Chesapeake Bay Comprehensive Plan

Section 905(b) (WRDA 1986) Analysis

February 2015

U.S. Army Corps of Engineers, Baltimore & Norfolk Districts

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ACRONYMS

ACEP	Agricultural Conservation Easement Program
BMPs	Best Management Practices
CAFO	Concentrated Animal Feeding Operations
CAP	Continuing Authorities Program
CBP	Chesapeake Bay Program
CBF	Chesapeake Bay Foundation
CBFO	Chesapeake Bay Field Office (U.S. Fish and Wildlife Service)
CBWI	Chesapeake Bay Watershed Initiative
Cfs	Cubic feet per second
CIDMA	Craney Island Dredged Material Management Area
COG	Council of Governments
CSP	Conservation Stewardship Program
CSRM	Coastal Storm Risk Management
DMMP	Dredged Material Management Plan
DOD	U.S. Department of Defense
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
EPA	United States Environmental Protection Agency
ERDC	Engineer Research and Development Center
EVA	Erosion Vulnerability Assessment
EQIP	Environmental Quality Incentives Program
FCSA	Feasibility cost-sharing agreement
FEMA	Federal Emergency Management Agency
FLC	Federal Leadership Committee
FPMS	Floodplain Management Services Program
FRMP	Flood Risk Management Project
GIS	Geographic Information Systems
GRR	General Reevaluation Report
HFRP	Healthy Forests Reserve Program
ICPRB	Interstate Commission on the Potomac River Basin
ICW	Inspection of Completed Works
IIS	International Interagency Support
IWRM	Integrated water resources management
M&I	Municipal and industrial
MCY	Million cubic yard
MD DNR	Maryland Department of Natural Resources
MDE	Maryland Department of the Environment
MPA	Maryland Port Administration
MS4	Municipal Separate Storm Sewer System
NACCS	North Atlantic Coast Comprehensive Study
NFS	Non-federal sponsor
NFWF	National Fish and Wildlife Foundation

NGO	Non-governmental organization
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NYSDEC	New York State Department of Environmental Conservation
ORP	Oyster Recovery Partnership
PADEP	Pennsylvania Department of Environmental Protection
PAS	Planning Assistance to States
PFBC	Pennsylvania Fish and Boat Commission
PL	Public Law
PMP	Project Management Plan
RCPP	Regional Conservation Partnership Program
SAV	Submerged Aquatic Vegetation
SRBC	Susquehanna River Basin Commission
SRS/FEIS	Special Resource Study and Final Environmental Impact Statement
TMDL	Total Maximum Daily Load
TNC	The Nature Conservancy
TSS	Total Suspended Solids
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
VIMS	Virginia Institute of Marine Science
VMRC	Virginia Marine Resources Commission
WIP	Watershed Implementation Plan
WRDA	Water Resources Development Act
WRRDA	Water Resources Reform and Development Act
WRP	Wetlands Reserve Program
WWTP	Wastewater Treatment Plant

Chesapeake Bay Comprehensive Plan

Section 905(b) (WRDA 86) Analysis

1. STUDY AUTHORITY

This investigation is being conducted under the authority provided by the United States Senate Committee on Environment and Public Works, Committee Resolution adopted 26 September 2002. This 905(b) Analysis was prepared in direct response to specific language contained in the Committee Resolution that directed the U.S. Army Corps of Engineers (USACE) to develop a coordinated, comprehensive master plan within USACE mission areas for restoring, preserving and protecting the Chesapeake Bay ecosystem. The study shall be conducted in cooperation with other federal agencies, the State of Maryland, the Commonwealth of Virginia, the Commonwealth of Pennsylvania, the State of New York, the State of Delaware, the State of West Virginia, the District of Columbia, and their political subdivisions and agencies, as well as the Chesapeake Bay Program, the Chesapeake Bay Commission, and the Chesapeake Executive Council. The full committee resolution reads:

> *"Resolved by the Committee on Environment and Public Works on the United States Senate, that the Secretary of the Army is requested to review the report of the Army Corps of Engineers on the Chesapeake Bay Study, dated September 1984, and other pertinent reports, with a view to developing a coordinated, comprehensive master plan within the Corps mission areas for restoring, preserving and protecting the Chesapeake Bay ecosystem. The plan shall focus on integrating existing and future work of the Corps of Engineers, shall be developed in cooperation with State and local governments, other Federal agencies, the Chesapeake Bay Program, the Chesapeake Bay Commission, and the Chesapeake Executive Council, and shall encompass all Corps actions necessary to assist in the implementation of the goals of the 2000 Chesapeake Bay Agreement. The plan shall identify additional feasibility studies and research efforts required to better understand and solve the environmental problems of the Chesapeake Bay."*

The study received $250,000 in appropriations for fiscal year 2014.

2. STUDY PURPOSE

The purposes of this reconnaissance phase are: (a) to determine whether there is a federal interest in implementing a project or projects within USACE mission areas for restoring, preserving and protecting the Chesapeake Bay aquatic ecosystem; (b) scope one or more project management plan(s) (PMP) focused on restoring, preserving and protecting the Chesapeake Bay ecosystem; and (c) negotiate a cost-sharing agreement(s) (CSA) between USACE and non-federal sponsor(s) (NFS) to cost-share the feasibility phase. Feasibility investigations are expected to include a comprehensive plan as well as traditional feasibility studies that may lead to project implementation. If the 905b Analysis determines federal interest and identifies a non-federal sponsor(s), the Baltimore and Norfolk District(s) will pursue negotiation of a PMP(s) and execution of a CSA(s).

The 2014 Chesapeake Bay Watershed Agreement and the associated Management Strategies developed by the program's Goal Implementation Teams (GITs) provide a roadmap for the Chesapeake Bay Comprehensive Study. GITs are interagency teams assigned to develop management strategies for specific Chesapeake Bay Program goals. The GITs sit under and

report to the Chesapeake Bay Program Management Board. The problems and opportunities identified later in this report reflect the problems and opportunities laid out in the Agreement. Some opportunities that fall within USACE mission areas can be addressed by USACE, while some will require action by others. Goals and outcomes that most closely align with USACE missions include Sustainable Fisheries, Vital Habitats, Healthy Watersheds, and Climate Resiliency. USACE is actively involved in several of the Chesapeake Bay Program GITs, including the Sustainable Fisheries GIT, Habitat GIT, Healthy Watersheds GIT, and various working groups.

USACE is authorized to undertake efforts to restore, preserve, and protect the Chesapeake Bay ecosystem within the USACE mission areas. The Chesapeake Bay and its watershed, spanning 64,000 square miles, is the nation's largest estuary. The Chesapeake Bay watershed touches or encompasses six states plus the nation's capital: Delaware, the District of Columbia, Maryland, New York, Pennsylvania, Virginia, and West Virginia (Figure 1), and provides a diversity of habitats that fuel fisheries production, waterfowl migration along the Atlantic Flyway, the economy, and recreation. Land use activities (i.e., agriculture, industrialization, and urbanization) have resulted in the introduction of pollutants and contaminants that have degraded habitats and water quality.

The Chesapeake Bay Watershed has gained much deserved attention due to its immense ecological, cultural, economic, historic, and recreational value. The purpose of the Chesapeake Bay Comprehensive Plan is to identify problems within the watershed and the adverse impacts as a result of those problems, which the USACE or others can address through coordinated action. The USACE can address problems within the watershed that are directly related to the USACE missions and will identify actions that cannot be addressed through USACE mission areas, but could be addressed by other federal, state, and local agencies, or NGOs. Significant impacts to the Chesapeake Bay Watershed include, but are not limited to, diminished fisheries resources, degraded tidal and non-tidal habitats, impaired stream health and function, fish passage blockages, shoreline and stream bank erosion, flooding, mismanagement of dredged material and coastal storm damage. These impacts have been caused by increased land use and population pressures, as well as sea level and climate change.

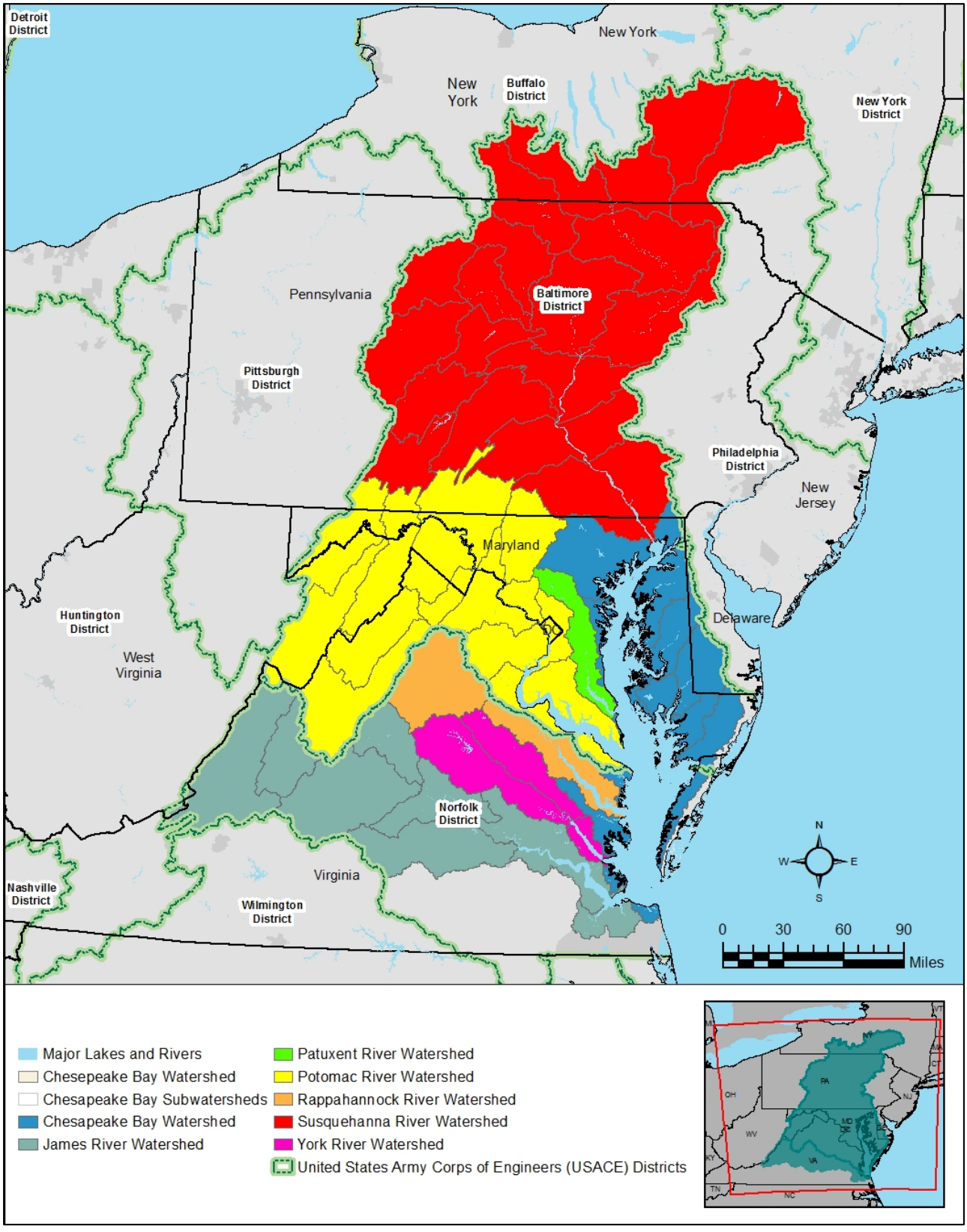

Figure 1. Study Area- Chesapeake Bay and its Watershed

3. RECOMMENDATION/FINDING OF FEDERAL INTEREST

3.1 Recommendation

It is recommended that the Chesapeake Bay Comprehensive Plan proceed into multiple feasibility studies with multiple partners throughout the entire study area. One feasibility study will undertake development of a comprehensive plan of the Chesapeake Bay watershed, entitled the Chesapeake Bay Comprehensive Water Resources and Restoration Plan (the Plan) as stated in the Joint Explanatory Statement of the Committee of Conference for Water Reform and Resources Development Act (WRRDA) 2014. The Plan will be aimed at identifying USACE studies and projects that are in the federal interest and support the Chesapeake Bay Agreement. The Plan will be compliant with all applicable SMART Planning guidance. Applicable states where the alternative could be implemented, anticipated benefits, potential impacts, potential outputs, potential limits to implementation, and possible implementation pathways are provided.

Other feasibility studies are recommended that continue the investigation of ecosystem restoration opportunities, as well as other USACE mission areas (structural and non-structural flood risk management, coastal storm risk management, integrated water resources management and watershed management, and navigation) where they could add value to aquatic habitat resources to address aquatic ecosystem habitat impairments in the Chesapeake Bay study area. These investigations are expected to be focused, follow-on traditional feasibility studies that result in project implementation, identification of research efforts (per the authorization) and identification of projects appropriate for the Continuing Authorities Program, technical assistance programs and Department of Defense (DoD) and International Interagency Support (IIS) partnerships. These efforts could be parallel or sequential to the Plan. Parallel efforts are less likely, but could present themselves as the Comprehensive Plan analyses move forward. These efforts are completely dependent upon available funding, sponsorship, and identification of an opportunity within the federal interest.

Efforts or studies undertaken as a recommendation of the Plan could be conducted anywhere within the Chesapeake Bay watershed, and potential sponsors or partners could include federal, state or local government, as well as the Chesapeake Bay Program, Chesapeake Bay Commission, various river keepers and watershed associations, or other non-governmental/non-profit organizations, as outlined by the authorization. Studies could be conducted under Investigations, CAP, Section 729, or any other appropriate program. Specific types of studies that could be conducted include (but are not limited to):

- Coastal Storm Risk Management
- Climate resiliency
- Fish barrier removal
- Tidal wetlands restoration
- Brook trout habitat restoration
- Riparian habitat restoration
- Stream restoration

- Non-tidal wetlands restoration
- Estuary habitat restoration (not wetlands)
- Acid mine drainage, abandoned coal mines
- Watershed assessment
- Flood Risk Management (FRM)
- Integrated Water Resources Management (IWRM)
- Beneficial use of dredged material

Section 13 presents more details on an array of topics that could be further investigated as potential feasibility studies.

The plan will utilize Integrated Water Resource Management (IWRM). Realizing the need for integration of information across various disciplines to serve the nation's future water resource needs and address future challenges, the federal government (including USACE) has embraced the importance of IWRM to consider all aspects of water resource management. Various federal agencies participated in the development of the Federal Support Toolbox which is a one-stop-shop for IWRM information for planning and management. Stemming from this, there is also a federal interest in developing alternatives that combine flood risk management, ecosystem restoration, watershed management, coastal storm risk management, and any and all other related issues that could be developed within existing policy.

As will be evident in the following Section 905 (b) document, water quality is a significant problem throughout the watershed. Although water quality enhancement is not a USACE mission, opportunities to enhance water quality, if incidentally linked to a USACE mission in a project or study, can be considered Additionally, extensive efforts are being led by the U.S. Environmental Protection Agency (EPA) to address water quality impairments through the Chesapeake Bay Total Maximum Daily Load. The focus on improving water quality by EPA and the watersheds' jurisdictions will set the stage for broad habitat restoration opportunities for USACE throughout the watershed.

3.2 Finding of Federal Interest

The following sections discuss the institutional, public, and technical significance that support federal interest in the Chesapeake Bay and its watershed. Additionally, the National Park Service has documented the national significance of the Chesapeake Bay in developing the Chesapeake Bay Special Resource Study and Final Environmental Impact Statement (SRS/FEIS) which considered the potential for a new unit of the National Park System focused on the Chesapeake Bay (NPS 2004). This was in response to a request from Congress included within report language for the Fiscal Year 1999 Interior Appropriations Act.

In addition to the significance documented in the following discussion, the federal government is a substantial landowner in the watershed. Federal land holdings in the watershed account for approximately 5.5%, encompassing 2,252,837 acres (CBP, personal communication, based on

2013 data). Military lands alone account for 231,485 acres (depicted in Figure E-1 in Appendix E).

3.2.1 Institutional/National Significance

The federal government has established numerous executive orders, laws, and regulations aimed at preserving and improving the integrity of our natural environment.

Executive Order 13508, Chesapeake Bay Protection and Restoration

On May 12, 2009, President Obama issued Executive Order (EO) 13508 to protect and restore the Chesapeake Bay and its watershed. The EO declared the Chesapeake Bay a "national treasure" and recognized that there are many nationally significant assets owned by the federal government in the Chesapeake Bay and its watershed such as public lands, facilities, military installations, parks, forests, wildlife refuges, monuments, and museums. The Executive Order directed the federal government to exercise a greater leadership role to restore this ecological, economic, and cultural resource. In November 2009, the Federal Leadership Committee (FLC) designated by EO 13508 issued a series of reports containing recommendations for addressing challenges facing the health of the Chesapeake Bay watershed including developing tools and actions to improve water quality; focusing on conserving resources; strengthening of stormwater management at federal facilities; consideration of climate change impacts; science and decision-making support for ecosystem management; and habitat and research activities. The FLC was convened to manage the development of strategies and program plans for the watershed and ecosystem of the Chesapeake Bay and oversee their implementation. The FLC for the Chesapeake Bay is composed of representatives including the Assistant Secretary of the Army for Civil Works and those from the Departments of Agriculture, Commerce, Defense, Homeland Security, Interior and Transportation. FLC Senior Designees are provided in the Appendix in Table D-1.

As directed by the EO, the Strategy for Protecting and Restoring the Chesapeake Bay was released in May 2010. Federal agencies have been collaborating with state and local government, non-governmental organizations (NGOs), academic institutions, community groups, and individual citizens to implement the Strategy. An Action Plan and Annual Progress Report have been published each year since 2011. The reports lay out federal agencies and their partners' efforts to address EO 13508 Goals and Supporting Strategies:

Restore clean water	Expand citizen stewardship
Recover habitat	Develop environmental markets
Sustain Fish and Wildlife	Respond to climate change
Conserve land and public access	Strengthen science

Associated reports include:

- *Chesapeake Forest Restoration Strategy* (US Forest Service (USFS)),
- *Chesapeake Bay Watershed Public Access Plan* (National Park Service),
- *Mid-Atlantic Elementary and Secondary Environmental Literacy Strategy* (CBP),
- *Native Oyster Restoration Master Plan* (USACE), and

- A technical report titled *Toxic Contaminants in the Chesapeake Bay and its Watershed: Extent and Severity of Occurrence and Potential Biological Effects* (U.S. EPA, USGS, USFWS).

The Clean Water Act (CWA) of 1972, as amended

The Clean Water Act regulates discharges of pollutants into waters of the United States and sets water quality standards for surface waters. Although, there are many components of the Clean Water Act, Section 303(d) and the Total Maximum Daily Load (TMDL) Program are a primary focus of current Chesapeake Bay restoration efforts.

Chesapeake Bay Total Maximum Daily Load

Section 303(d) of the CWA requires states to develop a list of impaired waters and report them to the EPA. Impaired waters are those waters where water quality standards are not being attained or maintained. The national goal of the CWA is to have waters that are both safe for swimming and fishing. A TMDL is developed to restore listed waterways (i.e., streams, lakes, etc.) to a condition where water quality standards are met. Waterbodies can be removed from the list once the water quality impairment has been reversed. USACE regulates the waters of the U.S. in order to minimize and mitigate for fill activities under Section 404 of the Clean Water Act as well as Section 10 of the Rivers and Harbors Act.

In 2010, the EPA established the Chesapeake Bay TMDL to restore clean water in the Chesapeake Bay and the region's streams, creeks, and rivers. The Chesapeake Bay TMDL is the largest ever developed by the EPA. As a key part of the EO 13508 water quality goal, the TMDL identifies pollution reductions (Total nitrogen, Total phosphorous and Total Suspended Solids (TSS)) that are needed from major sources across the Chesapeake Bay watershed to meet water quality standards in the Bay and tidal segments of its rivers. The seven Chesapeake Bay watershed jurisdictions (Delaware, District of Columbia, Maryland, New York, Pennsylvania, Virginia, and West Virginia) have developed watershed implementation plans (WIPs), which detail how each of the Bay watershed jurisdictions will meet their assigned nitrogen, phosphorus, and sediment load allocations as part of the Chesapeake Bay total maximum daily loads (TMDLs). The TMDLs were defined to achieve dissolved oxygen (DO), water clarity, SAV and algae (measured as chlorophyll) levels required for healthy aquatic life.

The program requires 60 percent implementation by 2017 and full implementation by 2025. Although full implementation is targeted for 2025, it is unsure how long it will take to realize the maximum benefits due to legacy sediments and nutrients in the watershed and streams. However, it is important to note that improvements in the overall water quality within the Chesapeake Bay will help set the stage for broad scale aquatic ecosystem restoration opportunities throughout the watershed. While there are always opportunities with the Chesapeake Bay watershed for aquatic ecosystem restoration, having impaired waters makes the restoration efforts less effective. While this process will take time, significant improvement will be seen in the short term and as each year progresses the benefits from these actions will increase. Ecosystem restoration efforts by USACE and others will become more effective as water quality improves and water quantity is better controlled.

Additionally, many individual rivers and streams within the Chesapeake Bay watershed are listed as impaired on the 303(d) list. Many of these have their own TMDLs for specific problems such as nutrients, biological impairments, turbidity, pathogens, metals, mercury, trash, toxics, pesticides, etc.

Chesapeake Bay Program

Federal interest in the ecological health of the Chesapeake Bay can be traced to the late 1970s/early 1980s and to the Chesapeake Bay Program. The Chesapeake Bay was the first estuary targeted by Congress for restoration and protection (CBP 2012a). The Chesapeake Bay Program (CBP) was established in 1983. EPA is the federal lead agency that coordinates restoration efforts and implements strategies, but the CBP is a regional partnership of government agencies and organizations. A list of the numerous agencies and groups associated with CBP are provided in Appendix D, Table D-2. There are 18 federal agencies listed as CBP partners (including USACE), as well as 26 academic institutions, 35 non-governmental organizations (NGOs), and at least 6 other partners.

There have been a number of agreements since 1983 for the purpose of guiding Chesapeake Bay restoration. These include the Chesapeake Bay Agreement of 1983, the 1987 Chesapeake Bay Agreement, Chesapeake 2000, and the recently signed 2014 Chesapeake Bay Agreement. Through the 2014 Chesapeake Bay Agreement, the partnership has recommitted its efforts to restoration of the Bay and its watershed. Ten goals with associated outcomes were established in the Agreement as shown in Table 1 below and in Appendix B.

For each outcome, management strategies will be developed that outline how the outcome will be accomplished, as well as monitoring, assessing and reporting progress, and coordinating partners' efforts. Management strategies are expected to be complete in June of 2015.

Table 1. 2014 Chesapeake Bay Agreement Goals and Outcomes

Goals	Outcomes
Sustainable Fisheries	**Blue Crab Abundance:** Maintain a sustainable blue crab population based on the current 2012 target of 215 million adult females. Refine population targets through 2025 based on best available science.
	Blue Crab Management: Manage for a stable and productive crab fishery including working with the industry, recreational crabbers and other stakeholders to improve commercial and recreational harvest accountability. By 2018, evaluate the establishment of a Bay-wide, allocation-based management framework with annual levels set by the jurisdictions for the purpose of accounting for and adjusting harvest by each jurisdiction.
	Oyster: Continually increase finfish and shellfish habitat and water quality benefits from restored oyster populations. Restore native oyster habitat and populations in 10 tributaries by 2025 and ensure their protection.
	Forage Fish: Continually improve the Partnership's capacity to understand the role of forage fish populations in the Chesapeake Bay. By 2016, develop a strategy for assessing the forage fish base available as food for predatory

Goals	Outcomes
	species in the Chesapeake Bay.
	Fish Habitat: Continually improve effectiveness of fish habitat conservation and restoration efforts by identifying and characterizing critical spawning, nursery and forage areas within the Bay and tributaries for important fish and shellfish, and use existing and new tools to integrate information and conduct assessments to inform restoration and conservation efforts.
Vital Habitats	**Wetlands:** Continually increase the capacity of wetlands to provide water quality and habitat benefits throughout the watershed. Create or reestablish 85,000 acres of tidal and non-tidal wetlands and enhance the function of an additional 150,000 acres of degraded wetlands by 2025. These activities may occur in any land use (including urban) but primarily occur in agricultural or natural landscapes.
	Black Duck: By 2025, restore, enhance and preserve wetland habitats that support a wintering population of 100,000 black ducks, a species representative of the health of tidal marshes across the watershed. Refine population targets through 2025 based on best available science.
	Stream Health: Continually improve stream health and function throughout the watershed. Improve health and function of ten percent of stream miles above the 2008 baseline for the Chesapeake Bay watershed.
	Brook Trout: Restore and sustain naturally reproducing brook trout populations in Chesapeake headwater streams with an eight percent increase in occupied habitat by 2025.
	Fish Passage: Continually increase available habitat to support sustainable migratory fish populations in Chesapeake Bay freshwater rivers and streams. By 2025, restore historical fish migratory routes by opening 1,000 additional stream miles, with restoration success indicated by the consistent presence of alewife, blueback herring, American shad, hickory shad, American eel and brook trout, to be monitored in accordance with available agency resources and collaboratively developed methods.
	Summered Aquatic Vegetation (SAV): Sustain and increase the habitat benefits of SAV (underwater grasses) in the Chesapeake Bay. Achieve and sustain the ultimate outcome of 185,000 acres of SAV Bay-wide necessary for a restored Bay. Progress toward this ultimate outcome will be measured against a target of 90,000 acres by 2017 and 130,000 acres by 2025.
	Forest Buffer: Continually increase the capacity of forest buffers to provide water quality and habitat benefits throughout the watershed. Restore 900 miles per year of riparian forest buffer and conserve existing buffers until at least 70 percent of riparian areas throughout the watershed are forested.
	Tree Canopy: Continually increase urban tree canopy capacity to provide air quality, water quality and habitat benefits throughout the watershed. Expand urban tree canopy by 2,400 acres by 2025.
Water Quality	**2017 Watershed Implementation Plans (WIP):** By 2017, have practices and controls in place that are expected to achieve 60 percent of the nutrient and sediment pollution load reductions necessary to achieve applicable water quality standards compared to 2009 levels.

Goals	Outcomes
	2025 WIP: By 2025, have all practices and controls installed to achieve the Bay's dissolved oxygen, water clarity/submerged aquatic vegetation and chlorophyll a standards as articulated in the Chesapeake Bay TMDL document.
	Water Quality Standards Attainment and Monitoring: Continually improve the capacity to monitor and assess the effects of management actions being undertaken to implement the Bay TMDL and improve water quality. Use the monitoring results to report annually to the public on progress made in attaining established Bay water quality standards and trends in reducing nutrients and sediment in the watershed.
Toxics	**Toxic Contaminants Research:** Continually increase our understanding of the impacts and mitigation options for toxic contaminants. Develop a research agenda and further characterize the occurrence, concentrations, sources and effects of mercury, PCBs and other contaminants of emerging and widespread concern. In addition, identify which best management practices might provide multiple benefits of reducing nutrient and sediment pollution as well as toxic contaminants in waterways.
	Toxic Contaminants Policy and Prevention: Continually improve practices and controls that reduce and prevent the effects of toxic contaminants below levels that harm aquatic systems and humans. Build on existing programs to reduce the amount and effects of PCBs in the Bay and watershed. Use research findings to evaluate the implementation of additional policies, programs and practices for other contaminants that need to be further reduced or eliminated.
Healthy Watersheds	**Healthy Watersheds:** 100 percent of state-identified currently healthy waters and watersheds remain healthy.
Stewardship	**Citizen Stewardship:** Increase the number and diversity of trained and mobilized citizen volunteers with the knowledge and skills needed to enhance the health of their local watersheds.
	Local Leadership: Continually increase the knowledge and capacity of local officials on issues related to water resources and in the implementation of economic and policy incentives that will support local conservation actions.
	Diversity: Identify minority stakeholder groups that are not currently represented in the leadership, decision-making and implementation of conservation and restoration activities and create meaningful opportunities and programs to recruit and engage them in the Partnership's efforts.
Land Conservation	**Protected Lands:** By 2025, protect an additional two million acres of lands throughout the watershed—currently identified as high conservation priorities at the federal, state or local level—including 225,000 acres of wetlands and 695,000 acres of forest land of highest value for maintaining water quality. (2010 baseline year)

Goals	Outcomes
	Land Use Methods and Metrics Development: Continually improve the knowledge of land conversion and the associated impacts throughout the watershed. By 2016, develop a Chesapeake Bay watershed-wide methodology and local level metrics for characterizing the rate of farmland, forest and wetland conversion, measuring the extent and rate of change in impervious surface coverage and quantifying the potential impacts of land conversion to water quality, healthy watersheds and communities. Launch a public awareness campaign to share this information with citizens, local governments, elected officials and stakeholders.
	Land Use Options Evaluation: By the end of 2017, with the direct involvement of local governments or their representatives, evaluate policy options, incentives and planning tools that could assist them in continually improving their capacity to reduce the rate of conversion of agricultural lands, forests and wetlands as well as the rate of changing landscapes from more natural lands that soak up pollutants to those that are paved over, hardscaped or otherwise impervious. Strategies should be developed for supporting local governments' and others' efforts in reducing these rates by 2025 and beyond.
Public Access	**Public Access Site Development:** By 2025, add 300 new public access sites, with a strong emphasis on providing opportunities for boating, swimming and fishing, where feasible. (2010 baseline year)
Environmental Literacy	**Student:** Continually increase students' age-appropriate understanding of the watershed through participation in teacher-supported, meaningful watershed educational experiences and rigorous, inquiry-based instruction, with a target of at least one meaningful watershed educational experience in elementary, middle and high school depending on available resources.
	Sustainable Schools: Continually increase the number of schools in the region that reduce the impact of their buildings and grounds on their local watershed, environment and human health through best practices, including student-led protection and restoration projects.
	Environmental Literacy Planning: Each participating Bay jurisdiction should develop a comprehensive and systemic approach to environmental literacy for all students in the region that includes policies, practices and voluntary metrics that support the environmental literacy Goals and Outcomes of this Agreement.
Climate Resiliency	**Monitoring and Assessment:** Continually monitor and assess the trends and likely impacts of changing climatic and sea level conditions on the Chesapeake Bay ecosystem, including the effectiveness of restoration and protection policies, programs and projects.
	Adaptation: Continually pursue, design and construct restoration and protection projects to enhance the resiliency of Bay and aquatic ecosystems from the impacts of coastal erosion, coastal flooding, more intense and more frequent storms and sea level rise.

3.2.1.1 Federal Agency Recognitions

The 2008 Farm Bill established the Chesapeake Bay Watershed Initiative (CBWI), which was administered by the U.S. Department of Agriculture (USDA)/Natural Resources Conservation Service (NRCS). NRCS is a sub agency of the USDA and through the CBWI program;

approximately $235 million was invested on implementing conservation practices on agricultural land in the Bay watershed between 2008 and 2012 (USDA-NRCS 2013). In 2012 alone, over $40 million in financial assistance was provided to implement conservation practices on 109,389 acres (USDA-NRCS 2013). The various conservation practices are designed to reduce nitrogen, phosphorus, and sediment; enhance habitat; and increase productivity and sustainability of agricultural and forest lands. The 2014 Farm Bill restructured funding for conservation practices. A new initiative called the Regional Conservation Partnership Program (RCPP) will receive up to $100 million annually towards implementing conservation practices. As part of the RCPP, USDA identified eight critical conservation areas across the nation, of which the Chesapeake Bay watershed is one, that will be focus areas for funding. Additional NRCS programs focused on land management and conservation are the Environmental Quality Incentives Program (EQIP), the Wetlands Reserve Program (WRP), the Conservation Stewardship Program (CSP), the Agricultural Conservation Easement Program (ACEP), and the Healthy Forests Reserve Program (HFRP).

In 2014, NOAA selected the Choptank River complex on the Maryland Eastern Shore and Delaware as a Habitat Focus Area under the National Oceanic and Atmospheric Administration (NOAA) Habitat Blueprint. NOAA will focus resources in the Choptank Complex to support habitat conservation and restoration. Additionally, NOAA administers the National Estuarine Research Reserve System. The Chesapeake Bay Reserve in Maryland includes a diversity of habitats including salt marsh at Monie Bay, a tidal freshwater marsh at Otter Point Creek, and a tidal riverine system at Jug Bay. The Virginia Reserve ranges from tidal freshwater to high salinity habitats along the York River including Sweet Hall Marsh, Taskinas Creek, Catlett Island, and Goodwin Islands.

The Water Resources Development Act (WRDA) of 1996 established the Chesapeake Bay Restoration and Protection Program under Section 510. The authorization was later amended by Section 5020 of WRDA 2007 and Section 4010 of the Water Resources Reform and Development Act (WRRDA) of 2014. Section 4010 of WRRDA 2014 also links the program to the development of the Chesapeake Bay Comprehensive Plan. The program provides design and/or construction assistance to non-federal interests for environmental projects that support the restoration and protection of the Chesapeake Bay estuary. Design and construction costs are cost-shared 75 percent federal and 25 percent non-federal.

In 1984 Congress created the National Fish and Wildlife Foundation (NFWF). NFWF is an independent 501(c)(3) nonprofit organization, governed by a 30-member Board of Directors approved by the Secretary of the Interior. NFWF manages conservation grants nationwide to protect and restore our nation's fish, wildlife, plants, and habitats. NFWF works closely with many federal agencies, as well as other nonprofit organizations and corporations. NFWF administers the Chesapeake Bay Stewardship Fund, which awards $8 million to $12 million a year through competitive grant programs and technical assistance. The Chesapeake Bay Stewardship Fund is a partnership with the Federal-State Chesapeake Bay Program.

