National Fish and Wildlife Foundation

Chesapeake Bay Business Plan

August 2012 (Revised August 2018)

Purpose of a Business Plan

The purpose of a NFWF business plan is to provide a concise blueprint of the strategies and resources required to achieve the desired conservation outcomes. The strategies discussed in this plan do not represent solely the foundation's view of the actions necessary to achieve the identified conservation goals, but instead reflect the majority view of the many federal, state, academic, and organizational experts that consulted during plan development. This plan is not meant to duplicate ongoing efforts but rather to invest in areas where gaps might exist so as to support the efforts of the larger conservation community.

Acknowledgements

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About NFWF

Chartered by Congress in 1984, the National Fish and Wildlife Foundation (NFWF) protects and restores the nation's fish, wildlife, plants and habitats. Working with federal, corporate and individual partners, NFWF has funded more than 4,500 organizations and generated a conservation impact of more than $4.8 billion. Learn more at *www.nfwf.org*.

Note on Business Plan Presented to NFWF's Board of Directors

This version of the business plan does not include appendices due to board book space constraints. Additional materials will accompany the public version of this plan.

Photo credit: All photographs provided by the Chesapeake Bay Program.

Background

The National Fish and Wildlife Foundation ("NFWF") is updating its Chesapeake Bay Business Plan to reflect the latest conditions in the watershed, particularly in light of recent funding trends, development of new partnership-based Bay restoration and protection goals, and the availability of new data and information to focus effort and measure conservation impact.

As one of the largest watershed restoration efforts in the world, the federal–state Chesapeake Bay Program ("CBP") partnership has been charged since 1983 with directing the coordinated actions of federal and state agencies, local governments, non-profit organizations and academic institutions working to protect and restore the Chesapeake Bay.

NFWF is a core partner of the CBP and the U.S. Environmental Protection Agency ("EPA"), specifically working to advance local on-the-ground watershed restoration actions, build local capacity for restoration, and accelerate innovation in watershed management through conservation grant-making, technical assistance, information exchange, and technology transfer.

NFWF's role in the Chesapeake began in 1999 when it was competitively selected to administer the EPA's newly-authorized Small Watershed Grants program. Since then, NFWF has secured additional competitively-awarded EPA funding to expand its work advancing watershed restoration efforts, including funding from the Innovative Nutrient and Sediment Reduction Grants program and the legacy Targeted Watershed Grants program.

NFWF's Chesapeake Bay Stewardship Fund ("Stewardship Fund") has further grown over time to incorporate a range of additional federal, corporate, and private foundation partners and now invests $10-15 million annually in on-the-ground restoration projects, technical assistance activities, and directed partnerships to advance major Chesapeake initiatives. All told, NFWF has invested in excess of $150 million across more than 1,000 individual projects, leveraging more than $200 million in additional local funding for a total conservation impact of nearly $350 million. These investments have collectively reduced annual nutrient pollution by nearly 25 million pounds, restored more than 1,800 miles of riparian habitat and 6,700 acres of wetland, and engaged more than 2 million watershed residents through outreach, training and volunteer opportunities.

NFWF formalized its long-term commitment to advancing Chesapeake restoration with the 2012 Chesapeake Bay Business Plan. The Business Plan outlines a comprehensive strategy to guide NFWF's conservation investments in the region through 2025 and establishes clear and achievable conservation goals to enhance the resilience of the Chesapeake Bay ecosystem, increase populations of priority species, reduce harmful pollutants from entering streams, rivers and the Bay, and reduce the costs of the recovery effort. With a $100 million budget, NFWF has already invested $50 million in support of the Chesapeake Bay Business Plan in its first seven years.

Shortly after the adoption of NFWF's Chesapeake Bay Business Plan, the federal government and watershed jurisdictions renewed their commitments to Chesapeake watershed restoration and protection through the 2014 Chesapeake Bay Watershed Agreement, which outlines shared goals and outcomes across a broad range of conservation and community engagement efforts. This update, in part, is aimed at maximizing alignment of NFWF's Chesapeake Bay investments with the new partnership-based Watershed Agreement.

Conservation Need

Recognized as a "national treasure" for its historical, cultural, economic, and ecological significance, the Chesapeake is the largest estuary in North America and one of the most productive in the world. Its watershed stretches across more than 64,000 square miles in the Mid-Atlantic United States covering areas of six states and the entirety of the District of Columbia. Its watershed spans from Norfolk, Virginia to Cooperstown, New York and from the sandy coastal plains of Delmarva Peninsula in the east to the headwaters of the Potomac River in West Virginia's Appalachian Mountains.

Compared to its vast watershed, the Chesapeake estuary itself is relatively small with a surface area of just 4,500 square miles. The relatively narrow mouth of the Bay further influences a unique set of estuarine processes that limits the rate at which water and constituent pollutants are flushed out of the Bay and into the Atlantic Ocean.[1] The result is that the Bay and its tributary rivers and streams are particularly vulnerable to land-based activities throughout its contributing watershed.

The Chesapeake and its watershed has undergone intense alteration and development since John Smith and other early European settlers arrived in Jamestown in the early 17th century. To generate arable land capable of sustaining growing colonial populations, early settlers extensively cleared native forests and drained marshes and wetland systems.

This loss of forest and wetland cover, combined with the damming of streams and channelization of rivers for navigation and commerce accelerated throughout the 19th and 20th centuries, leading to the loss of nearly two-thirds of the watershed's precolonial forest and wetland habitats, degradation of two-thirds of stream habitats and declines in many culturally and economically important species. These land use changes also increased the flow of nutrients and sediments to the Chesapeake and its tributary rivers and streams, directly contributing to major declines in Chesapeake water quality and estuarine habitat conditions, namely dissolved oxygen, chlorophyll, water clarity and underwater Bay grasses. Compounding these watershed-scale impacts, overharvesting of the Chesapeake's once bountiful finfish and shellfish resources have further decimated the estuarine ecosystem.

Water Quality

While declines in Chesapeake water quality and associated habitat conditions trace their roots to centuries of land use change, the more recent intensification in both agricultural production and urban and suburban development across the watershed have accelerated nutrient and sediment loading and associated estuarine habitat declines.

Agriculture. Agriculture, especially livestock and dairy production, remains a major economic and cultural facet the region and represents the largest single source of nutrient and sediment pollution to the Chesapeake. Unfortunately, the chemical fertilizers that revolutionized the global agricultural sector

[1] Du, J. & Shen, J. (2016). Water residence time in Chesapeake Bay for 1980-2012. Journal of Marine Systems, 164, 101-111.

in the 20th century are frequently applied at rates that exceed what plants can readily absorb. Dramatic shifts in animal agriculture in the past century have also led to intensification of livestock and dairy production, resulting in manure "hotspots" where nutrient supplies far exceed needs for local crop production. As a result, fertilizers are too often applied at rates and times inconsistent with local crop needs, leading excess fertilizers to run off into surface waters or leach from nutrient-saturated soils into groundwater supplies. Furthermore, some livestock producers still allow their animals free access to streams for watering based on cultural norms established by earlier generations. The result is erosion of stream banks, destruction of riparian vegetation, and direct deposit of animal manure into surface waters.

Development. The Chesapeake watershed is home to nearly 18 million people, including the densely-populated I-95 corridor from Richmond, Virginia to Baltimore, Maryland. Development of the Chesapeake watershed represents a unique and growing challenge. While agriculture still contributes the largest share of nutrient and sediment pollution to the Chesapeake, urban and suburban areas are the only growing sources of these pollutants.

Urban development and associated impervious surfaces have dramatically altered local hydrology across the Chesapeake watershed. Roofs, roads, sidewalks, and other built surfaces prevent rain from filtering through the soil and impact both the timing and the quality of runoff entering local streams. Collectively, these impervious surfaces speed the delivery of rainfall to surface waters, increasing the volume and velocity of runoff entering stream channels, eroding streambanks and degrading the stream channel itself. Furthermore, impervious surfaces prevent rainwater from filtering through the soil, which further limits the natural pollution filtering service of the soil profile and causes stormwater runoff to transport excess pollution directly to local streams.

Species and Habitat

Eastern Brook Trout. Eastern brook trout (*Salvelinus fontinalis*) are the only native trout species in the Chesapeake Bay watershed. They are prized by recreational anglers and have been designated as the state fish of New York, Pennsylvania, and Virginia. Residents of the Chesapeake's headwater streams, Eastern brook trout require cool, clean water. Wild brook trout populations in the Bay watershed have significantly declined over the past two centuries. Factors affecting brook trout include land use and warmer temperatures that degrade high quality stream habitats, and increased competition from other species and the loss of genetic integrity. In the Chesapeake watershed, most brook trout are confined to headwater streams, where disturbance is minimal and forest cover is still prevalent.

