

VIRGINIA ECOLOGICAL SERVICES STRATEGIC PLAN 2010 - 2014

February 2012



This document will not be updated in 2014 due to Federal budget instability and decreases in staffing within the Virginia Ecological Services offices of the U.S. Fish and Wildlife Service. We will delay the work involved in updating this Strategic Plan until such time as staff can be made available to conduct a quality assessment and update. Accomplishments under the Virginia Ecological Services Strategic Plan will continue to be reported utilizing the Ecological Services Priority Planning database that was created for this purpose.

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U.S. Fish and Wildlife Service

Mission

Working with others to conserve, protect, and enhance fish, wildlife, plants, and their habitats for the continuing benefit of the American people.

Vision

We will continue to be a leader and trusted partner in fish and wildlife conservation, known for our scientific excellence, stewardship of lands and natural resources, dedicated professionals, and commitment to public service.

Conservation Principles

Stewardship - Our ethic is to conserve natural resources for future generations.

People - Our employees are our most valued asset.

Science - Our work is grounded in thorough, objective science.

Partnerships - We emphasize creative, innovative partnerships.

Professionalism - We hold ourselves to the highest ethical standards, strive for excellence, and respect others.

Legacy - We ensure the future of natural resource conservation by connecting people with nature.

Service - It is our privilege to serve the American people.

Priorities

National Wildlife Refuge (NWR) System - Conserving our lands and resources.

Landscape Conservation - Working with others.

Migratory Birds - Conservation and management.

Threatened and Endangered Species - Achieving recovery and preventing extinction.

Aquatic Species - National Fish Habitat Action Plan and trust species.

Connecting People with Nature - Ensuring the future of conservation.

Ecological Services Programs

Ecological Services is a program of the U.S. Fish and Wildlife Service (Service). Biologists in Ecological Services work to reduce or eliminate threats to endangered and threatened species, migratory birds, and nationally significant fisheries through habitat and ecosystem conservation and restoration, endangered and threatened species recovery activities, assessing and eliminating the impacts of contaminants, minimizing impacts of the built environment, and fish passage improvements. Within Ecological Services the following programs address these issues.

Conservation Planning Assistance (CPA) Program

The Service uses its authorities under the Clean Water Act (CWA), Endangered Species Act (ESA), Federal Power Act, Fish and Wildlife Coordination Act (FWCA), National Environmental Policy Act (NEPA), and other laws and to protect fish and wildlife resources. Protection of these resources is accomplished

through early coordination between the Service and other federal agencies on project planning and design to minimize potential environmental impacts and provide for successful mitigation for unavoidable impacts. The coordination may include projects constructed by federal agencies, projects permitted under the U.S. Army Corps of Engineers' (Corps) regulatory program, and projects licensed for non-federal hydropower projects, as well as various federal actions on and off federal lands.

Endangered Species (ES) Program

The Service and the National Marine Fisheries Service (NMFS) are the principal federal agencies responsible for administering the ESA. The Service and NMFS recover and conserve our Nation's imperiled species by fostering partnerships, employing scientific excellence, and developing a workforce of conservation leaders. We strive to ensure a strong scientific basis for decisions regarding endangered and threatened species to facilitate large-scale planning to accommodate land use and wildlife habitat and to promote innovative public/private partnerships. We carry out our responsibilities through candidate conservation, consultation with other federal agencies, administration of grants for states and territories, applicant assistance during the Habitat Conservation Planning process, ensuring development is consistent with conserving listed species, listing species, designating critical habitat, recovery plan development and implementation, and working with Native American Tribes.

Environmental Contaminants (EC) Program

The Service works with other organizations to investigate, identify, and monitor contaminant impacts to fish and wildlife resources on and off NWRs. We ensure that Service lands are purchased and managed in ways that do not expose fish and wildlife to harmful chemicals or the Service to legal liability. Studies are conducted to determine how pollution affects fish and wildlife, and we propose actions to reduce or eliminate pollution in our environment. We investigate oil and hazardous chemical spills so harm to fish and wildlife can be minimized. We restore natural resources destroyed or degraded by oil spills or hazardous waste. We work with state and other federal natural resource agencies to plan and implement restoration activities to compensate for injury to fish, wildlife, and their habitats from the released contaminant.

Partners for Fish and Wildlife (PFW) Program

The Service protects, enhances, and restores important fish and wildlife habitats on private lands through partnerships, offering an opportunity to regain some of America's most important natural resources. This voluntary cost-share program builds on the strength and interest of committed individuals and organizations to accomplish shared conservation goals.

Virginia Ecological Services – Strategic Plan Development

Virginia Ecological Services is comprised of the Virginia Field Office (VAFO) located in Gloucester and the Southwestern Virginia Field Office (SVFO) located in Abingdon.

Purpose

The purpose of developing and implementing a Strategic Plan for Virginia Ecological Services is to work as one group, crossing and blurring program boundaries, to determine statewide resource priorities and

a strategic approach to addressing these priorities in our daily actions, resulting in a more focused effort on specific Service priorities that will produce the largest conservation benefit.

Priority Identification

In August - September 2009, Virginia Ecological Services supervisors met to discuss a draft methodology to determine our resource priorities throughout Virginia. On a state map of Virginia we overlaid GIS layers of federal trust species and priority habitats, including 1) Bird Conservation Regions and distributions of high priority migratory bird species; 2) fish and mussel priorities as determined by the Service’s Northeast Region Fisheries Program Strategic Plan Fiscal Year 2009; 3) occurrences of federally listed and proposed species, federal candidate species, and species of concern and federally designated critical habitat (grouping of designations referred to as listed species); and 4) acquisition boundaries of the Service’s NWRs. The outcome was a preliminary map with multiple areas proposed for consideration as priorities (see September 2009 map in Appendix 1). The supervisors agreed that after the final priority areas were determined, a threats assessment (using categories such as threats to the species, cause of the threats, level of threat, what Ecological Services can do to address the threats, and who can help Ecological Services address the threats) would be conducted for each area to help focus actions within that priority area. For each priority area there was an associated species list of priority migratory birds, fish/mussel species of conservation concern, and listed species. Note that the Service’s Landscape Conservation priority was not explicitly discussed as it was interwoven in all of the above and subsequent discussions.

In October 2009 Virginia Ecological Services staff discussed the preliminary map of priority areas. This led to an in-depth discussion of trust resources/priorities (i.e., listed species, migratory birds, interjurisdictional fishes, NWRs, Connecting People with Nature) and how we may or may not be able to focus on these resources with existing programs, staff, and financial resources. We ultimately agreed that we would focus on listed species, migratory birds, interjurisdictional fishes, and NWRs. We then discussed which areas and listed species should/should not be a priority, and for which Ecological Services Program(s) (CPA, ES, EC, PFW) these would be a priority. The following table summarizes that discussion (the specific species listed below are those for which Virginia Ecological Services has Service lead):

Priority	EC Focus	PFW Focus	ES/CPA Focus	Comments
Madison Cave isopod (<i>Antroulana lira</i>)	X	X	X	Make a priority area for this species
Virginia round-leaf birch (<i>Betula uber</i>)				Do not make a priority area for this species – already encompassed by other priority areas, on U.S. Forest Service (USFS) lands
Virginia spiraea (<i>Spiraea virginiana</i>)				Do not make a priority area for this species – brink of recovery species
James spiny mussel (<i>Pleurobema collina</i>)	X	X	X	Add remaining Virginia distribution of this species to make a priority area for this species
Northeastern beach tiger beetle (<i>Cicindela dorsalis dorsalis</i>)			X	Add remaining Virginia distribution of this species to make a priority area for this species – work with Corps to increase recovery prospects

Priority	EC Focus	PFW Focus	ES/CPA Focus	Comments
Roanoke logperch (<i>Percina rex</i>)	X	X	X	Add remaining Virginia distribution of this species to make a priority area for this species
Virginia sneezeweed (<i>Helenium virginicum</i>)				Do not make a priority area for this species – see if Missouri will take the lead
Shale barren rock-cress (<i>Arabis serotina</i>)				Do not make a priority area for this species – partially encompassed by other priority areas mostly on USFS lands
Sensitive joint-vetch (<i>Aeschynomene virginica</i>)				Do not make a priority area for this species – concerns about impacts to species from sea level rise, already on NWR lands, not a lot more we can do
Shenandoah salamander (<i>Plethodon shenandoah</i>)				Do not make a priority area for this species – completely on National Park Service lands
Virginia fringed mountain snail (<i>Polygyriscus virginianus</i>)				Do not make a priority area for this species – low prospect for recovery
Peter's mountain mallow (<i>Iliamna corei</i>)				Do not make a priority area for this species – completely on The Nature Conservancy (TNC) lands
Upper Tennessee River Basin	X	X	X	Keep as priority area – national biodiversity hotspot/part of United Nations Southern Appalachians Man and the Biosphere Reserve
Upper Roanoke River	X	X	X	Keep as priority area – focus only on Roanoke logperch
Nottoway River		X	X	Keep as priority area – high level of Atlantic Slope fish/mussel diversity/endangered aquatics
Lower Rappahannock River	X			Change this priority area to Rappahannock River Valley NWR acquisition boundary
Upper James River	X	X	X	Keep as priority area
Eastern Shore	X	X	X	Keep as priority area – United Nations Biosphere Reserve/migratory birds/biodiversity
Blackwater River		X		Keep as priority area
Northern Albemarle	X	X		Change this priority area to Great Dismal Swamp NWR acquisition boundary

Note – In some priority areas all Ecological Services programs will work to address threats together or with our partners. In other priority areas one or more Ecological Services programs will be addressing these threats.

After additional discussions, the Upper Roanoke River was encompassed in the Roanoke Logperch priority area. The Upper Tennessee River Basin (defined here as all waters above the U.S. Geological Survey gauging station at Chattanooga, Tennessee) was divided into two areas because, while some problems are common throughout, the Clinch and Powell Rivers Watershed and Holston River Watershed face different threats (see February 2011 map in Appendix 1).

In November 2011, the plan was reviewed and as part of that process we examined the original priority areas and the work we proposed/accomplished in each. As a result of that review and associated staff discussions, it was agreed that the Upper James River Watershed priority area would be removed from the plan because it was encompassed in the James spiny mussel priority area and benefits proposed for the Chesapeake Bay would be reached through conservation actions in other priority areas (i.e., James Spiny mussel, Northeastern Beach Tiger Beetle, Rappahannock River Valley National Wildlife Refuge) (see December 2011 map in Appendix 1). The result was 11 priority areas.

Some priority areas are large in size and we are not able to work effectively throughout the entire area. In November 2011 as we reviewed/redefined our priority areas, we identified focal areas within some priority areas. Focal areas define a more specific geographic area within a priority area in which our efforts will be focused (see maps in Appendix 2).

Blackwater River Watershed Priority Area (PFW Focus) – This watershed contains 80+ priority migratory bird species, several fisheries species of conservation concern, 1 listed species, and several species of concern. It is an important headwater to the Albemarle and Pamlico Sounds. Initial work is being conducted under the Service’s Northeast Region Strategic Plan Fiscal Year 2007-2011, Partners for Fish and Wildlife/Coastal Program. Our goal is to restore 100 acres of longleaf pine habitat for the federally listed red-cockaded woodpecker (*Picoides borealis*) and priority migratory birds in coordination with over 20 partners in America’s Longleaf: A Restoration Initiative for the Southern Longleaf Pine Ecosystem and the Rangewide Conservation Plan for Longleaf Pine (Regional Working Group for America’s Longleaf 2009).

Blackwater Red-cockaded Woodpecker Habitat Restoration Focal Area – This area historically supported longleaf pine dominated ecosystems and their unique community of species, including the red-cockaded woodpecker. This area is comprised of sandy or acidic nutrient poor soils (primarily Entisols and to a lesser extent Ultisols and Spodosols) that are uniquely suited to and support the vast majority of longleaf pine. We will pursue funding to restore 100 acres of longleaf pine habitat for the red-cockaded woodpecker and priority migratory birds in coordination with partners.

Clinch and Powell Rivers Watershed Priority Area – This watershed has 30+ federally listed, proposed, and candidate species, many of which are also fisheries species of conservation concern, 30+ priority migratory bird species, many species of concern, and designated critical habitat for 6 aquatic species. This watershed is an important headwater of the Tennessee River system and is a globally significant area of biodiversity. The Clinch and Powell rivers are part of an area designated in 1988 by the United Nations Educational, Scientific, and Cultural Organization as the Southern Appalachian Man and the Biosphere Reserve (<http://www.unesco.org/mabdb/br/brdir/directory/biores.asp?mode=all&code=USA+44>). Our goal is to protect and recover these species and maintain and restore the habitats upon which they depend. Our next steps towards this goal are ensure water quality protections are in place through coal mining permit reviews; evaluate the exposure and toxicological effects of contaminant stressors in the water and sediment; continue to propagate and release listed fish and mussel species injured from spills; finalize a streambank stabilization project on the North Fork Powell River; and continue to facilitate a Cooperative Conservation Partnership Initiative Program in partnership with the U.S. Department of Agriculture Natural Resources Conservation Service and FishAmerica Foundation that will provide cost-share funds to landowners for agricultural best management practices (BMPs) implementation through 2013.

Mainstem Clinch River Watershed Focal Area – The Virginia portion of the mainstem Clinch River has 26 federally listed, proposed, and candidate aquatic species which demonstrate a high degree of endemism. The threat level faced by these species is high due to ongoing coal mining, natural gas drilling, and power generation. The loss of aquatic communities within the Clinch River would likely precipitate the extinction of many federally listed species. We will evaluate the exposure and toxicological effects of contaminant stressors in the water and sediment and pursue available partnership opportunities for research and recovery activities to benefit listed, proposed, and candidate aquatic species.

Indian Creek Watershed Focal Area – The federally listed purple bean (*Villosa perpurpurea*), a spotlight species, rough rabbitsfoot (*Quadrula cylindrica strigillata*), and tan riffleshell (*Epioblasma florentina walkeri*) are found in Indian Creek. After a tanker truck spill in 1998 killed populations of these species in the mainstem Clinch River and a catastrophic sedimentation event during construction of a gas pipeline in 2006 effected populations in Indian Creek, the creek became the subject of restoration efforts. This watershed discharges to the upper reaches of the Clinch River and impacts mainstem water quality. We will evaluate the exposure and toxicological effects of contaminant stressors in the water and sediment and pursue available partnership opportunities for riparian protection, research, and other recovery activities to benefit candidate and listed aquatic species.

Copper Creek Watershed Focal Area – In Copper Creek there are one candidate and six federally listed mussels, two federally listed fishes, and designated critical habitat for one fish and two mussels. This watershed discharges to the Clinch River and affects mainstem water quality. Many listed species propagation and release efforts have taken place, such as those for the yellowfin madtom. Although threats from agriculture are high, many partners are working in the drainage to address the problems. PFW has longstanding involvement in the drainage and has funded several projects, including livestock exclusion and an ongoing fish barrier removal. We will restore fish passage, protect and restore stream banks, and conduct outreach activities to educate the community about agriculture and other impacts to federally listed species and aquatic communities.

Powell River Watershed at River Mile 116.5 to River Mile 175.0 Focal Area – There are 22 federally listed and candidate aquatic species in this portion of the Powell River watershed, and species demonstrate a high degree of endemism. The watershed contains significant karst resources, including the only known populations of the federally listed Lee County cave isopod (*Lirceus usdagalun*). Threats from coal mining and natural gas drilling, which are economically and politically difficult to address, may render listed aquatic species vulnerable to extirpation and extinction. We will continue research and recovery efforts by reviewing coal mine permit applications in accordance with the ESA and FWCA and by participating in Total Maximum Daily Load (TMDL) technical advisory teams. We will assist conservation partners in enhancing implementation of BMPs related to livestock operations via Clean Water Initiative and other cost share programs, and in land protection to expand the State Cedars Karst Area Preserve.

Eastern Shore Priority Area – This area has 95 priority migratory bird species, several fisheries species of conservation concern, and 11 federally listed and candidate species. It supports two NWRs and TNC's Virginia Coast Reserve, and has been designated a United Nations Biosphere Reserve (<http://www.unesco.org/mabdb/br/brdir/directory/biores.asp?mode=all&code=USA+31>). Our goal is to restore/protect upland, wetland, and coastal habitat for priority migratory birds and listed and candidate species on state, federal, and private lands by identifying four high priority properties for land protection through continued coordination with the Land Protection Working Group.

Great Dismal Swamp National Wildlife Refuge Priority Area (PFW and EC Focus) – This area has 60+ priority migratory bird species, several fisheries species of conservation concern, and 1 federally listed species. The area is an important part of the headwaters of the Albemarle and Pamlico Sounds and is a state-designated exceptional water, meaning new or increased point source discharges to the waterbody are prohibited. Initial work is being conducted under the Service’s Northeast Region Strategic Plan Fiscal Year 2007-2011, Partners for Fish and Wildlife/Coastal Program. Our goals are to assess the risk level of atmospheric deposition of mercury to trust resources to inform NWR management practices and to protect/restore habitat for the red-cockaded woodpecker and priority migratory birds. Our next steps towards these goals are to restore hydrology to 6,000 acres of forested wetlands in the NWR, and evaluate the impact of several major fires on mercury levels in the NWR, including biota and sediment.

Holston River Watershed Priority Area – This watershed has 25 federally listed, proposed, and candidate species, several fisheries species of conservation concern, 30+ priority migratory bird species, many species of concern, and designated critical habitat for 1 aquatic species. This watershed is an important headwater area of the Tennessee River system and is a globally significant area of biodiversity. Our goal is to protect and recover these species and maintain and restore the habitats upon which they depend. Our next steps towards this goal are to continue to work on Saltville Natural Resource Damage Assessment and Restoration Program settlement negotiations, and continue work on reintroducing the federally listed yellowfin madtom (*Noturus flavipinnis*) in the North Fork Holston River reach designated for establishment of a non-essential experimental population.

North Fork Holston River at River Mile 85.0 above Saltville Focal Area – There are 10 federally listed and candidate aquatic species in this portion of the North Fork Holston River, and species in the watershed demonstrate a high degree of endemism. Agriculture and transportation threats likely have resulted in loss of species diversity. Downstream threats, such as the long-term discharge of mercury and other contaminants, have created demographic and connectivity problems for remaining faunal components. A pending settlement in the Saltville Natural Resource Damage and Assessment case will likely result in significant on-the-ground habitat and population restoration actions. Water quality and biological components in this focal area may contribute to downstream recovery. Contaminants studies indicate this area is suitable for propagation and reintroduction efforts. The river has been determined to be suitable for establishment of a non-essential experimental population of the yellowfin madtom. We will continue participating in a multi-agency team that is actively engaged in madtom population establishment, via evaluation of population genetics and habitat suitability. In partnership with the Virginia Department of Game and Inland Fisheries (VDGIF), we will continue monitoring mussel populations and will conduct caging studies with a broader array of native species than used thus far to identify river reaches best suited for reintroduction or population augmentation.

James Spiny mussel Priority Area – This federally listed endangered species extant range is Virginia, West Virginia, and North Carolina with the majority occurring in Virginia. Our goal is to further the recovery of this species through protection/restoration of habitat and improvement to water quality.

Craig Creek Watershed Focal Area – Several waterbodies within this watershed support the species, including Dicks Creek which contains the largest known James spiny mussel population. The Virginia Department of Transportation is conducting a 10-year James spiny mussel augmentation effort in Craig Creek to complete a term and condition in a 2007 biological opinion. VDGIF is conducting a long-term mark and recapture study in Dicks Creek and will be expanding this to Johns Creek to inform survey methods, searcher efficiency, and a population viability analysis. We will support our partners to ensure

completion of the ongoing studies and to focus on riparian restoration, livestock exclusion from streams, livestock watering and shelter in Johns Creek watershed; interpretative materials, signage, and riparian planting and fencing at the Black Diamond Ranch in Craig County; and other projects identified within the watershed that will improve or protect the James spiny mussel and its habitat.

Rivanna River Watershed Focal Area – Several previously known waterbodies and six additional, newly discovered locations support the James spiny mussel in this watershed. A number of non-governmental organizations as well as state and local agencies are interested in both the recovery of the species and enhancing water quality and habitat. We will work with our partners to engage in outreach and support survey efforts for James spiny mussel.

Madison Cave Isopod Priority Area – This federally listed threatened species is a Virginia and West Virginia endemic and represents habitat quality/quantity for other karst species and ground water in general. Our goal is to further the recovery of this species through development of BMPs for landowners/project proponents and subsequent implementation by working with localities.

Northeastern Beach Tiger Beetle Priority Area – This federally listed threatened species' range encompasses the coast of the northeastern U.S. with the majority of the extant range occurring along the beaches of the Chesapeake Bay in Virginia. Our goal is to develop and implement a multi-faceted, multi-partner, long-term recovery strategy for the species.

Mathews County Focal Area – Mathews County initiated efforts to improve shoreline management and contracted development of a countywide shoreline management plan. The county approached the Service with concerns about how to include conservation measures that would benefit the tiger beetle and help residents avoid listed species conflicts. The Service initiated efforts to work with Bavon Beach Homeowners Association to implement a model shoreline management project, and continues to foster this relationship through dialog with the Planning Office, Wetlands Board, the U.S. Army Corps of Engineers, other agencies and organizations in Mathews County, homeowners associations, and private citizens. The Service hopes that these interactions will serve as a model and help to foster improved shoreline management efforts on a larger scale to benefit the citizens of the county, the beetle, and its habitat. We will complete the Bavon project and a genetics study, and will work with Mathews County to define future project areas and establish a mitigation fund.

Nottoway River Watershed Priority Area – This watershed contains 50+ priority migratory bird species, several fisheries species of conservation concern, 6 federally listed species, and several species of concern. It is an important headwater to the Albemarle and Pamlico Sounds and is uniquely pristine. The Nottoway River has been identified as a priority Roanoke logperch recovery area in the species' recovery plan (Service 1992). Our goal is to pursue funding to restore 100 acres of longleaf pine habitat for the red-cockaded woodpecker and priority migratory birds in coordination with our partners.

Nottoway Red-cockaded Woodpecker Habitat Restoration Focal Area – This area historically supported longleaf pine dominated ecosystems and their unique community of species, including the red-cockaded woodpecker. This area is comprised of sandy or acidic nutrient poor soils (primarily Entisols and to a lesser extent Ultisols and Spodosols) that are uniquely suited to and support the vast majority of longleaf pine. We will pursue funding to restore 100 acres of longleaf pine habitat for the red-cockaded woodpecker and priority migratory birds in coordination with partners.

Rappahannock River Valley National Wildlife Refuge Priority Area (EC Focus) – This area contains 100+ priority migratory bird species, several fisheries species of conservation concern, several federally listed species, and species of concern. The Rappahannock River is a spawning and nursery area for striped bass (*Morone saxatilis*), American shad (*Alosa sapidissima*), blueback herring (*Alosa aestivalis*), and alewife (*Alosa pseudoharengus*). It is also an important nursery area for American eel (*Anguilla rostrata*). Our goal is to assess the effects of endocrine disrupting chemicals to fish and aquatic dependent and piscivorous species, such as bald eagles (*Haliaeetus leucocephalus*) and wading birds, in support of the NWR.

Roanoke Logperch Priority Area – This federally listed endangered species' extant range is Virginia and North Carolina with the majority occurring in Virginia. Our goal is to recover the species within 10 years by working with an interagency team to protect/restore habitat, complete a reintroduction/augmentation plan, and accomplish other recovery actions. Our next steps towards this goal are to complete a conservation framework and programmatic biological opinion for specific activities and maintain, enhance, and restore habitat.

Pigg River Watershed Focal Area – The Pigg River watershed includes the entire river and selected tributaries above the Leesville Lake headwaters. The Pigg River logperch population, along with the Upper Roanoke River population, faces more threats than in the remainder of the species' range. Projects on the Pigg River that have or will benefit the logperch include removal of Power and Veteran's Park Dams (ongoing), riparian restoration projects (e.g., Oakes Bros.), Leesville Lake re-licensing, and the ongoing TMDL implementation. The logperch population in the Pigg River has less genetic diversity than the Roanoke, Nottoway, and Smith river populations (Roberts et al. 2009) and therefore, has been identified for potential population/genetic augmentation. VAFO has been involved in numerous restoration projects in the Pigg River, and continued focus on this area will complement past projects. We will remove Veterans Park Dam and continue working on a logperch augmentation and reintroduction plan.

Upper Roanoke River Watershed Focal Area – The Upper Roanoke River watershed is that portion of the mainstem Roanoke River from the headwaters of Smith Mountain Lake, upstream and including the Roanoke River mainstem, the North and South Forks of the Roanoke River, and selected tributaries of these three waterbodies. The Upper Roanoke River logperch population, along with the Pigg River population, faces more threats than in the remainder of the species' range. Projects on the Upper Roanoke River that have or will benefit the logperch include consultation on the Roanoke River Flood Reduction Project and the Smith Mountain Lake re-licensing, Wiley Drive low water bridge replacement, Wasena Park dam removal, and Blacksburg Country Club golf course. The Upper Roanoke River continues to support the largest and most robust logperch population in a largely urbanized area where numerous actions occur that may threaten the logperch and its habitat. VAFO has been involved in numerous restoration projects in the Upper Roanoke River, and continued focus on this area will complement past projects. We will maintain and improve habitat in this area to reduce threats to the core of the population.

Map Development

The preliminary map developed in September 2009 (Appendix 1) was revised to reflect the priority areas (Upper James River Watershed was included at that time) in a February 2011 map (Appendix 1). Since that time, additional species occurrences have been documented, the Upper James River Watershed has been removed as a priority area, our understanding of the probability of species occurrence has

improved, and focal areas have been added. The result is a December 2011 map of the priority areas (Appendix 1) and maps of the focal areas (Appendix 2). The priority area boundaries were determined as follows.

The priority areas identified geographically/by watershed were mapped based on 8-digit hydrologic unit code (HUC). Eight-digit HUCs (average size 945,451 acres) were chosen because 10- (average size 86,918 acres) and 12- (average size 21,455 acres) digit HUCs were smaller and would have created fragmented priority areas.

- Blackwater River Watershed - boundaries defined by the extent of HUC 03010202.
- Clinch and Powell Rivers Watershed - boundaries defined by the extent of HUCs 06010206 and 06010205; includes the upper Clinch and Powell River HUCs.
- Eastern Shore - boundaries defined by the extent of HUCs 02080109 and 02080110; includes the Eastern and Western Lower Delmarva HUCs.
- Holston River Watershed - boundaries defined by the extent of HUCs 06010101 and 06010102; includes the North Fork, South Fork, and Middle Fork Holston River HUCs.
- Nottoway River Watershed - boundaries defined by the extent of HUC 03010201.

The priority areas identified by NWR were mapped based upon NWR acquisition boundaries:

- Great Dismal Swamp National Wildlife Refuge – <http://library.fws.gov/CCPs/GDS/greatdismalswamp06.pdf>.
- Rappahannock River Valley National Wildlife Refuge – http://www.fws.gov/northeast/rappahannock/maps/Refuge_Ownership_Map.pdf.

The priority areas identified by species were mapped as follows:

- James Spiny mussel – boundaries defined by the intersection of the 8-digit HUCs and the counties where the species is known to occur; VDGIF and Virginia Department of Conservation and Recreation, Division of Natural Heritage (VDCR-DNH) databases were used to delineate known species occurrences.
- Madison Cave Isopod – boundaries defined by areas with a high/medium probability of species occurrence based upon a distribution model created by VDCR-DNH. As a karst aquifer species, it is difficult or even impossible to survey all locations; therefore, mapping known locations would have greatly underestimated the range of the species.
- Northeastern Beach Tiger Beetle – boundaries based on surveys, observations, and preliminary modeling; delineated areas are a 75 meter buffer surrounding shoreline areas known to have habitat that supports or may support the beetle. The boundaries also include adjacent shorelines where most shoreline stabilization projects, if undertaken, may result in a negative impact to the adjacent areas used by the beetle.
- Roanoke Logperch – boundaries defined by the intersection of the 8-digit HUCs and the counties where the species is known to occur; VDGIF and VDCR-DNH databases were used to delineate known species occurrences.

Supporting Species List Development

For each of the priority areas that contain multiple Service trust resources, three supporting species lists (priority migratory birds, fisheries species of conservation concern [fish/mussels], listed species [federally listed and proposed species, federal candidate species, species of concern, federally designated critical habitat]) were developed (Appendix 3). For the priority areas identified by species, supporting species lists were not developed since these areas are defined by listed species known and potential habitat versus a compilation of trust resource occurrences.

Priority Migratory Bird Species - Includes all bird species that received a highest or high priority ranking as determined by the Atlantic Coast Joint Venture and Partners in Flight Initiative (http://www.acjv.org/bird_conservation_regions.htm) and/or were listed by the Service as Birds of Conservation Concern (http://library.fws.gov/Bird_Publications/BCC2008.pdf).

Occurrences were verified through:

- VDGIF Virginia Fish and Wildlife Information System (VaFWIS) database (<http://vafwis.org>).
- Breeding Bird Surveys (<http://www.pwrc.usgs.gov/bbs/index.html>).
- Cornell University bird range maps (<http://www.allaboutbirds.org/guide/search>).
- Bird lists for Great Dismal Swamp, Rappahannock River Valley, Chincoteague, and Eastern Shore NWRs.

Fisheries Species of Conservation Concern - Includes all fish and mussel species listed as Species of Conservation and Management Concern as determined by the Service's Northeast Region Fisheries Program Strategic Plan Fiscal Years 2009-2013 (<http://www.fws.gov/northeast/fisheries/reports/reports/FisheriesStrategicPlan.pdf>) and/or the Service's Northeast Region Fisheries Program Strategic Plan Fiscal Years 2009-2013: Supplement, June 2009 (<http://www.fws.gov/northeast/fisheries/reports/reports/StrategicPlanSupplement6-11-09.pdf>).

Occurrences were verified through:

- VDGIF VaFWIS database (<http://vafwis.org>).
- Jenkins, R.E., and N.M. Burkhead. 1993. Freshwater Fishes of Virginia. American Fisheries Society, Bethesda, Maryland.
- NatureServe (<http://www.natureserve.org>).
- North Carolina Wildlife Resources Commission. 2005. North Carolina Wildlife Action Plan. Raleigh, North Carolina. (http://www.ncwildlife.org/Plan/WSC_WAP_Downloads.htm).
- Personal communications with various species/fisheries experts.

Federally Listed and Proposed Species, Federal Candidate Species, Federally Designated Critical Habitat, and Species of Concern – Includes federally designated critical habitat and all known or likely federally listed and proposed species, federal candidate species, and species of concern based on occurrences in:

- VDGIF VaFWIS database (<http://vafwis.org>).
- VDCR-DNH database (http://www.dcr.virginia.gov/natural_heritage/dbsearchtool.shtml).

Species of concern have no federal status, but are those species with a global rank of G1, G2, G_T1, or G_T2. Global ranks are assigned by a consensus of the network of natural heritage programs, scientific experts, and NatureServe (a non-profit conservation organization) to designate the rangewide rarity of a species or subspecies (NatureServe 2009).

- G1 - Critically Imperiled - At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.
- G2 – Imperiled - At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.
- G#G# - Range Rank - A numeric range rank (e.g., G2G3) is used to indicate the range of uncertainty in the status of a species or community. Ranges cannot skip more than one rank (e.g., GU should be used rather than G1G4).
- T# - Intraspecific Taxon (trinomial) - The status of intraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank. Rules for assigning T-ranks follow the same principles outlined above for global conservation status ranks. For example, the global rank of a critically imperiled subspecies of an otherwise widespread and common species would be G5T1. A T-rank cannot imply the subspecies or variety is more abundant than the species as a whole—for example, a G1T2 cannot occur. A vertebrate animal population, such as those listed as distinct population segments under the ESA, may be considered an intraspecific taxon and assigned a T-rank; in such cases a Q is used after the T-rank to denote the taxon's informal taxonomic status.

Threats Assessment Development

After the priority areas were defined, we completed a threats assessment for each. Multiple meetings were scheduled and all available Virginia Ecological Services staff participated with most threats assessments being completed “start to finish” at these group meetings. In a few instances, individual staff members drafted a threats assessment that was then revised and completed at a group meeting(s).

The purpose of the threats assessments was to (1) identify, characterize, and prioritize threats to trust resource species (priority migratory birds, fisheries species of conservation concern, listed species) in the priority areas identified geographically/by watershed/by NWR and (2) identify, characterize, and prioritize threats to a specific species (James spiny mussel, Madison Cave isopod, northeastern beach tiger beetle, Roanoke logperch) in the priority areas identified by species. The assessments identify conservation actions intended to remove or reduce threats to Service trust resources.

For each threats assessment, the following was determined based on group discussion resulting from staff experience and review of relevant documents (e.g., TNC 2009): threat (i.e., type of threat), stressor (i.e., agent causing the threat), cause of the threat, level of threat, trust resources affected, what Ecological Services can do to address the threat, who can help Ecological Services address the threat. We assessed each threat as high, medium, or low. The assessment of threat level included the impact occurring now and the likelihood of threat in near-term future.

All threats related to climate change were assessed as high. We are uncertain of the appropriate assessment of threat related to climate change in some instances and additional data may change a specific assessment of threat over time.