The Chesapeake Bay Estuarine Complex was recognized in 1987 by The Ramsar Convention on Wetlands as a "Wetlands of International Importance" (Ramsar 2013). With the designation, Ramsar acknowledged the diverse natural habitats, value to endangered breeding birds, use of

the area by large numbers of staging and wintering waterfowl and shorebirds, and the economic value of the Bay's fisheries.

The Urban Waters Federal Partnership is a partnership among 11 federal agencies with the mission of helping urban and metropolitan areas, particularly those that are under-served or economically distressed, connect with their waterways and work to improve them. The partnership has designated urban waters locations where federal and local projects are planned and implemented to improve water quality, restore habitat, enhance local economies, and work with local communities. There are eighteen urban waters locations nationwide and two of those partnership locations are located within the Chesapeake Bay Watershed.

3.2.2 Public Significance

There is great public significance of the value of the Chesapeake Bay ecosystem. There are a large number of public organizations with an interest in some aspect of the Chesapeake Bay watershed. To demonstrate this, Table D-2 (Appendix D) provides a list of the 35 NGOs and 26 academic institutions that are involved in the Chesapeake Bay Program. Many NGOs have outlined Chesapeake Bay-specific strategies or priorities. For example, The Nature Conservancy (TNC) has priority areas, which include conservation targets, in the Chesapeake Bay watershed. In addition to this, there are subwatershed groups established for local watersheds throughout the larger Chesapeake Bay watershed. These groups work to improve the quality of their local watershed. Further evidence of the public recognition of the value of the Chesapeake Bay is the size of the Chesapeake Bay Foundation (CBF). CBF, one of the leading non-profit organizations focused on Bay restoration, has over 200,000 members and has supporters from all 50 states. There is broad distribution of the Chesapeake Bay Journal published by CBF. The objective of the Chesapeake Bay Journal is to inform the public about events and issues that affect the Chesapeake Bay. Additionally, recreation throughout the Chesapeake Bay is extensive and speaks to the public value placed on the Bay and its ecosystem. The 17,000,000 residents of the Chesapeake Bay watershed have over 700 public access points to the Bay and its tributaries (CBP 2012a). There are national, state, local parks, and wildlife management areas, and 2,600 miles of designated water trails.

The Chesapeake Bay has historical and cultural significance. The Bay's abundance has supported human settlements in the watershed for thousands of years from Native Americans to early colonists and the founding of America through today. The Chesapeake Bay and its watershed played a prominent role in America's development. Some of the first English settlements, Jamestown (VA) and St. Mary's City (MD) are located along the shores of the Chesapeake. The Chesapeake Bay provided plentiful food, timber resources, fertile soils for agriculture, and navigational paths to support European colonization. Colonial events, the signing of the Declaration of Independence, the American Revolution, the War of 1812, and the Civil War all occurred within and were influenced by the Chesapeake Bay and its watershed. With the location of the nation's capital in the watershed, national events continue to be influenced by the Bay. The Bay's natural abundance has fueled commercial development. A culture developed along the Bay that was inherently tied to the water. Communities of watermen that lived off the Bay's bounty developed and supported a thriving fisheries-based economy in Maryland and Virginia. Agriculture flourished throughout the watershed. Other primary industries developed such as ship building, commercial shipping, mining, and manufacturing.

3.2.3 Technical Significance

Significance in terms of technical recognition is based on scientific or other technical criteria that establish a resource's significance. As the nation's largest estuary, the Chesapeake Bay and its watershed spans 64,000 square miles and includes over 124,000 miles of streams and rivers (NPS 2004). The extensive shoreline provides a close connection between land-based activities and the waters of the watershed. The Chesapeake Bay watershed is home to several thousand species of plants and wildlife and because the Chesapeake Bay and its wetlands are a critical link of the Atlantic Flyway, nearly one million waterfowl winter on the Bay, stopping to feed and rest (CBP 2012a). This accounts for nearly a third of the waterfowl that migrate along the Atlantic Flyway. The extensive bay grasses (over 80,000 acres) and tidal wetlands (approximately 284,000 acres) provide critical nursery, refuge, and foraging grounds for finfish, shellfish, and a diverse assemblage of aquatic invertebrates. According to the U.S. Fish and Wildlife Service Chesapeake Bay Field Office website approximately 70 to 90 percent of all striped bass were spawned in the Bay (CBF 2014a). Additionally, the Economic Argument for Cleaning Up the Chesapeake Bay and its Rivers, a Chesapeake Bay Foundation Economic Report from May 2012 identified the blue crab industry as the highest-valued commercial fishery. For nearly a century (beginning in the late 1800s), the oyster industry had also been one of the region's most highly-valued fisheries. The National Marine Fisheries Service (NMFS) has designated essential fish habitat under the Magnuson-Stevens Act for a broad array of species throughout the Chesapeake Bay. The USFWS administers protection of threatened and endangered species and the designation of critical habitat under Section 7 of the Endangered Species Act. The Chesapeake Bay watershed provides critical habitat for 46 plants and 113 animals listed on the Endangered Species List. Table 2 documents the threatened and endangered species listed for the watershed.

Table 2. Threatened and Endangered Species in the Chesapeake Bay Watershed (as of August 2014)

Species Name	Status	State	Counties	Class	Order	In State
Hay's Spring amphipod (Stygobromus hayi)	Endangered	MD	Montgomery, Prince George's	Crustacean - Malacostraca	Amphipod	Yes
Hay's Spring amphipod (Stygobromus hayi)	Endangered	DC	District of Columbia	Crustacean - Malacostraca	Amphipod	Yes
Indiana bat (Myotis sodalis)	Endangered	MD	Not Defined	Mammal	Bat	Yes
Indiana bat (Myotis sodalis)	Endangered	NY	Onondaga	Mammal	Bat	Yes
Indiana bat (Myotis sodalis)	Endangered	PA	Throughout	Mammal	Bat	Yes
Indiana bat (Myotis sodalis)	Endangered	VA	Alleghany, Augusta, Bath, Botetourt, Buckingham, Buena Vista, Clarke, Covington, Craig, Frederick, Giles, Harrisonburg, Highland, Lexington, Montgomery, Page, Roanoke, Rockbridge, Rockingham, Shenandoah, Staunton, Warren, Waynesboro, Winchester	Mammal	Bat	Yes
Indiana bat (Myotis sodalis)	Endangered	WV	Berkeley, Grant, Hampshire, Hardy, Jefferson, Mineral, Monroe, Morgan, Pendleton	Mammal	Bat	Yes
Maryland darter (Etheostoma sellare)	Endangered	MD	Harford	Fish	Perch-Like Fish	Yes

Species Name	Status	State	Counties	Class	Order	In State
Green sea turtle (Chelonia mydas)	Threatened	MD	Worchester	Reptile	Turtle	Yes
Green sea turtle (Chelonia mydas)	Threatened	DE	Sussex	Reptile	Turtle	Yes
Green sea turtle (Chelonia mydas)	Threatened	VA	Accomack, Northampton, Virginia Beach	Reptile	Turtle	Yes
Hawksbill sea turtle (Eretmochelys imbricata)	Endangered	MD	Worchester	Reptile	Turtle	Yes
Hawksbill sea turtle (Eretmochelys imbricata)	Endangered	VA	Accomack, Northampton, Virginia Beach	Reptile	Turtle	Yes
Hawksbill sea turtle (Eretmochelys imbricata)	Endangered	DE	Sussex	Reptile	Turtle	Yes
Kemp's Ridley sea turtle (Lepidochelys kempii)	Endangered	MD	Not Defined	Reptile	Turtle	Yes
Kemp's Ridley sea turtle (Lepidochelys kempii)	Endangered	VA	Accomack, Northampton, Virginia Beach	Reptile	Turtle	Yes
Kemp's Ridley sea turtle (Lepidochelys kempii)	Endangered	NY	Not Defined	Reptile	Turtle	Yes
Kemp's Ridley sea turtle (Lepidochelys kempii)	Endangered	DE	Not Defined	Reptile	Turtle	Yes
Leatherback sea turtle (Dermochelys coriacea)	Endangered	DE	Sussex	Reptile	Turtle	Yes
Leatherback sea turtle (Dermochelys coriacea)	Endangered	MD	Worchester	Reptile	Turtle	Yes

Species Name	Status	State	Counties	Class	Order	In State
Leatherback sea turtle (Dermochelys coriacea)	Endangered	VA	Accomack, North Hampton, Virginia Beach	Reptile	Turtle	Yes
Delmarva Peninsula fox squirrel (Sciurus niger cinereus)	Endangered	DE	Sussex	Mammal	Rodent	Yes
Delmarva Peninsula fox squirrel (Sciurus niger cinereus)	Endangered	MD	Caroline, Dorchester, Kent, Queen Anne's, Somerset, Talbot, Wicomico, Worcester	Mammal	Rodent	Yes
Delmarva Peninsula fox squirrel (Sciurus niger cinereus)	Endangered	VA	Accomack, North Hampton	Mammal	Rodent	Yes
Delmarva Peninsula fox squirrel (Sciurus niger cinereus)	Endangered	PA	N/A	Mammal	Rodent	No
Shortnose sturgeon (Acipenser brevirostrum)	Endangered	DE	Not Defined	Ray-Finned Fish	Sturgeon & Paddlefish	Yes
Shortnose sturgeon (Acipenser brevirostrum)	Endangered	MD	Not Defined	Ray-Finned Fish	Sturgeon & Paddlefish	Yes
Shortnose sturgeon (Acipenser brevirostrum)	Endangered	NY	Not Defined	Ray-Finned Fish	Sturgeon & Paddlefish	Yes
Shortnose sturgeon (Acipenser brevirostrum)	Endangered	VA	Not Defined	Ray-Finned Fish	Sturgeon & Paddlefish	Yes
Northeastern beach tiger beetle (Cicindela dorsalis dorsalis)	Threatened	MD	Anne Arundel, Calvert, Somerset, St. Mary's	Insect	Beetle	Yes

Species Name	Status	State	Counties	Class	Order	In State
Northeastern beach tiger beetle (Cicindela dorsalis dorsalis)	Threatened	VA	Accomack, Hampton, Lancaster, Mathews, Middlesex, Northampton, Northumberland, Poquoson	Insect	Beetle	Yes
Northeastern beach tiger beetle (Cicindela dorsalis dorsalis)	Threatened	NY	N/A	Insect	Beetle	No
Northeastern beach tiger beetle (Cicindela dorsalis dorsalis)	Threatened	PA	N/A	Insect	Beetle	No
Puritan tiger beetle (Cicindela puritana)	Threatened	MD	Anne Arundel, Calvert, Cecil, Harford, Kent, Queen Anne's, St. Mary's	Insect	Beetle	Yes
Bog Turtle (Clemmys muhlenbergii)	Threatened	DE	New Castle	Reptile	Turtle	Yes
Bog Turtle (Clemmys muhlenbergii)	Threatened	MD	Baltimore, Carroll, Cecil, Harford	Reptile	Turtle	Yes
Bog Turtle (Clemmys muhlenbergii)	Threatened	NY	Onondaga	Reptile	Turtle	Yes
Bog Turtle (Clemmys muhlenbergii)	Threatened	PA	Adams, Berks, Chester, Cumberland, Lancaster, Lebanon, Schuylkill, York	Reptile	Turtle	Yes
Dwarf wedgemussel (Alasmidonta heterodon)	Endangered	MD	Caroline, Charles, Kent, Queen Anne's, St. Mary's	Mollusk	Freshwater Mussel	Yes
Dwarf wedgemussel (Alasmidonta heterodon)	Endangered	DE	N/A	Mollusk	Freshwater Mussel	No
Dwarf wedgemussel (Alasmidonta	Endangered	NY	Delaware	Mollusk	Freshwater Mussel	Yes

Species Name	Status	State	Counties	Class	Order	In State
heterodon)						
Dwarf wedgemussel (Alasmidonta heterodon)	Endangered	PA	Wayne	Mollusk	Freshwater Mussel	Yes
Dwarf wedgemussel (Alasmidonta heterodon)	Endangered	VA	Throughout	Mollusk	Freshwater Mussel	Yes
Finback whale (Balaenoptera physalus)	Endangered	DE	Not Defined	Mammal	Whale	Yes
Finback whale (Balaenoptera physalus)	Endangered	MD	Not Defined	Mammal	Whale	Yes
Finback whale (Balaenoptera physalus)	Endangered	NY	Not Defined	Mammal	Whale	Yes
Finback whale (Balaenoptera physalus)	Endangered	VA	Not Defined	Mammal	Whale	Yes
Humpback whale (Megaptera novaeangliae)	Endangered	DE	Not Defined	Mammal	Whale	Yes
Humpback whale (Megaptera novaeangliae)	Endangered	MD	Not Defined	Mammal	Whale	Yes
Humpback whale (Megaptera novaeangliae)	Endangered	NY	Not Defined	Mammal	Whale	Yes
Humpback whale (Megaptera novaeangliae)	Endangered	VA	Not Defined	Mammal	Whale	Yes

Species Name	Status	State	Counties	Class	Order	In State
North Atlantic right Whale (Eubalaena glacialis)	Endangered	DE	Not Defined	Mammal	Whale	Yes
North Atlantic right Whale (Eubalaena glacialis)	Endangered	MD	Not Defined	Mammal	Whale	Yes
North Atlantic right Whale (Eubalaena glacialis)	Endangered	NY	Not Defined	Mammal	Whale	Yes
North Atlantic right Whale (Eubalaena glacialis)	Endangered	VA	Not Defined	Mammal	Whale	Yes
American Burying beetle (Nicrophorus americanus)	Endangered	MD	N/A	Insect	Beetle	No
American Burying beetle (Nicrophorus americanus)	Endangered	DE	N/A	Insect	Beetle	No
American Burying beetle (Nicrophorus americanus)	Endangered	NY	N/A	Insect	Beetle	No
American Burying beetle (Nicrophorus americanus)	Endangered	PA	N/A	Insect	Beetle	No
American Burying beetle (Nicrophorus americanus)	Endangered	VA	N/A	Insect	Beetle	No
American Burying beetle (Nicrophorus americanus)	Endangered	WV	N/A	Insect	Beetle	No
Piping Plover (Charadrius melodus)	Endangered	MD	N/A	Bird	Plover	No
Piping Plover (Charadrius melodus)	Threatened	VA	Accomack, Hampton, Northampton,	Bird	Plover	Yes

Species Name	Status	State	Counties	Class	Order	In State
			Portsmouth, Virginia Beach			
Piping Plover (Charadrius melodus)	Threatened	DE	N/A	Bird	Plover	No
Eastern puma (Puma concolor couguar)	Endangered	MD	N/A	Mammal	Feline	No
Eastern puma (Puma concolor couguar)	Endangered	DE	N/A	Mammal	Feline	No
Eastern puma (Puma concolor couguar)	Endangered	NY	N/A	Mammal	Feline	No
Eastern puma (Puma concolor couguar)	Endangered	PA	N/A	Mammal	Feline	No
Eastern puma (Puma concolor couguar)	Endangered	VA	N/A	Mammal	Feline	No
Eastern puma (Puma concolor couguar)	Endangered	WV	N/A	Mammal	Feline	No
Gray wolf (Canis lupus)	Endangered	MD	N/A	Mammal	Canine	No
Gray wolf (Canis lupus)	Endangered	DE	N/A	Mammal	Canine	No
Gray wolf (Canis lupus)	Endangered	NY	N/A	Mammal	Canine	No
Gray wolf (Canis lupus)	Endangered	PA	N/A	Mammal	Canine	No
Gray wolf (Canis lupus)	Endangered	VA	N/A	Mammal	Canine	No
Gray wolf (Canis lupus)	Endangered	WV	N/A	Mammal	Canine	No
Northeastern bulrush (Scirpus ancistrochaetus)	Endangered	MD	Washington	Plant	Grass	Yes
Northeastern bulrush (Scirpus	Endangered	NY	Steuben	Plant	Grass	Yes

Species Name	Status	State	Counties	Class	Order	In State
ancistrochaetus)						
Northeastern bulrush (Scirpus ancistrochaetus)	Endangered	PA	Adams, Bedford, Blair, Cambria, Centre, Clinton, Columbia, Cumberland, Dauphin, Franklin, Fulton, Huntingdon, Lackawanna, Lycoming, Mifflin, Perry, Snyder, Tioga, Union	Plant	Grass	Yes
Northeastern bulrush (Scirpus ancistrochaetus)	Endangered	VA	Alleghany, Augusta, Bath, Rockingham	Plant	Grass	Yes
Northeastern bulrush (Scirpus ancistrochaetus)	Endangered	WV	Berkeley, Hardy	Plant	Grass	Yes
Canby's dropwort (Oxypolis canbyi)	Endangered	DE	Kent	Plant	Asterid	Yes
Canby's dropwort (Oxypolis canbyi)	Endangered	MD	Caroline, Kent, Queen Anne's	Plant	Asterid	Yes
Sandplain gerardia (Agalinis acuta)	Endangered	MD	Baltimore, Carroll	Plant	Mint	Yes
Harperella (Ptilimnium nodosum)	Endangered	MD	Alleghany, Washington	Plant	Asterid	Yes
Harperella (Ptilimnium nodosum)	Endangered	VA	Stafford	Plant	Asterid	Yes
Harperella (Ptilimnium nodosum)	Endangered	WV	Berkeley, Morgan	Plant	Asterid	Yes
Sensitive joint-vetch (Aeschynomene	Threatened	MD	Anne Arundel, Calvert, Charles, Prince George's,	Plant	Legume	Yes

Species Name	Status	State	Counties	Class	Order	In State
virginica)			Somerset			
Sensitive joint-vetch (Aeschynomene virginica)	Threatened	DE	N/A	Plant	Legume	No
Sensitive joint-vetch (Aeschynomene virginica)	Threatened	VA	Charles City, Chesterfield, Essex, Henrico, James City, King and Queen, King William, New Kent, Richmond, Stafford, Surry, Westmoreland	Plant	Legume	Yes
Sensitive joint-vetch (Aeschynomene virginica)	Threatened	PA	N/A	Plant	Legume	No
Swamp pink (Helonias bullata)	Threatened	DE	Kent, New Castle, Sussex	Plant	True Lily	Yes
Swamp pink (Helonias bullata)	Threatened	MD	Anne Arundel, Baltimore, Cecil, Dorchester, Harford, Howard, Talbot	Plant	True Lily	Yes
Swamp pink (Helonias bullata)	Threatened	VA	Augusta, Caroline, Henrico, Nelson	Plant	True Lily	Yes
Swamp pink (Helonias bullata)	Threatened	NY	N/A	Plant	True Lily	No
Seabeach amaranth (aka seabeach pigweed)* (Amaranthus pumilus)	Threatened	MD	N/A (Worchester*)	Plant	Amaranth	No
Seabeach amaranth (aka seabeach pigweed)* (Amaranthus pumilus)	Threatened	DE	Sussex	Plant	Amaranth	Yes

Species Name	Status	State	Counties	Class	Order	In State
Seabeach amaranth (aka seabeach pigweed)* (Amaranthus pumilus)	Threatened	VA	Accomack, Northampton	Plant	Amaranth	Yes
American chaffseed (Schwalbea americana)	Endangered	MD	N/A	Plant	Mint	No
American chaffseed (Schwalbea americana)	Endangered	DE	N/A	Plant	Mint	No
American chaffseed (Schwalbea americana)	Endangered	NY	N/A	Plant	Mint	No
Smooth coneflower (Echinacea laevigata)	Endangered	MD	N/A	Plant	Daisy	No
Smooth coneflower (Echinacea laevigata)	Endangered	VA	Alleghany, Amherst, Botetourt, Campbell, Lynchburg, Montgomery, Nottoway, Roanoke	Plant	Daisy	Yes
Smooth coneflower (Echinacea laevigata)	Endangered	PA	N/A	Plant	Daisy	No
Small whorled pogonia (Isotria medeoloides)	Threatened	DE	Kent, New Castle	Plant	Orchid	No
Small whorled pogonia (Isotria medeoloides)	Threatened	PA	Centre, Chester, Venango	Plant	Orchid	Yes

Species Name	Status	State	Counties	Class	Order	In State
Small whorled pogonia (Isotria medeoloides)	Threatened	VA	Appomattox, Bedford, Buckingham, Caroline, Craig, Fairfax, Gloucester, James City, King William, Madison, New Kent, Prince William, Spotsylvania, Stafford, Williamsburg, York	Plant	Orchid	Yes
Small whorled pogonia (Isotria medeoloides)	Threatened	DC	N/A	Plant	Orchid	No
Red Knot (Calidris canutus rufa)	Proposed Threatened	DE	Kent, Sussex	Bird	Shorebird	Yes
Red Knot (Calidris canutus rufa)	Proposed Threatened	MD	Worchester	Bird	Shorebird	Yes
Red Knot (Calidris canutus rufa)	Proposed Threatened	NY	Needs Refinement	Bird	Shorebird	Yes
Red Knot (Calidris canutus rufa)	Proposed Threatened	PA	Not Defined	Bird	Shorebird	Yes
Red Knot (Calidris canutus rufa)	Proposed Threatened	VA	Accomack, North Hampton, Virginia Beach	Bird	Shorebird	Yes
Red Knot (Calidris canutus rufa)	Proposed Threatened	WV	Berkeley, Grant, Hampshire, Hardy, Jefferson, Mineral, Monroe, Morgan, Pendleton	Bird	Shorebird	Yes
Knieskern's beaked-rush (Rhynchospora knieskernii)	Threatened	DE	Not Defined	Plant	Sedge	Yes

Species Name	Status	State	Counties	Class	Order	In State
Chittenango ovate amber snail (Succinea chittenangoensis)	Threatened	NY	Madison	Gastropod	Land Snail	Yes
Roseate tern (Sterna dougallii dougallii)	Endangered	NY	Range needs to be refined	Bird	Shorebird	Yes
Roseate tern (Sterna dougallii dougallii)	Endangered	VA	Accomack, Northampton, Virginia Beach	Bird	Shorebird	Yes
Canada Lynx (Lynx canadensis)	Threatened	NY	N/A	Mammal	Canine	No
Northern wild monkshood (Aconitum noveboracense)	Threatened	NY	Delaware	Plant	Buttercup	Yes
Leedy's roseroot (Rhodiola integrifolia ssp. leedyi)	Threatened	NY	Schuyler, Yates	Plant	Rose	Yes
American Hart's-Tongue fern (Asplenium scolopendrium var. americanum)	Threatened	NY	Madison, Onondaga	Plant	Fern	Yes
Eastern prairie fringed orchid (Platanthera leucophaea)	Threatened	NY	N/A	Plant	Asparagus	No
Eastern prairie fringed orchid (Platanthera leucophaea)	Threatened	PA	N/A	Plant	Asparagus	No
Eastern prairie fringed orchid (Platanthera leucophaea)	Threatened	VA	Augusta	Plant	Asparagus	Yes

Species Name	Status	State	Counties	Class	Order	In State
Sheepnose Mussel (Plethobasus cyphyus)	Endangered	WV	Not Defined	Mollusk	Freshwater Mussel	Yes
Snuffbox mussel (Epioblasma triquetra)	Endangered	WV	Not Defined	Mollusk	Freshwater Mussel	Yes
Karner Blue butterfly (Lycaeides melissa samuelis)	Endangered	PA	N/A	Insect	Butterfly	No
Fanshell (Cyprogenia stegaria)	Endangered	PA	N/A	Mollusk	Freshwater Mussel	No
Pink mucket (Lampsilis abrupta)	Endangered	PA	N/A	Mollusk	Freshwater Mussel	No
Rough pigtoe (Pleurobema plenum)	Endangered	PA	N/A	Mollusk	Freshwater Mussel	No
Orangefoot pimpleback (Plethobasus cooperianus)	Endangered	PA	N/A	Mollusk	Freshwater Mussel	No
Ring pink (Obovaria retusa)	Endangered	PA	N/A	Mollusk	Freshwater Mussel	No
Ring pink (Obovaria retusa)	Endangered	WV	N/A	Mollusk	Freshwater Mussel	No
Virginia spiraea (Spiraea virginiana)	Threatened	PA	N/A	Plant	Rose	No
Gray bat (Myotis grisescens)	Endangered	VA	Appomattox, Bath	Mammal	Bat	Yes
Gray bat (Myotis grisescens)	Endangered	WV	Not Defined	Mammal	Bat	Yes
Virginia Big-Eared bat (Corynorhinus townsendii virginianus)	Endangered	VA	Bath, Highland, Rockingham, Shenandoah, Warren	Mammal	Bat	Yes

Species Name	Status	State	Counties	Class	Order	In State
Virginia Big-Eared bat (Corynorhinus townsendii virginianus)	Endangered	WV	Grant, Pendleton	Mammal	Bat	Yes
Madison Cave isopod (Antrolana lira)	Threatened	VA	Augusta, Botetourt, Clarke, Page, Rockbridge, Rockingham, Shenandoah, Warren	Crustacean - Malacostraca	Isopod	Yes
Madison Cave isopod (Antrolana lira)	Threatened	WV	Jefferson	Crustacean - Malacostraca	Isopod	Yes
Roanoke logperch (Percina rex)	Endangered	VA	Bedford, Botetourt, Campbell, Craig, Dinwiddie, Lynchburg, Montgomery, Nottoway, Prince Edward, Prince George, Roanoke	Ray-Finned Fish	Perch-Like Fish	Yes
Shenandoah salamander (Plethodon shenandoah)	Endangered	VA	Madison, Page, Rappahannock	Amphibian	Salamander	Yes
Loggerhead sea turtle (Caretta caretta)	Threatened	VA	Accomack, Northampton, Virginia Beach	Reptile	Turtle	Yes
Spectaclecase (Cumberlandia monodonta)	Endangered	WV	Not Defined	Mollusk	Freshwater Mussel	Yes

Species Name	Status	State	Counties	Class	Order	In State
James spinymussel (Pleurobema collina)	Endangered	VA	Albemarle, Alleghany, Amherst, Appomattox, Augusta, Bath, Bedford, Botetourt, Buckingham, Buena Vista, Campbell, Charlottesville, Chesterfield, Covington, Craig, Cumberland, Danville, Giles, Goochland, Greene, Hanover, Henrico, Highland, Lexington, Louisa, Lynchburg, Montgomery, Nelson, Orange, Powhatan, Richmond City, Roanoke, Rockbridge, Rockingham	Mollusk	Freshwater Mussel	Yes
James spinymussel (Pleurobema collina)	Endangered	WV	Monroe	Mollusk	Freshwater Mussel	Yes
Peter's Mountain mallow (Iliamna corei)	Endangered	VA	Giles	Plant	Mallow	Yes
Shale barren rock cress (Arabis serotina)	Endangered	VA	Alleghany, Augusta, Bath, Highland, Page, Rockbridge	Plant	Mustard	Yes
Shale barren rock cress (Arabis serotina)	Endangered	WV	Hardy, Pendleton	Plant	Mustard	Yes
Virginia sneezeweed (Helenium virginicum)	Threatened	VA	Augusta, Rockbridge, Rockingham	Plant	Daisy	Yes
Michaux's sumac (Rhus michauxii)	Endangered	VA	Dinwiddie, Nottoway	Plant	Sumac	Yes

Species Name	Status	State	Counties	Class	Order	In State
Diamond Darter (Crystallaria cincotta)	Endangered	WV	Not Defined	Ray-Finned Fish	Perch-Like Fish	Yes
Cheat Mountain salamander (Plethodon nettingi)	Threatened	WV	Grant, Pendleton	Amphibian	Salamander	Yes
Spectaclecase (mussel) (Cumberlandia monodonta)	Endangered	WV	Not Defined	Mollusk	Freshwater Mussel	Yes
Rayed Bean (Villosa fabalis)	Endangered	WV	N/A	Mollusk	Freshwater Mussel	No
Rabbitsfoot (Quadrula cylindrica cylindrica)	Threatened	WV	N/A	Mollusk	Freshwater Mussel	No
Running buffalo clover (Trifolium stoloniferum)	Endangered	WV	Tucker	Plant	Rose	Yes
Sperm whale (Physeter carodon)*	Endangered	MD	Oceanic	Mammal	Whale	Yes

3.2.3.1 Economic Significance

The natural and cultural resources of the Chesapeake Bay are essential components of the economy of both Maryland and Virginia, but the entire Chesapeake Bay watershed contributes to the economic health of all the watershed states. Fishing, tourism, recreation, real estate, agriculture, and shipping are all vibrant industries supported by the Chesapeake Bay and its watershed. A wide variety of resource-dependent commercial and recreational activities are significant for the regional economy as well as the well-being of its citizens (Paolisso and Dery 2008). Additionally, clean waterways, associated technologies, and the environmental industry as a whole provide economic value to the region. Property values are higher in areas with a healthy environment (CBF 2014c). The following sections document the value of some of the primary economic industries for the watershed: commercial fisheries, recreation and tourism, commercial shipping, and agriculture.

3.2.3.2 Commercial Fishery

The Bay produces over 570 million pounds of seafood each year (CBP 2012a). The 2011 Fisheries Economics of the U.S. report identified that in Maryland and Virginia, the commercial seafood industry accounted for $3.61 billion in sales, $890 million in income, and an estimated 66,000 in local jobs (NMFS 2012; CBF 2014b). Oysters, blue crab, scallops, striped bass, and menhaden remain commercially important species.

The oyster fishery is an important part of the larger Chesapeake Bay seafood industry. The Chesapeake Bay is one of the last places in the world where some degree of a wild fishery remains. The oyster has a direct value as a food source for consumers and as a product for the industry that catches, grows, processes, and sells the shellfish (Lipton et al. 2005). Historically, tens of millions of bushels of oysters were harvested from the Bay each year. In 2010, just one million bushels of oysters were harvested; valued at $9.4 million (CBF 2014c). Commercial landings of oysters in Chesapeake Bay declined steadily beginning in the late 19th Century. Oyster harvests stabilized for several decades (through the late 1970s) before beginning a further decline through the 1990s. Based on recent oyster surcharges and licenses sold in Maryland and Virginia, there are approximately 500 to 600 watermen employed as oyster fishermen. According to the USACE Baltimore and Norfolk District 2012 Chesapeake Bay Native Oyster Restoration Master Plan, aquaculture in Virginia supported 53 full and 81 part-time jobs as of 2010. Much of the oyster processing industry has been lost. Aquaculture is gaining more of a prominence in the shellfish industry in Maryland and Virginia. A recent CBF document identifies that oyster aquaculture is generating $7 million per year in Virginia and clam aquaculture is generating $70 million per year (CBF 2011).

The blue crab is another critically important commercial species in the Chesapeake Bay. Each year, nearly one-third of the blue crabs harvested in the U.S. come from the Chesapeake Bay (CBP 2012b; CBF 2014b). In 2009, the dockside value of the blue crab harvest was approximately $78 million (CBF 2014b). The average commercial harvest in Maryland and Virginia was over 55 million pounds per year (CBF 2014c).

Striped bass are the most popular commercial and recreational finfish in the Chesapeake Bay (CBF 2014b). Including fishing expenditures, travel, lodging, and other expenses, the striped

bass fishery generates nearly $500 million in economic value (CBF 2014b). Harvests alone generated $97 million in Maryland and Virginia in 2003 (Southwick Associates 2005).

It should be recognized that current seafood harvests are greatly reduced compared to historical levels. In many situations, fisheries continue to decline. For example, declining crab harvests between 1998 and 2006 resulted in a loss of $640 million (NOAA 2009). Associated with declining harvests is a decrease in the number of watermen (Horton 2003; Environment Virginia 2009).

3.2.3.3 Recreation and Tourism

Recreational economic benefits extend to all watershed states. Although the following information is statewide data, it is reflective of the value of recreation and tourism in the Chesapeake Bay watershed because large portions of Pennsylvania, Maryland, and Virginia are within the Bay watershed. In Pennsylvania, it is estimated by the 2012 Economic Argument for Cleaning Up the Chesapeake Bay and its Rivers, a Chesapeake Bay Foundation Economic Report, that nearly 2 million people go fishing each year which contributes over $1.6 billion to the economy. Additionally, Pennsylvanians spend $1.7 billion on boating in a given year (PFBC as cited by CBF 2014b). A 2010 Chesapeake Bay Foundation publication "What is the 'Value' of the Chesapeake Bay and Virginia's Waterways?" indicated that visitors to recreational facilities and heritage sites produced $18 billion in Virginia in 2007. Tourism and recreation generates jobs. Approximately, 350,000 workers in Virginia are employed in tourist and leisure industries through 2010 (U.S. Department of Labor 2010). Lipton (2007) documents that 32,025 people are employed in the recreational boating industry which generated $2.03 billion per year. Wildlife viewing is another area that produces economic benefits. In 2006, approximately eight million wildlife watchers spent $636 million, $969 million, and $1.4 billion in Maryland, Virginia, and Pennsylvania, respectively (USFWS 2006). The Chesapeake Bay watershed also includes 55 national parks, 16 national wildlife refuges, five national trails including the Captain John Smith Chesapeake National Historic Trail and the Appalachian National Scenic Trail, two national forests, two Bureau of Land Management management areas, and multiple America's Great Outdoors (U.S. Department of Interior) projects.

3.2.3.4 Commercial Shipping

The Bay encompasses two of the largest commercial ports along the U.S. Atlantic Coast, Baltimore and Hampton Roads. The Port of Baltimore is a healthy, nationally significant port ranking 14th in the U.S. in foreign cargo tonnage, the 8th U.S. East Coast container port, 9th in the U.S. in the value of foreign cargo, 1st in automobiles and Roll-on Roll-off heavy equipment (e.g., combines, tractors, hay balers), 1st in imports of sugar, gypsum, alumina, and forest products, and 2nd in exported coal. The Port of Baltimore generates over 40,000 jobs, $3 billion in wages and salaries, and $304 million in state and local tax revenues annually (data provided by MPA). The Port of Baltimore is within an overnight drive of two-thirds of the U.S. population and is the closest East Coast port to the Midwest (MPA 2014).

