

Black Duck Outcome Management Strategy 2015–2025, v.2



(Photo by Will Parson/Chesapeake Bay Program)

I. Introduction

The American black duck has been called the “gold standard” of eastern waterfowl. Historically, the black duck was the most abundant dabbling duck in eastern North America and comprised the largest portion of the region’s waterfowl harvest. Despite its importance to hunters and outdoor enthusiasts, the continental black duck population declined by more than 50 percent between the 1950s and 1980s. Scientists believe this is due to loss of food and habitat (namely tidal wetlands) associated with changing land use. The Mid-Atlantic region, which includes the Chesapeake Bay watershed, supports the largest portion of eastern North America’s wintering black duck population, and preserving habitat in this

region is critical to the long-term sustainability of the species. Black ducks experience a variety of stressors during their annual lifecycle, many of which are beyond the control of conservationists in the watershed. However, managers can support the Chesapeake's portion of the continental population goal, as set by the North American Waterfowl Management Plan (NAWMP), by providing adequate food resources for ducks wintering in the Atlantic Flyway. As an important indicator species, restoration of habitat for black ducks will also benefit other waterfowl that winter in the Bay region.

II. Goal, Outcome and Baseline

This management strategy for the *Chesapeake Bay Watershed Agreement* identifies approaches for achieving the following goal and Outcome:



Vital Habitats Goal

Restore, enhance and protect a network of land and water habitats to support fish and wildlife, and to afford other public benefits, including water quality, recreational uses and scenic value across the watershed.

Black Duck Outcome

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.

This Black Duck Management Strategy aims to provide guidance to state and federal agencies, local governments, nongovernmental organizations (NGOs) and any group managing land and resources within the watershed to ensure that actions taken will benefit habitat outcomes for the American black duck as set forth by the *Watershed Agreement*.

Objectives:

- Adequate wintering habitat for 100,000 black ducks
- Ample foraging habitat for black ducks and connectivity across landscape
- Estimate breeding habitat management opportunities in areas where breeding has occurred historically and where it is known to occur currently

Baseline and Current Condition

The target is based on a NAWMP *continental* breeding population goal of 640,000 black ducks. The goal, most recently revised in 2004, is based on 1990 population estimates for this species. The core of the black duck population winters in the Mid-Atlantic region and biologists have agreed that achieving the watershed-scale goal of conserving adequate habitat in key areas to support 100,000 wintering black ducks will contribute significantly to the larger continental goal, thus facilitating the removal of black ducks from the Birds of Management Concern (BMC) list. Current data showing available energy and demand estimates for Maryland and Virginia indicates there is sufficient food to support 100,000 black ducks. However, this does not account for competition and assumes all food is available to and used by

black ducks. Management recommendations should emphasize slowing the rate of habitat loss into the future. They should also consider sea level rise and other factors that will affect available black duck habitat, as well as use and accessibility of that habitat.

Black duck numbers in the watershed are estimated annually through Mid-winter Waterfowl Surveys, which are conducted by teams of pilots and biologists from state resource agencies (and formerly the U.S. Fish and Wildlife Service). The number of wintering ducks is dependent on sufficient food resources like vegetation, tubers and bivalves. Protecting, restoring and improving the ability of Chesapeake marshes, especially tidal marshes, to support wintering ducks will be important in achieving the black duck population goal.

Mid-winter Waterfowl Survey results:

- 2012-2014: 48,828 black ducks
- 2013-2015: 51,332 black ducks

While state organizations continue to conduct the Mid-winter Survey, the USFWS discontinued collecting black duck Mid-winter Survey data in 2016. Because of this, the long-term monitoring of black duck populations through the Mid-winter Survey is not possible. The Chesapeake Bay Program will work to adopt a habitat-based indicator (in addition to tracking population numbers when made possible by individual states) to better reflect the Outcome language. Acres of restored, enhanced and protected black duck habitat will be tracked and counted toward Outcome progress. A baseline amount of existing black duck habitat will need to be established to accurately report progress. As primary black duck habitat exists as tidal, saltwater wetlands, this tracking and reporting process will occur separately of the non-tidal wetland based [CBP Wetland BMP Reporting Protocol](#).

