 total municipalities in the Basin). However, in both cases, much of the data on county and municipalities was reported by other entities, especially state agencies. Although some counties and municipalities did report that they had no relevant expenditures, the expectation is that both county-funded and municipal-funded expenditures during this period were significantly higher than shown in the database. As mentioned above, in **Table 8**, counties and municipalities account for a far higher level of reported project expenditures than their level of in-house funds would indicate. The conclusion is that they have been very successful in matching local funds (e.g., property taxes, bonds) with funding from higher levels of government and from non-governmental organizations. Even so, the shortfall in reporting from municipalities, and from counties to a lesser extent, is a major challenge for database development.

	Ag BMPs	Multi-type	Open Space	Ag Pres	Riparian	Storm Water - Green	Storm Water - Traditional	Other	Total
County Government	\$1,081,248		\$13,056,706	\$111,338,327	\$762,230	\$947,845	\$5,994,900	\$64,232	\$133,245,488
NYC Watershed Land Acquisition Program			\$47,027,533					\$0	\$47,027,533
Municipal Government		\$1,995,000	\$2,200,172	\$12,903,354	\$381,394	\$106,797	\$400,000	\$0	\$17,986,718
Utility Authority					\$29,238	\$563,147		\$6,500	\$598,886
Grand Total	\$1,081,248	\$1,995,000	\$89,730,697	\$120,674,203	\$1,174,444	\$1,620,789	\$7,295,900	\$70,732	\$223,643,012

Comparison of Expenditures and Government Capacity

As discussed in the Methodology section, government capacity to implement programs is not readily assessed. One option is to assess the relative share of expenditures against the relative wealth or lack of wealth in a county. **Table 14** provides an overview of these metrics. For each metric other than BIPOC

population, a box in pink indicates a low result relative to the average of all counties in the Basin, and green indicates a high result. The BIPOC Population column shows the percentage of Black, Indigenous and People of Color (aka BIPOC) within the total county population, with counties greater than 35% being highlighted. Counties shown in bold have a significant portion of their area within the Delaware River Basin; these are of primary concern. Counties with minimal land area within the Basin would be expected to have few project expenditures, regardless of county household income levels.

Table 14: Project Expenditure Relative to Household Income Metrics by County						
County	HHI Relative to Average of Basin Counties	County HH Income (\$million)	Population Below National Poverty Level	BIPOC* Population	Project Expenditures FY2014-2019 Total	% of Total Expenditures
DELAWARE						
Kent County	80.40%	\$3,461	13.00%	39.60%	\$22,559,968	2.49%
New Castle County	101.40%	\$15,895	10.10%	36.40%	\$33,285,729	3.67%
Sussex County	77.50%	\$4,496	12.60%	24.60%	\$15,694,417	1.73%
NEW JERSEY						0
Atlantic County	84.70%	\$6,647	11.10%	44.00%	\$173,968	0.02%
Burlington County	121.20%	\$15,581	5.50%	33.40%	\$35,679,544	3.94%
Camden County	95.10%	\$14,161	10.70%	77.20%	\$71,916,923	7.93%
Cape May County	97.70%	\$3,277	8.80%	15.00%	\$16,100,895	1.78%
Cumberland County	82.10%	\$3,234	13.20%	54.60%	\$44,871,254	4.95%
Gloucester County	106.80%	\$8,777	7.70%	22.20%	\$16,083,215	1.77%
Hunterdon County	154.30%	\$5,752	3.60%	15.20%	\$54,303,014	5.99%
Mercer County	122.20%	\$12,596	12.80%	51.80%	\$19,523,526	2.15%
Monmouth County	140.20%	\$25,782	6.00%	24.90%	\$39,882,910	4.40%
Morris County	155.30%	\$21,651	5.50%	29.50%	\$5,751,866	0.63%
Ocean County	93.10%	\$16,123	9.00%	15.70%	\$12,601,591	1.39%
Salem County	88.40%	\$1,726	12.40%	26.60%	\$26,256,481	2.90%
Sussex County	123.10%	\$5,297	4.70%	14.90%	\$33,950,658	3.75%
Warren County	109.20%	\$3,528	6.80%	19.60%	\$24,659,282	2.72%
NEW YORK						0
Delaware County	80.90%	\$1,203	16.60%	8.20%	\$39,760,240	4.39%
Greene County	90.10%	\$1,208	14.00%	15.20%	\$2,033,604	0.22%
Orange County	102.30%	\$9,992	12.50%	37.30%	\$11,815,553	1.30%
Sullivan County	73.90%	\$1,831	16.00%	29.30%	\$2,278,743	0.25%
Ulster County	85.60%	\$4,602	11.90%	21.20%	\$1,050,952	0.12%
PENNSYLVANIA						0
Berks County	84.00%	\$10,224	12.00%	29.70%	\$34,176,536	3.77%
Bucks County	117.10%	\$20,874	5.90%	16.70%	\$35,622,895	3.93%
Carbon County	73.10%	\$1,441	11.70%	9.00%	\$1,775,749	0.20%
Chester County	137.40%	\$19,840	6.40%	21.20%	\$69,635,786	7.68%

County	HHI Relative to Average of Basin Counties	County HH Income (\$million)	Population Below National Poverty Level	BIPOC* Population	Project Expenditures FY2014-2019 Total	% of Total Expenditures
Delaware County	101.50%	\$16,442	10.00%	34.40%	\$16,792,476	1.85%
Lackawanna County	75.90%	\$5,035	14.70%	16.20%	\$2,780,258	0.31%
Lancaster County	83.40%	\$12,687	10.10%	18.70%	\$38,018,811	4.19%
Lebanon County	83.60%	\$3,325	10.80%	19.00%	\$6,438,434	0.71%
Lehigh County	85.20%	\$8,908	12.50%	37.50%	\$21,907,191	2.42%
Luzerne County	71.20%	\$7,256	14.70%	20.70%	\$13,650,275	1.51%
Monroe County	84.70%	\$3,867	11.20%	35.50%	\$10,862,457	1.20%
Montgomery County	127.10%	\$30,713	5.90%	25.00%	\$34,375,123	3.79%
Northampton County	91.80%	\$8,044	8.60%	24.60%	\$34,586,480	3.82%
Philadelphia County	62.90%	\$28,372	24.30%	65.70%	\$3,967,265	0.44%
Pike County	107.90%	\$1,872	9.50%	20.40%	\$1,253,002	0.14%
Schuylkill County	65.50%	\$3,106	12.40%	9.90%	\$6,517,264	0.72%
Wayne County	89.70%	\$1,326	11.40%	10.10%	\$2,427,676	0.27%
Basin County Results		\$370,150			\$906,500,307	
Median of Counties	90.10%	\$6,951.50	11.10%	23.40%	\$18,158,001	1.78%

U.S. Bureau of the Census Quick Facts, available from: <https://www.census.gov/quickfacts>.

* “White alone, not Hispanic or Latino”

The results of the table do indicate a rough proportionality of county wealth to project expenditures, and of high poverty to lack of such expenditures. However, the proportionality is rough, indicating that other factors are also important. Most counties that are largely in the Basin and also have high percentages of BIPOC populations are either similar to or even above (e.g., Camden and Cumberland Counties in New Jersey) the Basin average for % of Total Expenditures, with the notable exception of Philadelphia. This table should be considered a work in progress due to missing data.

Expenditures Relative to Household Income

Figure 2 shows the relationship of project expenditures to total county household income (population times average household income), for only those counties shown in bold in **Table 14** above (i.e., with major land areas within the Basin). As can be seen, high levels of project expenditures occur across a wide range of total county household income. However, most of the lower expenditure levels occur at lower total county household incomes.

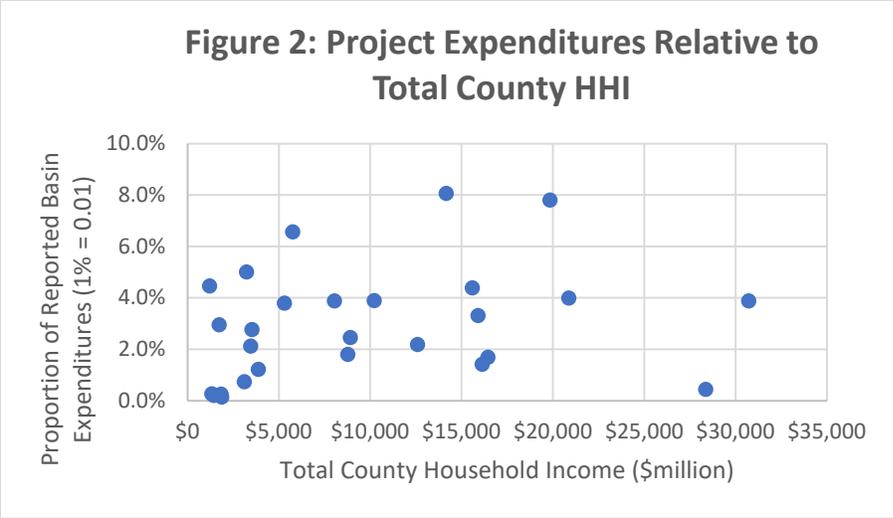
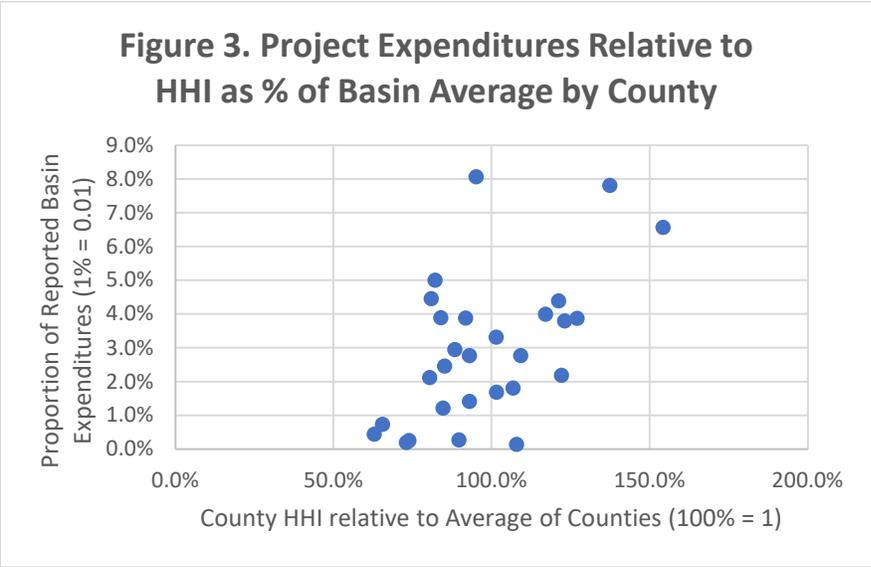


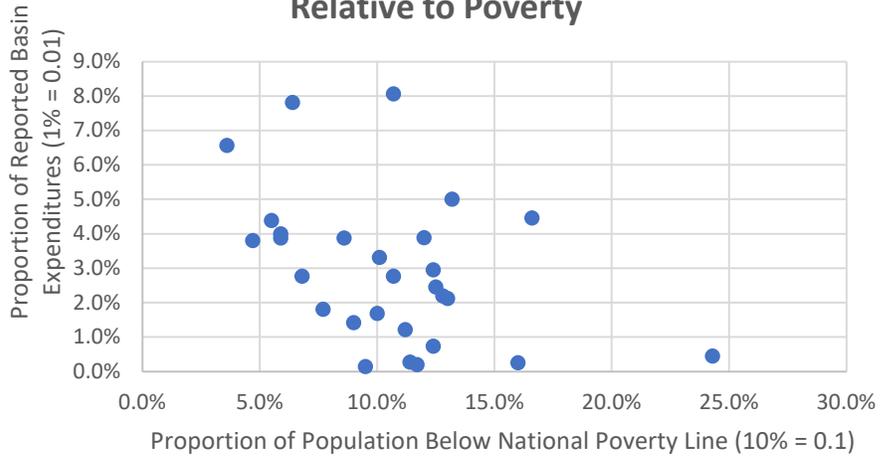
Figure 3 shows the relationship to the average household income by county as a percentage of the Basin average, for only those counties shown in bold in Table 14. Here, a stronger pattern emerges, with increased expenditures in line with higher incomes.



Expenditures Relative to Poverty Levels

Finally, Figure 4 shows the relationship of project expenditures to the percentage of households below the National Poverty Level, by county, for only those counties shown in bold in Table 14. The highest expenditure levels occur in counties at or below the median of 10.7% for all counties, and there is a general upward trend as poverty incidence declines below 10% (0.10 on the figure). The lowest expenditure levels occur across a wide range of poverty levels, but the lowest levels (below 1% of Basin expenditures, or 0.01 on the figure) occur at poverty levels of roughly 10% (0.1) and higher.

**Figure 4. Project Expenditures
Relative to Poverty**



Recommendations for Project Improvement and Extension

This project represents the first attempt to comprehensively collect and assess government funding and expenditures for protection and restoration of the Delaware River Basin regarding land preservation, agricultural best management practices, and stream restoration. A variety of lessons have been learned from this process (other than not scheduling an effort of this type when government offices are closed due to a pandemic). In this section, the Rutgers team provides recommendations for next steps.

The acquisition of data from hundreds of entities requires extensive effort to contact the right person in each agency or government, explain the purpose of the project, have that person collect and transmit the data, and merge the data into the regional database. In most cases, the data received will not be a precise fit to the database, requiring some level of processing to be useable. For this reason, the Rutgers team recommends that data acquisition not be an annual event. Rather, we recommend a biennial, phased process.

A longer period has too much potential for losing immediacy – the data will lose immediacy, and momentum and contacts with the government agencies will be lost. A shorter period (e.g., annual) will require too much effort for the amount of additional information collected.

Recommended Project Approach

Each project cycle should begin with compilation of budget information from the major regular funding sources: federal agencies, state agencies, large counties, major cities and foundations. The budget information can serve as a useful guide for determining whether the acquired project expenditures represent a complete data set. It can also help focus staff time on ensuring data acquisition from the largest funding sources. Finally, by understanding how budgeted funds are allocated and flow from source to ultimate project implementation, the potential for undercounting and overcounting can be minimized.

A major constraint with budget analysis is that many federal and state programs do not provide or have specific allocations of funding to the Delaware River Basin. Most federal programs will be either competitive (with changes in Basin expenditures each year depending on approved projects) or provide block grants to state agencies. The state agencies often will provide these funds for implementation projects on a competitive basis.

In this report, we estimated U.S. Department of Agriculture program funding by apportioning each state program allocation by the percentage of agricultural lands within and outside the Basin. This approach assumes that farmers will access stewardship funding (e.g., EQIP) similarly regardless of location, but that assumption might be incorrect. For example, there is a significant possibility (affirmed by interviewees) that farmers in the Susquehanna River Basin of Pennsylvania will be more likely to apply for funding to meet water pollution control requirements for the Chesapeake Bay; New York farmers in the Great Lakes region may be similarly motivated. Discussions with the state offices of NRCS could help determine whether more accurate distributions can be estimated.

The larger problem occurs regarding water quality restoration, stewardship and land preservation funds. The following suggestions can be discussed with experts and then implemented with the assistance of staff having significant expertise in GIS.

- **Farmland preservation.** Information would be needed on which farmlands are already preserved, and a trend analysis of preservation efforts. For example, does interest in farmland preservation increase with proximity to or distance from developed areas, or is it uniform? Does farmland preservation success increase or decrease as more lands are in preservation? Some states have GIS mapping of all farmland and preserved farms that can be used.
- **Forest and terrestrial habitat preservation.** Information would be needed statewide on the size, ownership type (e.g., government, water utility, private individual, private corporation) and current preservation status of forests and other terrestrial ecosystems that are important to water resources. Small parcels are unlikely to be preservation targets, and government-owned parcels are assumed to be preserved. Assuming that preservation funds will be apportioned across the available set of larger unpreserved properties, an estimate can be developed of the average preservation funding likely to be allocated to the Basin. Again, information from State preservation agencies could help understand whether more precise allocations are possible.
- **Stream restoration.** A simple approach would be to determine the number of stream miles within versus outside the Delaware River Basin for each state and assume a proportional expenditure of grant funds for restoration purposes. However, funds are more likely to be spent in damaged streams, and so an additional step in the analysis would be to determine the relative distribution of streams that indicate damage due to erosion and sedimentation. Restoration funds will be heavily affected by local capacity to implement projects, and so a history of state expenditures from such grant programs would help focus the estimates.

An additional consideration is to expand the types of expenditures addressed in the project. For example, expenditures required by regulations and permits were not included. However, an upgrade to a wastewater treatment plant or a combined sewer overflow provides direct benefits to water quality and therefore could be added to the database. We recommend the project gather data about an expanded set of targeted expenditure to better reflect the environmental objectives of the project. This project did not include several categories of government expenditures that should be considered because their intent is to improve water quality that has been damaged by legacy conditions. Therefore, the Rutgers team recommends that projects that improve historic conditions be included (e.g., treatment plant upgrades, stormwater system upgrades), while those that mitigate environmental damages due to new activities (e.g., wetlands fill, development, road projects) not be included because they do not result in an improvement of net conditions. The recommended new categories include:

- Wastewater treatment plant upgrades required for restoration of a previously impaired water through a Clean Water Act requirement such as a TMDL (total maximum daily load), WQBEL (water quality-based effluent limit) or CSO long term control plan.
- Stream restoration best management practices and stormwater management upgrades required for restoration of a previously impaired water through a Clean Water Act requirement such as a NPDES MS4 (municipal separate storm sewer system) permit, TMDL or CSO long term control plan.
- Stream restoration BMPs implemented through a Natural Resources Damage payment required by federal or state agencies.

While non-governmental funding was not a project focus, much governmental funding requires matching funds, and so the non-governmental funds can be a critical factor in the allocation of governmental funds. Carbon offset funds, mitigation funds, non-governmental Natural Resource Damage projects and other non-governmental resources can be important adjuncts to government funding. Therefore, the Rutgers team recommends expansion of the database effort to incorporate non-governmental funds, especially where they are linked to governmental expenditures.

Strengthening the 2014-2019 Database

This project used a “full court press” approach to data acquisition, where a list of governmental entities was compiled iteratively, and initial requests were sent to all contacts with follow-up requests as needed. Because these requests were sent and entities responded (or didn’t respond) at varying times, it was difficult to track where major data gaps existed. In the next cycle, a better tracking system is needed to ensure that the priority data sets are acquired early in the process, that the highest priority funding sources are identified through federal and state budgets and expert experience, and that the database be continually updated to identify gaps and problems.

The Rutgers team recommends that the first year after completion of this project (i.e., 2021) be used to fill gaps in the database from agencies that indicated data exist but were temporarily unavailable due to closed offices, furloughs and staffing constraints. In addition, there are a few agencies where relevant expenditures likely occurred, but no response was received. These would be high priority for database improvement for the target years.

While many agencies and organizations provided expenditure data or confirmed that they did not have expenditures (or in some cases did have expenditures but either did not have compiled information or lacked access to the information due to office closings), some critical agencies did not respond to inquiries or declined the request for information. Focusing on the federal and state levels, key missing programs are shown in **Table C-2 in Appendix C**. As noted in the [Missing Data](#) section, the major areas of concern involve some programs in the USDA Natural Resource Conservation Service (e.g., the Environmental Quality Incentive Program (EQIP)), the U.S. Environmental Protection Agency (e.g., the Section 319 grant program), and the National Park Service (e.g., the Land and Water Conservation Fund programs). Of these, EQIP may represent the largest funding but that remains to be determined.

Greatly improving the municipal and county funding and expenditures data will be a major challenge given that there are more than 900 municipalities, counties and related governmental entities (e.g., conservation districts, improvement authorities, utility authorities). A targeting method is needed to identify and focus upon the local entities most likely to have significant resources and expenditures.

Project Cycle

Based on the discussion above, the Rutgers team recommends a biennial cycle for extending the database into future years. Given the different fiscal years used by federal, state and local governments, arranging the project by academic year (July 1 through June 30) will allow for collection of the appropriate data from all entities. The general approach for the next three years would be as follows:

- AY 2021-2022: Backfilling the 2014-2019 database and preparing for the next cycle through an update to the project methodology
- AY 2022-2023: Collection and analysis of data from the years 2020 and 2021, and trend analysis of these data with the 2014-2019 database where possible

- AY 2023-2024: Backfilling the 2020-2021 database and preparing for the next cycle

Trend analysis will be more useful as future years are added and additional data are acquired to backfill the 2014-2019 database. Multi-year averages would then be used to smooth year-to-year fluctuations, especially regarding competitive grant programs where Basin funding can change greatly. A three-year rolling average should be useful (e.g., 2014-2016, 2015-2017).

Future years would use a similar approach, depending on the needs of the William Penn Foundation. In addition, consideration can be given to including acquisition and project expenditures by non-profit organizations that are self-funded, to capture matching funds to government grants as well as complementary work.