The Port of Virginia encompasses all facilities in Hampton Roads plus an inland intermodal facility at Front Royal, VA. In 2013, the Port of Virginia handled $66.9 billion dollars of cargo, and ranked as the 3rd U.S. East Coast container port and was the 4th in rankings of top U.S. port in total cargo tonnage (Virginia Port Authority 2014a). In 2013, 18.8 million short tons of cargo passed through Hampton Roads (Virginia Port Authority 2014b). An Economic Impact Study

completed in 2008 documented that the Port of Virginia generated 35,665 jobs, compensation of $1.6 billion, and $4.5 billion in revenue in 2006 (Virginia Port Authority 2008).

3.2.3.5 Agriculture

Nearly 30 percent of the Chesapeake Bay Watershed is agricultural land (NRCS 2014). There are over 87,000 farms and 8.5 million acres of cropland within the watershed resulting in over $10 billion of agricultural production annually (EPA 2010, NRCS 2014). More than 50 commodities are produced within the watershed. Primary crops include corn, soybeans, wheat, hay, pasture, fruits, and vegetables (EPA 2010). Dairy and poultry farming are significant activities in the watershed.

In summary, there are highly valued ecological, social, cultural, historic, recreational, and economic resources within the Chesapeake Bay watershed.

3.2.4 Federal Interest Determination

There is federal interest in efforts that will contribute to achieving the goals and strategies established for EO 13508 as well as the 2014 Chesapeake Bay Agreement, including aquatic ecosystem restoration and watershed management, fish and wildlife, and other conservation and restoration opportunities that could be developed within existing policy. There is also federal interest within existing policy to maintain navigation and a clean water supply, and manage risks from flooding and coastal storms to benefit ecological, social, cultural, historic, recreation, and economic resources of the watershed. IWRM has also become a focal point for the federal government, which supports developing alternatives that combine flood risk management, ecosystem restoration, watershed management, coastal storm risk management, and any and all other related issues that could be developed within existing policy. Based on the preliminary investigation, potential projects, including a comprehensive plan, could be evaluated and implemented as a system that would be consistent with USACE policies. USACE mission areas can be combined with missions of others within the watershed to restore and protect aquatic ecosystems within the Chesapeake Bay watershed.

4. STUDY AREA

The Chesapeake Bay is located in the middle Atlantic Coastal Plain Province and is a large drowned river valley. Its watershed lies across a variety of provinces including: the Appalachian Plateau, Appalachian Mountain, Blue Ridge, Great Valley, Mezosoic Lowland, Piedmont Upland, Piedmont Lowland, and Coastal Plain. The estuary was formed when the lower valley of the Susquehanna River was drowned during the post-Wisconsin rise in sea level. From the mouth of the Susquehanna River (northern bay) to the Cape Charles-Cape Henry entrance (southern bay), the bay is approximately 186 mi (300 km) long and ranges in width from 3 to 35 mi (5 to 56 km). The tidally-influenced shoreline of the bay is extremely irregular and is nearly 11,684 miles long, including more than a dozen tributary estuaries and 150 major rivers and streams. The bay takes up an area of 2,870,000 ac (11,600 km^2) and on average has a depth of 26 to 33 ft (8 to 10 m). The main channel of the bay is the former Susquehanna River and reaches depths of over 164 ft (50 m). The Chesapeake Bay is located in the northern Temperate zone and is subject to a highly variable temperate climate regime. This area experiences on

average mild winters and hot, humid summers. The highest wind speeds are experienced in the winter months while more gentle winds occur during the summer months.

The Chesapeake Bay watershed includes parts of six States and all of the Nation's capital: Delaware, Maryland, New York, Pennsylvania, Virginia, West Virginia, and the District of Columbia (Figure 1 on Page 3). Figure 2 below shows the Congressional Districts of the 113th Congress within the study area. Further, Figure 3 highlights the breadth of counties that are within the watershed. Appendix D, Table D-4 provides a list of current Congressional Senators and Representatives in the 113th Congress.

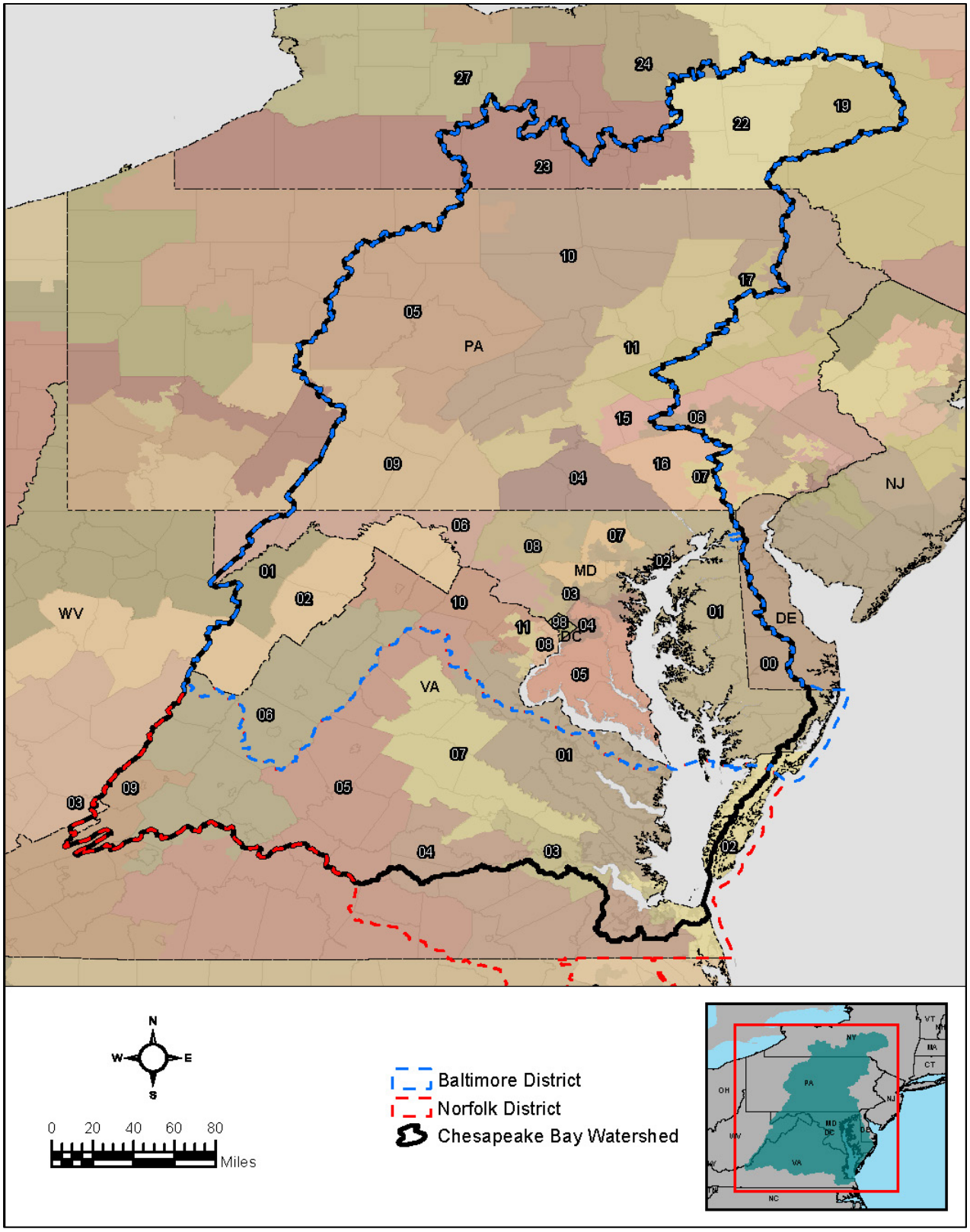

Figure 2. Congressional Districts within the Chesapeake Bay Watershed

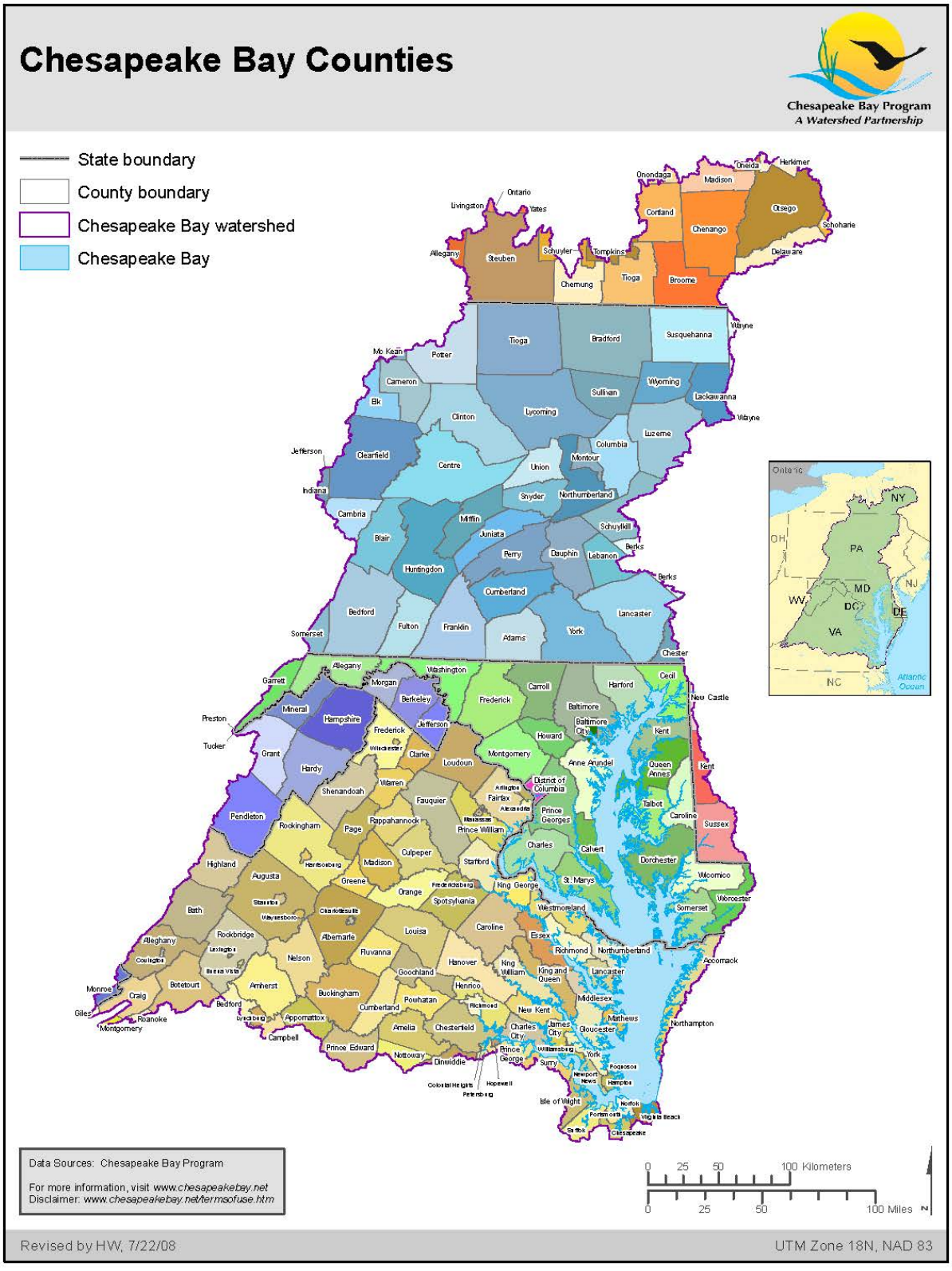

Figure 3. Counties within the Chesapeake Bay Watershed (Courtesy of CBP.

4.1 Existing Conditions

The Chesapeake Bay and its watershed have been degraded by development of the watershed within the past 350 years. Deforestation and land use alterations were the agents of change. The watershed was almost completely forested (95 percent) prior to European colonization in the 17th Century (USFS 2012). Forest cover was reduced to approximately 40 percent by the late 1800s as land was cleared for agriculture. Since then, forest cover has increased substantially from natural afforestation of abandoned agricultural lands, as well as the institution of modern forestry and soil conservation practices, which include planting trees. Today, forest cover is 55 percent of the watershed (USFS 2012). Excessive nitrogen and phosphorous, excessive sediments, and chemical contaminants are primary watershed impairments associated with increased runoff from deforestation. Figure 4 portrays current land cover in the watershed and Figure 5 depicts percent forested riparian buffer in each subwatershed (Hydrologic Unit Code (HUC) 10). Developed lands shown in Figure 4 are a good proxy for impervious surfaces as these are the areas where buildings and pavement are concentrated. A map of percent impervious surfaces is included in Appendix E, Figure E-2 and percent forest cover is included in Appendix E, Figure E-3.

Although, not an exhaustive list, the following USACE reports document the existing conditions in detail of specific areas and topics within the Chesapeake Bay:

- Chesapeake Bay:
    - Baltimore Harbor and Channels (Maryland and Virginia) Dredged Material Management Plan and Final Tiered Environmental Impact Statement (USACE, 2005a).
    - Mid-Chesapeake Bay Island Ecosystem Restoration Integrated Feasibility Report and Environmental Impact Statement (EIS) (USACE, 2005b).
    - Paul S. Sarbanes Ecosystem Restoration Project at Poplar Island (USACE, 1996, 2005c).
    - Chesapeake Bay Oyster Recovery, Maryland and Virginia: Native Oyster Master Plan (USACE, 2012).
    - Chesapeake Bay Shoreline Erosion Management Guide (USACE, 2010a).
    - Smith Island Environmental Restoration (USACE, 2004).
    - Lynnhaven Ecosystem Restoration Project (USACE, 2013a).
    - North Atlantic Coast Comprehensive Study Planning Aid Report: Biological Resources and Habitats Vulnerable to Sea Level Rise and Storm Activity in the Northeast United States (USFWS, 2014).
- Susquehanna River Watershed:
    - Upper Susquehanna River Watershed Assessment (USACE, 2014-2017).
    - Lower Susquehanna River Watershed Assessment (USACE, 2014a).
    - Susquehanna Low Flow (USACE, 2012 (Phase 1)).
- Potomac River Watershed:
    - Anacostia Watershed Restoration Plan (USACE 2010b).

- Middle Potomac Watershed Assessment (USACE, 2014b).
- Mattawoman Management Plan (USACE, 2003).

➢ Mid-Atlantic Region
- North Atlantic Coast Comprehensive Study- Maryland, Virginia, and Washington, DC Appendices (USACE, 2015).

The following resources provide extensive documentation of the environmental resources of the Bay and its watershed:

- The Chesapeake Bay Program's website- see tabs "Discover the Chesapeake" and "Learn the Issues," www.chesapeakebay.net.
- U.S. Fish and Wildlife Service: Chesapeake Bay Field Office- see "Wildlife and Habitats" on sidebar, http://www.fws.gov/chesapeakebay/index.html; Pennsylvania Ecological Services Field Office- http://www.fws.gov/northeast/pafo/, New York Ecological Services Field Office- http://www.fws.gov/offices/Directory/ OfficeDetail.cfm?OrgCode=52410; West Virginia Ecological Field Office- http://www.fws.gov/westvirginiafieldoffice/; and Virginia Ecological Services Field Office- http://www.fws.gov/northeast/virginiafield/.
- The Chesapeake Bay Foundation- www.cbf.org.
- *Life in the Chesapeake Bay* by Alice Jane Lippson and Robert L. Lippson is a comprehensive compilation of the wildlife of the Chesapeake Bay.
- Virginia Institute of Marine Science (VIMS)- Submerged Aquatic Vegetation (SAV) in Chesapeake Bay and Delmarva Peninsula Coastal Bays- http://web.vims.edu/bio/sav/.
- New York State Department of Environmental Conservation- http://www.dec.ny.gov/lands/33279.html.
- Pennsylvania: Department of Natural Resources- http://www.dcnr.state.pa.us/learn/index.htm; Fish and Boat Commission- http://www.fish.state.pa.us/; Department of Environmental Protection- http://www.depweb.state.pa.us/portal/server.pt/community/dep_home/5968.
- Delaware Department of Natural Resources and Environmental Control- http://delawarewatersheds.org/chesapeake-bay/.
- West Virginia Department of Environmental Protection- http://www.dep.wv.gov/WWE/watershed/wqmonitoring/Pages/ChesapeakeBay.aspx.
- Virginia Department of Conservation and Recreation- http://www.dcr.virginia.gov/.
- Maryland Department of Natural Resources Eyes on the Bay- http://mddnr.chesapeakebay.net/eyesonthebay/.

SAV, riparian buffers, wetlands, and oysters are primary resources that are focused on for restoration efforts by various state and federal agencies within the Chesapeake Bay watershed. All of these resources are significantly degraded from historic levels. The extent of wetlands in the watershed is included in Figure 4. Figures 6 and 7 depict the historic extent as well as the location of current viable resources of oysters and SAV, respectively. In Figure 6, large-scale oyster restoration projects by USACE and its partners within sanctuaries are highlighted by tributary. There are additional areas outside of restoration areas where oyster populations are

doing well and providing harvests for the wild fishery. These areas include Broad Creek, the Little Choptank River (lower), St. Mary's River, Tangier Sound in Maryland, and portions of the James and Rappahannock Rivers.

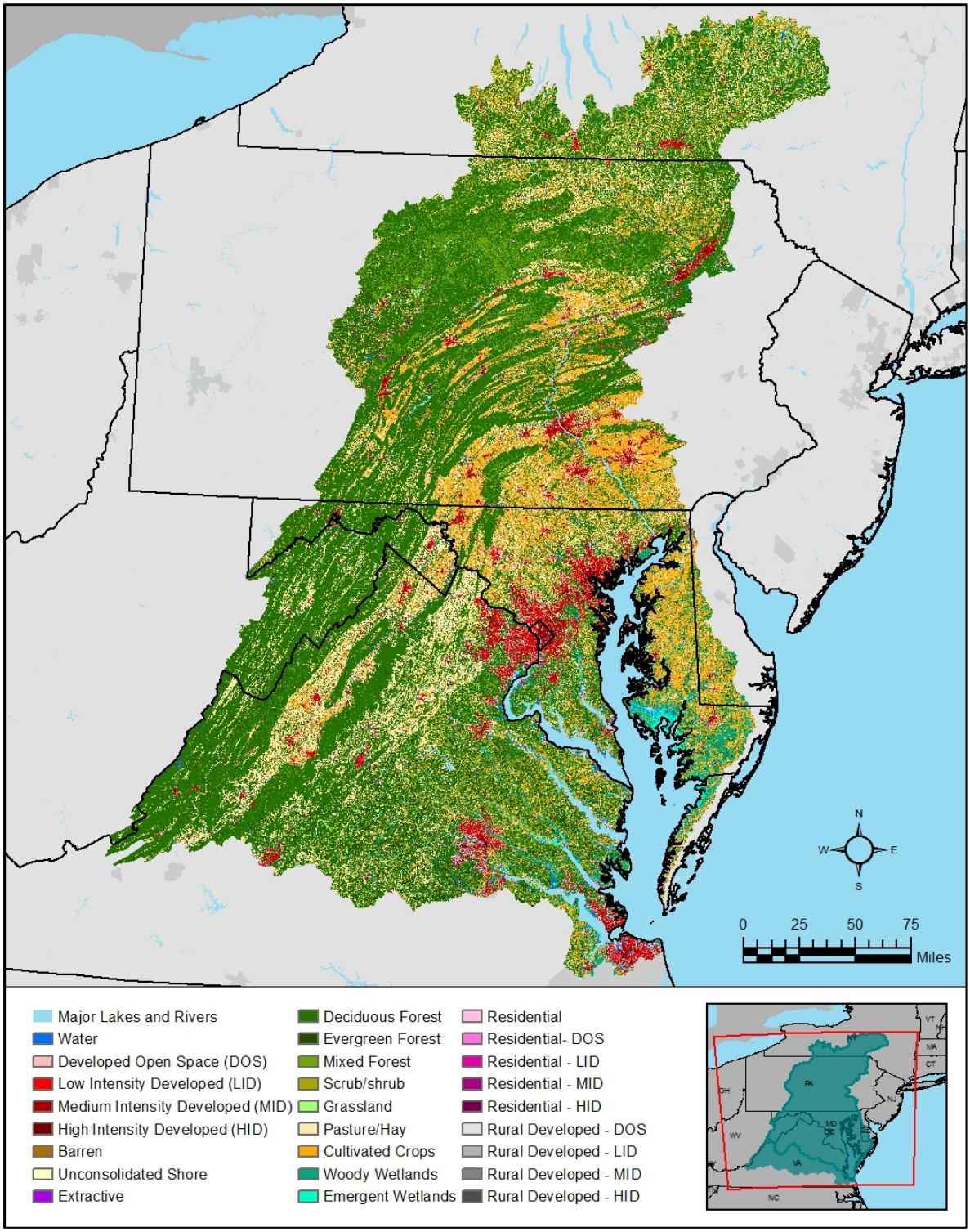

Figure 4. Chesapeake Bay Watershed Land Cover

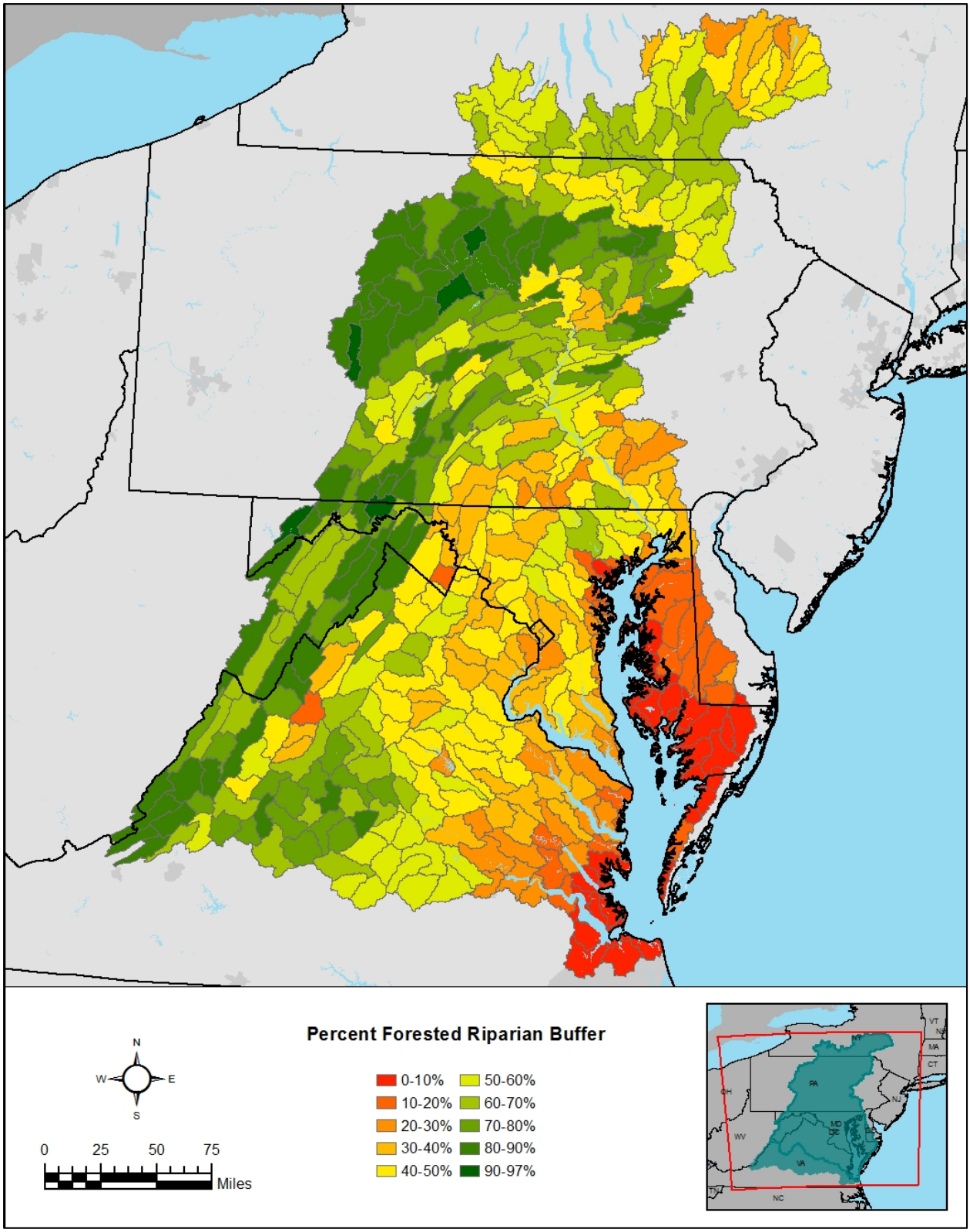

Figure 5. Chesapeake Bay Percent Forested Riparian Buffer

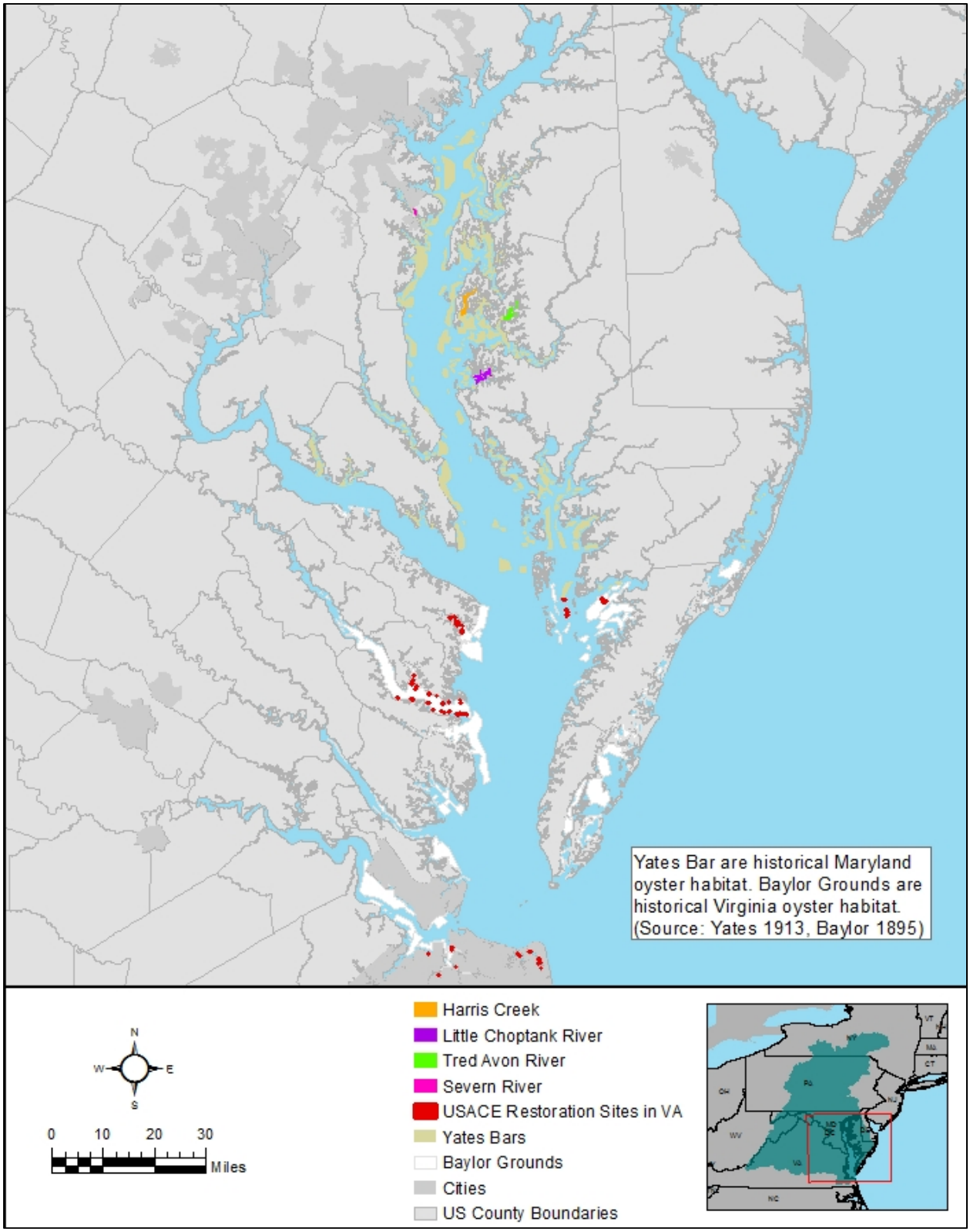

Figure 6. Historical Oyster Habitat and Current Restoration Efforts

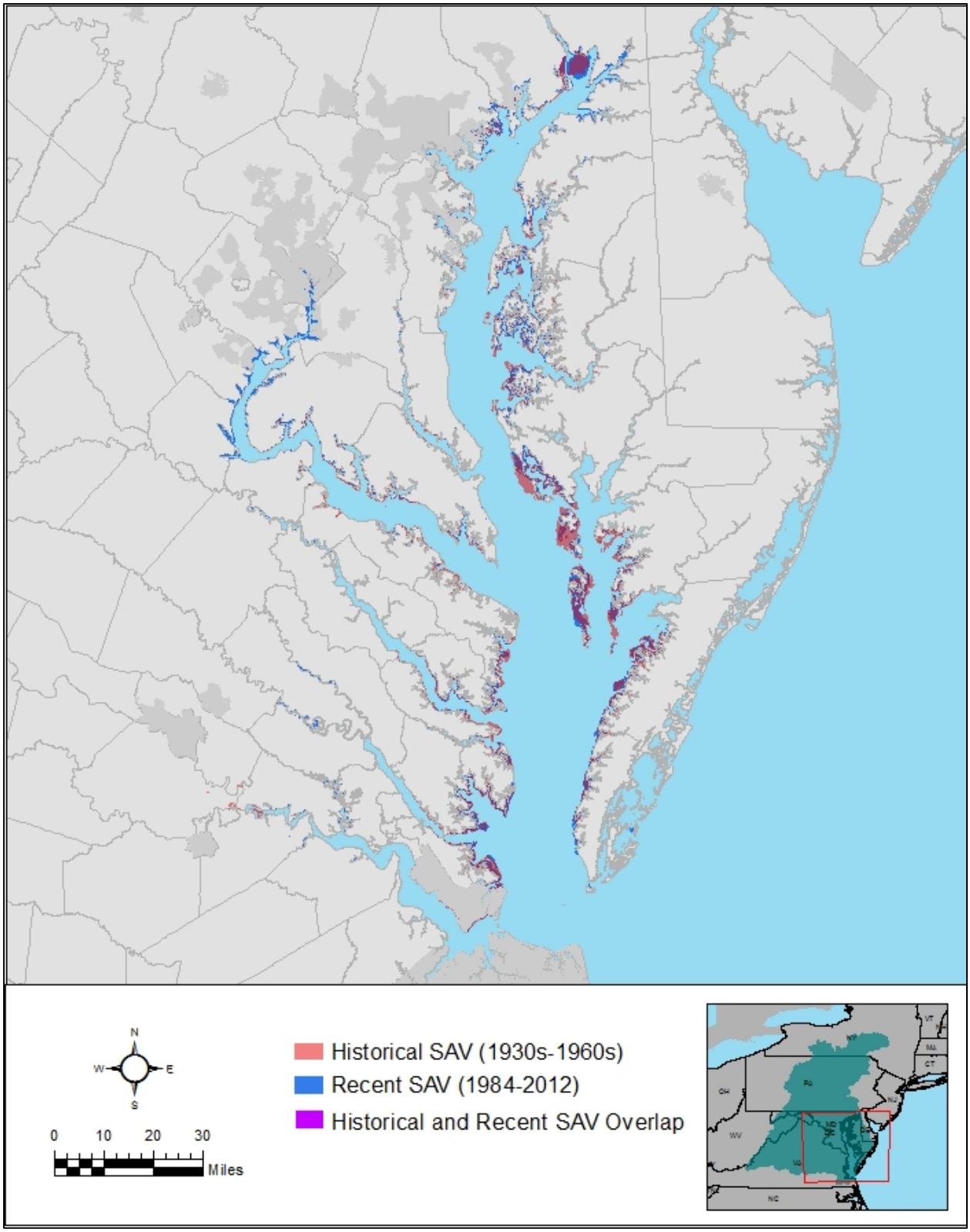

Figure 7. Historical and Recent SAV
(Source: CBP 2014)

4.1.2 Current Health of the Chesapeake Bay

Due to the extensive available documentation detailing Bay resources, the existing conditions section will focus on the existing health of the Chesapeake Bay and its watershed and the progress that restoration efforts over the past 30 years have accomplished.
The current health of the Chesapeake Bay and its watershed is tracked by a number of efforts:

- Chesapeake Bay annual report card by EcoCheck, http://ian.umces.edu/ecocheck/report-cards/chesapeake-bay/2013/ (detailed results presented in the following text).
- The Chesapeake Bay Foundation's State of the Bay, http://www.cbf.org/about-the-bay/state-of-the-bay.
- State of the Susquehanna by the Susquehanna River Basin Commission- http://www.srbc.net/stateofsusq2013/.

Restoration status is documented by the following efforts:

- Chesapeake Bay Agreements by Chesapeake Bay Program partners
    - Chesapeake Bay Program- website and Bay Barometer- *http://www.chesapeakebay.net/trackprogress.*
    - ChesapeakeStat by U.S. EPA to track progress meeting Bay goals, strategies, and commitment of resources- http://stat.chesapeakebay.net/.

4.1.2.1 Chesapeake Bay Report Card
EcoCheck (The Integration and Application Network (IAN)) has published a Chesapeake Bay Report Card annually since 2006. The report card tracks 15 regions of the Bay. Through 2011, seven indicators were combined to provide an overall health rating for the whole Bay:

- Chlorophyll *a*: measure of phytoplankton biomass, controlled by temperature, light, nutrients.
- Aquatic grasses (SAV): critical habitat to key species such as blue crab and striped bass; grasses positively improve water clarity.
- Dissolved oxygen: concentration of dissolved oxygen needed before aquatic organisms are stressed or die.
- Benthic Index of Biotic Integrity: measure of the condition of the benthic community living in or on the soft bottom areas of the Bay.
- Water Clarity: measure of the amount of light that penetrates the water column.
- Phytoplankton Index.
- Water Quality Index.