Team Lead: Vital Habitats Goal Team

Workgroup Lead: Black Duck Action Team

Opportunities for Cross-Goal Team Collaboration:

- Wetlands Workgroup
- Stream Health Workgroup
- Submerged Aquatic Vegetation Workgroup

Participating Partners (**Signatory Agencies in Bold**)

Level of Participation: High (actively involved in drafting the management strategy)

- U.S. Fish and Wildlife Service (USFWS)
 - Black Duck Joint Venture (BDJV)
 - Atlantic Coast Joint Venture (ACJV)
- Natural Resources Conservation Service (NRCS)
 - Black Duck – Working Lands for Wildlife 2.0
- **State of Maryland**
 - Maryland Department of Natural Resources (MD DNR)

- **State of Delaware**
 - Delaware Department of Natural Resources and Environmental Control - Division of Fish and Wildlife (DE DNREC)
 - University of Delaware
- **Commonwealth of Virginia**
 - Virginia Department of Game and Inland Fisheries (DGIF)
 - Virginia Institute of Marine Science (VIMS)
- **U.S. Environmental Protection Agency (EPA)**
- U.S. Geological Survey (USGS)
- Alliance for the Chesapeake Bay (ACB): Local Government Advisory Committee (LGAC)
- **District of Columbia (DC)**
 - Department of Energy and Environment (DOEE)
- Ducks Unlimited (DU)
- University of Massachusetts
 - Northeast Climate Science Center, Landscape Ecology Lab, Department of Environmental Conservation

Level of Participation: Medium (actively involved in reviewing the draft documents)

- **Chesapeake Bay Commission (CBC)**

Likely Participating Federal Partners:

- U.S. Army Corps of Engineers (USACE)

Regional Entities/Plans:

- The **NAWMP** was created in 1986 by the waterfowl management community, and through its revisions has become a model for international conservation using a scientific approach to waterfowl habitat restoration and protection. The NAWMP is signed by the Secretary of the Interior of the United States, the Minister of the Environment of Canada and the Secretary of the Environment and Natural Resources of Mexico.
- The **Atlantic Coast Joint Venture (ACJV)**, one of 14 habitat joint ventures throughout the United States, brings public and private partners together to coordinate and improve the effectiveness of native bird habitat conservation throughout the Atlantic Flyway. The ACJV goal for waterfowl is to “protect and manage priority wetland habitats for migration, wintering and production of waterfowl, with special consideration to black ducks, and to benefit other wildlife in the joint venture area.”
- The **Black Duck Adaptive Harvest Management Working Group (HMWG)** and the **Black Duck International Management Group (Management Group)**, formed in 2000 and 2008, respectively, include federal, provincial and state partners in the Atlantic and Mississippi Flyways of the United States and Canada. HMWG provides technical advice to the Management Group,

which is responsible for developing an international black duck harvest management strategy to ensure that hunting regulations in the United States and Canada are maintained and enforced to promote healthy populations of black ducks and other waterfowl.

- All **USFWS Refuges** are required to use the latest science and public participation to develop a **Comprehensive Conservation Plan (CCP)** to ensure that management actions fulfill the overall refuge mission. Actions detailed in each CCP support State Wildlife Action Plans (SWAPs) and improve habitat conditions for wildlife.

Most, if not all, of the CCPs of the USFWS Refuges within the watershed prioritize black duck habitat management. Examples include Chesapeake Marshlands NWR Complex (includes Blackwater, Glenn Martin and Susquehanna National Wildlife Refuges), Eastern Neck NWR, Eastern Shore of Virginia/Fisherman Island Refuges, Potomac River NWR Complex, James River NWR, Great Dismal Swamp Refuge Complex (the complex includes Nansemond NWR, which is entirely within the Chesapeake Bay watershed), Patuxent Research Refuge and the Occoquan Bay NWR.

Some of the black duck habitats mentioned in the CCPs include salt marsh, fresh/brackish emergent wetland, beach/dune habitat, managed waterfowl impoundments, palustrine emergent forests and submerged aquatic vegetation (SAV) beds, barrier and bay islands, croplands, moist soil units (low-lying, wet, non-forested areas where water is seasonally impounded), and green tree reservoirs (lowland forests that are seasonally flooded to attract waterfowl).

- **Bird Conservation Regions (BCRs)** are ecologically distinct regions that encompass landscapes having similar bird communities, habitats and resource issues. BCRs have management plans that prioritize conservation actions specific to the ecosystem within that region. BCRs 29 and 30—the Piedmont and the New England/Mid-Atlantic Coast Bird Conservation Regions, respectively—cover the Chesapeake Bay watershed.

To determine priority level, bird groups were ranked based on BCR-specific information, SWAPs and other valuation factors such as the population and threat level within that region. The Piedmont Bird Conservation Region (BCR 29) lists the black duck as a high priority species in their management plan. The New England/Mid-Atlantic Coast Bird Conservation Region (BCR 30) designates black ducks as “highest” priority. Current efforts in Bird Conservation Region 30 include delineating and defining geographic focus areas for priority species, estimating populations and habitat goals, identifying monitoring and research needs for priority birds and their habitats, building communication with partners and stakeholders, and linking bird conservation efforts.

III. Factors Influencing Success

Many factors, with wide-ranging levels of importance and management potential, influence the attainment of the black duck objectives.

