envision the susquehanna

A Vision for the Susquehanna River Watershed

March 2017

Photo: Ian Plant

pennsylvania
DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

NATIONAL PARK SERVICE

Chesapeake Conservancy

Susquehanna Greenway
PARTNERSHIP

WILDLIFE MANAGEMENT INSTITUTE
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About the Envision the Susquehanna Core Team

The **Chesapeake Conservancy**'s mission is to strengthen the connection between people and the watershed, conserve the landscapes and special places that sustain the Chesapeake's unique natural and cultural resources, and encourage the exploration and celebration of the Chesapeake as a national treasure.

The **National Park Services** mission is to preserve, unimpaired, the natural and cultural resources and values of the National Park System for the enjoyment, education, and inspiration of this and future generations.

Pennsylvania Department of Conservation and Natural Resources (DCNR) is charged with the maintenance and preservation of 120 state parks and 2.2 million acres of state forest land throughout the state. DCNR provides information on the state's ecological and geological resources; and establishes community conservation partnerships with grants and technical assistance with the goal of benefiting rivers, trails, greenways, recreation, heritage, open space, and natural areas.

Susquehanna Greenway Partnership is working to envision, create and sustain a greenway along the Susquehanna River to enhance river towns and the lives of current and future generations.

Susquehanna River Heartland Coalition for Environmental Studies is a unique collaboration of professors and students with the purpose of researching and studying the ecological conditions and processes of the watershed and creating educational opportunities to promote student interest and involvement.

Wildlife Management Institute (WMI) was established in 1911 with the goal of reversing the dramatic declines of many wildlife populations. WMI is committed to improving the professional foundation of wildlife management by fully focusing on resource issues and opportunities, taking into account all of the concepts of game management, biological diversity, and ecology.

Envision the Susquehanna Advisory Council

Appalachian Landscape Conservation Cooperative, Bucknell University, Chesapeake Bay Commission - Pennsylvania Office, Chesapeake Bay Foundation - Pennsylvania Office, Chesapeake Conservancy, Endless Mountains Heritage Region, Haudenosaunee Environmental Task Force, Lower Susquehanna Heritage Greenway, Lumber Heritage Region, National Park Service-Chesapeake Bay Office, North Atlantic Land Conservation Cooperative, Pennsylvania Department of Conservation and Natural Resources-Bureau of Forestry, Pennsylvania Department of Conservation and Natural Resources-Bureau of Recreation & Conservation, Pennsylvania Department of Environmental Protection, Pennsylvania Environmental Council, Pennsylvania Fish and Boat Commission, Pennsylvania Municipal Authorities Association, Susquehanna Greenway Partnership, Susquehanna Heritage, Susquehanna River Basin Commission, Susquehanna River Heartland Coalition for Environmental Studies, Susquehanna University, Susquehannock Wildlife Society, Trout Unlimited, U.S. Fish and Wildlife Service, Upper Susquehanna Coalition, Wildlife Management Institute

Contents

Introduction

Summary of Envision the Susquehanna

The *Envision the Susquehanna* (*ETS*) initiative, launched in 2013, has encouraged individuals, community leaders, and organizations to describe their vision for the Susquehanna River watershed. Using interviews, surveys, and workshops to solicit input from the Susquehanna River community, the *ETS* Team developed a shared vision for the river and its watershed, described here in the Vision for the Susquehanna River watershed.

The *ETS* Team is committed to the collaboration, foresight, and leadership required to achieve this vision. The *ETS* Team supports the goals of protecting, restoring, and passing on the natural, cultural, and historic assets of the Susquehanna River watershed for future generations.

Mission Statement

To protect, enhance, and promote the natural beauty and cultural heritage of the Susquehanna River watershed; to support community-based solutions to conserve the watershed and its most critical landscapes; and to encourage synergy of such efforts locally and regionally.

Goals Statement

The ultimate goals for *ETS* are: an increased awareness of the natural, historic and cultural resources that exist within the river basin, the creation of new opportunities to connect people to the Susquehanna, and the improvement of ecological and cultural integrity of the landscape. In so doing, *ETS* will also contribute to the economic sustainability of those living along the river.

Photo: Nicholas A. Tonelli

Purpose of the Vision Document

The *Vision document* is a report on the needs and challenges facing the Susquehanna River watershed and its stewards. The document identifies community-driven, evidence-based opportunities to address those needs. This *Vision* represents the input of more than 1,000 individuals and organizations collected through three years of community engagement and data analysis carried out by Chesapeake Conservancy and *ETS* partners.

The *Vision document* aims to identify common challenges **across the watershed** and opportunities for diverse partners to collaborate **within and across regions of the watershed**. Data analysis combines diverse variables to identify **regional hot spots** where focused efforts may achieve the greatest outcomes.

The *Vision document* highlights the unique character of **seven regions** of the watershed, as well as challenges and priorities shared across regions. Furthermore, the document also categorizes local priorities and resources within **five themes**, to help identify opportunities for partnerships and collaborative solutions.

The *Vision document* will serve as a framework for *ETS* **implementation activities**. Core Team partners will continue to facilitate partnerships and coordinate activities related to the *Vision* concepts and strategies laid out by local communities.

A Vision for Holistic, Collaborative, Long-term Thinking

The development of this *Vision for the Susquehanna* is not the end but the beginning of collaborative work that engages regional organizations with detailed knowledge, technical partners from universities and government agencies, local decision-makers, community members, and individuals and families living and working across the Susquehanna watershed. By identifying shared challenges, common goals, and innovative approaches, we can achieve a shared vision for all who live, work, and play in this watershed based on:

- A shared understanding of the economics of conservation and restoration
- Coordination of river-related messaging, monitoring and research efforts, and tracking of watershed goals
- Greater understanding of the connection between ecosystem services and human health
- Decision-making rooted in the best available science, that connects the Susquehanna and the Chesapeake Bay
- A long-term, landscape approach to land management, data analysis, and planning efforts
- Support from prepared elected leaders at all levels of government
- Increased technical capacity of volunteers and practitioners, including engaging the next generation of environmental leaders and preparing them to join the workforce
- Identification and support of critical conservation partnerships within the watershed by enabling conservation actions that address their foremost priorities
- Greater coordination across borders, sectors, levels of government, and themes
- The nurturing of a shared and evolving conservation consciousness

Background

A Brief History of the Susquehanna River

The Susquehanna River is one of the oldest rivers in the world. Spanning more than 700 miles from its headwaters in Cooperstown, New York, down to its connection with the Chesapeake Bay in Havre de Grace, Maryland, and including the entire West Branch, the mighty Susquehanna has been the lifeblood of communities and wildlife for centuries. To travel its length is to take a journey through forests, wilderness areas, and rolling farms; past flocks of migrating waterfowl and historical towns; and along unique geological features in the Appalachian Mountains.

Although the Susquehanna River and the Chesapeake Bay do not share a name, they do share an ancient past. The Bay is actually an extension of the lower Susquehanna, a valley that has been flooded by the Atlantic Ocean for the last 15,000 years. As such, the Susquehanna is critical to the health of the Chesapeake. Delivering nearly 20 billion gallons of freshwater into the Bay each day, the Susquehanna provides nearly half of the freshwater entering the Chesapeake and provides crucial habitats for countless species of Bay wildlife.

For thousands of years, the mighty Susquehanna provided food, transportation, commerce, and recreation for millions of people. Today, the Susquehanna continues to be a vibrant place for commerce, recreation, and wildlife. Yet the river's health and beauty has diminished. The river drains more than 27,500 square miles of land, transporting pollutants and sediments from an area roughly the size of West Virginia and Delaware combined.

Though more concentrated effort is needed, progress in bringing back the Susquehanna to its historical grandeur is slowly being made. Together we can *Envision the Susquehanna*—a healthy, restored river teeming with wildlife, providing drinking water, powering commerce, and offering open accessibility for everyone who lives, works, or plays in the river's watershed for generations to come.

Photo: Nicholas A. Tonelli

Community Engagement Campaign

The *Envision the Susquehanna* Core Team, in partnership with researchers from Bucknell University and Lycoming College, completed a community engagement campaign to gauge the conservation values, attitudes, and behaviors of residents living along the Susquehanna River Corridor. The four phases of the research process—informant interviews, strategic plan analysis, a phone survey, and community workshops—provide a picture of community needs and perceptions.

The results provide an overview of the assets, attitudes, challenges, and opportunities related to conservation and recreation throughout the selected river counties. Data collection was carried out in 19 of the 22 counties that are contiguous to the Susquehanna River in the states of New York, Pennsylvania, and Maryland. The campaign consisted of four phases, described below.

- Phase I - Interviews were conducted with 62 key stakeholders with expertise about land use and land conservation in the study area.
- Phase II - Thirty-six open space, greenway, and comprehensive plans within the study area were analyzed.
- Phase III - A phone survey of 965 randomly sampled residents from the selected counties was administered by students at the Lycoming College Polling Institute between February and April 2015.
- Phase IV - Input from more than 250 practitioners and community members was compiled through workshops and meetings in 17 communities throughout the watershed.

Compiling these data sources provides a dynamic and comprehensive overview of conservation attitudes, values, and behaviors within the river corridor. This information will help identify conservation solutions that are community supported and have lasting impacts across the watershed.

ETS Advisory Council Engagement

In addition to this focused research, the information in this *Vision document* was also informed by other activities carried out by *ETS* Advisory Council members. These include direct input from nearly 40 members of the Council, informed directly by partners' engagement in a variety of community-based efforts.

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Resident Phone Survey

During phase I of the Community Engagement Campaign, researchers divided the watershed into seven regions, each having unique sociocultural and geographical characteristics: Far West Branch, New York, Northern PA, Confluence, Capital, Lower PA, and Maryland (see Figure 1). A phone survey of 965 residents was conducted during the spring of 2015 to help understand and acknowledge regional differences, as well as similarities, in attitudes toward the conservation, recreation, and history along the Susquehanna River. The survey information can also help guide *ETS* implementation, allowing variability in strategies and activities based on local needs, challenges, and priorities. For a complete list of the 43 questions included in the survey, visit www.envisionthesusquehanna.org.

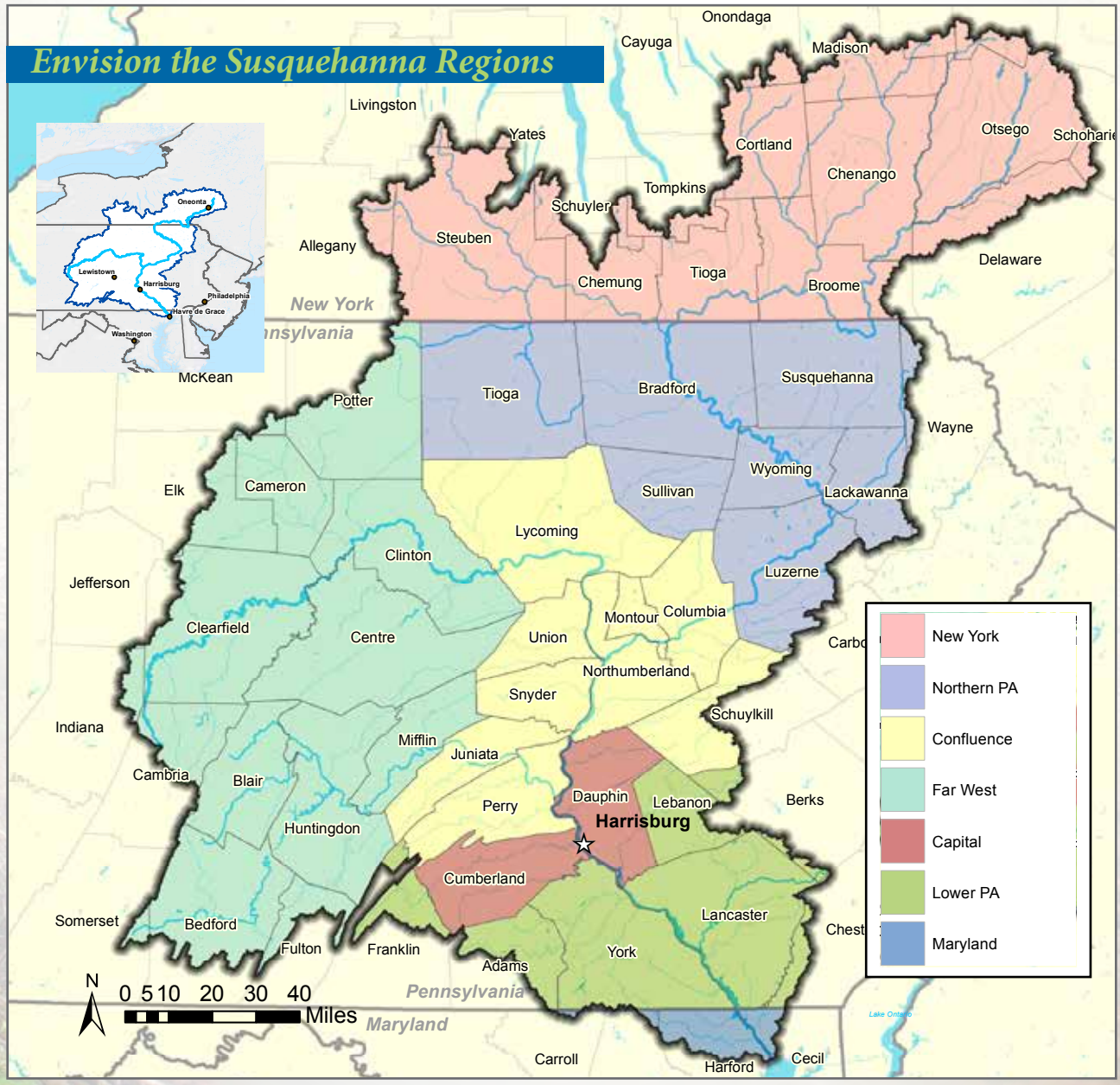

Fig. 1. The Susquehanna River watershed has seven unique sociocultural and geographical regions.