American Black Duck. The American black duck (*Anas rubripes*) was at one time the most abundant dabbling duck in eastern North America and comprised the largest portion of waterfowl harvests in the Mid-Atlantic region. Between the 1950s and 1980s, North American black duck populations declined by more than 50 percent, due largely to conversion of wetlands habitats to other land uses and the loss of associated food supplies. Situated along the Atlantic Flyway, the Chesapeake Bay watershed is especially critical as wintering habitat for the species, supporting the largest share of the species' wintering populations. Restoring and protecting wetland habitat in the Chesapeake is viewed as critical to the long-term sustainability of the species and the achievement of continental population goals.

River Herring. Alewife (*Alosa pseudoharengus*) and blueback herring (*A. aestivalis*), collectively known as river herring, were once abundant in the Chesapeake's tidal tributaries. As diadromous fish, river herring travel from the ocean to high quality tidal rivers and streams to spawn. Each spring, massive herring runs helped to sustain native communities and early colonial settlers. However, throughout the 18th and 19th centuries, river herring suffered a precipitous decline due to overharvesting and the construction of dams, which restrict access to high quality spawning habitats. Land use changes resulting

in the loss of riparian habitat and increases in impervious services have further degraded the quality of spawning streams. While fishing is now restricted in both Virginia and Maryland, barriers to fish passage and degraded stream health continue to negatively impact river herring throughout the watersheds.

Eastern Oysters. With its name roughly translated as "great shellfish bay" in the language of the Chesapeake watershed's native Algonquin tribes, it is no surprise that the Chesapeake Bay has long been renowned for its shellfish resources. The Chesapeake is well known for its blue crabs (*Callinectes sapidus*), but Eastern oysters (*Crassostrea virginica*) have played a particularly prominent role in the culture, history, and economy of the region. Native oyster beds were once so extensive that they regularly posed navigational hazards for the Chesapeake's early pilots. They were ecologically significant as well, with some estimates that the native oyster population in the Chesapeake was capable of filtering the entire volume of the estuary roughly every eight days. Oyster reefs also serve as key habitat for a variety of aquatic species and a driver of the estuary's broader food chains. As an economic resource, oysters have helped to build many fishing communities along the Chesapeake with harvests reaching nearly 20 million bushels per year at their peak. However, overharvesting, disease, and declines in estuarine and bottom habitats have ravaged native oyster populations. Eastern oysters now represent less than two percent of their peak historical populations.

Current Conservation Context

Since 1999, the Stewardship Fund has evolved into a robust set of competitive grant programs, directed partnership investments, and program-wide support functions to help advance the goals of the CBP partnership, funded primarily by the EPA and supported by a range of other public and private funders.

During that time, and after nearly three decades of significant, voluntary restoration efforts failed to achieve necessary improvements in Bay water quality, the EPA took the landmark step in December 2010 of establishing an enforceable regulatory framework for limiting nutrient and sediment pollution to the Bay. The Chesapeake Bay Total Maximum Daily Load (TMDL) establishes science-based limits on nitrogen, phosphorus, and sediment pollution to the Bay necessary to achieve specific nearshore, open water and benthic habitat conditions for dozens of the fish and shellfish species. Watershed jurisdictions developed and are now executing Watershed Implementation Plans to ensure all pollution controls needed to fully restore the Bay and its tidal rivers are in place by 2025.

The CBP partnership also recently renewed its shared commitment to a broader array of watershed restoration and protection actions through the 2014 Chesapeake Bay Watershed Agreement. Signed by the EPA Administrator and chief executives from each of the watershed jurisdictions and building on decades of earlier restoration agreements, the Agreement outlines ten goals and 31 associated outcomes spanning habitat restoration and fisheries management, water improvement, land conservation, and citizen stewardship efforts. Detailed management strategies and work plans are now being executed by the CBP's Goal Implementation Teams to achieve Agreement goals and outcomes.

NFWF's Chesapeake Bay Stewardship Fund, guided by this updated Business Plan, will complement regional, multiparty watershed restoration, habitat improvement, and citizen engagement efforts led by EPA and the CBP by focusing on actions and investments that hold promise to simultaneously maximize partner outcomes for water quality, species and habitat, and communities throughout the watershed. NFWF will continue to make investments in building the technical capacity of partner organizations to scale up their local restoration and protection efforts, including the support of innovative technologies and program delivery approaches that have demonstrated success in accelerating restoration progress ever since NFWF's original 2012 Chesapeake Bay Business Plan.

Conservation Outcomes

NFWF is committed to the vision of "an environmentally and economically sustainable Chesapeake Bay watershed" set forth in the Chesapeake Bay Watershed Agreement. To that end, NFWF's Chesapeake Bay Business Plan has been developed to provide measurable contributions to goals and outcomes of the Chesapeake Bay Program and the Chesapeake Bay Watershed Agreement associated with:

1. Water quality improvement through nutrient and sediment reduction to serve as the foundation for healthy fisheries, habitats and communities across the Chesapeake Bay region;
2. Restoring and protecting key Chesapeake bay species and their habitats; and
3. Fostering an engaged and diverse citizen and stakeholder presence that will build upon and sustain progress.

This Business Plan update revises selected goals and outcomes for the program established in 2012. Progress to date has allowed NFWF to increase selected goals and outcomes as a reflection of accelerated progress to date, new data and information have allowed NFWF to better refine and focus its investments, and revised partner goals adopted in the 2014 Chesapeake Bay Watershed Agreement warrant better reflection in NFWF's own strategic program vision. In sum, these changes represent NFWF's commitment to adaptive management in order to maximize the impact and relevance of its programs to existing regional partners. See Appendix A for additional information on goal revisions.

Specifically, NFWF will focus investments on achieving the following outcomes:

Water quality

NFWF will improve water quality in the Chesapeake Bay by **reducing: 1) nitrogen pollution by 10 million pounds annually**, or 13% of the nitrogen load reduction required by the Chesapeake Bay TMDL; **2) phosphorus pollution by 1 million pounds annually**, or roughly 25% of the phosphorus load reduction required by the Chesapeake Bay TMDL; and **3) sediment pollution by 200 million pounds annually**, or 6% of the sediment load reduction required by the Chesapeake Bay TMDL. Activities contributing to these outcomes by 2025 include:

- Improving water quality in agricultural areas by implementing best management practices to reduce polluted runoff from 1 million acres, or 11% of the area in priority subwatersheds.
- Improving water quality in urban and suburban areas by implementing green stormwater infrastructure practices to treat, capture, and/or store 150 million gallons of stormwater runoff.
- Continually increase the capacity of forest buffers to provide water quality and habitat benefits throughout the watershed by restoring 1,000 miles of riparian forest buffer and associated riparian habitat, or 10% of the Chesapeake Bay Watershed Agreement goal.
- Improving the health and function of 1,500 stream miles, equal to 10 percent of stream miles in priority subwatersheds and consistent with the Chesapeake Bay Watershed Agreement goal, in order to continually improve stream health and function throughout the watershed.

Eastern brook trout

NFWF will support recovery of Eastern brook trout in the Chesapeake Bay watershed by **maintaining and increasing Eastern brook trout populations in 6 stronghold patches**, as measured by number of effective breeders, consistent with the goals of the Chesapeake Bay Watershed Agreement. Activities contributing to this outcome by 2025 include:

- Increasing habitat integrity in six stronghold patches through protection and restoration of riparian areas, stream restoration, nonpoint source pollution controls and land use protections. NFWF will also support efforts to increase the size of occupied patches and average patch size through culvert replacement, dam removal, and fish passage improvement activities and where proposed projects can identify and address potential impacts from the introduction of nonnative brook trout species when conducting connectivity actions.

American black duck

NFWF will support the recovery of American black duck by **increasing wetland habitat and available food to support 5,000 wintering black ducks**, or 5% of the Chesapeake Bay Watershed Agreement goal for wintering black duck populations. Activities contributing to this outcome by 2025 include:

- Creating, reestablishing, or enhancing the function of 7,000 acres of tidal and non-tidal wetlands to increase black duck carrying capacity through improved food resources.
- Increasing available food resources by 680 million kilocalories.

River herring

NFWF will support recovery of river herring populations in the Chesapeake Bay watershed by **restoring access and use of 200 additional miles of high quality migratory habitat**, or roughly 10% of the Chesapeake Bay Program goal. Activities contributing to this outcome by 2025 include:

- Implementing 10 high priority, cost-effective connectivity enhancement projects through culvert replacement, fish passage improvements, and dam removal.