Black ducks use a wide variety of habitat types throughout the Chesapeake Bay watershed. Slightly different habitat characteristics are needed for breeding (nesting and brood-rearing), migration and wintering. Nesting can occur in upland areas or in lowland salt marsh habitats. After hatching, female black ducks typically lead their broods a considerable distance away from the nest, into marsh areas with adequate food resources and appropriate cover from predators and weather. Duckling survival is greatest when using interior rather than tidal habitats, likely due to increased predator numbers in tidal marshes. During migration, black ducks have greater flexibility than breeding birds with regard to their resource needs. They need adequate cover in the form of emergent, forested or scrub/shrub wetlands. Their feeding needs can be met by resources found in a variety of wetland types, but whether they are breeding, migrating or wintering, black ducks prefer undisturbed habitat and are rarely found near human developments. Black duck wintering habitat characteristics typically include large bodies of open water, ample food resources, little to no disturbance and cover for protection from severe weather.

Several factors have affected the black duck population within the watershed. While they are all important, the factors are listed below in rank order from most to least critical.

Factors Influencing Ability to Meet Goal:

1. Habitat conditions including habitat loss, degradation and fragmentation (including at other ends of the Atlantic Flyway population's range)
2. Food availability: affected by competition and proximity to disturbance (e.g., developed lands)
3. Shoreline disturbance
4. Climate impacts
 - Sea level rise
 - Flooding (habitat availability)
 - Salt marsh migration/salinity changes
 - Large storm events
 - Migration pattern and/or wintering range shift

Human System Factors:

1. Adequate financial resources
 - Administration and incentives
2. Effective policy in place for achieving goals
3. Sufficient knowledge about black duck habitat needs
4. Permitting issues (permits are required for any action that may impact the land, which could affect availability of habitat and food sources for black ducks)
5. Habitat restoration, enhancement and management, and protection efforts
6. Habitat and population monitoring efforts
7. Habitat use conflict
8. Local government engagement
9. Adequate extension infrastructure
 - Outreach
 - Technical assistance