Summary of Resident Phone Survey Results

Across all seven regions, respondents report caring about the environment (78%–90%) and taking personal action with the environment in mind (64%–77%). However, most respondents are not likely to attend public meetings to engage in environmental efforts (26%–46%).

When asked about the Susquehanna River specifically, most respondents agreed the river is important (55% in Maryland; 71% in Far West Branch) but many did not view the river as polluted (22% in Far West Branch and Confluence; 37% in Northern PA).

There was also disagreement over whether participants believed the river was getting sicker (18% in Far West Branch; 47% in New York) or getting healthier (31% in Lower PA and Maryland; 73% in Far West Branch).

These results may suggest that residents within the Susquehanna watershed care about their environment and the river, but may not fully understand the threats to its health. Public education and engagement may be important components of *ETS* implementation, but public meetings may not be the most effective way to reach interested audiences.

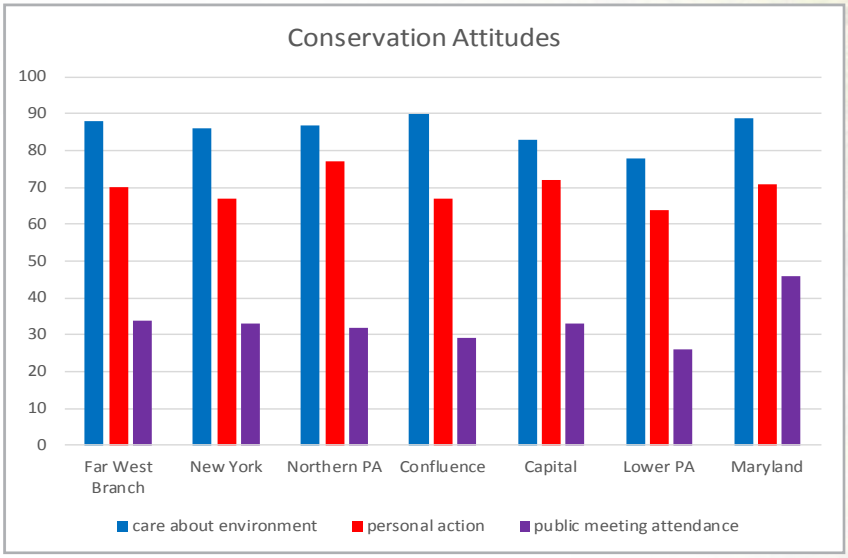

Fig. 2. Percentage of respondents who report caring about the environment, taking personal actions on behalf of the environment, and likely to attend a public meeting on the environment.

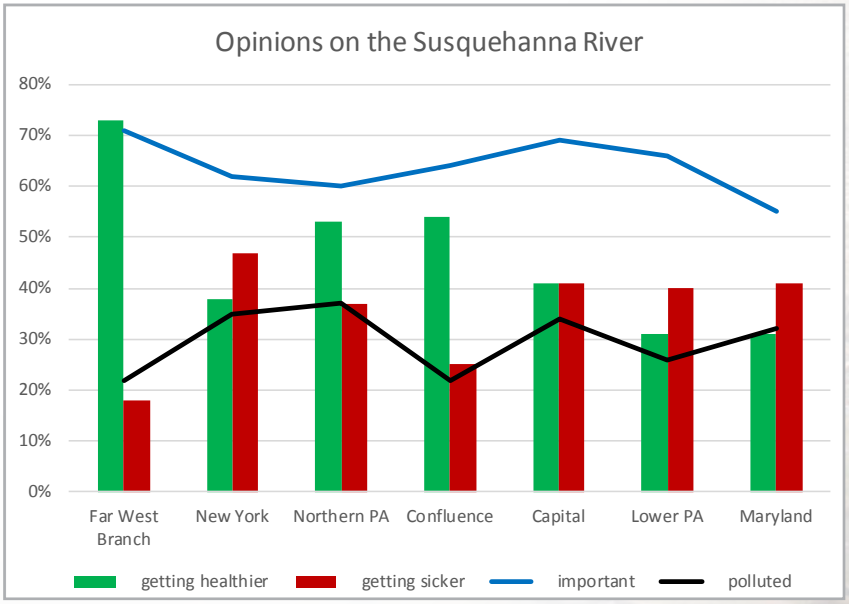

Fig. 3. Percentage of respondents who believe the Susquehanna River is important, polluted, getting healthier, and getting sicker.

Conservation and Recreation Priorities

Survey participants were asked questions about their conservation and recreation priorities, including questions about the purposes for which they think land should be conserved (Figure 4) and the kinds of activities in which they engaged over the past year (Figure 5). In four regions (Far West Branch; Northern PA; Confluence; and Lower PA), respondents most often reported that land should be conserved for water quality improvement. In the other three regions, wildlife habitat was most often reported as the highest priority for land conservation. While still above 50% in each region, the lowest priority for land conservation was for river-related tourism (52% in Lower PA; 66% in Confluence).

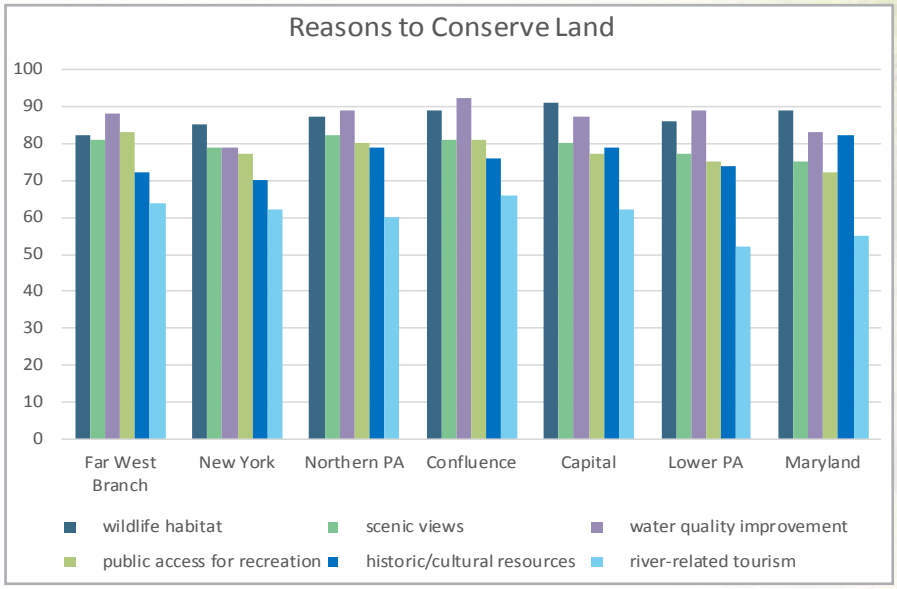

Fig. 4. Percentage of respondents who think land should be conserved for various reasons.

Visiting a park (62%–71%) and relaxing in or near the river (67%–68%) were the recreational activities in which the highest percentage of survey participants engaged in all but one region. The fewest respondents reported engaging in fishing (19%–38%) or using a boat (18%–31%) across all seven regions.

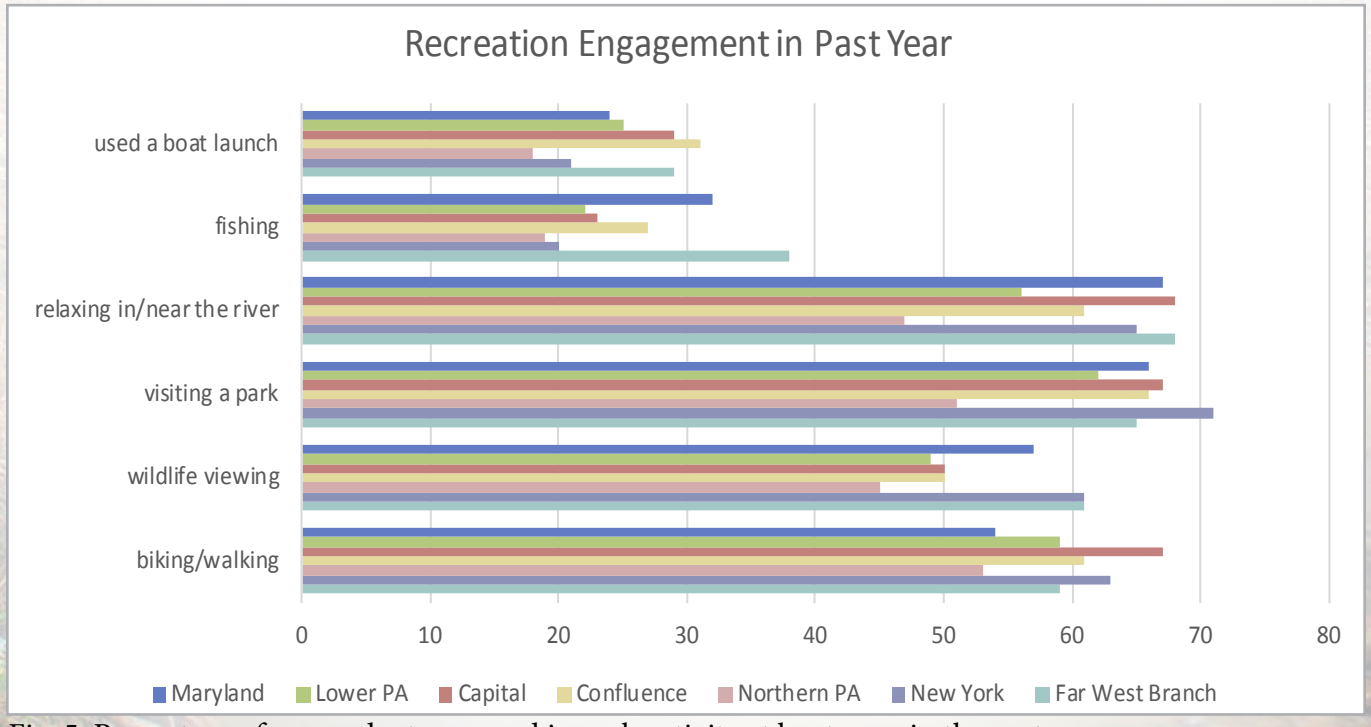

Fig. 5. Percentage of respondents engaged in each activity at least once in the past year.

Figure 6 shows the priorities for which survey respondents, personally, would be willing to pay more in taxes. Generally, participants were most supportive of additional tax spending on parks (61%–71%) and libraries (58%–71%) and least supportive of paying more taxes for boat launches (24%–44%) or land for hunting (17%–36%).

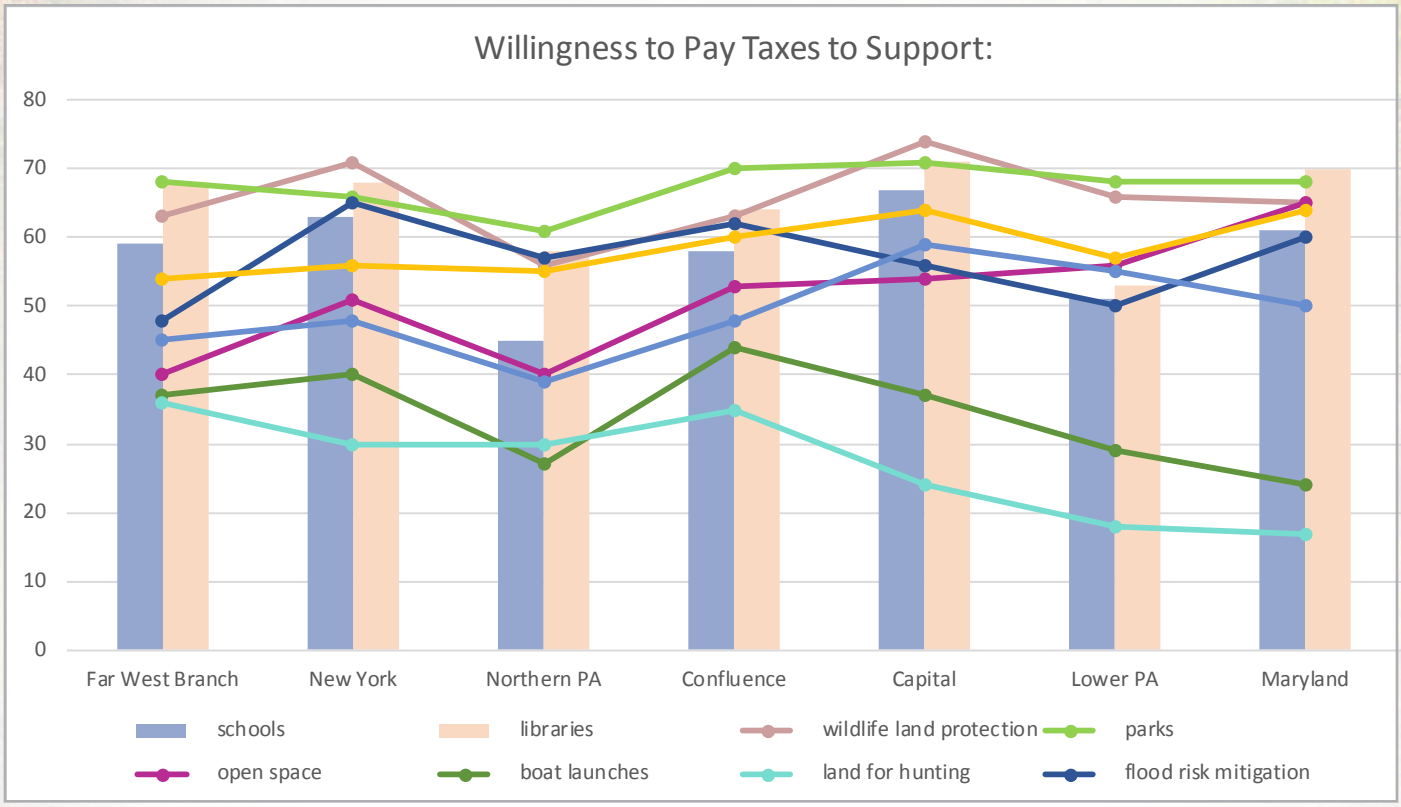

Fig. 6. Percentage of participants willing to pay more taxes for specific reasons.