For spills (oil, chemical, etc.) we made an assessment of high for the level of threat in all instances (except for the Rappahannock River that the U.S. Coast Guard has deemed moderate to low risk). Virginia has thousands of miles of ocean coastline and inland river systems as well as a multitude of diverse wetland habitats that support an abundance of trust resources. The potential for environmental injury from chemical and oil spills in these sensitive habitats is significant. On average, the VAFO EC Program annually reviews over 500 National Response Center spill reports for Virginia. An analysis of

these reports indicates that transmission of oil and chemicals via navigable waterways, pipelines, and/or tanker traffic on roads adjacent to waterways, pose serious and on-going threats to trust resources.

The complete threats assessments are in Appendix 4.

Upon completion of the threats assessments, staff convened to determine how best to utilize/address the results. We agreed that within each of the priority areas we would focus on only those threats that received an assessment of high. The revised threats assessments containing only those threats ranked as high and the associated actions are in Appendix 5.

Strategic Habitat Conservation (SHC) Planning and Conservation Actions

SHC is a science-based framework for making management decisions about where and how to deliver conservation efficiently to achieve specific biological outcomes. SHC is a way of thinking and of doing business that requires us to set specific biological goals, allows us to make strategic decisions about our work, and encourages us to constantly reassess and improve our actions.

For each priority area we have developed conservation actions to address high priority threats (Appendices 6-8). Appendices 6-8 indicate how we will address high level threats in each priority area through biological planning, conservation design, conservation delivery, monitoring, and research over the life of this plan. Specific conservation actions planned, completed, and contemplated are outlined. Additionally, some key activities will take place outside of priority areas, these activities are also captured in Appendices 6-8.

Virginia Ecological Services – Strategic Plan

Approach

Virginia Ecological Services will focus our personnel and financial resources in the priority areas and focal areas indicated on the maps in Appendix 2 to obtain a focused effort on Service priorities in most need of our attention to achieve a significant conservation benefit. We will concentrate on removing and reducing high level threats identified in Appendix 5 through implementing actions contemplated in those threats assessments both within Ecological Services programs and with the assistance of our partners and stakeholders as identified in conservation actions (Appendices 6-8). At times we will be working on species/issues outside the priority areas and in those instances we will attempt to resolve the matter expeditiously to return our focus to our priorities.

Goals

- Focus staff and monetary resources on addressing high level threats identified in each priority area as identified in conservation actions (Appendices 6-8).
- Make known to our internal and external partners/stakeholders where priority and focal areas are located, what the high level threats are, and how we plan to address them.
- Make our internal and external partners/stakeholders aware of outstanding needs they can help us to meet.

- Outside of priority areas, in most instances, spend minimal staff and monetary resources addressing conservation issues to ensure our focus remains on addressing high level threats in priority areas.

Inter-Program Coordination

To be effective in our efforts to address our highest priorities, we recognize a need to overcome staffing, workload, and geographic limitations. To accomplish this, staff will work cooperatively across programmatic boundaries to provide assistance and support on actions involving high level threats within priority and focal areas, as described below. Specific conservation actions are identified in Appendices 6-8.

SVFO ES Program – ESA Consultation

SVFO ES will serve as lead for technical assistance and consultation on all proposed projects related to coal mining and the Jefferson National Forest. Consultation requests within priority areas that involve high level threats will receive the greatest level of scrutiny and Service involvement to maximally incorporate appropriate mitigative measures. Consultation requests within priority areas that involve medium level threats will receive a moderate level of review and we will attempt to incorporate simple avoidance and minimization measures or incorporate activities that will also address related high level threats. Requests for consultation on projects located outside priority areas or those located within priority areas that involve low level threats will receive effort and attention that meets statutory requirements. SVFO ES and VAFO ES will coordinate to ensure consistency.

SVFO ES Program – Recovery

SVFO ES will lead efforts in the Clinch and Powell Rivers Watershed and Holston River Watershed priority and focal areas to identify, foster, and carry out recovery activities to ameliorate high level threats. EC issues factor significantly into high level threats in these two priority areas. SVFO ES will continue to work with VAFO EC by (1) reporting on and monitoring spill and pollution events, (2) providing technical assistance and coordination on EC activities, and (3) partnering in EC research. SVFO ES will work with VAFO ES, as needed, to accomplish recovery activities related to high level threats in other priority and focal areas.

VAFO CPA Program/VAFO ES Program – ESA Consultation

VAFO ES will provide consultation throughout Virginia. The on-line project review process (http://www.fws.gov/northeast/virginiafield/endspecies/Project_Reviews.html) will be used to address requests for species lists and technical assistance for all projects, including consultation and NEPA related inquiries. The response received from applicants through the on-line process will be evaluated based on the project's relation to priority areas and high level threats. Large-scale, regional, or programmatic activities outside of priority areas may receive consideration and attention due to policy implications, peripheral resource-related affects, and similar links to priorities. Consultation requests within priority areas that involve high level threats will receive the greatest level of scrutiny and Service involvement to maximally incorporate appropriate mitigative measures. Consultation requests within priority areas that involve medium level threats will receive a moderate level of review and we will attempt to incorporate simple avoidance and minimization measures or incorporate activities that will also address related high level threats. Requests for consultation on projects located outside priority

areas or those located within priority areas that involve low level threats will receive effort and attention that meets statutory requirements. The CPA Program will engage in projects/issues/activities that relate to priority and focal areas and high level threats.

VAFO ES Program – Recovery

VAFO ES will lead efforts to identify, foster, and carry out recovery activities that will ameliorate high level threats in each of the priority and focal areas in which the Program has a role. For the Clinch and Powell Rivers Watershed and Holston River Watershed priority areas, VAFO ES will aid SVFO ES in addressing high level threats when opportunities arise.

VAFO EC Program

VAFO EC will assess potential threats to species and habitat by participating in Triennial Review and individual amendments of Virginia's Water Quality Standards; continue to review General Virginia Pollution Discharge Elimination System (VPDES) Permit renewals; on an infrequent basis, review and comment to Virginia Department of Environmental Quality (VDEQ) on Virginia's Permit Writer's Guidance for VPDES Permit Issuance, as appropriate and related to removal and reduction of high level threats to aquatic species or aquatic dependent species in priority areas; participate in VDEQ regulatory changes that affect CWA 401 and 402 program areas; provide scientific literature to VDEQ to support criteria and standards that protect sensitive aquatic species; seek funding for new research to provide information on species sensitivity to various pollutants of concern; comment on TMDL documents and participate in TMDL work groups to address nutrients, sediments, other contaminants, and mining-related contaminant threats in priority areas; focus spill preparation and response efforts in all priority areas; conduct EC special studies and partner with U.S. Geological Survey and others, as needed and appropriate, to identify, monitor, and assess contaminant levels and effects in priority areas; seek funding through EC special study proposals to address poor water quality and point source discharges (municipal or industrial wastewater treatment plants - endocrine disruptors, personal care products, pharmaceuticals, etc.) in priority areas; focus Natural Resource Damage Assessment and Restoration Program actions in priority areas when possible; provide technical assistance to the Environmental Protection Agency (EPA) through the Biological Technical Assistance Group on hazardous waste sites as prioritized by EPA; provide technical assistance to NWRs through the Contaminant Assessment Process and through development of EC special studies to address contaminant (particularly related to mercury and endocrine disruptors and other emerging contaminants as appropriate) priorities on NWRs; support SVFO ES and lead, as appropriate, efforts to review permits, practices, and threats to trust resources due to gas extraction, deep well injection, and NPDES discharges; for Rappahannock River Valley NWR, review VPDES permits and consult with EPA to ensure permits are protective of NWR resources and complete species studies to identify and reduce the threat of exposure to endocrine disrupting compounds.

VAFO PFW Program

VAFO PFW will: Eastern Shore – Continue to collaborate with NWRs, TNC, and the Southern Tip Habitat Partnership to obtain funds to implement habitat restoration and protection at jointly selected sites, especially where habitat corridors can be established or improved for migratory bird benefits. Blackwater River Watershed – Continue to collaborate with TNC, VDCR-DNH, VDGIF, and private landowners to obtain funds to implement habitat restoration in locations jointly determined, especially where habitat fragmentation can be reduced and habitat corridors linked. Nottoway River Watershed –

Continue to collaborate with TNC, VDCR-DNH, VDGIF, and private landowners to obtain funds to implement habitat restoration in locations jointly determined, especially where habitat fragmentation can be reduced and habitat corridors linked. Great Dismal Swamp NWR – Continue to collaborate with NWR staff and partners to obtain funds to implement habitat restoration and protection in locations jointly determined, especially where habitat fragmentation can be reduced and habitat corridors improved. Clinch and Powell Rivers Watershed – (1) Work with private landowners and other partners to obtain funds to implement stream restoration and habitat protection, especially where habitat corridors can be linked; (2) be proactive in planning habitat conservation actions; and (3) conduct outreach to landowners and the general public. Holston River Watershed – Work with private landowners and other partners to obtain funds to implement stream restoration and dam removal, especially where habitat corridors can be linked; due to program limitations, emphasis cannot be provided in this priority area. Northeastern Beach Tiger Beetle – Continue to collaborate with TNC and the Southern Tip Habitat Partnership on the bayside Eastern Shore and with VAFO ES to obtain funds and implement habitat restoration and protection in locations jointly determined. Madison Cave Isopod – Work with VAFO ES and conservation partners to obtain funds to restore and protect habitat; due to PFW staffing limitations this species will not be a priority. James Spinymussel – Work with private landowners and other partners to obtain funds to implement stream restoration. Roanoke Logperch – Work with private landowners and other partners to obtain funds to implement stream restoration and dam removal, especially where habitat corridors can be linked.

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U.S. Fish and Wildlife Service. 2009. U.S. Fish and Wildlife Service's Northeast Region Fisheries Program Strategic Plan Fiscal Years 2009-2013: Supplement, June 2009. Hadley, Massachusetts. Available from: <http://www.fws.gov/northeast/fisheries/reports/reports/StrategicPlanSupplement6-11-09.pdf>.

Virginia Ecological Services – Contact Information

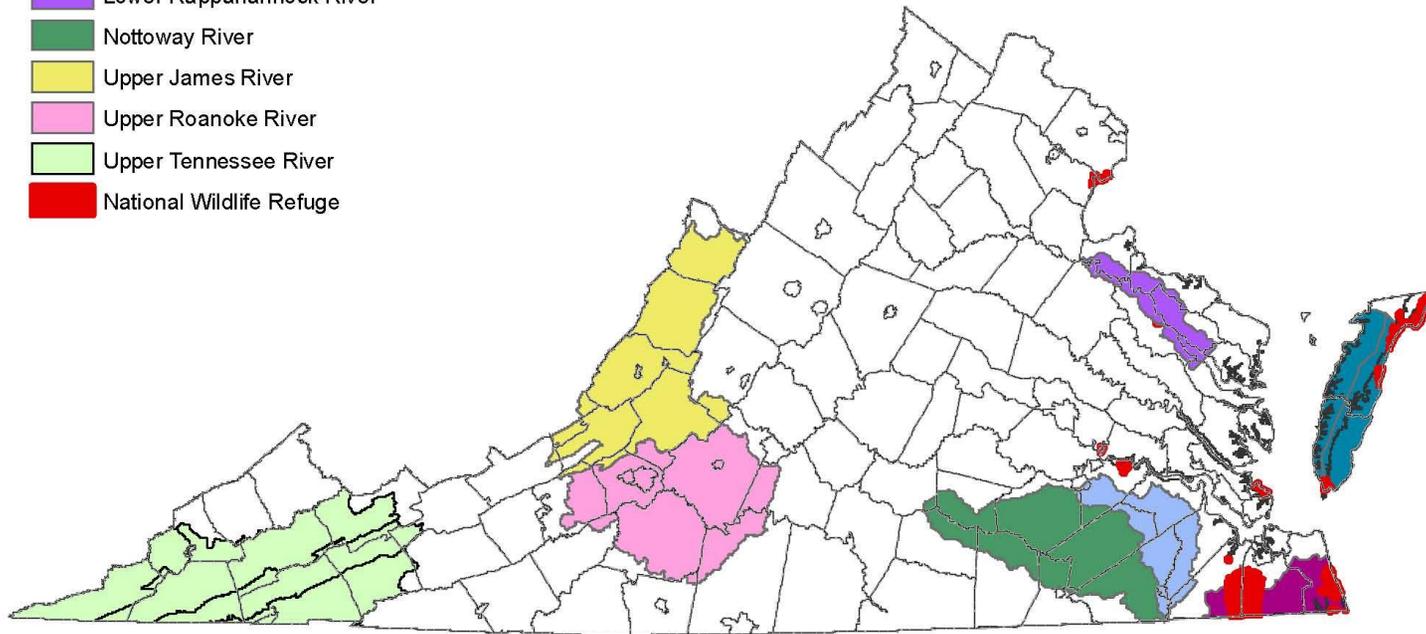
Southwestern Virginia Field Office
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804.693.9032 fax

APPENDIX 1 – PRIORITY AREA MAPS

SVFO/VAFO Trust Resource Priority Areas September 2009

-  Eastern Shore
-  Albemarle
-  Blackwater River
-  Lower Rappahannock River
-  Nottoway River
-  Upper James River
-  Upper Roanoke River
-  Upper Tennessee River
-  National Wildlife Refuge

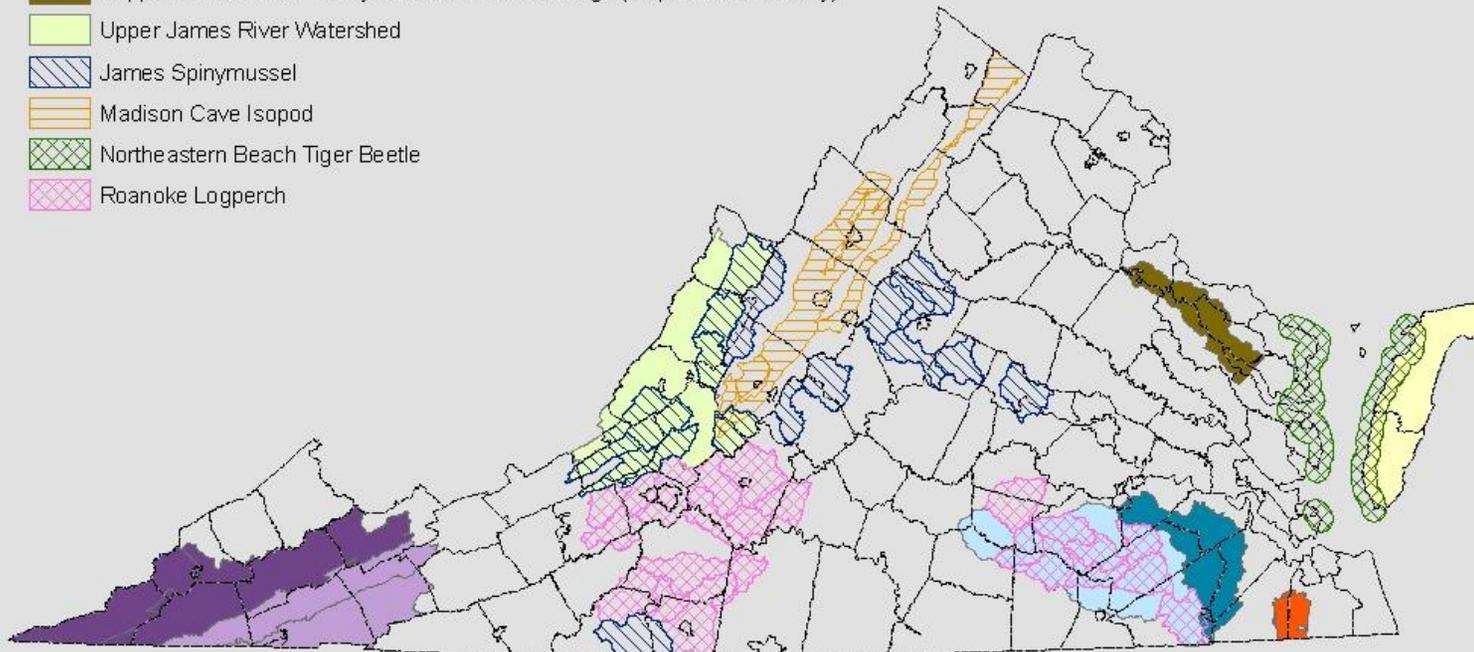


Virginia Ecological Services Priority Areas 02/11/2011



- Blackwater River Watershed
- Clinch and Powell River Watersheds
- Eastern Shore
- Great Dismal Swamp National Wildlife Refuge (acquisition boundary)
- Holston River Watershed
- Nottoway River Watershed
- Rappahannock River Valley National Wildlife Refuge (acquisition boundary)
- Upper James River Watershed
- James Spiny mussel
- Madison Cave Isopod
- Northeastern Beach Tiger Beetle
- Roanoke Logperch

(Priority areas include priority migratory birds, fisheries species of conservation concern, federally listed and proposed species and designated critical habitat, federal candidate species, species of concern, and/or National Wildlife Refuges.)



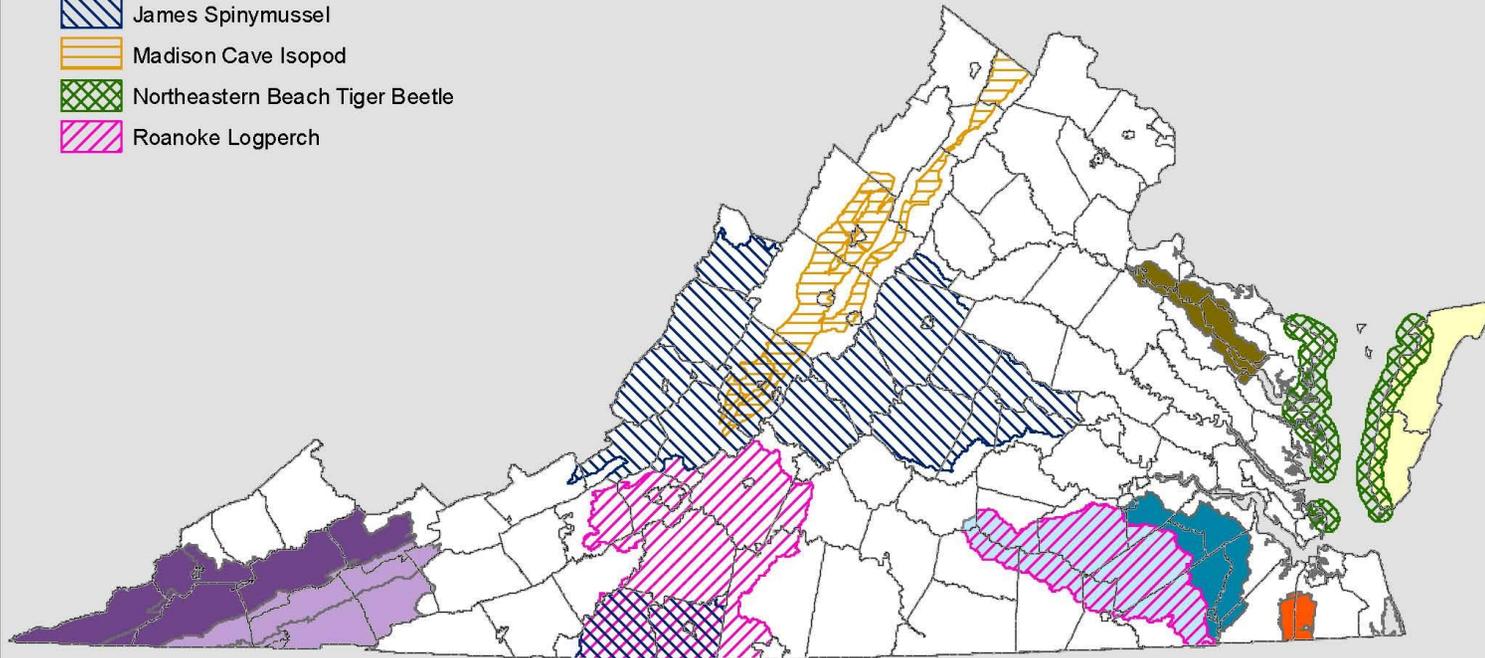
Virginia Ecological Services staff continue to have state-wide programmatic responsibility and will focus on identified priority areas

Virginia Ecological Services Priority Areas 12/21/2011



- Blackwater River Watershed
- Clinch and Powell River Watersheds
- Eastern Shore
- Great Dismal Swamp National Wildlife Refuge (acquisition boundary)
- Holston River Watershed
- Nottoway River Watershed
- Rappahannock River Valley National Wildlife Refuge (acquisition boundary)
- James Spiny mussel
- Madison Cave Isopod
- Northeastern Beach Tiger Beetle
- Roanoke Logperch

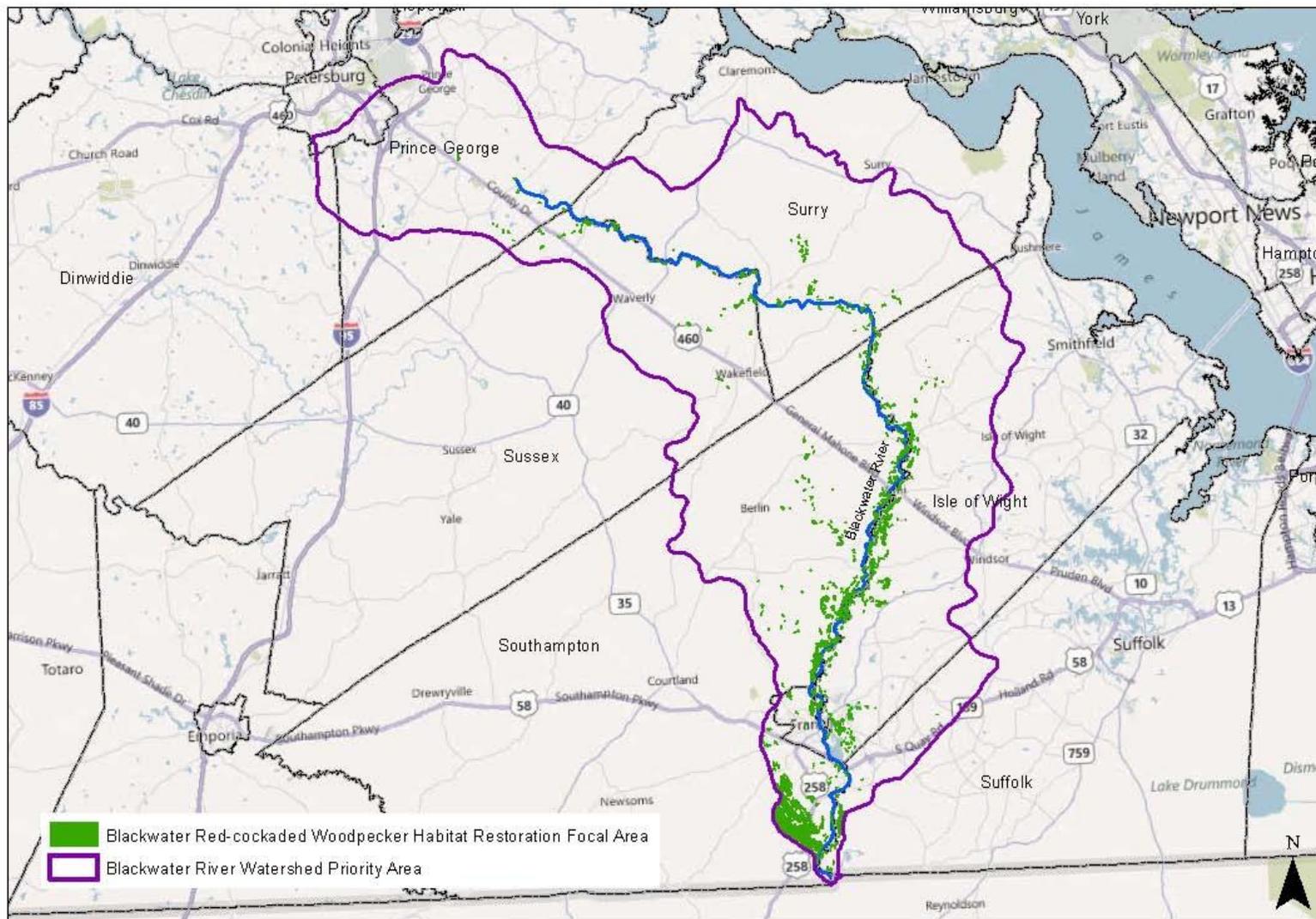
(Priority areas include priority migratory birds, fisheries species of conservation concern, federally listed and proposed species and designated critical habitat, federal candidate species, species of concern, and/or National Wildlife Refuges.)



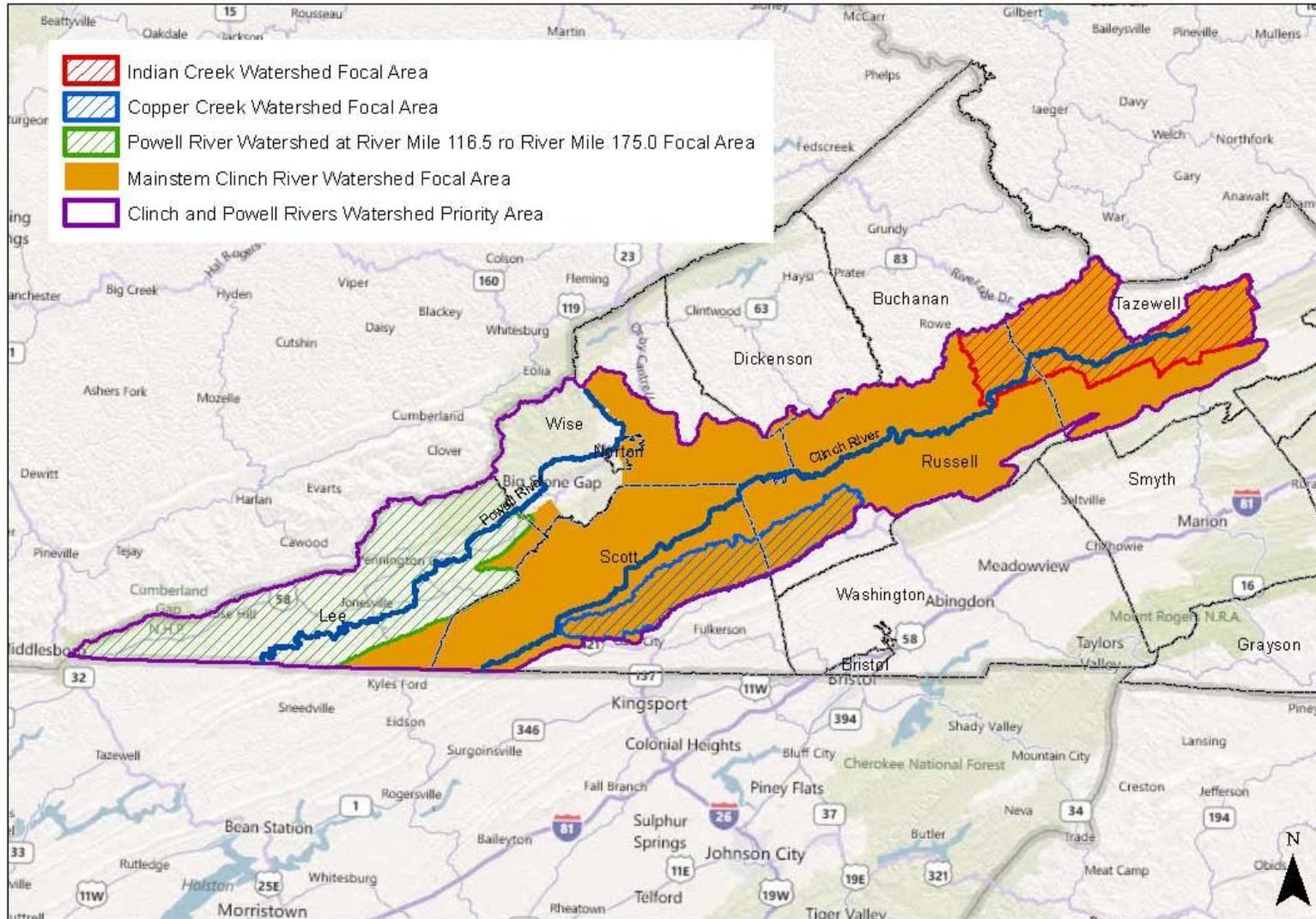
Virginia Ecological Services staff continue to have state-wide programmatic responsibility and will focus on identified priority areas

APPENDIX 2 – PRIORITY AREA AND FOCAL AREA MAPS

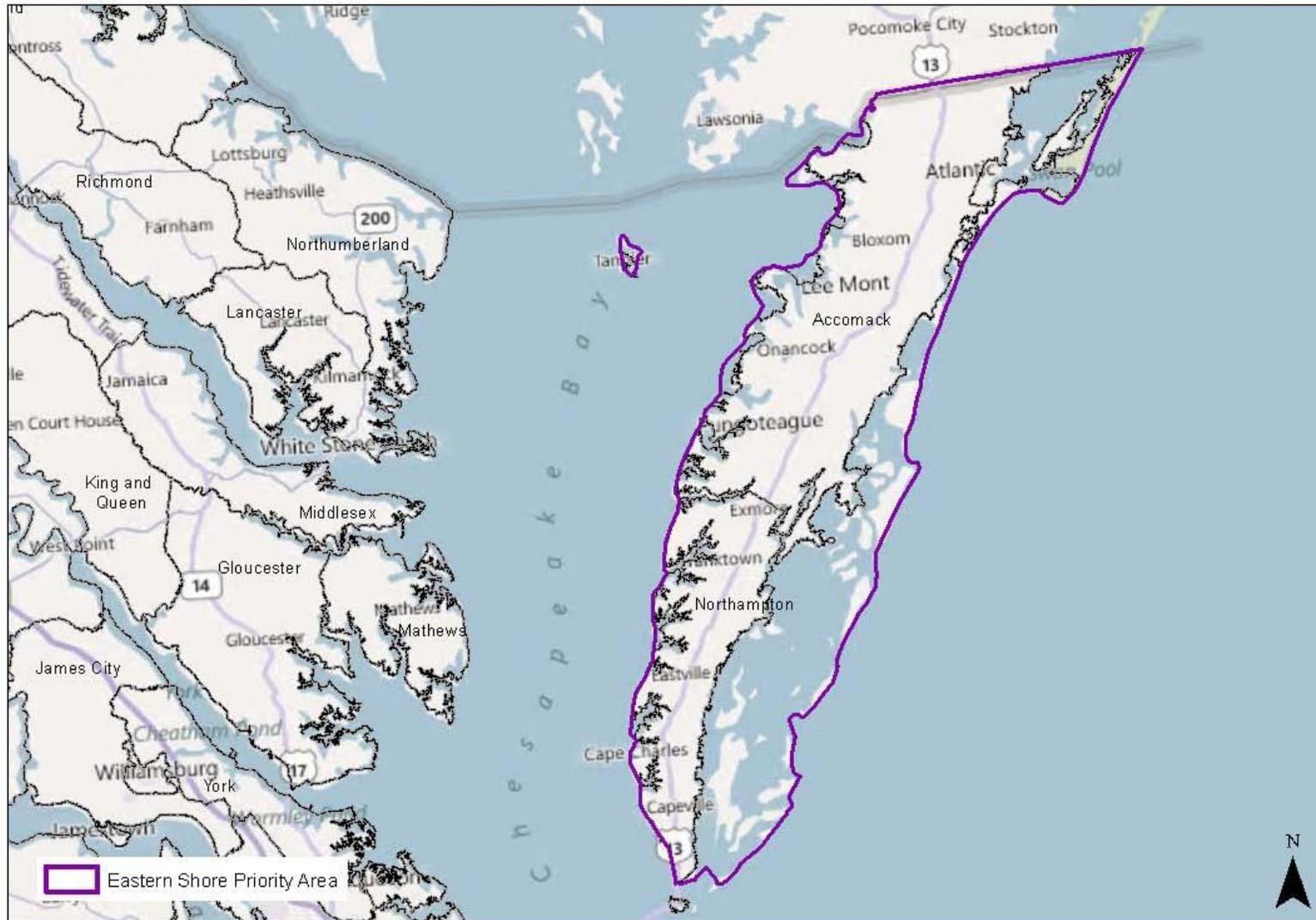
Blackwater River Watershed Priority Area January 20, 2012