Eastern oyster

NFWF will support recovery of Eastern oyster by supporting partner efforts **to restore oyster populations in five Chesapeake Bay tributaries**, or 50% of the Chesapeake Bay Watershed Agreement goal, in order to continually increase estuarine habitat and water quality benefits from restored oyster populations. Activities contributing to this outcome by 2025 include:

- Restoring 250 acres of native oyster reefs in targeted tributaries through spat production and reef construction.

Capacity and planning

In order to achieve this plan's conservation outcomes, NFWF will support efforts to **motivate 40,000 individuals in the watershed to adopt behaviors that benefit water quality, species, and habitats**. Examples include adoption of on-farm conservation and residential stormwater management practices. NFWF will achieve this outcome by building the capacity of citizens, organizations, institutions, local governments, and partner networks to implement conservation actions through outreach, technical assistance, and volunteer campaigns. Activities contributing to this outcome by 2025 include:

- Enlisting 25,000 individuals in local volunteer events to restore local natural resources and providing hands-on education and skill-building for individual action.
- Developing or improving 1,000 conservation, watershed, or habitat management plans that provide guidance to landowners, organizations, or local governments on how to manage properties and communities for improved conservation outcomes.

Geographic Focus

A core element of NFWF's Chesapeake Bay Business Plan is that strategic investment in priority places will allow NFWF to maximize shared outcomes for water quality, species, and habitat. Accordingly, NFWF will geographically focus its Stewardship Fund investments first in priority subwatersheds where NFWF and its partners have identified significant opportunity to reduce nutrient and sediment loading, specifically from agricultural and urban sources. NFWF will also use existing data and decision support tools developed by partner organizations to further target those areas where species-specific interventions can help to improve habitat and restore populations of Eastern brook trout, Eastern oysters, American black duck, and river herring within priority subwatersheds.

NFWF anticipates that a significant share of Stewardship Fund funding will be deployed in priority subwatersheds based on the unique opportunities to maximize multiple goals and outcomes. However, NFWF will continue to support water quality improvement activities across the Chesapeake Bay watershed in addition to habitat and species-specific activities in strategic locations that may be outside of priority subwatersheds.

Table 1 presents the various data and decision support tools used to establish NFWF's geographic focus areas for the Stewardship Fund. Expert consultation, as well as additional supplementary datasets were instrumental in refining these areas. Detailed maps of geographic priority areas can be found in Appendix A and at NFWF's online Chesapeake Bay Business Plan Mapping Portal.

Focal Area	Data Source(s)	Data Description
Water Quality	Chesapeake Assessment Scenario Tool (CAST)	Priority subwatersheds were identified as those representing the 5% of land area delivering the highest per acre nutrient yield to the tidal Bay and per acre sediment yield to local streams from agricultural and urban sources as of 2016. (See Figure 1).
Eastern brook trout	Eastern Brook Trout (EBT) Conservation Portfolio and Range-wide Assessment	NFWF will focus on efforts to increase populations in stronghold patches, population units with the highest resiliency to disturbances, likelihood of demographic persistence, and representation of genetic, life history, and geographic diversity. (See Figure 2).
American black duck	Black Duck Decision Support Tool (DST)	NFWF will focus wetland restoration, creation, and enhancement efforts in subwatersheds with a projected deficit of available food resources, while generally supporting efforts to stem future marsh loss across the species non-breeding range. (See Figure 3).
River herring	Smithsonian Environmental Research Center	NFWF has identified the top 30 culverts in priority rivers based on herring habitat use modeling and barrier prioritization approaches that account for barrier severity, elevation and upstream development, and current connectivity with existing habitat. (See Figures 4, 5, and 6).
Eastern oysters	Chesapeake Bay Program Fisheries Goal Implementation Team	NFWF will supplement state and Federal oyster reef restoration efforts in tributaries identified by the Chesapeake Bay Program and support complementary activities in adjacent subwatersheds that minimize disturbance and increase survivorship for these reefs. (See Figures 7 and 8).

Table 1. Data sources and descriptions for focal areas of NFWF's Chesapeake Bay Business Plan

Implementation Plan

The key strategies for this Business Plan include, first and foremost, efforts to reduce nutrient and sediment pollution to the Chesapeake Bay and its tributary rivers and streams, particularly from agricultural and urban sources. NFWF will then prioritize pollution reduction and water quality improvement activities that directly result in either habitat improvements for priority species or reduction of key threats to populations of priority species. The Business Plan will also include a more limited set of high-priority habitat restoration and management actions to benefit priority species that may require additional interventions. These strategies will be supported by investments to enhance the capacity of watershed partners to deliver effective conservation planning, programs, and partnerships at increasing geographic scales, and to effectively engage those watershed stakeholders critical to achieving the plan's conservation goals. A logic model mapping these strategies, associated interim outcomes, and their contribution to Business Plan goals is provided in Figure 9.

Strategy 1: Managing Agricultural and Urban Runoff

1.1 Managing Upland Agricultural Runoff Through Farm-Scale Conservation Systems and Solutions

Agricultural operations in the Chesapeake Bay region are often complex systems balancing goals for crop and livestock production, management of agricultural inputs and animal waste, and financial performance and stability. NFWF will support efforts to reduce water quality impacts while simultaneously maintaining or increasing profits, reducing costs, and enhancing financial performance of the region's farms through the implementation of suites of best management practices that reduce pollution at the farm scale. Selected examples include:

- Soil health management systems that combine improved tillage and pasture management, cover crops, crop and livestock rotations, and other practices to increase soil fertility while improving the capacity of crops and soils to reduce runoff and increase nutrient uptake.
- Precision nutrient management systems that fine-tune the rate, source, method, and timing of organic and synthetic nutrient applications to maintain or increase crop yields while minimizing nutrient input costs and associated losses to surface and groundwater.
- Certification, labeling, and other sustainable sourcing initiatives that provide price premiums and/or new markets for agricultural products produced in a manner that improves and protects water quality and/or habitats.
- "Whole-farm" conservation systems that package a variety of public and private financial assistance programs to reduce pollution from crop and pasture lands, animal production areas, and high-value natural resource areas like wetlands and riparian areas and significantly improve the environmental performance of the farm.

1.2 Managing Upland Urban Runoff through Green Stormwater Infrastructure Improvements

NFWF will assist local governments, nonprofit organizations, and community associations to improve urban and suburban stormwater management by implementing green stormwater infrastructure practices that capture, store, filter, and treat stormwater runoff closer to its sources. Green stormwater infrastructure practices (also known as environmental site design and low impact development approaches) reduce the impacts of roofs, parking lots, and other impervious surfaces on local waterways by replicating natural hydrologic processes and attenuating the volume, energy, and pollutant

concentrations of stormwater runoff. Example practices include rain gardens, bioswales and other bioretention approaches, conservation landscaping, and urban tree canopy among others. In limited cases, NFWF may also support urban floodplain and stream restoration for water quality improvement where existing or planned green stormwater infrastructure initiatives effectively control stormwater runoff from upland sources (see Strategy 2.1).

1.3 Accelerating Innovation in Watershed Management

In addition to support for innovative approaches to regional scale partnership development (see Strategy 4.1), NFWF will support the in-field application of new technologies and management approaches with the potential to reduce costs, increase nutrient removal efficiencies, and more effectively control emerging pollutant sources. For instance, advancements in manure processing and management, market-based solutions to manure management, innovative stormwater practices and design approaches, and improvements in the cost-effectiveness of proven water quality improvement approaches all show promise.

Strategy 2: Riparian and Freshwater Habitat Restoration, Conservation, and Management

2.1 Restoring Riparian and Freshwater Habitats through Forested Buffers, Floodplain and Wetland Reconnection, and Stream Restoration and Habitat Improvements

In combination with actions to manage runoff, NFWF will help to restore degraded riparian habitats to improve water quality, enhance aquatic habitat, and increase fish populations across the Chesapeake Bay region through a variety of actions and interventions including but not limited to the following:

- Implementation of riparian forested buffers slows and intercepts polluted surface and groundwater runoff while providing long-term benefits for priority fish species through shading of the stream channel and as a source of leaf litter, an important food source for aquatic macroinvertebrates, a critical link in the food cycle of healthy streams including for the diets of priority fish species.
- Reconnection of stream channels with historic floodplains and adjacent wetlands will further promote nutrient removal and attenuation of erosive stormflows and build more resilient riparian systems.
- Stream restoration[2] in both urban and rural landscapes will help to control streambank erosion, increase in-stream nutrient processing, and provide food, cover, and habitat for priority species.