Improving Data Quality and Completeness

One of the major constraints for a project of this type is that every agency and government collects and stores data according to their own needs, not for purposes of aggregation and analysis by others. Differences in data structure (i.e., everything from hard copy archives to Web-based portals), data gaps, missing data field explanations and many other factors required extensive time and effort to fit acquired data into the database. The effort will be somewhat reduced with the benefit of recent experience, but data quality control and management occupied a large proportion of staff time and costs.

A major constraint for most acquired data was the lack of geographic coding for the projects, which made it impossible to derive a sound assessment of how project locations (e.g., by watershed) related to other demographic, environmental and equity considerations.

Another constraint is how agencies account for expenditures. In federal and state government, there are generally three levels of fund commitments. First is the agency budget for specific programs, incorporated in the budget approved by Congress or a state legislature. Second is the obligation of funds to specific projects; an obligation is essentially a promissory note, stating that the agency will repay the costs of the project over the project period, which may be multiple years. Third is the expenditure, when the agency cuts the check to the project implementer. Some data sets did not distinguish clearly among these three steps, and especially between the last two, making it difficult to know whether the information provided represented a commitment (the obligation), which then could result in an expenditure years later (e.g., after negotiations result in closure on a land purchase), or an actual expenditure where the funds were transferred.

The William Penn Foundation and the project team could improve the functionality of this project by encouraging inter-governmental discussions about data structure and quality, to provide consistency. Options include identifying the data fields needed (and not needed) and working with prospective data providers to ensure that appropriate data are compiled and retained, and that their data can be provided or easily programmed into the database. Doing so will help secure comparable data and reduce the time spent cleaning and merging data.

Improving Data Analysis

The original project methodology anticipated more detailed analysis of how expenditures reflected demographic, environmental and equity considerations in the Delaware River Basin. In some cases, required information was not readily available, such as property valuations in states other than New Jersey. In other cases, information was available but needed a greater level of GIS expertise than

anticipated (e.g., comparison of existing water quality to project expenditures). Including a GIS specialist in the team would help to shape database structure, facilitate collection of data from target sources (especially those entities with GIS capacity), convert data more efficiently, identify/secure background demographics, more easily secure public on-line sources of data, and prepare better visuals for data analysis and communication.

Trends in Expert Perceptions of Equity

The interview process provided very useful information on the general expectations of practitioners regarding funding, funding trends, funding constraints, and the consideration of equity in funding allocations and expenditures. The William Penn Foundation should consider periodic evaluations of practitioner perceptions to determine whether and to what extent they are changing. As perceptions and practices are unlikely to change rapidly, interviews on a two to four-year cycle may be most appropriate, or an approach that varied the interview focus from one cycle to the next. One component of this evaluation could be to identify the most critical programs and resources that could address cross-cutting issues equity in water resource-related programs, focused on the aggregate needs of disadvantaged communities and of existing and potential programs.

Recommendations for Use of the Report

Policy opportunities presented in this section derive from findings presented above – including the review of research literature, data collected about government funding for the Delaware Basin, and expert practitioners’ responses to surveys and interviews – and from reflections on potential changes in the Basin’s physical and regulatory contexts in the future. The Rutgers research team presents these policy opportunities to inform the William Penn Foundation and the public but is not advocating for one or another approach.

The Delaware River Basin has benefitted from a long history of regional water pollution control, water supply management and flood control, initially through the Delaware River Basin Commission (DRBC, formed in 1961) and later through the environmental laws and programs of the four basin states and the federal government that came into existence after Earth Day 1970. The water quality results have been transformational for the Delaware River itself, going from anoxic conditions in the upper tidal river reach to a water quality that allows for the annual passage of shad to their historic spawning areas upstream. Municipal and industrial treatment plants are closely regulated, combined sewer outfalls (CSOs) are finally being reduced and controlled, and municipal separate storm sewer systems (MS4s) are in the early stages of improved management. Some flooding potential has been mitigated, though by no means all, and a robust system of water supply management exists.

Hundreds of municipalities, counties, non-governmental organizations and businesses now play major roles in addition to those of the federal and state governments and the DRBC. The results have been important for open space and farmland preservation, the removal of obsolete dams, and to a lesser extent, stream restoration and nonpoint source pollution control.

However, data and interview results from this project clearly show that these programs and results are often achieved in a fragmented, “silo” approach to management, rather than through a large-scale collaboration such as the Chesapeake Bay Program with its \$1.5 billion in annual federal and state expenditures. Ironically, one possible reason for the difference is that the Delaware River Basin’s worst pollution problems are history, while the Chesapeake Bay is still showing the enormous effects of excessive nutrients. Problems of the Delaware may not be sufficiently bad to garner the same level of attention from the federal government. The DRBC at one time was the dominant convenor regarding many water problems in the Basin, but now is just one of many players, used more to coordinate issues regarding the Delaware River itself than as a convenor of basin-wide collaborative efforts, except where the four states see a value in DRBC action (such as for control of hydraulic fracturing operations and direct wastewater effluent discharges). This reduced prominence clearly plays out in the DRBC’s longstanding budget problems.

The Basin doesn’t capture federal attention to the same extent as other, more troubled places. The Basin states also may tend to see issues in the Basin as:

- Roughly co-equal to other watersheds (e.g., New Jersey),
- Less of a concern than other watersheds (e.g., Pennsylvania, which must place priority on the Susquehanna River as a part of the Chesapeake Bay Program),
- A small area of a large state (e.g., New York State, though New York City plays a major role in the Catskills part of the upper Basin), or
- An estuarine focus more than a freshwater resource (e.g., Delaware and southern New Jersey).

The fragmentation of Basin programs by issue, laws and jurisdiction derives in large part from the different needs and political agendas of the states, the lack of federal focus, and the lack of a dominant environmental issue. The research literature reports that decisions about a watershed may be largely uncoordinated across jurisdictions or may be somewhat coordinated. Coordination may emerge because decision-makers seek to avoid or reduce penalties from regulations, but other motivators include reducing costs (e.g., a water utility paying to control upstream erosion) or overcoming a political stalemate over environmental conditions. Watersheds where decisions are coordinated in some fashion depend on networks of institutions and on sharing information, including information about current funding and funding needs.

The data about recent government funding for water quality improvements presented in this report could be a step toward information sharing that could build on existing institutional networks in the Basin. Government funding patterns reflect the priorities of individual funding initiatives at all levels of government, which have been built to operate separately from each other. The total funding available addresses a small portion of conditions that could be improved in the Basin's rural and urban areas. The comments of expert practitioners in surveys and interviews affirm their interest in learning about funding across the Basin and their difficulties in leveraging funds that could improve conditions across jurisdictions. Funding sources enable implementers to achieve goals for site-specific projects. This practical focus on projects was the center for their comments. Few mentioned specific aspirations for broader coordination that could provide a basis for bottom-up watershed coordination. Respondents did affirm their values for existing networks and opportunities for information sharing, such as the Delaware River Basin Commission (DRBC), but they felt these networks could be more robust and effective.

The question is whether a galvanizing environmental issue is likely to emerge that could drive a more collaborative approach that increases the effectiveness of water pollution control, land preservation and stream restoration. The physical and regulatory contexts for the Basin are changing, however, in ways that could be used as opportunities for more integrated actions to improve water quality across the watershed. We pose the following possibilities:

- **Climate Change Impacts on Flooding and Drought:** The DRBC's formation was driven in large part by the record flood of 1955, which led to the realization that individual state actions could not solve problems in the Delaware River itself, which is the boundary between the states. The floods of 2004, 2005 and 2006 emphasized this issue. Drought issues were being addressed separately through agreements through the federal court system, but they have become closely entwined with DRBC programs as well. In both cases, climate change can alter the underlying assumptions regarding the frequency and severity of floods and droughts. The challenge will be relating conservation and restoration programs to these issues, as land preservation, stream restoration and land stewardship are rarely seen in this context.
- **Sea Level Rise and the Salt Front:** A separate issue regarding climate change is the associated sea level rise for coastal waters, with projections of a 50% probability that a 1-meter (3.3 foot)

increase will occur by the year 2100, and 1.4 feet by 2050.¹⁴ The Basin’s water supply management scheme is based on assumptions regarding the location of the salt front in the tidal Delaware River, which must stay downstream of river intakes for the water supplies of Philadelphia and southwestern New Jersey, and of surficial aquifers that intersect with the tidal river. Existing management programs recognize that the salt front is very sensitive to river flow, resulting in a meshwork of agreements regarding reservoir releases and reduced withdrawals during droughts. River flows are driven by base flows (i.e., ground water movement into streams, plus wastewater effluent discharges) plus reservoir releases. Sea level rise in this century will force a modification of all models and agreements, as saline waters push upstream. This single issue has the potential to force changes in policies and programs across the board, to offset the effects of sea level rise over time. The obvious change would be in reservoir releases and downstream consumptive water uses, but other changes could target maintenance and enhancement of base flows, especially to the extent that climate change might reduce base flows.

- **Clean Water Act Implementation:** While the Basin does not see severe water quality impairment in the major rivers along the lines of the 1960s and 1970s period, water quality standards are still being violated in many parts of the Basin, especially in tributaries throughout the suburban and exurban regions due to municipal stormwater systems and nonpoint source pollution. The Clean Water Act with its water pollution remedial requirements (the Total Maximum Daily Load program) is a major impetus behind the Chesapeake Bay Program collaboration and spending both in the bay area and the tributary rivers. While there may or may not be a strong driver for a mainstem Delaware River TMDL that would force major changes, there already are TMDLs for nutrients and bacteria in many tributary waters. Evolution of the MS4 permitting program in the Delaware River Basin could result in regulatory requirements to reduce pollution loads from stormwater and nonpoint source pollution.¹⁵ The Delaware River is largely the sum of its tributaries, and so improvement in the tributaries – certainly useful for local watershed conditions – will also improve the Delaware River and Bay.

Interview Respondent

SO THERE [ARE] DOZENS AND DOZENS OF MUNICIPALITIES IN THE UPPER DELAWARE WATERSHED THAT ARE NOT MEETING FEDERAL ENVIRONMENTAL REQUIREMENTS, OR STATE ENVIRONMENTAL REQUIREMENTS, SIMPLY BECAUSE THEY DON'T VIEW THEM AS IMPORTANT, NOR DO THEY HAVE THE MONEY TO MAKE IT HAPPEN.

In all three cases, part of the answer may be gray infrastructure (e.g., treatment plants, flood control structures, reservoirs), which is a typical response of an urbanized, mechanized society. However, there

¹⁴ New Jersey Department of Environmental Protection. 2020. New Jersey Scientific Report on Climate Change, Version 1.0. (Eds. R. Hill, M.M. Rutkowski, L.A. Lester, H. Genievich, N.A. Procopio). Trenton, NJ. 184 pp. Available from: <https://nj.gov/dep/climatechange/docs/nj-scientific-report-2020.pdf>.

¹⁵ Attention nationally is moving to this concept, resulting in increased expectations for expenditures to modify stormwater systems. See: Water Environment Federation. 2021. 2020 National Municipal Separate Storm Sewer System (MS4) Needs Assessment Survey Results. Available from: <https://stormwater.wef.org/2021/03/2020-ms4-survey-highlights-stormwater-funding-needs/>.

are limits to the effectiveness of gray infrastructure. Management of the land (e.g., preservation, restoration) can play a significant part in mitigating river base flow losses, water demands, water pollutant loads, and flooding, **if** the actions are effectively designed and coordinated at the watershed and basin level. Isolated actions lack scale and impact, and generally are useful only as educational tools. The equivalent of the river flow provided by one reservoir, or of the flood protection of a single mega-structure, or of the water quality benefits of a single wastewater treatment plant, may require the implementation of thousands of small-scale but coordinated projects in land preservation, ecosystem restoration and stream restoration. However, these many smaller projects will have local co-benefits that major structures cannot, and they can augment the benefits of major structures in a manner that can't be duplicated by gray infrastructure.

Federal and state attention to the Delaware River Basin is unlikely to ever match that shown to the Chesapeake Bay region, which is nearly five times larger, or to the Great Lake region, which is far larger yet. However, a concerted regional effort to understand and address these three major issues could result in a more robust collaboration of programs that draw additional attention and resources. Even a doubling of federal funding for the Delaware River Basin and the revival of the DRBC as a basin-wide convener of interests could, in turn, attract far more resources and attention from state and local governments, the non-governmental organizations, foundations and businesses.

While these broader, long-term issues are evolving, Basin interests should develop a collaborative approach to several federal funding sources that have recently become more relevant and sizable.

- **Great American Outdoors Act of 2020:** This new law fully funds the Land and Water Conservation Fund (LWCF) at \$900 million per year; this has long been the authorized amount but historically has been budgeted at roughly half that level. The LWCF funds a variety of conservation projects, including the Forest Legacy Program, federal land acquisition, grants to states for land acquisition, and the Outdoor Recreation Legacy Program (ORLP, funding outdoor spaces in cities of greater than 50,000 people).¹⁶ Our understanding is that the Great American Outdoors Act takes the LWCF out of the annual appropriations process, making the appropriations automatic.
Basin Focus: The revitalized LWCF provides a great opportunity to draw more federal funds into the region, and through the ORLP to deliberately improve regional equity through parks projects in cities that both improve recreational access and better protect water resources for under-served communities. A doubling of LWCF funds would be the minimum target.
- **National Water Quality Initiative, Source Water Protection:** The U.S. Department of Agriculture's Natural Resource Conservation Service (NRCS) implements the NWQI, which provides funding and technical assistance for on-farm conservation practices and water quality monitoring and assessment.¹⁷ In FFY2019, the NRCS expanded the scope of the NWQI to include source water protection projects for public water supplies (both ground and surface water), in response to the 2018 Farm Bill. Readiness (planning) projects identify and plan for

¹⁶ Appalachian Mountain Club. August 4, 2020. Great American Outdoors Act Signed Into Law, Fully Funding LWCF. Available from: <https://www.outdoors.org/articles/amc-outdoors/great-american-outdoors-act-signed-into-law-fully-funding-lwcf>

¹⁷ USDA NRCS. National Water Quality Initiative. Available from: <https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/water/?cid=stelprdb1047761>

implementation projects that will better protect these water supplies, in collaboration with the public water systems.¹⁸ The FFY2021 list of projects includes many in the major agricultural states, but also has projects in Connecticut (New Haven system) and Pennsylvania (Reading system in Berks County).

Basin Focus: A focused project in agricultural watersheds that feed public water supplies could be a valuable way of increasing federal investment in the Basin. The program requires local partners, often the utilities, to provide funds and technical support. New Jersey and Pennsylvania could explore approaches to protect the water intakes of the NJ Water Supply Authority (e.g., the Delaware and Raritan Canal), the NJ American Water Company (Delran intake), and the Philadelphia Water Department (Delaware River and Schuylkill River), using a collaborative approach funded through the utilities, state resources and other sources.

- **Stormwater Utilities:** Stormwater utilities are fee-based enterprise funds that focus on the operations, management, maintenance, repair, rehabilitation and upgrading of municipal stormwater systems, including both combined sewers and separate systems. Most stormwater utilities rely on fees that are based on the amount of impervious surface on each land parcel.¹⁹ Western Kentucky University identified more than 1700 stormwater utilities in 40 states and the District of Columbia as of 2019. Of the four Basin states, Delaware has three (Lewes, Newark and Wilmington), New York has one (Ithaca, outside of the Basin), and Pennsylvania has 27, including several municipalities within the Basin such as Allentown, Chester, Easton, Philadelphia. (New Jersey has now authorized the creation of stormwater utilities but none have been formed to date.) The stormwater utility funds may be used by municipal public works departments, utility authorities that also have other services (e.g., wastewater management), or stand-alone entities; creation of a new level of government is not necessary but is sometimes chosen. Biennial surveys by Black & Veatch have emphasized the importance of creating stormwater utilities only when a clear need is identified and popular support is sufficient to overcome the difficulties of program development and implementation.²⁰ Evidence from many existing stormwater utilities shows that a fee based on impervious surfaces is a more equitable funding approach for stormwater management than either property taxes or sewer fees.

Basin Focus: A collaborative effort could identify municipalities with extensive impervious cover that are more likely to face federal and state requirements for improved management of either municipal separate storm sewer systems (MS4s) or combined sewer systems, where a stormwater utility has not already been formed. An inter-municipal mentoring program could match these municipalities with other municipalities that already have stormwater utilities, as a way of providing peer-to-peer learning and assistance in understanding whether a fee-based stormwater utility will improve both system management and funding equity.

¹⁸ See: Murphy, John D., and Adam T. Carpenter. 2020. USDA Source Water Protection Funding: Successes and Opportunities. Journal AWWA. Available from: <https://doi.org/10.1002/awwa.1481>.

¹⁹ Western Kentucky University. Stormwater Utility Surveys. Available from: https://www.wku.edu/ce/stormwater_survey.php.

²⁰ Kumar, Prabha, Anna White and Brian Merrit. 2021 Stormwater Utility Survey Report. Black & Veatch Management Consulting. Available from: <https://www.bv.com/sites/default/files/2021-03/2021%20Stormwater%20Utility%20Report%20WEB%20FINAL.pdf>

Finally, continued development, dissemination and technical assistance regarding the use of basin-wide information on a broad range of water supply, water quality, flood and ecological issues can help build a sense of common interests within the Delaware River Basin. Even if different players focus on their local concerns, a perception of common interests and needs should in turn improve federal, state and local government attention and funding for the Basin.

Appendix A: Project Methodology

The project methodology was developed in consultation with William Penn Foundation staff and an expert panel as listed in the Acknowledgements section (page iii), which included members from governmental, non-governmental and academic entities. The project is focused primarily on acquisition, management and interpretation of project expenditure data using government funds, but also includes acquisition of projects that depend on other funding sources, often as match to government grants. The methodology also includes the interview process for expert practitioners, and a brief literature search.

The methodology for the database includes identification of project categories, funding sources and funding types (e.g., general revenue versus bonds). The database structure was developed to allow a sorting of analysis of data across these parameters and by year. Based on these initial steps, the project team sought data from the relevant governmental sources and also from non-governmental entities that make extensive use of government funds.

Geography

The project area is the entire Delaware River Basin (DRB) in the states of New York, Pennsylvania, New Jersey and Delaware. Using available geographic and demographic information, the project identified relevant jurisdictional boundaries (e.g., state, county, municipal) and watersheds (HUC12) to determine what jurisdictions are partially or entirely within the DRB and the various subwatersheds thereof, and to what extent. This information was linked to the database file through GIS intersection. Finally, demographic information (e.g., population, household incomes) was added to the database for each census tract in the DRB. The following data sources were used.

Step	Data Sources
1. Counties and Municipalities	DRBC: GIS shapefile including the Basin and jurisdictional boundaries
2. Subwatersheds	USGS Hydrologic Unit Code system and maps, https://pubs.usgs.gov/gip/hydrologic_units/index.html
3. Stream reaches	National Hydrography Dataset, https://www.usgs.gov/core-science-systems/ngp/national-hydrography/national-hydrography-dataset?qt-science_support_page_related_con=0#qt-science_support_page_related_con
4. Land use and land cover	Shippensburg University, Delaware High-Resolution Land Cover Dataset (https://drbproject.org/delaware-land-cover-dataset/) for all four states in the Basin NJ Land Use/Land Cover, 2015.
5. Demographics	U.S. Bureau of the Census: 2010 Census, American Community Survey (ACS).

Literature Search

A literature search was conducted across a variety of databases related to funding for projects related to watershed conservation, restoration, and resiliency, and background research on watershed management approaches. The primary purpose of the literature search was to identify similar compilations of regional expenditures for environmental purposes, and especially watershed management programs, that could provide lessons for the construction of a relational database and compilation of relevant data.

Searches of databases used include: PAIS Index, Westlaw Campus Research, Worldwide Political Science Abstracts, Google Scholar, and Rutgers Libraries search engine. Key words used to search across these

databases were: spending AND river, budget AND watershed, budget AND river, appropriations AND watershed, watershed funding, watershed restoration funding, spending AND watershed, spending AND rivers, spending AND watershed, land preservation, stream preservation funding, government capacity, and government environmental capacity.

Methods for searching spending (grey literature)—USA only

- Federal programs:
 - Chesapeake watershed (e.g. Chesapeake Progress, <https://www.chesapeakeprogress.com/?/funding>, and Chesapeake Bay Program Funding, https://www.chesapeakebay.net/who/funding_and_financing)
 - Great Lakes
 - Farm Bill conservation practices
 - Delaware River Basin Restoration Program (DRBRP) in U.S. Fish and Wildlife Service
- Other similar watershed management or source water protection examples
 - NYC’s Catskill/Delaware watersheds (filtration avoidance program)
 - Philadelphia: Schuylkill not much has been studied, but new Action Plan being developed per web site
 - Pennsylvania Land Trust Association analysis of municipalities with dedicated open space funding

Methods for searching spending (academic) —USA only

- What methods have academics used to research spending for... [potential search terms]
 - Budget/appropriations/spending/expenditures... and
 - Land acquisition/ conservation/preservation/stewardship
 - Land/ecosystem restoration
 - Biodiversity conservation
 - Watershed management
 - Water quality
- Analog searches: similar policy realms that include the initial investments (we capture this as spending to purchase land) plus monitoring, maintenance, or upgrades (we capture this as spending on restoration of degraded lands). NOTE: this component is secondary to the next section on policy, administration, etc.
 - Public health—who has written about how you can calculate the total spending being done to improve public health? This approach is more complex than estimating spending on land conservation within a specific geographic scope (e.g., a search on “new york city watershed protection”) but might provide some useful ideas.
 - Infrastructure—similar approach

Policy, administration, organizational studies, research on concepts

- Local organizational or agency capacity (including current staffing, wealth, and other indicators of what might be spent)
- Equity (household financial, demographic, ethnic/racial) in spending for public purposes (whether spending comes from government or private sources)
- Efficiency? Do only a simple search of academic research on this.