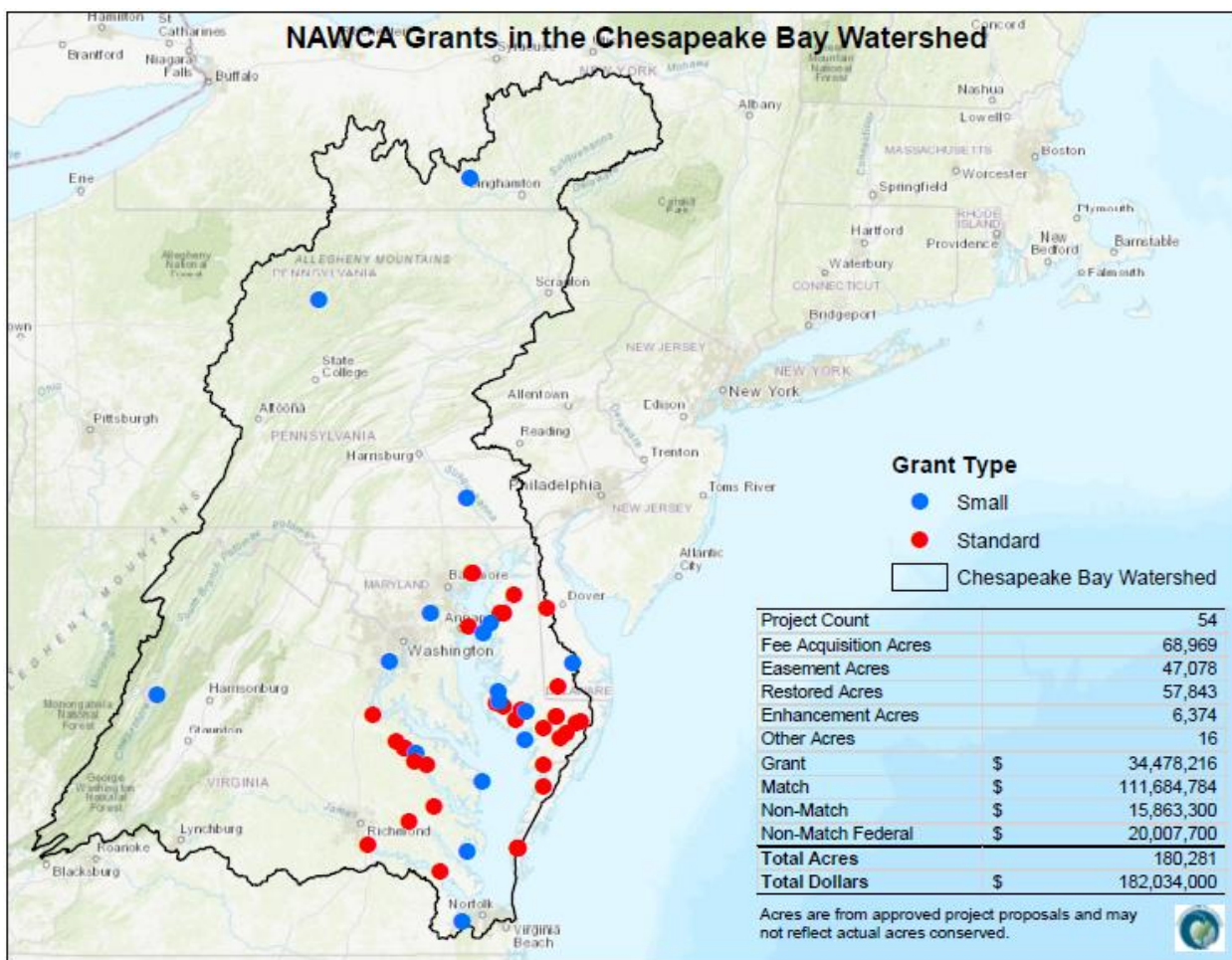
IV. Current Efforts and Gaps

Partner Coordination (Restoration, Enhancement, and Protection Activities, Financial Resources, and Extension Infrastructure)

- **Maryland:** The Maryland Department of Natural Resources uses the ACJV strategic plan for specific management guidance, and their actions currently involve conserving and restoring black duck habitat—primarily wintering and some breeding. Maryland has been active in purchasing properties for protection over the past 7 years and plans to continue these efforts. The state is doing restoration work at Deal Island—along with Ducks Unlimited, Maryland is actively monitoring water levels to regrow SAV inside an impoundment. Maryland is also working on the enhancement of freshwater impoundments at Natural Resource Areas in Maryland.
- **Virginia:** Virginia is not participating in restoration work but is working on berm rehabilitation and water level management enhancement projects in black duck habitat areas. The state will help NRCS prioritize projects for the Working Lands for Wildlife program. Virginia recently acquired a new tract of land that will put 2,500 acres of habitat in protection.
- **District of Columbia:** Limited habitat resources in the District will restrict the potential for a large wintering population or a small regular breeding population of black ducks in the foreseeable future. Climate change is also a concern and may impact or eliminate black duck habitat in the District in 25 to 50 years. Management actions in the District include: SAV restoration; stormwater runoff and erosion controls around wetlands; limiting impact of free-ranging cats; wetland restoration and conservation; and non-migratory goose management.
- **Ducks Unlimited:** Their priority areas are in Virginia, Maryland, Delaware and a small portion of Pennsylvania and are closely aligned with the NAWMP priorities. Their efforts focus on habitat conservation in areas utilized by black ducks and other migratory waterfowl. A regional action plan is in place that lays out the number of acres to target. DU is also partnering with and supporting various academic institutes to complete research projects in the region, some of which directly relate to black ducks and their habitat in the Chesapeake Bay. DU will restore 50 acres at Blackwater National Wildlife Refuge that show up as National Wetland Inventory (NWI) as wetlands. DU has been doing fresh emergent wetland restoration on agricultural land in the Maryland mid-shore area for past five to six years and will continue this work through the help of a Chesapeake and Atlantic Coastal Bay Trust grant. This restoration work is done free of cost to landowners.
- **Natural Resources Conservation Service:** The Natural Resource Conservation Service (NRCS), working with partners including Ducks Unlimited, The Nature Conservancy, National Fish and Wildlife Foundation, Black Duck Joint Venture, Atlantic Coast Joint Venture, and United State Fish & Wildlife Service, has approved a Black Duck Working Lands for Wildlife 2.0 project in DE, MD, NJ and VA. The Chesapeake Bay Watershed priority areas are on the Delmarva peninsula. This partnership effort will add staff capacity for outreach and technical assistance. NRCS will provide financial assistance for voluntary habitat restoration activities through the Environmental Quality Incentives Program and habitat protection through easements. A 2017 Chesapeake Bay Program GIT Funding project currently underway will provide a contractor to

work directly with landowners in targeted outreach areas to increase enrollment in habitat protection and restoration programs like Working Lands for Wildlife 2.0.

- Current funding assistance for work related to conservation actions that could benefit black ducks within the watershed includes the National Fish and Wildlife Foundation (NFWF) Chesapeake Bay Stewardship Fund, the USFWS North American Wetlands Conservation Act (NAWCA) grant programs, the USFWS National Coastal Wetlands Grants, the USFWS Partners for Fish and Wildlife Program grants and cooperative agreements, and Natural Resources Conservation Service (NRCS) Farm Bill incentives. Past efforts using these funding sources include habitat protection and restoration on refuges as well as private lands. For example, more than 167,000 total acres have been affected (via restoration, enhancement or protection) by NAWCA grants in the watershed (Figure 1).