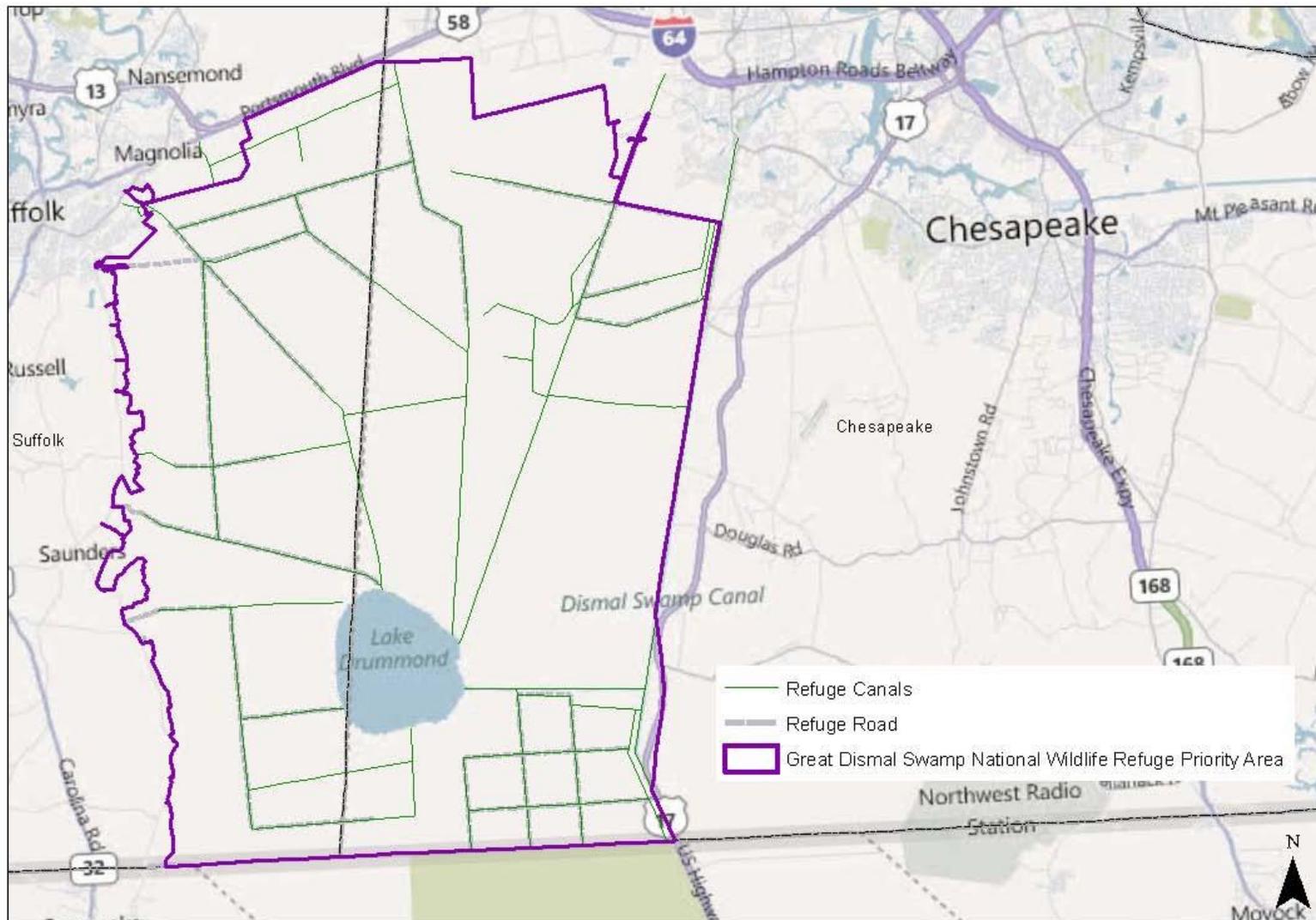
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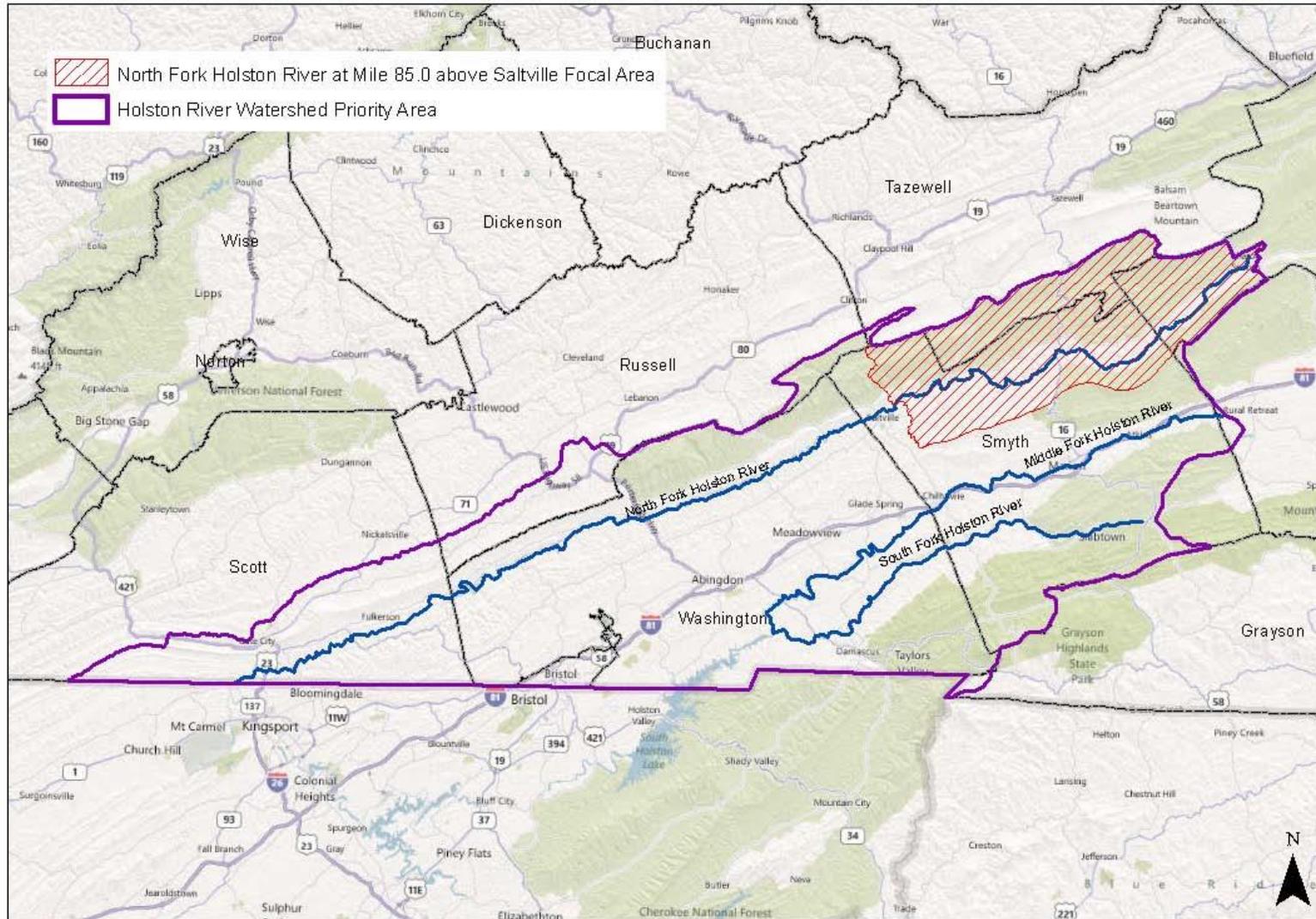
Eastern Shore Priority Area
January 20, 2012



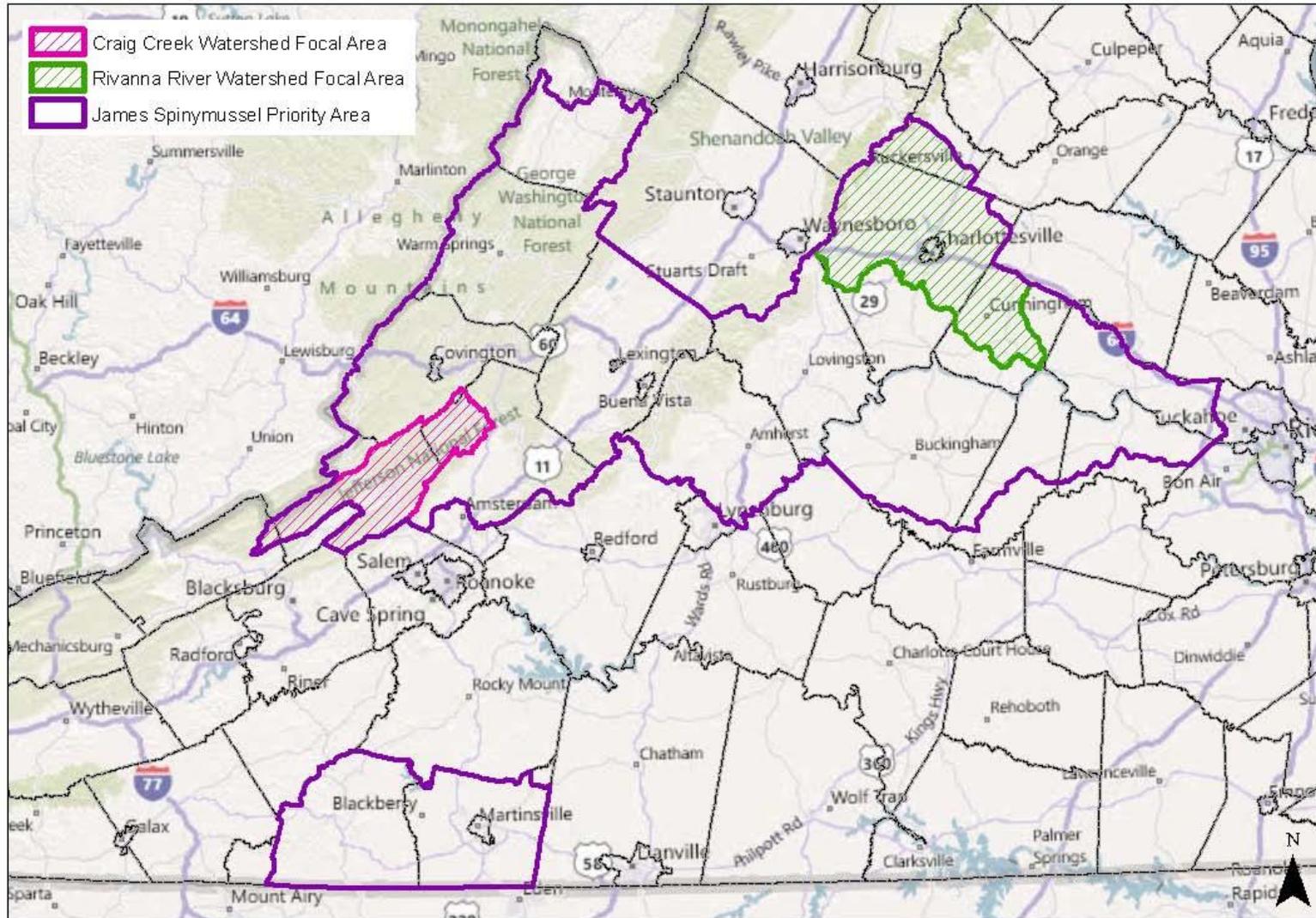
Great Dismal Swamp National Wildlife Refuge Priority Area
January 20, 2012



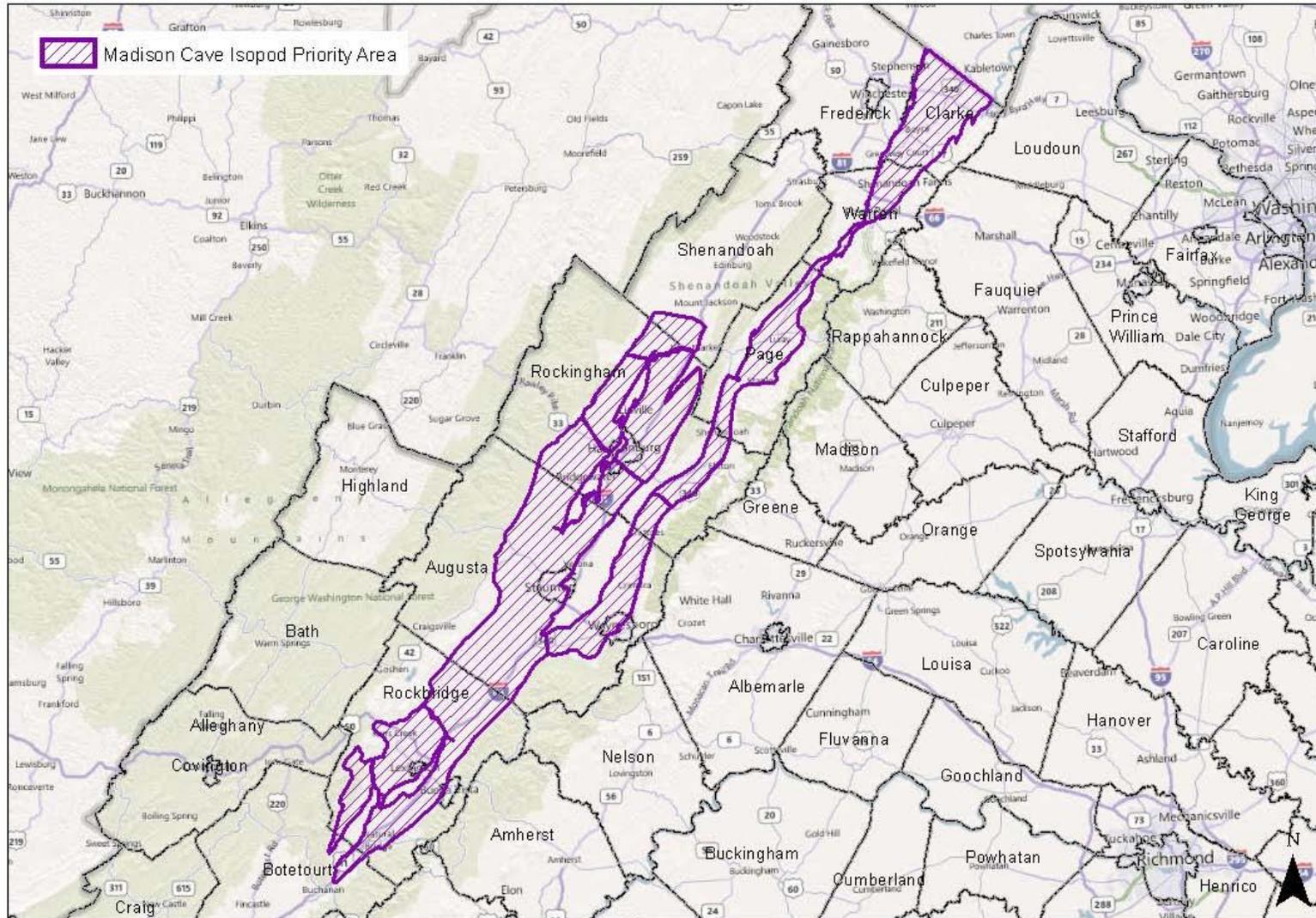
Holston River Watershed Priority Area January 20, 2012



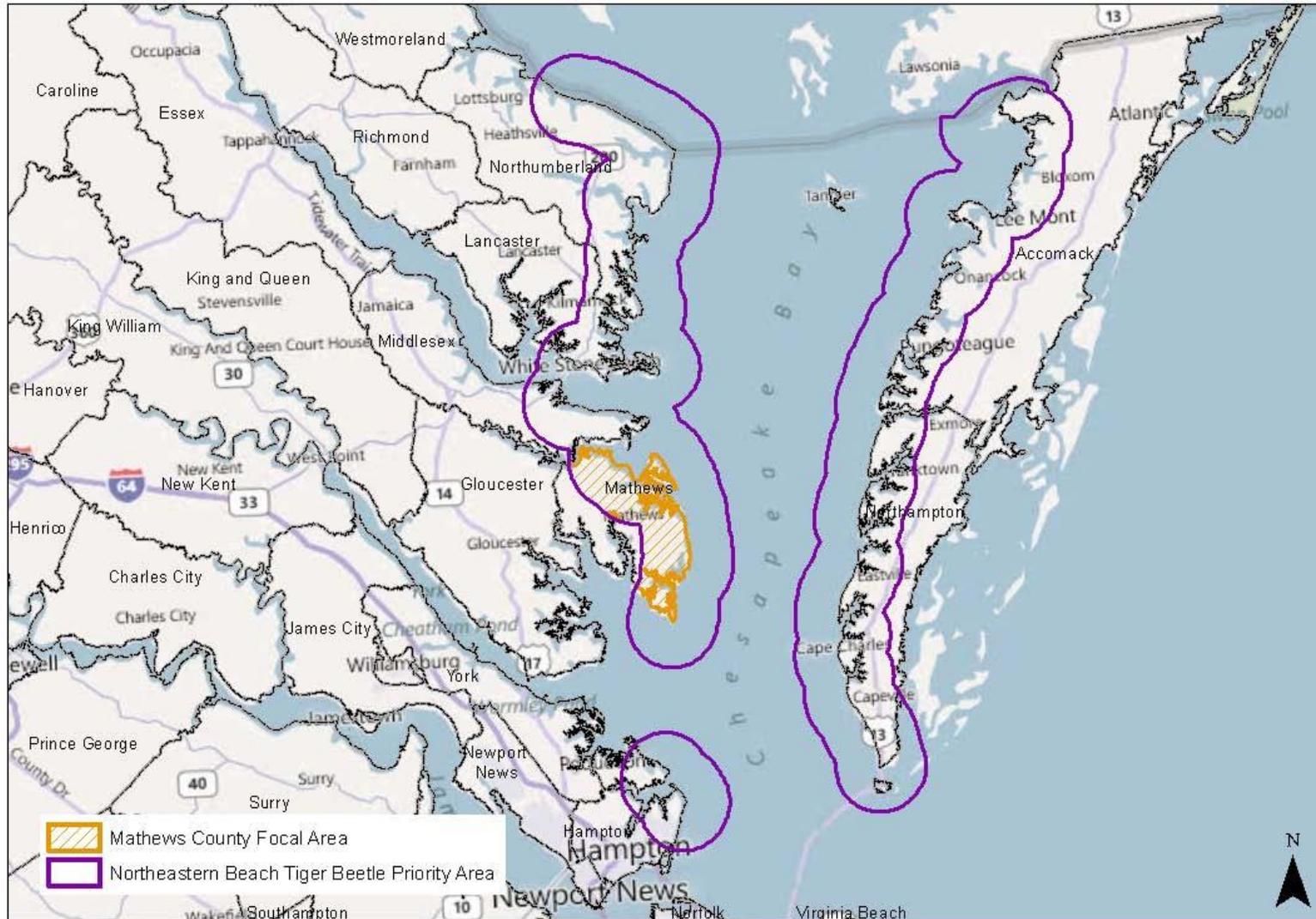
James Spiny mussel Priority Area January 20, 2012



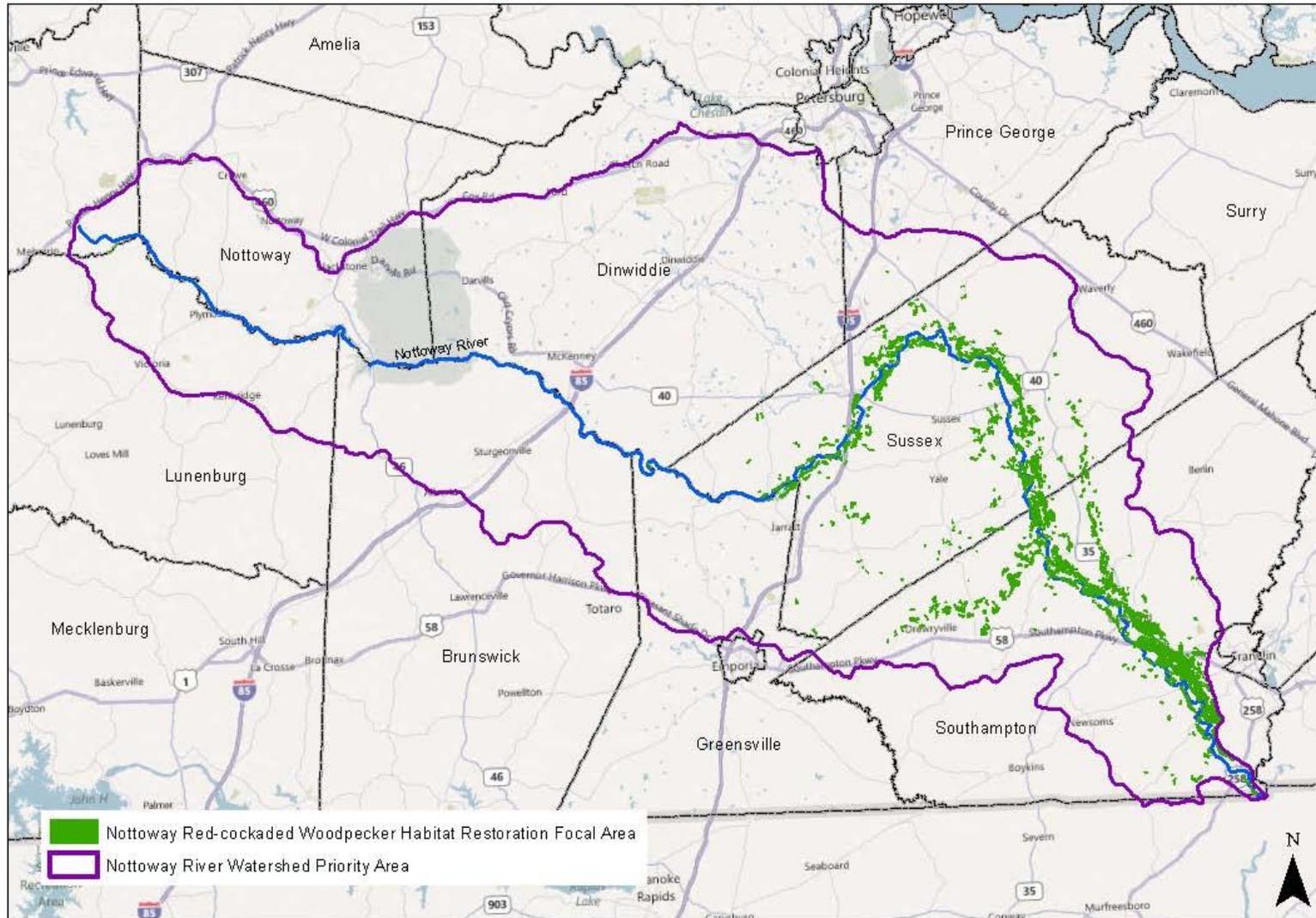
Madison Cave Isopod Priority Area
January 20, 2012



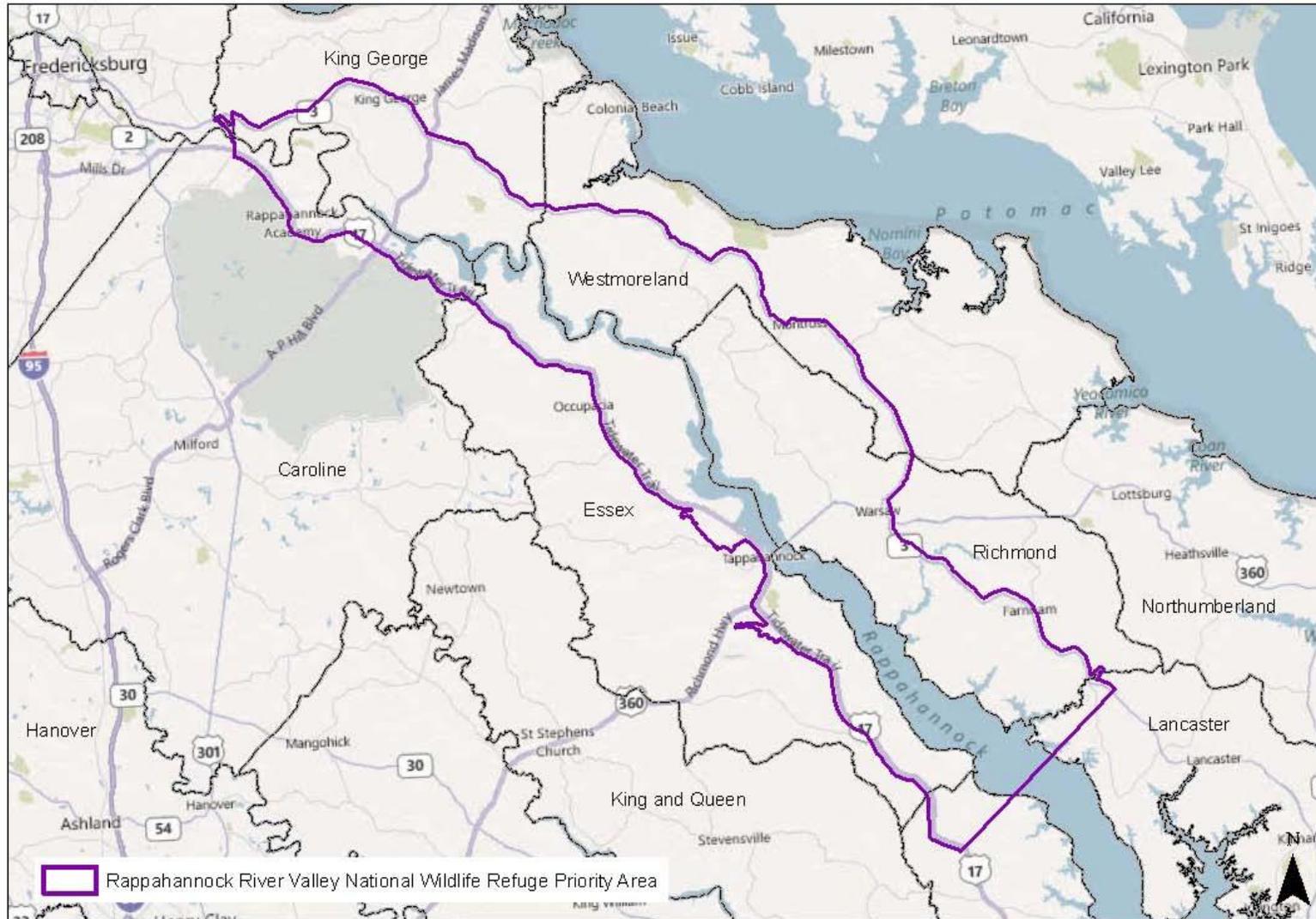
Northeastern Beach Tiger Beetle Priority Area
January 20, 2012



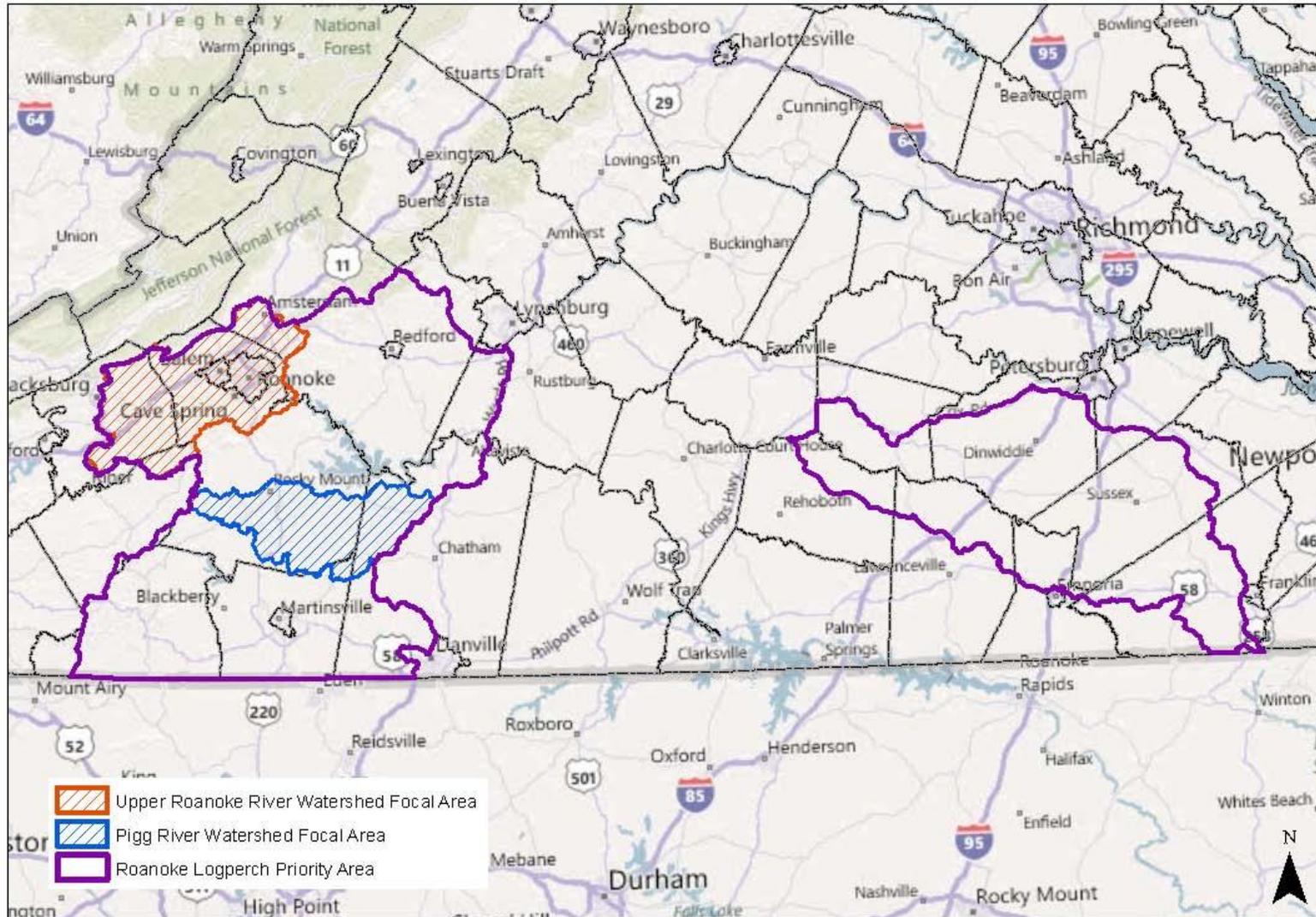
Nottoway River Watershed Priority Area
January 20, 2012



Rappahannock River Valley National Wildlife Refuge Priority Area
January 20, 2012



Roanoke Logperch Priority Area
January 20, 2012



APPENDIX 3 – SUPPORTING SPECIES LISTS FOR PRIORITY AREAS

Blackwater River Watershed Priority Migratory Bird Species

American avocet	Dunlin	Rusty blackbird
American bittern	Eastern kingbird	Sedge wren
American black duck	Eastern meadowlark	Semipalmated sandpiper
American coot	Eastern towhee	Short-billed dowitcher
American golden plover	Eastern wood-pewee	Short-eared owl
American kestrel	Field sparrow	Solitary sandpiper
American widgeon	Grasshopper sparrow	Song sparrow
American woodcock	Henslow's sparrow	Stilt sandpiper
Bald eagle	Horned grebe	Swainson's warbler
Bicknell's thrush	Kentucky warbler	Swallow-tailed kite
Black tern	King rail	Tricolored heron
Black-crowned night heron	Least bittern	Tundra swan
Black-throated green warbler	Least sandpiper	Upland sandpiper
Blue-winged teal	Lesser scaup	Vesper sparrow
Blue-winged warbler	Lesser yellowlegs	Virginia rail
Brant	Little blue heron	Western sandpiper
Brown thrasher	Loggerhead shrike	Whimbrel
Brown-headed nuthatch	Mallard	Whip-poor-will
Canada goose	Northern bobwhite	White ibis
Canvasback	Northern flicker	White-throated sparrow
Cerulean warbler	Northern pintail	Willow flycatcher
Chimney swift	Pied-billed grebe	Wilson's snipe
Chuck-will's-widow	Prairie warbler	Wood duck
Common goldeneye	Prothonotary warbler	Wood thrush
Common loon	Red-cockaded woodpecker	Worm-eating warbler
Common moorhen	Redhead	Yellow-billed cuckoo
Common tern	Red-headed woodpecker	Yellow-crowned night heron

Includes all bird species that received a highest (HH) or high (H) priority ranking as determined by the Atlantic Coast Joint Venture and Partners in Flight Initiative (http://www.acjv.org/bird_conservation_regions.htm) and/or were listed by the Service as Birds of Conservation Concern (http://library.fws.gov/Bird_Publications/BCC2008.pdf).

Occurrences verified through:

1. VDGIF VaFWIS database (<http://vafwis.org>).
2. Breeding Bird Surveys (<http://www.pwrc.usgs.gov/bbs/index.html>).
3. Cornell University bird range maps (<http://www.allaboutbirds.org/guide/search>).
4. Bird list for Great Dismal Swamp NWR (due to similarity of habitat types present).

Blackwater River Watershed Fisheries Species of Conservation Concern

Common Name	Scientific Name
Alewife	<i>Alosa pseudoharengus</i>
American eel	<i>Anguilla rostrata</i>
American shad	<i>Alosa sapidissima</i>
Atlantic sturgeon	<i>Acipenser oxyrinchus</i>
Blueback herring	<i>Alosa aestivalis</i>
Gizzard shad	<i>Dorosoma cepedianum</i>
Striped bass	<i>Morone saxatilis</i>

Includes all fish and mussel species listed as Species of Conservation and Management Concern as determined by the Service’s Northeast Region Fisheries Program Strategic Plan Fiscal Years 2009-2013 <http://www.fws.gov/northeast/fisheries/reports/reports/FisheriesStrategicPlan.pdf> and/or Northeast Region Fisheries Program Strategic Plan Fiscal Years 2009-2013: Supplement, June 2009 <http://www.fws.gov/northeast/fisheries/reports/reports/StrategicPlanSupplement6-11-09.pdf>.

Occurrences verified through:

1. VDGIF VaFWIS database (<http://vafwis.org>).
2. Jenkins, R.E., and N.M. Burkhead. 1993. Freshwater Fishes of Virginia. American Fisheries Society, Bethesda, Maryland.
3. NatureServe (<http://www.natureserve.org>, website accessed 3/9/2010).
4. Personal Communication, Eric Brittle, VDGIF, March 18, 2010.
5. Personal Communication, Brian Watson, VDGIF, March 18, 2010.
6. Personal Communication, Brian van Eerden, TNC, March 11, 2010.