Conceptual bounds--academic

- How do people define what constitutes spending on a policy concern? Search for useful guidelines, not philosophical debates.
 - Distinguishing: Budgets, appropriations, spending (project implementation)
 - Budgets as expressions of values
 - How do people distinguish spending for operations (ongoing staff etc. budgets) from spending on projects (land purchases, etc.)
- Governance vs. government
 - Without getting into debates about the neoliberal state, identify any literature review articles about
 - Spending by fed agencies vs. matching sources
 - Federalism and conservation spending

Once literature was identified, copies were collected using Zotero reference management software (or EndNote). Further relevant literature was identified by examining bibliographic sections of previously collected literature. The general result of the literature search is that there are few scholarly or practitioner references that address similar compilations of regional expenditures. These and other references are included in [Appendix F: Bibliography](#).

Interviews and Surveys of Key Experts

The Rutgers team interviewed key experts from state agencies, local governments and the non-governmental sector who work within or lead programs that directly affect water resources in the Basin. Potential interviewees were identified by members of the expert panel, William Penn Foundation staff, and the Rutgers project team. The team selected candidates from this list, aiming to reach experts with knowledge of programs across the Basin, experts from agricultural and natural resources programs, and experts with experience across agencies at each level of government, nongovernmental organizations, and firms.

We sought the perceptions of experts familiar with one or more of the major programs that funds water quality improvements in the Delaware River Basin. Interviewees and survey respondents included government experts who implement federal and state water resource and agriculture programs, state government experts in agencies' environmental justice initiatives, experts working on private sector conservation projects, and leaders from regional and site-specific nongovernmental organizations. Each interview was conducted through conversations online due to pandemic restrictions, using a protocol approved through the Rutgers Institutional Review Board (IRB). [Appendix D](#) provides the questions used for the in-person interviews.

In addition, the expert panel answered the same questions using an online Qualtrics survey, again in accordance with an IRB-approved protocol. [Appendix E](#) provides the questions used for the Qualtrics survey.

Database Structure

The database structure was developed through an iterative process. Microsoft Access was selected as the database program platform, due to William Penn Foundation staff familiarity and common use of Access with ESRI GIS software. The initial structure was created using a combination of known fields that store and allow for search queries and relational database analysis, in support of the project. As

initial funding and project data were gathered, the database structure was modified to ensure that all critical information could be loaded and searched. The following steps were used in database structure development. The database was built to accommodate expenditure data from 2014 through 2020. Because fiscal years differ between federal, state and local governments, the database stores data using the last year of the fiscal year (e.g., Federal Fiscal Year 2018 is stored as 2018).

Step	Method	Comments
1. Data fields and definitions	Develop a full set of data fields that need to be part of the database, with field definitions	Base on the literature search, project needs and initial identification of funding sources and expenditure types and locations. Included: contact and organization information and identifiers; project information, identifiers and locations; funding organization; receiving/expending organization; project category; project funding sources and levels (current year and future year expenditures); jurisdiction; project watershed(s) and subwatershed(s); fiscal year and relationship to database year.
2. Database structure	Create database table structure	Structure must allow full database development and analysis methods. See chart below
3. Field linkages	Create linkages between relevant database fields	See chart below
4. Data queries and reports	Develop a full set of data queries, statistical analyses and report templates	Statistics by: year; project category; funding source type; funding government level (e.g., federal, state, county, municipal) and agency; receiving/expending organization category (e.g., government, non-profit, utility); and watershed location.
5. Beta testing	Test all aspects of the database for correct operation and GIS interoperability	Initial data sets from readily available sources. Trial and modification as needed.
6. Final testing	Address any issues from beta testing and finalize database structure and protocols	Trial and modification as needed. Iterative process as new data sets are acquired.

Figure A-1 provides the current database structure, showing the relationships between organizational descriptions, data request status, contact information, funding entity, project information and project funder.

To avoid double-counting (where multiple entities identify expenditure of the same funds), reports were analyzed to detect possible duplicate entries. An Access Query showing project name, type of project, location, amount, fiscal year, funding entity, and data source was generated and copied into Excel. Using the Conditional Formatting feature to highlight cells with duplicate values, projects with the same location, same funder, same funding amount, and same project type, but which data was provided by different data sources were identified and scrutinized to determine if they were duplicate data or complementary data. Duplicate records were deleted.

WPF Database Table Relationships_2021.03.30

Final

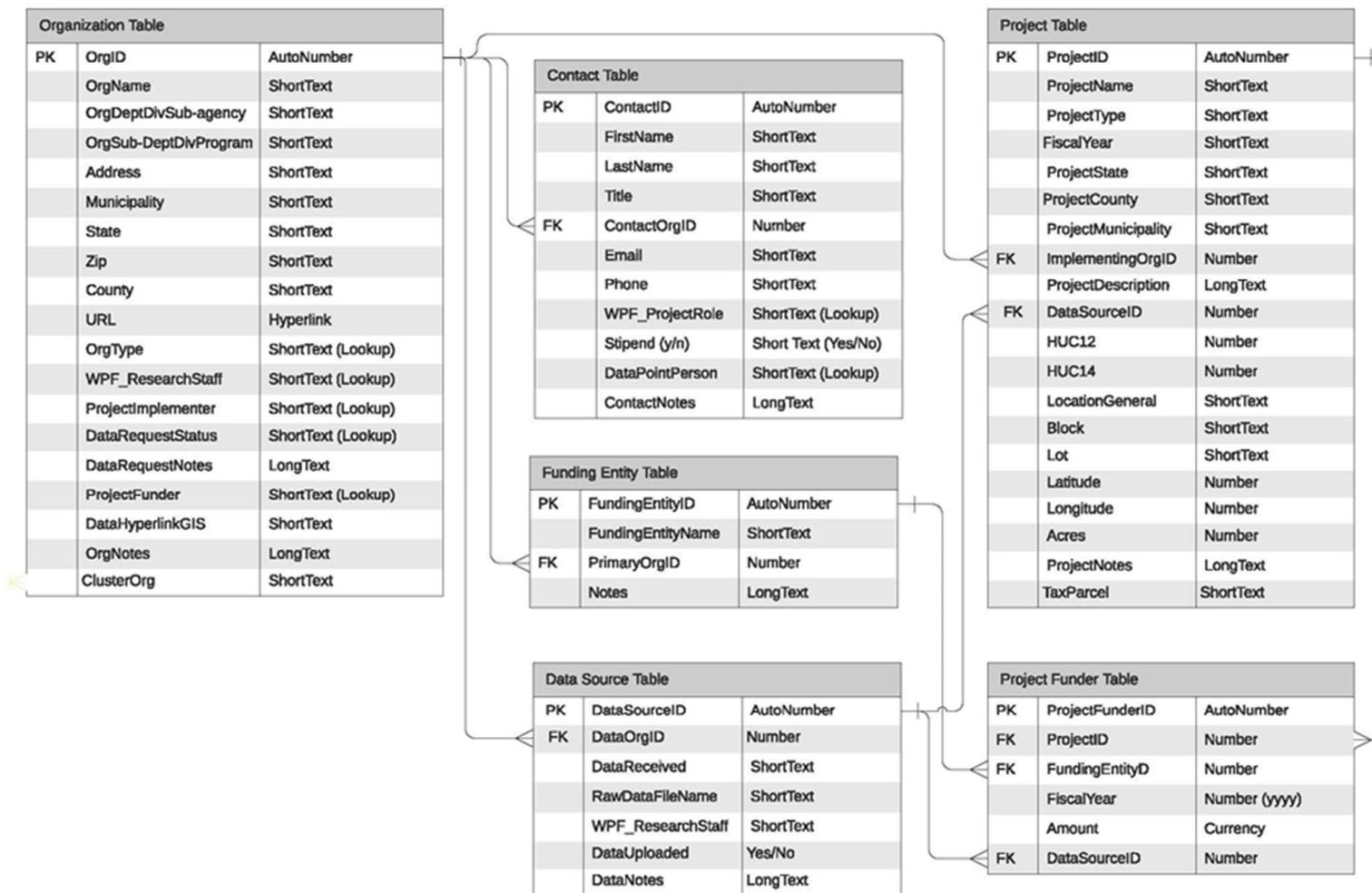


Figure A-1. Project Database Structure

Governmental Agencies Associated with Project Spending

The first step in data collection was identification of nearly 1,000 governmental entities that represent federal, state, regional, county and municipal levels located or with active programs partially or entirely within the Delaware River Basin, using a spreadsheet that incorporated available information on funding programs and sources (e.g., land preservation, best management practices, stream restoration) where a single governmental entity has more than one program. A 2016 University of Delaware report previously developed for the William Penn Foundation²¹ was used as one source of information on existing entities and programs. The spreadsheet includes contact information, request status, data availability (Yes/No) and data collection status. Initial inquiries to New Jersey agencies plus on-line search for all readily available data were used to test the process.

Government Funding Entities

The following entities represent the major categories of federal and state funding programs and associated agencies. A more complete discussion of federal agencies can be found in [Appendix C: Government Funding Agencies and Programs](#). Local government programs are primarily focused on land preservation; they may use grants from higher levels of government and from foundations and the non-profit sector to implement nonpoint source pollution control projects. There are nearly 900 counties and municipalities in the Basin, which were identified and contacted, but are not listed here for brevity. In addition, while non-governmental funding as a standalone funding source and as a matching source is mentioned by respondents to the survey or in interviews, it is not addressed here.

Federal Agencies	
Departments	Agency/Programs
Department of Agriculture (Note: for NRCS and FSA, identify WQ-focused Ag BMPs)	<ul style="list-style-type: none"> NRCS/FSA: Environmental Quality Incentives Program NRCS: Regional Conservation Partnership Program NRCS: Conservation Stewardship Program NRCS: Healthy Forests Reserve Program NRCS: Agricultural Conservation Easement Program US Forest Service: Land & Water Conservation Fund – Forest Legacy Program
Department of Interior	<ul style="list-style-type: none"> USF&WS: National Wildlife Refuge Program, Cooperative Endangered species fund, national coastal wetland conservation grant, Delaware Watershed Conservation Fund; Partners for Fish and Wildlife; Wildlife and Sportfish Restoration Funds; Resource Management base funds. National Park Service (NPS): Delaware Water Gap National Recreation Area; National Monuments; National Historic Parks; Wild & Scenic Rivers Program; LWCF State and Local Assistance Program Land & Water Conservation Fund – Cooperative Endangered Species Conservation Fund (“Section 6”), Highlands Conservation Act (HCA)
Environmental Protection Agency	<ul style="list-style-type: none"> State Grants in Aid for 319, 604b, Clean Water SRF (e.g., stream restoration, lake restoration, green stormwater infrastructure) Supplemental Environmental Projects (SEP) Natural Resource Damage (NRD) funds

²¹ Water Resource Center. 2016. Survey of Investment in the Delaware River Watershed (draft). University of Delaware on behalf of the William Penn Foundation.

Federal Agencies	
Departments	Agency/Programs
	<ul style="list-style-type: none"> National Estuary Program (Section 320 CWA); Delaware Estuary
Department of Defense	<ul style="list-style-type: none"> Army Corps of Engineers-Civil Division Department of the Army: Compatible Use Buffer (ACUB) Program
Department of Commerce: NOAA	Fisheries: Office of Habitat Conservation; Restoration Center
Department of Homeland Security	Federal Emergency Management Agency

State Agencies	
Delaware	Department of Agriculture: Aglands Preservation and Planning Department of Health and Social Services <ul style="list-style-type: none"> Division of Public Health, Office of Drinking Water Department of Natural Resources and Environmental Control: <ul style="list-style-type: none"> Division of State Parks Division of Climate, Coastal and Energy Division of Fish and Wildlife Division of Parks and Recreation Division of Water Division of Watershed Stewardship, Nonpoint Source Control Program DNREC/DHSS (Joint Program): Clean Water State Revolving Fund and Drinking Water Sate Revolving Loan Fund DELDOT - Transportation Alternative Program (stormwater management)
New Jersey	NJDEP Green Acres Program (Green Acres, Blue Acres) NJ State Ag Development Council (Farmland Preservation) NJDEP, Office of Natural Resources Restoration – NJDEP Division of Water Monitoring (319h NPS program) NJ Infrastructure Bank NJDOT - Transportation Alternative Program (stormwater management)
New York	Department of Environmental Conservation (e.g., Water Quality Improvement Program) Department of Health Department of Parks, Recreation & Historic Preservation NYSDOT - Transportation Alternative Program (stormwater management)
Pennsylvania	Department of Agriculture Department of Conservation and Natural Resources: <ul style="list-style-type: none"> Community Conservation Partnership Program Department of Environmental Protection Fish and Boat Commission Game Commission PENNVEST (PA Infrastructure Investment Authority) PADOT - Transportation Alternative Program (stormwater management)

Funding Categories

Governmental funding sources vary among governmental levels, agencies and programs. The specific programs generally use one typical funding source, such as these major funding categories. In some cases, funding sources for a program may shift over time, such as from bond funds to a dedicated tax or general revenue.

“Permanent” Revenue Sources	Temporary or Special Revenue Sources
General revenue (e.g., income tax, sales tax)	Bond acts and authorizations
Ad valorem property tax	Grants in aid (from higher level of government)
Enterprise funds (e.g., utility rate revenue)	Natural resource damages
Real estate transfer tax	Foundation grants
Excise taxes	Improvement district fees
Consumer demand-based revenue (e.g., permit fees, user fees, hotel taxes)	Time-limited revenues (i.e., authorized for specific number of years)

Project Identification

The primary objective of the project is a compilation of project expenditures by relevant implementing entities. Identifying funding budgets and obligations involved a top-down approach (i.e., contacting the governmental entities discussed under Funding Sources, above) and a bottom-up approach (i.e., identifying funding sources based on project reporting and grant match information by implementing entities, including non-government entities).

Some federal agencies do not directly implement projects, but rather provide funds through grants-in-aid to the states, which are then either directly used for state projects (e.g., land acquisition) or are passed through to other recipients (e.g., Section 319(h) grants, State Revolving Funds). Federal agencies also provide funds directly to landowners in some circumstances (e.g., NRCS/FSA Farm Bill programs). Federal agencies that operate public parks and wildlife refuges, on the other hand, will implement some acquisition and restoration projects directly while at other times providing grants to other entities (e.g., the National Park Service operates the Delaware Water Gap National Recreation Area but also provides funds to governmental entities and non-profit organizations to purchase lands). All the same government categories from [Government Funding Entities](#) were included as targets for project identification. (Note that ongoing operations of federal agencies, technical assistance programs, public education functions and such are not included in the database, as they are not land acquisition or water restoration projects.)

In addition, many non-profit organizations implement government-funded projects, and some water and sewer utilities may also. Regarding non-profit organizations, the Coalition for the Delaware River Watershed, the National Fish & Wildlife Foundation, the Open Space Institute, and the Delaware River Watershed Initiative organizations were the first points of contact. Online searches and networking were used to identify additional projects. [Appendix B: Potential Project Implementation Entities](#) has a more detailed listing of potential non-profit organizations, water utilities and universities that may implement projects that are funded by federal, state and local governments.

In each case, the initial contact was by email, with follow-up by email and telephone, and if necessary, a formal public information request. The emails followed the following general format.

Rutgers is working with the William Penn Foundation (WPF) to quantify annual government spending in the Delaware River Basin (DRB, see attached map) from 2014 through 2019 for open space and farmland preservation, stormwater management and stream restoration projects that protect and improve water quality (see attached listing of project types). Please note, the project does not include government expenditures for regulatory actions such as development review, compliance and enforcement, nor for developer efforts in response to permit requirements or enforcement actions.

We understand that your agency may fund or use pass-through grants for such efforts. If not, please let us know so that we can correct our information. If so, we request your assistance in providing available data for the 2014-2019 period, preferably as a digital spreadsheet, database, or GIS file. Let us know if there is a more appropriate point person for this information in your organization.

Specifically, we are interested in the following data for related activities in the DRB:

1. Government budgets (e.g., appropriations, obligations) and actual expenditures for each funding source
2. Government expenditures by project for each year, including geographic location (at least municipal level, preferably site level where allowed or feasible)
3. Where matching funds are used, the source (government and non-government) by project where available, or at least identification of any project partners outside of your agency who may have provided matching or supporting funds.

Please advise us of whether the requested information can be provided and a timeline. Our planned data acquisition period is through July.

Many thanks for your assistance and stay well!

One critical point is that the database was developed based on reported project expenditures, which are distinct from overall program funding (budgets). A good example is the Environmental Protection Agency, which provides funds to the region through Section 319(h) and National Estuary Program grants. Most of these funds flow through state agencies or NEP organizations (i.e., Partnership for the Delaware Estuary), which in turn may sub-grant funds to other entities for project implementation. This movement of funds through multiple levels (federal to grantee to sub-grantee or contractor) complicates the understanding of expenditures, potentially resulting in double-counting (where multiple entities identify expenditure of the same funds) or missing expenditures. The project team engaged in quality assurance to avoid double-counting, but in some cases, expenditures were not reported, resulting in an undercount of funding to the Basin. In some cases, the necessary documentation for this purpose was not available. Each agency or organization collects (or does not collect) information as appropriate to its own purposes. None of the data sets were developed with the intent of contributing to a regional compilation.

Data Acquisition

The data inquiry and collection process took place from April to September 2020, entirely overlapping with the SARS-CoV-2 pandemic. In a few cases, online data were available, but this was rare.

Where online data were not available, the “owners” of the data were contacted by email and/or telephone, wherever an appropriate contact point could be identified. Where necessary, formal requests were filed; some agencies have policies requiring that data will be released only upon receipt of a formal open public records request, which allows tracking of data responses. Such requests were rarely required. The larger problem was identifying the appropriate point of contact for data. There are

numerous cases (especially at the municipal level) where multiple inquiries resulted in no response, and so it is not known whether data exist.

In each case where a responsive contact was achieved, the database identifies where data were:

- **Determined to not exist.** The agency confirmed that they neither budgeted nor expended funds relevant to this project.
- **Determined to exist and provided.** Agency staff were able to access the necessary information for these inquiries.
- **Determined to exist but currently unavailable.** In some cases, the agency staff did not have full access to in-office computer systems and files, making it difficult or impossible to respond to the data requests. For those agencies with data access, in some cases the staff lacked sufficient time to compile and provide the data due to furloughs, shifts in work assignments, etc. Data also may exist in hard-copy storage, requiring physical access to file storage and significant time commitments for compilation.

Online and agency-provided data were reformatted and clarified as necessary to allow for loading in the database. No substantive information was changed, though the native data structure usually required modifications, and information needed to be added to fill the required fields for the database, such as project location, contact and organizational information, etc.

Data Evaluation

A variety of analyses were performed and provided using the database. The primary purpose of the project is to assess annual government expenditures as described above, including status and trends over the initial 2014-2019 period, and the extent to which available information allows or limits this assessment. The second purpose is to understand the expenditure patterns of these funds, by funding source, project sponsor and affected populations. In addition to the tabular results, narrative discussions will be provided, including maps where relevant. More detail is provided in the next section, [Assessment of Expenditure Patterns](#). This project report discusses data gaps and identifies methods for improving the database over time. Primary analyses include:

Step	Discussion
1. Data completeness, quality and weaknesses	Data identification and acquisition efforts will inevitably result in missing or incomplete information, especially regarding small municipalities and non-governmental organizations. The identification of expenditures by water and sewer utilities also was difficult. Data quality issues may include low-resolution locational information (e.g., municipality only, with no watershed referent), missing information on project partners or funding sources, missing budget information, etc.
2. Budget and expenditures by project category	Summation in tabular form. This analysis provides a basin-wide aggregation of budgets (or obligations, where necessary to differentiate budgeted funds by whether or not they are focused on the DRB) and expenditures.
3. Budget and expenditures by project category,	Summation in tabular form. This analysis breaks down the basin-wide aggregation by government level (e.g., federal, state, county and

Step	Discussion
government level, jurisdiction	municipal). Specific local jurisdictions are highlighted where they play a major or unusual role.
4. Budget and expenditures relative to watershed	Summation in tabular form. This analysis breaks down the basin-wide aggregation by watershed, to provide a geographic sense of expenditures. However, many project expenditures lacked sufficient geographic identification information.
5. Budget and expenditures relative to landowner category	Summation in tabular form. This analysis compares expenditures for land preservation and BMPs against the total amount of eligible lands in those categories, for the DRB as a whole, and by watershed for comparison to the Basin level.
6. Budget and expenditures relative to average household income, racial/ethnic geography	Equity indicator. Summation in tabular form. Comparison of expenditures by county against the average household income as an indicator of wealth, and racial/ethnic concentrations as a potential indicator.
7. Budget and expenditures relative to governmental fiscal capacity	Equity indicator. Summation in tabular form. Comparison of actual expenditures relative to an indicator of government fiscal capacity to fund projects.
8. Budget and expenditures relative to environmental benefit	Deferred due to methodology issues and the increased project effort required for data acquisition. The intent was to assess how funds related to environmental objectives.