ACJV September 2018 kirsten_luke@fws.gov

Figure 1. NAWCA Grants in the Chesapeake Bay watershed

Scientific and Technical Understanding (Monitoring Efforts, Food Availability, Habitat Conditions, Climate Impacts)

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- The ACJV recently completed a bioenergetics model of the Chesapeake Bay watershed to estimate black duck habitat needs under current and future landscape conditions (see Figures 2 and 3 below). It takes into consideration black duck populations in the watershed, use of wetland habitat type, energetic needs of black ducks, and urban growth and climate change projections. The ACJV developed targeted metrics of the number of acres of black duck habitat that need protection, restoration and enhancement to reach Bay Program goals. The resulting decision support tool includes 2030 (Figure 2) and 2080 (Figure 3) projection maps of the watershed, depicting each HUC12 sub-watershed with potential black duck habitat as “deficit” (does not currently meet energy needs to support 100,000 wintering black ducks—areas in which restoration or enhancement should be prioritized) or “surplus” (currently meets energy needs to support 100,000 wintering black ducks—areas in which protection should be prioritized). The ACJV modeling team is working to develop an enhancement/restoration prioritization scheme for HUC12 watersheds. This information will be used to develop a new habitat-based outcome indicator with which to measure progress.
 - The USFWS Black Duck Joint Venture (BDJV), in partnership with the Canadian Wildlife Service (CWS), USFWS National Refuge System, and state and provincial agencies in the Atlantic and Mississippi Flyways, is conducting a two-season banding program to obtain estimates of winter-summer survival to investigate the influence of winter habitat and conditions on population dynamics. The BDJV continues to provide technical support for the maintenance and implementation of the International Black Duck Harvest Management Strategy.
 - Federal science agencies (USGS and USFWS) worked with the BDJV, the ACJV and state and local partners to model the amount of energetically viable habitat available for wintering black ducks within the refuges of the Bay Watershed, including a five-kilometer buffer of surrounding habitat. This allowed them to produce management recommendations for increasing the quality and quantity of habitat available (including SAV) in the face of sea-level rise and development projections (two food availability factors). The final step is to convert the energetically viable habitat into acreage amounts, to be incorporated into a decision support tool (DST).
 - USGS plans to map hotspot areas of waterfowl use in the Chesapeake Bay watershed? using USFWS and state mid-winter waterfowl surveys and possibly E-Bird data to identify areas of greatest diversity of waterfowl species. This will subsequently inform site selection for in-depth wetland stressor modeling. These data would aid in the selection of areas where management actions could benefit wintering waterbirds and potentially showcase changes over time.