Beginning in 2012, the following indicators have been added, and the phytoplankton and water quality index dropped:

- Total nitrogen: concentration of nitrogen.
- Total phosphorus: concentration of phosphorus.
- Blue crabs: number of adult female crabs of reproducing age collected by winter dredge survey.

- Bay anchovy: seine survey data from VIMS and MDNR.
- Striped bass: trawl survey to estimate striped bass abundance index.

Table 3 provides the regional and overall health rating between 2006 and 2013. Overall, Bay health has been rated between D+ and C over the rating period. Similarly, CBF's State of the Bay has rated Bay health as a D to D+ between 2000 and 2012. Figure 8 depicts the trend in indicator ratings for the overall bay since 1986 (Appendix D-5 provides the scores and grades used to generate Figure 8).

As shown on Figure 8, there were eight indicators evaluated for the Chesapeake Bay and were provided a score to measure the overall health of the Chesapeake Bay Ecosystem. The eight indicators evaluated included Chlorophyll *a*, aquatic grasses, dissolved oxygen, the Benthic Index of Biotic Integrity, water clarity, total nitrogen, total phosphorus, and the bay health index. Included is a more detailed description of each of the indicators evaluated as well as a brief explanation of the target metrics for each of the indicators evaluated.

Chlorophyll *a* is used as a measure of phytoplankton (microalgae) biomass. Phytoplankton biomass is controlled by factors such as water temperature and the availability of light and nutrients. Elevated phytoplankton levels can lead to reduced water clarity and decomposing phytoplankton can lead to reduced dissolved oxygen levels. Aquatic grasses, or submerged aquatic vegetation (SAV), are one of the most important habitats in Chesapeake Bay, provide critical habitat to key species such as blue crab and striped bass, and can improve water clarity. Dissolved oxygen is critical to the survival of Chesapeake Bay's aquatic life. The amount of dissolved oxygen depletion before aquatic organisms are stressed, or even die, varies from species to species. The Benthic Index of Biotic Integrity measures the condition of the benthic community living in or on the soft bottom areas of the Bay. These organisms are a key food source for many species including perch, spot, and croaker. Water clarity is a measure of how much light penetrates though the water column. Water clarity is dependent upon the amount of particles (e.g. suspended sediment and plankton) and colored organic matter present. Water clarity plays an important role in determining bay grasses and phytoplankton distribution and abundance. Total nitrogen is used as an indicator of excess nitrogen in the Bay. Nitrogen runs off the land during rain events. Atmospheric nitrogen from power plants and factories settles on the Bay. Too much nitrogen can lead to algae blooms, which cause poor dissolved oxygen conditions and stresses Bay organisms. Total phosphorus is used as an indicator of excess phosphorus in the Bay. Phosphorus attaches to sediment particles, so phosphorus and sediment pollution are linked. Too much phosphorus can lead to algae blooms, which cause poor dissolved oxygen conditions and stresses Bay organisms. The Bay Health Index is an average of all seven indicators (chlorophyll a, dissolved oxygen, water clarity, total nitrogen, total phosphorus, aquatic grasses, and Benthic IBI) into an overall assessment of Chesapeake Bay health.

The rankings for these indicators go from A as being very good to F being very poor but with a target range of between an A and a C. A rating of A indicates that all water quality and biological indicators meet the desired levels. Quality of water in these locations tend to be very good, most often leading to very good habitat conditions for various fish and shellfish species. A rating of B indicates that most water quality and biological health indicators meet the desired levels and that the quality of water in these locations provide good habitat conditions for various fish and

shellfish species. A rating of C indicates that there is a mix of good and poor levels of water quality and biological health indicators. The quality of water in these locations tends to be fair and provides fair habitat conditions for the various fish and shellfish species that use the Chesapeake Bay.

Table 3. Chesapeake Bay Report Card Results (by EcoCheck) 2006-2013

Region	2006	2007	2008	2009	2010	2011	2012	2013
Upper Bay	C+	C+	C+	C+	C+	C	C	C
Mid Bay	D	D+	D+	C	C-	D	C	D+
Lower Bay	C-	C	C-	C	C	C	B-	B-
Upper Western Shore	D+	B	B-	B-	C	C	D	C-
Patapsco and Back Rivers	F	D	D-	F	F	D-	F	F
Lower Western Shore (MD)	D-	D-	F	D-	F	D	D-	D-
Patuxent River	D-	D-	D-	D-	D-	F	D	D
Potomac River	D+	D+	C-	C	D-	D	D+	C-
Rappahannock River	D	D+	C-	C	C-	D+	D+	C-
York River	D	D-	D	D-	D	D	D	D+
James River	C	C-	C	C-	C	D+	C	C
Elizabeth River	NA	NA	NA	NA	NA	F	D	D+
Upper Eastern Shore	D+	D	D	D	D	D	D	D
Choptank River	D-	D+	D	D	D	D	C	C-
Lower Eastern Shore (Tangier)	C	D	C-	C	C	C	C	C
Overall Bay	**D+**	**C-**	**C-**	**C**	**C-**	**D+**	**C**	**C**

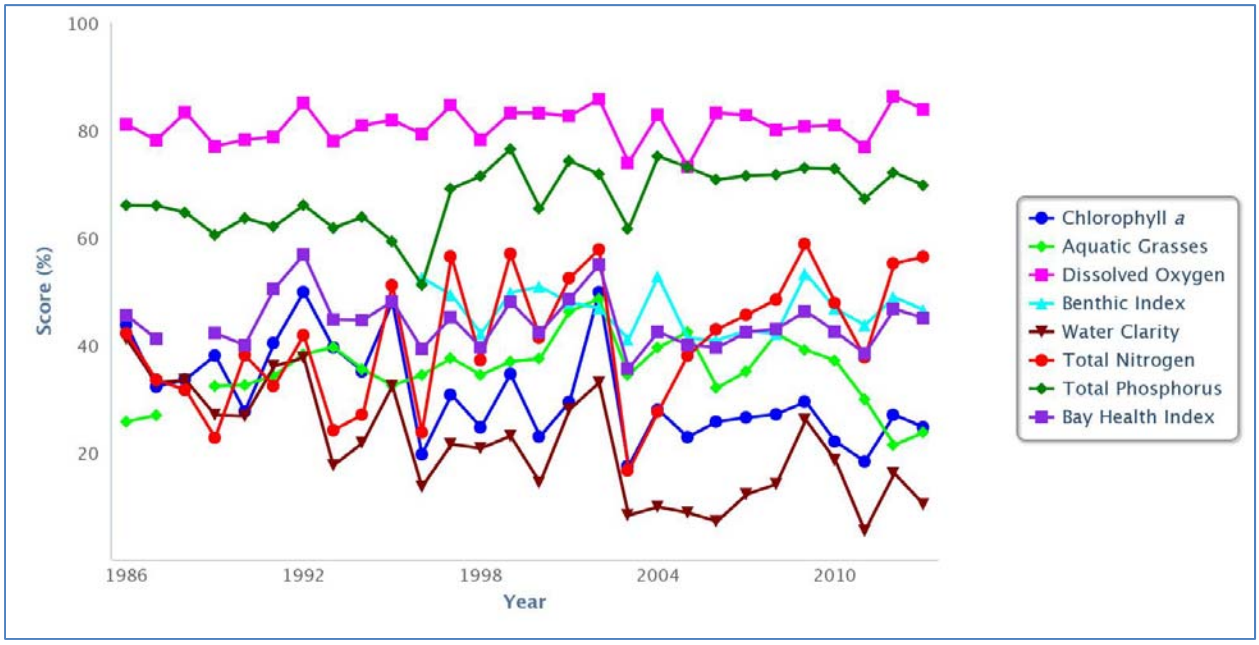

Figure 8. Trends in EcoCheck Bay Health Indicator Scores.
Reproduced from EcoCheck (2014).

Chlorophyll *a*, aquatic grasses, and water clarity are the most severely degraded. Dissolved oxygen, as measured, is healthy, and bay anchovy and striped bass are in very good condition. Although only tracked for two years, the blue crab indicator has shown the greatest variability.

The remainder of the indicators are moderately degraded. In general, since 1986, water clarity, chlorophyll *a*, and the aquatic grasses index have declined; the total nitrogen and phosphorus have improved; and dissolved oxygen, benthic index, and overall bay health index have remained relatively stable.

While the Report Card is focused on the Bay mainstem, the Chesapeake Bay Program has also evaluated the health of freshwater streams throughout the watershed. Using data collected from 2000 to 2010, the biological integrity of over 14,000 sampling sites was evaluated. Figure 9 provides the resulting evaluation of freshwater stream health by subwatershed (HUC10).

4.1.2.2 State of the Susquehanna

The Susquehanna River Basin Commission (SRBC) considers seven water resource indicators to provide a snapshot of data and trends in the basin:

- Water use and development.
- Floods and droughts.
- Stormwater.
- Mine drainage.
- Sediment and nutrients.
- Human health and drinking water protection.
- Habitat and aquatic resources.

Water use has increased in recent years within the Susquehanna River Basin, largely due to increased activity in the energy sector. Electric generation is the dominant user of surface water withdrawals. Public water supply, mining, and domestic withdrawals are the primary users of groundwater withdrawals. Major flooding occurs in the Susquehanna River Basin an average of once every 14 years; flash flooding occurs annually. Mainstem ice jams and flooding are common. Severe droughts have become more frequent in recent years.

Approximately 17% of the Susquehanna River Basin's waters are listed as impaired on the EPA 303(d) list. Pollution stems from agriculture, mine drainage, urban/suburban runoff, and atmospheric deposition.

SRBC has compiled a summary of the causes of stream impairment (SRBC 2014):

- Approximately 4,200 stream miles are impacted by nutrients and/or sediment, with a concentration of impacts in the Lower Susquehanna region.
- 2,010 miles of stream are impaired by mine drainage.
- 1,150 miles are impaired by stormwater runoff.

Stormwater runoff has increased in the basin as impervious cover has increased. Sources of sediment and nutrients include atmospheric deposition, fertilizers (agricultural and suburban lawns), impacts from animal grazing, and stormwater. Concerns about pollutants such as personal care products, antibiotics, pharmaceuticals, pesticides, and hormones on human health are rising.

Approximately 36.5% of stream miles in the Susquehanna River Basin are classified as higher quality waters and about 13.5% are classified as currently impaired by SRBC (SRBC 2014) (This rating differs from that used to report for the 303(d) list.) In Pennsylvania waters, siltation, metals, and nutrients are prime concerns; water level, flow, and nutrients are the dominant impairments in the New York portions of the basin. SRBC site assessments have identified that the Chemung subbasin has the greatest percentage of healthiest assessed sites. Moderately or severely impaired conditions were identified in the West Branch subbasin, the Tioga River headwaters, portions of the Frankstown Branch Juniata River, tributaries of Raystown Branch Juniata River, Shamokin Creek, and in the vicinity of Wilkes-Barre, Scranton, and Harrisburg (SRBC 2014).

While the Report Card is focused on the Bay mainstem, the Chesapeake Bay Program has also evaluated the health of freshwater streams throughout the watershed by using the Chesapeake Bay Basin-wide Benthic Index of Biotic Integrity, which was developed from benthic macroinvertebrate data collected across the entire Chesapeake Bay watershed from over 20 federal, state, local, and river basin commission monitoring programs. Each sampling event is scored on a standardized quantitative scale that allows scoring across jurisdictional boundaries and then qualitatively categorized in one of the following categories – very poor, poor, fair, good or excellent for a total of 15,112 scored sites. Figure 9 provides the resulting evaluation of freshwater stream health by subwatershed (HUC10).

Litter and debris, nutrient and sediment pollution, chemical contaminants, and the installation of dams, culverts and other structures can affect the health of rivers and streams. The abundance and diversity of snails, mussels, insects and other bottom-dwelling organisms are good indicators of the health of streams because they can't move very far and they respond to pollution and environmental stresses. Benthic macroinvertebrates are generally harmed by direct and indirect effects of pollutants such as metals, acidity, sediment, pesticides, nitrogen and phosphorus. Excess nutrients enter the water through agricultural and urban runoff, vehicle emissions and other sources. These nutrients can fuel the growth of harmful algae blooms, which block sunlight from reaching underwater grasses and lead to low-oxygen dead zones that suffocate marine life. Excess sediment enters the water through agricultural and urban runoff, stream bank and shoreline erosion, and other sources while suspended sediment can block sunlight from reaching underwater grasses, smother oysters and other bottom-dwelling species, and clog ports and channels. All of these sources of pollutants impacts affect the overall health of the Chesapeake Bay ecosystem and impact the fish and wildlife species that live within the watershed.

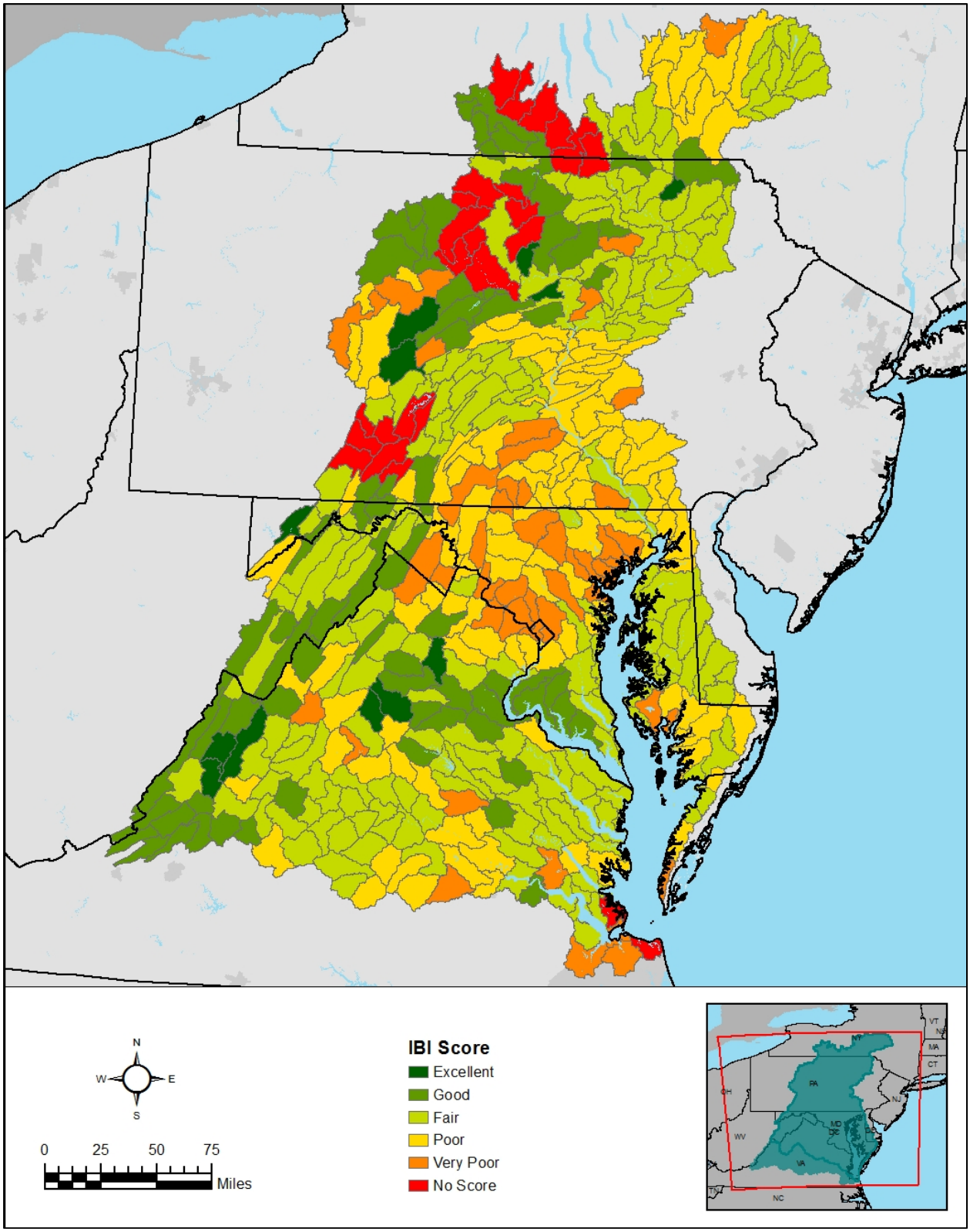

Figure 9. Chesapeake Bay Watershed Stream Health 2000-2010
Average Chesapeake Bay Basin-wide Benthic Index of Biotic Integrity (B-IBI). (Source: CBP 2012c)

4.1.3 Restoration Status

Chesapeake Bay Agreements are the primary driver along with EO 13508 for Chesapeake Bay restoration efforts. The most recent Chesapeake Bay restoration goals have been set by Chesapeake 2000, the 2009 Chesapeake Bay Protection and Restoration Executive Order (13508), and the 2014 Chesapeake Bay Agreement. In 2000, Chesapeake 2000 established 102 goals focused on reducing pollution, restoring habitats, protecting living resources, promoting land use practices that support a healthy watershed, and public outreach. Since that time, two-year milestones were established to focus on short-term restoration goals (milestones), EO 13508 Action Plans have been developed, and the Chesapeake Bay TMDL set limits for nitrogen, phosphorus, and sediment inputs to the Bay and its watershed. In 2014, a new Chesapeake Bay Agreement was signed which outlines ten Goals and 31 Outcomes that partners are working to achieve for restoration and protection of the Bay and its watershed (Table 1 and Appendix B).

There are a broad range of indicators that are tracked by the Chesapeake Bay Program to gauge progress toward meeting the various goals and outcomes. Progress is tracked on the Chesapeake Bay Program website, on ChesapeakeSTAT (MD only), and in an annual publication named the "Bay Barometer". Appendix D-6 provides a summary of the indicators including the restoration target, current status, and recent trend.

4.2 Future without Project Conditions

Future-without project conditions analysis assumes that conditions will continue to trend in the direction that is indicated within studies and data available at this time. References to future conditions assume a fifty year projected timeline. Because this document relies upon already existing information that differ substantially in their period of analysis, this section does present information on future conditions for topics important to the study for several decades to the end of the 21st century, depending on the source information

4.2.1 Population and Development

The Chesapeake Bay watershed is currently home to more than seventeen million people and the population is expected to continue to increase in the future (CBF 2014b). According to the Socioeconomic Atlas for the Bay watershed, the region's population increases by over 150,000 residents a year, with an anticipated population of over 20 million by 2030. The Socioeconomic Atlas also provides projections for population density change, and change in employment by industry (McKendry 2009). Baltimore and Hampton Roads, two of five major east coast U.S. ports as well as several major cities, including the Nation's Capitol, are located within the Bay watershed, contributing to the increasing population, energy consumption, and development of the region. The landscape of the region continues toward the development of suburban and urban areas, which will result in a loss of forests, wetlands, and agricultural lands in the future, with the potential to increase stormwater runoff and associated pollutant inputs. Urban areas that are already built-out would likely see a decrease in pollutant inputs as management measures are implemented to control stormwater. As the overall population numbers increase within the Chesapeake Bay watershed it is likely that there will be an increase in the amount of coastal storm and flood damages to be concerned about which provides the opportunity to blend ecosystem restoration efforts and resilience measures via the IWRM.

4.2.2 Water Use

An increase in population will also require increased domestic water and public water supply consumptive use, and possible challenges to meet demand during drought years (McKendry 2009). Some increase in demand for industrial and agricultural consumptive use is also expected (USACE 2012). Water use projections have been or are being made for various basins in the watershed. SRBC is conducting a Cumulative Water Use and Availability Study for the Susquehanna River Basin. That study will project cumulative water use for a number of water-use categories (electric power generation, public and self-supplied residential water supply, natural gas extraction, manufacturing, and agriculture) through 2030. Currently, electric power generation accounts for the greatest use (73 percent) of consumptive water use in the basin (SRBC 2013a). It can be expected that this industry will continue to be a dominant user of water in the Susquehanna River basin. The Middle Potomac River Watershed Assessment projected withdrawals and consumptive use for the Middle Potomac River watershed (USACE, TNC, and ICPRB 2014), which comprises 79 percent of the Potomac River watershed including the Washington, DC metropolitan area. Similar to the Susquehanna River basin, power generation is the use sector with the largest water withdrawals and largest projected use in future scenarios (42 – 65 percent). Domestic and public supply was the next largest sector (29 – 55 percent). The combined sectors of agriculture, industry, and mining sectors account for a small percentage (3 – 5) in future scenarios. Total withdrawals are projected to increase between 29 – 107 percent depending on the scenario; consumptive use is projected to increase between 24 – 104 percent depending on the scenario.

4.2.3 Climate Change

Climate change and sea level change will impact the future condition of the Bay region. With forecast global climate change, simulations for the Chesapeake Bay watershed out to the year 2100 predict increased precipitation amounts in winter and spring, as well as increased intensities of precipitation, tropical storms, and northeasters (though their frequency may decrease). River flows would increase in winter but be reduced in summer, on average (Najjar et al, 2010). The region can expect to see an increased frequency of nuisance tidal flooding.

The Bay region is susceptible to sea level rise impacts, but is also greatly impacted by gradual subsidence of the land due to geological shifts, as well as groundwater extraction (NOAA 2013). Based on sea-level rise scenarios contained in USACE engineering circular 1165-2-212, starting from the year 2015 sea-level would be expected to rise by 0.5 to 2.3 feet in 50 years in the Chesapeake Bay, depending on whether sea-level rise continues at current rates or accelerates to intermediate or high rates (USACE 2013b). The sea-level determination accounts for global and local factors. The rate of sea-level rise appears to be accelerating, as has been forecast for some time in accompaniment with ongoing global change (e.g., Calafat and Chambers 2013). Implications of sea-level rise at historic and accelerated rates to current resource management via regulation and restoration are beginning to be addressed by society. Maryland also has a 2012 executive order that dictates how the state will invest funds to address this issue; the executive order is at: http://www.governor.maryland.gov/executiveorders/01.01.2012.29.pdf.

In 2014, NOAA conducted an analysis using NOAA tide gauges to determine how frequently water levels reached flood thresholds documented by the National Weather Service (NWS). The

analysis found that there was generally an increase of tidal water levels reaching flood thresholds. Annapolis, Maryland, located on the Chesapeake Bay, had the highest average number of days per year above the NWS flood threshold since 2001, at 34. Overall, the analysis demonstrated that with climate-related sea level rise, the frequency of minor coastal flooding is increasing. Minor coastal flooding events generally are not a huge issue, but the impacts and consequences multiply when these minor flood events occur at a much greater frequency (NOAA 2014a).

Because annual precipitation changes are uncertain, the overall direction of salinity change in the Bay is uncertain. Forecasts of likely winter and spring streamflow increases as a result of climate change, in turn support forecasts that nutrient and sediment loading during winter and spring will likewise increase. Also, given no change in the annual flow regime, it is likely that phosphorus and sediment loading will increase as a result of the more intense and potentially less frequent rain events. Over a longer time period, changes in land use and land cover across the Bay watershed (caused, in part, by climate change) may dominate the change in nutrient and sediment flux to the Bay (Najjar et al. 2010).

The region can expect to see an increase in temperatures. The Intergovernmental Panel on Climate Change (IPCC) estimates a further increase in average air temperatures of 2.5 to 10.4 degrees F before 2100 (CBF 2007). Warming of the Bay could have large negative implications on DO as continued warming of the Bay causes low DO conditions to occur substantially earlier, or end substantially later in the year. Chesapeake Bay water temperatures are expected to continue to warm. Warming water temperatures would likely cause a reduction of eelgrass, an SAV species which is near its southern limit. Ultimately, aquatic life characteristics of warmer regions to the south along the Atlantic Coast would be favored in Chesapeake Bay (Najjar et al. 2010).

The more coastal and riverine storms the Chesapeake Bay watershed experiences means that more sedimentation will be delivered into the navigational channels throughout the bay watershed. This increase in sediment coming into the channels means more operation and maintenance efforts needed to keeping navigational operations going but also opens up the opportunity to not only reduce sediment coming upstream but use programs such as Natural and Nature-based features, regional sediment management, and the beneficial use of dredged material with ecosystem restoration to do something good with that excess material resulting from these coastal and riverine storms.

4.2.4 Aquatic Habitats

In general, aquatic habitats have all been reduced and are degraded due to human development of the watershed. The loss to some habitats such as oysters and SAV are well documented. Others, such as stream health have shorter datasets to substantiate their impairments. Approximately 450,000 acres of oyster habitat were mapped by Baylor (1894) and Yates (1906-1911) around the turn of the 20th Century. It has been widely accepted that current oyster populations are approximately 1 percent of historic abundance (Newell 1988 as cited by USACE 2009), and that remaining bars are in poor condition. Wilberg et al. (2011) have refined that estimate and project that oyster abundance has declined by 99.7 percent since the early 1880s and 92 percent since 1980, and that habitat has been reduced by 70 percent between 1980 and 2009. USACE is a

primary partner in EO13508 and 2014 Chesapeake Bay Agreement goals to restore oyster populations to 10 tributaries by 2025. The Maryland and Virginia Oyster Restoration Interagency Workgroups of the Bay Program's Sustainable Fisheries Goal Implementation Team (GIT) are responsible for identifying tributaries for restoration and developing Oyster Restoration Tributary Plans for each waterway, in consultation with partners and scientists. Workgroup members include representatives from the National Oceanic and Atmospheric Administration (NOAA), the U.S. Army Corps of Engineers (USACE) Baltimore and Norfolk districts, the Oyster Recovery Partnership, state agencies (including the Maryland Department of Natural Resources and the Virginia Marine Resources Commission), local organizations and consulting scientists. As of 2014, six tributaries have been selected for oyster restoration: Harris Creek, the Little Choptank River and the Tred Avon River in Maryland, and the Lynnhaven, Lafayette and Piankatank rivers in Virginia. The planned/targeted restoration acreage for each of the six tributaries is as follows: 377 acres for Harris Creek; 440 acres for the Little Choptank River; 135 acres for the Tred Avon River, 90 acres for the Lynnhaven River; and 21 acres for the Piankatank River. A target has not yet been established for Lafayette River; however, there have been 10 acres of constructed reefs and 11 acres of relic reefs to date. During the next 10 years, these partners will work to complete the oyster restoration efforts in these tributaries, and will identify four more tributaries within the Chesapeake Bay that would be suitable for oyster restoration. Table 4 summarizes USACE's projections for various aquatic habitats over the next 50 years.

Table 4. Future Without Project Habitat Projections

Habitat/ Resource	50 Year Without Project Projection	Historical Trend	Uncertainties
Eastern oyster	Increase expected in restored tributaries due to concerted EO 13508 federal restoration efforts and signs of development of disease resistance in challenged populations. USACE involvement is expected as co-lead of EO 13508 oyster restoration efforts. Increases are uncertain outside restoration areas.		Climate change- salinity, acidification; disease; state management decisions; funding
SAV	SAV is closely tied to water quality. Assuming TMDL will improve water quality, SAV beds should expand. However, increasing temperatures from climate change is expected to negatively affect eel grass which could balance increases in other species.		Water quality, climate change
Tidal wetlands	Although a focus area for restoration and protection, climate change (specifically sea level rise) is a significant threat to tidal wetlands, particularly those on the middle and lower Eastern shore of the Chesapeake Bay.		Climate change/SLR; shoreline erosion management measures; ability to migrate
Non-tidal wetlands	Expect losses due to urban/suburban and energy development.		Development
Forest cover	Although, there is a focused forest restoration strategy, urban/suburban and energy development will continue to result in loss and fragmentation. Expect mixed results. Forest cover increases in some areas are expected, but losses in others.		Land management decisions
Riparian forest buffer	Recent increases are not to the scale to reverse historical losses. Expect increases in areas that have identified this as a strategy for implementation in state WIPS. There will still remain opportunities for restoration in areas not addressed by WIPs or where funding is not available for implementation.		Willingness of property owners; funding
Stream health (Benthic-IBI)	Water quality improvements expected from TMDL will provide some improvement to stream health. The water quality improvements will also provide opportunities for involvement by USACE for stream habitat restoration. Additionally, there is the likelihood that stream habitat impaired by stressors other than those targeted for the TMDL will not be addressed.		Additional development
Fish habitat	Tidal and freshwater fish habitat impairments will not be fully addressed by current restoration efforts.		Climate change; continued development
Fish passage	Increase projected because it is a focus area of 2014 Bay Agreement. Bay Agreement efforts are voluntary and progress will be limited by willing partners, type of blockage, and funding. Fish passage restoration opportunities are expansive throughout the watershed and will remain for the foreseeable future.		Willingness of dam/blockage owner; funding

It is estimated that there were 135,000 acres of SAV in the 1930s. Since the 1960s, over half of the SAV has been lost from the Chesapeake Bay (USFWS 2011). In 2013, it was estimated that there was 59,927 acres of underwater grasses in the Chesapeake Bay. The overall goal is to have 185,000 acres of underwater grasses in the Chesapeake Bay watershed to represent the approximate historic abundance from the 1930s to the present. In addition to temperature increases that threaten eelgrass, sediment and nutrient inputs degrade water quality and impair SAV habitat. Implementation of practices to reduce sediment and nutrients has the potential to improve water quality. If this occurs, there would be opportunities for SAV restoration. In fact, the seed bank in some areas may be sufficient to restore SAV locally. Continued SAV loss would be tied to further loss of fisheries that use SAV beds as nursery grounds and reductions in migrating waterfowl that depend on SAV for feeding during winter migration. SAV habitat is also critically linked to bay scallop restoration in the southern portions of the Chesapeake Bay.

It is estimated that over 60 percent of historic wetlands have been lost from the Chesapeake Bay (NOAA 2014). Ongoing sea-level rise is anticipated to increase the rate of conversion of Bay tidal wetlands to open water, and lead to a substantial net loss of tidal wetlands over the next century (NOAA 2013). Tidal wetland habitat losses are expected because of usurpation of landward migration space by people, and because of steeper topography landward of many existing tidal wetlands (USCCSP 2009). The National Wetlands Inventory reports a downward trend for non-tidal wetlands. Losses are expected due to urban/suburban development, as well as potentially energy development.

Shoreline erosion and remote island loss are expected to increase in the future with unabated climate change and sea level rise. Approximately 10,500 acres of island habitat has been lost in middle-eastern portion of Chesapeake Bay in the last 150 years, and should present island loss rates continue in the future, it is estimated that remote island habitats will disappear from the Mid-Chesapeake Bay region within 20 years without efforts to stabilize these habitats (USACE 2008).

Freshwater fisheries have been severely degraded by urbanization, poor agricultural practices, acid mine drainage, and exotic species. Most healthy habitat is currently located in headwater areas of the watershed with little development. Eastern brook trout is a primary focus of restoration efforts in their historic range, as they are a recreationally and culturally important species, regional icon, and indicator of high water quality. Eastern brook trout is an important native species in high quality stream habitat in the eastern United States. However, populations have declined across their historic eastern United States range (Maine to Georgia). The CBP and others have identified Eastern Brook Trout as a key restoration species for the Chesapeake Bay. Fish passage blockages are closely tied to impairment of freshwater fisheries. There are over 5,482 blockages in the watershed that restrict movement of resident and migrant fish. With focused restoration goals set in the 2014 Chesapeake Bay Agreement and EO 13508, efforts have increase in the past few years to remove blockages and restore connectivity to the stream network. However, the challenges are still immense to restore healthy freshwater fisheries throughout the Bay watershed.

The extensive loss and degradation of aquatic habitats throughout the watershed will require participation of all sectors in order to recover the function that once existed in the Bay's watershed. USACE can play a role in coordinating efforts across jurisdictions. Federal involvement is warranted in restoration of aquatic habitats identified in Table 3 and the text, and called for by EO 13508, the 2014 Chesapeake Bay Agreement, and the study authority under which this 905(b) is being completed. There are EO 13508 and 2014 Chesapeake Bay Agreement goals and outcomes established for these as well as other problem areas identified in Section 7 (Problems) of this report. These goals will not be easy to achieve, but success is much more likely with a concerted federal, state, and local effort.

4.2.5 Ongoing USACE Restoration Efforts

Many current activities in the Bay region are expected to continue, even without new projects being implemented. USACE efforts include the continued restoration of Poplar Island, and the dredging of Federal channels. A General Re-evaluation Report (GRR) is also currently underway by USACE to determine if widening the channels in the Port of Baltimore to originally authorized widths would still be within the federal interest. GRRs are also planned for deepening the Norfolk Harbor main channel to the originally authorized depth of 55 feet and the Southern Branch of the Elizabeth River to the originally authorized depth of 45 feet if justified. With continued funding, oyster restoration efforts would continue at least through 2018 when the current USACE appropriation limit would be reached. There are restoration efforts planned beyond 2018, however, appropriation limits would need to be increased for those efforts to be implementable. Efforts to maintain existing levee systems will continue, but could be jeopardized by climate change. As water levels rise and storms become more frequent maintenance requirements could increase, or worse, levee systems may require additional height to provide sufficient risk reduction. Also continuing is the implementation of the Anacostia Watershed Restoration Plan in Montgomery and Prince George's County, Maryland. There are many other USACE efforts that fall within programs such as the Continuing Authority Program (CAP), Floodplain Management Services (FPMS), Planning Assistance to States (PAS), DoD and Interagency and International Support (IIS), and other technical services programs. A summary of each of these programs and related ongoing studies can be found in Section 5.1.1.6.