Assessment of Expenditure Patterns

This report includes an assessment of how known expenditures reflect a variety of considerations, most important being equity. A primary question is how the term “equity” should be applied in the analysis. Rutgers evaluates how revenue sources, budget allocations and expenditures relate to the following factors.

- Governmental capacity
- Geographic and demographic equity
- Environmental and land use situation
- Environmental benefit

Governmental capacity

The question here is the extent to which governmental capacity affects the types of funding used for watershed projects, the level of expenditures and the types of projects. The [Literature Search](#) provided few thoughts on how to assess governmental capacity to support public functions in the environmental field. National discussions regarding affordability of water and sewer utilities provide some insights on governmental capacity²² and are reflected in this report. However, some simple metrics could be valuable either alone or in combination. The focus is on the level of available economic wealth from which a government can tap some portion for public purposes. The focus here is not on how much of that wealth a government decides to tap, which is affected by mandates and local priorities. For

²² A good discussion is available from: National Academy of Public Administration. 2017. Developing a New Framework for Community Affordability of Clean Water Services. Washington, DC. This report is available from: https://www.napawash.org/uploads/Academy_Studies/NAPA_EPA_FINAL_REPORT_110117.pdf

example, one wealthy community may decide to minimize general government services,²³ while a similar community may decide that additional expenditures (e.g., open space acquisitions) enhance the long-term value of the community. A less-wealthy community may also decide that additional expenditures (e.g., green infrastructure to control local flooding) are beneficial despite the more constrained availability of resources.

The Rutgers team did consider the possibility of assessing the concept of social capital as a partial measure of governmental capital, but no statewide or regional assessments of social capital are available, and deriving this information is not within the project budget or framework. However, we recognize that increased social capital does play a major role in the ability of governments to think through issues, identify solutions and marshal funds to implement the solutions.²⁴

Based on the considerations above, the following metrics were evaluated.

- **Aggregate annual household income of the jurisdiction:** This metric incorporates both population and household income. The concept here is that more total wealth provides more flexibility in raising and expending government revenues. Jurisdictions with few people, however wealthy, will likely spend most government revenue on mandatory programs such as schools, police and road maintenance, as they do not benefit from economies of scale. Those with many people can support a more diverse set of programs and needs, and those with more people and of higher income will have even more flexibility to fund needs beyond the mandatory programs. Again, whether they choose to increase the municipal expenditures budget is a separate issue, beyond the scope of this project.
- **Average annual household income of the jurisdiction:** Whether small or large, a jurisdiction with a low average household income will be more constrained regarding non-mandatory expenditures. Those with many households below the statewide 20th percentile income or poverty level will face large needs to mitigate threats to those households. It will be difficult to free funds for programs that are both non-mandatory and not directly aimed at mitigating the impacts of low incomes and poverty. In most Basin states, local governments do not rely heavily on income taxes, which are primarily a state tax.²⁵ Still, areas with higher average household incomes generally should be able to tolerate higher local property tax burdens.
- **Aggregate corporate income of the jurisdiction:** This metric addresses the wealth generated by business activity, some portion of which can be captured for government activities. Because corporate income taxes are usually reserved to the federal and state governments, this metric is not relevant to local governments.

²³ In this analysis, school costs are not included within municipal expenses, as in most areas elected school boards determine school taxation levels rather than municipal governing bodies.

²⁴ For example, see: Larson, Lincoln R., T. Bruce Lauber, David L. Kay, Bethany B. Cutts. 2017. Local Government Capacity to Respond to Environmental Change: Insights from Towns in New York State. *Environmental Management* (2017) 60:118–135. DOI 10.1007/s00267-017-0860-1

²⁵ A major exception is New York City. However, the Catskill/Delaware watershed management programs of interest for this study are funded with NYCDEP utility revenue from ratepayers.

- **Total ad valorem property tax assessments:** Municipal governments throughout the region rely heavily on a combination of property taxes and state aid. Therefore, understanding the total assessed property value provides a good metric for capacity to capture government revenue. Individual municipalities will differ in how much they tap that capacity (the property tax rate), but that is a matter of priorities, not capacity. However, it should be recognized that tax assessments do not necessarily reflect the ability of households to pay taxes. It is common in areas with aging populations to have households that are land-rich and cash-poor, until such time that these households shift to other housing or age out and are replaced by those with more balanced housing to income ratios. This metric would provide a sense of local residential wealth (as distinct from income). However, difficulties arise with differences among the states regarding assessment methods, online availability of comprehensive results, and whether the municipality's assessments are current. Unfortunately, while this information is available for New Jersey, similar information from the other states was not found.
- **Annual governmental revenue budget:** The total budget of a government has major effect on whether a jurisdiction will fund open space purchases and water resources restoration. However, this is a metric of actualized capacity, not inherent capacity. It reflects taxing and spending priorities, rather than the underlying capacity of a government to raise revenues. In addition, the total budget reflects grants in aid from higher levels of government, which are measures of the granting jurisdictions rather than the recipient government that adopts the budget. Therefore, this measure should only be used if it is feasible to identify the self-generated revenues for specific jurisdictions. Identifying jurisdictions that have been especially active, or inactive, in seeking discretionary grants may be another useful approach, given the increased use of competitive federal grants in recent decades. For funds from the federal level, there is no issue. State budgets directly distinguish state revenues from federal aid. The question will be whether local governments do likewise.

FINAL APPROACH: With a universe of only four state governments, each of which has major areas outside of the Basin, an analysis of state financial capacity was not deemed useful. For counties and municipalities, a relative ranking of capacity to generate government revenue uses the following three metrics:

- **Aggregate annual household income at the jurisdictional level.** This metric is most direct method of understanding local residential income. Note that it does not measure investment or savings assets, which would be beneficial to know but not feasible in this study. This information was drawn from U.S. Bureau of the Census information.
- **The percentage of households at or below the national poverty level.** This information is reported by the U.S. Bureau of the Census. As the national poverty level is a "one size fits all" national metric, use of the 20th percentile income level was preferred, but this metric is not reported by the U.S. Bureau of the Census, and is more difficult to derive from Census information. **Figure A-2** shows the Census results, with a map showing the Basin coverage.

Table A-1. Average Household Income, Total Household Income and Population Below National Poverty Levels, by County in the Delaware River Basin (Counties in bold are largely in the Basin)						
County	# of Households	Average HH Income	HHI Relative to Average of Basin Counties	County HH Income (million)	Population Below National Poverty Level	BIPOC Population
DELAWARE						
Kent	54,896	\$63,041	80.6%	\$3,461	13.0%	39.6%
New Castle	199,840	\$79,539	101.6%	\$15,895	10.1%	36.4%
Sussex	74,029	\$60,732	77.6%	\$4,496	12.6%	24.6%
NEW JERSEY						
Atlantic	100,096	\$66,404	84.9%	\$6,647	11.1%	44.0%
Burlington	163,961	\$95,028	121.4%	\$15,581	5.5%	33.4%
Camden	189,895	\$74,571	95.3%	\$14,161	10.7%	77.2%
Cape May	42,763	\$76,635	97.9%	\$3,277	8.8%	15.0%
Cumberland	50,237	\$64,370	82.3%	\$3,234	13.2%	54.6%
Gloucester	104,782	\$83,765	107.0%	\$8,777	7.7%	22.2%
Hunterdon	47,550	\$120,962	154.6%	\$5,752	3.6%	15.2%
Mercer	131,500	\$95,784	122.4%	\$12,596	12.8%	51.8%
Monmouth	234,582	\$109,907	140.4%	\$25,782	6.0%	24.9%
Morris	177,786	\$121,784	155.6%	\$21,651	5.5%	29.5%
Ocean	220,972	\$72,963	93.2%	\$16,123	9.0%	15.7%
Salem	24,898	\$69,308	88.6%	\$1,726	12.4%	26.6%
Sussex	54,881	\$96,527	123.3%	\$5,297	4.7%	14.9%
Warren	41,208	\$85,614	109.4%	\$3,528	6.8%	19.6%
NEW YORK						
Broome	78,549	\$69,491	88.8%	\$5,458	18.8%	17.3%
Delaware	18,968	\$63,417	81.0%	\$1,203	16.6%	8.2%
Greene	17,100	\$70,633	90.3%	\$1,208	14.0%	15.2%
Orange	124,627	\$80,178	102.5%	\$9,992	12.5%	37.3%
Sullivan	31,599	\$57,954	74.1%	\$1,831	16.0%	29.3%
Ulster	68,581	\$67,106	85.7%	\$4,602	11.9%	21.2%
PENNSYLVANIA						
Berks	155,329	\$65,824	84.1%	\$10,224	12.0%	29.7%
Bucks	227,393	\$91,799	117.3%	\$20,874	5.9%	16.7%
Carbon	25,135	\$57,312	73.2%	\$1,441	11.7%	9.0%
Chester	184,160	\$107,732	137.7%	\$19,840	6.4%	21.2%
Delaware	206,516	\$79,614	101.7%	\$16,442	10.0%	34.4%
Lackawanna	84,662	\$59,472	76.0%	\$5,035	14.7%	16.2%
Lancaster	194,028	\$65,390	83.6%	\$12,687	10.1%	18.7%
Lebanon	50,701	\$65,572	83.8%	\$3,325	10.8%	19.0%
Lehigh	133,421	\$66,769	85.3%	\$8,908	12.5%	37.5%
Luzerne	129,884	\$55,862	71.4%	\$7,256	14.7%	20.7%
Monroe	58,234	\$66,397	84.8%	\$3,867	11.2%	35.5%
Montgomery	308,233	\$99,641	127.3%	\$30,713	5.9%	25.0%
Northampton	111,706	\$72,010	92.0%	\$8,044	8.6%	24.6%
Philadelphia	575,413	\$49,307	63.0%	\$28,372	24.3%	65.7%
Pike	22,119	\$84,629	108.1%	\$1,872	9.5%	20.4%
Schuylkill	60,449	\$51,384	65.7%	\$3,106	12.4%	9.9%
Wayne	18,841	\$70,356	89.9%	\$1,326	11.4%	10.1%
Basin Counties	4,799,524	\$78,260		\$375,608		

The results are distributed as shown in **Figure A-3**.

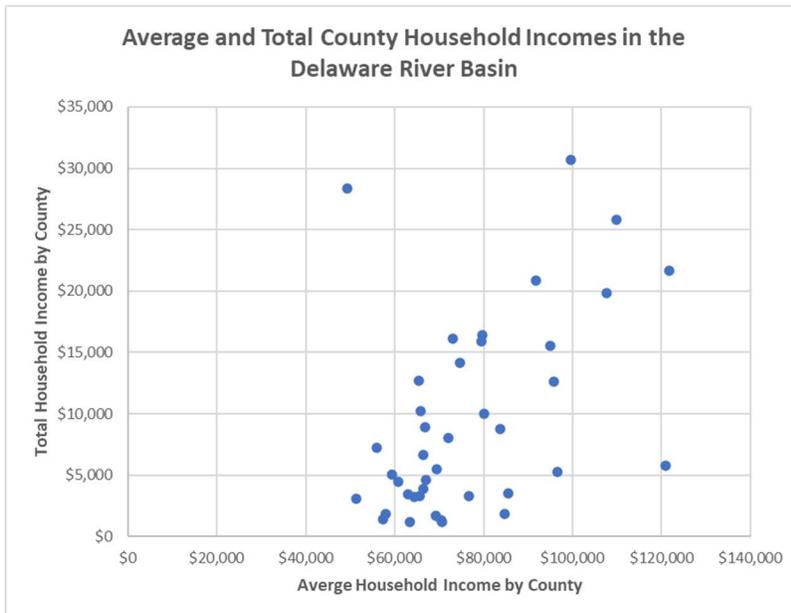


Figure A-3. Average and Total County Household Incomes in the Delaware River Basin

Geographic and demographic equity

Equity can be defined in many ways, including equity of process (freedom from bias or favoritism) and equity of results (Brasheer et al 2002; Sheppard et al., 1992). The latter can be applied going forward, so that new decisions are equitable, or it can be applied comprehensively to both the future and the results of the past, which can require redressing past inequities where the past has result in currently inequitable conditions. Programs that distribute funds widely, like farm and resource programs, are expected at least to have processes that are procedurally fair. Equity can be viewed program by program (e.g., source water protection), or relative to the overall impact of multiple programs within a category (e.g., protection of drinking water at the source, upon treatment and upon deliver to customers). Equity can be viewed based on a variety of social and demographic groups. In this case, the concept is applied to the equity of government decisions from the years 2014 through 2019. In addition, the differences in governmental capacity discussed in the prior section provide clear inference of the present expression of past inequities.

Equity can be evaluated in many ways. Are all small municipalities receiving the same types of assistance? Are areas with high concentrations of disadvantaged households or ethnic/racial groups receiving sufficient funds to elevate their efforts to achieve a more equal level of watershed services as wealthier areas? Are farmers in all major agricultural areas provided with equivalent funding relative to agricultural land area? The focus of these questions is related to the movement of funds from a higher jurisdiction to a lower, or from a jurisdiction to landowners, either directly or through non-governmental entities. A more comprehensive evaluation that includes historic inequities was beyond the scope of

this project, however. To assist in future evaluations, the [Interviews and Surveys of Key Experts](#) explored concepts of equity from multiple perspectives.

Based on the concepts discussed above, the following approaches were considered.

- **Distributional equity by jurisdiction:** How does the provision of federal and state grants and subsidies to local governments, and direct funding to non-governmental interests, differ by jurisdiction type (e.g., county and municipal government), jurisdiction government capacity (as discussed in [Government capacity](#)), and relative Basin location (i.e., headwaters versus estuary, or urban versus suburban or rural)? Here, the question is whether some local governments within the Basin receive more or less funding from the federal and state governments, compared to similar jurisdictions within a state or in other states that face similar environmental challenges or needs. Differences may reflect in part the ability of some jurisdictions to compete for competitive grants.
- **Distributional equity by household income:** The question here is simply whether wealthier jurisdictions receive more governmental funding per capita than poorer ones, or vice versa. The metric would be federal and state funding per capita compared to average household income. An alternative metric also would include local funding for the target purposes, to gain a sense of total government activity.
- **Distributional equity by racial/ethnic concentration:** The question here is whether jurisdictions with low minority populations (by percentage) receive more or less funding (e.g., open space, water quality improvement projects) than those with higher ratios. The metric would be federal and state funding per capita compared to percentage of minority populations.
- **Distributional equity by Basin watershed:** This metric would identify total expenditures per area for each major watershed of the Basin (e.g., Lehigh, Neversink, Paulinskill, Rancocas, Schuylkill). Normalizing the results using per area analyses is important to understanding how expenditures differ. This analysis could also evaluate expenditures per capita per area for each watershed. Finally, expenditures for land preservation and water quality restoration could be separately assessed.
- **Distributional equity by landowner category:** Government funds for the targeted purposes can preserve farmland or non-farm open space, and can restore water quality on public lands, other preserved lands, developed private lands, undeveloped private lands and farms (preserved or not). The metric here would be government expenditures in each category relative to the acres of available lands for that purpose.
 - Open space funding relative to total acres of unpreserved open space. This metric could be modified if it is possible to identify the areas of unpreserved open space that have significant values for watershed protection (e.g., core forests versus an undeveloped parcel in the middle of a major developed area).
 - Farmland preservation funding relative to total acres of unpreserved farmland. Again, this metric could be modified if it is possible to identify the areas of unpreserved farmland that have significant values for watershed protection (e.g., farm parcels with stream segments versus those without) or agricultural potential (e.g., soil quality).

- Water quality restoration funds relative to total acres of each land ownership category. This metric would be relevant to both preserved and unpreserved lands.

A potential constraint for this set of metrics is whether information is available on preserved open space and farmland in Delaware, Pennsylvania and New York State (see [Geography](#)). New Jersey routinely tracks preserved open space and farmland, both preserved (routine updates) and not preserved (roughly every five years).

FINAL APPROACH: The first four concepts have merit and can be implemented using available information. The selected approaches are:

- **Distributional equity by jurisdiction:** Federal and state funding per capita by county and municipal government jurisdiction, relative to jurisdiction government capacity (as discussed in [Government capacity](#)).
- **Distributional equity by household income:** Federal and state funding per capita by county and municipality, relative to average household income. Insufficient data are available to address equity at the municipal level or to add local government funding for relevant projects.
- **Distributional equity by poverty concentration:** Federal and state funding per capita compared to percentage of populations with income below the National Poverty Level by county.

While the “Distributional equity by landowner category” metric would be useful, its use is constrained regarding available data on land use/land cover and preservation status.

Environmental and land use situation

In this factor, the focus is on the extent to which funds are appropriately targeted (e.g., preservation funds to the highest value lands, based on criteria to be determined). A related question is the extent to which the expenditures achieve the highest benefit to cost (e.g., dollars per pound of pollutant loading removed). Existing tools developed through the DRWI or similar programs that are applicable to the Basin could be used. Data available and the identification of priority preservation and restoration areas are major needs for any evaluation. Some states have useful information. The NJ Department of Environmental Protection has GIS information on lands critical for threatened and endangered species (animal and plant), and the NJ State Agriculture Development Commission has mapped farmlands at various levels of state importance. The non-profit New Jersey Conservation Blueprint project (<https://www.njmap2.com/blueprint/>) is identifying high-priority lands for preservation. The NYS Department of Environmental Conservation has developed a GIS coverage of “New York State Natural Land Patches” (2020), defined as natural land areas greater than 100 acres in size (<http://gis.ny.gov/gisdata/inventories/details.cfm?DSID=1366>).

FINAL APPROACH: Deferred. There are major methodological and data acquisition issues that could not be addressed within the project schedule. Rutgers recommends discussions with the Academy of Natural Sciences, NFWF, NRCS and others on technical methods of assessing these issues. In addition, these analyses depend on intensive GIS analyses, which the pandemic rendered difficult, as Rutgers closed direct student access to GIS servers, drastically slowing GIS processing.

Other agencies in same geographic/topical space

Finally, Rutgers intended to evaluate whether agencies are “bunched” together, providing many services in some areas while other areas are not receiving significant service and benefits. The database captures both the governmental source of funds and the entity responsible for direct expenditures on land preservation and water quality restoration. The intent was analysis of project locations by geographic area, associated with funding and implementation entities. This analysis would provide for “hot spot” identification of watersheds where collections of entities are most active. The results would be used in combination with the earlier equity analyses to determine whether the hot spots could help address or deepen inequities. Again, insufficient project locational information was provided by many sources to effectively assess this issue. It remains an opportunity for future analysis.

Appendix B: Potential Project Implementation Entities Other than Federal and State Agencies

The following table lists non-governmental organizations and regional utilities that may implement relevant projects using governmental funds. The utilities listed have internal revenue that may be used for such projects, but also may receive financial grants and subsidized loans from state and federal governments for these purposes.

Table B-1: Potential Project Implementation Entities	
Entities	Data Sources/Comments
1. Non-profit organizations	Basin-wide or Major Portion: National Fish & Wildlife Foundation Open Space Institute Partnership for the Delaware Estuary (PDE) Trout Unlimited
	Delaware: Brandywine Conservancy Brandywine Red Clay Association Christina Conservancy Coalition for Natural Stream Valleys Delaware Audubon Society Delaware Nature Society Natural Lands (NL) Stroud Water Research Center (SWRC) The Nature Conservancy - Delaware Chapter
	New Jersey: American Littoral Society Association of New Jersey Environmental Commissions (ANJEC) Hunterdon Land Trust Musconetcong Watershed Association Natural Lands (NL) New Jersey Audubon Society (NJAS) New Jersey Conservation Foundation (NJCF) New Jersey Highlands Coalition North Jersey Resource Conservation & Development (RC&D) Pineland Preservation Association South Jersey Land and Water Trust The Land Conservancy of New Jersey The Nature Conservancy - New Jersey Chapter Wallkill River Watershed Management Group
	New York: Catskill Watershed Corporation Watershed Agricultural Council Catskill Center County SWCDs (Greene, Sullivan, Delaware, Ulster) Orange County Land Trust

Table B-1: Potential Project Implementation Entities	
Entities	Data Sources/Comments
	<p>Pennsylvania: (See also the WeConservePA web site that includes listings of land trusts and conservation collaborations by county, at https://weconservepa.org/groups/)</p> <p>Audubon Society - Pennsylvania (APA) Berks Nature (BN) Brodhead Watershed Association Delaware Highlands Conservancy Eastern Delaware County Stormwater Collaborative French & Pickering Creeks Conservation Trust Friends of Poquessing Watershed Friends of Upper Darby Creek Green Valleys Watershed Association Lower Merion Conservancy Natural Lands (NL) North Pocono Care Pennsylvania Environmental Council Pennypack Ecological Restoration Trust Philadelphia Resources Council Pinchot Institute for Conservation Poconos Heritage Land Trust (PHLT) Stroud Water Research Center (SWRC) The Nature Conservancy - Pennsylvania Chapter (TNC-PA) Tookany-Tacony-Frankford Watershed Association Wildlands Conservancy Wissahickon Valley Watershed Association</p>
2. Regional Utilities	<p>DE:</p> <p>NJ: NJ Water Supply Authority</p> <p>NY: NYC Department of Environmental Protection</p> <p>PA:</p>
3. University-based programs that directly implement relevant projects	<p>DE: University of Delaware</p> <p>NJ: Rutgers University</p> <p>NY:</p> <p>PA: Academy of Natural Sciences of Drexel University. East Stroudsburg University, Temple University. Villanova University</p>

Appendix C: Government Funding Agencies and Programs

Entities Providing Project Expenditure Data

The project expenditure database compiled for this report includes input from 59 entities, comprising five federal agencies (in some cases with multiple state or regional offices per agency), 15 state agencies, 23 counties and county soil conservation districts, 11 municipalities and five non-governmental organizations. These entities are listed in **Table C-1**.