These results suggest that respondents are generally supportive of land conservation for a variety of reasons, but less committed to paying more in taxes for conservation benefits. Higher reported participation in passive recreational pursuits, including relaxing near the river, visiting a park, and wildlife viewing, seems to correspond generally within each region to a higher percentage of respondents suggesting they would be willing to pay for corresponding things like wildlife land protection and parks. Similarly, relatively lower percentages of respondents reporting using a boat launch or fishing in the past year generally corresponds with a lower reported willingness to pay extra taxes for boat launches and hunting land across all regions.

The willingness-to-pay questions also included schools and libraries, both of which ranked as high or higher than many conservation priorities, suggesting the realities of competing priorities, beyond conservation, that are likely central to watershed residents. These results suggest that funding mechanisms beyond public resources may be necessary for new conservation and recreational efforts, in order to maintain public support.

Furthermore, survey participants were asked whether or not they had been displaced or inconvenienced by flooding in the past ten years. In New York, a relatively high percentage (41%) of respondents suggest they had been affected by flooding. In other regions, results ranged between 4% in Maryland and Lower PA regions to 20% in the Confluence. This might explain why the New York region reported the highest percentage of respondents willing to pay more taxes for flood risk mitigation (65%) than other regions.

Survey participants were also asked about their interest in and visitation to sites of historical significance within the past six months. The percentage of respondents from the Far West Branch reported the lowest rate of historical site visitation (47%), while the percentage of respondents from Maryland reported the highest historical site visitation (71%).

Respondents in every region reported agreement that states and nongovernmental organizations should do more to promote history, with American Indian history topping the list (65%–75%) and industrial history ranking lowest in every region (35%–55%).

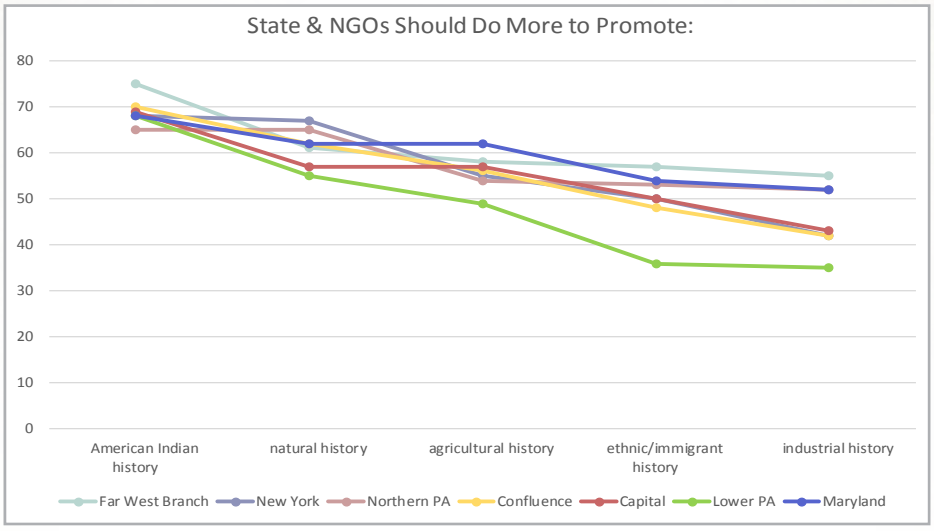

Fig. 7. Percentage of survey respondents who think more should be done to promote history.

Finally, survey participants were asked about their trust in various resources. Local government (municipal and county leaders) were most trusted by the largest percentage of respondents in five of seven regions (48% in Maryland; 68% in Far West Branch). In two regions, North Branch and Lower PA, the Pennsylvania Fish and Boat Commission specifically was the most trusted by the highest number of respondents (60% and 62%, respectively). This is interesting because in these same two regions, fishing and boating did not rank high as recreational pursuits in the past year.

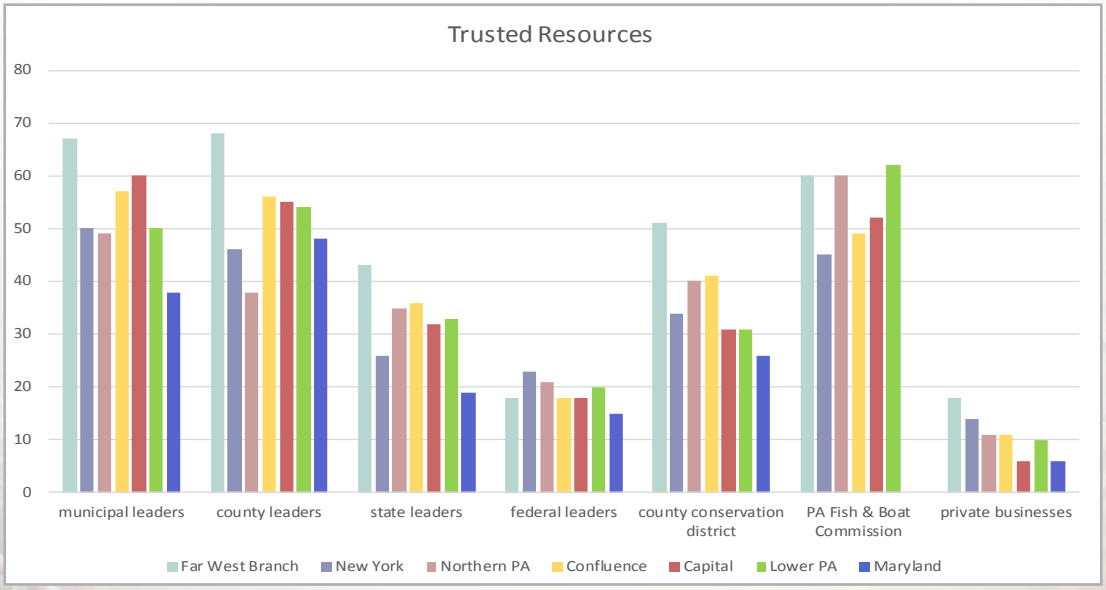

Fig. 8. Percentage of survey respondents who trust different entities to do conservation.

Interpretation of Community Engagement Campaign

Conservation attitudes, beliefs, and opinions differed among the seven regions of the watershed; therefore, activities and strategies undertaken should be receptive to and guided by local preferences.

Among the regions, there were thematic consistencies identified through the community engagement campaign and by the *ETS* Advisory Council. Therefore, the following five themes were identified to focus the *ETS* initiative:

American Indian Heritage and History
Recreation and Public Access
Working Lands
Stormwater and Flooding
Wildlife Habitat

The geographical coverage of groups working throughout the Susquehanna, the natural, economic, and cultural resources in the watershed, and the community preferences identified in the community engagement campaign, however, tended to be geographically segmented into three main watershed sections:

Upper Watershed *(New York, Northern PA)*
Middle Watershed *(Far West Branch, Confluence)*
Lower Watershed *(Capital, Lower PA, Maryland)*

The Vision Statements, Priorities, and Strategies outlined in the remainder of this document are described in the context of the five themes and three watershed sections.

Photo: Jeff Cushner

Envision the Susquehanna Themes

ETS is an initiative born out of the spirit of community. *ETS* Partners aim to improve ecological and cultural resources throughout the Susquehanna landscape and in so doing improve the quality of life for all citizens along the river. Therefore, the partners have agreed to coalesce around the following five thematic areas, which ranked as the highest priorities in the Resident Phone Survey and in subsequent public meetings.

American Indian Heritage and History

In the *ETS* Community Engagement Campaign phone survey, all regions ranked American Indian history highest when asked what they would like to see promoted more in their community. Susquehanna-wide, practitioners strongly believe that linking land ethic concepts, such as the American Indian "Seven Generations" philosophy, into river-related messaging would resonate strongly with residents and visitors.

Recreation and Public Access

In almost every region, more than half of residents reported relaxing in or next to the river, visiting a park, biking or walking, and viewing wildlife within the last year. Numerous groups working across the watershed agree that recreation and public access provide a connection between residents, visitors, and the natural and cultural resources of the Susquehanna, building appreciation for, and therefore stewardship of, the river.

Working Lands

More than 9,500 square miles (including farms and state forests) within the Susquehanna River watershed could be considered "working lands." The Susquehanna's natural resources are a major economic driver within the watershed, and about 60% of *ETS* survey respondents are willing to pay higher taxes to support agricultural land preservation.

Stormwater and Flooding

Stormwater and flooding are repeatedly mentioned in the comprehensive and open space plans assessed in the community engagement campaign. This represents an opportunity to intersect long-term economic and environmental planning. Further, stormwater runoff picks up pollution and delivers it to nearby streams, affecting water quality and wildlife habitat downstream.

Wildlife Habitat

Across the watershed, respondents supported land conservation for water quality improvement and wildlife habitat, including using public tax monies and private donations to support the protection of land for wildlife. Increasing efforts to conserve and restore habitats at the landscape scale indicate the need for a watershed-wide platform for collaboration, data sharing, planning, and conservation.

Selected Data Sources

ETS aims to support watershed stakeholders in evidence-based decision-making. Data analysis undertaken and published by multiple *ETS* partners has been integrated into this document to provide geospatial context for priorities and recommendations. Datasets used are listed in the table below. A major challenge in this exercise is the lack of consistency and continuity in data availability. The need for standardized datasets at the landscape scale is ubiquitous.

Indigenous Cultural Landscape areas, Native American Historical Sites, Cadzow's Archaeological Sites, Petroglyphs, Native American Paths - Dr. Katie Faull at Bucknell University, National Park Service; Water Trails - PA Fish and Boat Commission, PA Dept. of Conservation and Natural Resources, National Park Service, Chesapeake Conservancy; Boat Access sites - PA Fish and Boat Commission, MD Dept. of Natural Resources, NYS Dept. of Environmental Conservation

Rivertowns and Greenway Network Corridor - Susquehanna Greenway Partnership; LSHG Heritage Area - Lower Susquehanna Heritage Greenway; NY trails - NY State Department of Environmental Conservation; PA trails - PA Department of Environmental Protection; Towns - USGS; Esri. Sources: Captain John Smith Chesapeake National Historic Trail, Utility Priority Areas - Chesapeake Conservancy; Exelon property layer - Exelon Energy Company; PPL property layer - PPL Energy Company; Indian Cultural Landscape Priorities - National Park Service

State Forest - PA Dept. of Conservation and Natural Resources, NYS Dept. of Environmental Conservation, and the Conservation Fund; Shale sites - NYS DEC Division of Mineral Resources and PA DEP; Crop Layer - USDA National Agricultural Statistics Service; Impaired Streams - NYS DEC and PA DEP; Water Quality Monitoring Stations - Susquehanna River Basin Commission, Environmental Assessment and Standard Program, GLEON Lake Observer, MD DNR, NYS DEC Division of Water, PA DEP, USGS MD Water Science Center, USGS NY Water Science Center, USGS PA Water Science Center, National Water Quality Monitoring Council, EPA, USDA

Index of Ecological Integrity - North Atlantic Landscape Conservation Cooperative; Trout Priority Areas - Eastern Brook Trout Joint Venture; Culverts - PA DEP, NYS DEC; National Flood Hazard Layer - Federal Emergency Management Agency; Index of Ecological Integrity - NALCC; Water Quality Monitoring Stations - Susquehanna River Basin Commission, Environmental Assessment and Standard Program, GLEON Lake Observer, MD DNR, NYS DEC Division of Water, PA DEP, USGS MD Water Science Center, USGS NY Water Science Center, USGS PA Water Science Center, National Water Quality Monitoring Council, EPA, USDA

Natural Reproduction Trout Streams 2016, Class A Wild Trout Streams 2016, Stocked Trout Waters 2016 - PA Fish and Boat Commission; Integrated List Non-Attaining Waters 2016 - PA DEP; Waterbody Inventory and Priority Waterbodies List - NYS DEC, Division of Water, Bureau of Water Assessment and Management; Priority Areas - EBTJV, NRCS; Priority Areas - Eastern Brook Trout Joint Venture

American Indian Heritage and History

Context

Archaeological research suggests that American Indians have lived in the Susquehanna River Valley for at least 11,000 years. The name "Susquehanna" is derived from the Delaware Indian name "Sisa'we'had'hanna," which means River Oyster. Centuries before the arrival of Europeans, American Indians traversed the Susquehanna for trade, transport, and warfare. Ancient petroglyphs found along the lower Susquehanna indicate the river's long history as a sustaining resource for its inhabitants. In addition, the boundaries of the Susquehanna watershed represent the traditional territory of the Haudenosaunee Confederacy – a league of five nations that largely came together in the precolonial era.