4.2.6 Ongoing Restoration Efforts by Others

There are two significant watershed-wide efforts that are underway and will continue into the future, the Total Maximum Daily Load program implementation, guided by the EPA, and the 2014 Chesapeake Bay Agreement. Implementation of the TMDL is regulated; the Bay Agreement is voluntary. While the time to see evidence of improvements (i.e. restoration time lag) is uncertain, implementation of the TMDL program is expected to have significant benefits to water quality and subsequently, to aquatic habitats. However the actions required are enormous and funding to fulfill full implementation is an issue. Therefore, it can be assumed that much progress will be made toward implementing a broad range of management measures, but it is unclear at this time whether full implementation will be achieved. The Bay Agreement contains ten goal areas, which are tied to time specific and measurable actions. However, the actions are voluntary leaving implementation at the risk of available funding given other needs (such as the regulated TMDL).

Additional future activities that are expected to continue include land conservation efforts by NRCS, TNC, and others. Finally, government agencies are modeling consequences of global climate and land-use change scenarios. The USGS and EPA are currently involved with an effort to model future housing, jobs, land use, and land cover projections through 2030. From this modeling effort, the USGS will be developing maps that identify new development, farmland conversion, forest conversion, and phosphorus, nitrogen, and TSS projections for Maryland, Delaware, the District of Columbia, and parts of northern Virginia.

4.2.7 Conclusion

Increased USACE involvement in restoration of the Chesapeake Bay and its watershed is appropriate, and there is a need for an integrated comprehensive plan to align agencies and initiatives beyond USACE. The problems confronting the Bay are large in scale and arise from many different states, both the scale and political context support need for involvement by the Federal government. Ongoing restoration measures (TMDL) largely focus on meeting water quality improvement requirements of the Clean Water Act. These water quality improvements will provide a foundation for subsequent habitat restoration efforts. However, while numerous Bay restoration initiatives identify need for large-scale habitat restoration, funding and undertaking this work is a lower priority for jurisdictions than meeting requirements of the Clean Water Act. Thus a need exists to increase habitat restoration measures to compensate for historic and other ongoing non-regulated losses. The Bay Agreement and EO 13508 commit federal agencies, and USACE, to the task of restoring the Bay and its habitats.

There is federal interest and it is warranted that USACE undertake efforts to address the significant problems in the Chesapeake Bay watershed including but not limited to diminished fisheries resources, degraded tidal and non-tidal habitats, impaired stream health and function, fish passage blockages, shoreline and stream bank erosion, flooding, management of dredged material and coastal storm damage and resilience.

5. SUMMARY OF APPLICABLE STUDIES, REPORTS, AND EXISTING WATER RESOURCES PROJECTS

5.1 Federal Projects

5.1.1 USACE

USACE has a broad range of authorities specific to the Chesapeake Bay watershed that has permitted extensive involvement in the Chesapeake Bay watershed for ecosystem restoration, navigation, and flood risk management. Appendix C-1 provides a summary of active existing USACE authorities within the Chesapeake Bay watershed and investigations that have been conducted under the authorities. Figure 10 depicts the geographic coverage of the primary watershed authorities for the Baltimore and Norfolk Districts. For brevity, the following discussion only lists the most relevant, recent studies, projects, and programs based on USACE mission area. A detailed description of each project listed below is provided in Appendix C-2. Figures 11-13 show the location of USACE projects within the Chesapeake Bay and its watershed based on mission area.

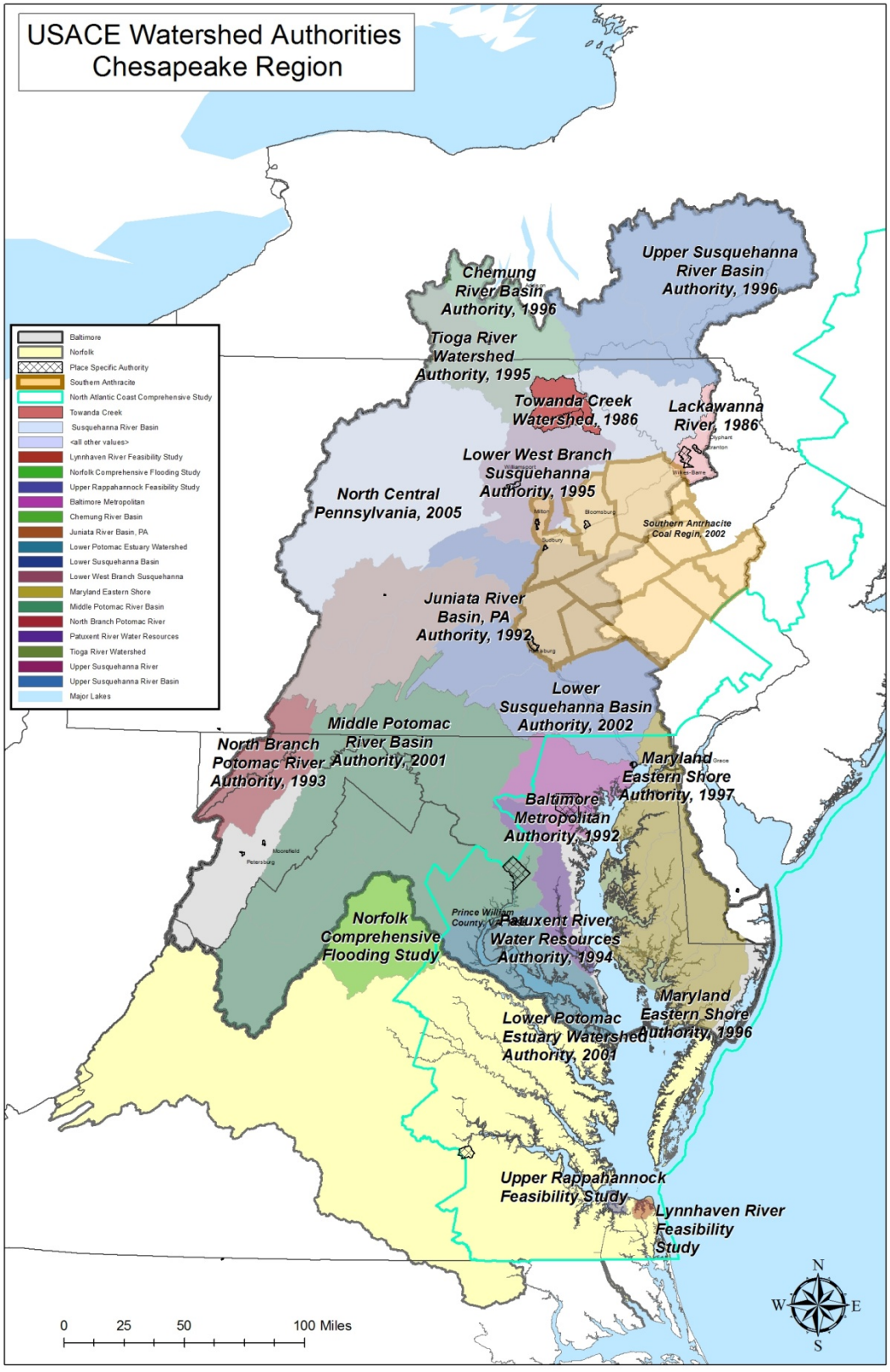

Figure 10. Major USACE Watershed Authorities in the Chesapeake Bay Watershed

5.1.1.1 Ecosystem Restoration

Aquatic ecosystem restoration is a primary mission of USACE. The following is a list of a number of relevant ecosystem restoration programs and projects throughout the watershed that span from remote island restoration to fish passage. Figure 11 depicts the location of recent ecosystem projects.

- Chesapeake Bay Shoreline Erosion, MD.
- The Paul S. Sarbanes Ecosystem Restoration Project at Poplar Island (Poplar Island).
- Chesapeake Bay Oyster Recovery, Maryland and Virginia.
- Mid-Chesapeake Bay Island Ecosystem Restoration Project.
- Smith Island Environmental Restoration.
- Lower Susquehanna River Watershed Assessment.
- Susquehanna Low Flow.
- Anacostia River Watershed Restoration Plan.
- Anacostia River Restoration Plan (Montgomery and Prince George's County, Maryland).
- Northwest Branch Anacostia River.
- Paint Branch Fish Passage and Stream Restoration.
- Middle Potomac Watershed Assessment.
- Mattawoman Watershed Assessment.
- Lynnhaven River Basin Ecosystem Restoration Project.
- Elizabeth River Environmental Restoration.
- Participation in River Basins- Susquehanna River Basin Commission (SRBC) and the Interstate Commission on the Potomac River (ICPRB).

Chesapeake Bay Environmental Restoration and Protection Program (Section 510)

Chesapeake Bay Environmental Restoration and Protection Program provides technical design and/or construction assistance to non-federal interests for environmental projects that support the restoration and protection of the Chesapeake Bay estuary. Projects include:

- Prince Georges County, MD Lower Sligo Creek low impact development project.
- Smith Island, MD Wastewater Treatment Plant (WWTP) Upgrades at Tylerton and Ewell.
- Taylors Island, MD Shoreline Protection.
- Middle Branch, Patapsco River, MD Trash Interceptor and Tidal Wetlands.
- Chesapeake Bay Oyster Programmatic Environmental Impact Statement, MD and VA.
- Rappahannock River, VA Oyster Restoration.
- Scranton, PA WWTP Upgrade.

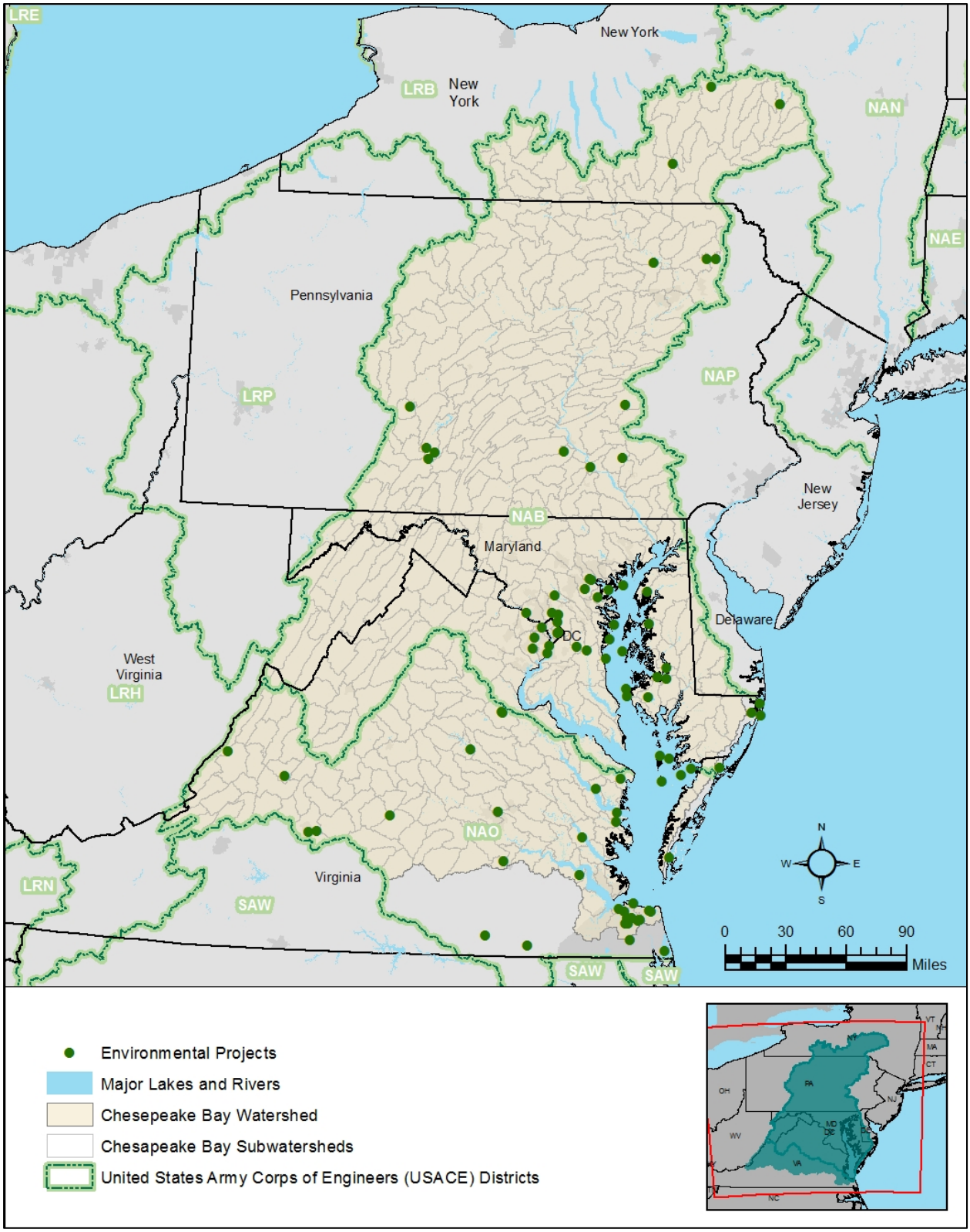

Figure 11. Ecosystem Restoration Projects by USACE in the Chesapeake Bay Watershed

5.1.1.2 Flood Risk Management

USACE has policies, programs, and projects focused on managing overall flood risk. Projects include levees, floodwalls, non-structural measures, and the operation of dams and reservoirs. The following discussion provides a brief description of a number of relevant projects throughout the watershed. Additional details for each project are provided in Appendix C-2. Figure 12 depicts the location of existing flood risk management projects, dams, and reservoirs.

Flood Risk Management Projects and Levees

There are 70 flood risk management systems (36 Flood Risk Management Projects (FRMPs)) that were constructed by USACE within the Baltimore District and fall under the purview of the Inspection of Completed Works (ICW) program. Federally authorized FRMPs were constructed in New York, Pennsylvania, Virginia, West Virginia, Maryland, and the District of Columbia. These systems provide flood risk management across a wide array of flooding sources (riverine, coastal, or combination thereof). Additionally, there are two flood risk management projects included in the dam safety program at Mansfield and Howard, Pennsylvania. Some of the larger projects of interest include:

- The Washington DC FRMP which is located on the Mall in Washington DC and protects irreplaceable national treasures.
- The Wyoming Valley FRMP which is located in northeastern Pennsylvania and has prevented over $7.5 billion dollars in damages since 1968.
- The Williamsport FRMP which is located in Williamsport Pennsylvania and protects the birthplace of little league baseball.
- The Binghamton FRMP which has been overtopped two times in the past decade with minimal damage.

Other flood risk management systems within the Virginia Chesapeake Bay watershed area include:

- Norfolk, Virginia FRMP was authorized by the 1962 Flood Control Act. The project provides for local protection from tidal flooding for the central business district of the City of Norfolk, located on the Elizabeth River, a tidal estuary of Hampton Roads.
- Richmond, Virginia FRMP was authorized by the Water Resources Development Acts of 1976 and 1986. The project includes a system of floodways and levees on both sides of the river in the downtown area which would protect against a flood higher than that which occurred in June 1972 which is the maximum flood of recent record.
- Buena Vista, VIRGINIA FRMP was authorized by the Water Resources Development Act of 1974. The project provides for a combination earth levee and floodwall along the left bank of the Maury River for nearly the full length of the City of Buena Vista. It will provide positive protection from a flood six feet higher than that of 1969.
- Gathright Dam FRMP provides flood protection of industrial, commercial and residential properties along the Jackson and James rivers with immediate impact on Covington, Va.

More information on these and other flood risk management projects within Virginia are located in Appendix C-2.

A number of levees were constructed by non-federal entities (Pennsylvania Department of Environmental Protection (PADEP), New York State Department of Environmental Conservation (NYSDEC), municipalities, etc.) that are inspected and included in the Rehabilitation Program under the USACE Flood Control and Coastal Emergency (FCCE) Program. The majority of the levees were turned over to non-federal entities (Sponsors) which cost-shared the original construction and perform the maintenance and operation of the structures.

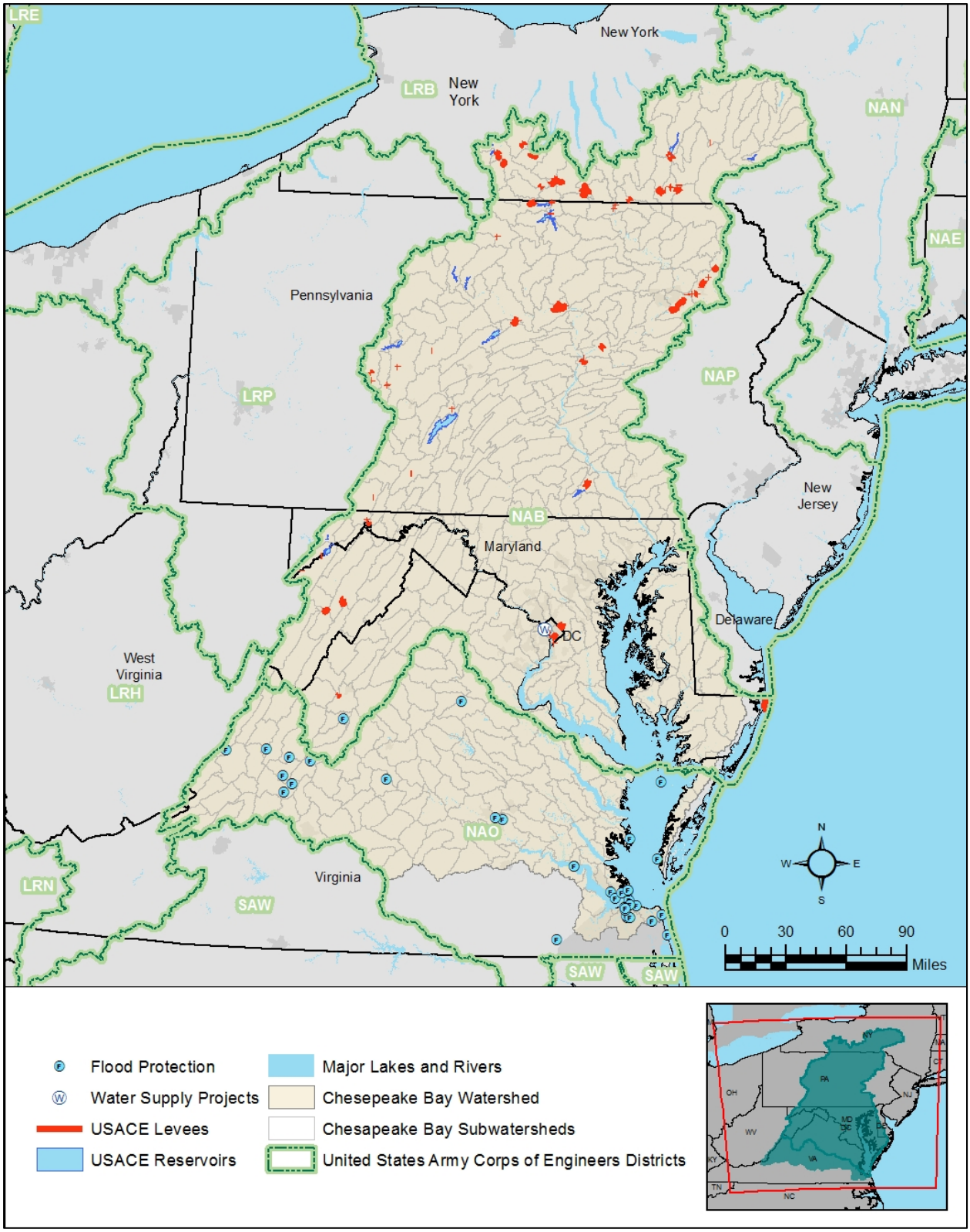

Figure 12. Flood Risk Management, and Water Supply Projects by USACE in the Chesapeake Bay Watershed

Dams and Reservoirs

USACE owns 16 dams and reservoirs (15 projects) throughout the watershed. The Tioga-Hammond project consists of two dams. It should also be noted that USACE guides operation at two additional state-owned dams; Savage River Dam and George B Stevenson Dam. Columns marked with an 'X' identify the authorized project purpose and columns marked with an 'O' identify incidental purposes, meaning those purposes not specifically Congressionally authorized but ancillary to the authorized purpose. An example is recreation. Most dam projects were not specifically authorized for recreation, but due to the presence of a lake those opportunities now exist. Table 5 summarizes existing USACE owned and/or managed dams and reservoirs and their authorized project purposes.

Table 5. Authorized Project Purposes of USACE Owned and/or Managed Dams and Reservoirs

	Flood Control	Water Quality Control	M&I Water Supply	Recreation	Hydropower
Jennings Randolph Lake	X	X	X	X	
Savage River Dam*	X	X	O	X	
Curwensville Lake	X	O	X	O	
George B Stevenson Dam*	X			O	
Alvin R Bush Dam	X	O		O	
Foster Joseph Sayers Dam	X	O		O	
Tioga-Hammond Lakes	X	O		O	
Cowanesque Lake	X	O	X	O	
Almond Lake	X			O	
Arkport Dam	X				
East Sidney Lake	X			O	
Whitney Point Lake	X	O		O	
Raystown Lake	X	X		X	X
Stillwater Lake	X		O	O	
Aylesworth Creek Lake	X	O		O	
Indian Rock Lake	X				
Gathright Dam	X	X		X	
		x = Authorized	o = Incidental		

*State owned

5.1.1.3 Water Supply

Within the Chesapeake Bay watershed, there are three USACE projects containing authorized municipal and industrial (M&I) water supply storage space (Table 4). They are located at Jennings Randolph Lake on the North Branch Potomac River in MD & WV, Cowanesque Lake on the Cowanesque River in north-central PA, and Curwensville Lake on the West Branch Susquehanna River in west-central PA. The water supply storage space is managed for various non-federal users who have contracted with USACE for its use. These non-federal users repay a share of the original projects costs as well as a share of the annual operation and maintenance costs.

At Jennings Randolph Lake, the storage space supplies three Washington, DC water utilities during low flow situations. ICPRB coordinates the requests for water supply releases on behalf of the three utilities. At Cowanesque and Curwensville Lakes in the Susquehanna River watershed, the storage space is used to make M&I water supply releases to offset downstream consumptive uses during low flow situations, particularly those associated with large electric generating plants. SRBC coordinates the requests for these releases.

Washington Aqueduct
Washington Aqueduct has been in continuous operation since 1860 providing potable water to the District of Columbia and since 1927 and 1947 to Arlington County and Falls Church, Va., respectively. On average, Washington Aqueduct produces 155 million gallons per day.

5.1.1.4 Navigation
Navigation was USACE's earliest mission, originating with federal laws in 1824 authorizing and funding USACE to improve safety on the Ohio and Mississippi Rivers and several ports. The following discussion lists a number of relevant navigation projects throughout the watershed. Additional details for each project are provided in Appendix C-2. Figure 13 depicts the location of existing navigation projects.

- Craney Island.
- Baltimore Harbor and Channels Dredged Material Management Plan (DMMP).
- Baltimore Harbor 50 ft Widening.
- Norfolk Harbor and Channels.

Operations and Maintenance Program (O&M)
Baltimore and Norfolk District operate and maintain hundreds of channels and tributaries within the Chesapeake Bay. The major ports of Baltimore and Norfolk use long term placement sites such as Craney Island in Norfolk and Cox Creek, Masonville, and Poplar Island in Baltimore. The shallow draft navigation projects try to incorporate beneficial use of dredged material practices which includes wetland creation, island creation, beach nourishment, and oyster and SAV restoration. In additional to the main channels, the Baltimore District maintains the C&D Canal lower approach channels which helps the economic viability of the Port of Baltimore. The Baltimore District also maintains stone structures such as levees and breakwaters that help retard shoreline erosion which is also part of the O&M effort. At the present time, overboard placement is not permitted in Maryland unless you are restoring remote island ecosystem restoration habitat based on historical footprints.

5.1.1.5 Coastal Storm Risk Management

North Atlantic Coast Comprehensive Plan
The North Atlantic Coast Comprehensive Study (NACCS) is a collaborative effort, bringing together governmental, academic, and non-governmental experts in coastal planning, engineering and science to collaboratively develop a risk management framework for the 31,000 miles of coastline within the North Atlantic Division that were affected by Hurricane Sandy including the entire Chesapeake Bay shoreline. The goals of the Comprehensive Study are to (1) provide risk management strategies to subjected vulnerable coastal populations, and (2) promote coastal

resilient communities to ensure a sustainable and robust coastal landscape system, considering future sea level and climate change scenarios, to reduce risk to vulnerable population, property, ecosystems, and infrastructure.

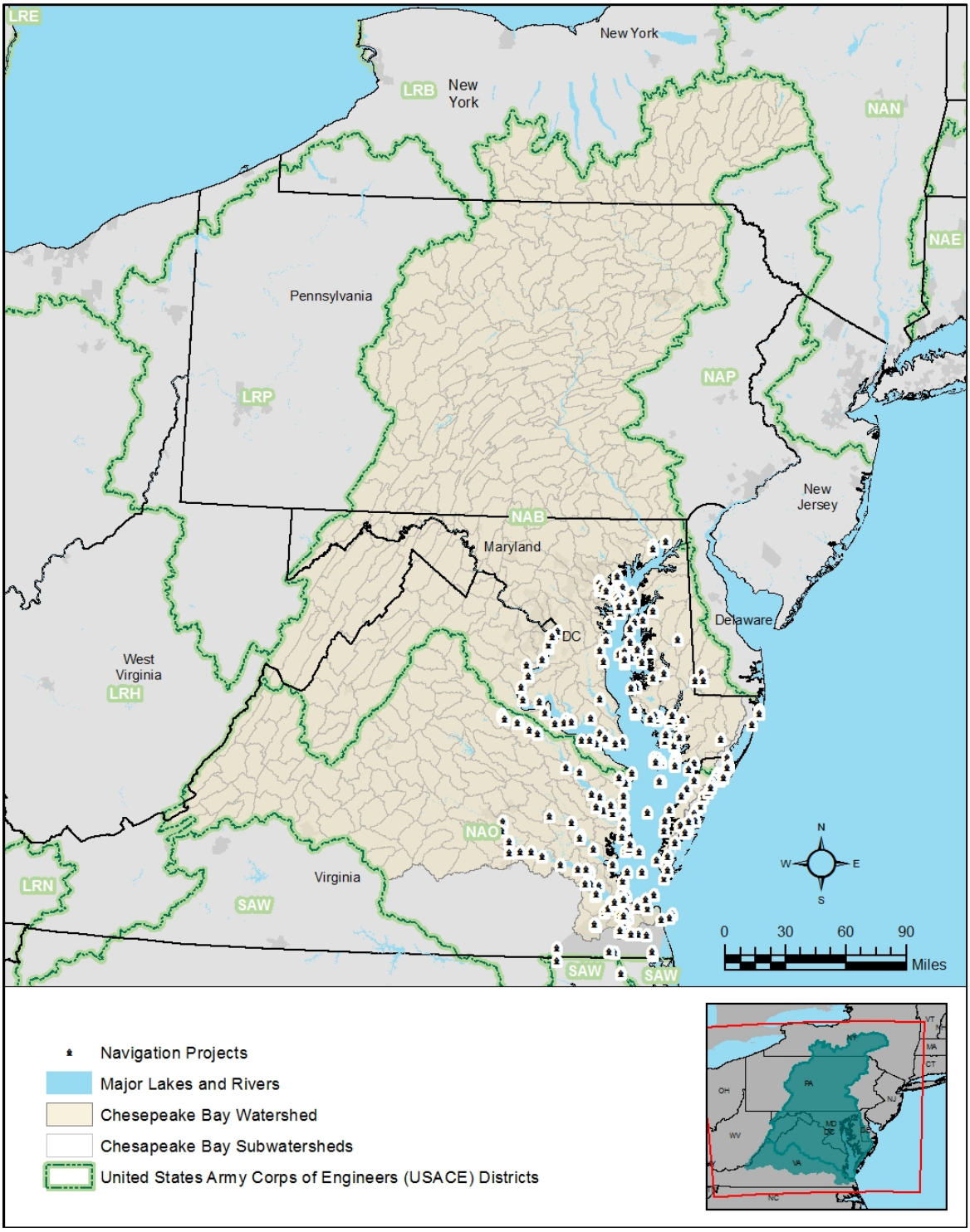

Figure 13. Navigation Projects by USACE in the Chesapeake Bay Watershed

Willoughby Spit Coastal Storm Risk Management Project
The Tentatively Selected Plan for this project would require the placement of approximately 1,200,000 cubic yards of initial fill and the subsequent periodic nourishment of 445,100 cubic yards of fill every nine years thereafter dredged from the Thimble Shoal Auxiliary Channel, the designated borrow area. Within the past year, the Willoughby Project has been included as "an authorized, but unconstructed" project under the Hurricane Sandy Initiative. It is anticipated that construction will be initiated in 2015.

5.1.1.6 Additional USACE Programs

PL 84-99
Under Public Law (PL) 84-99, the U.S. Army Corps of Engineers is authorized to rehabilitate federal and non-federal FRMPs damaged or destroyed by floods, as well federally authorized and constructed hurricane or shore protective structures damaged or destroyed by wind, wave, or water action of an other than ordinary nature. The FRMPs must have an active status in the Rehabilitation Program.

Silver Jackets
The Silver Jackets program provides a formal and consistent strategy for an interagency approach to planning and implementing measures to reduce the risks associated with flooding and other natural hazards.

Silver Jackets teams are developed at the state level, with federal support from agencies such as USACE and the Federal Emergency Management Agency (FEMA), among others. There are currently 42 active state teams (including Washington, D.C.) and 9 states developing teams; the ultimate goal is to offer an interagency team in every state. Teams partner to form unified forums to address each state's flood risk management priorities.

Floodplain Management Services Baltimore and Norfolk District Studies
The Floodplain Management Services Program (FPMS), authorized under Section 206 of the 1960 Flood Control Act (PL 86-645), authorizes USACE to conduct technical studies using either all federal funding or in combination with a voluntary contribution from a non-federal sponsor. The FPMS authority provides for technical assistance and does not have a provision for construction. Detailed plans and specifications as well as construction would have to be accomplished under other civil works authorities or by the non-federal sponsor. Assistance includes the development of data, completion of studies and outreach efforts. Examples of specific projects are provided in Appendix C-2.

Continuing Authorities Program (CAP)
USACE's Continuing Authorities Program (CAP) is a group of legislative authorities under which USACE can plan, design, and implement certain types of water resources projects without additional project specific congressional authorization. CAP authorities cover a range of mission areas from ecosystem restoration to navigation to improvements to past USACE projects. Examples of CAP projects under development in the Chesapeake Bay watershed are below:

- Belle Isle State Park Section 206 (Aquatic ecosystem restoration).

- James River Bank Stabilization, Section 14 (Emergency Streambank and Shoreline Protection).
- York River State Park Section 206 (Aquatic ecosystem restoration).
- Janes Island, Maryland, Section 103 (Shoreline erosion).
- Southeast Crisfield, Section 103 (Coastal storm risk management).

Planning Assistance for States Program
The Planning Assistance to States (PAS) Program is authorized by Section 22 of the Water Resources Development Act of 1974, as amended. Under this program, USACE is authorized to use its technical expertise in water and related land resources management to provide states, public entities within states, and Native American tribes planning assistance with water resources problems and needs. USACE conducts planning level investigations and prepares findings in conjunction with a non-federal sponsor. Types of projects under Section 22 may include, but are not limited to include all flood-related studies, Geographic Information Systems (GIS) mapping, stormwater assessments, stream assessments, sanitary sewer studies, water supply and demand, water system vulnerability assessments, surface and groundwater quality, environmental restoration, wetland delineations, and watershed planning.

DoD and Interagency and International Support
The DoD and Interagency and International Support Programs include a full range of comprehensive planning, environmental and technical services to support development of new facilities and management of existing facilities. Planning activities include environmental analysis, water resource planning, compliance efforts including NEPA, and Geographical Information Systems (GIS) support.

5.2 Efforts by Other Federal Agencies

There are several other federal agencies and programs that are doing research/ modeling efforts to help guide restoration efforts to improve fish and wildlife habitat as well as the water quality within the Chesapeake Bay watershed. A few of these federal agencies and their efforts within the Chesapeake Bay watershed are listed below.

5.2.1 United States Environmental Protection Agency

Chesapeake Bay Program
EPA is the federal lead agency that administers the Chesapeake Bay Program, a regional partnership of government agencies and organization that coordinates Bay restoration efforts to achieve goals agreed upon in the Chesapeake Bay Agreement. The CBP also oversees efforts toward achieving the outcomes of EO 13508 and administers the various Goal Implementation Teams established toward that end. The Chesapeake Bay Program is discussed in detail in Section 3.2.1.

Chesapeake Bay Total Maximum Daily Load
EPA is the federal lead agency coordinating efforts for the Chesapeake Bay TMDL, established in 2010. EPA developed the TMDL and is coordinating efforts to achieve its targets. EPA is the lead for gathering, reviewing, and incorporating new data and science into decision support tools for the TMDL and jurisdictional WIPs. EPA will evaluate the progress jurisdictions and federal

agencies make towards meeting 2017 and 2025 Bay TMDL goals, and optimize implementation of WIPs and milestones.

Chesapeake Bay Modeling Suite
The EPA has led the development of a number of computer models including watershed, estuary, airshed, and land change models that simulate Bay and watershed processes to help guide restoration efforts and evaluate the impacts of restoration on water quality and living resources. A full description of models is available at www.chesapeakebay.net/about/programs/modeling/. USACE's Environmental Research and Development Center (ERDC) has been a key partner in developing a number of the models. Modeling continues to be used to understand 1) how project implementation for the TMDL are improving water quality, 2) sediment dynamics in the Lower Susquehanna River basin associated with the Conowingo Dam, and 3) the influence of climate change on Chesapeake water quality standards and the 2010 Bay TMDL.

Chesapeake Bay Grant Programs
The EPA administers a number of programs and grants aimed at reducing nutrients and sediment inputs and improving habitat such as the Chesapeake Bay Implementation Grants Program, Regulatory and Accountability Grants, Innovative Nutrient and Sediment Reduction Grant Program, and Small Watersheds Grant Program.