Table C-1. Agencies and Organizations Provided Data Used in Project		
Primary Entity	Agency	Sub-agency or Program
FEDERAL GOVERNMENT		
US Department of Agriculture	Forest Service	Forest Legacy Program, Community Forestry Program
US Department of Agriculture	Natural Resources Conservation Service	Multiple Programs, including the Farmland Protection Program
US Department of Commerce	NOAA - Office for Coastal Management	Coastal Zone Management Program
US Army Corps of Engineers	Philadelphia District	Chester, Delaware, Montgomery Counties Regional Watershed Improvement Project
US Department of the Interior	US Fish & Wildlife Service	Endangered Species; National Coastal Wetland Conservation Grant
STATE GOVERNMENTS		
State of Delaware	Dept. of Agriculture	Aglands Preservation and Planning
State of Delaware	Dept. of Natural Resources and Environmental Control	Division of Parks and Recreation
State of Delaware	Dept. of Natural Resources and Environmental Control	Division of Watershed Stewardship
State of New Jersey	Dept. of Agriculture	Division of Agricultural and Natural Resources
State of New Jersey	Dept. of Agriculture, State Agriculture Development Committee (SADC)	Farmland Preservation
State of New Jersey	Dept. of Environmental Protection	Green Acres Program (Green Acres, Blue Acres)
State of New Jersey	Dept. of Environmental Protection	Office of Natural Resource Restoration
State of New Jersey	Dept. of Environmental Protection	Water Monitoring (319h NPS program)

Table C-1. Agencies and Organizations Provided Data Used in Project		
Primary Entity	Agency	Sub-agency or Program
State of New Jersey	NJ Infrastructure Bank	Environmental Infrastructure Trust
State of New York	Dept. of Environmental Conservation	Division of Water
State of New York	Dept. of Agriculture and Markets	
State of Pennsylvania	Dept. of Agriculture	
State of Pennsylvania	Dept. of Conservation and Natural Resources	State Parks Conservation and Natural Resources
State of Pennsylvania	PENNVEST	
State of Pennsylvania	Dept. of Environmental Protection	
COUNTY GOVERNMENT		
Berks County Conservation District		
Bucks County Conservation District		
Burlington County		
Cape May County		
Carbon County Conservation District		
Cumberland County		
Delaware County		
Delaware County Conservation District		
Hunterdon County		
Lebanon County Conservation District		
Lehigh County Conservation District		
Monmouth County		
Monroe County		
Monroe County Conservation District		
Montgomery County		
Morris County	Planning Department	
New Castle County		
Northampton County		

Table C-1. Agencies and Organizations Provided Data Used in Project		
Primary Entity	Agency	Sub-agency or Program
Northampton County Conservation District		
Ocean County		
Schoharie County Soil & Water Conservation District		
Schuylkill County		
Sussex County		
MUNICIPAL GOVERNMENTS		
Alexandria Township		
Village of Arden		
Centre Township		
East Pikeland Township		
Hamilton Township		
Londonderry Township		
Lower Alloways Creek Township		
Lower Gwynedd Township		
Media Borough		
New York City	Dept. of Environmental Protection	Bureau of Water Supply
City of Newark, DE		
NON-GOVERNMENTAL ORGANIZATIONS		
National Fish & Wildlife Foundation		
Partnership for the Delaware Estuary (PDE)		Drinking Water State Revolving Loan Fund
Schuylkill River Greenway Association		
Trust for Public Land (Newark)		
White Clay Watershed Association		

Federal and State Programs: Missing or Partial Project Expenditure Data

Unfortunately, various federal and state agencies provided only partial data or no data for many programs. In some cases, data were provided from entities other than the federal or state agency, indicating that such funds flow through that entity (e.g., a state agency using federal funds, a local government or non-governmental organization using federal or state funds). **Table C-2** provides an overview of the programs for which limited or no data were provided. The agencies or programs noted in bold font are those expected to represent the largest amounts of missing expenditures. The following section explores the extent of possible expenditures for federal agencies. For state programs, the ones shown in bold are based on similar programs in other states for which data were available, or funding identified through other preservation or restoration programs (e.g., as matching funds to land preservation projects).

Table C-2: Key Federal and State Funding Programs: Missing or Partial Project Expenditure Data (See Table C-1 for data received from other programs in the same agencies)		
Agency	Sub-agency	Program
US Department of Agriculture	Natural Resources Conservation Service (NRCS)	Various programs from State Offices in all four states
	US Forest Service	Cooperative Forestry Assistance and Forest Stewardship Program
US Department of Commerce	NOAA	NMFS Office of Habitat Conservation and Restoration Center
US Department of Homeland Security	FEMA	Region 2 and Region 3, various programs
US Department of Interior	National Park Service	Delaware Water Gap National Recreation Area land acquisition; Land and Water Conservation Fund (including the Forest Legacy Program); Wild and Scenic River program; Valley Forge National Historical Park
	US Fish & Wildlife Service	National Wildlife Refuge Program (Cherry Valley, John Heinz, Supawna, Cape May); Wildlife Restoration Program
US Environmental Protection Agency	Region 2 and Region 3 offices	Various programs, including Natural Resource Damage (NRD) funds

Table C-2: Key Federal and State Funding Programs: Missing or Partial Project Expenditure Data (See Table C-1 for data received from other programs in the same agencies)		
Agency	Sub-agency	Program
State of Delaware	Department of State	Division of Historical & Cultural Affairs
	Dept. of Agriculture	Forest Service Pesticide Management Nutrient Management
	Dept. of Natural Resources and Environmental Control	Division of Climate, Coastal and Energy; Division of Water ; Division of Fish & Wildlife; Division of Waste and Hazardous Substances
	Dept. of Transportation	
State of New Jersey	Dept. of Environmental Protection	Climate and Flood Resilience; Division of Fish and Wildlife; Site Remediation Program
State of New York	Dept. of Transportation	
	Dept of Parks, Recreation and Historic Preservation	
State of Pennsylvania	Dept. of Conservation and Natural Resources	Forestry; Bureau of Recreation and Conservation; ²⁶ Facility Design & Construction
	Dept of Environmental Protection	Environmental Stewardship Funds
	Fish & Boat Commission	
	Game Commission	

Federal Government Budgets and Allocations

Due to the ongoing pandemic and closure of offices, many federal agencies at the headquarters level (i.e., in Washington, DC) declined to or were not able to provide information on budgets, appropriations, allocations and commitments for the targeted program types. In some cases,

²⁶ Data from the Bureau were not provided on request but project data for 2015-2019 are available individually through a data portal (PA Bureau of Recreation and Conservation Grants Viewer, available at <https://palta.maps.arcgis.com/apps/webappviewer/index.html?id=ca77017d2f554989a74eec90dbf6c546>). The portal does not appear to support provision of the data through a table output.

regional or state-level offices did provide information, but the reporting was not comprehensive for the Delaware River Basin. Therefore, an internet search of federal agency budgets and funding commitments was conducted to help assess where major Basin expenditures may have been made but not reported to the Rutgers project team by any level of the relevant agencies.

Federal departmental or agency budget proposals to Congress generally include the President's proposal for the upcoming federal fiscal year and an overview of approved budgets for the prior two fiscal years. One of the major difficulties in using budget proposals is that they often provide too limited information to determine what funds are provided for operations (e.g., staff) versus state grants-in-aid versus competitive project funds. This problem was especially noteworthy for the Department of the Interior (which was also the only agency to post only one budget proposal, in that case FFY 2020), where the budget tables and supporting text were unclear on this point. At times, units or programs within the larger agency provided more detailed information, such as the U.S. Fish & Wildlife Service within the Department of the Interior. In some cases, sufficient information is available to know or estimate how much funding went to each state, but in no case was information localized enough to determine the Delaware River Basin share with any precision; only the Department of Agriculture information provided enough detail for a general estimate.

As a result, the information below provides the best information available but should not be considered complete.

Department of Agriculture

Nationally, the Department of Agriculture has more funding for implementation of watershed protection actions than any other federal entity. Little of this funding is for permanent land preservation. The vast majority is for agricultural best management practices on privately-owned farms, both through farming practices and the restoration of natural resource services such as wetlands and riparian buffers. The national funding and state shares are in the first table.

Of those funds, the large program is the Conservation Reserve Program (CRP) for protection and restoration of erodible and sensitive lands, wetlands and riparian areas. However, the CRP is recently a non-player in three of the four states comprising the Delaware River Basin. Delaware in FFY2020 had no acres newly signed up for CRP statewide, New Jersey had only 12 new acres, and New York had only 11 new acres, an indication that this program has little current viability in these states. (Prior years may have had signups that continued to receive funds into FFY2020.) Pennsylvania, on the other hand, had 1,296 acres newly signed up in FFY2020, all in riparian buffers, an indication that this program has a targeted focus in Pennsylvania; most of these acres are likely within the Susquehanna River Basin to protect the Chesapeake Bay, as part of the state's efforts to comply with Chesapeake Bay watershed management requirements.

The Regional Conservation Partnership Program has been increasing in recent years, to roughly \$300 million in FFY2021. According to the RCPP rules (7 CFR 1464, adopted 15 January 2021), "Through RCPP, NRCS seeks to co-invest with partners to implement projects that demonstrate innovative solutions to conservation challenges and provide measurable improvements and outcomes. RCPP projects may only be carried out on agricultural or nonindustrial private forest land or associated land on which NRCS determines an eligible activity would help achieve

conservation benefits.” The RCPP now includes authorities of “the Conservation Reserve Program (16 U.S.C. 3831–3835) and the Watershed Protection and Flood Prevention Program (Pub. L. 83–566), excluding the Watershed Rehabilitation Program, in the definition of ‘covered programs.’” The rule “expanded the purpose of RCPP to include protection of drinking water and ground water on eligible land.” Given the importance of drinking water protection in the Delaware River Basin, more attention should be given to the RCPP in coming years.

Table C-3: USDA National Program Budgets and State-level Expenditure Shares for DRB States							
USDA Agency and Programs	FFY 2014 (\$ Millions)	FFY 2015 (\$ Millions)	FFY 2016 (\$ Millions)	FFY 2017 (\$ Millions)	FFY 2018 (\$ Millions)	FFY 2019 (\$ Millions)	6-year % of National
FARM SERVICES AGENCY							
Grassroots Source Water Protection Program	6	6	7	7	7	7	
Conservation Reserve Program (w/ NRCS) • CRP (erodible & sensitive) • Wetlands • CREP (riparian)	1,732	1,808	1,821	1,882	1,953	2,086	
Emergency Forestry Conservation Reserve Program	0	3	6	5	2	2	
FOREST SERVICE							
Forest Legacy Program	Not mentioned in USDA budget documents						
NATURAL RESOURCES CONSERVATION SERVICE							
Environmental Quality Incentives Program	1,350	1,347	1,529	1,551	1,802	1,614	
• Delaware Commitments	7.68	7.702	9.862	10.382	8.751	8.867	0.58%
• New Jersey Commitments	7.03	6.243	7.272	7.299	7.980	7.509	0.47%
• New York Commitments	19.923	15.472	19.671	17.487	22.424	20.933	1.26%
• Pennsylvania Commitments	29.579	27.755	31.352	33.915	30.477	37.056	2.07%
Agricultural Conservation Easement Program	366	394	419	466	233	422	
Regional Conservation Partnership Program	96	93	93	93	93	281	
Conservation Security Program	125	28	5	5	0	0	
Conservation Stewardship Program	1,079	1,158	1,225	1,149	1,345	1,495	
• Delaware Commitments	1.323	1.511	1.769	1.982	1.866	1.870	0.14%
• New Jersey Commitments	0.404	0.592	0.485	0.603	0.620	0.735	0.05%
• New York Commitments	6.503	6.436	6.189	6.760	6.977	8.317	0.55%
• Pennsylvania Commitments	7.528	7.743	7.522	7.797	8.655	12.483	0.69%

The second table shows the state shares for the Environmental Quality Incentives Program (EQIP) and the Conservation Stewardship Program. For EQIP, the statewide totals amount to slightly more than 4 percent of national expenditures. Of that, only a portion of statewide funds would be spent in the Delaware River Basin. As a rough estimate, the table provides information on the percentage of statewide agricultural lands that are within the Basin (through a compilation of agricultural lands in the entirety of all counties that are mostly within the Basin), and then calculates the Basin share of national program funds by multiplying the percentage in the second column (from the first table for statewide allocations) by the percentage in the third column. The final column is in \$ millions, by multiplying the fourth column by the national program funding over the six years. While the analysis is not precise, **the result is an imputed annual DRB expenditure of nearly \$15 million per year for EQIP (\$89 million total over six years), primarily in Delaware and New Jersey, and \$2.5 million annually (a bit over \$15 million) for the Conservation Stewardship Program.** These are substantial expenses over a six-year period, though some portions of the funding may not be for purposes relevant to this report.

Table C-4: USDA Imputed Delaware River Basin Expenditures for EQIP and CSP				
	6-year % of National	% of State Ag Lands (Major Counties) in DRB	DRB as % of National Ag Lands	Imputed Annual DRB Expenditures (\$ Millions)
Environmental Quality Incentives Program				
• Delaware Commitments	0.58%	47.60%	0.28%	4.224
• New Jersey Commitments	0.47%	86.30%	0.41%	6.233
• New York Commitments	1.26%	2.90%	0.04%	0.560
• Pennsylvania Commitments	2.07%	12.20%	0.25%	3.866
TOTAL	4.38%		0.97%	14.88
Conservation Stewardship Program				
• Delaware Commitments	0.14%	47.60%	0.07%	0.819
• New Jersey Commitments	0.05%	86.30%	0.04%	0.495
• New York Commitments	0.55%	2.90%	0.02%	0.199
• Pennsylvania Commitments	0.69%	12.20%	0.08%	1.052
TOTAL	1.43%		0.21%	2.564

Program Explanations

The following information is excerpted from the FFY2019 USDA Budget.

FARM SERVICES AGENCY

Conservation Programs

Most of the conservation programs administered by FSA and NRCS (see NRCS section for further information) are funded through the CCC. These programs help farmers adopt and maintain conservation systems that protect water and air quality, reduce soil erosion, protect and enhance wildlife habitat and wetlands, conserve water, and sequester carbon.

Conservation Reserve Program (CRP)

The purpose of CRP is to assist farm owners and operators in conserving and improving soil, water, air, and wildlife resources by converting highly erodible and other environmentally sensitive acreage normally devoted to the production of agricultural commodities to a long-term resource conserving cover. CRP participants enroll in contracts for periods from 10 to 15 years in exchange for annual rental payments and cost-share and technical assistance for installing approved conservation practices. Amounts for CRP include financial and technical assistance. In addition to highly erodible cropland, CRP also can enroll cropland and marginal pastureland in areas adjacent to lakes and streams that are converted to buffers, and cropland that can serve as restored or constructed wetlands, cropland contributing to water quality problems, and cropland converted to valuable wildlife habitat. ... CRP enrolls land through general signups and continuous signups, including the Conservation Reserve Enhancement Program (CREP). CREP agreements are Federal/State partnerships designed to address specific environmental objectives. Under general signup provisions, producers compete nationally during specified enrollment periods for acceptance based on an environmental benefits index. Under continuous signup provisions, producers enroll specified high-environmental value lands such as wetlands, riparian buffers, and various types of habitat at any time during the year without competition. ... Among multiple environmental benefits, a key performance measure for CRP is the number of restored wetland acres. Restored wetlands and upland buffers increase prime wildlife habitat and water storage capacity, and lead to a net increase in wetland acres on agricultural land. Wetlands filter nutrients, recharge groundwater supplies, and sequester carbon.

NATURAL RESOURCES CONSERVATION SERVICE

Environmental Quality Incentives Program (EQIP)

EQIP provides assistance to landowners who face serious natural resource challenges (such as soil erosion, air quality, water quality and quantity, and the sustainability of fish and wildlife habitat) that impact soil, water and related natural resources, including grazing lands, wetlands, and wildlife habitat. EQIP will continue to be targeted to acres with the highest conservation benefit. The authority for EQIP's

Conservation Innovation Grant (CIG) program ends in 2018 and is subject to reauthorization in the next Farm Bill. In 2017, the CIG program focused on conservation finance; data analytics for natural resources; pay-for-success models to stimulate conservation adoption; precision conservation; water management technologies and approaches; and benefitting historically underserved farmers, ranchers and private forest landowners.

Agricultural Conservation Easement Program (ACEP)

ACEP has two components: agricultural land easements, under which NRCS assists eligible entities to protect agricultural land by limiting non-agricultural land uses; and wetland reserve easements, under which NRCS provides technical and financial assistance to landowners to restore, protect and enhance wetlands through the purchase of wetlands reserve easements. NRCS continues to maintain existing easements and contracts formed under the previous programs. ACEP's land easement component helps farmers and ranchers keep their land in agriculture while protecting grazing uses and related conservation values by conserving grassland, including rangeland, pastureland and shrubland. The wetland easement component supports habitat for fish and wildlife, including threatened and endangered species, reducing flooding, protecting biological diversity, and providing opportunities for educational, scientific and limited recreational activities. The program fosters public-private partnerships with landowners, Indian Tribes, State and local governments, and nongovernmental organizations through the use of cooperative agreements (agricultural land easements) and long-term easements or 30-year contracts (wetland easements).

Regional Conservation Partnership Program (RCPP)

Producers receive technical and financial assistance through RCPP while NRCS and its partners help producers install and maintain conservation activities. These projects may focus on water quality and quantity, soil erosion, wildlife habitat, drought mitigation, flood control, and other regional priorities. Partners include producer associations, State or local governments, Indian Tribes, non-governmental organizations, and institutions of higher education.

Conservation Stewardship Program (CSP)

CSP encourages participants to undertake new conservation activities in addition to maintaining and managing existing conservation activities. CSP operates under an annual limitation on new acres enrolled, and the 2014 Farm Bill extended the authority for CSP through 2018 with an annual enrollment cap of 10 million acres. CSP addresses natural resource concerns including soil quality, soil erosion, water quantity and quality, air quality, plant and animal resources, and energy efficiency.

Agricultural Acreage by State and County

USDA 2017 Census of Agriculture, <https://www.nass.usda.gov/Publications/AgCensus/2017/index.php#highlights>. Counties in bold are included in the totals for Major DRB Counties, by state.