2.2 Increasing Habitat Integrity for Eastern Brook Trout

In combination with pollution reduction, riparian habitat restoration, and conservation actions, NFWF will increase connectivity within and between occupied Eastern brook trout patches through dam removal, repair and replacement of culverts and road crossings, and other fish passage improvements. NFWF will support similar connectivity improvements to increase the amount of occupied habitat and number of Eastern brook trout where local partners can demonstrate: (1) sufficient existing habitat integrity to support brook trout populations; and (2) the absence of current or planned populations of nonnative trout species in otherwise extirpated patches adjacent to occupied habitats.

2.3 Improving Riparian Management through Livestock Exclusion

In agricultural landscapes, uncontrolled access of livestock to the stream channel can cause streambank erosion, stream channel degradation, and discharge of animal manures directly to surface waters. NFWF will support efforts to implement livestock exclusion fencing, along with complementary practices like

[2] Includes natural channel design, legacy sediment removal, and regenerative stormwater conveyance approaches.

stream crossing and off-stream watering, in order to balance livestock management needs with riparian and stream health.

2.4 Conserving High-Quality Riparian Corridors

High quality stream habitats and riparian corridors are some of the most important ecosystems in the Chesapeake Bay watershed, especially its headwater regions. NFWF will support long-term protection and preservation of these ecosystems by strategically leveraging federal, state, and local land conservation programs through assistance with transaction and due diligence costs, bonus payments for high-value riparian easements, and incorporation of riparian protection into existing agricultural land preservation programs.

Strategy 3: Estuarine and Tidal Habitat Restoration, Conservation, and Management

3.1 Restoring Large-Scale Oyster Reefs

NFWF will assist existing efforts to restore and protect large-scale oyster reefs strategically identified by the Maryland, Virginia and the CPB by leveraging funding from federal and state agencies to support oyster larvae and spat production, development of sustainable reef substrate supplies, and reef construction efforts in established oyster reef restoration tributaries.

3.2 Restoring River Herring Habitat Connectivity

In combination with pollution reduction and riparian habitat restoration and conservation actions, NFWF will increase connectivity and access to spawning habitat along priority migratory corridors for alewife and blueback herring through dam removal, repair and replacement of culverts and road crossings, and other fish passage improvements. NFWF will prioritize cost-effective connectivity enhancements that provide the access to the greatest amount of quality habitat at the lowest cost.

3.3 Restoring and Conserving Wetland and Tidal Marsh Habitat for American Black Duck

Wetlands and tidal marshes in the Chesapeake Bay's Coastal Plain region provide critical habitat to wintering populations of American black duck. NFWF will help to increase winter food supplies for these and other migratory waterfowl species both by restoring degraded tidal and non-tidal marsh and wetland habitats and by conserving existing high quality winter habitats. To address threats to habitat from sea level rise, NFWF will further support strategies that seek create corridors for future marsh migration through strategic land protection, restoration, and management.

3.4 Managing Shoreline Erosion and Marsh Loss

Shorelines and nearshore marshes in the Chesapeake Bay estuary act as important nursery and rearing habitat for aquatic species and serve as a buffer against erosive wind and wave action. Unfortunately, shorelines in the Chesapeake Bay region are eroding at a dramatic rate.[3] NFWF will support non-structural or hybrid living shoreline restoration practices that mitigate sediment transport to priority oyster reef restoration sites, establish and expand emergent or submerged aquatic vegetation, and/or help to protect adjacent marsh systems documented as critical black duck wintering habitat.

Strategy 4: Building Capacity for Landscape-Scale Watershed and Habitat Outcomes

4.1 Regional-Scale Partnership Development

With nearly 40 years of coordinated, local efforts to restore and protect the Chesapeake Bay, partners from all sectors across the region need new tools and resources to expand partnerships, programs, and

[3] Schieder, N.W., Walters, D.C., & Kirwan, M.L. (2018). Massive upland to wetland conversion compensated for historical marsh loss in Chesapeake Bay, USA. Estuaries and Coasts 40: 940-951.

implementation strategies to meet ambitious goals of the Chesapeake Bay TMDL and the Chesapeake Bay Watershed Agreement. NFWF will invest in activities that aim to scale up restoration outcomes through enhanced partnership and coordination across organizations at broader regional and landscape scales, especially those working through institutional mechanisms like Memoranda of Agreement, organizational mergers, etc. Examples of specific activities include:

- Developing or refining a collaborative strategic plan or financing strategy;
- Investigating and evaluating the potential for organizational collaboration, with the goal of developing a sustainable network or integrating or merging existing organizations;
- Improving processes for internal communications, operations, management, and fundraising in support of restoration activities;
- Developing or enhancing cooperative programming for funding, technical support, project identification and prioritization, planning, procurement and purchasing, project management, and other functions directly related to implementation;
- Developing venues for collaborating practitioners to share case studies, lessons learned, credible guidance, and other resources in support of restoration activities.

4.2 Improving Delivery of Outreach and Technical Assistance

With a significant portion of land in the Chesapeake Bay watershed in private ownership, resources for education, outreach and technical assistance are critical in recruiting urban, suburban, and agricultural landowners to adopt conservation practices and for providing assistance with the planning, design, implementation, and maintenance of those practices over time. NFWF will support conservation districts, nonprofits, local and state governments, and private sector partners to provide technical assistance necessary to achieve NFWF's habitat restoration, conservation, and management goals. Funding will support field positions, development of targeted outreach strategies such as community-based social marketing, and enhanced coordination and partnership among technical assistance providers to improve efficiency and reduce administrative bottlenecks.

Strategy 5: Watershed and Habitat Planning, Prioritization, Design, and Permitting

5.1 Assessing Local Watershed and Habitat Restoration Needs and Opportunities

While this Business Plan identifies watershed-scale needs and opportunities, NFWF recognizes that local conditions can dramatically impact where and how work can be done to maximize conservation outcomes. NFWF will provide resources to help local partners conduct watershed and habitat assessments, watershed implementation planning, and other planning and prioritization efforts to maximize conservation impact. Priority will be placed on efforts to translate Bay pollution reduction goals to local implementation plans, along with efforts to identify habitat restoration opportunities for NFWF's priority species at a local level. Examples include property or farm-level conservation and stormwater management plans, patch-level population and habitat assessments for Eastern brook trout, culvert and barrier assessments in priority rivers for river herring, and wetlands restoration and protection assessments to maximize black duck population outcomes.

5.2 Designing and Permitting Watershed and Habitat Improvements

Watershed and habitat restoration and management actions often require detailed technical analyses and designs in order to maximize outcomes and obtain necessary permits for implementation. NFWF will strategically assist local partners with costs associated with design and permitting for high-impact restoration and management actions.