5.2.2 U.S. Fish and Wildlife Service

The USFWS, specifically their Chesapeake Bay Field Office (CBFO), oversees management of federally rare, threatened, and endangered species, and their critical habitat in the watershed under Section 7 of the Endangered Species Act. Within the Chesapeake Bay, CBFO has outlined a number of priority areas including 1) oyster restoration to benefit wintering waterfowl and anadromous fish, 2) restoration of remote island habitat primarily for colonial nesting waterbirds and waterfowl, 3) restoration of riparian corridor and stream habitat including fish passage in the Anacostia River watershed, 4) maintenance of naturally dynamic shorelines, 5) restoration in the Lower Potomac/Patuxent River watersheds, and 6) Atlantic sturgeon restoration in the James River. USFWS is also a primary partner in USACE's Poplar Island restoration as well as other programs including the Partners for Wildlife.

5.2.3 National Park Service

The National Park Service Chesapeake Bay office administers and manages, with multiple partners, the Chesapeake Bay Gateways and Watertrails Network, the Captain John Smith Chesapeake National Historic Trail, and the Star-Spangled Banner National Historic Trail. EO 13508 specified that strategies to expand public access, conserve landscapes, and increase citizen stewardship should be coordinated with the John Smith Trail, the Star-Spangled Banner Trail, and the Chesapeake Bay Gateways and Watertrails Network. The National Park Service has long had an interest in the unique natural and cultural resources of the Chesapeake Bay.

5.2.4 National Oceanic and Atmospheric Administration

NOAA is primarily involved in Chesapeake Bay restoration efforts as a co-lead with USACE for achievement of the oyster outcome set by EO 13508. NOAA has selected the Choptank River complex as a habitat focus area for directing resources for habitat conservation and restoration.

National Marine Fisheries Service (NMFS) administers compliance for the Magnuson-Stevenson Act (Essential Fish Habitat (EFH)) and Section 7 of the Endangered Species Act (i.e., sea turtles, sturgeon, and marine mammals) throughout the Bay. NOAA is also involved with monitoring regarding issues such as sea level rise/subsidence, tide/river gage measurements, water quality, storm surge analysis, watershed H&H, topographic/bathymetric data collection, shoreline change, etc. Some other areas of focus NOAA has in regards to the Chesapeake Bay watershed include habitat assessments, oyster restoration, fish passage projects, SAV restoration and living shoreline/wetland restoration projects

5.2.5 U.S. Department of Agriculture/National Resources Conservation Service

NRCS is active in the watershed in implementing conservation practices on agricultural lands. NRCS helps America's farmers, ranchers and forest landowners conserve the nation's soil, water, air and other natural resources. All programs are voluntary and offer science-based solutions that benefit both the landowner and the environment. As described in Section 3.2.1, there are a number of programs and initiatives focused on directing resources into the Chesapeake Bay watershed for implementation of conservation practices. NRCS is also involved in Emergency Watershed Protection, Watershed Protection and Flood Prevention, Watershed Surveys and Planning, Watershed Operations, and Watershed Rehabilitation. Section 3.2.1.1 presented information on Farm Bill efforts administered by USDA/NRCS.

5.2.6 U.S. Geological Survey

In response to EO 13508, the USGS was identified as a co-lead federal agency (with NOAA) for two EO strategies: 1) to strengthen science, and 2) respond to climate change. USGS efforts will focus on improving models to assist with targeting projects, enhancing monitoring to access restoration progress, and evaluating the effectiveness of implementation (Phillips 2010). USGS has grouped their EO activities into four major themes (Phillips 2010):

- Promote adaptive management and decision support to enhance ecosystem management.
- Assess and explain water-quality conditions and change.
- Document the status and change of the health of fish, wildlife, and critical habitats.
- Forecast and assess impacts of climate and land-use change.

The USGS's Chesapeake Study Plan for 2011-2016 outlines planned activities and opportunities toward each of these four themes.

5.2.7 Federal Emergency Management Agency

Through the National Flood Insurance Study, FEMA determines the 100-and 500-year floodplain/flood elevation for many tidal and riverine sources, in addition to hazard mitigation, hurricane evacuation, and post-storm high water mark surveys. FEMA is a partner of USACE's for Silver Jackets Program.

5.3 State Projects

Chesapeake Bay watershed states are focused on a variety of activities including those to implement projects to meet Clean Water Act regulatory requirements for the Municipal Separate

Storm Sewer System (MS4) permits of the National Pollutant Discharge Elimination System (NPDES) and the TMDL. The jurisdictions have developed WIPs to meet nutrient and sediment reductions called for by the TMDL. As the mid-point check-in approaches in 2017, the jurisdictions are focused on implementing projects and programs to achieve 60 percent of their necessary nutrient and sediment load reductions needed to achieve water quality standards. The following discussion outlines the primary focus area in each jurisdiction's Phase II WIP. Additionally, the states have communicated to USACE through scoping some preliminary habitat restoration focus areas, some of which are being pursued as part of their WIPs.

5.3.1 New York

The New York portion of the Chesapeake Bay watershed consists of the Upper Susquehanna River watershed, which includes the Chemung River watershed. The Upper Susquehanna Coalition, a group of 19 Soil and Water Conservation Districts (USDA-NRCS) has identified 3 core focus areas to meet local and regional water quality goals: sustainable agriculture, stream corridor rehabilitation including riparian buffers, and wetland restoration. New York's watershed implementation plan (WIP) is focused on improving water quality, habitat, and flood resiliency. The Final Phase II WIP included numerous agricultural best management practices (BMPs) such as conservation plans, prescribed grazing, and livestock mortality composting systems; future limits on air emissions; addressing wastewater contributions; stormwater controls, particularly at construction sites; incorporating floodplain management into their stormwater program; beginning to develop trading and offsets and more closely working with federal land owners (NYSDEC 2013). There are 13 federal facilities identified in New York's Phase II WIP for coordination of BMP implementation on federal lands.

5.3.2 Pennsylvania

The Susquehanna River watershed encompasses most of eastern Pennsylvania. During a recent coordination meeting between USACE and PADEP, Pennsylvania voiced interest in furthering stream restoration efforts including addressing legacy sediments behind dams. Pennsylvania's WIP provides county-level targets (43 counties are within the watershed) that encompass federal facilities, with decisions to be made at the local government level regarding implementation strategies. The plan is focused on advanced manure technologies for the agriculture sector as well as increased involvement of local conservation districts, added development of MS4 plans for urban stormwater, nutrient trading, and enhanced compliance. In their response letter, EPA identified that Pennsylvania must identify specific strategies to achieve load reductions from the urban stormwater sector, should tackle onsite septic systems as a source of future increases in loadings, and develop an effective offset program. County input identified the need for stream bank stabilization in Bradford and Sullivan Counties, and an urban nutrient management program in Luzerne, Schuylkill, Carbon, Lackawanna, and Wayne Counties. County-based initiatives within Pennsylvania contributing to TMDL-related efforts include the Conewago Creek Conservation Initiative, the Susquehanna Greenway Partnership: Linking Land Use and Water Quality, the Lycoming County WIP Case Study, the Lancaster County Clean Water Consortium, the York County TMDL Workgroup, and the Little Conestoga Partnership Healthy Watersheds Incentives Program.

5.3.3 Maryland

Nearly all of Maryland is within the Bay watershed as well as extensive tidal shoreline along the Chesapeake Bay. Maryland is interested in climate resiliency to enhance habitat and provide economic benefit. A common definition of climate resiliency often used by the USACE and others, including the Presidential Executive Order on Climate Change, is the ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions. MDNR has identified 25 high priority projects for climate resiliency. Maryland has also developed the GreenPrint initiative, which identifies Targeted Ecological Areas (TEAs) and Maryland State programs that are available to help guide financial investment in conservation efforts. Maryland has similar mapping programs available for agricultural preservation priorities, growth and development efforts, stormwater BMP location identification, and stream health designations. The Final Phase II WIP documents recent key state legislation that will support pollutant load reductions; point source upgrades; implementation strategies for five major basins; revised nutrient management regulations as well as BMPs such as cover crops, enhanced nutrient management, decision agriculture, soil conservation and water quality plans, and waste management for the agriculture sector; inclusion of WIP strategy implementation in MS4 permits, stormwater retrofits, control of fertilizer applications, stream forest buffer, urban stream restoration, shoreline erosion control, and urban nutrient management for the urban stormwater sector, guiding growth onto central sewer and septic systems and upgrading septic systems, particularly those in the Critical Area (tidal waters) for the wastewater sector.

5.3.4 West Virginia

The headwaters of the Potomac River watershed lie in West Virginia. Preliminary conversations with West Virginia have identified an increased focus on stream restoration, fish passage projects, and flood reduction efforts. The Final Phase II WIP targets alternative pasture water systems, riparian buffer establishment, fencing of streams, stream channel stabilization, prescribed grazing, nutrient management plans, animal waste storage, cover crops, natural stream restoration, and conservation plans for the agriculture sector. Additionally, the WIP includes reducing combined sewer overflow and offsetting of new loads from growth from the wastewater sector; offsetting increased stormwater inputs from growth, LID, managing lawn fertilizer applications, encouraging stormwater BMPs with the highest nutrient reductions, and further designation of MS4 areas for the urban stormwater sector; and increased outreach and education.

5.3.5 Delaware

The southwestern half of the State of Delaware falls within the Chesapeake Bay watershed. The Delaware Final Phase II WIP identifies Concentrated Animal Feeding Operations (CAFOs) as a focus area for the agriculture sector in addition to implementing BMPs such as cover crops, nutrient management, soil conservation and water quality plans, conservation tillage, continuous no-till conservation, streamside grass and forest buffers, waste management, wetland restoration, shoreline erosion control, and decision agriculture. Managing fertilizer inputs from lawns, street sweeping, and MS4 and construction site inspections were focus areas for the urban stormwater sector, as well as the emphasis on reducing runoff and increasing infiltration. New septic regulations and an offset program for new growth are other initiatives.

5.3.6 Washington, D.C.

Washington, D.C. lies entirely within the Chesapeake Bay watershed. The Final Phase II WIP relies on engagement of federal land holders within the District, the District's MS4 permit, control of combined sewer overflows and enhanced nutrient removal at Blue Plains Wastewater Treatment Plant. Washington, D.C. coordinated with 9 federal agencies that served as local sponsors for development of the WIP, including USACE. USACE operates the Washington Aqueduct and Georgetown Reservoir within the District. The WIP includes inspection of Little Falls Branch and its tributaries running within Washington Aqueduct property for stream bank erosion on semi-annual basis as part of its two year milestones.

5.3.7 Virginia

Virginia has 15.3 million acres of land (approximately 56 percent of the state) in the Chesapeake Bay Watershed. Over half of Virginia's streams and rivers flow to the Bay. Almost three-fourths of the state's 8.0 million residents live within the watershed. In Virginia, the state recently commissioned a panel of experts/stakeholders to look at recurring coastal flooding and mitigation. Virginia has identified potential interest in coastal resiliency, oyster restoration, shoreline erosion management, and stream restoration. Coastal resiliency is defined by the Coastal Engineering Research Board (CERB) as the ability of a system to anticipate (prepare, avoid), resist (withstand), recover (bounce back), and adapt (evolve, transform, bounce forward) to achieve functional performance under the stress of disturbances through time. The Phase II WIP addressed wastewater, agriculture, urban/suburban stormwater, onsite wastewater, forest lands, resource extraction, and federal facilities. Federal lands and facilities represent approximately 12.3 percent of all land in Virginia's Chesapeake Bay watershed. They include more than 200 facilities, owned or managed by over a dozen federal agencies. While many of these federal holdings are parks, forests and wilderness areas, they also include many highly impervious facilities.

5.4 NGOs and River Basin Commissions

Table D-2 (Appendix D) provides a list of NGOs that are active in the Chesapeake Bay watershed. A select few are highlighted below.

5.4.1 National Fish and Wildlife Foundation

The National Fish and Wildlife Foundation (NFWF) is a conservation grant-making organization that works with public and private sectors to protect and restore the nation's fish, wildlife, plants, and habitats. NFWF's Chesapeake Bay Stewardship Fund is centered on protecting and restoring the Bay by providing assistance to local communities for restoration. NFWF has developed a Business Plan for the Chesapeake Bay Stewardship Fund that outlines a strategy to guide conservation investments through 2025. The business plan outlines targeted watersheds for Eastern Brook Trout habitat and River Herring habitat restoration as well as oyster restoration priority areas.

5.4.2 Chesapeake Bay Foundation

CBF works to restore the Bay through advocacy, education, science communications, litigation, corporate partnerships, and restoration projects. CBF is particularly active with tree plantings and SAV and oyster restoration.

5.4.3 The Nature Conservancy

TNC is a leading conservation organization working around the world to protect ecologically important lands and waters for nature and people. TNC has identified priority conservation areas throughout the Chesapeake Bay watershed. Additionally, TNC partners with public and private groups, including MDNR, VMRC, VIMS, CBF, ORP, and Virginia Commonwealth University to restore oyster reefs. TNC has also partnered with the USACE on several project studies including the Lower Susquehanna River Watershed Assessment and the Susquehanna River Basin Ecosystem flow recommendations.

5.4.4 The Susquehanna River Basin Commission

The Susquehanna River Basin Commission was established in 1970 by the adoption of the Susquehanna River Basin Compact by the U.S. Congress, and legislatures of New York, Pennsylvania, and Maryland. The Compact guides the conservation, development, and administration of water resources in the Susquehanna River Basin. SRBC coordinates water resources efforts of the three states and the federal government. USACE is designated with representing the federal government. SRBC activities involve updating the Low Flow Protection Policy, Ecological Flow Management, flood coordination and mapping, drought monitoring and coordination, consumptive use mitigation, water resources planning, and water availability studies. SRBC is also serving as the non-Federal Sponsor on the USACE Susquehanna River Basin Low Flow Management Study, which is a two-phase project. Phase I was completed in June 2012, with the goal of understanding of how the range of flows affects the aquatic ecosystem within the sub-watersheds of the Susquehanna River Basin, with particular emphasis on low flow conditions. Phase II and completion of the study will result in a final watershed assessment.

5.4.4 The Interstate Commission on the Potomac River Basin

The Interstate Commission on the Potomac River Basin mission is to enhance, protect, and conserve the water and associated land resources of the Potomac River and its tributaries through regional and interstate cooperation. Considered the "nation's river," for more than five million basin residents, the river plays an important role in the lives of all. Through regional cooperation and partnerships, ICPRB is protecting the river and improving the quality of life in the watershed, as it has since 1940.

6. SCOPING

Scoping was initiated by reviewing the public and agency comments submitted to the Chesapeake Bay Program through the development of the 2014 Chesapeake Bay Agreement in 2013 and 2014. Meetings have been held with NFWF, PADEP, (Virginia Marine Resources Commission (VRMC), MDNR, CBP, the Chesapeake Bay Commission, the National Wildlife Federation, and the Campbell Foundation. Further meetings with the jurisdictions and a broader set of stakeholders are being carried out.

6.1 Agency Coordination

Agency coordination with USFWS and NOAA has been initiated. USACE coordinates with both agencies for Section 7 of the Endangered Species Act. USFWS-CBFO has provided information to enable compilation of threatened and endangered species lists for the watershed (appendix) and has additionally provided priority areas. Additionally, USACE has in place existing communication strategies in which quarterly meetings are held with both USFWS-CBFO under the Fish and Wildlife Coordination Act and NOAA under the Magnuson-Stevenson Act to discuss current and upcoming restoration projects and discuss how to best align these efforts to improve the overall health and fish and wildlife habitat of the Chesapeake Bay watershed. Efforts are ongoing with USFWS to develop a strategy to engage all the field offices throughout the watershed in addition to the CBFO. The main points of contact for scoping with the states are state-resource agency personnel, but specific resource-focused coordination will be planned as part of the following feasibility studies.

7. PROBLEMS/OPPORTUNITIES

During a USACE study, six planning steps that are set forth in the U.S. Water Resources Council's Principles and Guidelines are repeated to focus the planning effort and eventually select and recommend a plan for authorization. The six planning steps are: (1) specify problems and opportunities, (2) inventory and forecast conditions, (3) formulate alternative plans, (4) evaluate effects of alternative plans, (5) compare alternative plans, and (6) select recommended plan. The iterations of the planning steps typically differ in the emphasis that is placed on each of the steps. In the early iterations, those conducted during the reconnaissance phase, the step of specifying problems and opportunities is emphasized. The sub-paragraphs that follow present the results of the initial iterations of the planning steps that were conducted during the reconnaissance phase. This information will be refined in future iterations of the planning steps that will be accomplished during the feasibility phase.

7.1 Problems

The Chesapeake Bay and its watershed are national treasures with ecological, cultural, historical, economic, recreational and social value. EO 13508 recognized the value to restore and protect the Chesapeake Bay, the nation's largest estuary. While over thirty years of efforts to restore and maintain the Bay and its watershed have made great progress, the ecological health remains impaired due to the tremendous scale and diversity of problems.

The ecological health of the Chesapeake Bay and its watershed is impaired due to human population and increased development, manifested in numerous symptoms. While increases in population and development cannot be controlled by USACE, the symptoms or impacts that result from these problems offer opportunities for USACE and others to take action.

Adverse impacts of population pressures in the Bay Watershed include ecosystem degradation, increases in stormwater runoff and localized flooding, impaired water quality, and a loss of ecologically, culturally, or historically, or recreationally significant landscapes. Ecosystem degradation includes impacts to numerous resources such as fisheries, submerged aquatic

vegetation (SAV), wetland and terrestrial habitat, riparian forest buffers, and coastal habitats. Poor land management practices on agricultural, urban, and suburban lands also contribute to erosion, sedimentation, and contaminants that enter the Bay waters, thus degrading receiving waterways. Reduction of forest cover also contributes to impaired water quality, habitat loss, and localized flooding. Networks of dams, such as those built in the Lower Susquehanna River to generate hydropower block fish passage and trap sediments that are later flushed out in large pulses during strong storm events. Increased urbanization produces more impervious land cover, which results in increased stormwater runoff and localized flooding.

The extensive tidal shoreline (approximately 11,684 miles) provides a close connection between land-based activities and the waters of the watershed. This close connection is a primary reason as to why deforestation and other land use alterations have resulted in waterway impairment in the watershed. Additionally, the watershed area to surface water area ratio is very high. Air pollution released into the Chesapeake Bay's airshed will eventually fall back to the earth's surface, where it could wind up in our rivers and streams. Airborne nitrogen, for example, is one of the largest sources of pollution affecting the Bay causing the increase need for the Chesapeake Bay watershed jurisdictions to work to maintain the forest habitat that can then absorb the airborne pollutants and as well as work to enact regulations to reduce emissions from our vehicles and power plants.

Climate and sea level change will further exacerbate these impacts. Shoreline erosion is expected to increase as sea levels rise. More frequent and strong storms will lead to loss of wetlands and other important habitats, as well as increased nutrient and sediment loads to the Bay. Nuisance flooding has become and will continue to become more noticeable and widespread because of rising seas, sinking land and the loss of natural flood barriers. Any acceleration in sea level rise that is predicted to occur this century will further intensify nuisance flooding impacts over time, and will further reduce the time between flood events. Coastal flooding is projected to increase due to more frequent and intense storms. Alterations to the biochemistry of the Bay stemming from climate change could impact a wide variety of species and habitats. Temperature, acidity, and salinity changes are forecasted.

Section 4.2 of this 905 (b) report discusses the future without project conditions, which lays out problems and impacts to the Bay Watershed in further detail. The section that immediately follows lays out the opportunities that exist for USACE and others to restore, preserve, and protect the Chesapeake Bay.

7.2 Opportunities

Specific opportunities associated with the problems and impacts identified are listed below. USACE has the opportunity and capability to examine a variety of issues facing the Chesapeake Bay through using several of our mission areas such as ecosystem restoration, flood risk management, water supply, and coastal storm risk management. Each of the these missions are described in more detailed below as well as examples of how each mission could help address some major issues facing the Chesapeake Bay ecosystem. Opportunities beyond missions of USACE also exist and are mentioned throughout each sub-section.

7.2.1 Aquatic Ecosystem Restoration

Aquatic Ecosystem Restoration is one of the primary missions of the Civil Works program. The purpose of ecosystem restoration activities is to restore significant aquatic ecosystem function, structure, and dynamic processes that have been degraded. Aquatic ecosystem restoration efforts involve a comprehensive examination of the problems contributing to the system degradation, and the development of alternatives and solutions.

Through the USACE ecosystem restoration mission, there is the possibility to help restore and improve the overall health of the Chesapeake Bay watershed. For example, there are opportunities to improve diminished fisheries resources, improve SAV populations, restore lost and/or degraded wetlands, improve the health of streams by repairing impaired stream functions, improve fish passage, and restoring forest cover and riparian forest buffers throughout the Chesapeake Bay ecosystem. USACE can also look at ways to consider the connectivity of natural habitats in project plans to try and devise a restoration plan to maximize habitat resources across the Chesapeake Bay ecosystem. The ecosystem restoration mission also allows USACE to enhance ecosystem services provided by open space and habitat within the watershed to address the loss of ecologically, culturally, historically, or recreationally significant landscapes within the Chesapeake Bay.

There are also ecosystem restoration opportunities for other federal agencies, state and local governments, NGOs, and tribes to help improve the health and function of the Chesapeake Bay and to address the goals of the 2014 Chesapeake Bay Agreement. States within the Chesapeake Bay watershed can improve overall water quality within the Bay watershed by implementing their respective WIPs and by promoting the long term conservation and protection of healthy watershed systems through stakeholder engagement, collaboration and education, which is critical to the health of the larger ecosystem. The Bay states are putting a great deal of focus on addressing water quality issues in the watershed, which creates several opportunities for USACE and those various other state and federal agencies to partner to enhance the Chesapeake Bay ecosystems through habitat restoration. With improved water quality, there is the opportunity to implement various aquatic ecosystem restoration efforts to improve the fish and wildlife habitat throughout the watershed. For example, other organizations and agencies within the Chesapeake Bay watershed can work with USACE to increase the capacity of wetland, which will provide water quality and habitat benefits throughout the watershed. For example, other organizations and agencies within the Chesapeake Bay watershed can work with USACE to increase the capacity of critical wetland functions by conserving healthy habitats and restoring the connectivity and function of degraded habitats which is essential to the long-term resilience and sustainability of the ecosystem and the region's quality of life. As stated in the 2014 Chesapeake Bay Agreement, the opportunity exists to create or reestablish 85,000 acres of tidal and non-tidal wetlands and enhance the function of an additional 150,000 acres of degraded wetlands by 2025. Other restoration opportunities that could benefit from both USACE and other state and federal efforts include restoring, enhancing, or preserving habitats that support wintering populations of black duck. Other projects may include improving stream health and function throughout the watershed, which could restore and sustain natural reproducing brook trout population with the Chesapeake Bay headwater streams.

7.2.2 Flood Risk Management

The focus of USACE's Flood Risk Management Program is to work towards reducing overall flood risk, including reducing the risk of loss of life, reducing the long term economic damages to the public and private sector, and improving the natural environment. The nation and the Chesapeake Bay watershed are currently challenged by aging flood management infrastructure, climate change, and changing hydrographs stemming from development. USACE has the potential to help manage future flood risks and provide flood risk management approaches that could provide environmental benefits as well.

USACE can work to manage flood risk by rehabilitating, modernizing, and revitalizing existing flood risk management projects, and considering construction of new projects. The USACE flood risk management program can also increase the capability of the Floodplain Management Services Program (FPMS) for providing assistance to additional local communities to include modeling and mapping, flood risk management studies, surveys, outreach, and other related assistance.

There are also flood risk management opportunities and measures that other entities, including other federal agencies, state and local governments, NGOs, and tribes can carry out to help improve the health and function of the Chesapeake Bay and work to address the goals of the 2014 Chesapeake Bay Agreement. Other state and Federal agencies within the Chesapeake Bay watershed can work to protect and conserve land use by continually improving knowledge of land conservation and the associated impacts, as well as working directly with local governments and their representatives to evaluate options, incentives and planning tools that could assist them in continually improving their capacity to reduce the rate of conversion of agricultural lands, forests and wetlands. They can also work to try and reduce the rate of changing landscapes from more natural lands that soak up pollutants to those that are paved over, landscaped or otherwise impervious which increase the risk of flood risk management efforts throughout the Chesapeake Bay watershed. Many efforts other state and federal agencies can participate in to manage flood risk concerns within the Chesapeake Bay can also improve the health of the Chesapeake Bay ecosystem, and help with climate resiliency, which is a mission area where USACE has interest. Opportunities exist to continually monitor and assess the trends and likely impacts of changing climatic and sea level conditions on the Chesapeake Bay ecosystems. USACE has the opportunity to augment efforts of other state and federal agencies to monitor and assess trends where USACE projects are implemented. These include evaluating the effectiveness of restoration and protection policies, programs, and projects. There are also opportunities to continue to pursue, design and construct projects which offer blended solutions, such as restoration and protection to enhance the resiliency of Bay and aquatic ecosystems from the impacts of coastal erosion, coastal flooding, more intense and more frequent storms, and sea level rise.

7.2.3 Water Supply

Although USACE's involvement with water supply has been limited to those projects authorized to provide M&I water supply at full non-federal cost responsibility, there may be future opportunities to contribute to a clean and reliable water supply within other civil works studies and investigations. Opportunities exist to consider a "systems management" approach for

increasing yield from existing sources, and to develop a water balance framework for allocating existing water supplies among competing uses during low flow conditions.

As a result of a growing population within the Chesapeake Bay watershed, there has become a problem with the oversubscribed uses of water and the need to develop strategies to balance available water supplies among various competing uses such as for ecosystem protection, municipal consumption, agricultural production, industrial processes, energy development, and power generation. Therefore the opportunity exists for USACE to identify and project consumptive water uses by major sub-basins within the Chesapeake Bay watershed. Consumptive use was projected through 2030 for the Middle Potomac watershed in the Middle Potomac River Watershed Assessment (USACE, 2014). Other entities that have regulatory authority over water supply, such as the River Basin Commissions, can also contribute to identifying and projecting consumptive water uses to help manage the Bay's water resources in the short and long term.

7.2.4 Navigation

As USACE's earliest mission area, navigation continues to be a primary effort for USACE. USACE maintains an extensive system of navigation channels throughout the Chesapeake Bay. Climate change will pose new challenges for maintaining the navigational system. Dredged materials are currently viewed as a beneficial resource for habitat restoration and enhancement rather than a waste or byproduct of dredging. USACE continues to maintain current navigation projects to provide benefits in the face of climate change and sea level rise. USACE, as well as other federal, state and local agencies responsible for dredging or material placement, can also partner to promote and utilize dredged material as a resource to restore habitat and address the impacts of sea level rise.

7.2.5 Recreation

USACE manages and owns reservoirs that provide recreational opportunities. Additionally, recreation features such as swimming, fishing, and camping, can be included at the non-federal sponsor's expense. An opportunity exists to expand access for recreation at many of the USACE reservoirs. While recreation can be a small component to any project, it cannot be the primary purpose for justification for a project to be completed.

There are also recreation opportunities for other entities, including other federal agencies, state and local governments, NGOs, and tribes. A goal of the Chesapeake Bay Agreement is to add 300 new public access sites by 2025. This goal can be accomplished through the addition of new and or enhancement of existing local, state and federal parks, refugees, reserves, trails and partner sites. Environmental literacy is another goal of the Chesapeake Bay Agreement that could be addressed through recreation. Recreation sites offer the opportunity to post educational signage and provide information about the Bay and its resources. While recreation is not one mission areas of the USACE, there are opportunities to work with non-federal sponsors on efforts including ecosystem restoration projects or flood risk management projects which could have an ancillary benefit of some recreation features such as boardwalks or kiosks that would enhance the end product and provide public access to various projects around the Chesapeake Bay watershed.

7.2.6 Coastal Storm Risk Management

The focus of Coastal Storm Risk Management is to provide leadership and strive to develop, maintain and apply the best national and regional expertise in science and engineering to protect our coastlines, including plan formulation, economics, environmental and engineering disciplines. There are many opportunities for USACE including undertaking long-term, comprehensive climate change adaptation planning and developing prioritized local plans. USACE could also consider participation in regional planning commissions, with the goal of addressing problems with a systems approach that incorporates an array of management measures. USACE can also further investigate management options for areas identified to be at risk by the NACCS (Tier II/III analyses) through traditional civil works processes or through other technical services programs, such as PAS, as mentioned in earlier sections.

Additional actions to be considered by USACE and others include development of creative incentives to maximize the use of an array of resilient management measures, and expanding the use of public-private partnerships to strengthen resiliency. Opportunity also exists to improve implementation of natural and nature-based features (NNBF), and blended solutions, including quantification of their overall value to communities including economic, ecological, recreation, social, and structural. The USACE NACCS effort greatly advanced the science related to NNBF, which provides the foundation for further exploration of these measures and their benefits in CSRM projects completed by USACE and others. The Chesapeake Bay Watershed Agreement also identifies the goal to increase the resiliency of the Bay watershed to impacts from climate change. Efforts to implement and further explore NNBF would help meet this goal.

7.2.7 Additional opportunities not currently addressed by existing USACE missions

USACE actions are bound by the primary mission areas of the organization. Some opportunities can be addressed as ancillary benefits of a larger project (e.g., recreation at a reservoir), but in some cases other federal, state, and local agencies, as well as NGOs can have a lead role in actions to restore, preserve, and protect the Bay.

Some overarching opportunities to expand USACE involvement include obtaining new authorizations for or modification of existing authorizations to permit USACE involvement in new mission areas, and exploring all options for partnering with non-federal sponsors and other NGO organizations under the authorities that currently exist. USACE should also incorporate a planning priority framework for budgeting that weighs the importance of problems from an economic perspective and benefits that can be achieved over time.

Specific opportunities noted in the Chesapeake Bay Agreement include goals related to water quality, toxic contaminants, and stewardship. Opportunities exist to reduce pollutant loads to the Bay through implementation of best management practices (BMPs) as described in state WIPs. Supporting local improvements to wastewater and CSO systems also aid in meeting state WIP goals. Federal, state, and local governments can engage in stormwater management through planning assistance and/or implementation of BMPs. There are opportunities for improved stormwater management on the many federal facilities within the watershed. There are extensive opportunities on non-federal properties for improved stormwater management. Actions to implement BMPs will help meet the water quality and toxic contaminant goals of the Watershed

Agreement. There is also a need to promote land use decisions that sustainably manage population growth and development. These types of actions require local leadership, which is an outcome of the stewardship goal within the Chesapeake Bay Agreement.

7.2.8 Opportunities to contribute to Chesapeake Bay 2014 Goals and Outcomes

The limitations of USACE authorities and mission areas may prevent USACE participation in some of the opportunities listed above, such as those directed only toward water quality. However, there are a number of broad opportunities within current USACE mission areas to contribute to the achievement of Chesapeake Bay 2014 Goals and Outcomes, as described in the sections above. These Goals and Outcomes that align most directly with USACE mission areas are summarized in Table 6.

Table 6. 2014 Chesapeake Bay Agreement Goals and Outcomes Most Directly Aligned with current USACE Mission Areas

Goal	Outcome(s)
Fisheries	Fish Habitat, Blue Crab Abundance
Vital Habitats	Wetlands, Black Duck, Fish Passage, Oysters, SAV, Stream Health, Brook Trout, Forest Buffer, and Tree Canopy
Healthy Watersheds	Healthy Watersheds
Stewardship*	Local Leadership
Public Access*	Public Access Site Development
Environmental Literacy*	Student
Climate Resiliency	Monitoring and Assessment, Adaptation

*These goals may be addressed through ancillary benefits of projects within primary USACE mission areas

8. PLANNING GOALS/OBJECTIVES

Within the planning community, goals are the broad, over-arching purposes for a study. They may be defined by the non-federal partner or any other stakeholder, and will be unique to each study. An objective is a statement of the intended purposes of the planning process. It is a statement of what an alternative plan should try to achieve. More specific than goals, a set of objectives will effectively make up the mission statement of the federal/non-federal planning partnership.

8.1 Goal

Protect and restore the Chesapeake Bay watershed through coordinated actions within USACE mission areas, and identification of actions outside USACE mission areas that can be implemented by others.

8.2 Objectives

These broad objectives were developed by the project team to help address not only the management strategies and the 2014 Chesapeake Bay Agreement but the goals and objectives of the various habitat goal implementation teams the USACE participates in as well.

1. Collaborate and coordinate with stakeholders to formulate a water resources restoration plan that guides USACE contributions to 2014 Chesapeake Bay Agreement goals and outcomes.
2. Contribute towards sustainable, healthy populations of blue crabs, oysters, fish and other wildlife.
3. Promote a broad network of land and water habitats that support fish and wildlife, as well as humans, that are resilient to the impacts of development and climate change.
4. Reduce the risk of flooding to communities within the watershed.
5. Develop aquatic ecosystem restoration projects that additionally provide the benefit of reducing pollutants and contaminants entering waterways so as to contribute toward habitat conditions that support aquatic living resources in streams, rivers, and the Bay, and protects human health.
6. Improve resiliency of communities to coastal storms and climate change.
7. Address regional sediment management issues.
8. Consider land conservation on USACE lands and within the planning process.
9. Provide for access for public recreation.
10. Enhance the management of USACE lands through stewardship to benefit the Chesapeake Bay watershed.
11. Maintain or create resilient, reliable, safe, and high quality sources of water supply for municipal and industrial uses.
12. Dam management for instream flows.
13. Manage at the watershed scale for preservation and enhancement of the natural hydrology to benefit human and natural communities.
14. Accomplish effective, equitable, and collaborative integrated watershed management.
15. Investigate various sources of funding, including federal and non-federal sources, to maximize existing resources and ensure the most efficient use of resources available.

Objectives specific to USACE and the primary missions are listed below.