Table C-5: Agricultural Acreage by State and Basin County			
Entity	Ag Acres	% of State Ag Acres	Comments
DELAWARE	525,324		Statewide Total
• Kent	182,396	34.7%	Delaware Bay drainage, less than half DRB
• New Castle	67,455	12.8%	Upper Delaware Bay drainage, mostly DRB
• Sussex			Delaware Bay drainage, mostly not DRB
DE Total, Major DRB Counties		47.6%	
NEW JERSEY	734,084		Statewide Total
• Atlantic			Almost no area in DRB
• Burlington	96,256	13.1%	More than half in DRB
• Camden	9,298	1.3%	Half in DRB
• Cape May			Delaware Bay drainage, over half
• Cumberland	66,256	9.0%	Delaware Bay drainage, almost entirely in DRB
• Gloucester	49,381	6.7%	Mostly in DRB
• Hunterdon	101,290	13.8%	One-third in DRB
• Mercer	25,230	3.4%	Half in DRB
• Monmouth	39,198	5.3%	Minimal area in DRB, but ag area
• Morris	14,514	2.0%	Limited area in DRB, but ag area
• Ocean			Minimal area in DRB
• Salem	98,239	13.4%	Delaware Bay drainage
• Sussex	59,766	8.1%	Half in DRB
• Warren	73,874	10.1%	Entirely in DRB
NJ Total, Major DRB Counties		86.3%	
NEW YORK	6,866,171		Statewide Total
• Broome			Minimal area in DRB
• Chenango			Almost no area in DRB

Table C-5: Agricultural Acreage by State and Basin County			
Entity	Ag Acres	% of State Ag Acres	Comments
• Delaware	140,225	2.0%	Mostly in DRB
• Greene			Minimal area in DRB
• Orange			Minimal area in DRB
• Schoharie			Almost no area in DRB
• Sullivan	59,942	0.9%	Mostly in DRB
• Ulster			Minimal area in DRB
NY Total, Major DRB Counties		2.9%	
PENNSYLVANIA	7,278,668		Statewide Total
• Berks	224,722	3.1%	Mostly in DRB
• Bucks	77,255	1.1%	Entirely in DRB
• Carbon	19,498	0.3%	Entirely in DRB
• Chester	150,514	2.1%	Mostly in DRB
• Delaware	2,385	0.0%	Entirely in DRB
• Lackawanna			Minimal area in DRB
• Lancaster			Almost no area in DRB
• Lebanon			Almost no area in DRB
• Lehigh	74,511	1.0%	Entirely in DRB
• Luzerne			Minimal area in DRB
• Monroe	27,607	0.4%	Entirely in DRB
• Montgomery	30,896	0.4%	Entirely in DRB
• Northampton	59,195	0.8%	Entirely in DRB
• Philadelphia	284	0.0%	Entirely in DRB
• Pike	24,700	0.3%	Entirely in DRB
• Schuylkill	96,886	1.3%	Half in DRB
• Wayne	100,696	1.4%	Mostly in DRB
PA Total, Major DRB Counties		12.2%	

Department of Commerce

The National Oceanographic and Atmospheric Administration (NOAA) is the primary agency in the Department of Commerce that funds environmental restoration projects. Coastal and Marine Habitat Restoration Grants of roughly \$4 million annually provide funding for projects. According to the NOAA website, “The Community-Based Restoration Program provides technical and financial assistance for habitat restoration projects that support our nation’s fisheries and lead to lasting benefits for communities and the environment.” These include dam removal projects. However, of those listed for FFY2017 through FFY2020, no projects are listed for the Delaware River Basin.

Department of the Interior

Unlike the Department of Agriculture, the Department of the Interior only provides final budget information online for two years (FFY2018 and FFY2019) as reported in the FFY2020 budget. Our assumption is that prior years are unlikely to have been lower, and so these two budget years can be useful for a rough analysis. Another difficulty is that each program has a different focal point (e.g., fish and game, endangered species, parks) so it is not feasible to identify a rough percentage of each program that would be provided to or spent in the four states or their Delaware River Basin portions. Finally, the Interior budgets are difficult to parse, as they include both operational and project implementation funds, and both dedicated (permanent authorization) and annual request funds, any or all of which may be provided to states through combined grants. No information on the Delaware Watershed Conservation Fund²⁷ was available online or in the FFY2020 Interior budget document. The National Coastal Wetlands Conservation Grant Program is apparently very small, having funded only \$51 million in projects nationally since 1990.²⁸

State-level allocations were identified for several programs, shown in the following table. Where grants are to states, the resulting project funds should be shown in the data from the states. USDOI does expend some funds directly on restoration projects and land acquisition, but the available information did not allow for these costs to be identified. In other cases, awards are competitive, and awards for FFY2014 through FFY 2019 show very few projects that may be related to the Delaware River Basin.

The following **Species Recovery Land Acquisition Grants** benefit threatened and endangered species protection and are or may be within the Delaware River Basin; the funds likely flowed through state agencies and should be identified as projects reported by those agencies:

- \$201,300: New Jersey Bog Turtle: Beaver Run (FFY18/19)
- \$2,019,000: Delaware Bayshore Land Acquisition for Red Knot Recovery (FFY17)
- \$250,000: Swamp Pink Recovery in Cumberland County (FFY17)
- \$75,000: Bog Turtle Recovery in Northern New Jersey, Project 1 (Sussex County – watershed not mentioned) (FFY15)
- \$375,000: Bog Turtle Recovery in Northern New Jersey, Project 2 (Sussex County – watershed not mentioned) (FFY15)

²⁷ The National Fish & Wildlife Foundation did provide data on the portion of the DRCF that they granted out for fiscal years 2018, 2019 and 2020.

²⁸ See National Coastal Wetlands Conservation Grant Program at <https://www.fws.gov/northeast/wsfr/grant-programs/coastal-wetlands.html>

In addition, Pennsylvania received a \$675,000 planning grant in FFY2014 to study the effects on two bat species of forest management practices on state lands. However, this grant did not acquire land or directly implement any water restoration projects.

The following **North America Wetlands Conservation** grants benefit wetlands conservation and restoration and are or may be within the Delaware River Basin; these funds likely flowed through state agencies and should be identified as projects reported by those agencies:

- \$100,000: Acquisition of Thompson/Wright Property in the Atlantic Coast – Pine Barrens (watershed not mentioned) (FFY18/FFY19)
- \$67,334: New York Highlands Wetlands Project (watershed not mentioned) (FFY16/FFY17)
- \$1,000,000: Delaware’s Declining Wetland Habitats (watershed not mentioned) (FFY14/FFY15)
- \$66,427: Paulinskill Wetland Restoration (NJ) (FFY14/FFY15)

As can be seen from the following table, the largest national program is the Federal Aid in Wildlife Restoration (\$729 million in FFY2019) and then Sport Fish Restoration (\$370 million in FFY2019). Both include operational and management funds for state agencies; restoration projects should be documented by the state agencies but were not available from USF&WS.

Table C-6: USDOJ National Program Budgets and State-level Expenditure Shares for DRB States						
USDOJ Agency and Programs	FFY 2014 (\$ Millions)	FFY 2015 (\$ Millions)	FFY 2016 (\$ Millions)	FFY 2017 (\$ Millions)	FFY 2018 (\$ Millions)	FFY 2019 (\$ Millions)
FISH & WILDLIFE SERVICE						
Cooperative Endangered Species Conservation Program						
• HCP Land Acquisition Grants to States					19.638	19.638
• Recovery Land Acquisition Grants					11.162	11.162
Delaware Watershed Conservation Fund	Implemented through allocations through the National Fish & Wildlife Foundation					
Federal Aid in Wildlife Restoration Total						729.337
• Delaware Commitments	3.113	3.318	2.823	3.146	3.186	2.686
• New Jersey Commitments	3.113	3.318	2.823	3.146	3.186	2.686
• New York Commitments	16.394	16.489	13.785	15.822	16.062	13.380
• Pennsylvania Commitments	23.829	25.193	21.031	23.395	23.357	19.470
Land Acquisition (NWR)					36.601	36.601
Highlands Conservation Act Total	0	3.000	9.680	9.680	9.680	10.695
• New Jersey Commitments	0	0.750	2.420	2.420	4.675	2.565
• New York Commitments	0	0.750	2.420	2.420	1.460	2.710
• Pennsylvania Commitments	0	0.750	2.420	2.420	1.460	2.710

Table C-6: USDOJ National Program Budgets and State-level Expenditure Shares for DRB States						
USDOJ Agency and Programs	FFY 2014 (\$ Millions)	FFY 2015 (\$ Millions)	FFY 2016 (\$ Millions)	FFY 2017 (\$ Millions)	FFY 2018 (\$ Millions)	FFY 2019 (\$ Millions)
Migratory Bird Conservation Account	Not Listed		93.902		85.399	79.601
National Coastal Wetland Conservation						
North America Wetlands Conservation					40	40
Partners for Fish and Wildlife Program						
Sport Fish Restoration	325.740	346.517	361.077	349.443	351.917	370.397
• Delaware Commitments	3.257	3.465	3.611	3.494	3.519	3.704
• New Jersey Commitments	3.257	3.465	3.611	3.494	3.519	3.704
• New York Commitments	7.928	8.090	8.173	7.790	7.820	8.132
• Pennsylvania Commitments	7.756	8.432	8.716	8.466	8.572	9.011
State and Tribal Wildlife Grants Total	47.878	45.995	49.727	50.073	50.814	52.029
• Delaware Commitments	0.479	0.460	0.497	0.501	0.508	0.520
• New Jersey Commitments	0.923	0.887	0.959	0.966	0.980	1.003
• New York Commitments	2.192	2.106	2.277	2.293	2.327	2.382
• Pennsylvania Commitments	1.502	1.443	1.560	1.570	1.594	1.632
NATIONAL PARK SERVICE						
Federal Land Acquisition Projects	~190	NA	NA	NA	26.4	26.4
State Conservation Grant Total	43.39	42.79	94.93	NA	120	120
• Delaware Commitments	0.416	0.410	0.910	NA	NA	NA
• New Jersey Commitments	1.130	1.114	2.476	NA	NA	NA
• New York Commitments	2.013	1.985	4.413	NA	NA	NA
• Pennsylvania Commitments	1.377	1.358	3.018	NA	NA	NA

Program Explanations

Some of the following information is derived from the FFY2020 USDO I Budget, the only budget available online from USDO I. In some cases, the only explanation provided is in the negative, for programs recommended for discontinuation (e.g., the Cooperative Endangered Species Conservation Program). Where the budget does not explain a program, information from the USDO I web site is used.

FISH & WILDLIFE SERVICE

Cooperative Endangered Species Conservation Program

The FFY2020 budget called for discontinuation of this program, focused on land acquisition. A variety of tools are available under the Endangered Species Act (ESA) to help states and landowners plan and implement projects to conserve species. The Cooperative Endangered Species Conservation Fund (section 6 of the ESA) is a tool that provides grants to states and territories to participate in a wide array of voluntary conservation projects for candidate, proposed, and listed species. The program provides funding to states and territories for species and habitat conservation actions on non-federal lands. States and territories must contribute a minimum non-federal match of 25 percent of the estimated program costs of approved projects, or 10 percent when two or more states or territories implement a joint project. A state or territory must currently have, or enter into, a cooperative agreement with the Secretary of the Interior to receive grants. Most states and territories have entered into these agreements for both plant and animal species.

The program includes several sub-programs including **Habitat Conservation Program (HCP) Land Acquisition Grants to States** and the **Species Recovery Land Acquisition Grants**, which are for the purpose of implementing Habitat Conservation Plans for federally threatened and endangered species through federal cost-sharing (25%). The HCP Land Acquisition Grants Program provides funding to states and territories for land acquisitions that are associated with approved HCPs. HCP Land Acquisition program has three primary purposes: 1) to fund land acquisitions that complement private mitigation responsibilities contained in HCPs, 2) to fund land acquisitions that have important benefits for listed, proposed and candidate species, and 3) to fund land acquisitions that have important benefits for ecosystems that support listed, proposed and candidate species. The Recovery Land Acquisition Grants Program provides funding to states and territories for acquisitions of habitats that support approved Endangered and Threatened Species Recovery Plans.

Delaware Watershed Conservation Fund

In August 2018, the National Fish and Wildlife Foundation launched the Delaware Watershed Conservation Fund in partnership with the U.S. Fish and Wildlife Service. The fund represents the first step in implementing a strategy developed by partners with guidance from the Service to focus conservation in four key areas: clean water, habitat, recreation, and flow management. The program prioritizes projects that address needs for listed and at-risk species, or NFWF business plan priority species.

Land Acquisition (NWR)

FWS will focus on completing enacted acquisitions and acquiring inholdings that enhance operational efficiency. [In other words, for acquiring lands within the boundaries of existing National Wildlife Refuges.]

Highlands Conservation Act

When Congress appropriates funding under the Highlands Conservation Act (HCA), the U.S. Fish and Wildlife Service manages a process to award grant money to state agencies for projects within the Highlands region. The states in partnership with local governments, conservation organizations, and private landowners propose land conservation projects that have met grant criteria and eligibility requirements.

The U.S. Fish and Wildlife Service then consults with the U.S. Forest Service to determine the eligibility of the proposals and ranks proposals for the portion of the funding that is distributed competitively. The grants awarded are administered by the U.S. Fish and Wildlife Service's Wildlife and Sport Fish Restoration Program.

The yearly HCA funding appropriation is divided into two separate categories – Base and Competitive. Any appropriation up to \$2 million is designated as Base funding. The \$2 million minimum of base funding takes into consideration the importance of consistency in funding for states to stay active in land acquisition through the HCA and ensures efficient program administration. All appropriated funding over \$2 million is divided evenly among Base and competitive categories (i.e., \$0.50 of every dollar appropriated over \$2 million will go to base funding and the other \$0.50 will go to competitive).

Migratory Bird Conservation Account

Funding leverages support from partners to protect African and Asian elephants, rhinos, tigers, great apes, and marine turtles from threats including those linked to illegal wildlife trafficking. These grants complement efforts in the FWS law enforcement program.

National Coastal Wetland Conservation

The National Coastal Wetlands Conservation Grant Program annually provides grants of up to \$1 million to coastal and Great Lakes states, as well as U.S. territories to protect, restore and enhance coastal wetland ecosystems and associated uplands. The grants are funded through the Sport Fish Restoration and Boating Trust Fund, which is supported by excise taxes on fishing equipment and motorboat fuel.

North America Wetlands Conservation

Funding continues these cost-shared partnership projects for wetlands and waterfowl conservation supporting conservation and outdoor recreation.

Partners for Fish and Wildlife Program

The Partners for Fish and Wildlife Program provides technical and financial assistance to landowners interested in restoring and enhancing wildlife habitat on their land. Projects are custom-designed to meet landowners' needs. Since the program's start in 1987, some 50,000 landowners have worked with Partners staff to complete 60,000 habitat restoration projects on 6 million acres. Partners projects are voluntary. Participating landowners continue to own and manage their land to serve their needs while they improve conditions for wildlife.

Sport Fish Restoration

The Sport Fish Restoration Program (SFR) provides grant funds to the states, the District of Columbia and insular areas fish and wildlife agencies for fishery projects, boating access and aquatic education. The Program is authorized by the Sport Fish Restoration Act (Dingell-Johnson DJ) of 1950. The SFR Program was created to restore and better manage America's declining fishery resources and was modeled after the successful Wildlife Restoration Program. Through the purchases of fishing equipment, motorboat and small engine fuels and import duties the SFR Program is one of the most successful user pay, user benefit programs.

State and Tribal Wildlife Grants

The State Wildlife Grant (SWG) Program provides Federal grant funds to State fish and wildlife agencies for developing and implementing programs that benefit wildlife and their habitats, including species that are not hunted or fished. Grant funds may be used to address a variety of conservation needs--such as research, fish and wildlife surveys, species restoration, habitat management, and monitoring—that are identified within a State's Wildlife Action Plan. These funds may also be used to update, revise, or modify a State's Plan. Grant funds are disbursed to States for approved grants at a maximum Federal share of 75% for planning grants and 65% for Plan implementation grants. Congress also allocates a portion of appropriated funds to the Competitive SWG Program.

Identified and described in the Wildlife Action Plans, "species of greatest conservation need" include many species experiencing significant population declines. Threats to these species are described in the Plans, including such factors as habitat loss and fragmentation, competition from non-native species, and stressors related to climate change. The Plans identify these species' habitats, as well as actions needed to restore and maintain viable populations of these species. The Plans also outline the methods to be used to monitor species populations and to measure the effectiveness of States' conservation actions, enabling grantees and their partners to utilize an adaptive management approach to conservation of these priority species.

Federal Aid in Wildlife Restoration

The Wildlife Restoration Act (WR), commonly referred to as the Pittman-Robertson (PR) Act, was sponsored by Senator Key Pittman of Nevada and Representative Willis Robertson of Virginia. The legislation was a cooperation between states, Federal Government, conservation groups

and the sporting arms industry. The legislation was drafted by Carl Shoemaker and was passed in 1937. The Wildlife Restoration Act provides grant funds to states, the District of Columbia and insular areas that have passed assent legislation. This means state legislation must be in effect and remain in effect restricting the use of revenue from license fees for use only by fish and wildlife agency. This Act later became the model for the Sport Fish Restoration Act. The WR Act authorizes annual distributions from the Wildlife Restoration Account for the following:

- Administration of the Wildlife Restoration Program
- Multistate Conservation Grant Program
- Hunter Education Enhancements - Section 10 apportionments
- Hunter Education - Section 4 (c) (1/2 taxes collected on pistols, revolvers, bows, arrows and archer accessories) apportionments
- Remaining Funds in Wildlife Restoration Account are apportioned to states/DC/insular areas
- Reversions in the WR Account are transferred to Migratory Birds.

NATIONAL PARK SERVICE

Land and Water Conservation Fund

The Land and Water Conservation Fund was established by Congress in 1964 to fulfill a bipartisan commitment to safeguard our natural areas, water resources and cultural heritage, and to provide recreation opportunities to all Americans. Using zero taxpayer dollars, the fund invests earnings from offshore oil and gas leasing to help strengthen communities, preserve our history and protect our national endowment of lands and waters. The LWCF program can be divided into the "State Side" which provides grants to State and local governments, and the "Federal Side" which is used to acquire lands, waters, and interests therein necessary to achieve the natural, cultural, wildlife, and recreation management objectives of federal land management agencies. In the USDOl budget, appropriations for these are shown as:

- **Federal Land Acquisition Projects:** The Federal portion of the Land and Water Conservation Fund is used to acquire lands, waters, and interests therein necessary to achieve the natural, cultural, wildlife, and recreation management objectives of the National Park Service. The NPS web site for this program was last updated in January 2016.
- **State Conservation Grants:** The State Side of the LWCF provides matching grants to States and local governments for the acquisition and development of public outdoor recreation areas and facilities. Seventy-five percent of the total funds obligated have gone to locally sponsored projects to provide close-to-home recreation opportunities that are readily accessible to America's youth, adults, senior citizens and the physically or mentally challenged.

The Land and Water Conservation Fund (LWCF) is intended to create and maintain a nationwide legacy of high quality recreation areas and facilities and to stimulate non-federal investments in the protection and maintenance of recreation resources across the United States. Initially authorized for a 25-year period, the LWCF was extended for another 25 years and expired September 30, 2015. The fund was temporarily

extended for 3 years in the Consolidated Appropriations Act, 2016, and expired September 30, 2018. On March 12, 2019, the Land and Water Conservation Fund was permanently reauthorized.

Environmental Protection Agency

USEPA is primarily a regulatory agency and much of the grant funding it has available is provided to states either for operational purposes (e.g., implementation of delegated permit programs and associated monitoring networks) or to provide capital funds for the Drinking Water and Clean Water State Revolving Funds. A portion of funding for the National Estuary Program may be used for restoration purposes, but most is used to maintain the planning, educational and research programs of NEP agencies. The Drinking Water SRF is not used for purposes relevant to this project. Historically, only a very small portion of the Clean Water SRF has been used for relevant restoration projects, such as stream and lake restoration and green stormwater infrastructure. Of the USEPA funding, only the Section 319 Nonpoint Source Control grants are largely focused on restoration projects.

The following table shows the budgets for these programs and the statewide allocations for Section 319 and the Clean Water SRF. Only a portion of these funds would be spent within the Delaware River Basin, and as mentioned, only a small percentage of the largest program, the Clean Water SRF, would be spent on restoration projects relevant to this analysis.

Table C-7: USEPA National Program Budgets and State-level Expenditure Shares for DRB States							
USEPA Programs	FFY 2014 (\$ Millions)	FFY 2015 (\$ Millions)	FFY 2016 (\$ Millions)	FFY 2017 (\$ Millions)	FFY 2018 (\$ Millions)	FFY 2019 (\$ Millions)	6-year Avg (\$ Millions) and % of National
National Estuary Program		27.529	25.862	26.759	25.187	26.723	26.412
• Delaware Estuary Program	0.552	0.588	0.629	0.620	0.600	0.655	
Section 319 NPS Grants	159.252	165.686	166.177	169.771	167.592	170.915	166.566
• Delaware Commitments	1.147	1.193	1.196	1.222	1.207	1.231	0.72%
• New Jersey Commitments	2.660	2.767	2.775	2.835	2.799	2.854	1.67%
• New York Commitments	5.415	5.633	5.650	5.772	5.698	5.811	3.40%
• Pennsylvania Commitments	4.698	4.888	4.902	5.008	4.944	5.042	2.95%
SRF Clean Water (mostly sewer systems)	1448.887	1438.247	1350.884	1380.739	1657.428	1693.887	1495.012
• Delaware Commitments	6.953	6.917	6.625	7.256	7.959	8.144	0.49%
• New Jersey Commitments	57.88	57.578	55.150	54.726	66.333	67.794	4.01%
• New York Commitments	156.313	155.520	150.360	147.822	178.948	183.120	10.84%
• Pennsylvania Commitments	53.539	55.813	53.962	53.048	64.221	65.716	3.86%

Program Explanations

National Estuary Program (from USEPA Budgets)

The program works to restore the physical, chemical, and biological integrity of estuaries and coastal watersheds. EPA will encourage states to continue this work and continue to implement conservation management plans.

Section 319 NPS Grants (from USEPA Budgets)

This program provides grants to assist states and tribes in implementing approved elements of Nonpoint Source Programs including: regulatory and non-regulatory programs, technical assistance, financial assistance, education, training, technology transfers, and demonstration projects. The Agency will continue to coordinate with the United States Department of Agriculture to target funding where appropriate to address nonpoint sources.