Notes on species:

1. Atlantic sturgeon – no records, VDGIF indicates possibly in lower Blackwater River.

Blackwater River Watershed Known or Likely Federally Listed Species, Federal Candidate Species,
Designated Critical Habitat, and Species of Concern

Endangered

Common Name	Scientific Name
Red-cockaded woodpecker ¹	<i>Picoides borealis</i>

Species of Concern

Common Name	Scientific Name	Rank ³
Long Beach seedbox ¹	<i>Ludwigia brevipes</i>	G2G3
New Jersey rush ²	<i>Juncus caesariensis</i>	G2
Raven's seedbox ²	<i>Ludwigia ravenii</i>	G1G2
Sandhills lily ²	<i>Lilium pyrophilum</i>	G2
Sun-facing coneflower ²	<i>Rudbeckia heliopsidis</i>	G2
Virginia least trillium ²	<i>Trillium pusillum</i> var. <i>virginianum</i>	G3T2
Winter quillwort ²	<i>Isoetes hyemalis</i>	G2G3
Yellow lance ^{1 2}	<i>Elliptio lanceolata</i>	G2G3

¹VDGIF VaFWIS database (<http://vafwis.org>).

²VDCR-DNH database (http://www.dcr.virginia.gov/natural_heritage/dbsearchtool.shtml).

³The species of concern list was compiled from information provided by VDCR-DNH. The global ranks are assigned by a consensus of the network of natural heritage programs, scientific experts, and NatureServe (a non-profit conservation organization) to designate the rangewide rarity of a species or subspecies. Species with G1, G2, G_T1, or G_T2, rankings are included on this list. (NatureServe 2009 <http://www.natureserve.org/explorer/granks.htm>).

G1	Critically Imperiled—At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.
G2	Imperiled—At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.
G#G#	Range Rank—A numeric range rank (e.g., G2G3) is used to indicate the range of uncertainty in the status of a species or community. Ranges cannot skip more than one rank (e.g., GU should be used rather than G1G4).
T#	Intraspecific Taxon (trinomial)—The status of intraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank. Rules for assigning T-ranks follow the same principles outlined above for global conservation status ranks. For example, the global rank of a critically imperiled subspecies of an otherwise widespread and common species would be G5T1. A T-rank cannot imply the subspecies or variety is more abundant than the species as a whole—for example, a G1T2 cannot occur. A vertebrate animal population, such as those listed as distinct population segments under the U.S. Endangered Species Act, may be considered an intraspecific taxon and assigned a T-rank; in such cases a Q is used after the T-rank to denote the taxon's informal taxonomic status.

Notes on species:

1. Dwarf wedgemussel (*Alasmidonta heterodon*), federally listed endangered, was considered for this area but eliminated due to lack of historic occurrences and omission from VDGIF aquatic Tier II potential habitat maps.

Clinch and Powell Rivers Watershed Priority Migratory Bird Species

Acadian flycatcher	Kentucky warbler
American black duck	Loggerhead shrike
American woodcock	Louisiana waterthrush
Bald eagle	Northern saw-whet owl
Bewick's wren	Prairie warbler
Black-billed cuckoo	Red crossbill
Black-capped chickadee	Red-headed woodpecker
Blue-winged warbler	Rusty blackbird
Canada goose	Sedge wren
Canada warbler	Swainson's warbler
Cerulean warbler	Upland sandpiper
Chimney swift	Whip-poor-will
Field sparrow	Wood thrush
Golden-winged warbler	Worm-eating warbler
Henslow's sparrow	Yellow-bellied sapsucker
Hooded warbler	

Includes all bird species that received a highest (HH) or high (H) priority ranking as determined by the Atlantic Coast Joint Venture and Partners in Flight Initiative (http://www.acjv.org/bird_conservation_regions.htm) and/or were listed by the Service as Birds of Conservation Concern (http://library.fws.gov/Bird_Publications/BCC2008.pdf).

Occurrences verified through:

1. VDGIF VaFWIS database (<http://vafwis.org>).
2. Breeding Bird Surveys (<http://www.pwrc.usgs.gov/bbs/index.html>).
3. Cornell University bird range maps (<http://www.allaboutbirds.org/guide/search>).

Clinch and Powell Rivers Watershed Fisheries Species of Conservation Concern

Common Name	Scientific Name
Appalachian monkeyface	<i>Quadrula sparsa</i>
Birdwing pearl mussel	<i>Lemiox rimosus</i>
Blackside dace	<i>Phoxinus cumberlandensis</i>
Brook trout	<i>Salvelinus fontinalis</i>
Cracking pearl mussel	<i>Hemistena lata</i>
Cumberland bean	<i>Villosa trabalis</i>
Cumberland combshell	<i>Epioblasma brevidens</i>
Cumberland monkeyface pearl mussel	<i>Quadrula intermedia</i>
Dromedary pearl mussel	<i>Dromus dromas</i>
Duskytail darter	<i>Etheostoma percnurum</i>
Fanshell	<i>Cyprogenia stegaria</i>
Fine-rayed pigtoe	<i>Fusconaia cuneolus</i>
Fluted kidneyshell	<i>Ptychobranthus subtentum</i>
Gizzard shad	<i>Dorosoma cepedianum</i>
Green blossom pearl mussel	<i>Epioblasma torulosa gubernaculum</i>
Littlewing pearl mussel	<i>Pegias fabula</i>
Oyster mussel	<i>Epioblasma capsaeformis</i>
Pink mucket	<i>Lampsilis abrupta</i>
Purple bean	<i>Villosa perpurpurea</i>
Rayed bean	<i>Villosa fabalis</i>
Rough pigtoe	<i>Pleurobema plenum</i>
Rough rabbitsfoot	<i>Quadrula cylindrica strigillata</i>
Sheepnose	<i>Plethobasus cyphus</i>
Shiny pigtoe	<i>Fusconaia cor</i>
Slabside pearl mussel	<i>Lexingtonia dolabelliformis</i>
Slender chub	<i>Erimystax cahni</i>
Spectaclecase	<i>Cumberlandia monodonta</i>
Tan riffleshell	<i>Epioblasma florentina walker</i>
Walleye	<i>Sander vitreus</i>
Yellowfin madtom	<i>Noturus flavipinnis</i>

Includes all fish and mussel species listed as Species of Conservation and Management Concern as determined by the Service's Northeast Region Fisheries Program Strategic Plan Fiscal Years 2009-2013 <http://www.fws.gov/northeast/fisheries/reports/reports/FisheriesStrategicPlan.pdf> and/or Northeast Region Fisheries Program Strategic Plan Fiscal Years 2009-2013: Supplement, June 2009 <http://www.fws.gov/northeast/fisheries/reports/reports/StrategicPlanSupplement6-11-09.pdf>.

Occurrences verified through:

1. VDGIF VaFWIS database (<http://vafwis.org>).
2. Jenkins, R.E., and N.M. Burkhead. 1993. Freshwater Fishes of Virginia. American Fisheries Society, Bethesda, Maryland.
3. NatureServe (<http://www.natureserve.org>, website accessed 3/9/2010).
4. Personal Communication, John Copeland, VDGIF, May 13, 2010.
5. Personal Communication, Brian Evans, Service, March 19, 2010.

6. Personal Communication, Jess Jones, Service, April 30, 2010.

Notes on species:

1. Gizzard shad – native.
2. Walleye – native.

Clinch and Powell Rivers Watershed Known or Likely Federally Listed and Proposed Species, Federal Candidate Species, Designated Critical Habitat, and Species of Concern

Endangered

Common Name	Scientific Name
Appalachian monkeyface pearlymussel ^{1 2}	<i>Quadrula sparsa</i>
Birdwing pearlymussel ^{1 2}	<i>Lemiox rimosus</i>
Cracking pearlymussel ^{1 2}	<i>Hemistena lata</i>
Cumberland bean ^{1 2 4}	<i>Villosa trabalis</i>
Cumberland monkeyface pearlymussel ^{1 2}	<i>Quadrula intermedia</i>
Cumberlandian combshell ^{1 2}	<i>Epioblasma brevidens</i>
Dromedary pearlymussel ^{1 2}	<i>Dromus dromas</i>
Duskytail darter ^{1 2}	<i>Etheostoma percnurum</i>
Fanshell ²	<i>Cyprogenia stegaria</i>
Fine-rayed pigtoe ^{1 2}	<i>Fusconaia cuneolus</i>
Gray bat ^{1 2}	<i>Myotis grisescens</i>
Green blossom pearlymussel ^{1 2}	<i>Epioblasma torulosa gubernaculum</i>
Indiana bat ^{1 2}	<i>Myotis sodalis</i>
Lee County cave isopod ²	<i>Lirceus usdagalun</i>
Little-wing pearlymussel ^{1 2}	<i>Pegias fabula</i>
Oyster mussel ^{1 2}	<i>Epioblasma capsaeformis</i>
Pink mucket ^{1 2 4}	<i>Lampsilis abrupta</i>
Purple bean ^{1 2}	<i>Villosa perpurpurea</i>
Rough pigtoe ^{1 2}	<i>Pleurobema plenum</i>
Rough rabbitsfoot ^{1 2}	<i>Quadrula cylindrical strigillata</i>
Shiny pigtoe ^{1 2}	<i>Fusconaia cor</i>
Tan riffleshell ^{1 2}	<i>Epioblasma florentina walker</i>
Virginia big-eared bat ^{1 2}	<i>Corynorhinus townsendii virginianus</i>

Threatened

Common Name	Scientific Name
Blackside dace ^{1 2}	<i>Phoxinus cumberlandensis</i>
Slender chub ^{1 2}	<i>Erimystax cahni</i>
Small whorled pogonia ²	<i>Isotria medeoloides</i>
Virginia spiraea ^{1 2}	<i>Spiraea virginiana</i>
Yellowfin madtom ^{1 2}	<i>Noturus flavipinnis</i>

Proposed Endangered

Common Name	Scientific Name
Rayed bean ^{1 4}	<i>Villosa fabalis</i>
Sheepnose ^{1 2}	<i>Plethobasus cyphus</i>
Snuffbox ^{1 2}	<i>Epioblasma triquetra</i>
Spectaclecase ^{1 2}	<i>Cumberlandia monodonta</i>

Candidate

Common Name	Scientific Name
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Fluted kidneyshell ^{1 2}	<i>Ptychobranthus subtentum</i>
Slabside pearlymussel ^{1 2}	<i>Lexingtonia dolabelloides</i>

Critical Habitat

Common Name	Scientific Name
Cumberlandian combshell	<i>Epioblasma brevidens</i>
Oyster mussel	<i>Epioblasma capsaeformis</i>
Purple bean	<i>Villosa perpurpurea</i>
Rough rabbitsfoot	<i>Quadrula cylindrical strigillata</i>
Slender chub	<i>Erimystax cahni</i>
Yellowfin madtom	<i>Noturus flavipinnis</i>

Species of Concern

Common Name	Scientific Name	Rank ³
Ashy darter ^{1 2}	<i>Etheostoma cinereum</i>	G2G3
Appalachian Bewick's wren ^{1 2}	<i>Thryomanes bewickii altus</i>	G5T2Q
Big Cedar Creek millipede ^{1 2}	<i>Brachoria falcifera</i>	G1
Blotchside logperch ^{1 2}	<i>Percina burtoni</i>	G2G3
Canby's mountain-lover ²	<i>Paxistima canbyi</i>	G2
A cave beetle ^{1 2}	<i>Pseudanophthalmus seclusus</i>	G2G3
A cave beetle ²	<i>Pseudanophthalmus</i> sp. 10	G1
A cave beetle ²	<i>Pseudanophthalmus</i> sp. 4	G1
A cave beetle ²	<i>Pseudanophthalmus</i> sp. 9	G1
A cave dipluran ²	<i>Litocampa</i> sp. 2	G1
A cave dipluran ²	<i>Litocampa</i> sp. 4	G2
A cave lumbriculid worm ²	<i>Spelaedrillus multiporus</i>	G1
A cave lumbriculid worm ^{1 2}	<i>Stylodrilus beattiei</i>	G2G3
A cave mite ²	<i>Poecilophysis extraneostella</i>	G2?
A cave planarian ²	<i>Geocentrophora cavernicola</i>	G1G2
A cave pselaphid beetle ²	<i>Arianops jeanneli</i>	G1
A cave pseudoscorpion ²	<i>Kleptochthonius binoculatus</i>	G1G2
A cave pseudoscorpion ²	<i>Kleptochthonius proximisetus</i>	G1
A cave pseudoscorpion ²	<i>Kleptochthonius regulus</i>	G1G2
A cave pseudoscorpion ²	<i>Kleptochthonius similis</i>	G1
A cave pseudoscorpion ²	<i>Kleptochthonius</i> sp. 1	G1
A cave spider ²	<i>Nesticus mimus</i>	G2
A cave springtail ^{1 2}	<i>Pseudosinella erehwon</i>	G1
A cave springtail ^{1 2}	<i>Pseudosinella extra</i>	G1G2
A cave springtail ²	<i>Arrhopalites carolynae</i>	G2G3
A cave springtail ²	<i>Arrhopalites commorus</i>	G2G4
A cave springtail ²	<i>Oncopodura hubbardi</i>	G1G2
A cave springtail ²	<i>Pseudosinella gisini virginia</i>	G3G4T1
Cedar millipede ²	<i>Brachoria cedra</i>	G2
Chandler's planarian ^{1 2}	<i>Sphalloplana chandleri</i>	G1G2
Cherokee clubtail ^{1 2}	<i>Gomphus consanguis</i>	G2G3
Clinch dace ^{1 2}	<i>Phoxinus</i> sp. 1	G1

Clinch sculpin ²	<i>Cottus sp. 4</i>	G1G2
Cumberland Gap cave amphipod	<i>Bactrurus angulus</i>	G1
Cumberland Gap cave beetle ²	<i>Pseudanophthalmus hirsutus</i>	G1G2
Cumberland Cave isopod ²	<i>Caecidotea cumberlandensis</i>	G1G2
Deceptive cave beetle ^{1 2}	<i>Pseudanophthalmus deceptivus</i>	G1
Gertsch's cave pseudoscorpion ²	<i>Kleptochthonius gertschi</i>	G1
Golden darter ^{1 2}	<i>Etheostoma denoncourti</i>	G2
Hoffman's xystodesmid millipede ²	<i>Brachoria hoffmani</i>	G2
Holsinger's cave beetle ²	<i>Pseudanophthalmus holsingeri</i>	G1
Hubricht's cave beetle ²	<i>Pseudanophthalmus hubrichti</i>	G1
Little Kennedy cave beetle ²	<i>Pseudanophthalmus cordicollis</i>	G1
Long-headed cave beetle ^{1 2}	<i>Pseudanophthalmus longiceps</i>	G1G2
Lutz's cave pseudoscorpion ²	<i>Kleptochthonius lutzi</i>	G1
Maiden Spring cave beetle ^{1 2}	<i>Pseudanophthalmus virginicus</i>	G1
A millipede ²	<i>Brachoria dentata</i>	G1
A millipede ²	<i>Brachoria insolita</i>	G1
A millipede ²	<i>Buotus carolinus</i>	G1
A millipede ²	<i>Dixioria fowleri</i>	G2
A millipede ^{1 2}	<i>Pseudotremia armesi</i>	G2
A millipede ²	<i>Pseudotremia tuberculata</i>	G2G3
Overlooked cave beetle ^{1 2}	<i>Pseudanophthalmus praetermissus</i>	G1
Powell Mountain millipede Sp a ²	<i>Brachoria sp. 1</i>	G1?
Powell Mountain millipede Sp b ²	<i>Brachoria sp. 2</i>	G1?
Powell River crayfish ²	<i>Cambarus jezerinaci</i>	G1G2
Powell Valley planarian ²	<i>Sphalloplana consimilis</i>	G2G3
Powell Valley terrestrial cave isopod ²	<i>Amerigoniscus henroti</i>	G2G3
Purple liliput ^{1 2}	<i>Toxolasma lividus</i>	G2
Pyramid pigtoe ^{1 2}	<i>Pleurobema rubrum</i>	G2G3
Roaring Branch Nannaria millipede ²	<i>Nannaria sp. 1</i>	G1?
Roaring Branch pseudotremia millipede ²	<i>Pseudotremia sp. 2</i>	G1?
Rotund cave beetle ²	<i>Pseudanophthalmus rotundatus</i>	G2G3
A rove beetle ²	<i>Atheta troglodila</i>	G1
Running glade clover ²	<i>Trifolium calcaricum</i>	G1
Rye Cove isopod ^{1 2}	<i>Lirceus culveri</i>	G1
Saint Paul cave beetle ^{1 2}	<i>Pseudanophthalmus sanctipauli</i>	G1G2
Silken cave beetle ^{1 2}	<i>Pseudanophthalmus sericus</i>	G1
Slender supercoil ²	<i>Paravitrea subtilis</i>	G2
Spiny riversnail ^{1 2}	<i>Io fluvalis</i>	G2
Tennessee clubshell ²	<i>Pleurobema oviforme</i>	G2G3
Tennessee heelsplitter ^{1 2}	<i>Lasmigona holstonia</i>	G2G3
Tennessee pigtoe ^{1 2}	<i>Fusconaia barnesiana</i>	G2G3
Thankless ghostsnail ²	<i>Holsingeria unthinksensis</i>	G2
Thomas' cave beetle ^{1 2}	<i>Pseudanophthalmus thomasi</i>	G1G2
Valentine's cave pseudoscorpion ²	<i>Microcreagris valentinei</i>	G1
Vicariant cave beetle ^{1 2}	<i>Pseudanophthalmus vicarius</i>	G2G3

Yarrow-leaved ragwort ²	<i>Packera millefolia</i>	G2
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¹VDGIF VaFWIS database (<http://vafwis.org>).

²VDCR-DNH database (http://www.dcr.virginia.gov/natural_heritage/dbsearchtool.shtml).

³The species of concern list was compiled from information provided by VDCR-DNH. The global ranks are assigned by a consensus of the network of natural heritage programs, scientific experts, and NatureServe (a non-profit conservation organization) to designate the rangewide rarity of a species or subspecies. Species with G1, G2, G_T1, or G_T2, rankings are included on this list. (NatureServe 2009 <http://www.natureserve.org/explorer/granks.htm>).

⁴Believed to be extirpated in Virginia.

G1	Critically Imperiled—At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.
G2	Imperiled—At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.
G#G#	Range Rank—A numeric range rank (e.g., G2G3) is used to indicate the range of uncertainty in the status of a species or community. Ranges cannot skip more than one rank (e.g., GU should be used rather than G1G4).
T#	Infraspecific Taxon (trinomial)—The status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank. Rules for assigning T-ranks follow the same principles outlined above for global conservation status ranks. For example, the global rank of a critically imperiled subspecies of an otherwise widespread and common species would be G5T1. A T-rank cannot imply the subspecies or variety is more abundant than the species as a whole—for example, a G1T2 cannot occur. A vertebrate animal population, such as those listed as distinct population segments under the U.S. Endangered Species Act, may be considered an infraspecific taxon and assigned a T-rank; in such cases a Q is used after the T-rank to denote the taxon's informal taxonomic status.

Eastern Shore Priority Migratory Bird Species

American bittern	Glossy ibis	Red knot
American black duck	Golden-winged warbler	Red-headed woodpecker
American golden plover	Great-crested flycatcher	Red-throated loon
American oystercatcher	Greater scaup	Roseate tern
American woodcock	Greater shearwater	Ruddy turnstone
Bald eagle	Greater yellowlegs	Rusty blackbird
Baltimore oriole	Gull-billed tern	Saltmarsh sharp-tailed sparrow
Bay-breasted warbler	Henslow's sparrow	Sanderling
Bicknell's thrush	Horned grebe	Sandwich tern
Black rail	Hudsonian godwit	Seaside sparrow
Black scoter	Kentucky warbler	Sedge wren
Black skimmer	Least bittern	Semipalmated sandpiper
Black-and-white warbler	Least tern	Short-billed dowitcher
Black-bellied plover	Lesser scaup	Short-eared owl
Blue-winged warbler	Lesser yellowlegs	Snowy egret
Brant	Loggerhead shrike	Solitary sandpiper
Broad-winged hawk	Long-tailed duck	Surf scoter
Brown thrasher	Louisiana waterthrush	Tundra swan
Brown-headed nuthatch	Mallard	Upland sandpiper
Buff-breasted sandpiper	Marbled godwit	Whimbrel
Bufflehead	Marsh wren	Whip-poor-will
Canada goose	Nelson's sharp-tailed sparrow	White-rumped sandpiper
Canvasback	Northern bobwhite	White-winged scoter
Cerulean warbler	Northern flicker	Willet
Chimney swift	Northern gannet	Willow flycatcher
Clapper rail	Peregrine falcon	Wilson's phalarope
Common eider	Pied-billed grebe	Wilson's plover
Dunlin	Piping plover	Wood thrush
Eastern kingbird	Prairie warbler	Worm-eating warbler
Eastern towhee	Prothonotary warbler	Yellow-throated vireo
Field sparrow	Purple sandpiper	
Forster's tern		

Includes all bird species that received a highest (HH) or high (H) priority ranking as determined by the Atlantic Coast Joint Venture and Partners in Flight Initiative (http://www.acjv.org/bird_conservation_regions.htm) and/or were listed by the Service as Birds of Conservation Concern (http://library.fws.gov/Bird_Publications/BCC2008.pdf).

Occurrences verified through:

1. VDGIF VaFWIS database (<http://vafwis.org>).
2. Breeding Bird Surveys (<http://www.pwrc.usgs.gov/bbs/index.html>).
3. Cornell University bird range maps (<http://www.allaboutbirds.org/guide/search>).
4. Bird lists for Chincoteague and Eastern Shore NWRs

Eastern Shore Fisheries Species of Conservation Concern

Common Name	Scientific Name
Alewife	<i>Alosa pseudoharengus</i>
American eel	<i>Anguilla rostrata</i>
American shad	<i>Alosa sapidissima</i>
Atlantic sturgeon	<i>Acipenser oxyrinchus</i>
Blueback herring	<i>Alosa aestivalis</i>
Gizzard shad	<i>Dorosoma cepedianum</i>
Shortnose sturgeon	<i>Acipenser brevirostrum</i>
Striped bass	<i>Morone saxatilis</i>

Includes all fish and mussel species listed as Species of Conservation and Management Concern as determined by the Service's Northeast Region Fisheries Program Strategic Plan Fiscal Years 2009-2013 <http://www.fws.gov/northeast/fisheries/reports/reports/FisheriesStrategicPlan.pdf> and/or Northeast Region Fisheries Program Strategic Plan Fiscal Years 2009-2013: Supplement, June 2009 <http://www.fws.gov/northeast/fisheries/reports/reports/StrategicPlanSupplement6-11-09.pdf>.

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3. NatureServe (<http://www.natureserve.org>, website accessed 3/9/2010).

Eastern Shore Known or Likely Federally Listed Species, Federal Candidate Species, Designated Critical Habitat, and Species of Concern

Endangered

Common Name	Scientific Name
Delmarva Peninsula fox squirrel ¹	<i>Sciurus niger cinereus</i>
Kemp's (Atlantic) ridley sea turtle ¹	<i>Lepidochelys kempii</i>
Leatherback sea turtle ¹	<i>Dermodochelys coriacea</i>
Roseate tern ¹	<i>Sterna dougallii dougallii</i>
Shortnose sturgeon	<i>Acipenser brevirostrum</i>

Threatened

Common Name	Scientific Name
Green sea turtle ¹	<i>Chelonia mydas</i>
Loggerhead sea turtle ¹	<i>Caretta caretta</i>
Northeastern beach tiger beetle ^{1 2}	<i>Cicindela dorsalis dorsalis</i>
Piping plover ¹	<i>Charadrius melodus</i>
Seabeach amaranth ²	<i>Amaranthus pumilus</i>

Candidate

Common Name	Scientific Name
Red knot	<i>Calidris canutus</i>

Species of Concern

Common Name	Scientific Name	Rank
Creamflower tick-trefoil ²	<i>Desmodium ochroleucum</i>	G1G2
Virginia least trillium ²	<i>Trillium pusillum</i> var. <i>virginianum</i>	G3T2

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²VDCR-DNH database (http://www.dcr.virginia.gov/natural_heritage/dbsearchtool.shtml).

³The species of concern list was compiled from information provided by VDCR-DNH. The global ranks are assigned by a consensus of the network of natural heritage programs, scientific experts, and NatureServe (a non-profit conservation organization) to designate the rangewide rarity of a species or subspecies. Species with G1, G2, G_T1, or G_T2, rankings are included on this list. (NatureServe 2009 <http://www.natureserve.org/explorer/granks.htm>).

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G2	Imperiled—At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.
G#G#	Range Rank—A numeric range rank (e.g., G2G3) is used to indicate the range of uncertainty in the status of a species or community. Ranges cannot skip more than one rank (e.g., GU should be used rather than G1G4).
T#	Intraspecific Taxon (trinomial)—The status of intraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank. Rules for assigning T-ranks follow the same principles outlined above for global conservation status ranks. For example, the global rank of a critically imperiled subspecies of an

	otherwise widespread and common species would be G5T1. A T-rank cannot imply the subspecies or variety is more abundant than the species as a whole-for example, a G1T2 cannot occur. A vertebrate animal population, such as those listed as distinct population segments under the U.S. Endangered Species Act, may be considered an infraspecific taxon and assigned a T-rank; in such cases a Q is used after the T-rank to denote the taxon's informal taxonomic status.
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Great Dismal Swamp National Wildlife Refuge Priority Migratory Bird Species

American avocet	Common tern	Rusty blackbird
American bittern	Eastern kingbird	Semipalmated sandpiper
American black duck	Eastern meadowlark	Short-billed dowitcher
American coot	Eastern towhee	Solitary sandpiper
American kestrel	Eastern wood-pewee	Song sparrow
American widgeon	Field sparrow	Swainson's warbler
American woodcock	Horned grebe	Swallow-tailed kite
Bicknell's thrush	Kentucky warbler	Tundra swan
Black tern	King rail	Vesper sparrow
Black-crowned night heron	Least sandpiper	Virginia rail
Black-throated green warbler	Lesser scaup	Western sandpiper
Blue-winged teal	Lesser yellowlegs	Whimbrel
Brant	Little blue heron	White ibis
Brown thrasher	Mallard	White-throated sparrow
Brown-headed nuthatch	Northern bobwhite	Willow flycatcher
Canada goose	Northern flicker	Wood duck
Canvasback	Northern pintail	Wood thrush
Cerulean warbler	Pied-billed grebe	Worm-eating warbler
Chimney swift	Prairie warbler	Yellow-billed cuckoo
Chuck-will's-widow	Prothonotary warbler	Yellow-crowned night heron
Common goldeneye	Redhead	
Common loon	Red-headed woodpecker	

Includes all bird species that received a highest (HH) or high (H) priority ranking as determined by the Atlantic Coast Joint Venture and Partners in Flight Initiative (http://www.acjv.org/bird_conservation_regions.htm) and/or were listed by the Service as Birds of Conservation Concern (http://library.fws.gov/Bird_Publications/BCC2008.pdf).

Occurrences verified through:

1. Bird list for Great Dismal Swamp NWR.

Great Dismal Swamp National Wildlife Refuge Fisheries Species of Conservation Concern

Common Name	Scientific Name
Alewife	<i>Alosa pseudoharengus</i>
American eel	<i>Anguilla rostrata</i>
American shad	<i>Alosa sapidissima</i>
Atlantic sturgeon	<i>Acipenser oxyrinchus</i>
Blueback herring	<i>Alosa aestivalis</i>
Gizzard shad	<i>Dorosoma cepedianum</i>
Hickory shad	<i>Alosa mediocris</i>
Shortnose sturgeon	<i>Acipenser brevirostrum</i>
Striped bass	<i>Morone saxatilis</i>

Includes all fish and mussel species listed as Species of Conservation and Management Concern as determined by the Service's Northeast Region Fisheries Program Strategic Plan Fiscal Years 2009-2013 <http://www.fws.gov/northeast/fisheries/reports/reports/FisheriesStrategicPlan.pdf> and/or Northeast Region Fisheries Program Strategic Plan Fiscal Years 2009-2013: Supplement, June 2009 <http://www.fws.gov/northeast/fisheries/reports/reports/StrategicPlanSupplement6-11-09.pdf>.

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1. VDGIF VaFWIS database (<http://vafwis.org>).
2. Jenkins, R.E., and N.M. Burkhead. 1993. Freshwater Fishes of Virginia. American Fisheries Society, Bethesda, Maryland.
3. NatureServe (<http://www.natureserve.org>, website accessed 3/9/2010).
4. North Carolina Wildlife Resources Commission. 2005. North Carolina Wildlife Action Plan. Raleigh, North Carolina. (http://www.ncwildlife.org/Plan/WSC_WAP_Downloads.htm).
5. Personal Communication, Eric Brittle, VDGIF, March 18, 2010.

Notes on species:

1. With the exception of American eel, all species listed are only identified from the Pasquotank River, which abuts the current southern edge of the Great Dismal Swamp NWR.
2. Shortnose sturgeon has not been seen in over 100 years and may be extirpated from the Chowan River system.

Great Dismal Swamp National Wildlife Refuge Known or Likely Federally Listed Species, Federal Candidate Species, Designated Critical Habitat, and Species of Concern

Endangered

Common Name	Scientific Name
Red-cockaded woodpecker ¹	<i>Picoides borealis</i>

Species of Concern

Common Name	Scientific Name	Rank ³
A noctuid moth ²	<i>Lithacodia</i> sp. 1	G1G3
Raven's seedbox ²	<i>Ludwigia ravenii</i>	G1G2
Virginia least trillium ²	<i>Trillium pusillum</i> var. <i>virginianum</i>	G3T2

¹VDGIF VaFWIS database (<http://vafwis.org>).

²VDCR-DNH database (http://www.dcr.virginia.gov/natural_heritage/dbsearchtool.shtml).

³The species of concern list was compiled from information provided by VDCR-DNH. The global ranks are assigned by a consensus of the network of natural heritage programs, scientific experts, and NatureServe (a non-profit conservation organization) to designate the rangewide rarity of a species or subspecies. Species with G1, G2, G_T1, or G_T2, rankings are included on this list. (NatureServe 2009 <http://www.natureserve.org/explorer/granks.htm>).

G1	Critically Imperiled—At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.
G2	Imperiled—At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.
G#G#	Range Rank—A numeric range rank (e.g., G2G3) is used to indicate the range of uncertainty in the status of a species or community. Ranges cannot skip more than one rank (e.g., GU should be used rather than G1G4).
T#	Infraspecific Taxon (trinomial)—The status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank. Rules for assigning T-ranks follow the same principles outlined above for global conservation status ranks. For example, the global rank of a critically imperiled subspecies of an otherwise widespread and common species would be G5T1. A T-rank cannot imply the subspecies or variety is more abundant than the species as a whole—for example, a G1T2 cannot occur. A vertebrate animal population, such as those listed as distinct population segments under the U.S. Endangered Species Act, may be considered an infraspecific taxon and assigned a T-rank; in such cases a Q is used after the T-rank to denote the taxon's informal taxonomic status.

Holston River Watershed Priority Migratory Bird Species

Acadian flycatcher	Loggerhead shrike
American black duck	Louisiana waterthrush
American woodcock	Northern saw-whet owl
Bald eagle	Olive-sided flycatcher
Bewick's wren	Peregrine falcon
Black-billed cuckoo	Prairie warbler
Black-capped chickadee	Red crossbill
Blue-winged warbler	Red-headed woodpecker
Canada goose	Rusty blackbird
Canada warbler	Sedge wren
Cerulean warbler	Swainson's warbler
Chimney swift	Upland sandpiper
Field sparrow	Whip-poor-will
Golden-winged warbler	Wood thrush
Henslow's sparrow	Worm-eating warbler
Hooded warbler	Yellow-bellied sapsucker
Kentucky warbler	

Includes all bird species that received a highest (HH) or high (H) priority ranking as determined by the Atlantic Coast Joint Venture and Partners in Flight Initiative (http://www.acjv.org/bird_conservation_regions.htm) and/or were listed by the Service as Birds of Conservation Concern (http://library.fws.gov/Bird_Publications/BCC2008.pdf).

Occurrences verified through:

1. VDGIF VaFWIS database (<http://vafwis.org>).
2. Breeding Bird Surveys (<http://www.pwrc.usgs.gov/bbs/index.html>).
3. Cornell University bird range maps (<http://www.allaboutbirds.org/guide/search>).

Holston River Watershed Fisheries Species of Conservation Concern

Common Name	Scientific Name
Birdwing pearlymussel	<i>Lemiox rimosus</i>
Brook trout	<i>Salvelinus fontinalis</i>
Cumberland bean	<i>Villosa trabalis</i>
Cumberlandian combshell	<i>Epioblasma brevidens</i>
Cumberland monkeyface pearlymussel	<i>Quadrula intermedia</i>
Dromedary pearlymussel	<i>Dromus dromas</i>
Duskytail darter	<i>Etheostoma percnurum</i>
Fine-rayed pigtoe	<i>Fusconaia cuneolus</i>
Fluted kidneyshell	<i>Ptychobranthus subtentum</i>
Gizzard shad	<i>Dorosoma cepedianum</i>
Green blossom pearlymussel	<i>Epioblasma torulosa gubernaculum</i>
Littlewing pearlymussel	<i>Pegias fabula</i>
Purple bean	<i>Villosa perpurpurea</i>
Rough rabbitsfoot	<i>Quadrula cylindrica strigillata</i>
Shiny pigtoe	<i>Fusconaia cor</i>
Slabside pearlymussel	<i>Lexingtonia dolabelloides</i>
Slender chub	<i>Erimystax cahni</i>
Spotfin chub	<i>Erimonax monachus</i>
Tan riffleshell	<i>Epioblasma florentina walkeri</i>
Walleye	<i>Sander vitreus</i>
Yellowfin madtom	<i>Noturus flavipinnis</i>

Includes all fish and mussel species listed as Species of Conservation and Management Concern as determined by the Service's Northeast Region Fisheries Program Strategic Plan Fiscal Years 2009-2013 <http://www.fws.gov/northeast/fisheries/reports/reports/FisheriesStrategicPlan.pdf> and/or Northeast Region Fisheries Program Strategic Plan Fiscal Years 2009-2013: Supplement, June 2009 <http://www.fws.gov/northeast/fisheries/reports/reports/StrategicPlanSupplement6-11-09.pdf>.