Vision Statements

We Envision a Susquehanna…

- Where the cultural identity of the watershed is associated with its rich American Indian history.
- Where the philosophies of land ethic and stewardship of the watershed's indigenous residents resonate with residents and visitors and are reflected in the actions of local communities.
- Where American Indian communities in the region are reflected in current river-wide efforts and interpretive and celebratory events.
- Where sites of American Indian significance are mapped in order to help residents and visitors draw connections to local American Indian heritage and history, and to inform a strategic planning process for development that incorporates these priority regions.

In the spotlight: Important American Indian Sites—Map on opposite page

Dr. Katherine Faull of Bucknell University and her students, in partnership with the National Park Service's Chesapeake Bay Office have been working to map important American Indian sites in the Susquehanna River watershed and present them online for a collaborative project called the *Digital Atlas of the Susquehanna Valley*. Sites along the West Branch Susquehanna River are currently being mapped and should be completed in 2017. To share the rich history of the watershed with the public, Bucknell University has partnered with public television station WVIA, Bloomsburg University, SUNY Binghamton, Wilkes University, and the Haudenosaunee Environmental Task Force on a documentary series called *Stories of the Susquehanna* in an effort led by Bucknell University Associate Professor Dr. Alfred Kentigern Siewers.

"EACH OF US ARE A PART OF ALL THAT IS BENEATH US, ALL THAT IS AROUND US, AND ALL THAT IS ABOVE US. WE DO NOT OWN THE LAND BUT ARE STEWARDS THEREOF ON BEHALF OF THE NEXT SEVEN GENERATIONS TO COME."

- Seventh Generation Principle, Haudenosaunee Confederacy

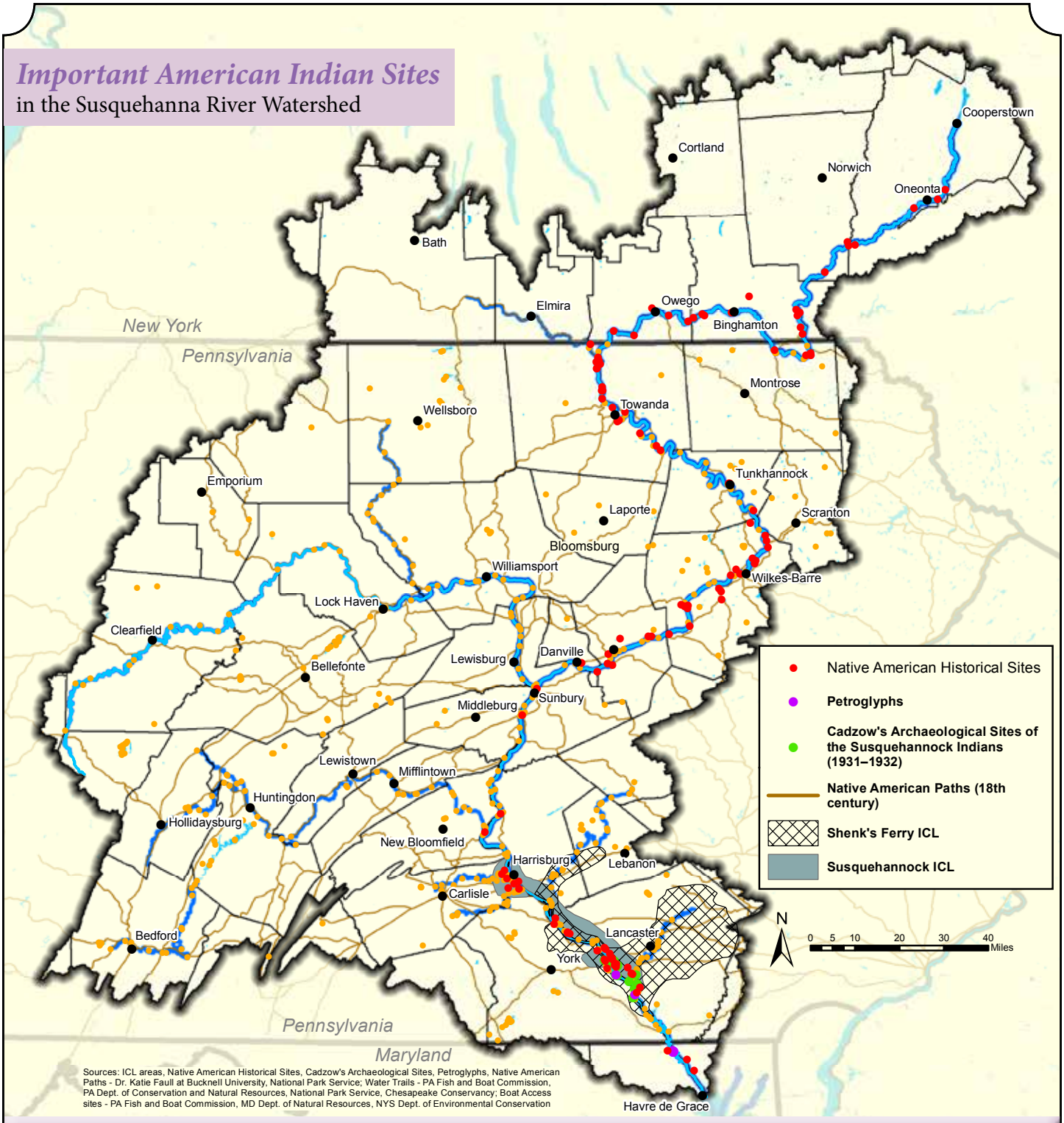

Fig. 9. Understanding the American Indian history within the Susquehanna River watershed at a local level can help landowners connect with thousands of years of stewardship of the lands, waters, plants, and wildlife. Researchers from Bucknell University, the National Park Service, and others have identified and mapped important American Indian sites which may help to tell the cultural and historical story of the watershed. **Native American paths** crisscross the watershed, echoing the highway systems of today. Indigenous Cultural Landscapes, or **ICL**s, illustrate the landscape on which American Indian communities like **Shenk's Ferry** Indians and **Susquehannock** Indians depended for hunting, farming, fishing, logging, and other basic needs. Pennsylvania State Archaeologist, Donald Cadzow, uncovered **Cadzow's Archaeological Sites of the Susquehannock Indians** in 1931–32. **Petroglyphs**, or ancient rock carvings, can still be found on huge rocks emerging from the waters of the Susquehanna River.

Photo: Arbogastlw

Upper Watershed American Indian Priority: The Haudenosaunee are celebrated and supported in their vision and efforts to steward the Susquehanna.

The active presence of American Indian cultures in the Upper Susquehanna is a valuable resource in this part of the watershed. Therefore, a top priority is to integrate their environmental stewardship ethic into policies and activities in this region.

- Develop a media campaign on the principles of Haudenosaunnee Environmental Task Force in order to educate and engage other regional residents in environmental stewardship.
- Work with public TV and radio to develop meaningful programming about the American Indian heritage and history of the Susquehanna.
- Celebrate the Haudenosaunee Environmental Task Force work on conservation and restoration.

Middle Watershed American Indian Priority: The region's residents understand and are connected with the history of American Indians in their region.

According to the community outreach campaign, residents in this region are least aware of the American Indian history in this region. This provides a key outreach opportunity, in particular when educating managers of working lands on the importance of land ethic and stewardship for the sustainable use of the Middle Susquehanna's myriad natural resources.

- Develop a watershed-wide cultural and historical working group and conference to compile knowledge and resources about the Susquehanna River watershed.
- Integrate important historical sites into land use decision-making.
- Create outreach and educational materials to introduce residents to the local history of this region.
- Direct messaging toward landowner to provide new perspectives on the importance of land ethic and stewardship, potentially based on American Indian philosophies.

Lower Watershed American Indian Priority: Local voices defend and celebrate the existing historical and cultural resources in this region.

The Lower Susquehanna is one of the most culturally and historically significant regions in the eastern United States, yet neither state in this region recognizes a tribal presence.

- Work with active American Indian communities nearby, including the Haudenosaunee Confederacy and the Maryland Commission on Indian Affairs, to build an active voice for American Indian history and culture in the lower Susquehanna.
- Thoroughly document and protect the ancient petroglyphs carved in rocks standing out from the riverbed.
- Encourage the stewardship and celebration of the region's American Indian heritage and history through K-12 education programs and cultural heritage tourism.
- Protect key viewsheds to preserve interpretive opportunities.

Mapping Viewsheds from Scenic Overlooks

Scenic overlooks in the Susquehanna River watershed have been valued by people for millennia. The King and Queen Seat in Rock State Park, Maryland (opposite page) and the Wyalusing Rocks Scenic Overlook in Northern Pennsylvania (below) are just two examples of overlooks now treasured by local communities that were lookout points, meeting places, and holy sites for the Haudenosaunee. Efforts to identify and conserve the viewsheds that can be seen from these important places can help provide interpretive sites and inspire stewardship, helping visitors and residents envision a landscape that had been valued and stewarded for thousands of years.

In the spotlight: Viewshed analysis to prioritize land conservation.

In support of land conservation and public access planning, the National Park Service's Chesapeake Bay Office, the Lancaster County Conservancy, the Pennsylvania Department of Conservation and Natural Resources, and other local stakeholders worked with the Chesapeake Conservancy to identify the parcels that could be seen from 12 scenic overlooks along the lower Susquehanna River.

Application: In the example below, the Pinnacle Overlook (left) was assessed for its viewshed (center). Parcels visible from this and three nearby overlooks were identified as conservation priorities (right).

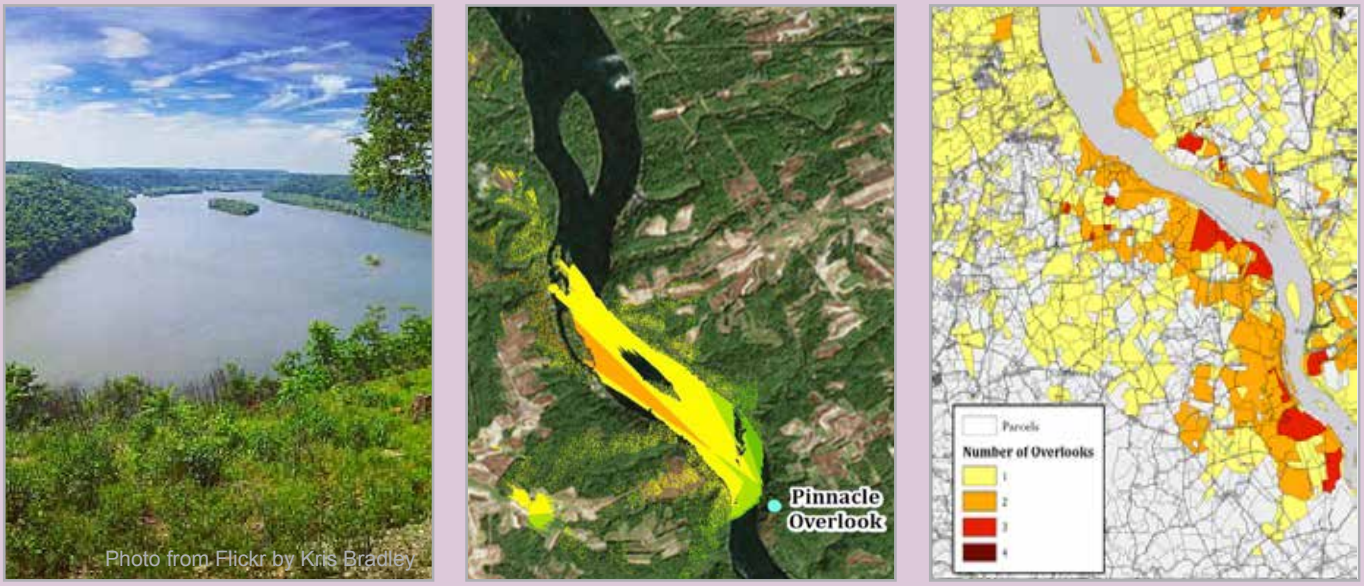

Fig. 10. Viewshed analysis of Pinnacle Overlook in the lower Susquehanna River watershed.

Recreation and Public Access

Context

The development of river-based recreation in the Susquehanna is considered a priority by local communities throughout the watershed. The Captain John Smith Chesapeake National Historic Trail, which extends up the Susquehanna River north to Cooperstown, NY, and west to Lock Haven, PA, highlights Captain Smith's exploration of the Chesapeake, celebrate's the American Indian heritage and history along the rivers of this region, and provides a platform to link recreation and public access with cultural heritage tourism based on American Indian heritage and history. The watershed-wide collaborative effort to establish the trail in the Susquehanna in 2012 represents the agreement of partners across the watershed to collaborate toward greater cohesion and connection of recreational activities across the river and its watershed.

Vision Statements

We Envision a Susquehanna…

- Where outdoor experiences leave people with a sense of connection to the natural landscape.
- Where visitors and residents recognize the context and importance of their location as it relates to the larger landscape.
- Where a connected network of trails and greenways links people to the river and the watershed's natural resources, and the river is valued for its countless recreation experiences.
- Where outdoor recreation is integrated into the experiences of residents and visitors, without barriers to park and river access.
- Where young people have access to meaningful outdoor experiences to help build the next generation of conservation leaders and inspire lifelong stewardship of the environment and communities.