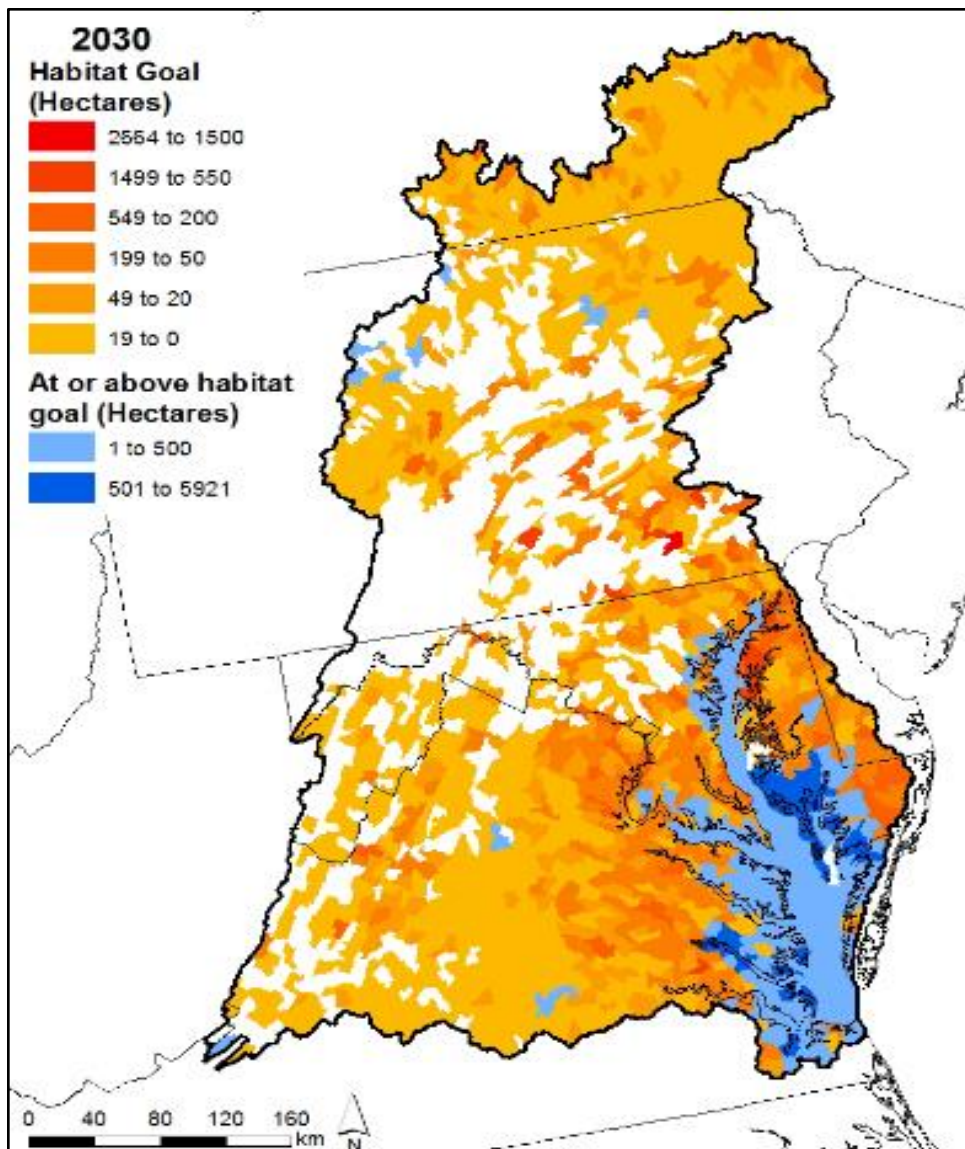


Figure 2. 2030 Predicted Black Duck Food Availability by Sub-watershed (ACJV).

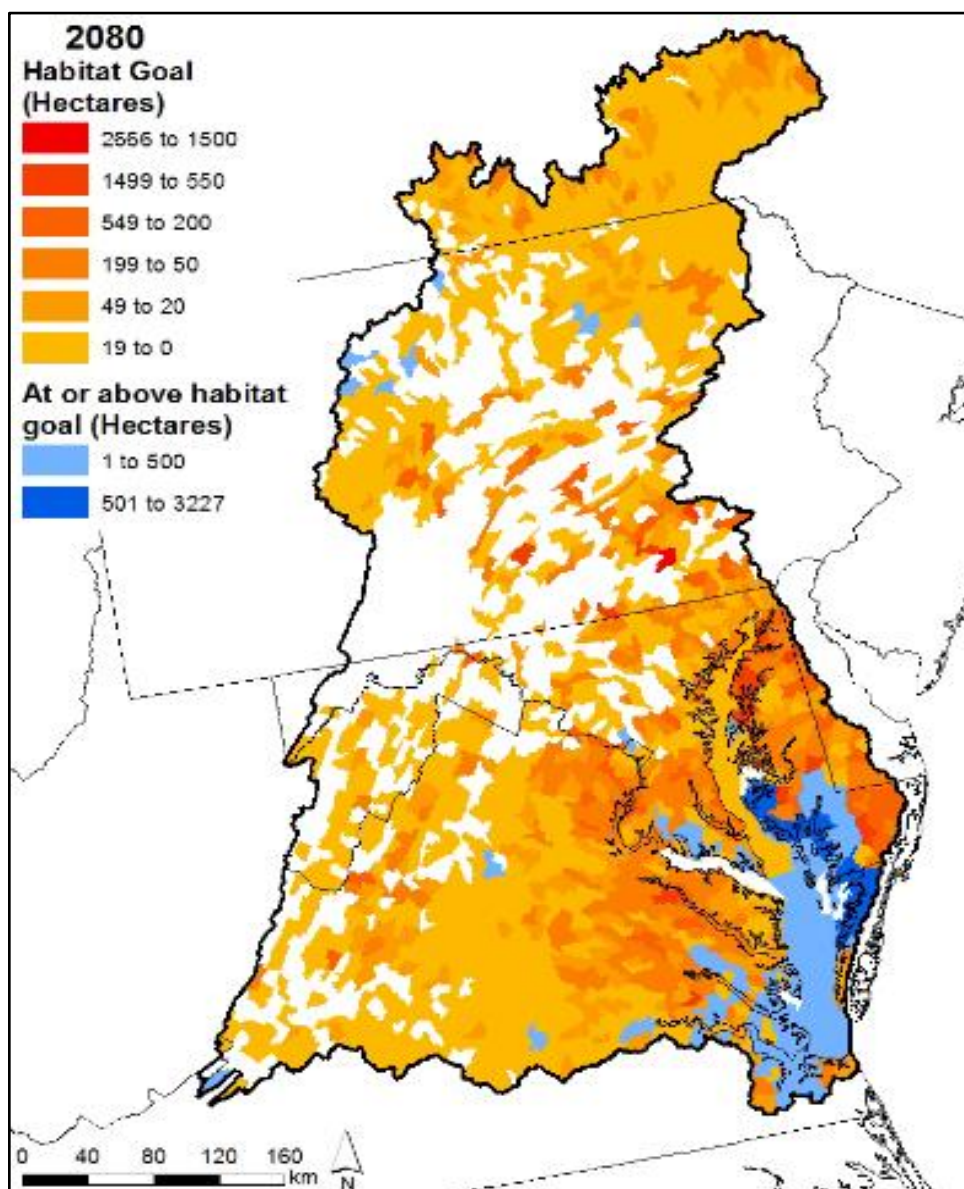


Figure 3. 2080 Predicted Black Duck Food Availability by Sub-watershed (ACJV).