Occurrences verified through:

1. VDGIF VaFWIS database (<http://vafwis.org>).
2. Jenkins, R.E., and N.M. Burkhead. 1993. Freshwater Fishes of Virginia. American Fisheries Society, Bethesda, Maryland.
3. NatureServe (<http://www.natureserve.org>, website accessed 3/9/2010).
4. Personal Communication, John Copeland, VDGIF, May 13, 2010.
5. Personal Communication, Brian Evans, Service, March 19, 2010.
6. Personal Communication, Jess Jones, Service, April 30, 2010.

Holston River Watershed Known or Likely Federally Listed and Proposed Species, Federal Candidate Species, Designated Critical Habitat, and Species of Concern

Endangered

Common Name	Scientific Name
Birdwing pearlymussel ^{1 2}	<i>Lemiox rimosus</i>
Carolina northern flying squirrel ^{1 2}	<i>Glaucomys sabrinus coloratus</i>
Cumberland bean ^{1 2 4}	<i>Villosa trabalis</i>
Cumberland monkeyface pearlymussel ²	<i>Quadrula intermedia</i>
Cumberlandian combshell ^{1 2}	<i>Epioblasma brevidens</i>
Dromedary pearlymussel	<i>Dromus dromas</i>
Duskytail darter	<i>Etheostoma percnurum</i>
Fine-rayed pigtoe ^{1 2}	<i>Fusconaia cuneolus</i>
Gray bat ^{1 2}	<i>Myotis grisescens</i>
Green blossom pearlymussel ^{1 2}	<i>Epioblasma torulosa gubernaculum</i>
Indiana bat ¹	<i>Myotis sodalis</i>
Little-wing pearlymussel ^{1 2}	<i>Pegias fabula</i>
Oyster mussel ^{1 2}	<i>Epioblasma capsaeformis</i>
Purple bean ²	<i>Villosa perpurpurea</i>
Rough rabbitsfoot ^{1 2}	<i>Quadrula cylindrical strigillata</i>
Shiny pigtoe ^{1 2}	<i>Fusconaia cor</i>
Tan riffleshell ^{1 2}	<i>Epioblasma florentina walkeri</i>
Virginia big-eared bat ¹	<i>Corynorhinus townsendii virginianus</i>

Threatened

Common Name	Scientific Name
Spotfin chub ^{1 2}	<i>Erimonax monachus</i>
Virginia round-leaf birch ^{1 2}	<i>Betula uber</i>
Yellowfin madtom ²	<i>Noturus flavipinnis</i>

Proposed Endangered

Common Name	Scientific Name
Snuffbox ^{1 2}	<i>Epioblasma triquetra</i>
Rayed bean ^{1 2 4}	<i>Villosa fabalis</i>

Candidate

Common Name	Scientific Name
Fluted kidneyshell ^{1 2}	<i>Ptychobranthus subtentum</i>
Slabside pearlymussel ^{1 2}	<i>Lexingtonia dolabelloides</i>

Critical Habitat

Common Name	Scientific Name
Spotfin chub	<i>Erimonax monachus</i>

Species of Concern

Common Name	Scientific Name	Rank ³
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A cave beetle ²	<i>Pseudanophthalmus</i> sp. 5	G1
A cave dipluran	<i>Litocampa</i> sp. 3	G2
A cave lumbriculid worm ²	<i>Spelaedrillus multiporus</i>	G1
A cave spider ²	<i>Nesticus mimus</i>	G2
A cave springtail ²	<i>Arrhopalites pavo</i>	G1G2
A cave springtail ²	<i>Pseudosinella bona</i>	G1G2
An Appalachian millipede ²	<i>Rhysodesmus restans</i>	G1G2
Appalachian Bewick's wren ^{1 2}	<i>Thryomanes bewickii altus</i>	G5T2Q
Blotchside logperch ^{1 2}	<i>Percina burtoni</i>	G2G3
Cherokee clubtail ^{1 2}	<i>Gomphus consanguis</i>	G2G3
Collinwood millipede ²	<i>Brachoria mendota</i>	G1
Comb supercoil ²	<i>Paravitrea dentilla</i>	G1
Cryptic willowfly ²	<i>Taeniopteryx nelsoni</i>	G1
Fraser fir ²	<i>Abies fraseri</i>	G2
A groundwater amphipod ²	<i>Stygobromus</i> sp. 8	G2G3
Hoffman's cave beetle ²	<i>Pseudanophthalmus hoffmani</i>	G2G3
Hoffman's cleidogonid millipede ²	<i>Cleidogona hoffmani</i>	G2
Holston sallfly ²	<i>Sweltsa holstonensis</i>	G1
Incurved cave isopod ²	<i>Caecidotea incurva</i>	G2G4
James cave amphipod ²	<i>Stygobromus abditus</i>	G2G3
Lobed roachfly ²	<i>Tallaperla lobata</i>	G2
Jefferson's short-nosed scorpionfly ²	<i>Brachypanorpa jeffersoni</i>	G2
Montane centipede ²	<i>Escaryus cryptorobius</i>	G2
A millipede ²	<i>Brachoria separanda hamata</i>	G2T2
A millipede ²	<i>Buotus carolinus</i>	G1
A millipede ²	<i>Cleidogona lachesis</i>	G2
A millipede ²	<i>Dixioria fowleri</i>	G2
A millipede ²	<i>Dixioria pela coronata</i>	G2T2
A millipede ²	<i>Pseudotremia momus</i>	G2
Piratebush ²	<i>Buckleya distichophylla</i>	G2
Purple liliput ^{1 2}	<i>Toxolasma lividus</i>	G2
Smokies needlefly ²	<i>Megaleuctra williamsae</i>	G2
Spiny riversnail ^{1 2}	<i>Io fluvalis</i>	G2
Tennessee clubshell ²	<i>Pleurobema oviforme</i>	G2G3
Tennessee heelsplitter ¹	<i>Lasmigona holstonia</i>	G2G3
Tennessee pigtoe ^{1 2}	<i>Fusconaia barnesiana</i>	G2G3
Turner's millipede ²	<i>Brachoria turneri</i>	G1
Whitetop Mountain centipede ^{1 2}	<i>Escaryus orestes</i>	G1G2

¹VaGIF VaFWIS database (<http://vafwis.org>).

²VDCR-DNH database (http://www.dcr.virginia.gov/natural_heritage/dbsearchtool.shtml).

³The species of concern list was compiled from information provided by VDCR-DNH. The global ranks are assigned by a consensus of the network of natural heritage programs, scientific experts, and NatureServe (a non-profit conservation organization) to designate the rangewide rarity of a species or subspecies. Species with G1, G2, G_T1, or G_T2, rankings are included on this list. (NatureServe 2009 <http://www.natureserve.org/explorer/granks.htm>).

⁴Believed to be extirpated in Virginia.

G1	Critically Imperiled—At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.
G2	Imperiled—At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.
G#G#	Range Rank—A numeric range rank (e.g., G2G3) is used to indicate the range of uncertainty in the status of a species or community. Ranges cannot skip more than one rank (e.g., GU should be used rather than G1G4).
T#	Intraspecific Taxon (trinomial)—The status of intraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank. Rules for assigning T-ranks follow the same principles outlined above for global conservation status ranks. For example, the global rank of a critically imperiled subspecies of an otherwise widespread and common species would be G5T1. A T-rank cannot imply the subspecies or variety is more abundant than the species as a whole—for example, a G1T2 cannot occur. A vertebrate animal population, such as those listed as distinct population segments under the U.S. Endangered Species Act, may be considered an intraspecific taxon and assigned a T-rank; in such cases a Q is used after the T-rank to denote the taxon's informal taxonomic status.

Nottoway River Watershed Priority Migratory Bird Species

American bittern	King rail
American black duck	Least sandpiper
American coot	Lesser yellowlegs
American kestrel	Little blue heron
American widgeon	Loggerhead shrike
American woodcock	Mallard
Bald eagle	Northern bobwhite
Black-crowned night heron	Northern flicker
Black-throated green warbler	Pied-billed grebe
Blue-winged teal	Prairie warbler
Blue-winged warbler	Prothonotary warbler
Brown thrasher	Red-cockaded woodpecker
Brown-headed nuthatch	Red-headed woodpecker
Canada goose	Rusty blackbird
Chimney swift	Song sparrow
Chuck-will's-widow	Tricolored heron
Common tern	Vesper sparrow
Eastern kingbird	Virginia rail
Eastern meadowlark	Whip-poor-will
Eastern towhee	White-throated sparrow
Eastern wood-pewee	Willow flycatcher
Field sparrow	Wood duck
Grasshopper sparrow	Wood thrush
Henslow's sparrow	Worm-eating warbler
Hooded merganser	Yellow-billed cuckoo
Horned grebe	Yellow-crowned night heron
Kentucky warbler	

Includes all bird species that received a highest (HH) or high (H) priority ranking as determined by the Atlantic Coast Joint Venture and Partners in Flight Initiative (http://www.acjv.org/bird_conservation_regions.htm) and/or were listed by the Service as Birds of Conservation Concern (http://library.fws.gov/Bird_Publications/BCC2008.pdf).

Occurrences verified through:

1. VDGIF VaFWIS database (<http://vafwis.org>).
2. Breeding Bird Surveys (<http://www.pwrc.usgs.gov/bbs/index.html>).
3. Cornell University bird range maps (<http://www.allaboutbirds.org/guide/search>).
4. Bird list for Great Dismal Swamp NWR due to similarity of habitat types present.

Nottoway River Watershed Fisheries Species of Conservation Concern

Common Name	Scientific Name
Alewife	<i>Alosa pseudoharengus</i>
American eel	<i>Anguilla rostrata</i>
American shad	<i>Alosa sapidissima</i>
Atlantic sturgeon	<i>Acipenser oxyrinchus</i>
Blueback herring	<i>Alosa aestivalis</i>
Dwarf wedgemussel	<i>Alasmidonta heterodon</i>
Gizzard shad	<i>Dorosoma cepedianum</i>
Roanoke logperch	<i>Percina rex</i>
Striped bass	<i>Morone saxatilis</i>
Walleye	<i>Sander vitreus</i>

Includes all fish and mussel species listed as Species of Conservation and Management Concern as determined by the Service's Northeast Region Fisheries Program Strategic Plan Fiscal Years 2009-2013 <http://www.fws.gov/northeast/fisheries/reports/reports/FisheriesStrategicPlan.pdf> and/or Northeast Region Fisheries Program Strategic Plan Fiscal Years 2009-2013: Supplement, June 2009 <http://www.fws.gov/northeast/fisheries/reports/reports/StrategicPlanSupplement6-11-09.pdf>.

Occurrences verified through:

1. VDGIF VaFWIS database (<http://vafwis.org>).
2. Jenkins, R.E. and N.M. Burkhead. 1993. Freshwater Fishes of Virginia. American Fisheries Society, Bethesda, Maryland.
3. NatureServe (<http://www.natureserve.org>, website accessed 3/9/2010).
4. Personal Communication, Eric Brittle, VDGIF, March 18, 2010.
5. Personal Communication, Brian Watson, VDGIF, March 18, 2010.
6. Personal Communication, Brian van Eerden, TNC, March 11, 2010.

Nottoway River Watershed Known or Likely Federally Listed Species, Federal Candidate Species,
Designated Critical Habitat, and Species of Concern

Endangered

Common Name	Scientific Name
Chaffseed ²	<i>Schwalbea americana</i>
Dwarf wedgemussel ¹	<i>Alasmidonta heterodon</i>
Michaux's sumac ²	<i>Rhus michauxii</i>
Red-cockaded woodpecker ¹	<i>Picoides borealis</i>
Roanoke logperch ¹	<i>Percina rex</i>
Smooth coneflower ²	<i>Echinacea laevigata</i>

Species of Concern

Common Name	Scientific Name	Rank ³
Atlantic pigtoe ¹	<i>Fusconaia masoni</i>	G2
Basil mountain-mint ²	<i>Pycnanthemum clinopodioides</i>	G2
Blue witch grass ²	<i>Dichanthelium caeruleum</i>	G2G3
New Jersey rush ²	<i>Juncus caesariensis</i>	G2
Reclining bulrush ²	<i>Scirpus flaccidifolius</i>	G2
Sandhills lily ²	<i>Lilium pyrophilum</i>	G2
Septima's clubtail ²	<i>Gomphus septima</i>	G2
Torrey's mountain-mint ²	<i>Pycnanthemum torrei</i>	G2
Virginia least trillium ²	<i>Trillium pusillum</i> var. <i>virginianum</i>	G3T2
Winter quillwort ²	<i>Isoetes hyemalis</i>	G2G3
Yellow lance ^{1 2}	<i>Elliptio lanceolata</i>	G2G3

¹Virginia Department of Game and Inland Fisheries BOVA/FWIS database (<http://vafwis.org>).

²Virginia Department of Conservation and Recreation, Division of Natural Heritage (VDCR-DNH) database (http://www.dcr.virginia.gov/natural_heritage/dbsearchtool.shtml).

³The species of concern list was compiled from information provided by VDCR-DNH. The global ranks are assigned by a consensus of the network of natural heritage programs, scientific experts, and NatureServe (a non-profit conservation organization) to designate the rangewide rarity of a species or subspecies. Species with G1, G2, G_T1, or G_T2, rankings are included on this list. NatureServe 2009 (<http://www.natureserve.org/explorer/granks.htm>).

G1	Critically Imperiled—At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.
G2	Imperiled—At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.
G#G#	Range Rank—A numeric range rank (e.g., G2G3) is used to indicate the range of uncertainty in the status of a species or community. Ranges cannot skip more than one rank (e.g., GU should be used rather than G1G4).
T#	Infraspecific Taxon (trinomial)—The status of infraspecific taxa (subspecies or varieties)

	<p>are indicated by a "T-rank" following the species' global rank. Rules for assigning T-ranks follow the same principles outlined above for global conservation status ranks. For example, the global rank of a critically imperiled subspecies of an otherwise widespread and common species would be G5T1. A T-rank cannot imply the subspecies or variety is more abundant than the species as a whole—for example, a G1T2 cannot occur. A vertebrate animal population, such as those listed as distinct population segments under the U.S. Endangered Species Act, may be considered an infraspecific taxon and assigned a T-rank; in such cases a Q is used after the T-rank to denote the taxon's informal taxonomic status.</p>
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Rappahannock River Valley National Wildlife Refuge Priority Migratory Bird Species

American bittern	Eastern kingbird	Redhead
American black duck	Eastern meadowlark	Red-headed woodpecker
American coot	Eastern towhee	Red-throated loon
American golden plover	Eastern wood-pewee	Rusty blackbird
American kestrel	Field sparrow	Saltmarsh sharp-tailed sparrow
American widgeon	Forster's tern	Seaside sparrow
American woodcock	Golden-winged warbler	Sedge wren
Bald eagle	Grasshopper sparrow	Semipalmated sandpiper
Baltimore oriole	Great-crested flycatcher	Short-billed dowitcher
Bay-breasted warbler	Greater scaup	Short-eared owl
Bicknell's thrush	Greater yellowlegs	Snowy egret
Black rail	Henslow's sparrow	Solitary sandpiper
Black scoter	Horned grebe	Song sparrow
Black tern	Kentucky warbler	Stilt sandpiper
Black-and-white warbler	King rail	Surf scoter
Black-bellied plover	Least bittern	Swainson's warbler
Black-crowned night heron	Least sandpiper	Tricolored heron
Black-throated green warbler	Least tern	Tundra swan
Blue-winged teal	LeConte's sparrow	Upland sandpiper
Blue-winged warbler	Lesser scaup	Vesper sparrow
Broad-winged hawk	Lesser yellowlegs	Virginia rail
Brown pelican	Little blue heron	Whip-poor-will
Brown thrasher	Loggerhead shrike	White-throated sparrow
Brown-headed nuthatch	Long-tailed duck	White-winged scoter
Bufflehead	Louisiana waterthrush	Willow flycatcher
Canada goose	Mallard	Wilson's snipe
Canvasback	Marsh wren	Wood duck
Cerulean warbler	Nelson's sharp-tailed sparrow	Wood thrush
Chimney swift	Northern bobwhite	Worm-eating warbler
Chuck-will's-widow	Northern flicker	Yellow-billed cuckoo
Common goldeneye	Northern pintail	Yellow-crowned night heron
Common loon	Pied-billed grebe	Yellow-throated vireo
Common moorhen	Prairie warbler	
Common tern	Prothonotary warbler	
Dunlin		

Includes all bird species that received a highest (HH) or high (H) priority ranking as determined by the Atlantic Coast Joint Venture and Partners in Flight Initiative (http://www.acjv.org/bird_conservation_regions.htm) and/or were listed by the Service as Birds of Conservation Concern (http://library.fws.gov/Bird_Publications/BCC2008.pdf).

Occurrences verified through:

1. VDGIF VaFWIS database (<http://vafwis.org>).
2. Breeding Bird Surveys (<http://www.pwrc.usgs.gov/bbs/index.html>).

3. Cornell University bird range maps (<http://www.allaboutbirds.org/guide/search>).
4. Bird list for Rappahannock River Valley NWR.

Rappahannock River Valley National Wildlife Refuge Fisheries Species of Conservation Concern

Common Name	Scientific Name
Alewife	<i>Alosa pseudoharengus</i>
American eel	<i>Anguilla rostrata</i>
American shad	<i>Alosa sapidissima</i>
Atlantic sturgeon	<i>Acipenser oxyrinchus</i>
Blueback herring	<i>Alosa aestivalis</i>
Gizzard shad	<i>Dorosoma cepedianum</i>
Hickory shad	<i>Alosa mediocris</i>
Striped bass	<i>Morone saxatilis</i>

Includes all fish and mussel species listed as Species of Conservation and Management Concern as determined by the Service's Northeast Region Fisheries Program Strategic Plan Fiscal Years 2009-2013 <http://www.fws.gov/northeast/fisheries/reports/reports/FisheriesStrategicPlan.pdf> and/or Northeast Region Fisheries Program Strategic Plan Fiscal Years 2009-2013: Supplement, June 2009 <http://www.fws.gov/northeast/fisheries/reports/reports/StrategicPlanSupplement6-11-09.pdf>.

Occurrences verified through:

1. VDGIF VaFWIS database (<http://vafwis.org>).
2. Jenkins, R.E. and N.M. Burkhead. 1993. Freshwater Fishes of Virginia. American Fisheries Society, Bethesda, Maryland.
3. NatureServe (<http://www.natureserve.org>, website accessed 3/9/2010).
4. Personal Communication, Bob Greenlee, VDGIF, March 20, 2010.

Rappahannock River Valley National Wildlife Refuge Known or Likely Federally Listed Species, Federal Candidate Species, Designated Critical Habitat, and Species of Concern

Threatened

Common Name	Scientific Name
Sensitive joint-vetch ^{2 4}	<i>Aeschynomene virginica</i>
Small whorled pogonia ⁴	<i>Isotria medeoloides</i>
Swamp pink ⁴	<i>Helonias bullata</i>

Species of Concern

Common Name	Scientific Name	Rank ³
Eastern prairie fringed orchid ⁴	<i>Platanthera leucophaea</i>	G2
Rappahannock spring amphipod ²	<i>Stygobromus</i> sp. 21	G2
Virginia least trillium ⁴	<i>Trillium pusillum</i> var. <i>virginianum</i>	G3T2
Winter quillwort ⁴	<i>Isoetes hyemalis</i>	G2G3

¹VDGIF VaFWIS database (<http://vafwis.org>).

²VDCR-DNH database (http://www.dcr.virginia.gov/natural_heritage/dbsearchtool.shtml).

³The species of concern list was compiled from information provided by VDCR-DNH. The global ranks are assigned by a consensus of the network of natural heritage programs, scientific experts, and NatureServe (a non-profit conservation organization) to designate the rangewide rarity of a species or subspecies. Species with G1, G2, G_T1, or G_T2, rankings are included on this list. (NatureServe 2009 <http://www.natureserve.org/explorer/granks.htm>).

⁴Rappahannock River Valley NWR Comprehensive Conservation Plan and Environmental Assessment December 2009.

([http://www.fws.gov/northeast/planning/Rappahannock/pdf/final_ccp/18w_Entire_Document\(5738MB\).pdf](http://www.fws.gov/northeast/planning/Rappahannock/pdf/final_ccp/18w_Entire_Document(5738MB).pdf)).

G1	Critically Imperiled—At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.
G2	Imperiled—At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.
G#G#	Range Rank—A numeric range rank (e.g., G2G3) is used to indicate the range of uncertainty in the status of a species or community. Ranges cannot skip more than one rank (e.g., GU should be used rather than G1G4).
T#	Intraspecific Taxon (trinomial)—The status of intraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank. Rules for assigning T-ranks follow the same principles outlined above for global conservation status ranks. For example, the global rank of a critically imperiled subspecies of an otherwise widespread and common species would be G5T1. A T-rank cannot imply the subspecies or variety is more abundant than the species as a whole—for example, a G1T2 cannot occur. A vertebrate animal population, such as those listed as distinct population segments under the U.S. Endangered Species Act, may be considered an intraspecific taxon and assigned a T-rank; in such cases a Q is used after the T-rank to denote the taxon's informal taxonomic status.

APPENDIX 4 – THREATS ASSESSMENTS FOR PRIORITY AREAS

BLACKWATER RIVER WATERSHED THREATS ASSESSMENT
Priority Area - Partners for Fish and Wildlife Program

Threat	Stressor	Cause	Assessment of Threat on Species* (high, medium, low)	Trust Resources Affected**	What PFW Can Do***
habitat loss/ degradation/ fragmentation	instream flow – alterations	climate change	H	all species	establish habitat corridors
habitat loss/ degradation/ fragmentation	contaminants	mercury	H	all species	restore wetlands
habitat loss/ degradation/ fragmentation	shifts in native communities/species composition, including non-natives	climate change	H	all species	restore habitat/protect lands
habitat loss/ degradation/ fragmentation	human migration/ relocation	climate change	H	all species	restore habitat/protect lands
habitat loss/ degradation/ fragmentation	increased drought/ increased rainfall	climate change	H	all species	restore habitat/protect lands
habitat loss/ degradation/ fragmentation	change in instream temps	climate change	H	all species	restore habitat/protect lands
demographic constraints	genetics, isolated populations, small population size, etc.	agriculture/forestry	H	all species	restore habitat/protect lands; landowner outreach, education
demographic constraints	genetics, isolated populations, small population size, etc.	low reproductive viability in existing patchy habitat	H	red-cockaded woodpecker	restore habitat/protect lands; locality and landowner outreach, education
non-native/ problematic native species	intentionally left blank	climate change	H	all species	restore habitat/protect lands; locality and landowner outreach, education
non-native/ problematic native species	intentionally left blank	habitat disturbance	H	all species	restore habitat/protect lands; landowner outreach, education
disease	intentionally left blank	climate change	H	all species	restore habitat/protect lands; landowner outreach, education
habitat loss/ degradation/ fragmentation	instream flow – alterations	deforestation	M	aquatics	provide funds for reseeding and land protection; work with TNC on SHAs; facilitate acquisition of timber rights; outreach to forest landowners on LLP restoration

habitat loss/ degradation/ fragmentation	instream flow – alterations	dams - existing, O&M and removal, new - proposed	M	aquatics	removal of dams (low priority); work with Fisheries; outreach to dam owners on effects of dams and options for removal/modification
habitat loss/ degradation/ fragmentation	sedimentation	agricultural runoff	M	aquatics	restore riparian; work with NRCS and SWCDs to implement BMPs; landowner outreach
habitat loss/ degradation/ fragmentation	sedimentation	forestry runoff	M	aquatics	work with VDOF on BMP implementation; restore forests; landowner outreach
habitat loss/ degradation/ fragmentation	contaminants	agricultural run-off	M	aquatics	riparian restoration and protection
habitat loss/ degradation/ fragmentation	contaminants	forestry pesticides	M	aquatics	work with partners to get easements
disease	intentionally left blank	non-native species	M	all species	restore habitat/protect lands; landowner outreach, education
habitat loss/ degradation/ fragmentation	instream flow – alterations	fill - instream and floodplain	L	migratory birds, aquatics	restore wetlands and streams
habitat loss/ degradation/ fragmentation	instream flow – alterations	ditches/tile drains	L	aquatics, migratory birds	restore wetlands; work with NRCS
habitat loss/ degradation/ fragmentation	sedimentation	construction/land disturbance	L	aquatics	support E&S regulations; develop enhanced E&S control
habitat loss/ degradation/ fragmentation	nutrient loading	unconfined livestock	L	aquatics	fence out livestock; support nutrient management; restore riparian
habitat loss/ degradation/ fragmentation	intentionally left blank	deforestation	L	all species	work with DOD/ACUB program, USFS, VDOF, NRCS to restore forests and strategically reduce fragmentation
demographic constraints	genetics, isolated populations, small population size, etc.	dams - large	L	aquatics	remove dams or modify for fish passage: outreach to dam owners on effects of dams and options for removal/modification
demographic constraints	genetics, isolated populations, small population size, etc.	dams - small	L	aquatics	remove dams or modify for fish passage; outreach to dam owners on effects of dams and options for removal/modification
demographic constraints	genetics, isolated populations, small population size, etc.	flood reduction/clean up channel	L	aquatics	provide NSCD tech asst
demographic constraints	genetics, isolated populations, small population size, etc.	sedimentation	L	aquatics	restore habitat/protect lands
demographic constraints	genetics, isolated populations, small population size, etc.	residential/commercial development	L	all species	land protection

*Includes impact occurring now and likelihood of threat in near-term future. Regarding climate change we are uncertain of the appropriate assessment of threat in some instances and additional data may change a specific assessment of threat over time.

**See species lists associated with this geographic priority area.

***Significant outreach and inreach efforts are inherent in many activities and specific actions are noted.

CLINCH AND POWELL RIVERS WATERSHED THREATS ASSESSMENT

Priority Area – All Ecological Services Programs

Category	Threat	Trust Resources Affected*	Stressor	Assessment of Threat on Species** (high, medium, low)	What Ecological Services Can Do***	Who Can Address Problem****
agriculture	Livestock	aquatics, karst species	nutrient loading, chemical contamination, sedimentation, stream instability, trampling,	H	restore/protect habitat; work with NRCS and SWCDs to improve and implement BMPs; outreach on BMPs and cost share programs to farmers	NRCS, SWCD, PFW, VDGIF, ES, VDCR, localities, landowners
agriculture	pasture and cropland development/maintenance	all species	habitat degradation, fragmentation, and loss	H	habitat restoration and protection; encourage BMPs; outreach to farmers	PFW, USDA, SWCD, VDCR, landowners
climate change	climate change	aquatics	change in instream temperatures	H	habitat restoration and protection; proactive planning regarding habitat availability, habitat/species shifts; promote alternative energy usage; public outreach on climate change and benefits of energy conservation and alternative energy development	PFW, ES, VDGIF, USGS, NOAA, TNC, VA Tech, EPA, VDEQ, DMME, OSM, FERC
climate change	climate change	all species	change in flow/hydrologic regime	H	work with partners on models and research projects to inform; assess potential need for refugia populations; promote alternative energy usage; habitat restoration and protection; water conservation and supply planning; public outreach on climate change and benefits of alternative energy development	PFW, ES, VDGIF, USGS, NOAA, TNC, FERC, DMME, OSM, localities, VA Tech, VDEQ, EPA, DMME
climate change	climate change	all species	shift in native species/ non-native species/ diseases	H	identify the threat and monitor for occurrence; conduct vulnerability assessments and develop response plans; habitat restoration/protection; public outreach on climate change and benefits of energy conservation and alternative energy development	VDACS, USGS, VDGIF, Corps, VDEQ, localities, VDOT, PFW, ES, CPA, USDA, TVA, EC
climate change	human migration/relocation	all species	pollution, habitat loss	H	habitat restoration/protection; public outreach on climate change and benefits of energy conservation and alternative energy development	PFW

mining	runoff from abandoned mine lands (including acid mine drainage)	aquatics, migratory birds, bats	contaminants, sedimentation	H	provide FWCA reports and technical assistance to Corps and others; review AML "emergency" projects and AML grant projects including water and sewer line installation; monitor to determine success of AML projects; EC special study; use NRDA restoration funds for projects/ matching funds; encourage Lands Unsuitable for Mining designation; acquire subsurface rights in sensitive areas; outreach on AML environmental priorities to regulators and congress	ES, EC, CPA, DMME, Corps, PDCs, EPA, VDEQ, Congress
mining	channelization/ instream modifications and fill	aquatics, bats, migratory birds	instream flows - alterations, habitat loss/degradation	H	work with VMRC, Corps, VDEQ, VDOT on permit review and enforcement; land protection, habitat restoration; evaluation/assessment of threat; work with localities to establish floodplain and buffer regulations; participate in partnerships/planning; promote natural stream channel design; work with DMME on SSPMs; encourage Lands Unsuitable for Mining designation; acquire subsurface rights in sensitive areas; outreach on environmental impacts of mining and of benefits energy conservation and alternative energy development	EC, CPA, PFW, Fisheries, NRCS, EPA, USGS, DMME, VDEQ, VDOT, ES, VDGIF, VMRC, Corps
mining	point source effluents (e.g., sedimentation ponds, valley fill ponds, coal preparation plants)	aquatics	contaminants, sedimentation	H	conduct EC studies; continue to partner with USGS on SSP studies; review DMME and Corps permit applications; work on SSPMs under 1996 OSM BO; review draft TMDLs and provide comments to VDEQ and DMLR; encourage better cumulative impacts assessment in NEPA documents and mining review comments; encourage Lands Unsuitable for Mining designation; acquire subsurface rights in sensitive areas; outreach on environmental impacts of mining and benefits of energy conservation and alternative energy development	PFW, ES, CPA, EC, VDOF, DMLR, OSM, TNC, EPA, USFS, VDEQ, Corps, VDGIF, DMME, universities, USGS
mining	non-point source run-off	aquatics	contaminants, sedimentation	H	review DMME and Corps permit applications; work on SSPMs under 1996 OSM BO; review draft TMDLs and provide comments to VDEQ and DMLR; encourage Lands Unsuitable for Mining designation; acquire subsurface rights in sensitive areas; outreach on environmental impacts of mining and benefits of energy conservation and alternative energy development	PFW, ES, CPA, EC, VDOF, DMLR, OSM, TNC, EPA, USFS, VDEQ, Corps, VDGIF, DMME, universities, USGS
mining	re-mining	aquatics	contaminants, sedimentation	H	review DMME and Corps permit applications; work on SSPMs under 1996 OSM BO; review draft TMDLs and provide comments to VDEQ and DMLR; encourage Lands Unsuitable for Mining designation; acquire subsurface rights in sensitive areas; outreach on impacts of mining contaminants to industry and regulators	PFW, ES, CPA, EC, VDOF, DMLR, OSM, TNC, EPA, USFS, VDEQ, Corps, VDGIF, DMME, universities, USGS

gas	mining runoff	aquatics	sedimentation	H	review permit applications; work on SSPMs under 1996 OSM BO; acquire subsurface rights in sensitive areas; outreach on environmental impacts of gas drilling and benefits of energy conservation and alternative energy development	EC, CPA, ES, OSM, DMME, Corps, DMLR, EPA, VDEQ
gas	coal-bed methane	aquatics, migratory birds, bats	contaminants, sedimentation, habitat loss/fragmentation	H	HCPs; work with DMME on BMPs and permits; review EPA deep well injection permits; work with industry to minimize impacts; acquire subsurface rights in sensitive areas; outreach on environmental impacts of coal-bed methane production and benefits of energy conservation and alternative energy development	EC, EPA, ES, DMME, VDEQ, industry, NWRS, VOF, TNC, NGOs
power generation	carbon burning power plants	all species	contaminants (air and water), habitat loss/fragmentation, water withdrawal	H	consult where there is a federal nexus; encourage EPA/VDEQ involvement; monitor, work with industry to minimize impacts; EC special studies; outreach on environmental impacts of carbon-burning plants and benefits of energy conservation and alternative energy development	EC, ES, CPA, EPA, VDEQ, industry, Corps, VSCC, localities, USGS
recreation	caving/vandalism	bats, isopod	habitat loss/degradation, direct mortality, disease vector	H	promote cave gating; research associated with disease vectors; outreach to cavers and landowners about disease vectors and caving impacts	caving groups, ES, VDGIF, VDCR, USGS, universities, USFS, DMLR, NPS, TNC, BCI, PFW, landowners
transportation	Spills	aquatics	contaminants	H	respond to spills as needed, follow through with NRDAR where appropriate; work with agencies/industry on rail, bridge and road design; outreach on signs at bridge crossings and watershed divides (e.g., "Entering UTRB Watershed") and via brochures and websites with links on how to report spills	EC, VDOT, industry, FHWA, CPA, ES, Federal Rail Administration, localities, citizens
transportation	highway, airport, and rail development/maintenance (including runoff and pesticide applications)	all species	habitat loss/degradation/fragmentation, contaminants	H	section 7 consultations; work with localities; BMPs; karst protection; planning to avoid sensitive areas; stormwater management; monitoring to assess contaminant levels; outreach to transportation industry and public via signage (see cell above)	EC, CPA, ES, VDOT, localities, VDCR, UTRR, FHWA, FRA, FAA
urbanization and commercial/industrial development	construction/land disturbance	all species	habitat loss/degradation/fragmentation, sedimentation, contaminants, instream flow alteration, degradation of karst systems	H	support erosion and sediment regulations; develop enhanced erosion and sediment control for listed species; monitoring to assess contaminant levels; work with localities on planning and zoning; outreach to communities and landowners on BMPs	ES, PDCs, Industrial Development Authorities, USDA, RC&Ds, SWCD, CDBG, UTRR, CPA, EC, VDOF, TNC, USFS, VDEQ, VDGIF, universities, USGS, localities, landowners