The Chesapeake Bay Comprehensive plan will:

1. Identify and prioritize watersheds where USACE can investigate/implement aquatic ecosystem restoration projects that complement Chesapeake Bay restoration work by others, that contribute to sustainable, healthy populations of blue crabs, oysters, fish, and other wildlife, and that can potentially be implemented immediately through USACE design/build authority, immediately following Feasibility Study, or through the Continuing Authorities Program (CAP).

2. Identify locations where sediment and erosion control projects, including shoreline stabilization, are best suited and can be implemented immediately following completion of the Comp Plan through USACE design/build authority or through the Continuing Authorities Program (CAP).

3. Identify localities within the Chesapeake Bay watershed that require further investigation for flood risk management projects, which could also produce incidental ecosystem

benefits, and that could be potentially implemented immediately following USACE Feasibility Study.

4. Identify localities most susceptible to coastal storms and climate change impacts. Propose follow on investigations of these areas through CAP, Floodplain Management Services (FPMS), or other USACE programs as appropriate that could be implemented immediately following USACE Feasibility Study.

5. Contribute to the 2014 Bay Agreement Goals by considering enhancements to existing USACE projects that could allow for public access, recreation and/or educational opportunities. Identify opportunities within the Chesapeake Bay Watershed, which could be implemented or are planned for implementation immediately following the Comp Plan by other federal, state, or local organizations, as well as NGOs.

9. PLANNING CONSTRAINTS

An essential element of any planning study is the set of constraints confronting planners. *A constraint is basically a restriction that limits the extent of the planning process*. Constraints, like objectives, are unique to each planning study and can be either resource constraints or planning restraints.

1. Existing laws, regulations, and local ordinances will guide and may limit opportunities identified in the Comprehensive Plan.
2. Many of the problem areas in the watershed are on private property which could increase the complexity of coordinating restoration activities.
3. The extent of the watershed's current population and development, high in certain areas, will likely limit the restoration potential of some areas. Conflicting uses of the watershed may limit the type and extent of restoration in some areas.

10. FISH AND WILDLIFE RESOURCES CONSIDERATIONS

Important habitats that support plant, fish, and wildlife species, including endangered species, are typically afforded consideration in project planning and construction to ensure that unacceptable impacts to these existing resources are not produced. Detrimental impacts to existing resources are least when projects are constructed on otherwise environmentally compromised or degraded sites. However, ecological requirements of target beneficiary plant, fish, and wildlife species often necessitate construction of habitat restoration projects in areas where the environment in the vicinity is minimally degraded. In some cases, regionally important habitats of plants, fish, and wildlife occur at or in close proximity to restoration project sites, and the location of these habitats is then a principal concern in project planning and construction.

Other than for shallow water, habitat types such as oyster beds, SAV beds, wetlands (tidal and nontidal), and forest underwent trends of substantial loss over the last century. Direct and indirect impacts of human activities drove negative trends for resources other than tidal wetlands. In the Bay, tidal wetland loss appears to be driven on a regional scale primarily by impacts of rising sea level and the consequences of hardening shorelines. Conversely, shallow water has

likely increased in area concomitant with Bay growth driven by rising sea level and excess sedimentation, the latter from human activities.

The majority of the notable habitats mentioned above are regulated throughout the Bay watershed by a mix of federal and state environmental regulations. However, forest parcels are protected in most of Maryland by state law, but are not otherwise protected in the Bay watershed based on presence of forest alone. The Clean Water Act and Magnuson Stevens Fishery Conservation and Management Act are of principal importance for aquatic habitats listed above. The latter contains designated EFH for managed species. EFH includes open water habitat not otherwise protected under the Clean Water Act.

Oysters occur in the lower portion of the upper Bay, as well as the middle and lower regions of Chesapeake Bay where favorable shell or natural hard bottom substrates, and brackish salinities occur. Vertically in these waters, temperature and oxygen conditions limit where oysters occur from generally several feet deep to as much as 25 feet. Oyster beds provide habitat for numerous other species which favor hard substrate and physical structure. Oysters formerly occurred in vast beds which are still depicted on maps utilized by regulatory agencies. Oysters today still occur in many of these beds, but in greatly reduced numbers such that most areas on oyster bed maps do not actually contain live oysters or any significant reef habitat. Activities in proximity to oyster beds are restricted during times of year when oysters would be vulnerable to excess sediment and larval entrainment. All mapped oyster beds, whether oysters occur there or not, are generally afforded regulatory protection.

Shallow waters less than 6 feet deep are valued because of their potential to serve as nursery areas for juvenile fish, blue crabs, and locations for SAV beds. Shallow waters occur along the Bay margins, in headwater tributaries, in the Susquehanna River delta, and in vicinity of Bay islands. The low salinity shallow waters in the uppermost Chesapeake Bay, the delta of the Susquehanna River, are of particular regional importance. These serve as spawning and nursery grounds for numerous species of anadromous fish. Comparable low salinity headwaters of other major tributaries serve the same function.

SAV beds occur in shallow waters where water clarity is good and the bottom is sandy in a band on the Bay margin and in other shallow waters, including the Susquehanna River delta and in the vicinity of large Bay islands. SAV provides important habitat for fish and wildlife and supports the Bay food web. Activities that could impact bottom supporting SAV are strictly regulated. SAV beds show pronounced interannual variation in bottom area occupied and location. Consequently, determining where SAV beds occur to ensure avoidance is sometimes problematic. SAV is particularly vulnerable to turbidity during their April through October growing season, so activities that could impact SAV are often restricted during that time.

Tidal wetlands provide important habitat for fish and wildlife, and exported plant detritus supports the Bay food web. Tidal wetlands occur along the shores of the Bay and tidal rivers. Tidal wetlands occupy vast areas along the flat, low elevation lower Eastern Shore. Tidal wetlands are well-mapped, although specific locations and boundaries require field evaluation. Direct physical disturbance to tidal wetlands is minimized. Tidal wetlands require some

sediment input to maintain elevation. There is the potential for placement of thin layers of dredged material to simulate natural sedimentation processes to combat SLR.

Diadromous fish are migratory species that spend portions of their lives in fresh water and a portion in salt water. Anadromous fish live in salt water but utilize freshwater rivers to spawn, as well as low-salinity Bay tidal waters described above. Anadromous fish move upstream in late winter/early spring to spawn, and then young travel downstream in late spring to Bay habitats. Rivers with good water quality lacking fish blockages are of greatest value as spawning grounds. Time of year restrictions typically are utilized to provide protection to spawning fish. Anadromous fish species include a number of species of shad and river herring, as well as the endangered shortnose sturgeon as well as the Atlantic sturgeon. The shortnose sturgeon is known to spawn in the Bay only in the Potomac and Susquehanna Rivers. Catadromous fish species live most of their lives in freshwater but spawn in salt water. The only catadromous fish species occurring in the Bay is American eel. Declines in eel populations have focused increased regulatory scrutiny on activities that could impact eel. Other measures typically undertaken to protect and restore freshwater aquatic life would benefit eel.

Migratory staging areas for wintering waterfowl are identified in Bay open waters, typically in sheltered settings. Human activities in these areas may be subject to time of year restrictions if the activity could disturb wintering waterfowl. Waters in the Bay in which blue crab and diamondback terrapin winter may also be subject to time of year restrictions on bottom activities that could impact these species.

Endangered and threatened species are protected under federal and state law. Areas supporting concentrations of breeding/nesting rare species are often afforded substantial protection. Important examples of these include tiger beetle habitats locally along the Bay shoreline, and non-tidal wetland sites providing habitat for bog turtle in the watershed.

10.1 Other Project Planning Concerns

In addition, other environmental and social concerns can spatially affect project planning. Of potential concern include the Chesapeake Bay critical areas buffer and locations of hazardous and toxic waste.

10.2 Potential Mitigation Measures and Features

Mitigation involves avoidance and minimization, and then compensation for losses. Avoidance is a goal to make projects cost-effective, environmentally acceptable, and feasible from an engineering standpoint. Properly formulated and constructed aquatic ecosystem restoration projects benefit fish and wildlife resources. However, project restoration and maintenance invariably produce environmental impacts. USACE avoids/minimizes impacts to air and water quality and fish and wildlife in accordance with requirements of existing federal and state environmental laws and policies. Impact avoidance/minimization efforts are commensurate with environmental conditions and resources present in a potential project area. Federally listed and state listed endangered species are afforded particularly rigorous protection. Restoration projects avoid/minimize unacceptable impacts via proper site selection and design, practices. Typically,

the physical location of sensitive resources are excluded as no action areas in laying out a restoration project footprint, unless those sensitive resources are to be enhanced or benefitted by the project. Project shape and dimensions are often laid out to avoid/minimize environmental detrimental impacts. Project habitat components and built features often serve not only to optimize for success of the restoration effort, but to avoid/minimize environmental harm.

Mitigation measures and features incorporated into restoration planning and maintenance include a wide array of possibilities to avoid/minimize unacceptable environmental impacts. BMPs and project features control water depths and movement, prevent excess erosion or sedimentation, restrict entry into areas containing habitats or species sensitive to physical disturbance, and include measures to control invasive species that are or could become problematic. Temporal measures focus on identification of times of year when impacts would be least but restoration efforts would be still practicable, as well as implementation of BMPs that would allow restoration efforts to occur during sensitive times of year to prevent unacceptable impacts. Monitoring and maintenance activities may include tracking success of plant communities or fish and wildlife species and conducting plantings, invasive species control, and project modifications to ensure that desired success is produced.

11. HISTORICAL AND CULTURAL RESOURCES CONSIDERATIONS

Humans have inhabited the Middle Atlantic region since at least the Paleo-Indian period (circa 11,000 to 8,000 B.C.). The majority of known prehistoric sites (past settlements) are located along the Chesapeake Bay shoreline; many are now inundated or threatened by erosion. With the development of agriculture, Native Americans began to establish fixed settlements around 1,000 AD. Native American sites are scattered throughout the watershed. Stemming from this long history of habitation, there are bountiful prehistoric, historic, and cultural resources throughout the Chesapeake Bay and its watershed.

The Chesapeake Bay and its watershed have a rich colonial history (1500-1775). The bountiful resources of the watershed enabled the birth of our nation and its industrialization. The first permanent English settlements in the Chesapeake Bay area were established at Jamestown, VA in 1607 and St. Mary's City, MD in 1634. Pennsylvania was founded in 1681 by a land grant from King Charles II to William Penn. Although outside the Chesapeake Bay watershed, Delaware has its roots in a Dutch coastal settlement established near present day, Lewes, in 1631.The Swedes established a colony near what is today Wilmington in 1638. A settlement at Mecklenburg (current Shepherdstown) along the Potomac River in 1727 is believed to be the first white settlement in West Virginia (West Virginia Division of Culture and History 2014). European settlement in portions of New York within the watershed was mostly after the Revolutionary War.

Colonial and pre-Colonial archaeological resources along the James and York rivers are anchored by the Jamestown Island Historic District and Williamsburg and Yorktown. Many of the great estates of the 18th century "Golden Age of Virginia" are along the James River, including Berkeley, Shirley, Brandon, and Carter's Grove. Native American sites, including Maycocks Point, Werowicomico, and the Pamunkey Indian Reservation suffer from erosion or flooding. The Potomac and Rappahannock Rivers hold some of the most highly significant

properties including Mount Vernon, Old Town Alexandria and Wakefield Plantation in Westmoreland County which was George Washington's birthplace.

The Chesapeake Bay and its watershed played a primary role in the Revolutionary War, the War of 1812, and the Civil War. Many battlefields and forts are preserved throughout the watershed. Washington, DC and Baltimore, Maryland are not only prime urban centers but areas of central importance to the development of the United States government and nation. Notable properties in Baltimore include Fort McHenry National Monument and Historic Shrine and the Fell's Point historic district. In 2009, the District of Columbia inventory of historic sites contained more than 700 designated historic sites, encompassing nearly 25,000 properties. Included in the inventory are 500 historic landmark designations, covering more than 800 buildings; 150 historic landmark designations of other structures, including parks, engineering structures, monuments, building interiors, artifacts, and archaeological sites; and 50 historic districts, including 28 neighborhood historic districts. (http://planning.dc.gov/DC/Planning).

Given its maritime history, shipwrecks within the Chesapeake Bay are a significant archaeological resource. The Chesapeake Bay Program website identifies that over 1,800 shipwrecks are documented for the Chesapeake Bay.

In 2009, the Chesapeake Bay Program completed a cultural assessment for the Chesapeake Bay watershed. The effort mapped National Historic Landmarks, National Historic Districts, National Historic Register Sites, State inventoried sites, and archaeological sites to identify and rank cultural resources throughout the watershed. The resulting map is provided in Figure 14.

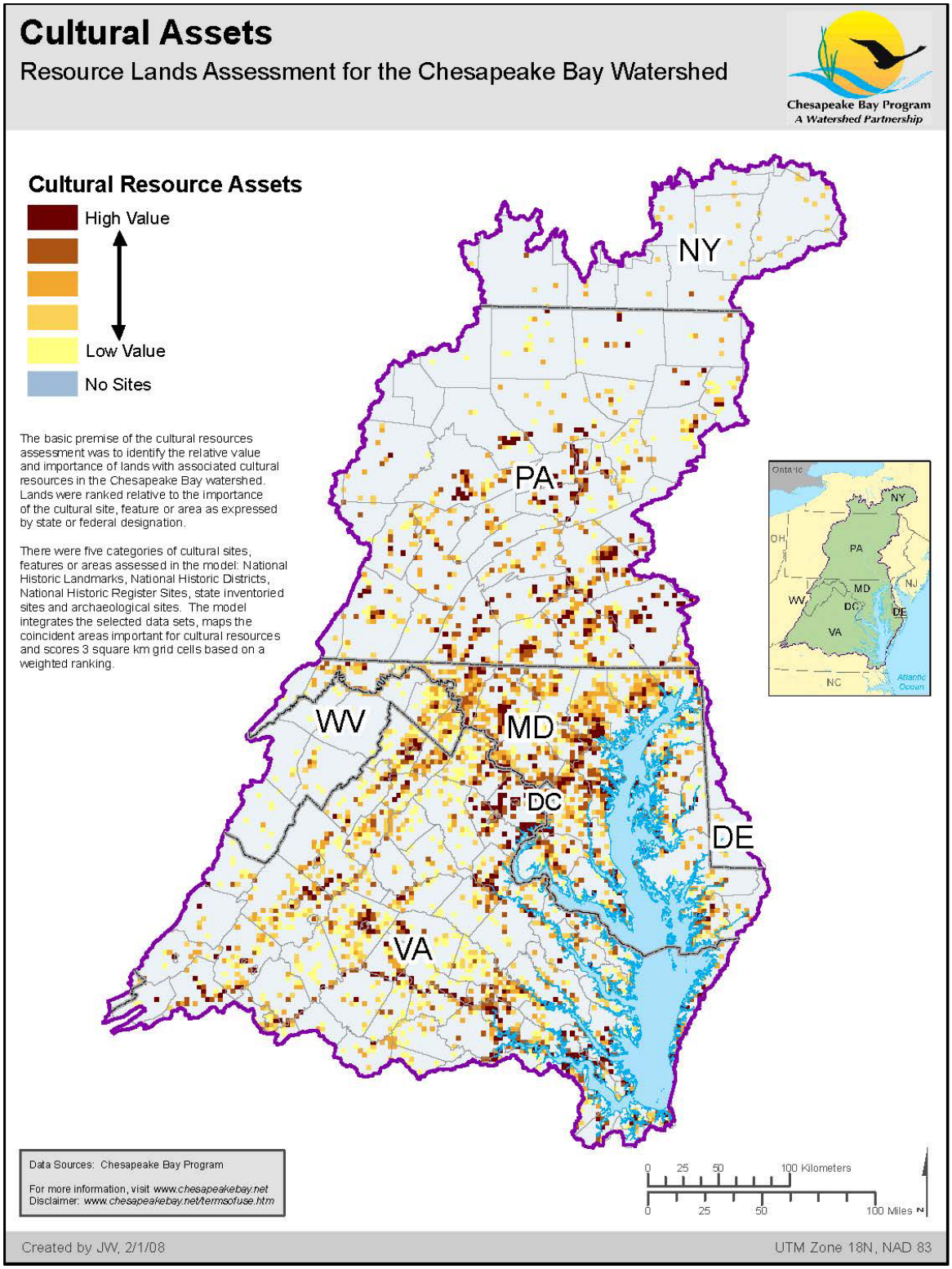

Figure 14. Chesapeake Bay Program Cultural Asset Inventory
(Courtesy of CBP, Source: Chesapeake Bay Program 2009)

12. FORMULATING ALTERNATIVE PLANS

The vast and diverse problems plaguing the health of the Chesapeake Bay and its watershed result in a wide array of management measures and alternatives that could be undertaken to address the problems. The restoration of the Chesapeake Bay and its watershed must be a collaborative effort with a number of federal, state, and local stakeholders. Through such ongoing collaborative efforts such as the 2014 Chesapeake Bay Agreement, EO 13508 Action Plans, and regulatory-driven efforts of the Chesapeake Bay TMDL watershed implementation plans (WIPs) there exist many identified projects and approaches. The role of the formulation of this reconnaissance report is to identify areas where federal investments through USACE efforts can assist other federal, state, and local stakeholders enhance the overall health of the Chesapeake Bay watershed ecosystem.

12.1 Management Measures

Management measures have been identified for all USACE mission areas applicable to the watershed. Tables 7a-d provide a broad list of management measures that could be undertaken to address problems within the watershed and identifies the objectives that are addressed by each. Additional measures could be identified in the future.

12.2 Screening of Measures

The problems that are likely to be addressed in the feasibility study phase are wide-ranging and could be implemented on a basinwide, sub-basin, state, or project level. At the reconnaissance level, the implementation scale is unknown, making further screening inappropriate at this time. Potential screening criteria for subsequent feasibility studies are listed in Table 8.

Table 7a. Management measures- Ecosystem Restoration

ID	Management Measures and Alternatives	Objective(s) Addresses														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Ecosystem Restoration															
ER1	*Oyster reef restoration*															
ER1a	Oyster reef restoration- construct alternate substrate reefs	X	X	X			X								X	X
ER1b	Oyster reef restoration- plant oyster seed	X	X	X											X	X
ER1c	Oyster reef restoration- add material to reef to increase reef height	X	X	X			X								X	X
ER2	*SAV restoration*															
ER2a	SAV restoration- planting	X	X	X			X								X	X
ER2b	SAV restoration- seeding	X	X	X			X								X	X
ER3	*Tidal wetland restoration*															
ER3a	Facilitate/plan for landward migration of tidal wetlands	X	X	X			X								X	X
ER3b	Maintain tidal wetlands elevation with dredged material or hydrologic alterations	X	X	X			X	X							X	X
ER3c	Invasive species management in tidal wetlands	X	X	X											X	X
ER3d	Increase spatial extent of tidal wetlands	X	X	X			X								X	X
ER4	*Mollusk restoration*															
ER4a	Soft clam restoration	X	X	X											X	X
ER4b	Razor clam restoration	X	X	X											X	X
ER5	*Beach restoration*	*X*	*X*	*X*											*X*	*X*
ER6	*Mudflat restoration*	*X*	*X*	*X*											*X*	*X*
ER7	*Non-tidal wetland restoration*															
ER7a	Non-tidal wetland restoration associated with agricultural drainage	X	X	X											X	X
ER7b	Non-tidal wetland restoration associated with urban drainage	X	X	X	X										X	X
ER7c	Vernal pool restoration	X	X	X											X	X
ER7d	Invasive species management in non-tidal wetlands	X	X	X											X	X
ER8	*Provide or restore fish passage*															
ER8a	Remove fish blockage	X	X	X											X	X
ER8b	Incorporate fish ladders or other methods into existing and future projects to enable fish to bypass blockages	X	X	X											X	X

ID	Management Measures and Alternatives	Objective(s) Addresses														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
ER8c	Conduct transport of fish past blockage	X	X	X											X	X
ER8d	Manage impoundments to promote habitat requirements for anadromous/diadromous fish	X	X	X									X		X	X
ER9	*Prevent or minimize eroding coastal shorelines*															
ER9a	Minimize the use of hard structures for shoreline protection		X	X			X							X	X	X
ER9b	Maximize the use of living shorelines for shoreline protection						X							X	X	X
ER10	*Habitat restoration using dredged material*															
ER10a	Wetland restoration using dredged material	X	X	X	X		X	X							X	X
ER10b	Island habitat restoration using dredged material	X	X	X	X		X	X							X	X
ER11	*Stream restoration*															
ER11a	Geomorphic stream restoration	X	X	X	X	X								X	X	X
ER11b	Prevent or minimize stream bank and channel erosion	X	X	X		X									X	X
ER11c	Remove legacy sediments	X	X	X		X		X						X	X	X
ER11d	Daylight streams	X	X	X											X	X
ER11e	Floodplain restoration along stream network	X	X	X	X									X	X	X
ER11f	Reconnect streams with floodplain habitat	X	X	X	X	X								X	X	X
ER11g	Minimize the use of hard structures for streambank stabilization	X	X	X											X	X
ER11h	Trash management.	X	X	X		X									X	X
ER11i	Invasive species management	X	X	X											X	X

Table 7b. Management measures- Ecosystem Restoration (con't) and Policy/Coordination

ID	Management Measures and Alternatives	Objective(s) Addresses														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
ER12	*Riparian buffer restoration*															
ER12a	*Replace riparian buffers where they have been removed*	X	X	X	X	X		X			X	X		X	X	X
ER12b	*Improve the function of impaired buffers*	X	X	X	X	X		X			X	X		X	X	X
ER12c	*Stream fencing*	X	X	X	X	X		X			X	X		X	X	X
ER12d	*Riparian buffer expansion to increase connectivity*	X	X	X	X	X		X			X	X		X	X	X
ER13	*Dam sediment management*															
ER13a	Identify and implement management steps for sediment and nutrient management associated with dams in Lower Susquehanna River system	X	X	X		X		X							X	X
ER13b	Engage in strategic monitoring		X	X		X		X							X	X
ER14	*Freshwater mussel restoration*		*X*	*X*											*X*	*X*
ER15	*Native (brook trout, smallmouth bass, eel) stream fish restoration*	*X*	*X*	*X*											*X*	*X*
ER16	*Urban/suburban stormwater management*															
ER16a	Stormwater management on federal lands	X	X		X	X	X	X			X			X	X	X
ER16b	Stormwater management on non-federal lands	X	X		X	X	X	X						X	X	X
ER17	*Acid mine drainage management*															
ER17a	Reduce acid mine drainage		X	X		X								X	X	X
ER17b	Provide treatment for acid mine drainage		X	X		X								X	X	X
ER18	*Open water trash management*		*X*	*X*		*X*									X	X
	Policy/Coordination															
PC1	*Conduct comprehensive watershed planning and restoration efforts that consider issues within and outside of USACE mission*															
PC1a	Promote land use decisions that sustainably manage population growth and development			X	X		X							X	X	
PC1b	Evaluate connectivity of existing habitats and resources in project planning	X	X	X		X								X	X	

ID	Management Measures and Alternatives	Objective(s) Addresses														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
PC1c	Engage regional river basin commissions to promote sound planning of energy development projects.			X								X			X	
PC1d	Consider current status of waters and watersheds of study area to maintain or improve current quality and value.	X	X	X										X	X	X
PC1e	Incorporate adaptive management into all projects														X	
PC2	*Engage all stakeholders; increase public awareness of natural resource issues*															
PC2a	Increase awareness of potential invasive species, particularly at USACE reservoirs and managed lands			X						X	X					
PC2b	Engage local governments in the planning process and future USACE projects	X														X
PC3	*Identify finance and implementation strategies*	X													X	X
PC4	*Seek new authorizations*															
PC4a	Attain new authorizations for or modification of existing authorizations to permit USACE involvement in new mission areas	X				X										

Table 7c. Management measures- FRM, Water Supply, Navigation, and Recreation

ID	Management Measures and Alternatives	Objective(s) Addresses														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Flood Risk Management															
FRM1	*Undertake new projects to reduce flood risk*															
FRM1a	Increase public awareness of non-structural and green flood risk reduction measures.			X	X		X									
FRM1b	Incorporate non-structural and green infrastructure into projects to the maximum extent			X	X		X									
FRM1c	New structural projects including levees and floodwalls				X											
FRM2	*Rehabilitate, modernize, and revitalize existing flood risk management projects*				X		X									
FRM2a	Incorporate non-structural and green infrastructure into projects to the maximum extent			X	X		X									
FRM2b	Undertake structural improvements				X											
FRM3	*Stormwater management*	X	X	X	X	X	X	X			X			X	X	X
FRM4	*Reconnect streams with their floodplains*	X	X	X	X	X								X	X	X
FRM5	*Conduct additional studies, surveys, and mapping including floodplain management studies, flood risk management studies, stormwater network mapping, etc.*				X									X	X	
	Water Supply															
WS1	*Provide a clean and reliable water supply for all competing uses*											X	X			
WS2	*Consider a "systems management" approach for increasing yield from the existing sources*											X	X		X	
WS3	*Conduct a water supply needs analysis and a consumptive use analysis budget for the Chesapeake Bay watershed*			X								X			X	
	Navigation															
N1	*Maintain current navigation projects to provide benefits in the face of climate change and sea level rise*						X								X	
N2	*Promote and utilize dredged material for habitat restoration and to address sea level rise*															

ID	Management Measures and Alternatives	Objective(s) Addresses														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
N2a	Wetland restoration using dredged material	X	X	X	X		X	X							X	X
N2b	Island habitat restoration using dredged material	X	X	X	X		X	X							X	X
	Recreation															
R1	*Increase public access opportunities*															
R1a	Enhance and expand recreational opportunities at USACE reservoirs									X	X					
R1b	Incorporate recreational opportunities in project planning									X						

Table 7d. Management measures- Coastal Storm Damage Reduction

ID	Management Measures and Alternatives	Objective(s) Addresses														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Coastal Storm Damage Reduction															
CSDR1	*Habitat restoration and/or construction to reduce coastal storm damage*															
CSDR1a	Dune restoration and/or construction		X	X			X								X	
CSDR1b	Beach restoration and/or construction		X	X			X								x	
CSDR2	*Implement structural management measures*															
CSDR2a	Flood wall construction				X		X									
CSDR2b	Jetty and breakwater construction				X		X									
CSDR3	*Implement non-structural management measures*															
CSDR3a	Incorporate natural and nature-based features into plans		X	X	X		X						X		X	
CSDR3b	Improve implementation of natural and nature-based features, and blended solutions; quantify their overall value to communities including economic, ecological, recreation, social, and structural, etc.		X	X	X		X						X		X	
CSDR4	*Avoid areas most vulnerable to storm damage*															
CSDR4a	Remove/relocate infrastructure				X	X	X					X				
CSDR5	*Promote long-term planning that incorporates resiliency*															
CSDR5a	Undertake long-term, comprehensive climate change adaptation planning; develop prioritized local plans.				X		X								X	
CSDR5b	Develop creative incentives to maximize the use of an array of resilient management measures.				X		X									X
CSDR5c	Participate in regional planning commissions	X												X	X	
CSDR5d	Address coastal storm risk problems with a systems approach that incorporates an array of management measures.				X		X								X	
CSDR6	*Further investigate management options for areas identified to be at risk by NACCS (Tier II/III analyses).*				X		X								X	

Table 8. Potential Screening Criteria

Criteria	Description	Evaluation
mission	Can be addressed by USACE mission	yes or no
authority	Current USACE authority exists	yes or no
CB Agreement	Contributes directly to 2014 Bay Agreement Goal or Outcome	specify which ones/how many
EO 13508	Contributes to goals of EO 13508 Strategy	specify which ones/how many
Objectives addressed	Comp Plan objectives addessed	specify which ones/how many
National priorities and objectives	National priorities and objectives addressed	specify which ones/how many
Legal	Limits presented by existing laws, regulations, and local ordinances	none, minor, or extensive
Ownership	Primary ownership of lands where alternative will be implemented	private, public, mixed
Development pressure	Current extent of population and development may limit restoration	yes or no
Conflicting uses	Restoration limited by conflicting uses	yes or no
Scale	Alternative limited by implementation scale- large number of stakeholders and diverse government structures. Multi-jurisdictional.	yes or no
Risk	Evaluates likelihood of achieving objectives and goals.	H, M, L
Involvement by others	Measure falls within mission of other federal agencies	yes/no; specify agency

13. ARRAY OF ALTERNATIVES

Broad alternatives that could be implemented across the watershed are identified in Tables 8a-b. Applicable states, potential participation of a non-governmental organization, anticipated benefits, potential impacts, potential outputs, potential limits to implementation, and possible implementation pathways are provided. The types of benefits from the proposed actions would include National Economic Development (NED), Regional Economic Development (RED), Other Social Effects (OSE), and NER. Based on Tables 8a-b, WRDDA 2014, the 2014 Chesapeake Bay Agreement, EO 13508 Action Plans, and the Chesapeake Bay TMDL state-specific WIPs, there are a number of potential feasibility studies that could be pursued with interested stakeholders. These are presented in the following section. Other studies stemming from alternatives listed in Tables 8a-b, but not included in the discussion below could also be pursued under this authority.

13.1 Potential Feasibility Studies

13.1.1 Chesapeake Bay Comprehensive Water Resources and Restoration Plan

The recommendation of this 905(b) reconnaissance report is to undertake a comprehensive plan of the Chesapeake Bay watershed and concurrent traditional feasibility studies as warranted. The effort will use the North Atlantic Coastal Comprehensive Study and the recently-completed Army Chesapeake Comprehensive Plan (a recent 2014 USACE Sustainability "Good Neighbor" Award winner) as models for the 2-year study as mandated by WRRDA 2014. The study will be titled, the Chesapeake Bay Comprehensive Water Resource and Restoration Plan, as stated in the Joint Explanatory Statement of the Committee of Conference for WRRDA 2014. The Chesapeake Bay Water Resources Restoration and Protection Plan will build upon years of ongoing initiatives focused on the restoration of the Bay. Figure 15 depicts the overall strategy of screening and sifting through the myriad of Bay-focused activities to determine the appropriate actions that should and must be undertaken by USACE to contribute toward realizing the defined goals of the 2014 Chesapeake Bay Agreement, EO 13508 and other acknowledged objectives. The plan will steer USACE investments in the watershed in the foreseeable future, identify additional feasibility investigations, consider projects suitable for implementation by

others, and address outstanding research needs. The measures outlined in Tables 8a-b will be further considered within the plan.

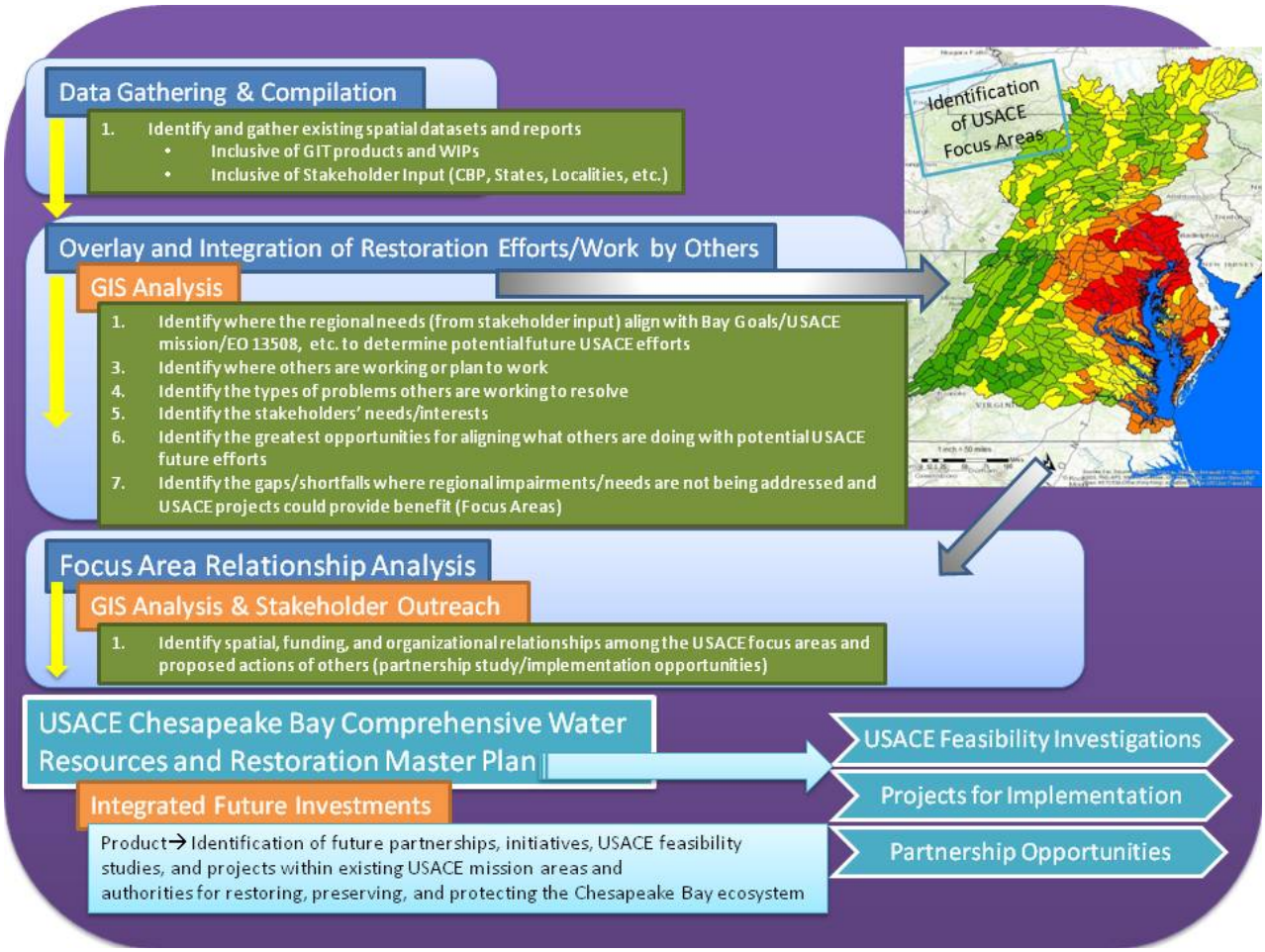

Figure 15. Chesapeake Bay Comprehensive Water Resources and Restoration Plan Strategy

This plan is to be generated in cooperation with federal, state, and local partners and is to encompass the entire watershed. NFWF has shown interest in serving as the non-federal sponsor for this effort, in conjunction with interested jurisdictions. The intent of the plan is to assure that restoration projects implemented by USACE are targeted in needed areas to achieve maximum benefit. The plan will consider all the proposed work documented in existing plans to identify where USACE investment and actions could best enable achievement of existing Chesapeake Bay Agreement goals. At the completion of, or concurrent with, the Chesapeake Bay Comprehensive Water Resource and Restoration Plan, potential projects could be further evaluated and implemented as a system that would demonstrate the efficiencies and effectiveness of a watershed informed process and integrated water resources management plan.