Monitoring

- While states and partner agencies continue to conduct a Mid-winter Survey, the USFWS discontinued collecting black duck Mid-winter Survey data in 2016. Because of this, the long-term monitoring of black duck populations through the Mid-winter Survey is not possible. The Chesapeake Bay Program is working to adopt a habitat-based indicator (in addition to tracking population numbers when made possible by individual states) to better reflect the Outcome language.

Gaps Affecting Black Duck Outcome Progress

- Need for the translation of ACJV DST maps to HUC12 sub-watershed level and communication of sub-watershed level information with partners.
- Need for further development and implementation of Black Duck DST at state level in order to focus work in priority areas.
- Need for incorporation of refuge-specific data into bioenergetics model.
- Need to keep local decision makers engaged in and aware of black duck habitat protection efforts and ways to incorporate protection efforts into local decision making.
- Need for land protection efforts to include areas that allow for inland marsh migration.
- Need for adequate capacity for restoration, enhancement and conservation efforts (funding and personnel are worn thin as protected areas to conserve increase).
- Need for adoption of habitat-based Outcome indicator and the technical assistance necessary to do so.
- Need for partners to be able to choose appropriate habitat restoration, enhancement or conservation sites according to food availability.
- Need for formal method with which to track/monitor partner progress toward Outcome.
- Need for funding for on the ground conservation work.

V. Management Approaches

The partnership will work together to carry out the following actions and strategies to achieve the Black Duck Outcome. These approaches seek to address the factors affecting the ability to meet the goal and the gaps identified above.

The Black Duck Outcome specifies that efforts of the strategy should be focused on *habitat*; therefore, wintering (resting/feeding, e.g. coastal salt marsh) and breeding (nesting/rearing, e.g. boreal forest) locations should be targeted to ensure vital habitat availability for black ducks within the watershed. Science partners (BDJV, ACJV and USGS) will work to improve information needed for decision-making toward habitat restoration, enhancement and protection. Efforts will include the use of land-change models and projections of sea-level rise to forecast potential loss of black duck habitat. Researchers and managers have discovered that wetland patch size is important (bigger is better), connectivity should be prioritized, and accessibility to forested and other wetland habitats and submerged aquatic vegetation (SAV) beds are key elements for black duck success in the watershed. It is also important to recognize that actions occurring outside of the watershed, while impactful to the species, are separate from the ability of managers to restore, enhance and preserve wetland habitats available to black ducks in this region.

The conservation actions listed below, if conducted in key black duck habitats, while also taking other limiting factors into consideration, will make the most significant impact on the ability to provide adequate wintering, and to some extent breeding, habitat for this far-ranging species. Additionally, these actions should benefit other waterfowl that utilize these habitats.

Support Efforts to Restore Degraded Wetlands or Vegetation in Areas Where Black Ducks Have Historically Bred or Wintered

Supporting partner efforts to restore degraded wetlands or vegetation in areas where black ducks have historically bred or wintered would be beneficial to the Black Duck Outcome. Tidal wetland hydrology restoration, riparian restoration of key land parcels on breeding grounds, and restoration of migration routes and wintering grounds are just a few examples of the types of restoration activities that land managers and conservation partners could consider to achieve the Black Duck Outcome.

Support Efforts to Enhance and Manage Wetlands or Vegetation in Areas Where Black Ducks Have Historically Bred or Wintered

Black duck habitat enhancement and management activities may include:

- Improving water level management on managed wetlands (replacing compromised water control structures, leaking levees, etc. to improve management capability)
- Restoring SAV or converted wetlands
- Open marsh management (to restore non-tidal waters back to salt marsh, for example)
- Restoring and managing riparian buffers
- Beaver management
- Controlling exotic and invasive species
- Prescribed burning
- Implementing Farm Bill conservation programs.

Support Efforts to Protect Wetlands or Vegetation in Areas Where Black Ducks Have Historically Bred or Wintered

Protection actions such as fee title acquisition, conservation easements, cooperative agreements, leases and financial incentives should be implemented in areas with adequate habitat and ideal circumstances for protection. To leverage existing protection while also increasing buffering from climate impacts, protecting land adjacent to National Wildlife Refuges or other public lands may be beneficial.