SRF Clean Water (from USEPA web site)

The CWSRF was created by the 1987 amendments to the Clean Water Act (CWA) as a financial assistance program for a wide range of water infrastructure projects, under 33 U.S. Code §1383. The program is a powerful partnership between EPA and the states that replaced EPA's Construction Grants program. States have the flexibility to fund a range of projects that address their highest priority water quality needs. The program was amended in 2014 by the Water Resources Reform and Development Act.

Using a combination of federal and state funds, state CWSRF programs provide loans to eligible recipients to:

- construct municipal wastewater facilities,
- control nonpoint sources of pollution,
- build decentralized wastewater treatment systems,
- create green infrastructure projects,
- protect estuaries, and
- fund other water quality projects.

Appendix D: In Person Interview Questions

This appendix provides the interview script used for in-person interviews conducted by Karen O'Neill, PhD, Associate Professor, Rutgers.

Interview questions for experts in government funding for conservation

[NOTE: Each interviewee will be asked only some of the following questions, depending on their knowledge.]

[NOTE: Interviews will be done by phone or video call. Before the interview, interviewees will receive by email the full text of the oral consent section, including contact information for the research team and the IRB staff. This information will be restated in the interview.]

Thank you for talking with me about conservation and restoration to improve water quality.

Before I ask you questions, I am going to review information about consent, which we sent to you by email.

I expect this interview will take between 20 minutes to an hour. Your participation is entirely voluntary. You may end the interview at any time or refuse to answer any question. If you decide to quit at any time before you have finished the interview your answers will NOT be recorded.

There are no foreseeable risks to this study. We believe that a wide range of people will benefit from our compiling current funding for conservation and water quality improvements.

This interview is confidential. That means that I will use a code number for the interview notes and will not identify you by name in our notes. In oral or written scientific presentations and in the report to the William Penn Foundation, we may mention the type of job you hold but will not identify your name or organization.

If there is information you are willing to tell us but don't wish to share directly with other organizations, please tell me so and I will note that.

Are these conditions acceptable to you, and are you willing to proceed with the interview?

[IF NOT] Are there others in your organization/agency or a similar entity that you think might be interested in talking to us?

May I record your answers on a digital recorder? The recording will not include information identifying you or your organization, and it will be used only to help me transcribe your comments.

[IF YES] I have started the recorder now...

If you have any questions about this interview, please contact Karen O'Neill at 848-932-9208. The mail address is:

Karen M. O'Neill, Assoc. Prof.
Human Ecology Dept.

55 Dudley Rd., #213
Rutgers University
New Brunswick, NJ 08901
karen.oneill@rutgers.edu

If you have questions about your rights as a research subject, you can contact the Director of the Institutional Review Board at:

New Brunswick/Piscataway Arts and Sciences IRB (732) 235-2866 or the Rutgers Human Subjects Protection Program at (973) 972-1149 or email them at humansubjects@ored.rutgers.edu.

This contact information was also included in the materials we previously sent to you via email.

Let me introduce our project.

Our team from Rutgers University is working with the William Penn Foundation to quantify annual government spending in the Delaware River Basin from 2014 through 2019. We're tracking spending to protect and improve water quality, including open space and farmland preservation plus stormwater management and stream restoration projects. We sent you a list of project types by email. We aren't tracking government spending for regulatory programs or actions like development review, compliance, or enforcement. We're also not tracking developer or governmental expenditures in response to regulatory requirements or enforcement actions.

We are doing interviews to help us understand the relative importance of various government funding sources, how these sources promote spending by other parties, and funding equity.

First, I'm going to ask you about the big picture of funding in the Basin.

For the years 2014 through 2019, did you see any trends in the quantity of government funding to improve water quality in the Basin?

[IF YES] Which government programs have changed the amount they are spending?

Did you see any important changes in the priorities or purposes for government funding in the Basin?

[IF YES] Which government programs have changed their priorities?

[PROMPT] For instance, do you see changes in the proportion of funding spent on acquiring land, on land stewardship and restoration, or on recreational improvements?

What government funding sources do you feel are most important for the Basin?

[FOLLOW-UP] Why are these sources important?

Which of these important government funding sources do you feel are most reliable for the Basin?

Did any major changes in government funding processes redefine who qualified for and received funding?

Did you see any trends in how organizations were getting matching funds for projects that need a match?

Now I'm going to ask about how funds have been distributed.

Equity in government spending does not usually mean giving **equal** dollar amounts to all farm-owners or to all jurisdictions. We want to learn how you would define **equity or fairness** in government spending. We're seeking your professional opinion as an individual. We will not use your answers as representing the views of any organization you are affiliated with.

First, I will ask you about how the purposes of some programs might create perceptions of that spending isn't done with equity.

Some government programs protect existing environmental functions, like land with high biodiversity. Do you think these programs cause equity problems in the Basin?

[PROBE] For instance, source waters are often in rural areas.

Another set of programs restore or improve environmental functions. Do you think water quality restoration programs cause equity problems in the Basin?

[PROBE] For instance, some programs target the most polluted sites and may leave other sites under-funded.

Is funding for water quality improvements done with equity for farmlands versus non-farmlands?

Next, I'll ask about concepts often used to assess equity.

Do you think there is equity in spending for water quality improvements as they affect poor versus wealthy people in the Basin?

Is there equity in spending for water quality improvements as they affect people in different racial or ethnic groups?

Do you think there is equity in spending for rural versus urban areas?

Is there equity in spending across municipalities and counties with large versus small populations?

Now I want to ask specifically about farmland programs.

Is there equity in funding from farmland preservation and restoration programs for farm owners of different racial or ethnic groups or of different genders?

Is there funding equity for owners of small farms versus large farms?

Should some types of farmlands receive more conservation funding than they currently receive?

Do you think there is equity in funding for water quality improvements on farmlands across the Basin's major watersheds?

Next, I'll ask about spending for non-farmlands.

Should some ecological functions on non-farmlands be given more funding than they currently receive?

Do you think there is equity in funding for non-farmlands across the Basin's major watersheds?

Now I will ask about municipal sources of funding.

Do municipal governments across the Basin spend similar proportions of their budgets for water quality improvements?

[IF NO]: How do they differ?

Do you think communities with major local water problems spend high proportions of their revenues on water quality protection and restoration?

Do you think mandates from higher levels of government lead municipalities to spend high proportions of their revenues on water quality improvements?

Reflecting on your comments about equity, are there organizations working in the Basin you think are doing important or interesting work on promoting equity in funding for water quality?

[IF SO]: Any others?

Any last thoughts about equity in funding for water quality improvements in the Delaware Basin?

Now I will ask about funding sources.

We are gathering data from federal, state, county, and local governments in this region. Based on the list we sent by email, are there significant federal or state funding sources we've missed?

Finally, I'm going to ask you about things we should look for in the future

The William Penn Foundation will probably track funding changes after 2019. Are there emerging spending initiatives they should watch? Are there spending initiatives that are sunsetting or transitioning?

Is there anyone else you suggest we contact?

Thank you so much for your help with this project. We hope the results will be useful for the Basin going forward. We look forward to sharing the results with you and others. Please contact us if you have any further thoughts.

Appendix E: Qualtrics Survey Questions

This appendix provides the script used for online survey of the expert panel, as conducted by Karen O’Neill, PhD, Associate Professor, Rutgers, with technical assistance from Kevin Keys of the Rutgers team.

Q1 *Project: Estimating Public Investments for the Delaware River Watershed* by Rutgers, The State University of New Jersey

Funding: William Penn Foundation *Principal Investigators:* Daniel J. Van Abs, PhD, FAICP/PP, Associate Professor of Professional Practice, Department of Human Ecology Karen O’Neill, PhD, Associate Professor, Department of Human Ecology Sara Malone, MES, Senior Research Specialist, Environmental Analysis and Communications Group, Edward J. Bloustein School of Planning and Public Policy

End of Block: Title

Start of Block: Introducing the project

Q2 Our Project

Our team from Rutgers University is working with the William Penn Foundation to quantify annual government spending in the Delaware River Basin from 2014 through 2019. We’re tracking spending to protect and improve water quality, including open space and farmland preservation, plus stormwater management, and stream restoration projects.

We aren’t tracking government spending for regulatory programs or actions like development review, compliance, or enforcement. We’re also not tracking developer or governmental expenditures in response to regulatory requirements or enforcement actions.

We are doing surveys to help us understand the relative importance of various government funding sources, how these sources promote spending by other parties, and funding equity.

Our questions cover a wide range of programs, and you are likely familiar with some more than others. For questions with an answer box, please tell us about the reasons why you think those conditions exist. If you have no opinion about a question, just indicate that in the answer box. Part of our aim is to learn about the patchwork nature of conservation in the Basin.

End of Block: Introducing the project

Start of Block: Consent

Q3 CONSENT TO TAKING THIS SURVEY:

Thank you for taking this survey about conservation and restoration to improve water quality.

This section reviews information about consent, which was included in the survey email. We expect this survey will take between 20 minutes and 45 minutes to complete. Your participation is entirely voluntary. You may end the survey at any time or skip any question you do not wish to answer. If you decide to quit at any time before you have submitted the survey your answers will NOT be recorded.

There are no foreseeable risks to this study. We believe that a wide range of people will benefit from our compiling information about recent funding for conservation and water quality improvements.

This survey is confidential. That means that we will use a code number for the survey notes and will not identify you by name in our notes. In oral or written scientific presentations and in the report to the William Penn Foundation, we may mention the type of job you hold but will not identify your name or organization.

If there is information you are willing to tell us but don't wish to share directly with other organizations, please mention that in your answer to the specific survey question.

By proceeding to take this survey, you affirm that these conditions are acceptable to you.

If you have any questions about this survey, please contact Karen O'Neill at 848-932-9208. The address is:

Karen M. O'Neill, Assoc. Prof.
Human Ecology Dept.
55 Dudley Rd., #213
Rutgers University
New Brunswick, NJ 08901
karen.oneill@rutgers.edu

If you have questions about your rights as a research subject, you can contact the Director of the Institutional Review Board at:

New Brunswick/Piscataway Arts and Sciences IRB, (732) 235-2866, or the Rutgers Human Subjects Protection Program at (973) 972-1149, or email them at humansubjects@ored.rutgers.edu.

This contact information was also included in the survey email materials.

Q4 Proceed with survey?

Yes

No

End of Block: Consent

Start of Block: End of Survey for No Consent

Q5 Thank you for taking the time to consider participating in this study. If you have further questions, please contact Karen O'Neill at karen.oneill@rutgers.edu or leave a message at 848-932-9208.

End of Block: End of Survey for No Consent

Start of Block: Questions about the big picture of funding in the Basin

Q6 Overall Funding Trends 2014-2019

Q7 For the years 2014 through 2019, did you see any trends in the quantity of government funding to improve water quality in the Basin?

Yes

No

Display This Question:

If For the years 2014 through 2019, did you see any trends in the quantity of government funding to... = Yes

Q8 Which government programs have changed the amount they are spending? How have they changed?

Q9 Did you see any important changes in the priorities or purposes for government funding in the Basin?

Yes

No

Display This Question:

If Did you see any important changes in the priorities or purposes for government funding in the Basin? = No

Q10 For instance, do you see changes in the proportion of funding spent on acquiring land, on land stewardship and restoration, or on recreational improvements?

Yes

No

Display This Question:

If Did you see any important changes in the priorities or purposes for government funding in the Basin? = Yes

Or For instance, do you see changes in the proportion of funding spent on acquiring land, on land st... = Yes

Q11 Which government programs have changed their priorities? How have they changed?

Q12 What government funding sources do you feel are most important for the Basin and why are they important?

Q13 Which of these important government funding sources do you feel are most reliable for the Basin and why do you think they are reliable?

Q14 Did any major changes in government funding processes redefine who qualified for and received funding?

Q15 Did you see any trends in how organizations were getting matching funds for projects that need a match?

Q16 Do you have any further thoughts on overall government funding in the Delaware River Basin?

End of Block: Questions about the big picture of funding in the Basin

Start of Block: How funds have been distributed

Q17

How Funds Have Been Distributed

Equity in government spending does not usually mean giving **equal** dollar amounts to all farm-owners or to all jurisdictions. We want to learn how you would define **equity or fairness** in government spending.

We're seeking your professional opinion as an individual. We will not use your answers as representing the views of any organization you are affiliated with.

First, we present questions about how the purposes of some programs might create perceptions that spending isn't done with equity.

Q18 Some government programs protect existing environmental functions, like land with high biodiversity. Do you think these programs cause equity problems in the Basin? For instance, source waters are often in rural areas.

Yes

No

Q19 Why do you think so?

Q20 Another set of programs restore or improve environmental functions.

Q21 Do you think water quality restoration programs cause equity problems in the Basin? For instance, some programs target the most polluted sites and may leave other sites under-funded.

Yes

No

Q22 Why do you think so?

Q23 Is funding for water quality improvements done equitably for farmlands versus non-farmlands?

Yes

No

Q24 Why do you think so?

Q25 Do you have any further thoughts on how government funds have been distributed in the Delaware River Basin?

End of Block: How funds have been distributed

Start of Block: Concepts often used to assess equity

Q26

Concepts Often Used to Assess Equity

For the following questions, please describe the extent to which you think there is equity in the Basin.

Q27 To what extent do you think there is equity in spending for water quality improvements as they affect poor versus wealthy people in the Basin?

Q28 To what extent is there equity in spending for water quality improvements as they affect people in different racial or ethnic groups?

Q29 To what extent is there equity in spending for rural versus urban areas?

Q30 To what extent is there equity in spending across municipalities and counties with large versus small populations?

End of Block: Concepts often used to assess equity

Start of Block: Spending in farmland programs

Q31

Spending for Farmlands

For the following questions, please describe the extent to which you think there is equity regarding funding for farmland in the Basin.

Q32 To what extent do you think there is equity in funding from farmland preservation and restoration programs for farm owners of different racial or ethnic groups or of different genders?

Q33 To what extent is there funding equity for owners of small farms versus large farms?

Q34 Should some types of farmlands receive more conservation funding than they currently receive?

- Yes
 - No
 - I don't know
-

Display This Question:

If Should some types of farmlands receive more conservation funding than they currently receive? = Yes

Q35 What types of farmlands should receive more conservation funding than they currently receive?

Q36 To what extent is there equity in funding for water quality improvements on farmlands across the Basin's major watersheds?

Q37 Do you have any further thoughts on funding equity and farmlands in the Delaware River Basin?

End of Block: Spending in farmland programs

Start of Block: Spending for non-farmlands

Q38 Spending for Non-Farmlands

Q39 Should some ecological functions on non-farmlands be given more funding than they currently receive?

- Yes
 - No
 - I don't know
-

Display This Question:

If Should some ecological functions on non-farmlands be given more funding than they currently receive? = Yes

Q40 What types of non-farmlands should receive more conservation funding than they currently receive?

Q41 Please describe to what extent you think there is equity in funding for non-farmlands across the Basin's major watersheds. For example, water quality improvements could include habitat restoration, stream channel restoration, or rainwater cisterns.

Q42 Do you have any further thoughts on funding equity and non-farmlands in the Delaware River Basin?

End of Block: Spending for non-farmlands

Start of Block: Municipal sources of funding

Q43 Municipal Sources of Funding

Q44 Do municipal governments across the Basin spend similar proportions of their budgets for water quality improvements?

- Yes
 - No
 - I don't know
-

Display This Question:

If Do municipal governments across the Basin spend similar proportions of their budgets for water qu... = No

Q45 How do they differ?

Q46 Do you think communities with major local water problems spend higher proportions of their revenues on water quality protection and restoration?

- Yes
 - No
 - I don't know
-

Display This Question:

If Do you think communities with major local water problems spend higher proportions of their revenu... = Yes

Or Do you think communities with major local water problems spend higher proportions of their revenu... = No

Q47 Why do you think so?

Q48 Do you think mandates from higher levels of government lead municipalities to spend higher proportions of their revenues on water quality improvements?

- Yes
- No
- I don't know

Display This Question:

If Do you think mandates from higher levels of government lead municipalities to spend higher propor... = Yes

Or Do you think mandates from higher levels of government lead municipalities to spend higher propor... = No

Q49 Why do you think so?

Q50 Reflecting on your comments about equity, could you name any organizations working in the Basin you think are doing important or interesting work on promoting equity in funding for water quality, and explain why you think so?

Q51 Any last thoughts about equity in funding for water quality improvements in the Delaware Basin?

End of Block: Municipal sources of funding

Start of Block: Things we should look for in the future

Q52 The William Penn Foundation will probably track funding changes after 2019. We anticipate governmental funding programs may change in the future.

Q53 Are there emerging spending initiatives the Foundation should watch?

Q54 Are there any governmental spending initiatives that are sunseting or transitioning?

End of Block: Things we should look for in the future

Start of Block: End

Q55 Do you have any further thoughts for us?

Q56 Thank you so much for your help with this project. We hope the results will be useful for the Basin going forward. We look forward to sharing the results with you and others.

End of Block: End

Appendix F: Interview Results

The report provides an overview of interview and survey results in the section on [Interviews and Surveys of Key Experts](#). We describe top-line results for each question here, based on edited notes and the survey responses. These responses are not interpreted by the Rutgers team but rather reflect what the respondents provided based on their own viewpoints. The statements are not necessarily in priority order under each heading.

Quantity of funding

- Increases in funding from the Delaware River Basin Restoration Program each year, from its inception in 2018 to present (the Delaware Conservation Fund of the USFWS, administered by NFWF); Great American Outdoors Act made funding for the Land and Water Conservation Fund permanent; NRCS's Regional Conservation Partnership Program grant, with the help of the William Penn Foundation
- One respondent commented that federal and state funding for monitoring, modeling, and assessment has reportedly declined in the Basin. Another respondent stated that the US Geologic Service (USGS) Office of the Delaware River Master has new monitoring instrumentation.
- Delaware state funding increased for water programs (Clean Water State Revolving Fund and Drinking Water State Revolving Fund) and land conservation; New Jersey voters approved constitutional amendment dedicating a portion of the corporate business tax to permanently fund land conservation and Blue Acres.
- Some local governments increased open space spending, others reduced it; few created stormwater fees or utilities.

Change in funding priorities

- Delaware River Basin Restoration Program bringing new federal attention to the Basin and some capacity for planning, although not regulatory power. Fish and wildlife prioritized in this program.
- One expert panel member commenting on this report said that the NFWF Delaware Conservation Fund is increasingly likely to be used for land acquisition to meet its goals, not just restoration.
- One expert panel member commenting on this report said that the New York State Water Quality Improvement Funds may be applicable to projects in the Delaware watershed in some cases.
- The 2018 Farm Bill required that 10% of conservation funding (in the Regional Conservation Partnership Program) be dedicated to source water protection. NRCS and the Farm Services Agency are responsible for implementation. The RCPP also set priority areas for conservation in the Basin. According to an expert panel member commenting on this report, the RCPP has also funded carbon aggregation projects in the upper basin.
- Some federal and state programs give points for projects near densely settled sites, such as New Jersey's Roebing Park freshwater tidal wetlands restoration (funded in part by the Delaware Conservation Fund).
- Pennsylvania and Delaware states have encouraged stormwater management but have provided little new funding for this.
- It is difficult to get projects approved by Pennsylvania's DCNR unless the project has a recreational component.
- State and private foundations increasingly emphasizing climate change in their project funding.

- There has been a general shift in land trust and conservancies' emphasis from land acquisition toward stewardship of the lands already under conservation. Pennsylvania state rules changed in 2013 to emphasize stewardship, but municipalities still submitting mostly open space acquisition projects. Respondents specified this for New York City watershed land and for suburban and rural fringe land in Pennsylvania and New Jersey. The economic downturn of 2008 had created an unusual opportunity for buying land, but prices have increased.
- Local open space programs are changeable. Some have ended, some have shifted to funding only agricultural easement purchases (tied in part to superior matching opportunities for farmland projects), and a few are creating new open space initiatives.
- Municipal (MS4) stormwater permit requirements have encouraged some municipalities to create new projects.

Most important governmental funding sources

- Farm Bill funds through USDA
- New York City
- Delaware River Basin Restoration Program
- Highlands Conservation Act
- Land and Water Conservation Fund
- Forest Stewardship Program
- Wildlife and Sportfish Restoration Fund
- North American Wetlands Conservation Act Grant Program
- National Coastal Wetlands Conservation Grant Program
- Hurricane Sandy Coastal Resiliency Competitive Grant program
- Federal funding for federal and state transportation departments to reduce runoff of contaminants from roads, a process that has often lacked transparency.
- Science assessment by USGS, USFS, EPA, and state departments of environmental protection
- Local programs
- Pennsylvania's Keystone Recreation, Park and Conservation Fund and Environmental Stewardship Fund
- Garden State Preservation Trust (including the New Jersey Green Acres and farmland preservation programs)

Most reliable governmental funding sources

- U.S. Department of Agriculture: NRCS/FSA
- New York City
- Delaware River Basin Restoration Program
- Land and Water Conservation Fund
- Local programs
- State revolving funds for drinking water and wastewater
- Water utility revenue
- New Jersey Garden State Preservation Trust
- Pennsylvania DCNR; Pennsylvania's Keystone Recreation, Park and Conservation Fund and Environmental Stewardship Fund
- Delaware state programs

Changes in who qualifies for governmental funding

- As a new program, advocates hope to shape DRBRP funding to be more equitable (e.g., points for serving under-served communities).
- NRCS has more strongly enforced its restrictions to funding only farm owners with income below \$900,000 a year and has dropped minimum income requirements.
- Trends toward shovel-ready projects puts poor cities at a disadvantage because they cannot pay for engineering studies in advance.
- New Jersey's programs shifted to funding more coastal projects after Hurricane Sandy
- PENNVEST's temporary program allowing re-loaning of funds enabled private grantees to receive state funds, which gave project managers some flexibility and produced novel approaches.