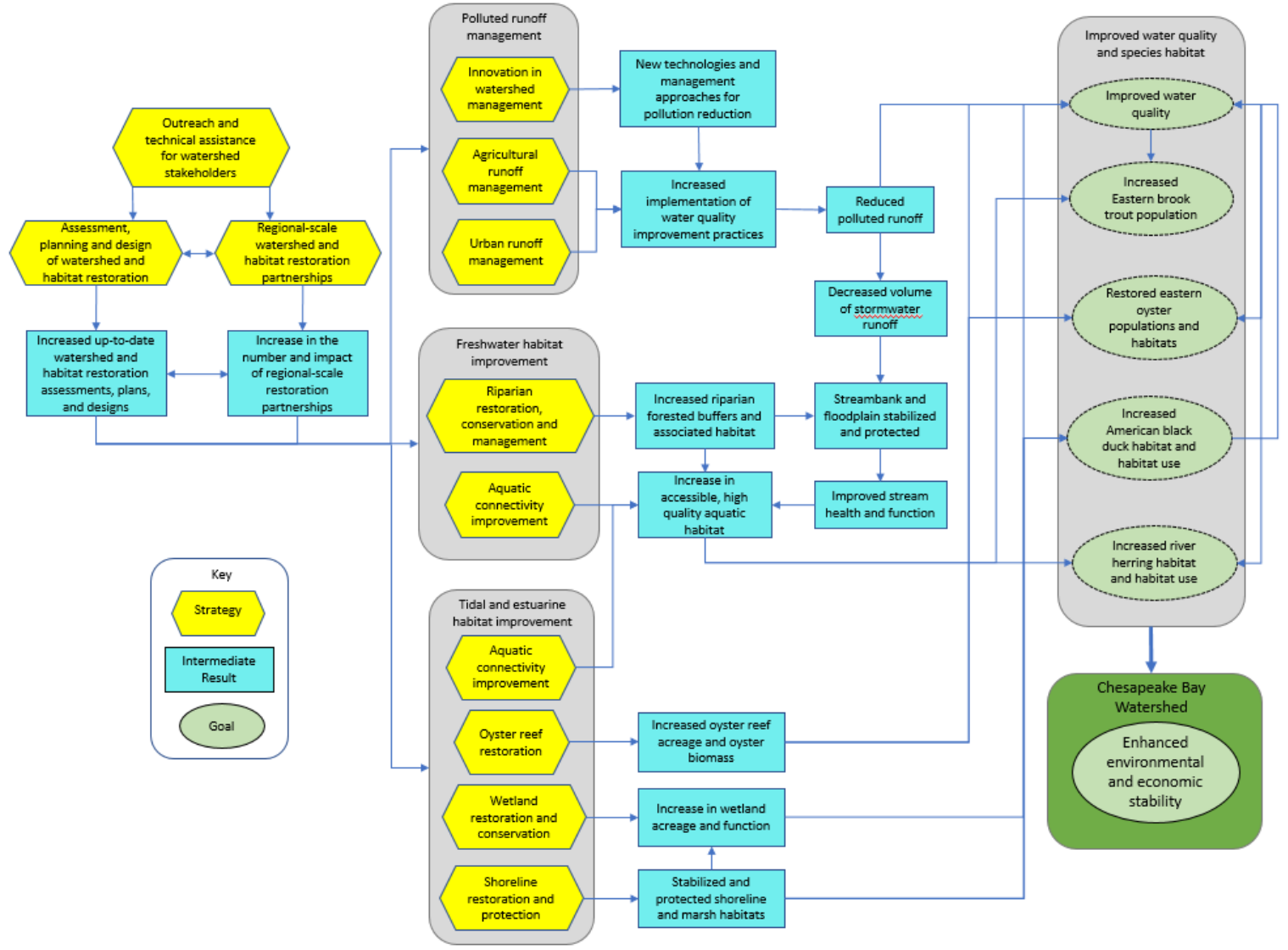

Figure 9. Logic model depicting how business plan strategies are anticipated to lead to intermediate results and ultimately to the Chesapeake Bay business plan goals.

Risk Assessment

Risk is an uncertain event or condition which, if it occurs, could impact a program's desired outcome. In consultation with external experts, NFWF assessed seven risk categories to determine the extent to which they could impede progress towards our stated Business Plan strategies and goals during the next 10 years. Below, we identify the greatest potential risks to success and describe strategies that we will implement to minimize or avoid those risks, where applicable.

RISK CATEGORY	RISK RATING	RISK DESCRIPTION	MITIGATING STRATEGIES
Regulatory Risks	**Low**	The Chesapeake Bay TMDL provides a regulatory framework to advance water quality goals, though inconsistent enforcement of state and local standards may limit incentives to implement necessary improvements. Inconsistent fisheries management and stocking practices may further limit range-wide goals.	Not addressed in plan.
Financial Risks	**High**	Heavy reliance on a single funder for a majority of program funds presents inherent vulnerabilities. Inconsistent state and local funding across the watershed also limits potential for leveraging of NFWF funding. Necessary funds for ongoing maintenance of funded efforts are unidentified.	Budget plan includes development and fundraising strategies to diversify programmatic funding sources. Long-term maintenance of restoration investments is a priority for leveraged funding.
Environmental Risks	**Medium**	Anticipated changes in hydrologic regimes may make it more difficult to manage and limit polluted runoff and erosive stormwater flows. Increased temperatures and sea level rise may contribute to increased shoreline and marsh erosion and stress for freshwater species. Contamination from toxic chemicals and development may further stress target species.	Large-scale hydrologic modifications will be limited to areas with effective upland stormwater controls. Freshwater conservation strategies will focus on securing high quality habitat at lower risk to change. Shoreline restoration strategies target efforts to protect existing high quality habitats.
Scientific Risks	**Low**	Lack of scientific consensus on achievable goals for targeted species and specific and measurable benefits to species of proposed interventions.	Targeted investments in monitoring and assessment will fill key informational gaps.
Social Risks	**Low**	Social factors can impact the willingness of landowners to implement proposed interventions. Demographic changes and urban development may require tailored approaches for new communities and stakeholders.	Outreach and technical assistance strategies support initiatives to inform local efforts with social science principles.
Economic Risks	**Medium**	Highly variable agricultural commodity and input prices may impact ability of producers to cost-share necessary interventions. Economic incentives may place increasing development pressure on key resource areas.	Agricultural water quality strategies aim to support approaches that provide economic returns to producers. Strategies to support conservation of priority areas may limit risk of development.
Institutional Risks	**High**	Lack of effective coordination among local restoration partners may cause inefficiencies and unintended consequences.	Plan strategies for regional-scale partnership development support collaborative and integrated approaches to restoration.

Monitoring & Evaluating Performance

Performance of the Stewardship Fund will be assessed at both project and program scales. At the project scale, individual grants will be required to track relevant metrics from Table 2 for demonstrating progress on project activities and outcomes, and to report on them in their interim and final programmatic reports. At the program scale, broader habitat and species outcomes will be monitored through targeted grants, existing external data sources, and aggregated data from relevant grant projects, as appropriate. In addition, NFWF may conduct internal assessments and commission third-party evaluations in the future to determine program outcomes and adaptively manage.

To enhance the quality and consistency of grantee reporting for performance monitoring and evaluation, NFWF will utilize the FieldDoc platform to collect geographically explicit, hierarchical data on NFWF-funded activities at the practice, site, and project level. FieldDoc captures local factors (hydrology, topography, soil type, etc.), robust information on the types of conservation practices implemented, and ongoing practice monitoring data, allowing for the application of environmental models that can consistently translate grantee-reported information into estimates of conservation outcome. Current FieldDoc functionality allows for the estimation of nutrient and sediment reduction benefits consistent with the methods and models used by EPA for regulatory purposes. Additional functionality and models will be incorporated in the short term to build FieldDoc's capacity to estimate modeled species and habitat outcomes.

In cases where modeled conservation outcomes via FieldDoc are NFWF's primary source of performance data, NFWF will fund targeted field-based monitoring to validate modeled outcomes at regular intervals.

Category	Strategies and Outcomes	Metrics	Baseline (2012)	Progress (2018)	Goal (2025)	Data source(s)
Water Quality	Reduce nitrogen pollution	Pounds of nitrogen pollution reduced annually (lbs/yr)	0	7M	10M	FieldDoc (modeled pollutant reductions)
	Reduce phosphorus pollution	Pounds of phosphorus pollution reduced annually (lbs/yr)	0	550,000	1M	FieldDoc (modeled pollutant reductions)
	Reduce sediment pollution	Pounds of sediment pollution reduced annually (lbs/yr)	0	124M	200M	FieldDoc (modeled pollutant reductions)
	Implement best management practices to reduce polluted runoff	Acres of BMPs implemented	0	495,376	1M	Grantee reporting
	Implement green stormwater infrastructure practices	Gallons of stormwater capture and runoff reduction from installed infrastructure	0	TBD	150M	FieldDoc (modeled volume reductions)
	Restore 1,000 miles of riparian forest buffer	Miles of riparian habitat restored	0	462	1,000	Grantee reporting, validated by site-level functional assessments
	Improve health and function of 1,500 stream miles	Miles of healthy, functioning stream	0	508	1,500	Grantee reporting, validated by independent stream biota monitoring

Eastern brook trout	Increase populations in 6 stronghold patches	Number of effective breeders	0	0	6	Independent EBT population monitoring
	Increase habitat integrity in 6 occupied patches	Number of patches with improved habitat integrity	0	0	6	Grantee reporting, validated by independent EBT population monitoring
Eastern oyster	Restore native Eastern oyster habitat and populations in 5 Chesapeake Bay tributaries	Number of tributaries with restored oyster populations	0	2	5	Chesapeake Bay Program's existing monitoring efforts
	Restore 250 acres of native oyster reefs within targeted tributaries	Acres of oyster reef restored	0	142	250	Grantee reporting, validated by Chesapeake Bay Program monitoring
American black duck	Increasing wetland habitat and available food to support 5,000 wintering black ducks	Number of black duck utilizing wetland restoration sites	0	0	5,000	Independent duck use monitoring
	Create, reestablish, or enhance the function of 7,000 acres of tidal and non-tidal wetlands	Acres of wetland restored	0	965	7,000	FieldDoc
	Increase available food resources by 680 million kilocalories	Kilocalories of black duck food resources	0	0	680 million	FieldDoc, supported by estimates of energy value by wetland type
River herring	Increase river herring presence in 200 additional miles of high quality migratory habitat	Miles of stream opened	0	13	200	FieldDoc, validated by independent occurrence monitoring
	Implement 10 connectivity enhancement projects	Number of barriers rectified	0	0	10	Grantee reporting
Capacity and planning	Motivate 20,000 individuals to adopt conservation behaviors	Number of individuals demonstrating changed behavior	0	21,257	40,000	Grantee reporting
	Enlist 25,000 in local volunteer events	Number of volunteers participating	0	10,099	25,000	Grantee reporting
	Develop or improve 1,000 conservation, watershed, or habitat management plans	Number of plans developed or improved	0	118	1,000	Grantee reporting

Table 2. Program Metrics

Budget

This Business Plan update comes seven years into NFWF's Business Plan-focused investing in Chesapeake Bay restoration efforts. Based on 2012 projections of a 14-year, $100 million budget, NFWF is well on track with anticipated spending towards Plan outcomes with roughly $59.8 million spent to date on activities half way through the Chesapeake Bay Business Plan.