demography	poor demography	all species	low reproductive viability in existing patchy habitat, small population size, genetic drift, demographic stochasticity	H	propagation and reintroduction to suitable habitat; conduct population modeling and viability analysis and perform candidate assessments; assess threat; assess genetic differences among remaining populations; outreach to funding sources and interagency groups on problem	ES, universities, USGS, VDGIF, VDCR, TVA, Fisheries
right-of-way development and maintenance	utility corridors	all species	habitat loss/ fragmentation/ degradation	H	support erosion and sediment regulations; develop enhanced erosion and sediment control for listed species; consult and plan to avoid sensitive areas; permit reviews; work with localities on planning and zoning; outreach to industry on impacts and to public on benefits of energy conservation and alternative energy development (e.g., passive and local stored solar).	localities, ES, CPA, FERC, VSCC, industry, TVA, Corps, VDGIF, VDCR, VDEQ, USDA, VDOT
agriculture	pesticide runoff	aquatics, karst species	contaminants	M	riparian restoration and protection, EC special study; outreach to farmers on benefits of proper pesticide usage	EC, PFW, ES, USDA, EPA, VDGIF, SWCD, VDEQ, landowners
agriculture	sediment runoff	aquatics, karst species	sedimentation	M	restore/protect habitat; work with NRCS and SWCDs to improve and implement BMPs; outreach on BMPs to farmers	NRCS, SWCD, PFW, VDGIF, ES, USGS, VDCR, localities, landowners
agriculture	biosolids application	aquatics, karst species, migratory birds	nutrient loading, biological oxygen demand, eutrophication, chemical contamination	M	riparian restoration and protection; EC special study; work with VDEQ on permits/regulations; outreach on BMPs and regulations to farmers	EC, VDEQ, ES, PFW, landowners
agriculture	Fertilizer	aquatics	nutrient loading	M	riparian restoration and protection; EC special study; work with VDCR and USDA on BMPs, guidance, regulations; outreach on organic farming and BMPs to farmers	EC, VDCR, USDA, PFW, SWCD, TNC, UTRR, landowners
agriculture	sinkhole dumps	aquatics, karst species	contaminants	M	encourage sinkhole cleanup and protection; outreach on waste disposal to farmers	VDGIF, PFW, ES, NRCS, EC, VDCR, landowners
mining	deforestation	all species	instream flows - alterations, sedimentation, contaminants, habitat loss/ fragmentation	M	encourage Forestry Reclamation Approach for mining; consult with USFS where applicable; obtain conservation easements; encourage deep mining instead of surface mining where possible; encourage Lands Unsuitable for Mining designation; acquire subsurface rights in sensitive areas; outreach on environmental impacts of mining and benefits of energy conservation and alternative energy development	ES, EC, CPA, DMME, OSM, Corps, USFS, VDOF, VDGIF, EPA, USGS

gas	Marcellus shale	aquatics	instream flows - alterations, sedimentation, contaminants, habitat loss/fragmentation	M	coordinate with DMME and VDEQ on permits and instream monitoring (chemical and biotic); HCPs; EC special study; collaborative research; acquire subsurface rights in sensitive areas; outreach on environmental impacts of Marcellus Shale drilling and benefits of alternative energy development	EC, CPA, USGS, EPA, VDEQ, DMME, DMLR, ES, universities
power generation	dams	all species	instream flows - alterations, habitat alteration/fragmentation (including migration impacts), sedimentation, thermal impacts	M	work with Cookeville FO and TVA to comment on large dams; comment on FERC regulatory permits; facilitate fish connectivity through population augmentation; outreach on potential environmental impacts of dam operations and benefits of energy conservation and alternative energy development	CPA, EC, ES, Fisheries, TVA, FERC, TN, VDGIF
wind turbines	wind turbines	migratory birds, bats	habitat alteration/fragmentation (including migration impacts), direct mortality	M	land protection; HCPs; work with industry; develop BMPs and regulations with state permitting agencies and localities; identify sensitive areas that are of most concern; section 7 when appropriate; explore financial incentives to protect areas of concern; outreach on potential environmental impacts of wind turbines and benefits of energy conservation and alternative energy development	ES, localities, CPA, industry, VDEQ, VDGIF, TNC, NGOs, USFS, NPS, VSCC, FERC
mill ponds	small dams	aquatics	instream flows - alterations, habitat alteration/fragmentation (including migration impacts), sedimentation, thermal impacts	M	work with dam owners on removal and modification; facilitate fish connectivity through population augmentation; outreach on benefits of fish passage and impacts of small dams	PFW, USDA, ES, SWCD, NRDA, VDOT, landowners, VDGIF, localities
recreation	introduction of non-natives/disease/pet trade	aquatics	competition, habitat loss/displacement, reduced viability	M	surveillance for introduced species and develop response plan; encourage outreach; work with pet trade and state agencies on regulations; outreach to boat and pet owners and anglers about problems and how to avoid them	VDGIF, ES, industry, VDCR, anglers
forestry	deforestation/forest type conversion, run-off	all species	Instream flows - alterations, habitat loss/degradation/fragmentation, invasive species, sedimentation	M	land protection; HCPs; work with industry; develop BMPs and regulations with state permitting agencies and localities; identify sensitive areas that are of most concern; section 7 when appropriate; explore financial incentives to protect areas of concern; promote forest management planning; GAP analysis to id riparian restoration needs; outreach to landowners on BMPs	CPA, ES, VDOF, USFS, localities, landowners, industry, TNC, Migratory Birds, PFW, EC
forestry	pesticide application (including Bt for gypsy moths)	all species	contaminants, habitat degradation, mortality of non-target organisms	M	work with agencies on long-term management plans and non-programmatic projects; work with EPA on label requirements; outreach on pesticide BMP's	ES, EC, CPA, USDA, VDACS, EPA, VDOF

urbanization and commercial/ industrial development	growth related point and non-point waste (e.g., lawn care)	aquatics	nutrient loading, contaminants, sedimentation	M	develop permits limits; support erosion and sediment regulations; develop BMPs and enhanced erosion and sediment control for listed species; monitoring to assess contaminant levels; work with localities on planning and zoning; outreach to localities on impacts and BMPS	landowners, ES, PDCs, Industrial Development Authorities, USDA, RC&Ds, SWCD, CDBG, UTRR, CPA, EC, VDOF, TNC, VDEQ, VDGIF, universities, USGS, localities, DMME, Corps, landowners
urbanization and commercial/ industrial development	straight pipes	aquatics	nutrient loading, contaminants, sedimentation	M	monitoring to assess contaminant levels; work with localities on planning; research VA Dept of Health records to determine where straight pipes are a concern; encourage installation of proper sewage treatment and/or relocation of homes; facilitate funding to correct straight pipes in key areas; outreach to localities on impacts and BMPS	landowners, ES, PDCs, USDA, RC&Ds, SWCD, CDBG, UTRR, CPA, EC, TNC, VDEQ, VDGIF, universities, USGS, localities, DMME, VDOH, Corps, EPA, landowners
urbanization and commercial/ industrial development	landfill leachate/ roadside dumps/littering/ waste transfer stations	aquatics	contaminants	M	monitoring to assess threats and contaminants level; identify location of current and historic landfills/waste dumps; develop appropriate regulations and work with localities to implement regulations; work with localities on siting of facilities; cleanup old dump facilities; encourage door-to-door pickup and waste disposal; outreach to localities on impacts and BMPS	CPA, ES, USGS, VDEQ, localities, RC&Ds, EC, PDCs, EPA, VDCR
urbanization and commercial/ industrial development	water supply (wells, surface water withdrawal, inter intra basin transfer)	aquatics, karst species	instream flows - alterations	M	comment on VDEQ/Corps regulatory permits; work with VDEQ to lower the reporting threshold for water withdrawals; review county water supply plans provided to VDEQ; work with RC&Ds and PDCs on water supply planning; develop instream flow models for trust resources; develop water conservation plans; oppose inter intra basin transfer in sensitive areas; review USDA/ FSA/ HUD loans for water development and promote water conservation; outreach to localities on growth impacts and water conservation	USGS, TNC, VMRC, TVA, PFW, USDA, EPA, VDEQ, Corps, HUD, RC&D, PDC, FSA, localities, landowners
agriculture	water withdrawal	aquatics	instream flows - alterations	L	work with VDEQ to lower the water withdrawal reporting threshold; outreach on water conservation to farmers and alternative watering supplies	all, Fisheries, VDEQ, TNC, USGS, landowners
agriculture	failure/ seepage/ overflow of animal waste storage facilities	aquatics, karst species	nutrient loading, biological oxygen demand, eutrophication, chemical contamination	L	assist with enforcement and cost share to remedy; outreach on containments impacts and prevention to farmers	PFW, EC, ES, LE, VDEQ, VDCR, USDA, landowners

agriculture	ditches/tile drains	aquatics	instream flows - alterations	L	restore hydrology; review Corps permits and Swampbuster; outreach to farmers on wetlands benefits and cost share programs	PFW, Corps, USDA, SWCD, VDEQ, RC&D, landowners
agriculture	spring development	aquatics	instream flows - alterations	L	request NRCS to report all spring development annually to VDEQ/Corps; outreach on alternative water supplies and BMPs to farmers	PFW, VDEQ, Corps, NRCS, landowners
aquaculture	hatchery development/maintenance	aquatics	excessive nutrients, introduction of exotic species, pathogen spread	L	assess future threat and monitor existing threat; outreach on BMPs to private hatcheries	VDEQ, VDGIF, hatchery operators
recreation	ATV	all species	direct destruction of habitat, noise disturbance	L	work with landowners; fence trails; work with ATV manufacturers about habitat destruction; establish ATV trails; outreach about ATV impacts by use of signs and brochures	PFW, LE, VDACS, localities, industry, ES, VDGIF LE, USFS, VDOF, VDCR, landowners
forestry	prescribed burning	all species	habitat alteration, smoke, contaminants, runoff, direct mortality	L	promote forest management planning that considers trust resources; BMPs; consult on listed species; facilitate prescribed burning to improve habitat; outreach to landowners on BMPS	CPA, PFW, ES, USFS, VDOF, USDA, VDCR, VDGIF, TNC, TVA, landowners
urbanization and commercial/industrial development	flood control	aquatics	instream flow alteration, habitat loss/degradation/fragmentation	L	review permit applications; report and encourage action on violations; habitat restoration; outreach to landowners and localities on growth impacts and stormwater management	ES, localities, Corps, VMRC, TVA, landowners, CPA, PDCs

*See species lists associated with this geographic priority area.

**Includes impact occurring now and likelihood of threat in near-term future. Regarding climate change we are uncertain of the appropriate assessment of threat in some instances and additional data may change a specific assessment of threat over time.

***Significant outreach and inreach efforts are inherent in many activities and species actions are noted.

****All refers to all programs in Ecological Services.

EASTERN SHORE THREATS ASSESSMENT
Priority Area – All Ecological Services Programs

Threat	Stressor	Cause	Assessment of Threat on Species* (high, medium, low)	Trust Resources Affected**	What Ecological Services Can Do***	Who Can Address Problem***
habitat loss/ degradation/ fragmentation	hydrologic alterations	ditches/tile drains	H	migratory birds, fish	restore wetlands; work with NRCS; land protection; outreach/education agriculture & forestry landowners	Coastal Program, NAWCA, PFW, CPA, TNC, NWRS, NOAA, Southern Tip Partnership
habitat loss/ degradation/ fragmentation	hydrologic alterations	climate change	H	all species	establish (protect/restore) habitat corridors	Coastal Program, NAWCA, PFW, CPA, TNC, NWRS, NOAA, Southern Tip Partnership, ES
habitat loss/ degradation/ fragmentation	sedimentation	agricultural runoff	H	migratory birds, fish	restore habitats; work with NRCS and SWCDs to implement BMPs	Coastal Program, NOAA, NAWCA, PFW, NRCS, CPA
habitat loss/ degradation/ fragmentation	nutrient loading	animal waste storage facilities	H	migratory birds, fish	work on regulations with VDEQ; comment on discharge permits; review USDA BMP specs	EC, PFW, VDEQ, USDA
habitat loss/ degradation/ fragmentation	nutrient loading	agricultural fertilizer	H	migratory birds, fish	restore/protect habitat buffers	Coastal Program, NOAA, NAWCA, PFW, NRCS, SWCD, Southern Tip Partnership, NOAA
habitat loss/ degradation/ fragmentation	contaminants	spills (on and off shore)	H	all species, NWR lands	spill prevention/planning; respond to spills; work with others on training for spill response	EC, CPA, ES, NWRS, USCG, DEQ, NOAA, EPA,
habitat loss/ degradation/ fragmentation	contaminants	agricultural (poultry/ row crops) run-off	H	migratory birds, fish	buffer restoration and protection; conduct ES special studies to evaluate poultry waste	EC, PFW, USGS
habitat loss/ degradation/ fragmentation	shifts in native communities/ species composition (including non-natives)	climate change	H	all species	restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/funding decisions to consider climate change; controls invasive	NOAA, NAWCA, all, NWRS, NRCS, Southern Tip Partnership
habitat loss/ degradation/ fragmentation	human migration/ relocation	climate change	H	all species	restore habitat/protect lands;	NOAA, NAWCA, PFW, Coastal Program, NWRS, NRCS, Southern Tip Partnership

habitat loss/ degradation/ fragmentation	sea level rise	climate change	H	all species	restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/funding decisions to consider climate change; planning; education/outreach to localities	NOAA, NAWCA, PFW, Coastal Program, NWRS, NRCS, Southern Tip Partnership
habitat loss/ degradation/ fragmentation	increased drought/ increased rainfall/ temperature change	climate change	H	all species	work with VDEQ on water supply planning to include trust resource needs; restore habitat/protect lands	VDEQ, PFW, Coastal Program, NWRS, NRCS, Southern Tip Partnership
habitat loss/ degradation/ fragmentation	increased storm events resulting from climate change	climate change	H	all species	restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/funding decisions to consider climate change; planning; education/outreach to localities	NOAA, NAWCA, PFW, Coastal Program, NWRS, NRCS, Southern Tip Partnership
habitat loss/ degradation/ fragmentation	habitat alteration/ fragmentation (including migration impacts)	deforestation	H	migratory birds, fish, listed species	work with VDOF, NRCS to restore forests and strategically reduce fragmentation; outreach and education to forest landowners	PFW, Coastal Program, VDOF, VDCR, NRCS, TNC, VDEQ, NGOs, NWRS, Southern Tip Partnership, private landowners
habitat loss/ degradation/ fragmentation	shoreline alteration	sea level rise	H	all species	restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/funding decisions to consider climate change; planning; education/outreach, primarily to localities	Coastal Program, NOAA, NAWCA, PFW, NWRS, NRCS, Southern Tip Partnership
habitat loss/ degradation/ fragmentation	shoreline alteration	increased storm events	H	all species	restore habitat/protect lands, establish/protect habitat corridors, prioritize conservation actions/funding decisions to consider climate change, planning, education/outreach, primarily to localities	Coastal Program, NOAA, NAWCA, PFW, NWRS, NRCS, Southern Tip Partnership
habitat loss/ degradation/ fragmentation	shoreline alteration	bulkheads/riprap	H	coastal species	permit review to encourage less destructive measures and minimize impacts; look for funding to assist landowners to offset their costs for alternate shoreline protection (living shoreline); outreach/education to public, localities, permitting agencies; buy shoreline habitat; encourage shoreline protection/planning in a regional context	Coastal Program, NOAA, NAWCA, CPA, ES, TNC, NOAA, VIMS, Corps, VMRC, localities
non-native/ problematic native species and diseases	intentionally left blank	climate change	H	all species	implement appropriate control measures; planning; habitat restoration; outreach/education with landowners and Plant ES Natives campaign; monitoring for disease outbreaks	Coastal Program, NOAA, NAWCA, PFW, EC, NWRS, USDA, USGS, VDGIF, localities, NOAA, VIMS
non-native/ problematic native species and diseases	intentionally left blank	habitat disturbance (forestry, development, agriculture, etc.)	H	all species	implement appropriate control measures; planning, habitat restoration; outreach/education; monitoring for outbreaks; comment on permits	Coastal Program, NOAA, NAWCA, PFW, EC, NWRS, USDA, USGS, VDGIF, localities, NOAA, VIMS, CPA

habitat loss/ degradation/ fragmentation	hydrologic alterations	agricultural instream water withdrawal from impoundments	M	migratory birds, fish	land protection; restore wetlands and streams	PFW, TNC, NWRS, Coastal Program, NOAA, NAWCA
habitat loss/ degradation/ fragmentation	hydrologic alterations	dams (existing - operation and maintenance, removal; new - proposed)	M	migratory birds, fish	removal of dams (low priority) outreach to private dam owners	PFW, CPA, NOAA, TNC, NWRS,
habitat loss/ degradation/ fragmentation	hydrologic alterations	dredging for navigation	M	migratory birds, fish	review permits	CPA, ES
habitat loss/ degradation/ fragmentation	nutrient loading	biosolids application	M	migratory birds, fish	restore/protect habitat buffers; work with VDEQ on regulations	Coastal Program, NOAA, NAWCA, EC, PFW, VDEQ, USDA, Southern Tip Partnership
habitat loss/ degradation/ fragmentation	contaminants	point source discharges (municipal or industrial wastewater treatment plants - endocrine disruptors, personal care products, pharmaceuticals, etc.)	M	all species	work with EPA on developing regulations	EC
habitat loss/ degradation/ fragmentation	habitat alteration/ fragmentation (including migration impacts), direct mortality	wind turbines	M	migratory birds, bats	land protection; HCPs; work with industry; develop BMPs and regulations with state permitting agencies and localities; identify sensitive areas that are of most concern; sec 7 when appropriate; explore financial incentives to protect areas of concern	ES, localities, CPA, industry, VDEQ, VDGIF, TNC, NGOs, USFS, NPS, VSCC, FERC
habitat loss/ degradation/ fragmentation	shoreline alteration	groins/jetties	M	coastal species	permit review to encourage less destructive measures; look for funding to assist landowners to offset their costs for alternate shoreline protection (living shoreline); outreach/education to public, localities, permitting agencies; buy shoreline habitat; encourage shoreline protection/planning in a regional context	Coastal Program, NOAA, NAWCA, CPA, ES, TNC, NOAA, VIMS, Corps, VMRC, localities
non-native/ problematic native species and diseases	intentionally left blank	boats - ballast water	M	aquatics	intentionally left blank	Intentionally left blank

non-native/ problematic native species and diseases	intentionally left blank	non-native introduction/spread (plants and animals)	M	all species	planting lists for restoration projects; work with state and local invasive species task force, outreach/education with landowners and Plant ES Natives campaign	CPA, ES, PFW, Coastal, Fisheries, EC, state agencies
non-native/ problematic native species and diseases	intentionally left blank	pollution (e.g., immune response effects)	M	all species	EC special studies; habitat restoration; work with regulatory agencies	Coastal Program, NOAA, NAWCA, PFW, EC, DEQ, EPA
habitat loss/ degradation/ fragmentation	hydrologic alterations	fill (instream and associated wetlands)	L	migratory birds, fish	land protection; restore wetlands and streams	PFW, CPA, NWRS, TNC, Southern Tip Partnership, Coastal Program, NOAA, NAWCA
habitat loss/ degradation/ fragmentation	hydrologic alterations	deforestation	L	migratory birds, fish	land protection; restore forests; facilitate acquisition of timber rights	PFW, NWRS, TNC, Southern Tip Partnership , Coastal Program, NOAA, NAWCA
habitat loss/ degradation/ fragmentation	hydrologic alterations	truck crop farming (plasticulture)	L	migratory birds, fish	restore aquatic habitat buffers	PFW, NRCS, VDCR, TNC
habitat loss/ degradation/ fragmentation	hydrologic alterations	water supply (wells)	L	migratory birds, fish	collaborate with VDEQ, TNC and others to lower reporting threshold for wells, assess influence of climate change, and improve water supply planning decisions	CPA, VDEQ, EPA, USGS
habitat loss/ degradation/ fragmentation	sedimentation	dredging for navigation/spoil placement	L	migratory birds, fish	review permits	CPA, ES
habitat loss/ degradation/ fragmentation	sedimentation	forestry runoff	L	migratory birds, fish	work with VDOF on BMP implementation, restore forests	Coastal Program, NOAA, NAWCA, PFW, NWRS, TNC, Southern Tip Partnership
habitat loss/ degradation/ fragmentation	sedimentation	construction/land disturbance	L	migratory birds, fish	support E&S regulations; develop enhanced E&S control	CPA
habitat loss/ degradation/ fragmentation	nutrient loading	straight pipes/aging septic systems	L	migratory birds, fish	work with VDEQ on discharge rules	EC, RC&Ds, VDEQ
habitat loss/ degradation/ fragmentation	contaminants	forestry pesticides	L	migratory birds, fish	intentionally left blank	Intentionally left blank
habitat loss/ degradation/ fragmentation	contaminants	air pollution (including mercury, rockets)	L	all species	EC special study; promote carbon sequestration	EC, PFW

habitat loss/ degradation/ fragmentation	shoreline alteration	beach/dune augmentation (including sand dredging)	L	coastal species	permit review to minimize impacts; investigate design standards; look for funding to assist landowners to offset their costs for integrated shoreline protection; outreach/education to public, localities, permitting agencies; buy shoreline habitat; encourage shoreline protection/planning in a regional context	Coastal Program, NOAA, NAWCA, CPA, ES, TNC, NOAA, VIMS, Corps, VMRC, localities
habitat loss/ degradation/ fragmentation	shoreline alteration	navigation dredging and associated spoil placement	L	coastal species	permit review to minimize impacts; collaborate on beneficial use of dredge spoil	CPA, ES, PFW, Coastal Program
habitat loss/ degradation/ fragmentation	shoreline alteration	breakwaters	L	coastal species	permit review to minimize impacts; investigate design standards; look for funding to assist landowners to offset their costs for alternate shoreline protection (living shoreline); outreach/education to public, localities, permitting agencies; buy shoreline habitat; encourage shoreline protection/planning in a regional context	CPA, ES, Coastal Program, TNC, NOAA, VIMS, Corps, VMRC, localities
direct disturbance	intentionally left blank	shoreline recreation	L	listed species, migratory birds	outreach/education, support VDCR & VDGIF public education efforts; work with localities; land protection	ES, PFW
direct disturbance	intentionally left blank	Wallops Island operations	L	all species	permit review; work with NASA/military on operational planning	CPA, ES, Corps

*Includes impact occurring now and likelihood of threat in near-term future. Regarding climate change we are uncertain of the appropriate assessment of threat in some instances and additional data may change a specific assessment of threat over time.

**See species lists associated with this geographic priority area.

***Significant outreach and inreach efforts are inherent in many activities and species actions are noted.

****All refers to all programs in Ecological Services.

GREAT DISMAL SWAMP NATIONAL WILDLIFE REFUGE THREATS ASSESSMENT
Priority Area - Partners for Fish and Wildlife and Environmental Contaminants Programs

Threat	Stressor	Cause	Assessment of Threat on Species* (high, medium, low)	Trust Resources Affected**	What PFW/EC Can Do***	Who Can Address Problem****
habitat loss/ degradation/ fragmentation	hydrologic alterations	fill for roads, historic side-casting for ditches	H	all species	install culverts to reconnect hydrology; inreach to NWR hydrologist and staff	PFW, NWRS, Coastal Program, NAWCA, DU, VDGIF
habitat loss/ degradation/ fragmentation	hydrologic alterations	water control structure operation and maintenance	H	all species	provide technical assistance; comment on CCP; work with Corps and NWR on Feeder Ditch WCS and locks; coordinate with NWR hydrologist; fund replacement of failing structures	PFW, NWRS, TNC, DU, Corps, Coastal Program, VDGIF, USGS
habitat loss/ degradation/ fragmentation	hydrologic alterations	ditches	H	all species	restore wetlands; install water control structures; land protection; coordinate with NWR hydrologist	USGS, Coastal Program, NAWCA, NWRS, PFW, CPA, TNC, NRCS, VDGIF
habitat loss/ degradation/ fragmentation	hydrologic alterations	climate change	H	all species	protect/restore recharge areas; monitor plant and animal communities	Coastal Program, NAWCA, PFW, USGS, NRCS, TNC, NWRS, VDCR, VDGIF
habitat loss/ degradation/ fragmentation	hydrologic alterations	land use conversion (increased impervious surface and runoff)	H	all species	work with localities on low impact development and comprehensive planning; work with state agencies on BMP development and implementation; land protection	CPA, VDCR, localities, VDEQ, PFW, TNC, Coastal Program, NWRS, Corps
habitat loss/ degradation/ fragmentation	contaminants	spills	H	all species	spill prevention/planning, respond to spills; work with others on training for spill response; inreach and public outreach	EC, CPA, ES, NWRS, VDEQ, NOAA, EPA
habitat loss/ degradation/ fragmentation	contaminants	air pollution (including mercury)	H	all species	EC special study; promote carbon sequestration; permit review; work with VDEQ and EPA on Hg regulations; inreach and outreach to community through the 2010 College of William and Mary Mercury Expo	EC, PFW, NWRS, CPA, EPA, VDEQ, NADP/MDN
habitat loss/ degradation/ fragmentation	contaminants	hydrologic manipulation that releases mercury	H	all species	EC special study; work with NWR to minimize Hg releases, inreach with Refuge	EC, NWRS, USGS, VDGIF, VDEQ, Corps, NWR
habitat loss/ degradation/ fragmentation	shifts in native communities/ species composition (including non-natives)	climate change	H	all species	restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/funding decisions to consider climate change; controls invasive	NWRS, NOAA, NAWCA, all, NRCS, TNC

habitat loss/ degradation/ fragmentation	human migration/ relocation	climate change	H	all species	restore habitat/protect lands	NOAA, NAWCA, PFW, Coastal Program, NWRS, NRCS, TNC
habitat loss/ degradation/ fragmentation	sea level rise	climate change	H	all species	restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/funding decisions to consider climate change; planning	NOAA, NWRS, NAWCA, PFW, Coastal Program, NRCS, TNC
habitat loss/ degradation/ fragmentation	increased drought/ increased rainfall/ temperature change	climate change	H	all species	restore habitat/protect lands	PFW, Coastal Program, NWRS, NRCS, TNC
habitat loss/ degradation/ fragmentation	increased storm events	climate change	H	all species	restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/funding decisions to consider climate change; planning	NOAA, NAWCA, PFW, NWRS, Coastal Program, NRCS, TNC
demographic constraints	genetics, isolated populations, small population size, etc.	hydrologic alteration	H	all species	review CCP; restore habitat/protect lands; prioritize conservation actions/ decisions to promote connectivity; planning; work with NWR hydrologist	Coastal Program, NAWCA, PFW, NWRS, TNC, USGS
demographic constraints	genetics, isolated populations, small population size, etc.	residential/ commercial development	H	migratory birds	land protection; encourage local zoning; permit review; work with counties to leave corridors intact	Coastal Program, NOAA, NAWCA, PFW, NWRS, NRCS, CPA
non-native/ problematic native species and diseases	intentionally left blank	climate change	H	all species	implement appropriate control measures; planning; habitat restoration; inreach to NWR & outreach/education; monitoring for disease outbreaks	Coastal Program, NOAA, NAWCA, PFW, EC, NWRS, USDA, USGS, VDGIF, localities, NOAA, VIMS
habitat loss/ degradation/ fragmentation	hydrologic alterations	fire (peat soils)	M	all species	restore forests and hydrology; work with NWR and R5 regional refuge biologist on prescribed fire techniques,	ES, PFW, TNC, Coastal Program, NAWCA, VDOF, NWRS, NCDOF, NC State Parks
habitat loss/ degradation/ fragmentation	intentionally left blank	fire, forestry roads, and fire breaks within NWR	M	migratory birds	work with NWR to assess affects and management needs; work with Fire Management Officer work with NWR to determine if roads can be abandoned and restored	PFW, NWRS, NAWCA, Coastal Program, USGS, TNC

demographic constraints	genetics, isolated populations, small population size, etc.	agriculture/ forestry (including fire roads and breaks)	M	migratory birds, listed species	restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/decisions to promote connectivity; planning; education/outreach to APO & inreach to NWR	Coastal Program, VDGIF, VDOF, NCDOF, TNC, NC State Parks, City of Chesapeake, NAWCA, PFW, ES, NWRS, NRCS
non-native/problematic native species and diseases	intentionally left blank	non-native introduction/spread (plants and animals)	M	all species	work with state and local invasive species task force; work with localities; outreach/education; comprehensive control and monitoring program;	PFW, NWRS, localities, TNC, Coastal Program, Fisheries, EC, state agencies
non-native/problematic native species and diseases	intentionally left blank	habitat disturbance (forestry, development, agriculture, etc.)	M	all species	implement appropriate control measures; planning; habitat restoration; APO & locality outreach/education; monitoring for outbreaks; comment on permits	Coastal Program, NAWCA, PFW, EC, NWRS, USDA, USGS, VDGIF, localities, CPA
non-native/problematic native species and diseases	intentionally left blank	pollution (e.g., immune response effects)	M	all species	EC special studies; habitat restoration; work with regulatory agencies	Coastal Program, NAWCA, PFW, NWRS, EC, VDEQ, EPA
habitat loss/ degradation/ fragmentation	hydrologic alterations	forestry practices	L	all species	land protection; restore forests and hydrology; facilitate acquisition of timber rights; work with landowners and NWR on timing and type of practice implemented	ES, PFW, TNC, Coastal Program, NAWCA, DoD, VDOF, NWRS, TPL, Conservation Fund, NCDOF, NC State Parks, NCWRC
habitat loss/ degradation/ fragmentation	hydrologic alterations	residential/ industrial water withdrawal (surface and groundwater)	L	all species	permit review; work with VDEQ and localities on water supply planning	NWRS, VDEQ
habitat loss/ degradation/ fragmentation	hydrologic alterations	agricultural runoff	L	all species	restore habitats; work with NRCS and SWCDs to implement BMPs	Coastal Program, NAWCA, NWRS, PFW, NRCS, SWCD
habitat loss/ degradation/ fragmentation	nutrient loading	livestock	L	aquatics	restore/protect habitat buffers; work with NRCS and SWCD to implement BMPs	Coastal Program, NAWCA, PFW, NRCS, SWCD, TNC, EC, NWRS
habitat loss/ degradation/ fragmentation	nutrient loading	wastewater discharge	L	aquatics	VDEQ permit review; work with NWR; work with HRSD	VDEQ, EC, HRSD, NWRS, EPA
habitat loss/ degradation/ fragmentation	nutrient loading	agricultural fertilizer	L	aquatics	restore/protect habitat buffers; work with NRCS and SWCD to implement BMPs	EC, Coastal Program, NAWCA, PFW, NRCS, SWCD, TNC
habitat loss/ degradation/ fragmentation	nutrient loading	biosolids application	L	aquatics	restore/protect habitat buffers; review permits/work with VDEQ on regulations	EC, Coastal Program, NAWCA, PFW, NRCS, NWRS, SWCD, TNC, VDEQ

habitat loss/ degradation/ fragmentation	contaminants	pesticide (agricultural, forestry, transportation, ditches, residential run-off)	L	all species	buffer restoration and protection work with VDACS; work with VDOT; work with VDOF	VDOT, VDOF, Coastal Program, NAWCA, PFW, NRCS, SWCD, NWRS, TNC, EC, VDACS
habitat loss/ degradation/ fragmentation	contaminants	mosquito control	L	all species	assess threat; buffer restoration and protection work with VDACS and localities	Coastal Program, NAWCA, PFW, NRCS, SWCD, TNC, EC, VDACS, localities, DoD
habitat loss/ degradation/ fragmentation	contaminants	point source discharges (municipal or industrial wastewater treatment plants - endocrine disruptors, personal care products, pharmaceuticals, etc.)	L	all species	VDEQ permit review; work with NWR; work with HRSD; work with EPA on regulations	VDEQ, EC, USGS, HRSD, NWRS, EPA
demographic constraints	genetics, isolated populations, small population size, etc.	highway development/ maintenance	L	migratory birds	comment on permits; restore habitat/protect corridors	CPA, VDOT, PFW, Coastal Program, TNC, NWRS, City of Chesapeake, NCDOT
demographic constraints	genetics, isolated populations, small population size, etc.	canals	Unknown	none	Intentionally left blank	Intentionally left blank

*Includes impact occurring now and likelihood of threat in near-term future. Regarding climate change we are uncertain of the appropriate assessment of threat in some instances and additional data may change a specific assessment of threat over time.