Other Conservation Actions Benefiting Waterfowl Habitat

In addition to habitat restoration, enhancement, management and protection, the following actions could have a direct or indirect impact on ensuring adequate black duck habitat in the watershed:

- The creation and adoption of a habitat-based outcome indicator, including a streamlined partner progress reporting/monitoring process
- Regulatory legislation and enforcement
- Streamlined regulation
- Wetland mitigation
- Information/education
- Extension education on best management practices
- Simplification/streamlining of permitting processes
- Public use management
- Watershed protection and management
- Management of competition and hybridization (with other waterfowl, particularly mallards)
- Predator management (especially on Bay islands)

Choosing Appropriate Sites

When choosing sites for restoration, enhancement or protection activities, partners and conservation managers should explore areas where dense populations of black duck populations are known to currently (and historically) occur and where food availability is medium to high, but where the risk of habitat loss due to sea level rise and/or land conversion is low. Conservation managers are now able to consult the ACJV bioenergetics DST to assist in choosing appropriate sites. A few possibilities include the Chester River, Fishing Bay and Patuxent River. In the Chester River area, there are large farms which have not been subdivided and where shoreline development is low; the Fishing Bay area has large amounts of public-owned and protected salt marshes with low disturbance and very little concern regarding encroaching development; and the Patuxent River may have excellent opportunities for coastal marsh system protection in close proximity to forested wetlands. Sea level rise and lack of inland tidal wetland migration could hinder efforts in a variety of these areas, however, and must be considered in planning.

VI. Monitoring Progress

As of 2016, most jurisdictions within the watershed conduct the Mid-winter Waterfowl Survey to determine population estimates. The results of these surveys have served as indices of the extent of black duck (and other waterfowl) use of the available habitat. Inadequate resources (funding and personnel) prevent the U.S. Fish and Wildlife Service from supporting this survey, making it difficult to accurately count black duck populations. While some watershed jurisdictions do fly their own surveys, not all count black duck populations.

Because the Black Duck Outcome specifically states habitat for 100,000 black ducks should be made available, the Bay Program will develop and implement a habitat-based indicator using the

ACJVbioenergetics DST. The Bay Program will measure acres of wintering black duck habitat restored, enhanced and protected each year as reported by watershed jurisdictions. Representatives from all jurisdictions will compile all state, federal and nongovernmental wetland conservation accomplishments for each year. Separately, USGS plans to complete hotspot mapping of waterfowl use in the Chesapeake Bay using USFWS and state Mid-winter Waterfowl Surveys (and possibly E-Bird data) to identify areas of greatest diversity of waterfowl species, and subsequently to inform site selection for in-depth wetland stressor modeling. These data would aid in the selection of areas where management actions could benefit wintering waterbirds and potentially showcase changes in population over time. The Bay Program will continue to track population numbers when made possible by individual states. Further guidance on tracking conservation actions will be developed in the coming two years.

VII. Assessing Progress

The progress will be assessed by tracking conservation actions of watershed jurisdictions and comparing acreage to the ACJV's bioenergetics DST predicted acreage needed to reach the Outcome goal. This information will be collected and evaluated on an annual basis. Further guidance on assessing progress will be developed in the coming two years.

VIII. Adaptively Managing

As the landscape changes with implementation of the restoration, enhancement and protection actions described above, and as climate change and land use activities impact the available habitat, it will be necessary to rerun the habitat and food availability models to determine where the priority areas are within the watershed and assess whether there have been shifts in those priority areas. Conservation managers will determine research needs to better inform the adaptive management cycle, such as which habitat management effort provides the highest quality habitat for black ducks and whether the available resources and actions completed will support 100,000 black ducks. Annual reports by Action Team partners

Lessons Learned **Habitat Based Indicator** **Development**

The Atlantic Coast Joint Venture (ACJV) recently completed a bioenergetics model of the Chesapeake Bay watershed to estimate black duck habitat needs under current and future landscape conditions. It takes into consideration black duck populations in the watershed, use of wetland habitat type, energetic needs of black ducks, and urban growth and climate change projections. The ACJV was able to develop targeted metrics of the number of acres of black duck habitat that needs protection, restoration and enhancement to reach Bay Program goals.

The resulting decision support tool includes 2030 and 2080 projection maps of the watershed, depicting each HUC12 sub-watershed with potential black duck habitat as "deficit" (does not currently meet energy needs to support 100,000 wintering black ducks—areas good for restoration or enhancement) or "surplus" (currently meets energy needs to support 100,000 wintering black ducks—areas good for protection).

Because the black duck outcome specifically states habitat for 100,000 black ducks should be made available, the Bay Program will develop and implement a habitat-based indicator using the ACJV bioenergetics DST. Progress will be assessed by tracking conservation actions of watershed jurisdictions and comparing acreage to the ACJV's bioenergetics DST predicted acreage needed to reach the outcome goal. This information will be collected and evaluated on an annual basis.

will provide data on the acreage of black duck habitat restoration, enhancement and conservation taking place in the Watershed, allowing the CBP to track outcome progress.

IX. Biennial Workplan

Workplans for each management strategy will be revised biennially. They will include the following information:

- Each key action
- Timeline for the action
- Expected outcome
- Partners responsible for each action
- Estimated resources