The following budget shows the estimated total costs to implement the revised set of Business Plan activities set forth in this updated document, including activities initiated and already funded since 2012. NFWF will have to raise funds to meet these costs; therefore, this budget reflects NFWF's anticipated engagement over the Business Plan period of performance and it is *not* an annual or even cumulative commitment by NFWF to invest. This budget assumes that current activities funded by others will, at a minimum, continue.

BUDGET CATEGORY	Total
Strategy 1. Managing Agricultural and Urban Runoff	
1.1 Managing Agricultural Runoff	$30.00M
1.2 Managing Urban Runoff	$10.00M
1.3 Accelerating Innovation	$2.50M
Strategy 2. Riparian and Freshwater Habitat Restoration, Conservation, and Management	
2.1 Restoring Riparian and Freshwater Habitats	$30.00M
2.2 Increasing Connectivity and Occupied Habitat	$0.50M
2.3 Improving Riparian Management	$5.00M
2.4 Conserving Riparian Corridors	$0.50M
Strategy 3. Estuarine and Tidal Habitat Restoration, Conservation, and Management	
3.1 Restoring Oyster Reefs	$2.00M
3.2 Restoring Migratory Fish Habitat	$0.75M
3.3 Restoring and Conserving Wetland and Marsh Habitat	$2.75M
3.4 Managing Shoreline Erosion and Marsh Loss	$1.00M
Strategy 4. Building Capacity for Landscape-Scale Watershed and Habitat Outcomes	
4.1 Regional-Scale Partnership Development	$5.00M
4.2 Improving Outreach and Technical Assistance	$5.00M
Strategy 5. Watershed and Habitat Planning, Prioritization, Design, and Permitting	
5.1 Watershed and Habitat Assessment	$1.25M
5.2 Design and Permitting Watershed and Habitat Improvements	$1.00M
Monitoring and Assessment	$2.75M
TOTAL BUDGET	**$100.00M**