**See species lists associated with this geographic priority area.

***Significant outreach and inreach efforts are inherent in many activities and specific actions are noted.

****All refers to all programs in Ecological Services.

HOLSTON RIVER WATERSHED THREATS ASSESSMENT

Priority Area – All Ecological Services Programs

Category	Threat	Trust Resources Affected*	Stressor	Assessment of Threat on Species** (high, medium, low)	What Ecological Services Can Do***	Who Can Address Problem****
agriculture	sediment runoff	aquatics	sedimentation	H	restore/protect habitat; work with NRCS and SWCDs to improve and implement BMPs; develop enhanced E&S controls; outreach on BMPs to farmers	USDA, VDEQ, SWCD, PFW, VDGIF, ES, USGS, VDCR, localities, EC, VDACS, landowners
agriculture	Livestock	aquatics	nutrient loading, chemical contamination, sedimentation, stream instability, trampling	H	restore/protect habitat; work with NRCS and SWCDs to improve and implement BMPs; outreach on BMPs and cost share programs to farmers	NRCS, SWCD, PFW, VDGIF, ES, VDCR, localities, NGOs, localities, landowners
agriculture	pasture and cropland development/maintenance	all species	habitat degradation, fragmentation, and loss	H	habitat restoration and protection; encourage BMPs, outreach to farmers	ES, PFW, USDA, SWCD, VDCR, landowners
climate change	climate change	aquatics	change in instream temperatures	H	assess threat; habitat restoration and protection; proactive planning regarding habitat availability, habitat/species shifts; promote alternative energy usage; public outreach on climate change and benefits of energy conservation and alternative energy development	PFW, ES, VDGIF, USGS, NOAA, TNC, VA Tech, EPA, VDEQ, DMME, OSM, FERC
climate change	climate change	all species	change in flow/hydrologic regime	H	work with partners on models and research projects to inform; assess potential need for refugia populations; promote alternative energy usage; habitat restoration and protection; water conservation and supply planning; public outreach on climate change and benefits of energy conservation and alternative energy development	PFW, ES, VDGIF, USGS, NOAA, TNC, FERC, DMME, OSM, localities, VA Tech, VDEQ, EPA, DMME
climate change	climate change	all species	shift in native species/ non-native species/ diseases	H	identify the threat and monitor for occurrence; conduct vulnerability assessments and develop response plans; habitat restoration/protection; public outreach on climate change and benefits of energy conservation and alternative energy development	VDACS, USGS, VDGIF, Corps, VDEQ, localities, VDOT, PFW, ES, NGOs, CPA, USDA, TVA, EC,
climate change	human migration/relocation	all species	pollution, habitat loss	H	habitat restoration/protection; public outreach on climate change and benefits of energy conservation and alternative energy development	PFW, EC, ES, NGOs

power generation	carbon-burning power plants	all species	contaminants (air and water), habitat loss/fragmentation	H	consult where there is a federal nexus; encourage EPA/VDEQ involvement; monitor, work with industry to minimize impacts; EC special studies; coordinated review with NPS and USFS for air pollution permits; outreach on environmental impacts of carbon-burning plants and benefits of energy conservation and alternative energy development.	EC, ES, CPA, EPA, VDEQ, industry, Corps, VSCC, localities, USGS, NPS, USFS
recreation	caving/vandalism	bats	habitat loss/ degradation, direct mortality, disease vector	H	promote cave gating; research associated with disease vectors; work with landowners to control cave access; outreach to cavers and landowners about disease vectors and caving impacts	caving groups, ES, VDGIF, VDCR, USGS, universities, USFS, DMLR, NPS, TNC, BCI, PFW, landowners
transportation	Spills	aquatics	contaminants	H	respond to spills as needed, follow through with NRDAR where appropriate; work with agencies/industry on rail, bridge and road design; outreach on signs at bridge crossings and watershed divides (e.g., "Entering UTRB Watershed") and via brochures and websites with links on how to report spills	EC, VDOT, industry, FHWA, CPA, ES, Federal Rail Administration, localities, citizens
transportation	highway, airport, and rail development/ maintenance (including runoff and pesticide applications)	all species	habitat loss/ degradation/ fragmentation, contaminants	H	section 7 consultations; work with localities; BMPs; karst protection; planning to avoid sensitive areas; stormwater management; monitoring to assess contaminant levels; outreach to transportation industry and public via signage (see cell above)	EC, CPA, ES, VDOT, localities, VDCR, UTRR, FHWA, FRA, FAA
urbanization and commercial/ industrial development	point and non-point waste (e.g., lawn care)	aquatics	nutrient loading, contaminants, sedimentation	H	develop permits limits; support erosion and sediment regulations; develop BMPs and enhanced erosion and sediment control for listed species; monitoring to assess contaminant levels; work with localities on planning and zoning; address straight pipes; outreach to localities on impacts and BMPs	landowners, ES, PDCs, Industrial Development Authorities, USDA, RC&Ds, SWCD, CDBG, UTRR, CPA, EC, VDOF, TNC, VDEQ, VDGIF, universities, USGS, localities; DMME, Corps, landowners
urbanization and commercial/ industrial development	legacy point and non-point industrial discharges	all species	mercury (Saltville), contaminants	H	continue NRDA and work with EPA through the BTAG; comment on TMDLs; NRDA/EC studies on legacy sites	EC, EPA, VDEQ, industry, localities, landowners
demography	poor demography	all species	low reproductive viability in existing patchy habitat, small population size, genetic drift, demographic stochasticity	H	propagation and reintroduction to suitable habitat; conduct population modeling and viability analysis and perform candidate assessments; assess threat; assess genetic differences among remaining populations; outreach to funding sources and interagency groups on problem	ES, universities, USGS, VDGIF, VDCR, TVA, Fisheries, NGOs, TWRA, NRDAR

right-of-way development and maintenance	utility corridors	all species	habitat loss/ fragmentation/ degradation	H	support erosion and sediment regulations; develop enhanced erosion and sediment control for listed species; consult and plan to avoid sensitive areas; permit reviews; work with localities on planning and zoning; outreach to industry on impacts and to public on benefits of energy conservation and alternative development (e.g., passive and local stored solar)	localities, ES, CPA, FERC, VSCC, industry, TVA, Corps, VDGIF, VDCR, VDEQ, USDA, VDOT
agriculture	pesticide runoff	aquatics, bats	contaminants	M	riparian restoration and protection, EC special study; outreach to farmers on benefits of proper pesticide usage	EC, PFW, ES, USDA, EPA, VDGIF, SWCD, VDEQ, landowners
agriculture	biosolids application	aquatics, migratory birds, bats	nutrient loading, biological oxygen demand, eutrophication, chemical contamination	M	riparian restoration and protection; EC special study; work with VDEQ on permits/regulations; outreach to farmers on BMPs and regulations	EC, VDEQ, ES, PFW, localities, landowners
agriculture	Fertilizer	aquatics	nutrient loading	M	riparian restoration and protection; EC special study; work with VDCR and USDA on BMPs, guidance, regulations; outreach on organic farming and BMPs to farmers	EC, VDCR, USDA, PFW, SWCD, TNC, UTRR, ES, landowners
agriculture	sinkhole dumps	aquatics, bats	contaminants	M	encourage sinkhole cleanup and protection; outreach on waste disposal to farmers	NGOs, VDGIF, PFW, ES, NRCS, EC, VDCR, landowners
gas	Marcellus shale	aquatics	instream flows - alterations, sedimentation, contaminants, habitat loss/ fragmentation	M	coordinate with DMME and VDEQ on permits and instream monitoring (chemical and biotic); HCPs; EC special study; collaborative research; acquire subsurface rights in sensitive areas; outreach on environmental impacts of Marcellus Shale drilling and benefits of alternative energy development	EC, CPA, USGS, EPA, VDEQ, DMME, DMLR, ES, universities
power generation	dams	all species	instream flows - alterations, habitat alteration/ fragmentation (including migration impacts), sedimentation, thermal impacts	M	work with Cookeville FO and TVA to comment on large dams; comment on FERC regulatory permits; facilitate fish connectivity through population augmentation; outreach on potential environmental impacts of dam operations and benefits of energy conservation and alternative energy development.	CPA, EC, ES, Fisheries, TVA, FERC, TN, VDGIF
wind turbines	wind turbines	migratory birds, bats	habitat alteration/ fragmentation (including migration impacts), direct mortality	M	land protection; HCPs; work with industry; develop BMPs and regulations with state permitting agencies and localities; identify sensitive areas that are of most concern; section 7 when appropriate; explore financial incentives to protect areas of concern; outreach on potential environmental impacts of wind turbines and benefits of energy conservation and alternative energy development.	ES, localities, CPA, industry, VDEQ, VDGIF, TNC, NGOs, USFS, NPS, VSCC, FERC

mill ponds	small dams	aquatics	instream flows - alterations, habitat alteration/ fragmentation (including migration impacts), sedimentation, thermal impacts	M	work with dam owners on removal and modification; facilitate fish connectivity through population augmentation; outreach on benefits of fish passage and impacts of small dams	PFW, USDA, ES, SWCD, NRDA, VDOT, landowners, VDGIF, localities
recreation	introduction of non-natives/ disease/pet trade	all species	competition, habitat loss/displacement, reduced viability	M	surveillance for introduced species and develop response plan; encourage outreach; work with pet trade and state agencies on regulations; outreach to boat and pet owners and anglers about problems and how to avoid them	VDGIF, ES, industry, VDCR, anglers, USFS
forestry	deforestation/ forest type conversion, run-off	all species	Instream flows - alterations, habitat loss/degradation/ fragmentation, invasive species, sedimentation	M	land protection; HCPs; work with industry; develop BMPs and regulations with state permitting agencies and localities; identify sensitive areas that are of most concern; section 7 when appropriate; explore financial incentives to protect areas of concern; promote forest management planning; GAP analysis to id riparian restoration needs; outreach to landowners on BMPs	CPA, ES; VDOF, USFS, localities, landowners, industry, TNC, Migratory Birds, PFW, EC
forestry	pesticide application (including Bt for gypsy moths)	all species	contaminants, habitat degradation, mortality of non-target organisms	M	work with agencies on long-term management plans and non-programmatic projects; work with EPA on label requirements; outreach on pesticide BMPs	ES, EC, CPA, USDA, VDACS, EPA, VDOF
urbanization and commercial/ industrial development	construction/ land disturbance	all species	habitat loss/ degradation/ fragmentation, sedimentation, contaminants, instream flow alteration, degradation of karst systems	M	support erosion and sediment regulations; develop enhanced erosion and sediment control for listed species; monitoring to assess contaminant levels; work with localities on planning and zoning; outreach to communities and landowners on BMPs	ES, PDCs, Industrial Development Authorities, USDA, RC&Ds, SWCD, HUD, UTRR, CPA, EC, VDOF, TNC, USFS, VDEQ, VDGIF, universities, USGS, localities, landowners
urbanization and commercial/ industrial development	straight pipes	aquatics	nutrient loading, contaminants, sedimentation	M	monitoring to assess contaminant levels; work with localities on planning; research VA Dept of Health records to determine where straight pipes are a concern; encourage installation of proper sewage treatment and/or relocation of homes; facilitate funding to correct straight pipes in key areas; outreach to localities on impacts and BMPs	landowners, ES, PDCs, USDA, RC&Ds, SWCD, CDBG, UTRR, CPA, EC, TNC, VDEQ, VDGIF, universities, USGS, localities, DMME, VDOH, Corps, EPA, landowners

urbanization and commercial/ industrial development	landfill leachate/ roadside dumps/ littering/ waste transfer stations	aquatics	contaminants	M	monitoring to assess threats and contaminants level; identify location of current and historic landfills/ waste dumps; develop appropriate regulations and work with localities to implement regulations; work with localities on siting of facilities; cleanup old dump facilities; encourage door-to-door pickup and waste disposal; outreach to localities on impacts and BMPs	CPA, ES, USGS, VDEQ, localities, RC&Ds, EC, PDCs, EPA, VDCR
urbanization and commercial/ industrial development	water supply (wells, surface water withdrawal, inter intra basin transfer)	aquatics	instream flows - alterations	M	comment on VDEQ/Corps regulatory permits; work with VDEQ to lower the reporting threshold for water withdrawals; review county water supply plans provided to VDEQ; work with RC&Ds and PDCs on water supply planning; develop instream flow models for trust resources; develop water conservation plans; oppose inter intra basin transfer in sensitive areas; review USDA/FSA/HUD loans for water development and promote water conservation; outreach to localities on growth impacts and water conservation	USGS, TNC, VMRC, TVA, PFW, USDA, EPA, VDEQ, Corps, HUD, RC&D, PDC, FSA, localities
agriculture	water withdrawal	aquatics	instream flows - alterations	L	work with VDEQ to lower the water withdrawal reporting threshold; outreach on water conservation to farmers and alternative watering supplies	all, Fisheries, VDEQ, TNC, USGS, landowners
agriculture	failure/ seepage/ overflow of animal waste storage facilities	aquatics	nutrient loading, biological oxygen demand, eutrophication, chemical contamination	L	assist with enforcement and cost share to remedy; outreach on containments impacts and prevention to farmers	PFW, EC, ES, LE, VDEQ, VDCR, USDA, EC, PFW, ES, USDA, EPA, VDGIF, SWCD, VDEQ, landowners
agriculture	ditches/tile drains	aquatics	instream flows - alterations	L	restore hydrology; review Corps permits and Swampbuster; outreach to farmers on wetlands benefits and cost share programs	ES, PFW, Corps, USDA, SWCD, VDEQ, RC&D, NGOs, landowners
agriculture	spring development	aquatics	instream flows - alterations	L	request NRCS to report all spring development annually to VDEQ/Corps; outreach on alternative water supplies and BMPs to farmers	PFW, VDEQ, Corps, NRCS, landowners
aquaculture	hatchery development/ maintenance	aquatics	excessive nutrients, introduction of exotic species, pathogen spread	L	assess future threat and monitor existing threat; outreach on BMPs to private hatcheries	EC, VDEQ, ES, VDGIF; hatchery operators
hard rock mining	point and non-point runoff	aquatics	contaminants, sedimentation	L	work with VDEQ and VDCR and DMME and Corps, and VMRC on permitting; work with landowners; EC special study; encourage enhanced E&S controls; protect sensitive areas	ES, EC, CPA, DMME, Corps, VDCR, VMRC, NGOs, VDEQ
hard rock mining	heavy equipment	aquatics	direct mortality, habitat degradation	L	work with VDEQ and VDCR and DMME and Corps, and VMRC on permitting; work with landowners; protect sensitive areas	ES, EC, CPA, DMME, Corps, VDCR, VMRC, NGOs, VDEQ

recreation	ATV	all species	direct destruction of habitat, noise disturbance	L	outreach; work with landowners; fence trails; work with ATV manufacturers about habitat destruction; establish ATV trails; outreach about ATV impacts by use of signs and brochures	PFW, LE, VDACS, localities, industry, ES, VDGIF LE, USFS, VDOF, VDCR, landowners
forestry	prescribed burning	all species	habitat alteration, smoke, contaminants, runoff, direct mortality	L	promote forest management planning that considers trust resources; BMPs; consult on listed species; facilitate prescribed burning to improve habitat; outreach to landowners on BMPs	CPA, PFW, ES, USFS, VDOF, USDA, VDCR, VDGIF, TNC, TVA, landowners
urbanization and commercial/ industrial development	flood control	aquatics	instream flow alteration, habitat loss/degradation/ fragmentation	L	review permit applications; report and encourage action on violations; habitat restoration; outreach to landowners and localities on growth impacts and stormwater management	ES, localities, Corps, VMRC, TVA, landowners, CPA, PDCs

*See species lists associated with this geographic priority area.

**Includes impact occurring now and likelihood of threat in near-term future. Regarding climate change we are uncertain of the appropriate assessment of threat in some instances and additional data may change a specific assessment of threat over time.

***Significant outreach and inreach efforts are inherent in many activities and species actions are noted.

****All refers to all programs in Ecological Services.

JAMES SPINYMUSSEL THREATS ASSESSMENT

Priority Area – All Ecological Services Programs

Threat	Stressor	Cause	Assessment of Threat on JSM* (high medium, low)	What Ecological Services Can Do**	Who Can Address Problem
habitat loss/ degradation/ fragmentation	sedimentation, temperature, downstream scour	large dams/ reservoirs (operation and maintenance of existing dams, construction of new dams)	H	comment/consult on new projects and relicensing and operations; work with localities on watershed/water supply and comprehensive planning; regional HCPs; conservation agreements; public outreach	ES, PFW, Coastal Program, TNC, VDNH, localities, FERC, dam owners, Corps, CPA, Fisheries, NRCS, VDGIF, VDEQ, DMME?
habitat loss/ degradation/ fragmentation	sedimentation/ suspended solids	poor land practices (e.g., small dams, residential and industrial development, forestry, agriculture) and transportation/ utilities	H	riparian and stream restoration; work with localities on comprehensive planning; work with state agencies on relevant regulatory changes; regional HCPs; conservation agreements; comment/consultation on projects; public outreach at annual mussel event	EC, VDEQ, ES, localities, CPA, NRCS, SWCDs, Coastal Program, PFW, VDGIF, VDCR, Corps, VDOT, VDOF, USFS
habitat loss/ degradation/ fragmentation	contaminants	spills	H	spill prevention/planning; respond to spills; work with others on training for spill response; identify sensitive areas; work with NRCS and SWCDs on potential threats; assist in threat removal/reduction; comment on NRCS standard practices	EC, VDEQ, ES, EPA, NRCS, SWCDs, PFW, VDGIF, CPA, localities, VDOT
habitat loss/ degradation/ fragmentation	hydrologic alteration	climate change	H	restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/funding decisions to consider climate change; planning; education/public outreach; work with localities to support low impact development; work with VDEQ on water supply planning to include trust resource needs;	ES, TNC, VDEQ, Coastal Program, PFW, VDGIF. NRCS, SWCDs, Corps, CPA, localities
demographic constraints	genetics, isolated populations, small population size, etc.	movement barriers for fish host and mussel (e.g., dams, cold water releases, lentic habitat, culverts, low water crossings, embeddedness)	H	remove/modify barriers; provide fish passage; evaluate translocation/augmentation/reintroduction; restore riparian habitat; coordinate with FERC on relicensing and downstream management; permit reviews; regional HCPs	ES, PFW, CPA, FERC, VDGIF, Corps, VDEQ, Fisheries, NRCS, universities, VDOT, dam owners
demographic constraints	genetics, isolated populations, small population size, etc.	spills	H	spill prevention/planning; respond to spills; work with others on training for spill response; identify potential threats; work with NRCS and SWCDs on potential threats; assist in threat removal/reduction; comment on NRCS standard practices; evaluate translocation/augmentation/reintroduction; public outreach	EC, VDEQ, ES, EPA, NRCS, SWCDs, PFW, VDGIF, CPA, localities, VDOT, courts

demographic constraints	genetics, isolated populations, small population size, etc.	Allee effect	H	evaluate this threat; conduct PVA; improve our understanding of demographics; further develop augmentation/reintroduction approach; assess genetic diversity in remaining populations to facilitate recovery	ES, universities, USGS, VDGIF, Fisheries, surveyors
non-native/problematic native species	shifts in species composition	climate change	H	restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/funding decisions to consider climate change; control invasive; evaluate stressor	PFW, Coastal Program, NRCS, VDGIF, ES, LCCs, TNC, Fisheries
habitat loss/degradation/fragmentation	contaminants	nutrients (e.g., straight pipes, all sources)	M	investigate significance of this threat; work with state agencies to fund appropriate wastewater disposal; work with VDEQ on TMDL implementation; work with RC&Ds; comment on permits and NRCS standard practices; work with state permitting agencies; restore riparian corridors and conduct public outreach	EPA, VDEQ, ES, EC, VDGIF, PFW, NRCS, RC&Ds, SWCDs, TNC, Corps
habitat loss/degradation/fragmentation	movement/migration barriers to host fish	dams, pipelines, large sections of unsuitable habitat, culverts, low water crossings	M	provide passage/remove dams; restore habitat; remove/replace culverts; comment on permits; remove/re-route/bury pipelines; identify which impediments are problematic; conduct public outreach as appropriate at the annual mussel festival	PFW, ES, TNC, VDEQ, FishAmerica, Coastal Program, Fisheries, VDGIF, NRCS, SWCDs, Corps, CPA
habitat loss/degradation/fragmentation	hydrologic alteration	increased runoff, changes in hydroperiod, surface and groundwater withdrawal, increased impervious surfaces	M	work with localities on comprehensive/watershed planning; work with agencies on permits, stormwater regulations, and BMP implementation/design	ES, TNC, VDEQ, Coastal Program, FERC, Fisheries, NOAA, VDGIF, NRCS, SWCDs, Corps, CPA, localities
demographic constraints	genetics, isolated populations, small population size, etc.	sedimentation	M	riparian and stream restoration; comment on projects; work with localities on comprehensive planning; work with state agencies on relevant regulatory changes; regional HCPs; conservation agreements; investigate where populations are isolated due to sedimentation; evaluate translocation/augmentation/reintroduction; determine effects of sedimentation on survival and recruitment of young; conduct public outreach and increase awareness at mussel festival	EC, VDEQ, ES, localities, CPA, NRCS, SWCDs, Coastal Program, PFW, VDGIF, VDCR, EPA, VDOF, USGS, universities, Fisheries, USFS
habitat loss/degradation/fragmentation	contaminants	pesticides	L	investigate significance of this threat; comment on permits and NRCS standard practices; work with state permitting agencies; riparian restoration; comment on pesticide registration; public outreach at annual mussel event	VDACS, VDOT, EPA, VDEQ, ES, EC, VDGIF, PFW, NRCS, USGS
habitat loss/degradation/fragmentation	contaminants	acid deposition	L	investigate significance of this threat; work with USFS;	EC, USGS, ES, LCC, EPA, VDEQ, USFS, NADP
habitat loss/degradation/fragmentation	hydrologic alteration	temperature regime alteration (e.g., dams, buffers)	L	investigate significance of this threat; restore riparian buffers; work with localities to support low impact development; evaluate dam operation and maintenance and comment as needed; evaluate discharges	ES, TNC, VDEQ, Coastal Program, FERC, Fisheries, NOAA, VDGIF, NRCS, SWCDs, Corps, CPA, localities

habitat loss/ degradation/ fragmentation	hydrologic alteration	channelization	L	permit review; restore instream and floodplain habitat; Corps planning; work with localities on watershed and comprehensive planning; work with FEMA; land protection; NRCS EWP coordination; public outreach/education	ES, TNC, VDEQ, Coastal Program, FEMA, PFW, VDGIF, local watershed groups, NRCS, SWCDs, Corps, CPA, localities
intentionally left blank	direct mortality from crushing	vehicle crossings, livestock	L	work with VDOT and SWCD on public outreach to landowners; habitat restoration/protection; encourage/design correct stream crossings in sensitive areas	VDOT, SWCD, ES, PFW, NRCS, VDGIF
non-native/ problematic native species	predation/ competition	accidental and intentional introduction of non-native species (e.g., non-native trout, bait buckets)	L	assess trout threat on host fish; work with VDGIF to evaluate stocking program; public outreach to anglers	VDGIF, Fisheries, ES
non-native/ problematic native species	Disease	disease introduction or other stressor (e.g., climate change, contaminants) that increases susceptibility	L	investigate/monitor; reduce other stressors where possible	universities, USGS, Fisheries, Fish Health Center, VDGIF, EC, ES, PFW

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**Significant outreach and inreach efforts are inherent in many activities and specific actions are noted.

MADISON CAVE ISOPOD THREATS ASSESSMENT

Priority Area – All Ecological Services Programs

Threat	Stressor	Cause	Assessment of Threat on MCI* (high, medium, low)	What Ecological Services Can Do**	Who Can Address Problem
habitat loss/ degradation/ fragmentation	hydrologic alterations	fill (sinkholes, fissures etc)	H	outreach to landowners, stress that it's a water quality issue; clean out sinkholes	landowners, VDOT, NRCS, ES, PFW, CPA, VDNH, localities, NGOs, TCF
habitat loss/ degradation/ fragmentation	hydrologic alterations	impervious surface and runoff	H	stormwater management; outreach to promote low impact site development (i.e., pervious surfaces, rain gardens); habitat restoration/protection; identify recharge areas of known occurrences, outreach to landowners -stressing importance of recharging local aquifers	NPS, localities, PFW, VDCR, NRCS, VDOF, ES, VOF,TCF
habitat loss/ degradation/ fragmentation	hydrologic alterations	water withdrawal/ inter intra basin transfer (conversion of ground water to surface water)	H	investigate the severity of this threat; work with VDEQ on permits, regulations, and policies; water supply planning	VDEQ, ES, universities, VDCR, USGS, localities, CPA,TCF
habitat loss/ degradation/ fragmentation	hydrologic alterations	climate change	H	assess and monitor affects of climate change; habitat restoration/ protection	VOF, ES, PFW, CPA, VDCR, LCC, USGS, localities
habitat loss/ degradation/ fragmentation	nutrient loading	agricultural fertilizer/ biosolids application	H	permit reviews, work with VDEQ on regulations; work with NRCS/ VDCR on standards and specs; restore/protect habitat buffers; work with NRCS and SWCD to implement BMPs	EC, NGOs, PFW, NRCS, SWCD, VDEQ, VDCR, landowners, localities, ES
habitat loss/ degradation/ fragmentation	contaminants	spills	H	spill prevention/planning, respond to spills; work with others on training for spill response	EC, CPA, ES, VDEQ, EPA,
habitat loss/ degradation/ fragmentation	contaminants	biosolids	H	permit reviews, work with VDEQ on regulations; restore/protect habitat buffers; work with NRCS and SWCD to implement BMPs; EC special studies	EC, NGOs, PFW, NRCS, SWCD, VDEQ, VDCR, landowners, localities, ES
habitat loss/ degradation/ fragmentation	contaminants	non-point source (e.g., roads, pesticides)	H	develop application BMPs; buffer restoration and protection work with VDACS; section 7 consultation; work with VDOT, localities, and NRCS on BMPs to avoid sensitive areas; identify most significant threats; develop a list of approved pesticides	industry, PFW, SWCD, VDACS, VDOT, ES, NRCS, localities, EC, VDCR, USGS,TCF
demographic constraints	genetics, isolated populations, small population size, etc.	loss of connectivity and genetic diversity (e.g., hydrologic alteration, habitat degradation/loss, spills)	H	work with USGS-Leetown Science Center and other researchers to further knowledge of the genetics of each population; assess the threat level of this stressor; land protection; encourage local zoning; permit review; review county water supply plans; work with counties to leave corridors intact	ES, USGS, universities, VDCR,TCF
lack of info on species	intentionally left blank	intentionally left blank	H	determine connectivity of aquifers and identify recharge zones; determine range and conduct rangewide survey; genetic information; life history information	ES, TCF, USGS, universities, VDCR

habitat loss/ degradation/ fragmentation	contaminants	water pH chemistry (change in ionic potential from surface runoff to dilute Ca availability)	L	assess the effects	ES, EC, universities, USGS
habitat loss/ degradation/ fragmentation	hydrologic alterations	alteration of drainage pattern/ recharge (e.g., diversions, impoundments)	M	hydrologic restoration/protection; culvert sizing; stormwater management guidelines; low impact development; identify recharge areas of known occurrences	ES, VDOT, Corps, VDCR, localities, TCF
habitat loss/ degradation/ fragmentation	hydrologic alterations	collapsing or shifting of karst limestone from blasting, trenching, digging, mining, etc.	M	permit review; develop BMPs; HCPs	ES, CPA, VDCR, universities, USGS
habitat loss/ degradation/ fragmentation	nutrient loading	aging septic systems/ straight pipes, livestock, animal waste storage facilities	M	work on regulations with VDEQ; comment on discharge permits; review and implement USDA BMP specs; restore/protect habitat buffers; determine effects of nutrients and threat level	VDEQ, VDCR, USGS, PFW, NRCS, SWCD, EC
habitat loss/ degradation/ fragmentation	sedimentation	runoff from residential/ commercial development, agriculture, transportation, utilities, poor land management	M	assess threat level of this stressor; restore habitat/protect lands; work with landowners(outreach), localities, and VDOT, etc. on developing and implementing BMPs; section 7	PFW, EC, VDEQ, ES, VDCR, VDOT, TCF, localities, NRCS, industry, TCF
habitat loss/ degradation/ fragmentation	contaminants	mercury - South River	M	DuPont NRDAR	EC
habitat loss/ degradation/ fragmentation	contaminants	point source discharges (municipal or industrial wastewater treatment plants - endocrine disruptors, personal care products, pharmaceuticals, etc.)	M	evaluate the threat; work with EPA on developing regulations; work with VDEQ on discharge permit reviews; section 7; EC special study	EPA, VDEQ, ES, EC, USGS, universities

demographic constraints	genetics, isolated populations, small population size, etc.	Allee effect/low reproductive viability in existing patchy habitat	M	assess the threat level of this stressor; restore/protect habitat and recharge areas; connectivity/corridors; permit reviews	PFW, ES, EPA, VDEQ, VDCR, USGS, universities, TCF, NRCS, CPA
invasives	intentionally left blank	intentionally left blank	Unknown	work with VDCR to track this issue	ES, VDCR, universities, USGS, EC
disease	intentionally left blank	intentionally left blank	Unknown	work with VDCR to track this issue	ES, VDCR, universities, USGS

*Includes impact occurring now and likelihood of threat in near-term future. Regarding climate change we are uncertain of the appropriate assessment of threat in some instances and additional data may change a specific assessment of threat over time.

**Significant outreach and inreach efforts are inherent in many activities and specific actions are noted.

NORTHEASTERN BEACH TIGER BEETLE THREATS ASSESSMENT

Priority Area – All Ecological Services Programs

Threat	Stressor	Cause	Assessment of Threat on NBTB* (high, medium, low)	What Ecological Services Can Do**	Who Can Address Problem***
habitat loss/ degradation/ fragmentation	shoreline modification (changes in sand transport and placement of structure and change in habitat conditions)	bulkhead/riprap	H	permit review to encourage less destructive measures and minimize impacts, look for funding to assist landowners to offset their costs for alternate shoreline protection (living shoreline), public outreach, localities, permitting agencies; buy shoreline habitat, encourage shoreline protection/planning in a regional context, evaluate adjacent impacts	ES, Corps, landowners, VIMS, NOAA, localities, DNH, VMRC, contractors, TNC, Coastal Program, PFW
habitat loss/ degradation/ fragmentation	shoreline modification (changes in sand transport and placement of structure and change in habitat conditions)	groins/jetties	H	permit review to encourage less destructive measures, look for funding to assist landowners to offset their costs for alternate shoreline protection (living shoreline), outreach to public, localities, & permitting agencies; buy shoreline habitat, encourage shoreline protection/planning in a regional context, evaluate adjacent impacts	ES, Corps, landowners, VIMS, NOAA, localities, DNH, VMRC, contractors, TNC, Coastal Program, PFW
habitat loss/ degradation/ fragmentation	shoreline modification (changes in sand transport and placement of structure and change in habitat conditions)	construction/upland disturbance	H	comment on projects, work with localities on comprehensive planning; regional HCPs; conservation agreements; public outreach	ES, PFW, Coastal Program, TNC, DNH, localities
habitat loss/ degradation/ fragmentation	contaminants	spills (off shore)	H	spill prevention/planning, respond to spills, work with others on training for spill response	EC, NWRS, USCG, DEQ, ES
habitat loss/ degradation/ fragmentation	climate change	shifts in native communities/species composition, including non-natives	H	restore habitat/protect lands, establish/protect habitat corridors, prioritize conservation actions/funding decisions to consider climate change, control invasives	PFW, Coastal Program, NOAA, ES, TNC, DNH, NWRS
habitat loss/ degradation/ fragmentation	climate change	human migration/relocation	H	restore habitat/protect lands, education/outreach	PFW, Coastal Program, NOAA, ES, TNC, DNH, NWRS

habitat loss/ degradation/ fragmentation	climate change	sea level rise	H	restore habitat/protect lands, establish/protect habitat corridors, prioritize conservation actions/funding decisions to consider climate change, planning, education/outreach	PFW, Coastal Program, NOAA, ES, TNC, DNH, NWRS
habitat loss/ degradation/ fragmentation	climate change	increased storm events (number and severity)	H	restore habitat/protect lands, establish/protect habitat corridors, prioritize conservation actions/funding decisions to consider climate change, planning, education/outreach	PFW, Coastal Program, NOAA, ES, TNC, DNH, NWRS
demographic constraints	genetics, isolated populations, small populations, etc.	spills	H	spill prevention/planning, respond to spills, work with others on training for spill response; respond and assess effects	EC, ES, USCG, DEQ, EPA, NWRS, NOAA, localities
demographic constraints	genetics, isolated populations, small populations, etc.	development/shoreline alteration	H	land protection, encourage local zoning, permit review, work with counties on comprehensive shoreline management plans and to promote protection of shoreline habitats	ES, Coastal Program, PFW, localities, NWRS, TNC, DNH, NOAA
demographic constraints	genetics, isolated populations, small populations, etc.	human activities (e.g., driving, foot traffic)	H	Assess threat; implement appropriate control measures; planning; habitat restoration; public outreach; local ordinances to prevent use during appropriate times	ES, Coastal Program, PFW, localities, NWRS, TNC, researchers, DNH, NOAA
demographic constraints	genetics, isolated populations, small populations, etc.	storm events	H	restore/protect habitat, maintain connectivity of sites, population augmentation; genetic augmentation; genetic research; intensive population management	ES, Coastal Program, PFW, localities, NWRS, TNC, DNH, NOAA, researchers, FEMA
habitat loss/ degradation/ fragmentation	shoreline modification (changes in sand transport and placement of structure and change in habitat conditions)	breakwaters	M	permit review to minimize impacts, investigate design standards; look for funding to assist landowners to offset their costs for alternate shoreline protection (living shoreline), outreach/education to public, localities, permitting agencies; buy shoreline habitat, encourage shoreline protection/planning in a regional context, evaluate adjacent impacts	ES, Corps, landowners, VIMS, NOAA, localities, DNH, VMRC, contractors, TNC, Coastal Program, PFW
habitat loss/ degradation/ fragmentation	shoreline modification (changes in sand transport and placement of structure and change in habitat conditions)	beach/dune augmentation (including dredge spoil placement)	M	permit review to minimize impacts, investigate design standards, including grain size analysis; look for funding to assist landowners to offset their costs for integrated shoreline protection, outreach to public, localities, & permitting agencies; buy shoreline habitat, encourage shoreline protection/planning in a regional context, evaluate adjacent impacts	ES, Corps, landowners, VIMS, NOAA, localities, DNH, VMRC, contractors, TNC, Coastal Program, PFW

demographic constraints	genetics, isolated populations, small populations, etc.	Allee effect	M	restore/protect habitat, maintain connectivity of sites, permit reviews, population augmentation; genetic augmentation; genetic research; intensive population management	ES, Coastal Program, PFW, localities, NWRS, TNC, DNH, NOAA, researchers
habitat loss/ degradation/ fragmentation	shoreline modification (changes in sand transport and placement of structure and change in habitat conditions)	dredging for navigation/dredge material placement offshore	L	review permits; evaluate impacts to determine level of threat	ES, Corps, landowners
habitat loss/ degradation/ fragmentation	shoreline modification (changes in sand transport and placement of structure and change in habitat conditions)	non-native plants	L	assess threat; implement appropriate control measures; planning; habitat restoration; public outreach	ES, Coastal Program, PFW, localities, NWRS, TNC, researchers, DNH, NOAA
habitat loss/ degradation/ fragmentation	contaminants	pesticides	L	work with counties, public outreach; determine threat level and type of mosquito control; determine threats from Chemlawn, landowner pesticide applications, etc.	EC, NWRS, DEQ, ES, localities, VDACS?
demographic constraints	genetics, isolated populations, small populations, etc.	competition/ predation (native and non-native insect and plant species)	L	assess threat; implement appropriate control measures; planning; habitat restoration; public outreach	ES, USDA-WS, Coastal Program, NOAA, localities, PFW, NWRS, TNC, DNH, researchers

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**Significant outreach and inreach efforts are inherent in many activities and specific actions are noted.