As an integrated water resources management plan, this effort would take into account a multitude of water uses over the full watershed. This broad perspective would allow a complex array of public values, institutional policies and priorities, regulatory procedures, planning

criteria, public participation and private sector business interests to be considered. Integrated water resources management highlights four key concepts: a systems approach; spatial or geographic integration; balance across multiple uses or functions; and a collaborative approach.

13.1.2 Coastal Storm Risk Management for the Chesapeake Bay Watershed

The North Atlantic Coast Comprehensive Plan has identified the most vulnerable areas to coastal storm damage in the Chesapeake Bay area. Hotspots that are being proposed for specific investigation are: Baltimore, Maryland; Annapolis, Maryland; Norfolk, Virginia; and Washington, DC. However, there are many smaller, localized areas within Maryland and Virginia that were determined to be highly vulnerable. Feasibility efforts could be undertaken with local governments of the vulnerable areas to evaluate and implement measures that could be undertaken to reduce exposure to coastal storm damages and provide value towards Bay Agreement goals such as wetland and coastal habitat restoration. Appendix E-4 provides a depiction of the composite exposure index for the Chesapeake Bay region as determined by the NACCS.

13.1.3 Climate Resiliency and Shoreline Erosion

Improving resiliency within the Chesapeake Bay to climate change is a primary concern of USACE and Bay States. Increased frequency of storms and more powerful storms as well as higher tides stemming from climate change threaten already eroding shorelines and habitat. USACE and the State of Maryland have previously partnered on the Chesapeake Bay Shoreline Erosion Study (USACE, 2010a) among other efforts. Problem areas identified through that effort are depicted in Figure 16, but it should be viewed with the knowledge that the evaluation was restricted to boatable shorelines, and excluded islands. The State of Maryland has expressed interest in pursuing climate resiliency projects that would provide benefits to habitat as well as consider the economic benefits of increasing resiliency. Recommendations from the Chesapeake Bay Shoreline Erosion Study would be additional candidates for further consideration. This is also a prime concern for the Commonwealth of Virginia. Based on WIP Phase 2 documentation, the State of Delaware may also have interest in shoreline erosion control efforts (Delaware 2012). Potential projects could include non-structural efforts such as living shorelines, beach and wetland restoration, as well as structural projects. Two specific projects that were identified through the Shoreline Erosion Study (Maryland) and continue to have stakeholder interest are Franklin Point and Calvert Cliffs.

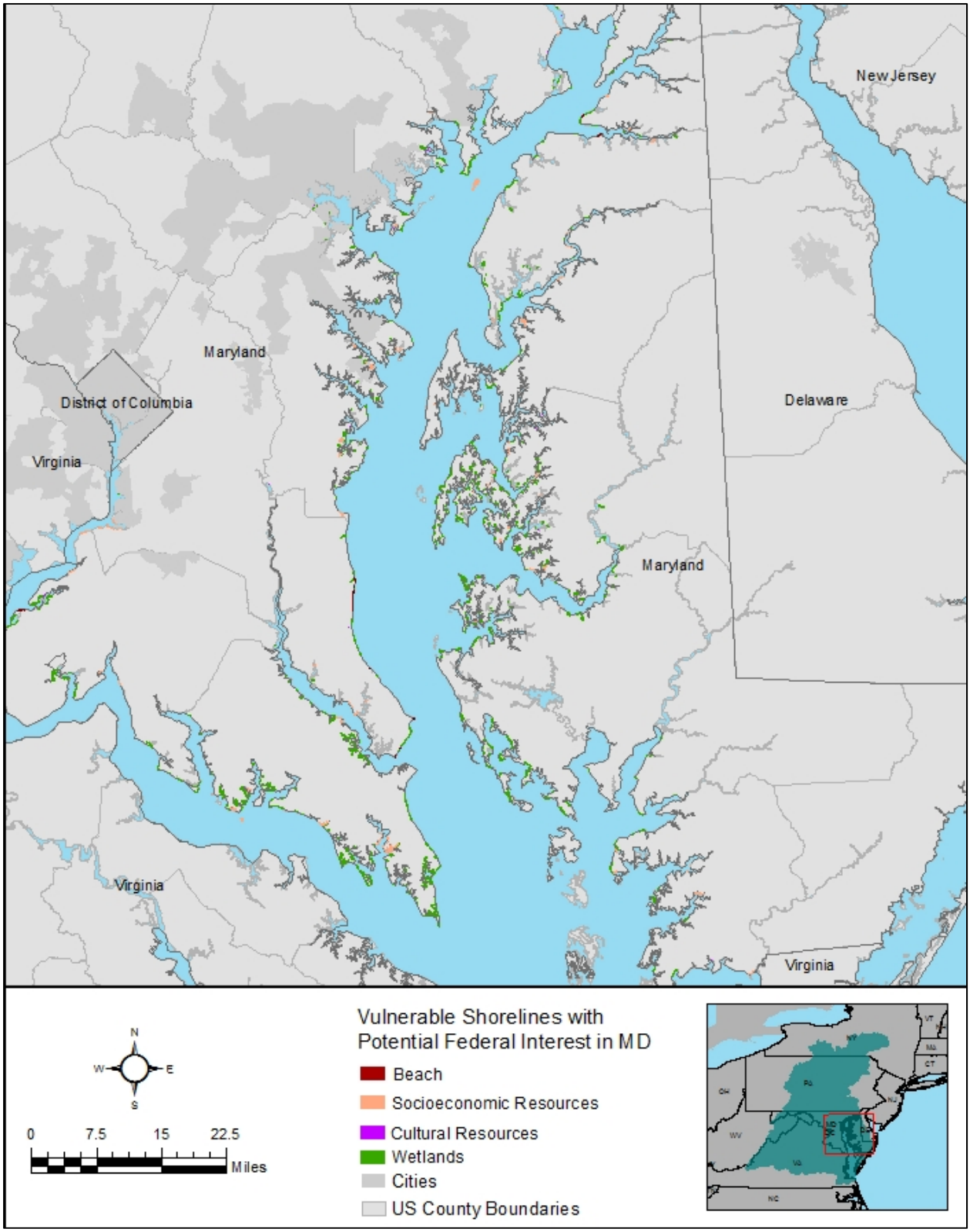

Figure 16. Shoreline Erosion Problem Areas in Maryland

13.1.4 Fish Passage

There are 5,482 identified fish passage blockages throughout the watershed that impair diadromous, resident, and brook trout habitat (Figure 17). The Nature Conservancy and a broad group of agencies recently developed the Chesapeake Bay Fish Passage Prioritization Tool to assist with evaluating potential fish passage removal projects throughout the watershed. Blockages included dams, impassable culverts, old mill dams, and other in-stream obstructions to fish passage. There are broad opportunities to partner with state and local jurisdictions to reconnect stream habitat for these fish species throughout the watershed.

13.1.5 Legacy Sediments, Fish Passage, and Stream Restoration in Pennsylvania

The Commonwealth of Pennsylvania has voiced interest in addressing the large number of dams and associated legacy sediments in mill ponds associated with those dams. Additionally, county-level input received through WIP development identified excess erosion as a primary contributor of nutrients and sediment in Bradford and Sullivan Counties (Pennsylvania 2012). There is an opportunity to evaluate dams throughout Pennsylvania to identify the best candidates for removal; where the greatest opportunities are to restore stream habitat by addressing legacy sediments; in conjunction with stabilizing stream banks.

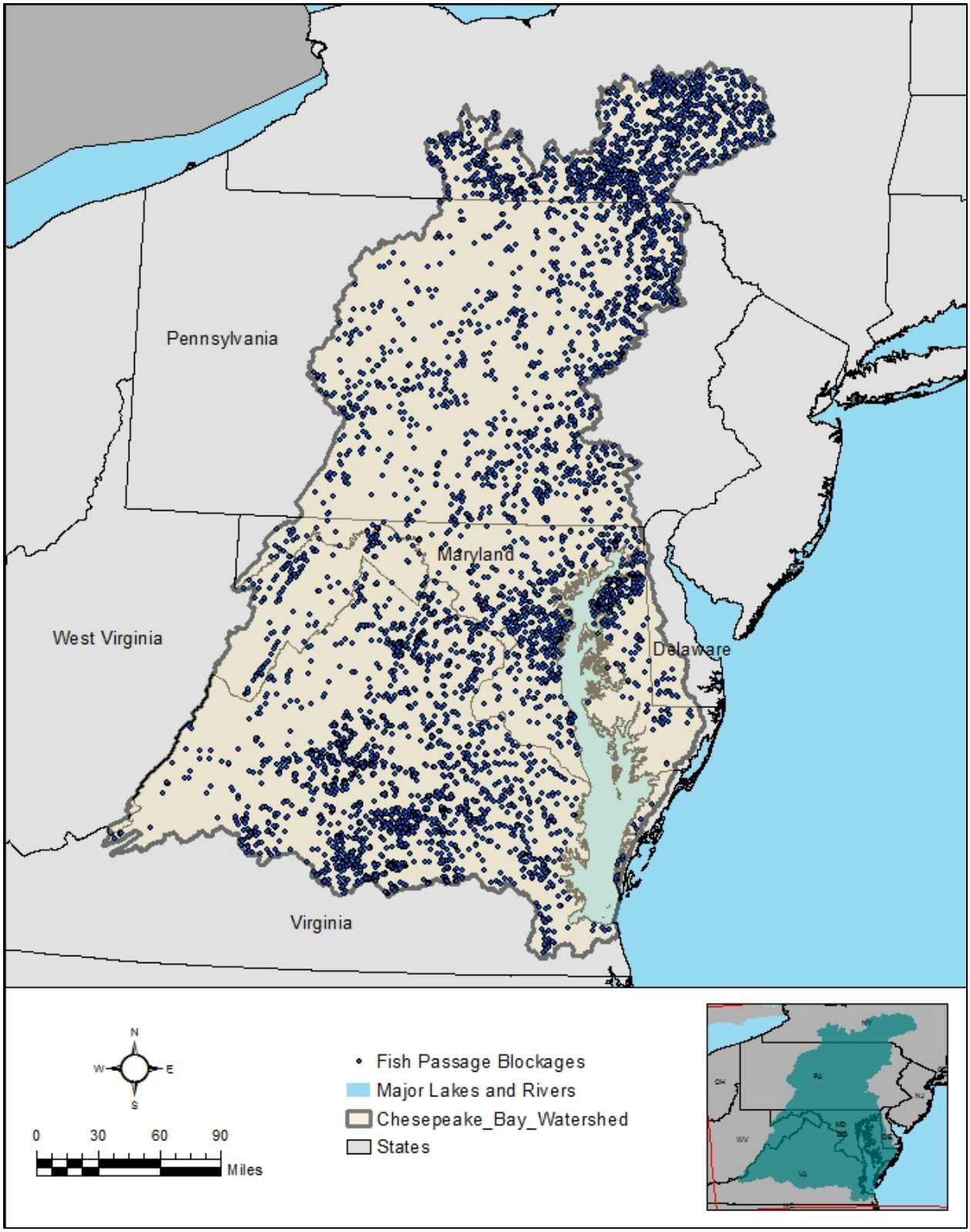

Figure 17. Fish Passage Blockages in the Chesapeake Bay Watershed
(Source: Chesapeake Bay Fish Passage Prioritization Tool (Martin and Apse 2013)

13.1.6 Chesapeake Bay Oyster Restoration

USACE has specific authority provided by Section 704(b) of WRDA 1986 to undertake oyster restoration throughout the Chesapeake Bay watershed. USACE expects to continue to work under this authority in partnership with NOAA, the non-federal sponsors, and other restoration partners to perform large-scale restoration in Maryland and Virginia to meet Bay Agreement and EO 13508 objectives. As science develops, there may come a time when oyster restoration is supported as a BMP for nutrient removal for the Chesapeake Bay TMDL. If that were to happen, there may be broader opportunities to implement localized restoration projects to provide not only habitat, but also targeted nutrient reductions to benefit water quality.

13.1.7 Habitat Improvements throughout the Susquehanna River Watershed

The Lower Susquehanna River Watershed Assessment identified that it is not just the sediments, but more so the nutrients entering the dam network from the Susquehanna watershed that are significant impairments to the Bay. The source of nutrients and sediment to the Susquehanna watershed are introduced primarily from stormwater runoff from urban/suburban areas and agricultural lands. Although stormwater management falls outside of the current USACE missions, there are opportunities to address habitat restoration efforts within the Susquehanna watershed that would have the potential to reduce nutrients and sediments entering the Chesapeake Bay watershed such as restoring or creating riparian forest buffers which are critical to clean water as they prevent pollution from entering waterways and stabilize the stream banks. There are opportunities for habitat restoration within the Susquehanna River watershed, such as restoring riparian forest buffers and stabilizing stream banks that will positively affect aquatic resources and their habitats. An ancillary benefit of restored and stable habitat is that it may more effectively process nutrients and process sediments.

13.1.8 Energy Development in the Basin

Much of the Susquehanna River Basin and areas in the Potomac River Basin are underlain by geologic strata that are suitable for natural gas development. Vast reserves of natural gas are being developed or have the potential to be developed in Pennsylvania, New York, western Maryland, and West Virginia. The frequency, magnitude, and duration of energy development and associated industrial operations in the watershed are expected to increase over time. The short and long-term direct, indirect, and cumulative impacts of these operations are not currently assessed or managed on a watershed basis. Typical impacts include air emissions from truck traffic (including carbon emissions, fugitive dust, and particulate matter); alterations of natural drainage patterns (including headwater impacts, stormwater management impacts, retention and withdrawal basins); and excessive fragmentation of wildlife habitat. A feasibility study could be performed with individual jurisdictions or local governments to evaluate opportunities for mitigating impacts of industrial operations, wetland restoration, floodplain restoration, habitat connectivity and maintaining natural flow regimes.

13.1.9 Reconnection of Stream and Floodplain

Where streambanks are being restored, opportunities may exist to build a floodplain bank in conjunction with the improved streambank. Restoration of floodplains and reconnection to those areas will improve flood water retention and restore habitats. Reconnection of these two systems

will reduce habitat fragmentation. There is also the possibility of restoring riparian buffers associated within the stream network. Although flood risk management and habitat restoration were previously thought of as generally mutually exclusive efforts, USACE has institutionally recognized the interlink between these two objectives by establishing procedures for formulation of projects that combine NER and NED federal objectives. Undertaking aquatic ecosystem habitat restoration measures also offers the potential to improve water quality in receiving streams. Stream restoration may improve flows and reduce floodwater levels. Large-scale wetland restoration may restore floodplain space for temporary storage of flood waters that can also contribute to reduced floodwater levels. Large-scale wetland restoration may restore floodplain space for temporary storage of flood waters that can also contribute to reduced floodwater levels. This opportunity exists in all jurisdictions throughout the watershed.

13.1.10 Enhancing Flood Risk Management Projects to Improve Stream Habitat

FRM projects constructed by government and private interests prior to modern levels of concern over impacts to the environment have degraded aquatic habitat. These impacts include channelization, instream and floodplain habitat simplification, and separation of streams from their floodplain. According to the 1997 Upper Susquehanna River Basin Section 905(b) WRDA 86 Analysis Watershed Management Study, an estimated 1,600 acres of riverine and riparian habitat, and 22 miles of river reach have been adversely impacted by existing USACE FRM projects (mostly reservoirs) in that basin alone. However, impacts to aquatic habitat from FRM projects are a reality throughout the watershed. These impacts also include wetland loss and degradation. A feasibility study could be commenced with interested jurisdictions to evaluate opportunities and implement projects to maintain, enhance, and restore natural stream geomorphology to reduce excessive erosion and to provide riparian and aquatic habitat benefits.

13.1.11 Riparian Forest Buffer Restoration

Riparian forest buffers enhance stream and streamside habitat. They are also identified as a prime BMP to reduce nutrient and sediment loads towards meeting Bay TMDL goals by many jurisdictional WIPs. A feasibility study could be undertaken to investigate where the greatest opportunities lie within the watershed to restore or enhance riparian buffers throughout the watershed to improve aquatic habitat while also reducing pollutant loads for the Bay TMDL if it could be justified as part of one the USACE mission areas such as ecosystem restoration. USACE cannot formulate solutions for purposes of treating or abating pollution in which other entities have a legal or compliance responsibility, including implementation of projects to comply with TMDLs.

13.1.12 Additional opportunities identified in WIP Phase II Plans

Many jurisdictional WIP Phase II plans identified the need for urban nutrient management plans and stormwater management plans, particularly for Pennsylvania counties. USACE could provide assistance for these efforts through the PAS States Program (Section 22). Additionally, aquatic habitat-focused BMPs identified in the WIPs such as stream restoration, floodplain reconnection, riparian buffer restoration, and wetland restoration could be undertaken under existing USACE authorities. Figure 18 depicts the extent of impaired streams on the 303(d) list within the watershed.

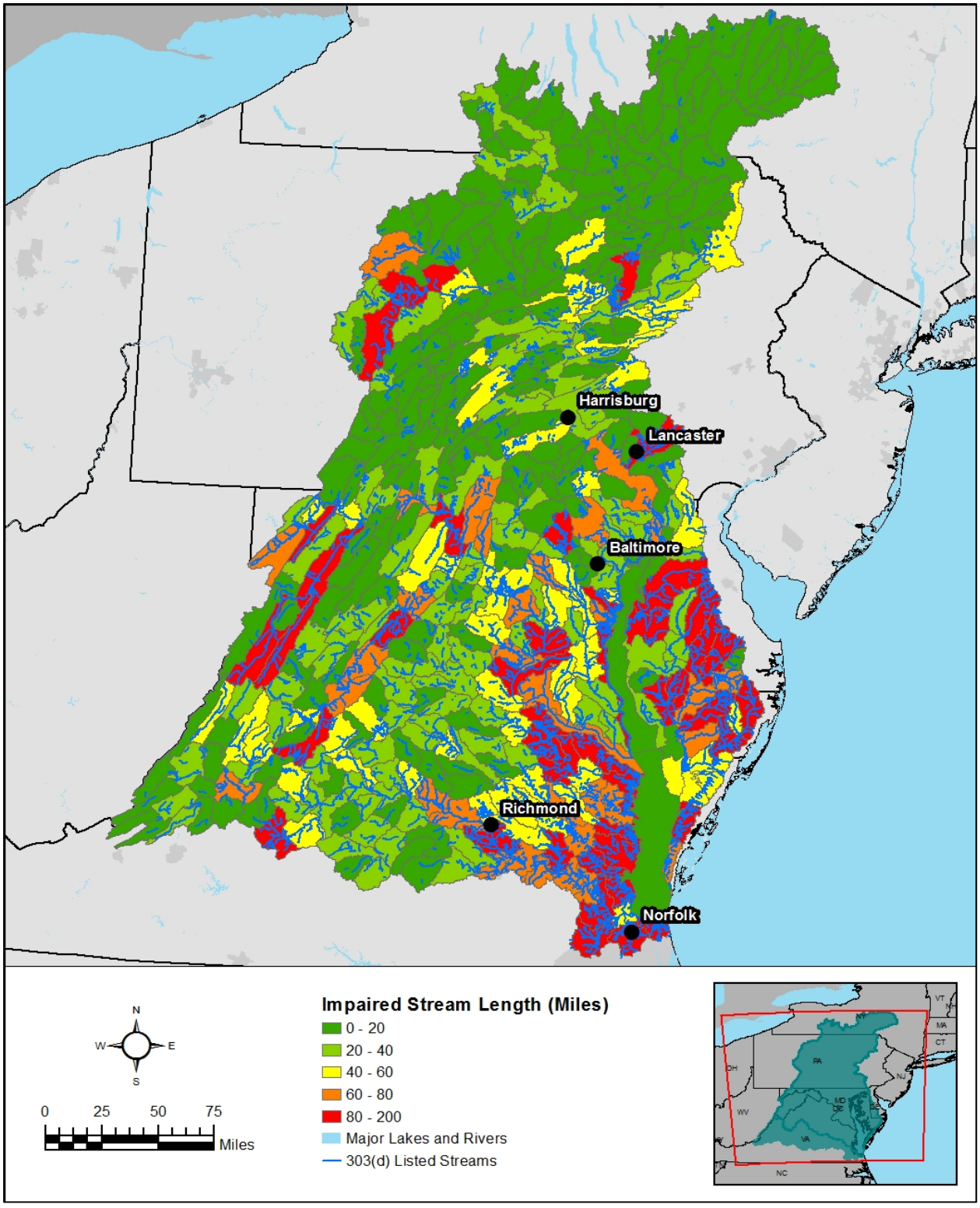

Figure 18. Impaired Streams (303(d) Listed) in the Chesapeake Bay Watershed

13.1.13 Research

In line with the study authority, USACE is authorized to identify research efforts required to improve the understanding of Chesapeake Bay processes and impairments to help solve the watershed's environmental problems. Currently, there are several modeling efforts being completed by a variety of different state and federal agencies to look at a wide array of issues facing the Chesapeake Bay watershed. ERDC is the primary modeling and research group of USACE. ERDC has been involved in developing the suite of Chesapeake Bay models for the TMDL and modeling completed for the Lower Susquehanna River Watershed Assessment. ERDC is currently working on wave and climate change research as well as looking at dredged material movement/analysis through the regional sediment management program efforts. ERDC has the expertise to investigate SAV restoration topics. There may be opportunities that arise to specifically investigate research needs. However, it is more likely that research needs will be identified through investigations undertaken by other feasibility studies pursued through the study authority.

Table 9a. Array of Potential Alternatives- Ecosystem Restoration

FRM3	Stormwater management	X	X	X	X	X	X	X		N*	water quality, habitat, FDR	none	BCR,	water quality, largely falls outside USACE mission	Section 510*, federal lands
FRM4	Reconnect streams with their floodplains	X	X	X	X	X	X	X	X	Y	habitat, wildlife, water quality, FDR	none	BCR, stream miles reconnected	water quality, largely falls outside USACE mission	Section 510, GI, CAP
FRM5	Conduct additional studies, surveys, and mapping including floodplain management studies, flood risk management studies, stormwater network mapping, etc.	X	X	X	X	X	X	X		Y	improved knowledge; better decision making	none	information- maps or reports produced	none	PAS, FPMS, Silver Jackets, Section 729
											Water Supply				
WS1	Provide a clean and reliable water supply for all competing uses	X	X	X	X	X		X		Y	water quality and supply, socioeconomic, habitat	none	gallons	USACE facilities provide water/water supply storage to a small portion of watershed	PL 85-500, PL 78-534, Secion 6
											Navigation				
N1	Maintain current navigation projects to provide benefits in the face of climate change and sea level rise	X			X			X		Y	navigation	additional impacts to Bay/river bottoms	feet maintained	impacts from climage change and sea level rise not definitive and will make long-term planning difficult	O&M, CAP
N2	Promote and utilize dredged material for habitat restoration and to address sea level rise	X			X			X		Y	habitat, sediment, wildlife	none	acres	costs; proximity of restoration sites to source of dredged material	Section 510, GI, CAP, O&M
											Coastal Storm Damage Risk Reduction				
CSDR1	Habitat restoration and/or construction to reduce coastal storm damage	X			X		?	X		Y	habitat, CSDR, sediment, wildlife, socioeconomic, FDR	none	acres protected, habitat acres	conflicts with current land uses	Section 510, GI, CAP
CSDR2	Implement structural management measures	X			X		?	X		Y	CSDR, FDR, sediment, socioeconomic	habitat, natural hydrology	acres protected	ownership; costs	Section 510, GI, CAP
CSDR3	Implement non-structural management measures	X			X		?	X		Y	CSDR, FDR, sediment, socioeconomic, habitat	none	acres protected	ability to communicate benefits	Section 510, GI, CAP
CSDR4	Avoid areas most vulnerable to storm damage	X			X		?	X		Y	socioeconomic	displaced residents	acres	current societal mindset	Section 510, GI, CAP
CSDR5	Promote long-term planning that incorporates resiliency	X			X		?	X		Y	CSDR, FDR, sediment, socioeconomic, habitat	none		none	Section 510, GI, CAP
CSDR6	Further investigate management options for areas identified to be at risk by NACCS (Tier II/III analyses).	X			X			X		Y	CSDR, FDR, sediment, socioeconomic, habitat	habitat, natural hydrology	detailed plans, area protected	ownership; current footprint of built-out communities	Section 510, GI, CAP
											Recreation				
R1	Increase public access opportunitie	X	X	X	X	X	X	X		Y	socioeconomic	none	area accessed, number of access points		GI, CAP

Definitions for 'Anticipated Benefits'		
	Habitat	provides habitat for one or more species
	Wildlife	directly contributes to increased populations
	water quality	reduced nutrients and sediment, improved water clariy
	CSDR	coastal storm damage reduction

Table 9b. Array of Potential Alternatives- FRM, Water Supply, Navigation, Coastal Storm Damage Reduction, and Recreation

ID	Alternative	Potential non-federal partners								USACE Mission	Anticipated Benefits	Potential Impacts (negative)	Potential Outputs**	Limits to Implementation	Possible Implementation Paths
		MD	PA	NY	VA	WV	DE	DC	NGO						
	Flood Risk Management														
FRM1	Undertake new projects to reduce flood risk	X	X	X	X	X	X	X		Y	FDR	habitat, natural hydrology	BCR	real estate, ownership	GI, CAP
FRM2	Rehabilitate, modernize, and revitilize existing flood risk management projects	X	X	X	X	X	X	X		Y	FDR	none	BCR	none	PL 84-99
FRM3	Stormwater management	X	X	X	X	X	X	X	X	N*	water quality, habitat, FDR	none	BCR,	water quality, largely falls outside USACE mission	Section 510*, federal lands
FRM4	Reconnect streams with their floodplains	X	X	X	X	X	X	X	X	Y	habitat, wildlife, water quality, FDR	none	BCR, stream miles reconnected	water quality, largely falls outside USACE mission	Section 510, GI, CAP
FRM5	Conduct additional studies, surveys, and mapping including floodplain management studies, flood risk management studies, stormwater network mapping, etc.	X	X	X	X	X	X	X	X	Y	improved knowledge; better decision making	none	information- maps or reports produced	none	PAS, FPMS, Silver Jackets, Section 729
	Water Supply														
WS1	Provide a clean and reliable water supply for all competing uses	X	X	X	X	X		X		Y	water quality and supply, socioeconomic, habitat	none	gallons	USACE facilities provide water/water supply storage to a small portion of watershed	PL 85-500, PL 78-534, Secion 6
	Navigation														
N1	Maintain current navigation projects to provide benefits in the face of climate change and sea level rise	X			X			X		Y	navigation	additional impacts to Bay/river bottoms	feet maintained	impacts from climage change and sea level rise not definitive and will make long-term planning difficult	O&M, CAP
N2	Promote and utilize dredged material for habitat restoration and to address sea level rise	X			X			X		Y	habitat, sediment, wildlife	none	acres	costs; proximity of restoration sites to source of dredged material	Section 510, GI, CAP, O&M
	Coastal Storm Damage Risk Reduction														
CSDR1	Implement structural management measures	X			X		?	X		Y	CSDR, FDR, sediment, socioeconomic	habitat, natural hydrology	acres protected	ownership; costs	Section 510, GI, CAP
CSDR2	Implement non-structural management measures	X			X		?	X		Y	CSDR, FDR, sediment, socioeconomic, habitat	none	acres protected	ability to communicate benefits	Section 510, GI, CAP
CSDR3	Avoid areas most vulnerable to storm damage	X			X		?	X	X	Y	socioeconomic	displaced residents	acres	current societal mindset	Section 510, GI, CAP
CSDR4	Promote long-term planning that incorporates resiliency	X			X		?	X	X	Y	CSDR, FDR, sediment, socioeconomic, habitat	none		none	Section 510, GI, CAP
CSDR5	Further investigate management options for areas identified to be at risk by NACCS (Tier II/III analyses).	X			X			X	X	Y	CSDR, FDR, sediment, socioeconomic, habitat	habitat, natural hydrology	detailed plans, area protected	ownership; current footprint of built-out communities	Section 510, GI, CAP
CSDR6	Habitat restoration and/or construction to reduce coastal storm damage	X			X		?	X	X	Y	habitat, CSDR, sediment, wildlife, socioeconomic, FDR	none	acres protected, habitat acres	conflicts with current land uses	Section 510, GI, CAP
	Recreation														
R1	Increase public access opportunitie	X	X	X	X	X	X	X	X	Y	socioeconomic	none	area accessed, number of access points		GI, CAP

Definitions for 'Anticipated Benefits'

Habitat	provides habitat for one or more species
Wildlife	directly contributes to increased populations

Table 9c. Array of Potential Alternatives- Footnotes

Definitions for 'Anticipated Benefits'	
Habitat	provides habitat for one or more species
Wildlife	directly contributes to increased populations
Water quality	reduced nutrients and sediment, improved water clariy
CSDR	coastal storm damage reduction
FDR	flood damage reduction
Sediment management	contributes to sustainable regional sediment management
Socioeconomic	provides value to communities that include quality of life and economics

14. KEY FEASIBILITY STUDY ASSUMPTIONS AND ASSOCIATED UNCERTAINTIES

Assumptions and estimates associated with sea level change and climate change are relevant to any future feasibility studies, but particularly pertinent to those that address flood risk management, coastal storm risk management, and habitat restoration efforts dependent on water levels such as wetlands. Assumptions pertinent to the Chesapeake Bay Water Resources Restoration and Protection Plan are that diverse needs of multiple jurisdictional partners can be met by this broad plan. Future funding levels for jurisdictional implementation of projects as well as USACE funding levels are uncertainties. Additionally, with respect to contributing to the 2014 Chesapeake Bay Agreement goals, Management Strategies for the various outcomes are yet to be developed. These Management Strategies are intended to outline the necessary actions to achieve each individual outcome. The focus of the Chesapeake Bay Comprehensive Study will be to proactively work to determine the best way to coordinate the management strategies described in the 2014 Chesapeake Bay Agreement with the mission areas of not only the USACE, but those of the project stakeholders to work to restore and protect the health of the Chesapeake Bay.

15. FEASIBILITY PHASE COST ESTIMATE AND SCHEDULE

Feasibility phase cost estimate(s) and schedule(s) will progress as the interests of the sponsor(s) and partners are developed for potential feasibility studies. Under SMART Planning and 3x3x3, the total feasibility study cost must be $3 million and completed in 3 years time. Based upon current input from NFWF, it is anticipated that the total project cost for the Chesapeake Bay Water Resources Restoration and Protection Plan would be approximately $3 million at a 50% federal/50% non-federal cost-share.

16. LETTER OF INTENT

NATIONAL FISH and WILDLIFE FOUNDATION
1133 Fifteenth Street, N.W. Suite 1100
Washington, D.C. 20005
P 202-857-0166 | F 202-857-0162 | nfwf.org

October 15, 2014

Colonel J. Richard Jordan, III
Commander, U.S. Army Corps of Engineers
Baltimore District
P.O. Box 1715
Baltimore, MD 21203-1715

Dear Colonel Jordan:

This letter confirms the National Fish and Wildlife Foundation's (NFWF) general interest in serving as the Non-Federal Sponsor for the Chesapeake Bay Comprehensive Plan Feasibility Study.

NFWF has become a leader in the protection and restoration of the Chesapeake Bay watershed through the Chesapeake Bay Stewardship Fund (CBSF), an innovative public-private funding mechanism that provides state and local governments, watershed organizations and others partners a critical funding source for innovative and community-based approaches to Chesapeake Bay conservation. Since 1999, NFWF has invested more than $100 million in grant funding through CBSF to nearly 900 projects focused on Chesapeake Bay restoration. In 2012, NFWF released its landmark Chesapeake Bay Business Plan to further guide NFWF investments in the region and catalyze additional Federal and private funding sources.

NFWF fully supports greater integration of USACE in the Chesapeake Bay restoration effort. This new Chesapeake Bay Comprehensive Plan will help codify a more explicit role for USACE in implementing the new Chesapeake Bay Watershed Agreement, Executive Order 13508, and the Chesapeake Bay Total Maximum Daily Load and associated Watershed Implementation Plans (WIPs). USACE's unique mission areas and authorities, technical expertise, and construction resources can significantly accelerate the shared efforts of partners through these various commitments and further assist in achieving NFWF goals as outlined in our Chesapeake Bay Business Plan. NFWF specifically encourages USACE to consider CBSF as an efficient and effective mechanism for allocating eventual design-build assistance made available through a complemented Comprehensive Plan.

NFWF's continued interest in serving as the Non-Federal Sponsor is contingent on sustained USACE engagement of state partners in the scoping and reconnaissance effort, both in the recruitment of necessary cost-share resources and in identifying how USACE efforts can best complement and reinforce existing Watershed Implementation Plan commitments. The collective cash and in-kind resources invested by state and local partners in the WIP development process are significant and should be leveraged wherever possible in USACE's effort, including in consideration as eligible cost-share as appropriate.

Thank you for your continued engagement and I look forward to further discussion.

Sincerely,

Jake Reilly
Director, Chesapeake Bay Programs
National Fish and Wildlife Foundation

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