Appendix A. Geographic Focus Areas

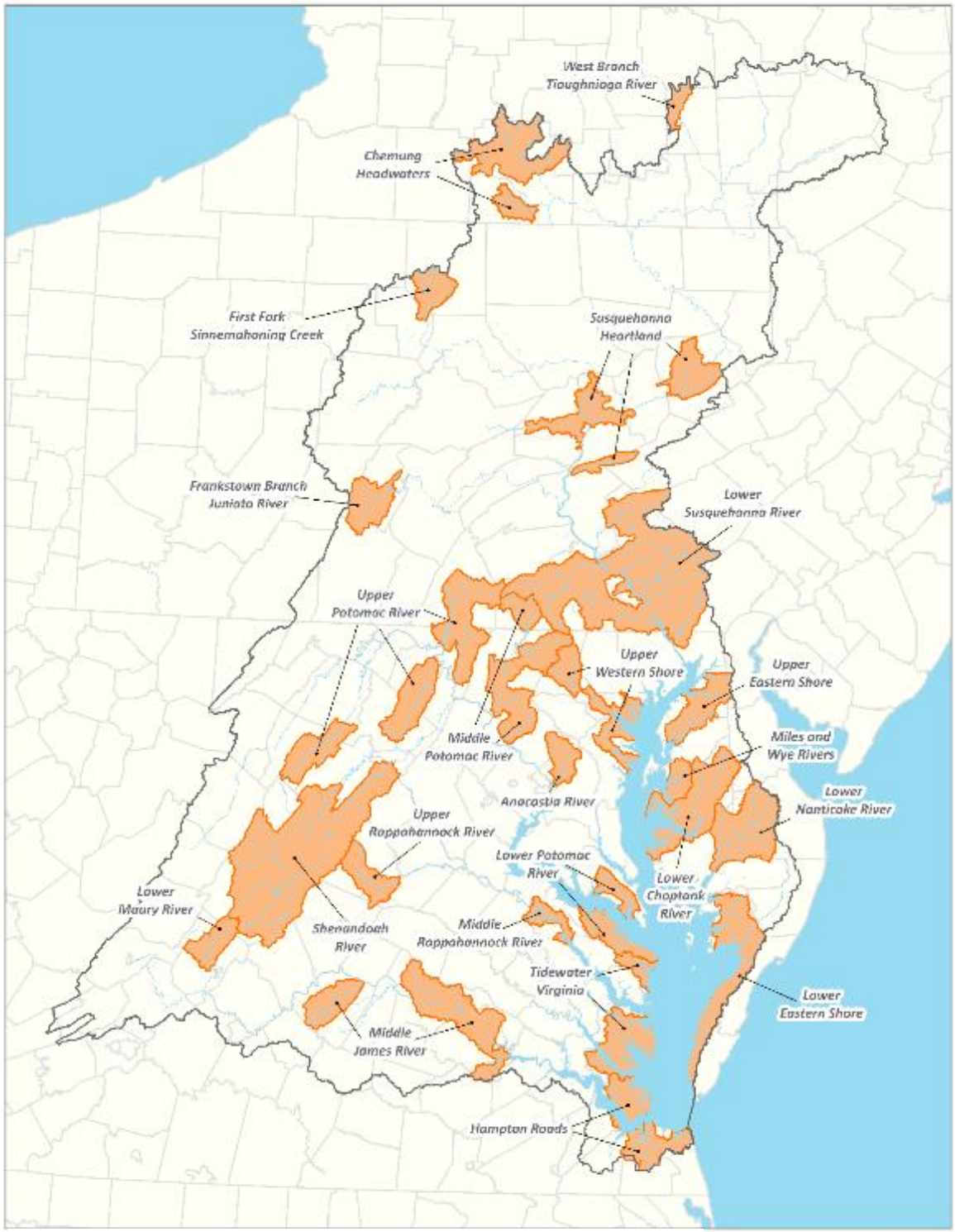

Figure 1. Priority Subwatersheds for Water Quality Improvement

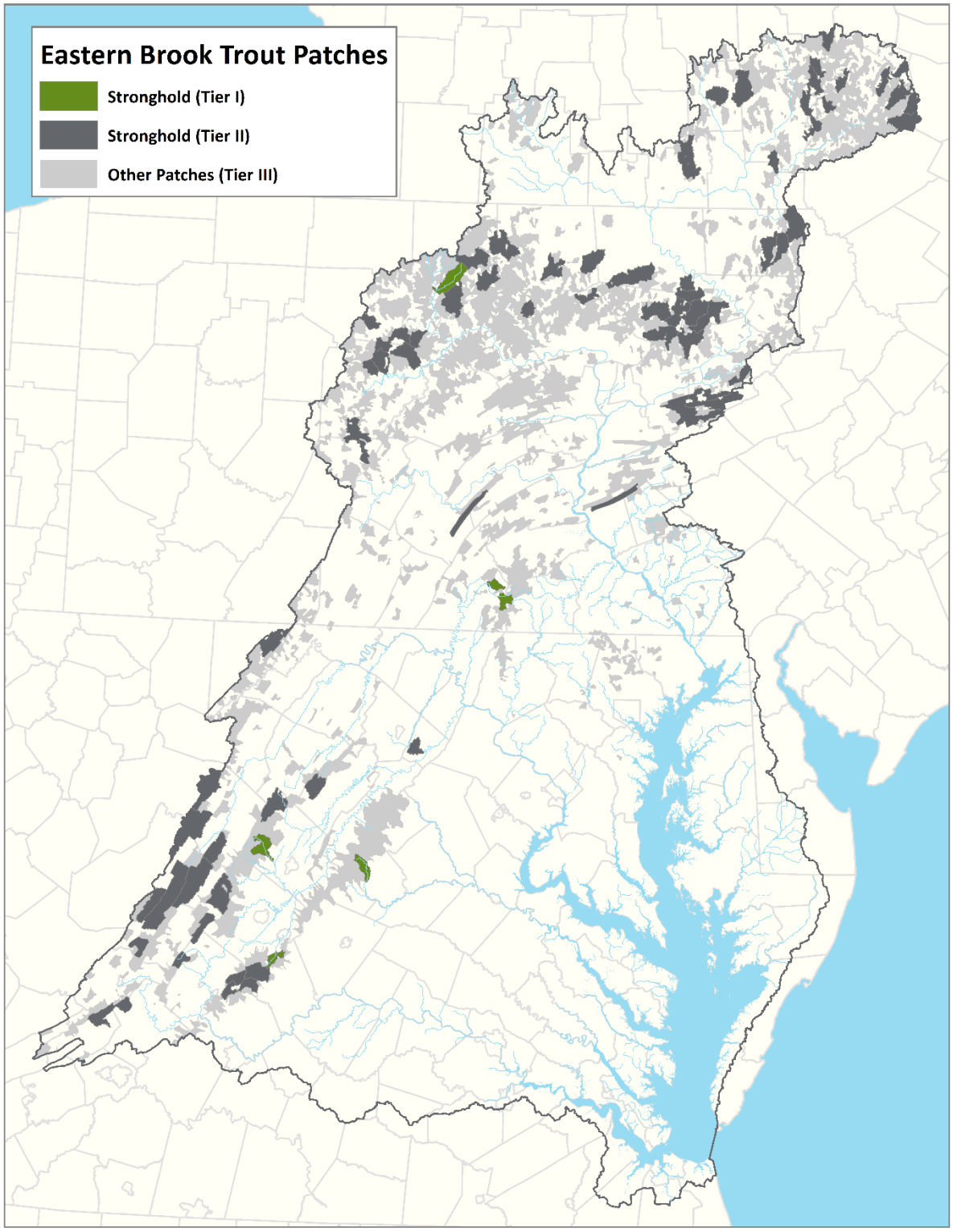

Figure 2. Stronghold Patches for Brook Trout Population Increase

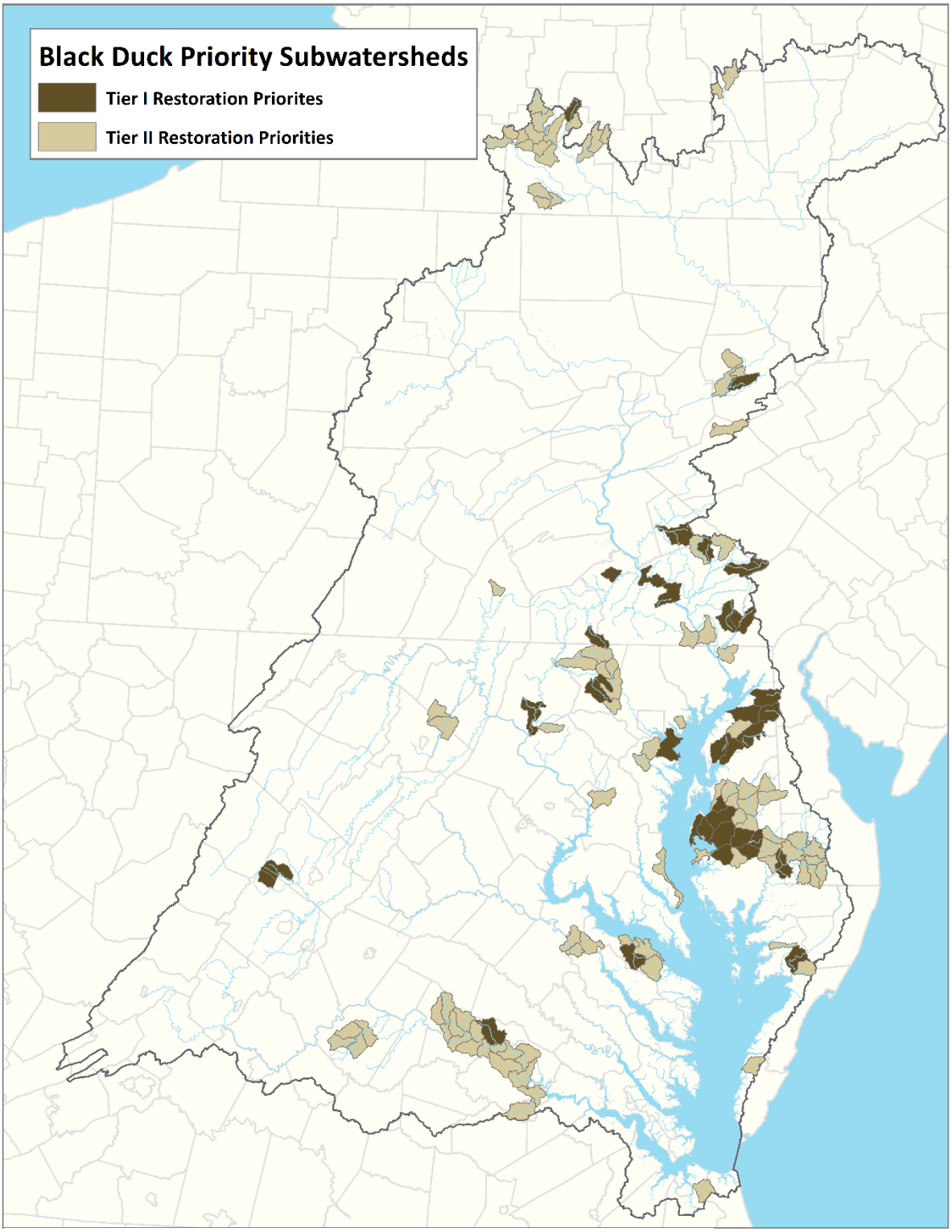

Figure 3. Priority Subwatersheds for Black Duck

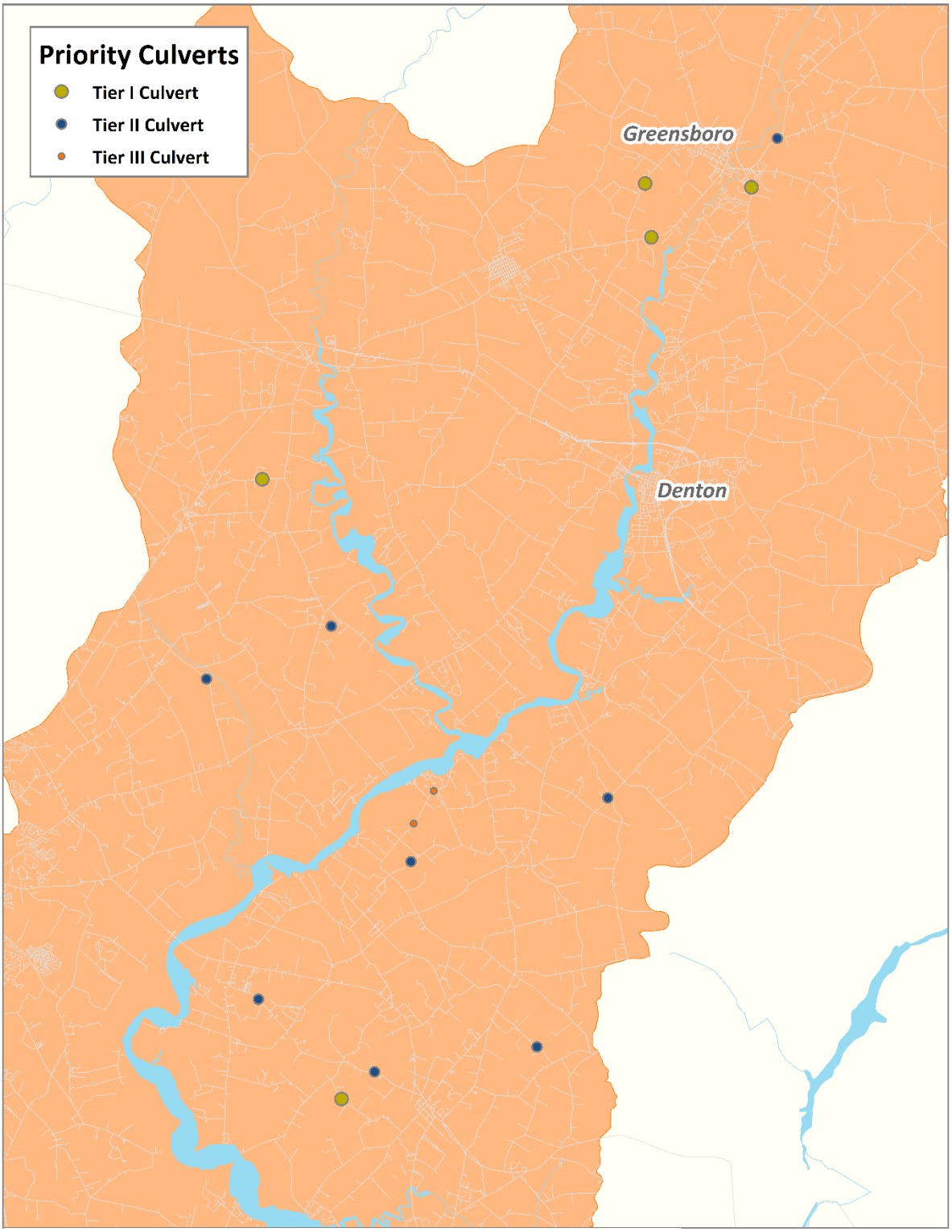

Figure 4. Priority Culverts for River Herring, Choptank River (MD)