In the spotlight: Important Recreation and Public Access Sites—Map on opposite page

The Susquehanna Greenway Partnership's River Towns program provides investment in river town parks, trails, and open spaces to create healthier, greener communities, attract business investment, encourage urban living, and improve the economic potential for tourism. The Partnership has designated 11 towns as River Towns, and 7 towns are currently undergoing the designation process.

CAPTAIN JOHN SMITH CHESAPEAKE NATIONAL HISTORIC TRAIL

The Susquehanna River segment of the John Smith Chesapeake Trail is a 552-mile system of water trails along the main stem and West Branch of the Susquehanna River in Maryland, Pennsylvania, and New York. Sections of the trail are managed by a variety of organizations and agencies, all of which support the component connecting designation. Overall coordination of the component is provided by the Susquehanna Greenway Partnership.

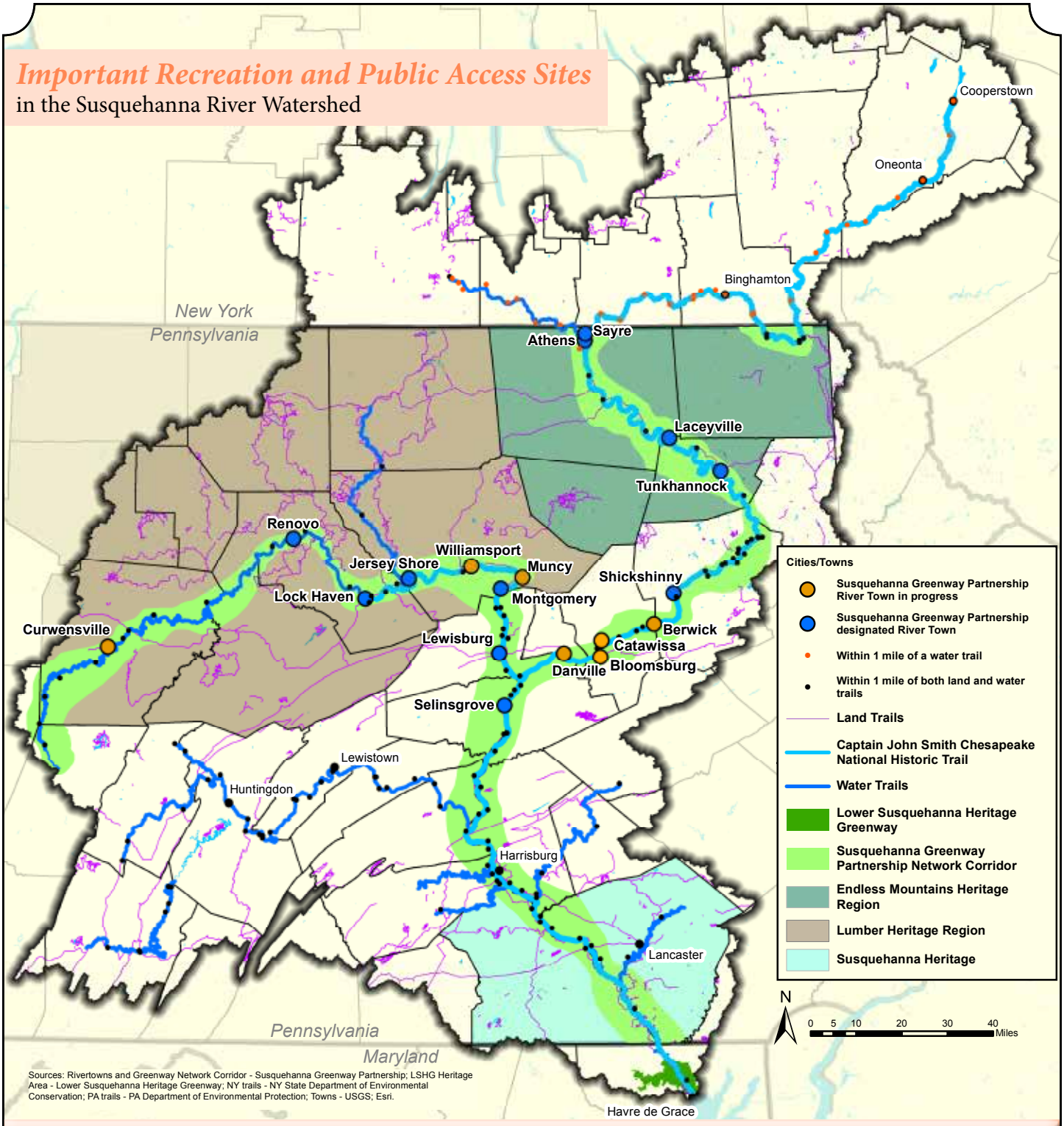

Fig. 11. Organizations and collaboratives throughout the Susquehanna River watershed including the **Susquehanna Greenway Partnership (SGP)**, **Endless Mountains Heritage Region, Lumber Heritage Region, and Susquehanna Heritage** in Pennsylvania and the **Lower Susquehanna Heritage Greenway** in Maryland, recognize and celebrate the economic benefits of river-related cultural heritage tourism. The **Captain John Smith Chesapeake National Historic Trail** was extended up the Susquehanna in 2012 to help drive recreation, tourism, and interpretation along the river. Efforts to enhance the visitor experience in riverfront towns, such as the SGP's **River Towns program**, could provide economic opportunities for local communities and help visitors experience and celebrate the Susquehanna and its tributaries in the 165 towns in the watershed located **within one mile of water trails**, of which 29 are **within one mile of both land and water trails**.

Photo: Jon Dawson

Upper Watershed Recreation and Public Access Priority: Continuity in water trails, maps, and signage.

The Upper Susquehanna is a largely untapped resource for recreation and tourism, particularly in New York where trail maps are outdated and signage visible from the river is lacking. Furthermore, large distances between public river access sites, overnight camping sites, and the presence of unmarked, derelict dams present a barrier for thru-padding this section of the river.

- Identify and prioritize gaps in public river access and overnight camping.
- Improve trail connectivity by developing uniform water and land trail maps and signage, as well as virtual access to trip planning information that spans the NY–PA border.
- Establish and communicate the connection of the Susquehanna to the Chesapeake Bay by removing or portaging physical barriers, celebrating thru-paddlers in the "444-Club," and developing Bay-related messaging on signage and at river-related events.

Middle Watershed Recreation and Public Access Priority: Foster nature-based economic and community development.

For more than two decades, the Commonwealth of Pennsylvania has invested millions of dollars to mitigate environmental impacts of abandoned mines and reduce agricultural and stormwater pollution into nearby streams. Improved water quality in this region provides a unique opportunity to encourage river use through a connected network of greenways and riverfront communities.

- Encourage the development and use of land and water trails, greenways, and scenic by-ways that connect communities through recreation.
- Connect riverfront communities through a series of cohesive outdoor spaces and coordinated river-related events.

Lower Watershed Recreation and Public Access Priority: The region is a cultural and heritage tourism destination providing a diversity of experiences.

The "Lower Susquehanna" is one of the most culturally and historically significant regions in the eastern United States. This region's residents want to capitalize on its easy access from major transportation corridors to develop resource-based tourism.

- Carry out an assessment of the economic benefits of cultural heritage tourism to riverfront communities.
- Connect communities along the river physically with greenways and trails and contextually with consistent interpretive messaging for a cohesive visitor experience.
- Support local visitor contact centers with locally relevant interpretative materials.

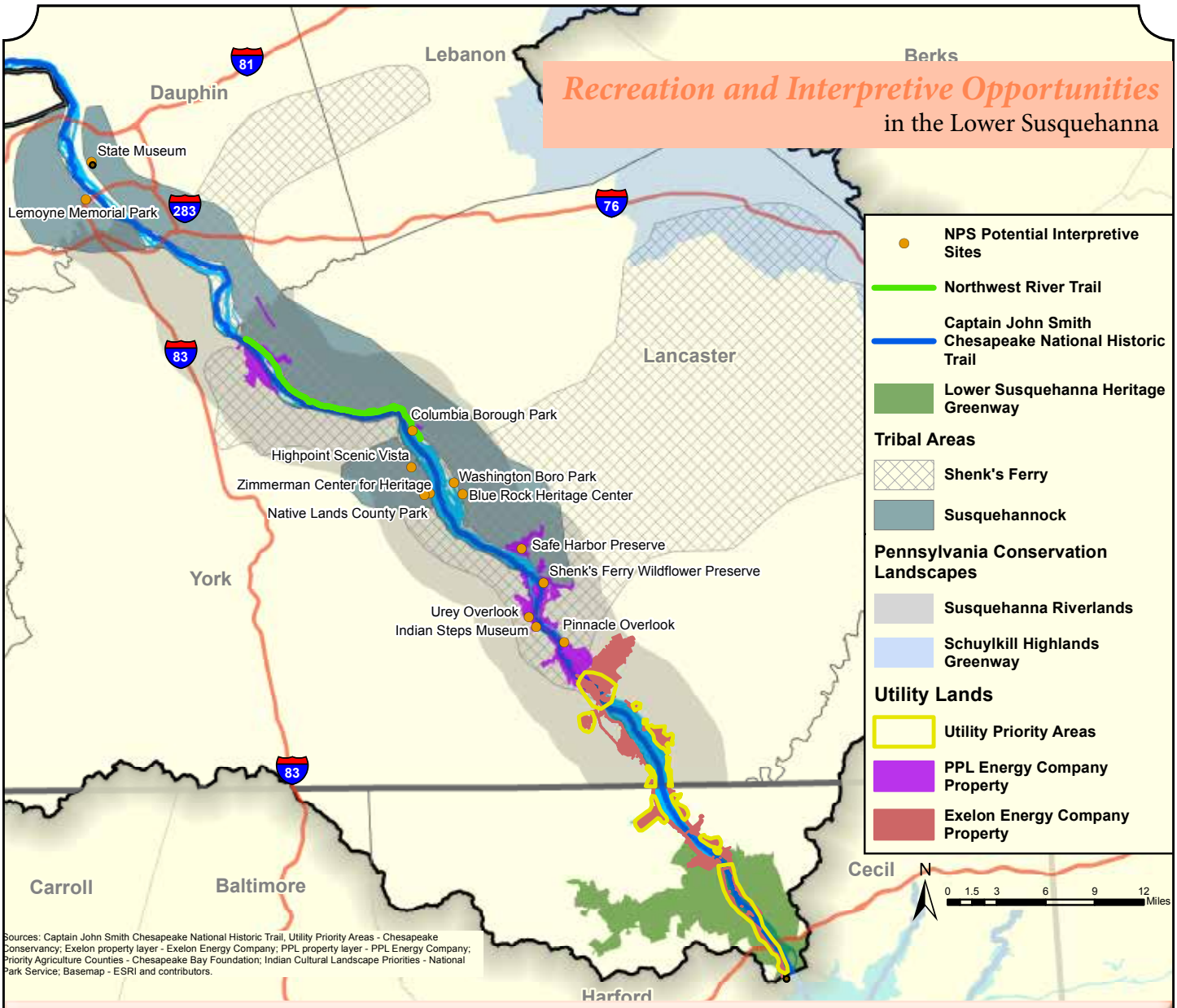

Fig. 12. In 2016 and 2017, the National Park Service's Chesapeake Bay Office coordinated the development of an implementation plan for the lower Susquehanna segment of the John Smith Chesapeake Trail. The plan outlines actions to improve visitor experience and identifies **potential interpretive sites**, including the historical Tribal Areas of **Shenk's Ferry** and the **Susquehannock** Indians.

The **Susquehanna Riverlands** and **Schuylkill Highlands Greenway** are two of seven **Conservation Landscapes** designated by the Pennsylvania Department of Conservation and Natural Resources. Conservation Landscapes are large regions are working together to drive strategic investment and actions around sustainability, conservation, community revitalization, and recreational projects. Major Features of the Susquehanna Riverlands include the 14-mile **Northwest River Trail**, and the Turkey Hill section of the 29-mile Enola Low Grade Rail Trail and more than 2,000 acres of protected publicly accessible land.

PPL Energy Company and **Exelon Energy Company** run three major hydroelectric dams on the lower Susquehanna and own waterfront land as part of dam operations. In 2013, the Chesapeake Conservancy convened stakeholders to submit comments to the Federal Energy Regulatory Commission regarding Exelon's application for a new major license for the southernmost Conowingo Dam in Maryland. An assessment of utility-owned land was carried out. Stakeholders identified **utility priority lands** that could be key public access and wildlife habitat lands, should they be opened to the public as part of relicensing.

Working Lands

Context

The Susquehanna's beautiful landscape and fertile agricultural soils attracted European settlers throughout the 18th century. The history of this region is rich with resource extraction, including timber harvesting, coal mining, natural gas extraction and transport, hunting, fishing, agriculture, and hydroelectric power. The watershed's wealth of natural resources is central to residents' cultural identity, and should be integrated into river-related initiatives.

Vision Statements

We Envision a Susquehanna…

- Where the productivity of the watershed is in balance with and mutually supportive of the natural environment.
- Where the patchwork of working lands across the landscape is understood through a watershed-wide perspective of their ecosystem services, economic opportunities, and cultural value to the lands and waters.
- Where landowners work together throughout the watershed to practice and celebrate successes in land stewardship.
- Where working land and business owners are the strongest advocates for environmental stewardship.
- Where resource management decisions are rooted in the best available science.