Changes in matching funds

- The negotiation to allow funds spent by New York City to count as matching funds in the areas below its reservoirs was a major change that enabled the tailwater areas of New York state to apply for more of the DRBRP funds. II.
- William Penn Foundation's funds dramatically changed the ability to fund projects in its cluster areas (administered through NFWF and the Open Space Institute)
- Corporate grants and private investment in dam removal (or perhaps sediment trading in the future) are increasing but could become even more important.
- Organizations increasing their use of multiple sources of matching funds, nontraditional sources such as Natural Resources Damage Assessment funds and state transportation funds, and in-kind matches.
- Difficult for some projects to get matching funds. In Delaware it is difficult to find state or local matches, in part because of local government structures and because there is a less developed nongovernmental sector.

Equity in protecting environmental functions

- Respondents agreed that protection of upstream rural areas is a public good and potentially helps people elsewhere. But benefits from the improved quality of the environment and access to recreation are mostly gained by wealthier white residents who live there, or who can visit. Programs operate within a social context of inequality.
- Resource programs have been designed for preserving resources, not for social equity. The foremost equity concerns are the lack of conservation in more racially and ethnically diverse cities, which also have high burdens of their industrial past. Some poor rural, majority White communities also face equity problems when they are excluded from land that is preserved and are not provided new opportunities for local recreation. Those residents may also fear that conservation will block the possibility of local economic development.
- Resource programs are often based on ecological scientific criteria and on analyses that show protecting upstream and rural areas is most cost effective. However, these criteria are not necessarily superior to others. Including estimates of the economic impacts of living near polluted sites could yield different funding priorities.
- Federal and state farm programs have separate pools for small farm parcels and underrepresented groups, but their main emphasis is on conserving high quality soils. By its nature this discriminates against poor and beginning farmers.

- The reliance on grant applications puts poor communities at a disadvantage. They lack staff capacity and resources to track opportunities, to apply, to get partners, to get matching funds, and to administer projects.
- Giving technical assistance and extra points for projects in cities or for under-represented farmers can improve equity.

Equity in restoration

- Funds for environmental restoration are often directed to places that have little environmental damage, to preserve more intact ecosystems. But restored riparian buffers can improve water quality even at developed sites.
- Comments about functions other than land conservation and restoration projects tabulated in this report include the following: In developed areas, gray infrastructure investments or loans for water and wastewater upgrades should be included in comparisons to land conservation projects, because these produce important gains in water quality. An expert panel member commenting on this report added that green infrastructure projects can also provide co-benefits such as recreation and reduction of the heat-island effect.
- Existing systems do not intentionally distribute funds inequitably but do not include equity as key factor in making decisions.
- Places with the most need for restoration are also the most disadvantaged and face the greatest number of barriers in finding and applying for grants.

Equity in funding for farms versus non farms

- A much higher proportion of money is spent on farms than on forests or on other types of non-farmland. The federal farm programs are a poor fit for our region, which has much more acreage in forested land than in farms.
- Reducing runoff from farms helps the entire watershed and is very cost effective. Farms contribute a third of the nutrient load to the Basin. Treating a single farm can yield immediate improvements in surface water quality.
- When non-farmland is preserved, the burden passes to an agency or organization to sustain stewardship, as opposed to a private farm owner. Small land trusts may have difficulty sustaining legal control over these parcels, and all land managers are faced with questions about how to manage land once it is acquired.
- Farm programs are designed to address any resource need a farmer might have. That sort of service to the owner is not present for stewardship programs regarding non-farmlands. Farmers have access to cost-share funding that other owners do not have. Farmers are also not required to file for permits under the Clean Water Act.

Equity in poor versus wealthy communities

- Wealthy residential areas are more likely to seek funds and are better able to access and win funds, treating them as investments in water quality, because they have greater political and organizational capacity and resources. In poorer communities, other priorities dominate, such as housing.
- Much local conservation depends on individuals who donate land to local conservancies. Conservation also depends on the availability of local open space funds paid for by residents.
- Not all upstream communities where conservation is intensive are wealthy, however.

- Drinking water concerns in poor communities that are poorly addressed by policies include the local quality of septic systems and wells in rural areas and lead in service lines for drinking water to urban areas.
- Site exposure to forever chemicals like PFOA is not well measured and may affect wealthy and poor areas.

Racial equity

- There are racial inequities in the way that people benefit from conservation projects. In our region, African Americans in particular tend to be concentrated and segregated in the region's cities. In some places, they may have access to high-quality drinking water, but in other communities, they may be served by lead service lines.
- How the environmental movement goes forward depends on overcoming such obvious inequities. People in minority racial and ethnic groups support conservation and pay taxes for it, but they do not share equitably in the resulting conservation projects.

Equity in rural and urban areas

- Conservation is prioritized in the upstream headwaters areas of this region and in agricultural areas anywhere in the Basin. These projects can help the entire watershed. It is cheaper to preserve rural lands than urban lands because the underlying land costs are less expensive and because urban lands nearly always require remediation before restoration can begin.
- The benefits of upstream protections for downstream residents are less apparent and could be better promoted.
- Some municipalities with a high tax base can better access conservation programs that require matching funds, however those are mostly in wealthy suburban or rural fringe areas.
- Spending for improvements to water and wastewater systems in urban areas is costly and can yield high-quality drinking water in some places. Poor rural communities may have low-quality drinking water.

Equity in locales with large versus small populations

- Municipalities and counties with large populations may have more capacity and a larger tax base, a larger number of people to push for environmental issues, and simply a more diverse policy agenda that leaves some room for environmental issues to be discussed. But any funds received by these locales may be spread thinly across that population.
- Most respondents saw population in itself as less important than local leadership, affluence, or organizational capacity.

Equity in farm funding by race and gender

- High value lands are less likely to be owned by women, racial or ethnic minorities, or non-English speaking owners (see the next question about farm size).
- There is a long history of discrimination against members of ethnic and racial minority groups in federal farm programs. NRCS programs do require counties to submit parity reports, comparing grantees to County ethnicities.

Equity in small versus large farms

- The paperwork burden is the same for small versus large farms and so programs are more worthwhile for large landholders. Large farmers are likely first to the table, and they are the easiest for programs to process because they have the capacity to apply and manage grants.
- The preference of farm programs toward high quality soils biases these programs toward high-cost farmlands, and the paperwork burdens, biases these programs toward large acreage farms. From the point of view of the agencies, large farms have a better return on investment for conservation because the administrative costs are nearly the same for a large farm as for a small farm.
- Large farms are also more likely to have resource problems that would be eligible for grants. An expert panel member commenting on this report noted that owners of large farms also have greater ability to legally delay or resist environmental regulations.
- Even when development rights have been stripped and farms preserved through conservation easements, agricultural land in New Jersey is still too expensive for purchase by most new farmers.
- However, the NRCS set aside separate pools for small farmers. Minimum acreage and minimum income requirements for farm and forest production have been dropped.

Farm types that should get more conservation funding

- Farms that grow food for people²⁹
- Dairy farms, because they often produce the most pollution.
- Urban agriculture
- Lands with large portions of forest, which have complicated funding needs because they combine open space and farmland preservation components.
- Requires stewardship of farms that are already in programs, not just having them complete conservation plans. Incentives to farmers who adopt low- or no-till practices and other protective approaches.
- Farms with high biodiversity especially threatened and endangered species; farms near streams
- Farms that are marginally productive and that could be retired.
- Farms that are able to sequester carbon through soil regeneration.

Equity of conservation spending on farms across the Basin

- The Chesapeake Bay Basin receives much more funding than the Delaware River Basin does.
- Within the Basin, New York City's watershed area gets much more funding than all the other areas of the Basin combined.
- Because farm funds flow to high quality soils, they are concentrated geographically, including the New Jersey Bayshore and the Brandywine regions.
- Within New Jersey, farms in the Delaware Basin receive much more funding than farms in the rest of the state because the Basin is the prime farm area of the state.

Ecological functions that should receive more funding on non-farmlands

- Swales
- Forests
- Old-fields, with restoration
- Brownfield remediation

²⁹ By example, roughly half of all New Jersey agricultural receipts are for turf grass, flowers and nursery plants.

- Carbon sequestration in forests
- Prioritizing land near people, rather than relying primarily on ecological metrics
- Climate resilience
- Habitat and biodiversity
- Wetlands
- Opportunities for recreation
- Projects that can provide co-benefits; sites that can contribute to landscape and aquatic connectivity; resilience to landscape change; permeability; higher ecological integrity

Geographic equity in spending for non-farmlands

- One respondent stated that the New York City watershed receives far more funding than that of all other states combined.
- Another respondent stated that the Delaware Estuary attracts more funds than elsewhere, likely referring to areas in the lower Basin.
- Each program creates different inequities. For example, wealthy suburbs and rural fringe areas may protect land that does not have high ecological value, and some federal and state programs target special areas such as migratory bird flyways.
- Expensive land values in New Jersey mean that projects in that state are less competitive in funding pools than projects in some less expensive rural Pennsylvania lands. Land values are also challenging for non-farmland preservation; as an expert panel member commenting on this report noted, a program of the Open Space Institute has a ceiling of \$500,000 for most grants, which limits their ability to be a key funder for large projects.
- The presence of land conservancies drives some conservation projects.
- In Delaware state, there is little funding outside of William Penn Foundation's cluster areas.

Proportion of budgets spent by municipalities

- New York City stands out as spending more than any other government entity in the Basin, whether at the federal, state, or local level.
- Municipalities vary greatly in their spending on open space. Rural municipalities spend very little. Wealthy communities spend more, often to protect residential property values.
- Some municipalities limit their open space spending to farmland preservation, often because there are better matching opportunities to state funds.
- Municipalities with active environmental organizations tend to spend more on local conservation.
- Municipalities with an MS4 permit will have more of their budgets invested in managing stormwater.

The influence of local water quality problems on municipal spending

- Municipalities in the downstream, developed areas of the Basin probably have the worst water quality conditions. But the municipalities (other than New York City) that spend the most are probably suburbs that are facing development pressure.
- Municipalities may not be aware of problems, or may be aware of problems but unable to address them or to have direct effect on those problems through local action.
- Emergencies can prompt municipalities to spend more money, however.

- New York City as the major funder in the Basin defines some conditions as water quality problems that other municipalities would not consider problems.

The influence of mandates on municipal spending

- A judicial consent order in Philadelphia (CSOs) and the Filtration Avoidance Program for the New York City Catskills reservoirs (both Delaware and Hudson) have led to major water quality restoration and protection efforts in the Basin. Most other communities require leadership and coordination from a higher level to get projects going. Incentives seem to be more effective than mandates.
- Mandates may get attention and may even provoke more spending, but they don't necessarily yield results. Municipal MS4 permitting and Total Maximum Daily Load (TMDL) guidelines have encouraged some local actions, for example. But there has been no clear evidence of water quality improvement from all the spending on the resulting stormwater projects.
- Rural communities have not responded with much action in response to sewage treatment mandates and other rules.
- Unfunded mandates are ineffective. You also need education and political pressure to get action.

Organizations working on equity in funding

- The Nature Conservancy's city projects in Philadelphia and Wilmington (added by an expert panel member commenting on this report)
- Natural Lands (PA)
- Tookany/Tacony-Frankford Watershed Partnership (PA)
- Coopers Ferry Partnership (NJ) and the Camden Smart Initiative
- Coalition for the Delaware River Watershed, operated by New Jersey Audubon, formed with the William Penn Foundation (regional)
- Mercer County's funding for programs in underserved areas (NJ)
- The Alliance for Watershed Education (regional)
- Camden County Municipal Utility Authority (NJ)
- The Watershed Institute (NJ)
- Jersey Water Works (NJ)
- Trust for Public Land projects in Philadelphia school yards, and park access

Potential funding and program trends to track

- Program cuts due to the COVID crisis, already evident in 2020 revenues for states. Losing state funds would reduce the ability to provide matches to federal funds that will be provided in the coming years.
- Stewardship versus acquisition as an emphasis in funding, which shifts concern to sustained, long-term funding needs for lands that have already been conserved. There is a question of whether sources of funding for land acquisition would be willing to fund long-term maintenance and stewardship.
- Innovative uses of credits such as sediment trading, mitigation banking, carbon markets, or other approaches that involve private parties.
- The role of County preservation boards to leverage funds and to act as more permanent land holders. Private land trusts may dissolve overtime, but counties will continue to exist and be able to manage preserved lands.

- New Jersey reformatting its infrastructure bank. This could allow municipalities to manage long term plans.
- The potential for the Regional Greenhouse Gas Initiative and cap and trade funds to generate conservation funds.
- America's Great Outdoors Act, which should double the Land and Water Conservation Fund
- The US Climate Alliance Natural Working Lands initiatives
- Hurricane Sandy Coastal Resiliency Competitive Grant Program is sunseting
- New York City's Regen NY program
- Stormwater fees in communities, and the potential for stormwater banking
- New York state's environmental bond, which is likely in 2021 (was pulled from the 2020 ballot)
- The push to create a Growing Greener 3 program in Pennsylvania
- NYC's possible expansion of its Schoharie riparian buffer pilot program
- Environmental justice legislation just passed in New Jersey
- New Jersey's interagency climate panel
- User-pay and beneficiary-pay initiatives
- EPA EFAB work on opportunity zones

Appendix G: Bibliography

- Brashear TG, Brooks CM, Boles JS (2004) Distributive and procedural justice in a sales force context: Scale development and validation *Journal of Business Research* 57:86-93
[https://doi.org/10.1016/S0148-2963\(02\)00288-6](https://doi.org/10.1016/S0148-2963(02)00288-6)
- Castillo, D., Kaplan, D., & Mossa, J. (2016). A Synthesis of Stream Restoration Efforts in Florida (USA): Florida Stream Restoration. *River Research and Applications*, 32(7), 1555–1565.
<https://doi.org/10.1002/rra.3014>
- Duke, J. M., & Aull-Hyde, R. (2002). Identifying public preferences for land preservation using the analytic hierarchy process. *Ecological Economics*, 42, 131–145. [https://doi.org/10.1016/S0921-8009\(02\)00053-8](https://doi.org/10.1016/S0921-8009(02)00053-8)
- Fleming, W. M., & Hall, G. E. (2000). Water conservation incentives for New Mexico: Policy and legislative alternatives. *Natural Resources Journal*, 40(1), 69–92.
- Gargan, J. J. (1981). Consideration of Local Government Capacity. *Public Administration Review*, 41(6), 649–658. <https://doi.org/10.2307/975741>
- Gerlak AK (2005) Federalism and U.S. Water Policy: Lessons for the Twenty-First Century *Publius: The Journal of Federalism* 36:231-257 doi:10.1093/publius/pji032
- Hassett, B., Palmer, M., Bernhardt, E., Smith, S., Carr, J., & Hart, D. (2005). Restoring watersheds project by project: Trends in Chesapeake Bay tributary restoration. *Frontiers in Ecology and the Environment*, 3(5), 259–267. [https://doi.org/10.1890/1540-9295\(2005\)003\[0259:RWPBPT\]2.0.CO;2](https://doi.org/10.1890/1540-9295(2005)003[0259:RWPBPT]2.0.CO;2)
- Hardy SD (2010) Governments, Group Membership, and Watershed Partnerships *Society & Natural Resources* 23:587-603 doi:10.1080/08941920802534572
- Jenkins-Smith HC, Sabatier AP (1993) The Study of Public Policy Processes. In: Sabatier AP, Jenkins-Smith HC (eds) *Policy Change and Learning: An Advocacy Coalition Approach*. Westview Press, Boulder, CO
- Jiang, Y., & Swallow, S. K. (2017). Impact Fees Coupled with Conservation Payments to Sustain Ecosystem Structure: A Conceptual and Numerical Application at the Urban-Rural Fringe. *Ecological Economics*, 136, 136–147. <https://doi.org/10.1016/j.ecolecon.2017.02.007>
- Johnston, R. J., Swallow, S. K., & Weaver, T. F. (1999). Estimating Willingness to Pay and Resource Tradeoffs with Different Payment Mechanisms: An Evaluation of a Funding Guarantee for Watershed Management. *Journal of Environmental Economics and Management*, 38, 97–120.
<https://doi.org/10.1006/jeem.1999.1077>
- Kafle, A., Swallow, S. K., & Smith, E. C. (2015). Does Public Funding Affect Preferred Tradeoffs and Crowd-In or Crowd-Out Willingness to Pay? A Watershed Management Case. *Environmental and Resource Economics*, 60(3), 471–495. <https://doi.org/10.1007/s10640-014-9782-z>
- Kaiser, C. (2015). NatureVest: Natural Capital Investment Solutions to Transform the Way We Protect Nature. *Social Research; New York*, 82(3), 749-760,860.
- Koontz, T. M., & Sen, S. (2013). Community Responses to Government Defunding of Watershed Projects: A Comparative Study in India and the USA. *Environmental Management*, 51(3), 571–585.
<https://doi.org/10.1007/s00267-012-0008-2>

- Larson, L. R., Lauber, T. B., Kay, D. L., & Cutts, B. B. (2017). Local Government Capacity to Respond to Environmental Change: Insights from Towns in New York State. *Environmental Management*, 60(1), 118–135. <https://doi.org/10.1007/s00267-017-0860-1>
- Lin, H., & Ueta, K. (2012). Lake watershed management: Services, monitoring, funding and governance. *Lakes & Reservoirs: Science, Policy and Management for Sustainable Use*, 17(3), 207–223. <https://doi.org/10.1111/lre.12003>
- Nelson, L. S., & Weschler, L. F. (1998). Institutional readiness for integrated watershed management: The case of the Maumee River. *The Social Science Journal*, 35(4), 565–566.
- O'Neill KM (2002) Why the TVA Remains Unique: Interest Groups and the Defeat of New Deal River Planning *Rural Sociology* 67:163-182
- Palmer, M. A., & Allan, J. D. (2006). Restoring Rivers. *Issues in Science and Technology*, 22(2), 40–48.
- Sabatier AP (1993) Policy Change Over a Decade or More. In: Sabatier AP, Jenkins-Smith HC (eds) *Policy Change and Learning: An Advocacy Coalition Approach*. Westview Press, Boulder, CO, pp 13-39
- Sabatier AP, Focht W, Lubell M, Trachtenberg Z, Vedlitz A, Matlock M (2005) Collaborative Approaches to Watershed Management. In: Sabatier AP, Focht W, Lubell M, Thrachtenberg Z, Vedlitz A, Matlock M (eds) *Swimming Upstream: Collaborative Approaches to Watershed Management*. MIT Press, Cambridge, MA, pp 3-21
- Sheppard BH, Minton JW, Lewicki RJ (1992) *Organizational justice: the search for fairness in the workplace*. Issues in organization and management series, vol xii, 227 p. Lexington Books ; M. Macmillan Canada ; M. Macmillan International, New York : Toronto
- Sheppard BH, Minton JW, Lewicki RJ (1992) *Organizational justice: the search for fairness in the workplace*. Issues in organization and management series, vol xii, 227 p. Lexington Books ; M. Macmillan Canada ; M. Macmillan International, New York : Toronto
- Sloan, M. A., & Bidolli, B. T. (2014). Watershed management through transportation funding. *WIT Transactions on Ecology and The Environment*, 181, 603–614.
- Swallow, S. K., & McGonagle, M. P. (2006). Public Funding of Environmental Amenities: Contingent Choices Using New Taxes or Existing Revenues for Coastal Land Conservation. *Land Economics*, 82(1), 56–67. <https://doi.org/10.3368/le.82.1.56>
- Talberth, J., Selman, M., Walker, S., & Gray, E. (2015). Pay for Performance: Optimizing public investments in agricultural best management practices in the Chesapeake Bay Watershed. *Ecological Economics*, 118, 252–261. <https://doi.org/10.1016/j.ecolecon.2015.07.033>
- Warson, A. (1996). Voters say “yes” to spending on parks, water, open lands. *Planning*, 62(12), 20.
- Weiland, P. S. (1998). Environmental Regulations and Local Government Institutional Capacity. *Public Administration Quarterly*, 22(2), 176–203.
- Williams, J. R., Smith, C. M., Roe, J. D., Leatherman, J. C., & Wilson, R. M. (2012). Engaging Watershed Stakeholders for Cost-Effective Environmental Management Planning with “Watershed Manager.” *Journal of Natural Resources and Life Sciences Education*, 41, 44–53.