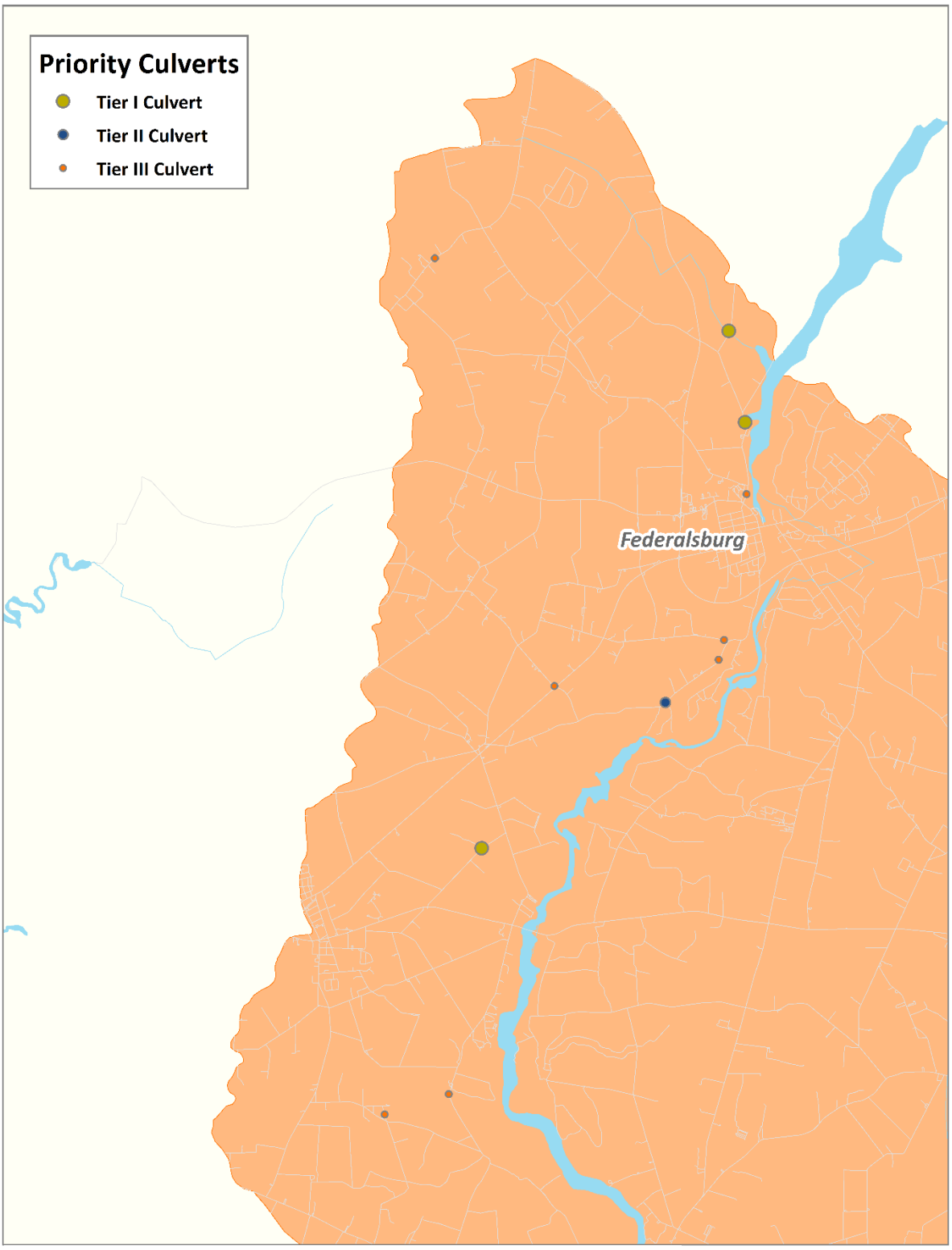

Figure 5. Priority Culverts for River Herring, Nanticoke River (MD)

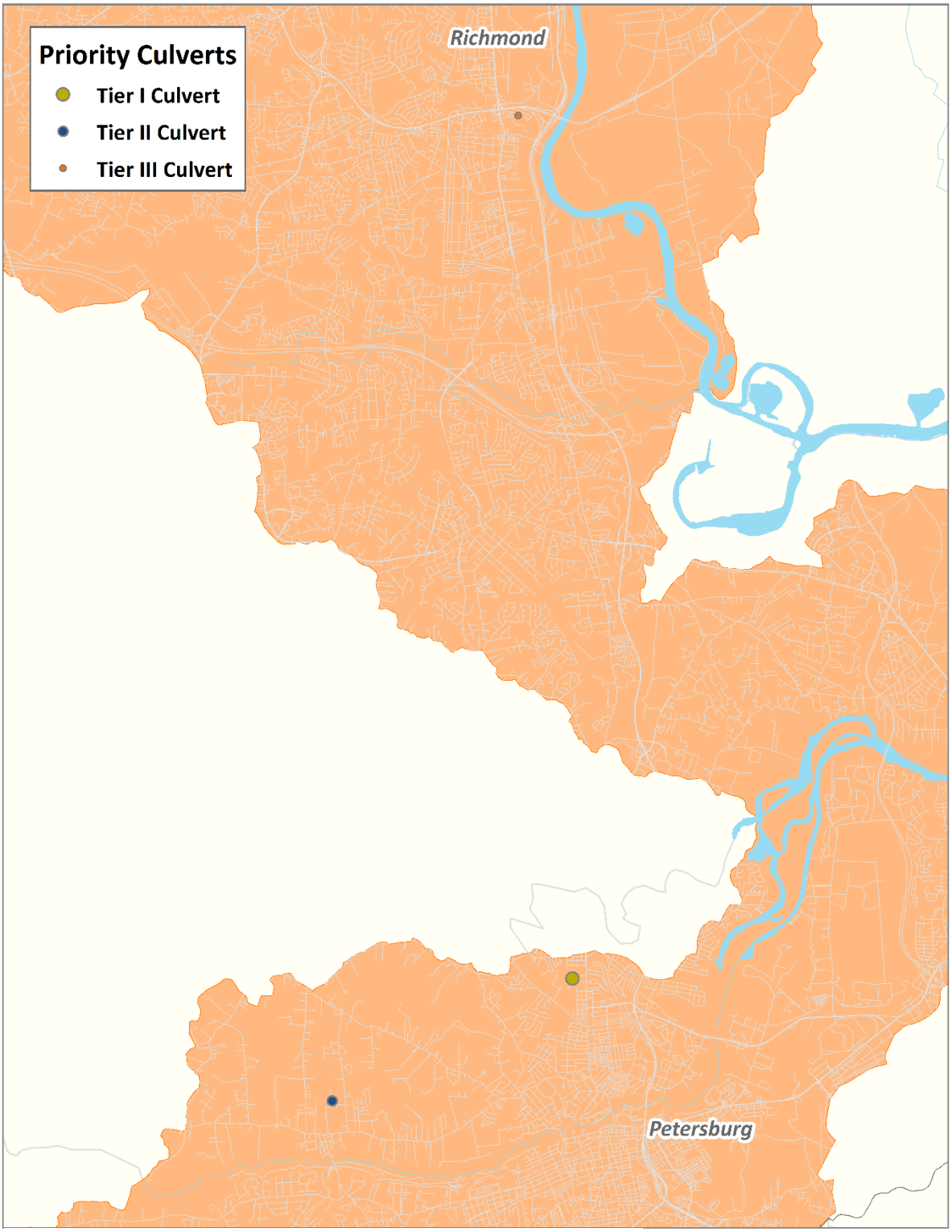

Figure 6. Priority Culverts for River Herring, James River (VA)

Figure 7. Oyster Restoration Tributaries (MD)