A STATE RICH WITH RESOURCES

"The Commonwealth of Pennsylvania is a geographic area of abundant natural resources. Over the last two centuries, Pennsylvania has been a world leader in the production of steel, zinc, coal, coke, cement and lumber. At the time of settlement, Pennsylvania was likely 90 percent forested, covered by a combination of white pine, eastern hemlock and assorted hardwoods. As settlers pushed inland from the east coast and the need for lumber grew, more and more of the Commonwealth's old-growth forests were harvested. Water-powered saw mills sprang up in the interior and mountainous areas of the State and lumber was harvested for all types of construction. Tall and straight, Pennsylvania's white pine and hemlock trees were much in-demand for ships masts. Williamsport became a boom town for lumber as men made their fortunes and workers flooded North and West to clear the hills. Lumber towns with associated industries, such as tanneries spread throughout the area in the late 1800s. However, by the 1920s, the trees were gone and the land deforested..."

- Pennsylvania Lumber Museum

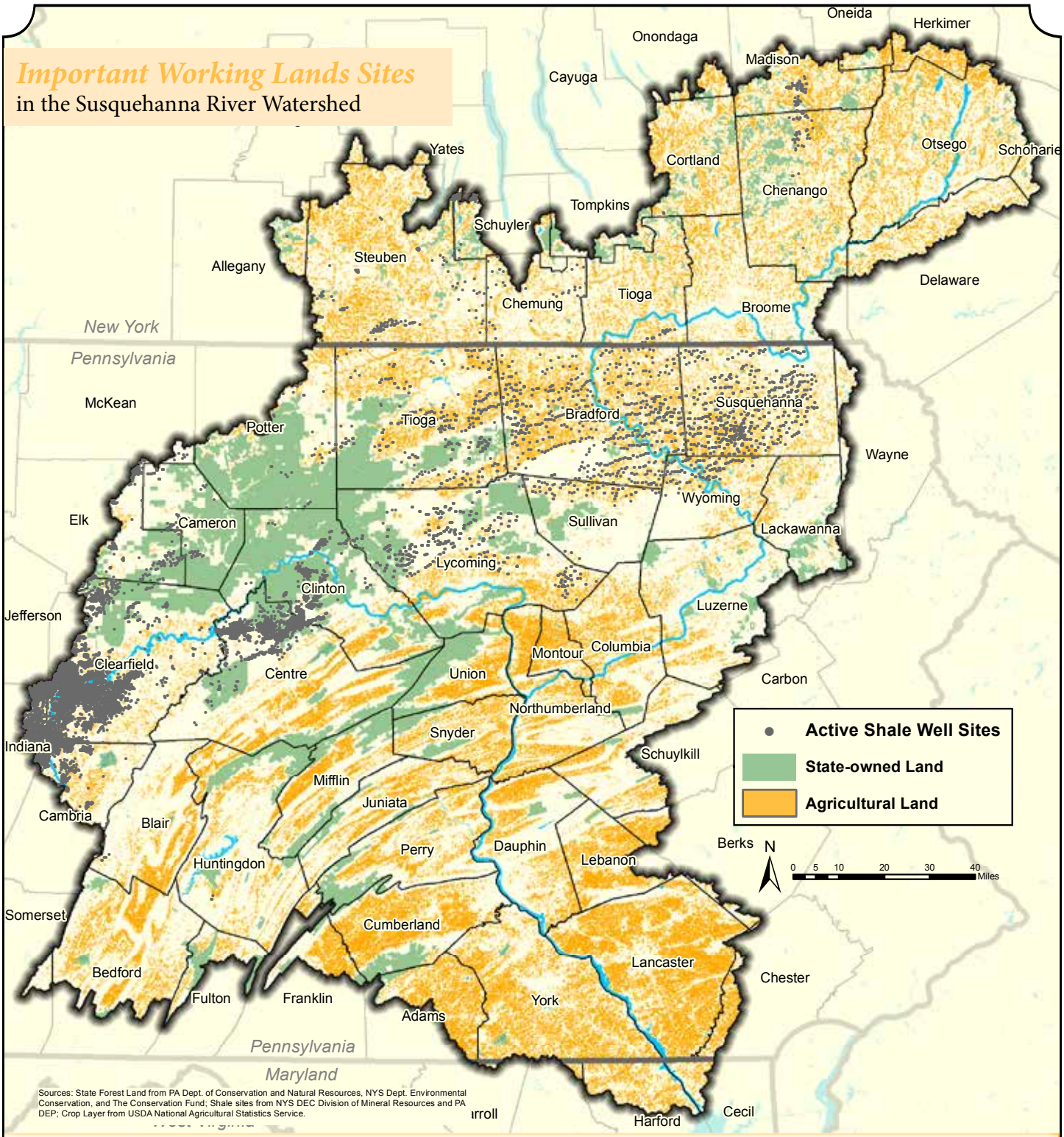

Fig. 13. The natural resources provided by the Susquehanna River watershed support local economies and quality of life for residents in New York, Pennsylvania, and Maryland. **State-owned land**, including 3,100 square miles of state forests, game lands, and parks, provides unique opportunities to work with agencies to prioritize and implement best management practices (BMPs) strategically across a large scale. More than 35,000 farms totalling over 6,400 square miles of **agricultural land** provide necessary food and fiber while supporting economic activity and the livelihoods of thousands of residents, but pose challenges for water quality and wildlife habitat. Nearly 12,000 **active shale well sites** and associated infrastructure, including pipelines, are the source of contention among some residents concerned about the potential impacts to human health.

Photo: Flickr: onallumette

Upper Watershed Working Lands Priority: Effects of Marcellus Shale and point source pollution are understood by residents and mitigated appropriately.

Efforts to mitigate the effects of point source pollution are currently poorly understood by residents, who lack trust in current water quality and the sources of information about water quality.

- Improve access to and interpretation of water quality data to the public. Expand data collection to include emerging containments.
- Work with entities trusted by local communities to deliver water quality messaging, especially related to Marcellus Shale development.
- Establish a method to effectively deliver water quality information to the public. Survey results indicate that residents believe the river is getting sicker, but this is also the least trusting region.

Middle Watershed Working Lands Priority: Efforts to carry out extractive and consumptive land and water uses sustainably are supported.

This region is rich in natural resources, including natural gas, timber, and agricultural production, which through careful and thoughtful planning can be sustainably extracted.

- Promote flexible opportunities for landowners to fund best management practices (BMPs). For example, the DCNR's income-producing buffer option in their Riparian Forest Grant Program addresses farmers' concerns about taking farmland out of production while still achieving environmental benefits.
- Use new models to identify and prioritize sites where BMPs could achieve the greatest reductions in nutrient and sediment loads.
- Measure riparian forest buffer coverage and set restoration goals for different segments of working lands.
- Encourage the meaningful participation of working lands industries in efforts aimed at land, water, and wildlife stewardship.
- Support and highlight successes in working lands management to encourage landowners to be ambassadors for environmental stewardship.
- Establish long-term protection of sites where substantial investments in remediation and restoration has occurred, including abandoned mine reclamation lands and riparian buffer restoration sites.

Lower Watershed Working Lands Priority: Activities related to utilities are integrated into long-term planning.

Utilities are major landowners in this region—providing drinking water, transporting natural gas, and delivering hydroelectric power to millions of people along the eastern seaboard.

- Integrate the creation and management of public access sites and trails into plans for utility land management. For example, establish safe, well-maintained portages around hydroelectric dams.
- Prioritize fish and eel passage in dam relicensing efforts.
- Overcome barriers to partnership with traditional farming communities including Amish and Mennonite.

Celebrating working lands successes and identifying restoration opportunities

In the past several years, the Susquehanna River watershed—especially within Pennsylvania—has received a tremendous amount of negative attention for lagging behind the nutrient reduction goals outlined in the Chesapeake Bay Watershed Agreement. The blame often lands on farmers, but communities and practitioners agree that highlighting successes and encouraging landowners to become local ambassadors for environmental stewardship could substantially accelerate the implementation of best management practices (BMPs). In addition, as enrollment in conservation programs wanes, there is an increasing need to identify new restoration opportunities across the landscape and set measurable, achievable goals.

In the spotlight: The Northcentral Stream Restoration Partnership

In the Middle Watershed, the Northcentral Stream Restoration Partnership—including 14 County Conservation Districts, the Pennsylvania Department of Environmental Protection (DEP), the Pennsylvania Fish and Boat Commission, and the Northcentral Pennsylvania Conservancy—is a primary example of successful partnership with landowners to achieve measurable environmental benefits. The partners have completed 85 projects in almost seven miles of agriculturally impaired streams in northcentral Pennsylvania and won a Governor's Award for Environmental Excellence in 2014. DEP's biologists and local universities monitor restoration sites in an ongoing effort to measure recovery. Farmer Field Days provide opportunities for neighbors to learn directly from the landowner about land stewardship and encourage enrollment in conservation programs.

Application: The following examples illustrate how high-resolution data can help identify and prioritize opportunities to partner with working land owners on restoration and stewardship.

Where working lands stewardship is working

The identification of streams that are not considered impaired by DEP but are in close proximity to working lands can help identify where the productivity of the watershed is in balance with and mutually supportive of the natural environment. These locations can be celebrated and highlighted as successes in stewardship of working lands.

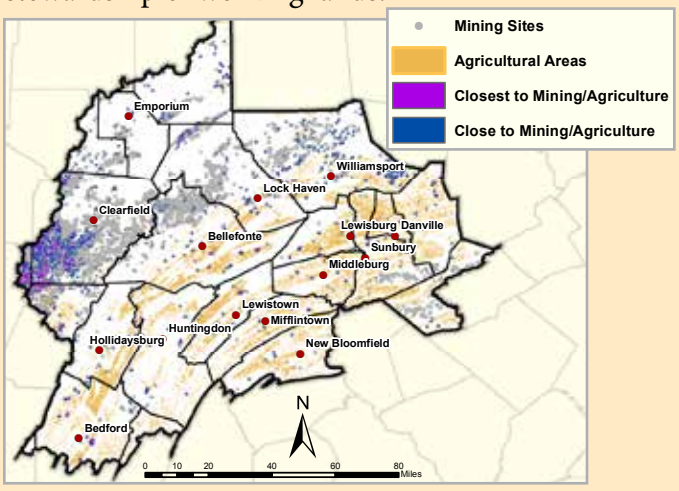

Fig. 14. Non-impaired streams close to working lands may be examples of successes.

Identifying new restoration opportunities

Riparian forest buffers are one of the most effective, cost-efficient BMPs available to landowners. The Pennsylvania Department of Conservation and Natural Resources is working with partners toward a goal of installing 95,000 acres of buffers. The Chesapeake Conservancy is currently using newly available high-resolution data to identify across the landscape where gaps in forest buffer coverage exist in order to set and measure progress toward this goal.

Fig. 15. Gaps in forest buffers are identified, quantified, and prioritized for restoration.

Stormwater and Flooding

Context

Stormwater runoff can erode stream banks; push excess nutrients, sediments, pesticides, and other chemical contaminants into rivers and streams; and can lead to flooding in urban and suburban areas. It is the fastest-growing source of pollution to the Chesapeake Bay. Tropical Storm Lee and Hurricane Irene in 2011 affected nearly every county within the Susquehanna River watershed, when water levels reached their highest flood stage since Hurricane Agnes in 1972. According to the U.S. Environmental Protection Agency, between 1958 and 2012, the northeastern United States (including the Susquehanna River watershed) saw a more than 70 percent increase in the amount of rainfall measured during heavy precipitation events, likely as a result of climate change.

Vision Statements

We Envision a Susquehanna…

- Where green infrastructure and natural environments, including riparian forest buffers, rain gardens, and floodplains, are supported in their functions to mitigate the effects of everyday and major storm events.
- Where all new and retrofitted gray infrastructure is designed to support the natural environment's ability to manage stormwater.
- Where efforts to manage stormwater and flooding consider effects on fish and wildlife and prepare for a changing climate.
- Where pathways of water flowing across the landscape and through stormwater infrastructure such as roadside ditches and sewer systems is understood, mapped, and prioritized for improvements and upgrades.

The Daily Item, September 6, 2016

After 5 years, water from Lee receded, but memories remain

By Eric Scicchitano

The ground buckled along Route 11 in Danville midway through the 3 o'clock hour on the morning of Sept. 8, 2011… Water from Mahoning Creek rushed over, inundating the Danville Middle School and the adjacent sewage treatment plant, which at that point, was past the halfway point in its $18 million renovation and upgrade. Richard Blosky stood among the emergency responders on Route 11, west of Route 54, as remnants of Tropical Storm Lee battered the Susquehanna Valley.

"The blacktop lifted up," recalled Blosky, Danville's emergency management coordinator and a former borough fire chief. "I thought, 'Here we go. We're gonna lose everything.'"

Blosky wasn't alone. That line of thinking was shared by thousands living in towns immediately along the Susquehanna River… Lee dumped an average of 10 inches of rain over three days throughout the Valley, causing flooding in many communities not seen since Hurricane Agnes swept up the East Coast in 1972...

Tropical Storm Lee caused an estimated $2 billion in damages along the East Coast, with New York and Pennsylvania hit hardest. The Federal Emergency Management Agency approved $275 million in public and private flood assistance throughout the eastern half of the commonwealth, including $24 million in Columbia, Montour, Northumberland, Snyder and Union counties.

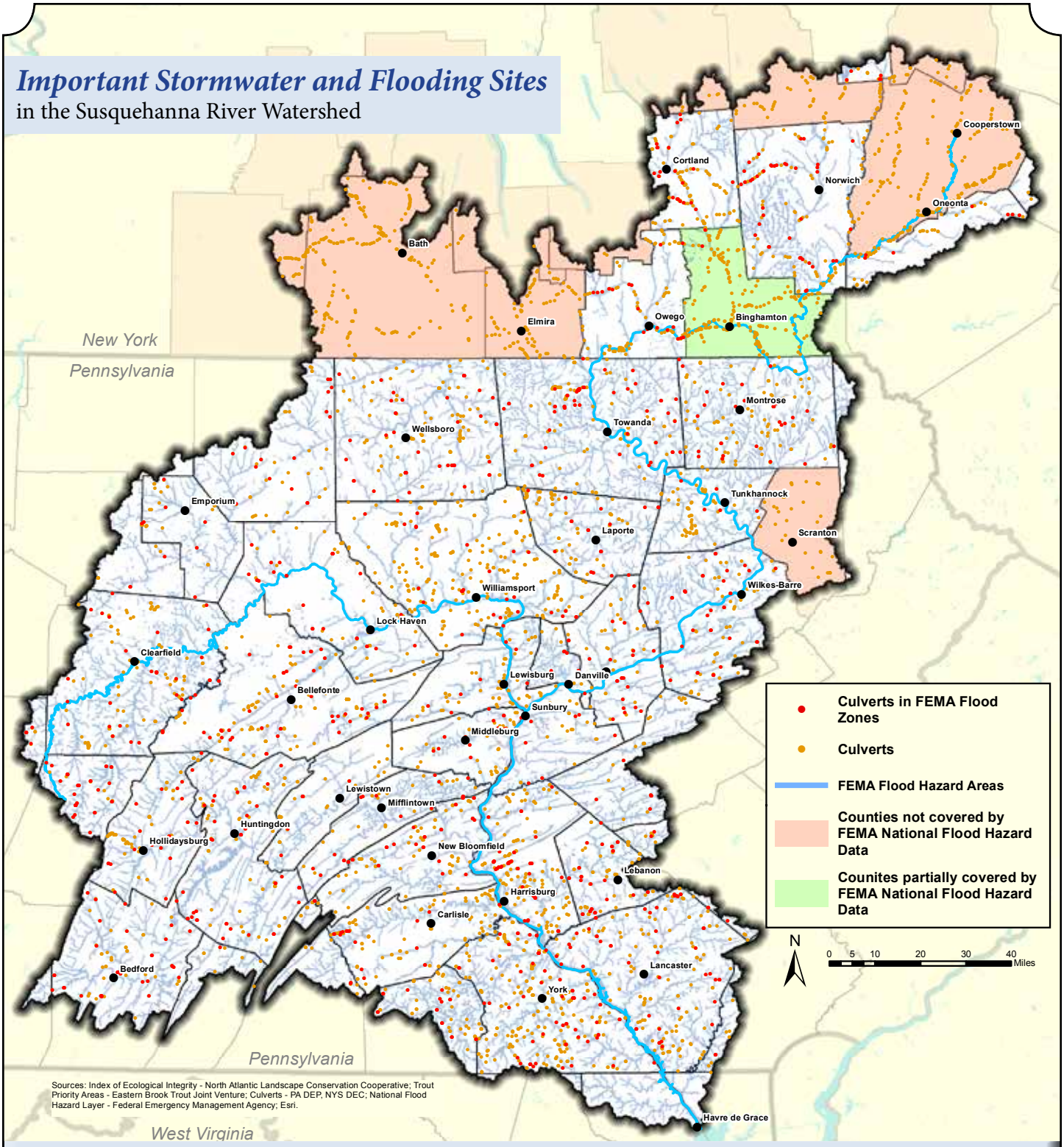

Fig. 16. Stormwater runoff can result in nonpoint pollution and flooding, especially where undersized or failing culverts do not adequately redirect stormwater flows from and around impervious areas. Therefore, identifying culverts in areas particularly affected by stormwater runoff, like **Federal Emergency Management Agency (FEMA) Flood Hazard Areas**, is a high priority throughout the watershed. Of the 4,369 **culverts** in the watershed, 951 of the **culverts are in FEMA flood zones**. There are 13 counties **not covered by FEMA National Flood Hazard Data**, and one county with **partial coverage**. Culvert replacement has been identified as a priority throughout the Susquehanna River watershed, both by stakeholders concerned about stormwater and flooding, and by wildlife habitat proponents who consider some culverts to be barriers to aquatic organisms.

Photo: Jamie Dannon

Upper Watershed Stormwater and Flooding Priority: Communities are prepared for the effects of flooding and prioritize green infrastructure.

In the New York, 41% of ETS survey respondents and the Northern PA region, 18% were displaced or inconvenienced by a flooding event in the past 10 years—the highest in the watershed.

- Identify and protect priority floodplains, wetlands, and natural areas.
- Develop education and training about stream processes and floodplain functions and conduct outreach to municipalities and the public.
- Collect data on the capacity of culverts to prioritize the needs for "right-sizing."
- Map roadside drainage systems and research techniques for reducing the impacts of ditches on flooding and water quality.

Middle Watershed Stormwater and Flooding Priority: New development prioritizes stormwater management. Investments in restoration, conservation, and green infrastructure provide measurable and sustainable ecosystem service benefits.

The word "development" was the most frequent word used in comprehensive and open space plans for seven of the nine counties in this region whose plans were assessed in the ETS community engagement campaign. Increased development can lead to more stormwater runoff and flooding.

- Incentivize long-term green infrastructure planning that delivers multiple benefits. For example, SGP works with municipal and county planners to install rain gardens as a flood mitigation strategy. Rain gardens help satisfy stormwater permit requirements with the added co-benefits of providing pollinator habitat and greening downtowns.
- Establish long-term monitoring sites, like the collaborative aquatic long-term research sites in Loyalsock Creek watershed established by Susquehanna University's Freshwater Research Initiative (FRI), to evaluate impacts of disturbance on biological communities.
- Utilize citizen science to add capacity to the stormwater community.
- Protect restoration investments through conservation easements.

Lower Watershed Stormwater and Flooding Priority: Restore the river to a drinkable, swimmable state by accelerating the pace of agricultural restoration and stormwater improvements.

Due in large part to its position within the watershed, this section is considered one of the most impaired sections of the river and is also within closest proximity to the watershed's highest-density population centers.

- Build collaboration across both state borders and county lines.
- Integrate evidence-based decision making into Municipal Separate Storm Sewer System (MS4) permits and Chesapeake Bay Pollution Reduction Plans (CBPRP).
- Track progress toward stormwater goals and utilize innovative pollution reduction models to prioritize projects with the greatest potential to protect and improve water quality.

A diversity of benefits from water monitoring and culvert replacement

The upper region of the Susquehanna was more concerned about stormwater and flooding than the rest of the watershed. In a move to identify and replace aging stormwater infrastructure like culverts, stormwater managers are engaging a diversity of partners to prioritize stormwater improvements where multiple benefits can be achieved and financial support can be leveraged across sectors.

In the spotlight: Cross-sector cooperation in the Upper Watershed

The objective of the Upper Susquehanna Conservation Alliance Flood Work Group is to collaborate on strategies for protecting and enhancing the natural and beneficial functions of floodplains, stream corridors, and stream channels. The group brings together regional and watershed organizations, nonprofits, universities, federal agencies, state departments, county agencies, and municipal staff to identify opportunities to collaborate on infrastructure and watershed education, mapping, and prioritization. The ultimate goal of the group is to focus strategies that support both the human and ecological systems affected by stormwater and flooding.

Application: The index of ecological integrity (IEI) is a measure of relative intactness (i.e., freedom from adverse human modifications and disturbance) and resiliency to environmental change (i.e., capacity to recover from or adapt to changing environmental conditions driven by human land use and climate change). Sites with high IEI scores are priorities for conservation in regions concerned with stormwater and flooding, due to their high resilience to human impacts.

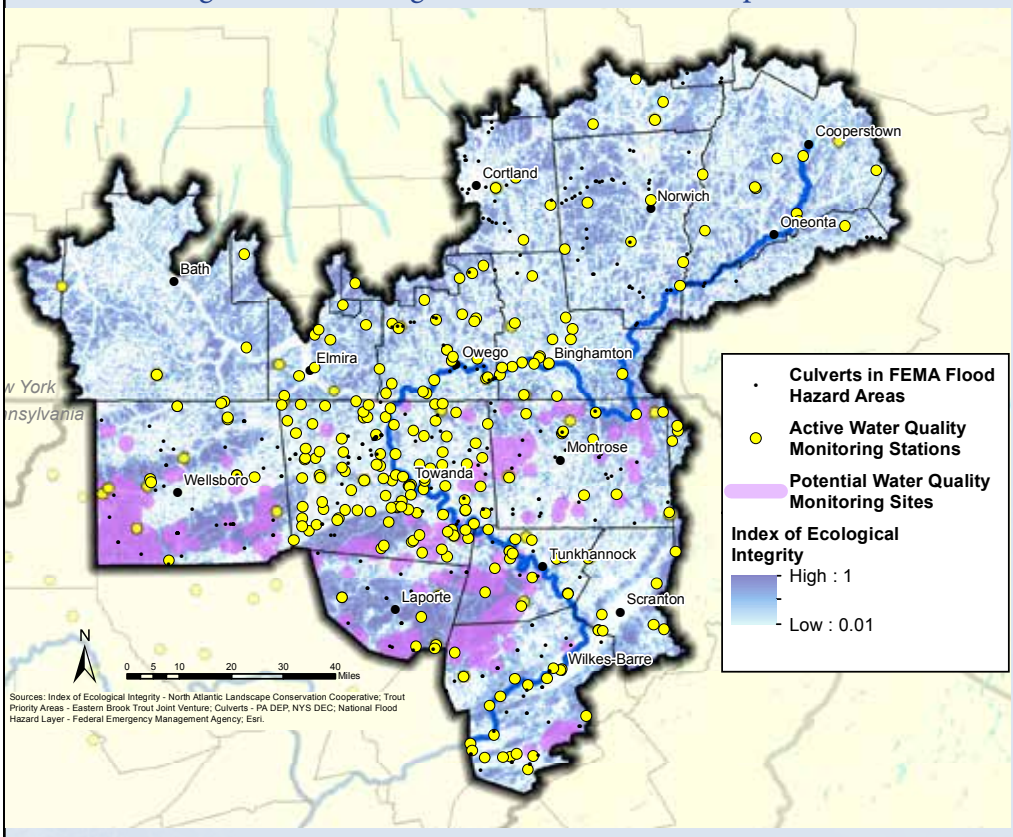

Fig. 17. Potential water quality monitoring sites in areas of shared priorities among stormwater and wildlife groups.

In this analysis, potential water-monitoring station locations were identified based on proximity to oil/gas/mineral extraction sites, the index of ecological integrity, and Eastern Brook Trout Joint Venture priority areas.

The site suitability extent was limited to the Federal Emergency Management Agency Flood Hazard Areas for the added benefit of monitoring flood conditions.

Water quality should be monitored in stormwater and flooding priority areas to track long-term trends in stormwater as a result of environmental change. Monitoring can help managers plan appropriately and lessen negative impacts to humans and the environment.

Wildlife Habitat

Context

The watershed contains huge tracts of forests, mountains, and more than 49,000 miles of rivers and streams. It is home to abundant wildlife of all kinds. The river remains key spawning ground and habitat for native fish species such as American shad, small mouth bass, and brook trout, as well as American eel. Iconic bird species like American woodcock, golden-winged warbler, and cerulean warbler call this watershed home. Hellbenders and pearly mussels live on the bottom of cool, clean creeks and streams. Fragmentation of the landscape and isolation of aquatic communities resulting from segments of streams that are polluted, as well as physical barriers like dams, culverts, highways, and pipelines, threaten wildlife and fish in the watershed. Researchers rush to study and understand these and other species in order to inform long-term, large landscape planning efforts to help maintain the wild, abundant biodiversity iconic to this watershed.

Vision Statements

We Envision a Susquehanna…

- Where intact, connected, and resilient ecosystems provide functions and services that benefit society, such as clean water, flood protection, and lands for farming, forestry, and recreation.
- Where sustainable, healthy, and diverse populations of fish, wildlife, and plants provide benefits and enjoyment for people.
- Where native species occur and thrive throughout their historic ranges, in a connected network of healthy habitats.
- Where human activity and stewardship of the natural environment allows species to thrive, migrate, and adapt in response to changing conditions.
- Where habitats and species are monitored and managed locally, with data and science necessary to connect local efforts to larger-scale priorities.

In the spotlight: Important Wildlife Habitat Areas—Map on opposite page

The Eastern Brook Trout Joint Venture is a collaborative effort that embodies the spirit of *Envision the Susquehanna*. A diverse group of partners, including state fish and wildlife agencies, federal resource agencies, Indian tribes, academic institutions, and non-governmental organizations are working to conserve eastern brook trout and their habitats. This fish habitat partnership has already produced a range-wide population assessment of wild brook trout; completed extensive work that identifies key threats to wild brook trout and their habitats; and developed conservation strategies to protect, enhance, and restore wild brook trout.

THE PENNSYLVANIA STATE FISH

*Eastern brook trout (*Salvelinus fontinalis*) is a priority species throughout the Susquehanna River watershed. This species relies on cool, clean water for its survival, and is an indicator of ecosystem health.*

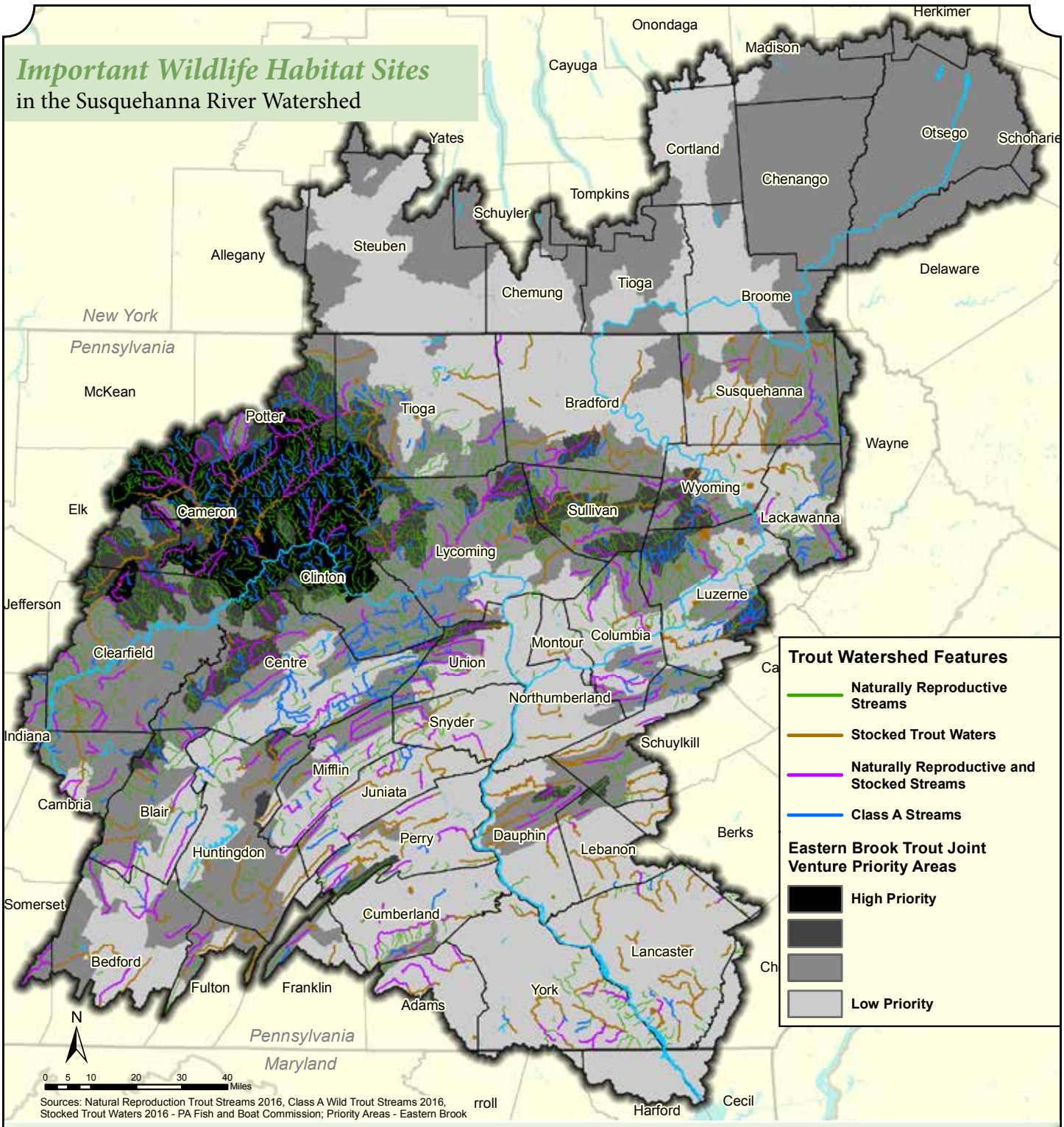

Fig. 18. The **Eastern Brook Trout Joint Venture priority areas** identify watersheds best for restoration, best for enhancement, and best for protection. A reflection of the cultural value on fishing, some streams are **stocked trout waters**. The Pennsylvania Department of Environmental Protection and the Pennsylvania Fish and Boat Commission (PFBC) have compiled detailed data across the state, identifying **naturally reproductive streams** and **Class A streams**—defined as streams that support a population of naturally produced trout of sufficient size and abundance to support a long-term and rewarding sport fishery. In order to adequately protect all high quality streams in Pennsylvania, each year the PFBC and a group of 13 cooperators led by Susquehanna University's Freshwater Research Initiative sample hundreds of streams through PFBC's Unassessed Waters Initiative that have never before been assessed.

Photo: Wikipedia by Womump

Upper Watershed Wildlife Priority: Aquatic and terrestrial ecosystems support self-sustaining populations of a variety of species whose habitats are managed in conjunction with other planning efforts.

Efforts in the upper watershed to bring together a variety of wildlife habitat stakeholders through the Upper Susquehanna Conservation Alliance provides opportunities to set and achieve co-benefits.

- Incorporate brook trout habitat information into stream trainings for stormwater managers.
- Identify sites for establishment and/or maintenance of early successional habitat to support species like the American woodcock, New England cottontail, and others.
- Evaluate the current status of freshwater mussels and promote their conservation. Advise the reintroduction and restoration of American eel—a species essential to the mussel life cycle.
- Carry out habitat and population restoration measures to support self-sustaining populations of hellbenders in the watershed.
- Establish a database and collaborative platform to share data, identify co-benefits, and partner on project implementation.

Middle Watershed Wildlife Priority: The West Branch and its tributaries provide prime trout fishing opportunities in the long term.

This region was once known for its excellent trout fishery, but pressures from human activities have reduced viable trout habitat and shoreline restrictions have reduced public access to fishing areas.

- Reestablish trout habitat connectivity by restoring damaged stretches of stream, replacing culverts, and removing dams.
- Expand infrastructure and public access for fishing and boating including river access at bridges and fishing access easements.
- Install and protect riparian forest buffers to improve water quality and in-stream habitats.
- Monitor restoration efforts for long-term effectiveness and protect restored sites through conservation programs.

Lower Watershed Wildlife Priority: Land use decision-making considers the long-term effects of fragmented habitats on wildlife.

This region has three major dams that span the Susquehanna. The lower Susquehanna in Pennsylvania is at the same time the most developed and the most farmed area in the watershed.

- Evaluate and prioritize habitat connectivity improvements; for example, the conservation of wildlife corridors among farmland.
- Work with utility companies to prioritize fish passage for keystone and iconic aquatic species.
- Celebrate the lower Susquehanna as an important migratory bird flyway and migratory fish route by increasing public access for birding and fishing. Educate residents and visitors on the regional significance of this region to wildlife by supporting nature education and research centers like the Susquehannock Wildlife Society in Maryland.

Large Landscape Conservation

A landscape-scale approach has become increasingly important to land conservation across the world. Wildlife habitats, the hydrologic cycle, geologic processes, climate change, and anthropogenic pressures occur at large scales across geopolitical boundaries. As a platform for large landscape collaboration, the Landscape Conservation Cooperative initiative was launched in 2009 by the U.S. Department of the Interior, primarily through the U.S. Fish and Wildlife Service and U.S .Geological Survey. LCC partners work together to identify common science needs, shared scientific capacity, and information and to coordinate natural resource conservation actions across the region. The Susquehanna River watershed is within the North Atlantic LCC region which includes nearly 130 million acres, from southeast Virginia north to Atlantic Canada. The North Atlantic LCC consists of federal agencies, states, tribes, universities, and private organizations and is part of a network of 22 Landscape Conservation Cooperatives.

In the spotlight: Tools for large landscape-scale planning

Fish Habitat Decision Support Tool
This tool provides access to the extensive spatial data and results produced from multiple fish habitat assessments. The Future Scenario modelling component allows users to make hypothetical changes to landscape characteristics and visually depict the impacts of those scenarios to aquatic health.

Nature's Network
This tool identifies places where the actions to support imperiled species and species of greatest conservation need, restore priority ecosystems, protect core landscapes, and promote connectivity between them will have the greatest benefit for fish and wildlife across the region.

Application: The following land conservation example in the West Branch Susquehanna River watershed demonstrates how regional datasets can provide large landscape-scale context for decision-making. Using North Atlantic LCC datasets and tools, the parcels of interest were assessed for their habitat value at a landscape scale.

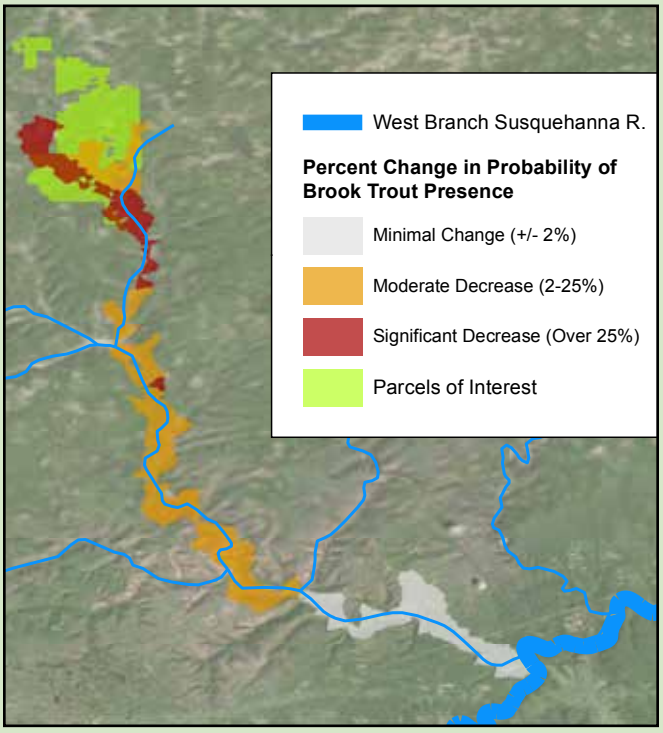

Fig. 19. Fish Habitat Decision Support Tool Futuring scenarios: Increasing impervious surface area to 20% in the parcels' five largest catchments.

- **Increasing agricultural land cover to 20%** may result in a 2-25% decrease in probability of trout presence in 20 downstream catchments. One downstream catchment would expect a significant decrease of more than 25% in probability of trout presence.
- **Increasing impervious surface to 20%** will have impacts to trout populations as far as 35 miles downstream, with 40 catchments experiencing a moderate decrease in probability of trout presence (2-25%), and 13 catchments, a decrease of more than 25%.
- **Nature's Network uses multi-variate analysis** to assess the intersection of habitats suitable for multiple species. When considering the suitability of this site to support three species, the watershed within which the parcel lies ranks in the 90th percentile of more than 7,300 HUC 12 watersheds in the North Atlantic region.

Percentile ranking the regional importance of the site for supporting important bird species			
American Woodcock	Cerulean Warbler	Louisiana Waterthrush	Multivariate Analysis
85	63	75	**90**

Moving Forward

The *ETS* Team is extremely pleased with the level of feedback and participation from partners, and with the priorities, recommendations, and action items that have surfaced in this process. This input collected by the Susquehanna River community through data, surveys, and community and partner meetings has helped form numerous partnership-driven initiative ideas for implementation in the years ahead. These initiatives build upon a variety of existing and future community, nonprofit, and government planning activities and capital infrastructure investments. They already reflect a strong measure of public support.

An Investment in Holistic, Collaborative, Long-term Efforts

The Susquehanna River community has indicated several priorities in the conservation and funding community in order to move the Envision the Susquehanna initiative forward.

Engage a diversity of partners in conservation

Within the watershed, there are entire groups of potential partners that can be further engaged to contribute innovative ideas and achieve greater success in conservation, recreation, and public access. These include traditional farming communities, absentee or second homeowners, private businesses, industry, legislators, federal partners, and Chesapeake Bay–focused organizations.

Add capacity by utilizing citizen scientists and academic institutions

Citizen science programs train the public in basic environmental assessment and project implementation skills and can add capacity to the conservation community. Further, many environmental leaders agree that local colleges and universities are underutilized in the Susquehanna River watershed. Where capacity is often a limiting factor to achieving Susquehanna River goals, better utilization of existing human capital can advance progress while at the same time educating citizenry and the next generation of environmental leaders.

Communicate the connectedness of the watershed

Many residents and visitors lack a watershed-wide perspective of the Susquehanna River. Educating people about the local connections to the extent of the watershed, the flow paths of water bodies, and habitat ranges for species can help build a community with shared and overlapping goals and vision.

Reinvent messaging about the environment

Stakeholders throughout the watershed have different priorities, goals, and opinions about their environment; therefore, messaging should reflect a diversity of values. Future messaging should explore the economics of the ecosystem services provided by the Susquehanna, a clearer understanding of the impacts to human health from the environment, and the connection to American Indian land ethic.

Develop and deliver better data for evidence-based decision-making

Throughout the *Envision the Susquehanna* community engagement campaign, practitioners cited a need for better data to help make decisions rooted in the best available science. Consistency across political boundaries, data relevant at the project scale, prioritization at the landscape scale, interpretation of complex datasets, and overall data access are data barriers in the conservation community.

Increase unrestricted funding

In order to develop meaningful, enduring collaborative programming, unrestricted dollars need to be invested into nonprofits. The thoughtful creation and implementation of initiatives like *Envision the Susquehanna* takes substantial up-front investment, but will ultimately leverage a diversity of partners and stakeholder groups to approach conservation holistically. This approach will generate substantial returns in the form of stewardship of the Susquehanna River for generations to come.

For more information, please visit www.envisionthesusquehanna.org.

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