***All refers to all programs in Ecological Services.

NOTTOWAY RIVER THREATS ASSESSMENT
Priority Area – All Ecological Services Programs

Threat	Stressor	Cause	Assessment of Threat on Species* (high, medium, low)	Trust Resources Affected**	What Ecological Services Can Do***	Who Can Address Problem****
habitat loss/ degradation/ fragmentation	hydrologic alterations	climate change	H	all species	establish (protect/restore) habitat corridors; work with localities on watershed planning	Coastal Program, NAWCA, PFW, CPA, TNC, NOAA, ES
habitat loss/ degradation/ fragmentation	contaminants	spills	H	all species	spill prevention/planning, respond to spills; work with others on training for spill response; work with DoD	EC, CPA, ES, NWRs, USCG, VDEQ, NOAA, EPA, CMI (Va Tech), DOD
habitat loss/ degradation/ fragmentation	shifts in native communities/ species composition (including non-natives)	climate change	H	all species	restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/ funding decisions to consider climate change; controls invasive	NOAA, NAWCA, all, NRCS, TNC
habitat loss/ degradation/ fragmentation	human migration/ relocation	climate change	H	all species	restore habitat/protect lands; education/outreach	NOAA, NAWCA, PFW, Coastal Program, NRCS, TNC
habitat loss/ degradation/ fragmentation	sea level rise	climate change	H	all species	restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/ funding decisions to consider climate change; planning; education/outreach	NOAA, NAWCA, PFW, Coastal Program, NRCS, TNC
habitat loss/ degradation/ fragmentation	increased drought/ increased rainfall/ temperature change	climate change	H	all species	work with VDEQ on water supply planning to include trust resource needs; restore habitat/protect lands	VDEQ, PFW, Coastal Program, NRCS, TNC
habitat loss/ degradation/ fragmentation	increased storm events	climate change	H	all species	restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/ funding decisions to consider climate change; planning; education/outreach	NOAA, NAWCA, PFW, Coastal Program, NRCS, TNC
demographic constraints	genetics, isolated populations, small population size, etc.	spills	H	all species	spill prevention/planning; respond to spills; work with others on training for spill response	EC, CPA, ES, NWRs, USCG, VDEQ, NOAA, EPA,

non-native/ problematic native species and diseases	intentionally left blank	climate change	H	all species	implement appropriate control measures; planning; habitat restoration; outreach/education; monitoring for disease outbreaks	Coastal Program, NOAA, NAWCA, PFW, EC, NWRS, USDA, USGS, VDGIF, localities, NOAA, VIMS
habitat loss/ degradation/ fragmentation	hydrologic alterations	dams (existing - operation and maintenance, removal; new - proposed)	M	migratory birds, fish, listed species	removal of dams	PFW, CPA, NOAA, TNC, ES, American Rivers, FishAmerica, VDGIF
habitat loss/ degradation/ fragmentation	hydrologic alterations	agricultural runoff	M	all species	restore habitats; work with NRCS and SWCDs to implement BMPs	Coastal Program, NOAA, NAWCA, PFW, NRCS, SWCD, CPA, ES
habitat loss/ degradation/ fragmentation	hydrologic alterations	forestry runoff	M	all species	work with VDOF on BMP implementation, restore forests	Coastal Program, NOAA, NAWCA, PFW, TNC, NRCS, VDOF, ES
habitat loss/ degradation/ fragmentation	hydrologic alterations	construction/land disturbance	M	all species	support E&S regulations; develop enhanced E&S control; work with localities; change buffer regulations	ES, CPA, VDCR, localities
habitat loss/ degradation/ fragmentation	nutrient loading	livestock	M	aquatics	restore/protect habitat buffers; work with NRCS and SWCD to implement BMPs	Coastal Program, NAWCA, PFW, NRCS, SWCD, TNC, EC
habitat loss/ degradation/ fragmentation	contaminants	agricultural run-off/ pesticides	M	all species	buffer restoration and protection work with VDACS	Coastal Program, NAWCA, PFW, NRCS, SWCD, TNC, EC, VDACS
habitat loss/ degradation/ fragmentation	contaminants	forestry runoff/ pesticides	M	all species	buffer restoration and protection work with VDACS, VDOF	Coastal Program, NAWCA, PFW, NRCS, SWCD, TNC, EC, VDACS, VDOF
habitat loss/ degradation/ fragmentation	contaminants	air pollution (including mercury)	M	all species	EC special study; promote carbon sequestration; permit review	EC, PFW, CPA
demographic constraints	genetics, isolated populations, small population size, etc.	agriculture/ forestry	M	all species	restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/ decisions to promote connectivity; planning; education/outreach	Coastal Program, NOAA, NAWCA, PFW, ES, NWRS, NRCS
demographic constraints	genetics, isolated populations, small population size, etc.	low reproductive viability in existing patchy habitat	M	listed species, migratory birds	restore habitat/protect lands; connectivity/corridors; permit reviews	Coastal Program, NOAA, NAWCA, PFW, ES, NWRS, NRCS, CPA
non-native/ problematic native species and diseases	intentionally left blank	boats as vectors	M	aquatics	intentionally left blank	Intentionally left blank

non-native/ problematic native species and diseases	intentionally left blank	non-native introduction/ spread (plants and animals)	M		all species	planting lists for restoration projects; work with state and local invasive species task force	CPA, ES, PFW, Coastal Program, Fisheries, EC, state agencies
non-native/ problematic native species and diseases	intentionally left blank	habitat disturbance (forestry, development, agriculture, etc.)	M		all species	implement appropriate control measures; planning; habitat restoration; outreach/education; monitoring for outbreaks; comment on permits	Coastal Program, NOAA, NAWCA, PFW, EC, NWRS, USDA, USGS, VDGIF, localities, NOAA, VIMS, CPA
habitat loss/ degradation/ fragmentation	hydrologic alterations	fill (instream and associated wetlands)	L		migratory birds, fish, listed species	land protection; restore wetlands and streams; permit review; work with DoD on INRMP	ES, PFW, CPA, TNC, Coastal Program, NOAA, NAWCA, DoD
habitat loss/ degradation/ fragmentation	hydrologic alterations	deforestation	L		migratory birds, fish, listed species	land protection; restore forests; facilitate acquisition of timber rights	ES, PFW, TNC, Coastal Program, NOAA, NAWCA, DoD, VDOF
habitat loss/ degradation/ fragmentation	hydrologic alterations	agricultural water withdrawal	L		migratory birds, fish, listed species	land protection; restore wetlands and streams	PFW, TNC, Coastal Program, NOAA, NAWCA
habitat loss/ degradation/ fragmentation	hydrologic alterations	residential/ industrial water withdrawal (surface and groundwater)	L		migratory birds, fish, listed species	permit review; work with VDEQ and localities on water supply planning	CPA, VDEQ, ES
habitat loss/ degradation/ fragmentation	hydrologic alterations	ditches/tile drains	L		migratory birds, fish, listed species	restore wetlands; work with NRCS; land protection	Coastal Program, NAWCA, PFW, CPA, TNC, NOAA, NRCS, VDGIF
habitat loss/ degradation/ fragmentation	hydrologic alterations	instream sand and gravel mining	L		aquatics	work with DMME, VMRC	CPA, ES, DMME, VMRC
habitat loss/ degradation/ fragmentation	nutrient loading	aging septic systems/straight pipes	L		aquatics	work with VDEQ	EC, RC&Ds, VDEQ
habitat loss/ degradation/ fragmentation	nutrient loading	animal waste storage facilities	L		aquatics	work on regulations with VDEQ; comment on discharge permits; review USDA BMP specs	EC, PFW, VDEQ, USDA, SWCD
habitat loss/ degradation/ fragmentation	nutrient loading	agricultural fertilizer	L		aquatics	restore/protect habitat buffers; work with NRCS and SWCD to implement BMPs	Coastal Program, NAWCA, PFW, NRCS, SWCD, TNC
habitat loss/ degradation/ fragmentation	nutrient loading	biosolids application	L		aquatics	restore/protect habitat buffers; work with VDEQ on regulations	EC, Coastal Program, NAWCA, PFW, NRCS, SWCD, TNC

habitat loss/ degradation/ fragmentation	contaminants	point source discharges (municipal or industrial wastewater treatment plants - endocrine disruptors, personal care products, pharmaceuticals, etc.)	L	all species	work with EPA on developing regulations	EC
habitat loss/ degradation/ fragmentation	habitat alteration/ fragmentation (including migration impacts)	deforestation	L	all species	Work with VDOF, NRCS, VDCR, NGO's to restore forests and strategically reduce fragmentation; outreach and education to forest landowners	PFW, Coastal Program, VDOF, VDCR, NRCS, NGOs, private landowners
demographic constraints	genetics, isolated populations, small population size, etc.	dams - small	L	aquatics	remove dams or modify for fish passage	PFW, Coastal Program
demographic constraints	genetics, isolated populations, small population size, etc.	instream sand and gravel mining	L	aquatics	work with DMME, VMRC	CPA, ES, DMME, VMRC
demographic constraints	genetics, isolated populations, small population size, etc.	highway development/maintenance	L	all species	appropriate culvert sizing and placement for fish passage; road underpasses; recommend bridges vs culverts/fill	CPA, VDOT, PFW, Coastal Program
demographic constraints	genetics, isolated populations, small population size, etc.	sedimentation	L	aquatics	restore habitat/protect lands	PFW, Coastal Program, NOAA, NAWCA
demographic constraints	genetics, isolated populations, small population size, etc.	residential/commercial development	L	all species	land protection; encourage local zoning; permit review; review county water supply plans; work with counties to leave corridors intact	Coastal Program, NOAA, NAWCA, PFW, ES, NWRS, NRCS, CPA

non-native/ problematic native species and diseases	intentionally left blank	pollution (e.g., immune response effects)	L	all species	EC special studies; habitat restoration; work with regulatory agencies	Coastal Program, NOAA, NAWCA, PFW, EC, VDEQ, EPA
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*Includes impact occurring now and likelihood of threat in near-term future. Regarding climate change we are uncertain of the appropriate assessment of threat in some instances and additional data may change a specific assessment of threat over time.

**See species lists associated with this geographic priority area.

***Significant outreach and inreach efforts are inherent in many activities and species actions are noted.

****All refers to all programs in Ecological Services.

RAPPAHANNOCK RIVER VALLEY NATIONAL WILDLIFE REFUGE THREATS ASSESSMENT

Priority Area - Environmental Contaminants Program

Threat	Stressor	Cause	Assessment of Threat on Species* (high, medium, low)	Trust Resources Affected**	What EC Can Do***	Who Can Address Problem
habitat alteration/ degradation/ fragmentation	contaminants	spills	M	all species	spill prevention/planning, respond to spills; work with others on training for spill response; inreach and public outreach	EC, CPA, ES, NWRS, VDEQ, NOAA, EPA
poor water quality	intentionally left blank	point source discharges (municipal or industrial wastewater treatment plants - endocrine disruptors, personal care products, pharmaceuticals, etc.) and non-point source discharges (ag land runoff)	H	aquatics	VDEQ permit review; work with NWR; EC special study; work with EPA on regulations; public education	VDEQ, EC, USGS, localities, NWRS, EPA, NOAA
habitat alteration/ degradation/ fragmentation	contaminants	PCBs (fish advisory from I-95 down to mouth)	M	all species	work with DEQ on TMDL implementation, EC special study to evaluate impacts; public outreach	EC, VDEQ
habitat alteration/ degradation/ fragmentation	contaminants	biosolids application	M	all species	restore/protect habitat buffers; review permits/ work with VDEQ on regulations	EC, NWRS, VDEQ, EPA
habitat alteration/ degradation/ fragmentation	contaminants	pesticide application and runoff (agricultural, forestry, transportation, golf courses, ditches, residential)	M	all species	buffer restoration and protection work with VDACS; work with VDOT	VDOT, VDOF, NWRS, EC, VDACS
habitat alteration/ degradation/ fragmentation	contaminants	mosquito control	L	all species	assess threat; buffer restoration and protection work with VDACS and localities	EC, VDACS, localities

*Includes impact occurring now and likelihood of threat in near-term future.

**See species lists associated with this geographic priority area.

***Significant outreach and inreach efforts are inherent in many activities and specific actions are noted.

ROANOKE LOGPERCH THREATS ASSESSMENT

Priority Area – All Ecological Services Programs

Threat	Stressor	Cause	Assessment of Threat on Logperch* (high, medium, low)	What Ecological Services Can Do**	Who Can Address Problem
habitat loss/ degradation/ fragmentation	intentionally left blank	large dams/reservoirs (operation and maintenance of existing dams, construction of new dams)	H	comment on new projects and relicensing and operations; work with localities on watershed/water supply and comprehensive planning; regional HCPs; conservation agreements	ES, PFW, Coastal Program, TNC, VDNH, localities, FERC, dam owners, Corps, CPA, Fisheries, NRCS, VDGIF
habitat loss/ degradation/ fragmentation	sedimentation/ suspended solids	poor land practices (e.g., dams, residential and industrial development, forestry, agriculture) and transportation/utilities	H	riparian and stream restoration; comment on projects; work with localities on comprehensive planning; work with state agencies on relevant regulatory changes; regional HCPs; conservation agreements; outreach to private landowners on sediment effects in-stream	EC, VDEQ, ES, localities, CPA, NRCS, SWCDs, Coastal Program, PFW, VDGIF
habitat loss/ degradation/ fragmentation	contaminants	spills	H	spill prevention/planning; respond to spills; work with others on training for spill response; identify potential threats; work with NRCS and SWCDs on potential threats; assist in threat removal/reduction; comment on NRCS standard practices; conduct outreach	EC, VDEQ, ES, EPA, NRCS, SWCDs, PFW, VDGIF, CPA, localities
habitat loss/ degradation/ fragmentation	movement/ migration barriers	dams, pipelines, large sections of unsuitable habitat, culverts, low water crossings	H	provide passage/remove dams; restore habitat; remove/replace culverts; comment on permits; remove/re-route/bury pipelines; identify which impediments are problematic; fund additional studies (e.g., cues to movement); conduct outreach to localities and dam/utility owners on in-stream effects	PFW, ES, TNC, VDEQ, FishAmerica, Coastal Program, ES, Fisheries, NOAA, VDGIF, NRCS, SWCDs, Corps, CPA
habitat loss/ degradation/ fragmentation	hydrologic alteration	climate change	H	restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/funding decisions to consider climate change; planning; education/outreach; work with localities to support low impact development; work with VDEQ on water supply planning to include trust resource needs;	ES, TNC, VDEQ, Coastal Program, VDGIF, NRCS, SWCDs, Corps, CPA, localities
demographic constraints	genetics, isolated populations, small population size, etc.	movement barriers (e.g., dams, cold water releases, lentic habitat, culverts, low water crossings, embeddedness)	H	remove/modify barriers; provide fish passage; evaluate translocation/augmentation/reintroduction; restore riparian habitat; coordinate with FERC on relicensing and downstream management; permit reviews; regional HCPs; conduct outreach with VDOT, localities and private landowners	ES, PFW, CPA, FERC, VDGIF, Corps, VDEQ, Fisheries, NRCS, universities, VDOT

demographic constraints	genetics, isolated populations, small population size, etc.	spills	H	spill prevention/planning; respond to spills; work with others on training for spill response; identify potential threats; work with NRCS and SWCDs on potential threats; assist in threat removal/reduction; comment on NRCS standard practices; evaluate translocation/augmentation/reintroduction; conduct outreach	EC, VDEQ, ES, EPA, NRCS, SWCDs, PFW, VDGIF, CPA, localities, VDOT, courts
non-native/problematic native species	shifts in species composition	climate change	H	restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/funding decisions to consider climate change; control invasives	PFW, Coastal Program, NRCS, VDGIF, ES, TNC, NOAA, Fisheries
habitat loss/degradation/fragmentation	contaminants	nutrients (e.g., straight pipes)	M	investigate significance of this threat; work with state agencies to fund appropriate wastewater disposal; work with VDEQ on TMDL implementation; work with RC&Ds; comment on permits and NRCS standard practices; work with state permitting agencies; restore riparian corridors	EPA, VDEQ, ES, EC, VDGIF, PFW, NRCS, RC&Ds, SWCDs, TNC, Corps
habitat loss/degradation/fragmentation	contaminants	PCBs	M	investigate significance of this threat; EC special study; work with VDEQ on TMDL implementation	EC, VDEQ, ES, EPA, USGS, localities
habitat loss/degradation/fragmentation	hydrologic alteration	increased runoff, changes in hydroperiod, surface and groundwater withdrawal, increased impervious surfaces	M	work with localities on comprehensive/watershed planning; work with agencies on permits, stormwater regulations, and BMP implementation/design	ES, TNC, VDEQ, Coastal Program, FERC, Fisheries, NOAA, VDGIF, NRCS, SWCDs, Corps, CPA, localities
habitat loss/degradation/fragmentation	hydrologic alteration	channelization	M	permit review; restore instream and floodplain habitat; Corps planning; work with localities on watershed and comprehensive planning; work with FEMA; land protection; NRCS EWP coordination; outreach to private landowners on effects to stream stability and property	ES, TNC, VDEQ, Coastal Program, FEMA, VDGIF, local watershed groups, NRCS, SWCDs, Corps, CPA, localities
demographic constraints	genetics, isolated populations, small population size, etc.	sedimentation	M	riparian and stream restoration; comment on projects; work with localities on comprehensive planning; work with state agencies on relevant regulatory changes; regional HCPs; conservation agreements; investigate where populations are isolated due to sedimentation; evaluate translocation/augmentation/reintroduction	EC, VDEQ, ES, localities, CPA, NRCS, SWCDs, Coastal Program, PFW, VDGIF, VDCR, EPA, VDOF, USFS
habitat loss/degradation/fragmentation	contaminants	pesticides	L	investigate significance of this threat; comment on permits and NRCS standard practices; work with state permitting agencies	VDACS, VDOT, EPA, VDEQ, ES, EC, VDGIF, PFW, NRCS
habitat loss/degradation/fragmentation	contaminants	acid deposition	L	investigate significance of this threat	EC, USGS, ES, EPA, VDEQ
habitat loss/degradation/fragmentation	hydrologic alteration	temperature regime alteration	L	investigate significance of this threat; restore riparian buffers; work with localities to support low impact development; evaluate dam operation and maintenance and comment as needed; evaluate discharges	ES, TNC, VDEQ, Coastal Program, FERC, Fisheries, NOAA, VDGIF, NRCS, SWCDs, Corps, CPA, localities, EC

non-native/ problematic native species	predation/ competition	accidental and intentional introduction of non-native species (e.g., non-native trout, bait buckets)	L	assess trout threat; work with VDGIF to evaluate stocking program; public outreach to anglers and bait suppliers	VDGIF, Fisheries, ES
non-native/ problematic native species	Disease	disease introduction or other stressor (e.g., climate change, contaminants) that increases susceptibility	L	investigate/monitor; reduce other stressors where possible	universities, USGS, CFI, Fisheries, Fish Health Center, VDGIF, ES, PFW

*Includes impact occurring now and likelihood of threat in near-term future. Regarding climate change we are uncertain of the appropriate assessment of threat in some instances and additional data may change a specific assessment of threat over time.

**Significant outreach and inreach efforts are inherent in many activities and specific actions are noted.

APPENDIX 5 – THREATS ASSESSMENTS WITH ONLY HIGH LEVEL THREATS

BLACKWATER RIVER WATERSHED THREATS ASSESSMENT

HIGH LEVEL THREATS*

Priority Area - Partners for Fish and Wildlife Program

Threat	Stressor	Cause	Trust Resources Affected**	What PFW Can Do***
habitat loss/ degradation/ fragmentation	instream flow - alterations	climate change	all species	establish habitat corridors
habitat loss/ degradation/ fragmentation	Contaminants	mercury	all species	restore wetlands
habitat loss/ degradation/ fragmentation	shifts in native communities/species composition, including non-natives	climate change	all species	restore habitat/protect lands
habitat loss/ degradation/ fragmentation	human migration/relocation	climate change	all species	restore habitat/protect lands
habitat loss/ degradation/ fragmentation	increased drought/increased rainfall	climate change	all species	restore habitat/protect lands
habitat loss/ degradation/ fragmentation	change in instream temps	climate change	all species	restore habitat/protect lands
demographic constraints	genetics, isolated populations, small population size, etc.	agriculture/forestry	all species	restore habitat/protect lands; landowner outreach, education
demographic constraints	genetics, isolated populations, small population size, etc.	low reproductive viability in existing patchy habitat	red-cockaded woodpecker	restore habitat/protect lands; locality and landowner outreach, education
non-native/ problematic native species	intentionally left blank	climate change	all species	restore habitat/protect lands; locality and landowner outreach, education
non-native/ problematic native species	intentionally left blank	habitat disturbance	all species	restore habitat/protect lands; landowner outreach, education
disease	intentionally left blank	climate change	all species	restore habitat/protect lands; landowner outreach, education

*Assessment of threat includes impact occurring now and likelihood of occurrence in near-term future.
**See species lists associated with this geographic priority area.
***Significant outreach and inreach efforts are inherent in many activities and specific actions are noted.

CLINCH AND POWELL RIVERS WATERSHED THREATS ASSESSMENT

HIGH LEVEL THREATS*

Priority Area – All Ecological Services Programs

Category	Threat	Stressor	Trust Resources Affected**	What Ecological Services Can Do***	Who Can Address Problem****
agriculture	livestock	nutrient loading, chemical contamination, sedimentation, stream instability, trampling,	aquatics, karst species	restore/protect habitat; work with NRCS and SWCDs to improve and implement BMPs; outreach on BMPs and cost share programs to farmers	NRCS, SWCD, PFW, VDGIF, ES, VDCR, localities, landowners
agriculture	pasture and cropland development/maintenance	habitat degradation, fragmentation, and loss	all species	habitat restoration and protection; encourage BMPs; outreach to farmers	PFW, USDA, SWCD, VDCR, landowners
climate change	climate change	change in instream temperatures	aquatics	habitat restoration and protection; proactive planning regarding habitat availability, habitat/species shifts; promote alternative energy usage; public outreach on climate change and benefits of energy conservation and alternative energy development	PFW, ES, VDGIF, USGS, NOAA, TNC, VA Tech, EPA, VDEQ, VDMME, OSM, FERC
climate change	climate change	change in flow/hydrologic regime	all species	work with partners on models and research projects to inform; assess potential need for refugia populations; promote alternative energy usage; habitat restoration and protection; water conservation and supply planning; public outreach on climate change and benefits of alternative energy development	PFW, ES, VDGIF, USGS, NOAA, TNC, FERC, OSM, localities, VA Tech, VDEQ, EPA, VDMME
climate change	climate change	shift in native species/ non-native species/ diseases	all species	identify the threat and monitor for occurrence; conduct vulnerability assessments and develop response plans; habitat restoration/protection; public outreach on climate change and benefits of energy conservation and alternative energy development	VDACS, USGS, VDGIF, Corps, VDEQ, localities, VDOT, PFW, ES, CPA, USDA, TVA, EC
climate change	human migration/relocation	pollution, habitat loss	all species	habitat restoration/protection; public outreach on climate change and benefits of energy conservation and alternative energy development	PFW

mining	runoff from abandoned mine lands (including acid mine drainage)	contaminants, sedimentation	aquatics, migratory birds, bats	provide FWCA reports and technical assistance to Corps and others; review AML "emergency" projects and AML grant projects including water and sewer line installation; monitor to determine success of AML projects; EC special study; use NRDA restoration funds for projects/matching funds; encourage Lands Unsuitable for Mining designation; acquire subsurface rights in sensitive areas; outreach on AML environmental priorities to regulators and congress	ES, EC, CPA, VDMME, Corps, PDCs, EPA, VDEQ, Congress
mining	channelization/ instream modifications and fill	instream flows - alterations, habitat loss/ degradation	aquatics, bats, migratory birds	work with VMRC, Corps, VDEQ, VDOT on permit review and enforcement; land protection, habitat restoration; evaluation/assessment of threat; work with localities to establish floodplain and buffer regulations; participate in partnerships/planning; promote natural stream channel design; work with DMME on SSPMs; encourage Lands Unsuitable for Mining designation; acquire subsurface rights in sensitive areas; outreach on environmental impacts of mining and of benefits energy conservation and alternative energy development	EC, CPA, PFW, Fisheries, NRCS, EPA, USGS, VDMME, VDEQ, VDOT, ES, VDGIF, VMRC, Corps
mining	point source effluents (e.g., sedimentation ponds, valley fill ponds, coal preparation plants)	Contaminants, sedimentation	aquatics	conduct EC studies; continue to partner with USGS on SSP studies; review DMME and Corps permit applications; work on SSPMs under 1996 OSM BO; review draft TMDLs and provide comments to VDEQ and DMLR; encourage better cumulative impacts assessment in NEPA documents and mining review comments; encourage Lands Unsuitable for Mining designation; acquire subsurface rights in sensitive areas; outreach on environmental impacts of mining and benefits of energy conservation and alternative energy development	PFW, ES, CPA, EC, VDOF, DMLR, OSM, TNC, EPA, USFS, VDEQ, Corps, VDGIF, DMME, universities, USGS
mining	non-point source run-off	contaminants, sedimentation	aquatics	review DMME and Corps permit applications; work on SSPMs under 1996 OSM BO; review draft TMDLs and provide comments to VDEQ and DMLR; encourage Lands Unsuitable for Mining designation; acquire subsurface rights in sensitive areas; outreach on environmental impacts of mining and benefits of energy conservation and alternative energy development	PFW, ES, CPA, EC, VDOF, DMLR, OSM, TNC, EPA, USFS, VDEQ, Corps, VDGIF, DMME, universities, USGS
mining	re-mining	contaminants, sedimentation	aquatics	review DMME and Corps permit applications; work on SSPMs under 1996 OSM BO; review draft TMDLs and provide comments to VDEQ and DMLR; encourage Lands Unsuitable for Mining designation; acquire subsurface rights in sensitive areas; outreach on impacts of mining contaminants to industry and regulators	PFW, ES, CPA, EC, VDOF, VDMLR, OSM, TNC, EPA, USFS, VDEQ, Corps, VDGIF, VDMME, universities, USGS
gas	mining runoff	sedimentation	aquatics	review permit applications; work on SSPMs under 1996 OSM BO; acquire subsurface rights in sensitive areas; outreach on environmental impacts of gas drilling and benefits of energy conservation and alternative energy development	EC, CPA, ES, OSM, DMME, Corps, DMLR, EPA, VDEQ

gas	coal-bed methane	contaminants, sedimentation, habitat loss/ fragmentation	aquatics, migratory birds, bats	HCPs; work with DMME on BMPs and permits; review EPA deep well injection permits; work with industry to minimize impacts; acquire subsurface rights in sensitive areas; outreach on environmental impacts of coal-bed methane production and benefits of energy conservation and alternative energy development	EC, EPA, ES, VDMME, VDEQ, industry, NWRs, VOF, TNC, NGOs
power generation	carbon burning power plants	contaminants (air and water), habitat loss/ fragmentation, water withdrawal	all species	consult where there is a federal nexus; encourage EPA/ VDEQ involvement; monitor, work with industry to minimize impacts; EC special studies; outreach on environmental impacts of carbon-burning plants and benefits of energy conservation and alternative energy development	EC, ES, CPA, EPA, VDEQ, industry, Corps, VSCC, localities, USGS
recreation	caving/vandalism	habitat loss/ degradation, direct mortality, disease vector	bats, isopod	promote cave gating; research associated with disease vectors; outreach to cavers and landowners about disease vectors and caving impacts	caving groups, ES, VDGIF, VDCR, USGS, universities, USFS, VDMLR, NPS, TNC, BCI, PFW, landowners
transportation	spills	contaminants	aquatics	respond to spills as needed, follow through with NRDAR where appropriate; work with agencies/industry on rail, bridge and road design; outreach on signs at bridge crossings and watershed divides (e.g., "Entering UTRB Watershed") and via brochures and websites with links on how to report spills	EC, VDOT, industry, FHWA, CPA, ES, Federal Rail Administration, localities, citizens
transportation	highway, airport, and rail development/ maintenance (including runoff and pesticide applications)	habitat loss/ degradation/ fragmentation, contaminants	all species	section 7 consultations; work with localities; BMPs; karst protection; planning to avoid sensitive areas; stormwater management; monitoring to assess contaminant levels; outreach to transportation industry and public via signage (see cell above)	EC, CPA, ES, VDOT, localities, VDCR, UTRR, FHWA, FRA, FAA
urbanization and commercial/ industrial development	construction/land disturbance	habitat loss/ degradation/ fragmentation, sedimentation, contaminants, instream flow alteration, degradation of karst systems	all species	support erosion and sediment regulations; develop enhanced erosion and sediment control for listed species; monitoring to assess contaminant levels; work with localities on planning and zoning; outreach to communities and landowners on BMPs	ES, PDCs, Industrial Development Authorities, USDA, RC&Ds, SWCD, CDBG, UTRR, CPA, EC, VDOF, TNC, USFS, VDEQ, VDGIF, universities, USGS, localities, landowners
demography	poor demography	low reproductive viability in existing patchy habitat, small population size, genetic drift, demographic stochasticity	all species	propagation and reintroduction to suitable habitat; conduct population modeling and viability analysis and perform candidate assessments; assess threat; assess genetic differences among remaining populations; outreach to funding sources and interagency groups on problem	ES, universities, USGS, VDGIF, VDCR, TVA, Fisheries

right-of-way development and maintenance	utility corridors	habitat loss/ fragmentation/ degradation	all species	support erosion and sediment regulations; develop enhanced erosion and sediment control for listed species; consult and plan to avoid sensitive areas; permit reviews; work with localities on planning and zoning; outreach to industry on impacts and to public on benefits of energy conservation and alternative energy development (e.g., passive and local stored solar)	localities, ES, CPA, FERC, VSCC, industry, TVA, Corps, VDGIF, VDCR, VDEQ, USDA, VDOT
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*Assessment of threats includes impact occurring now and likelihood of occurrence in near-term future.

**See species lists associated with this geographic priority area.

***Significant outreach and inreach efforts are inherent in many activities and species actions are noted.

****All refers to all programs in Ecological Services.

EASTERN SHORE THREATS ASSESSMENT
HIGH LEVEL THREATS*
Priority Area – All Ecological Services Programs

Threat	Stressor	Cause	Trust Resources Affected**	What Ecological Services Can Do***	Who Can Address Problem****
habitat loss/ degradation/ fragmentation	hydrologic alterations	ditches/ tile drains	migratory birds, fish	restore wetlands; work with NRCS; land protection; outreach/education agriculture and forestry landowners	Coastal Program, NAWCA, PFW, CPA, TNC, NWRS, NOAA, Southern Tip Partnership
habitat loss/ degradation/ fragmentation	hydrologic alterations	climate change	all species	establish (protect/restore) habitat corridors	Coastal Program, NAWCA, PFW, CPA, TNC, NWRS, NOAA, Southern Tip Partnership, ES
habitat loss/ degradation/ fragmentation	sedimentation	agricultural runoff	migratory birds, fish	restore habitats; work with NRCS and SWCDs to implement BMPs	Coastal Program, NOAA, NAWCA, PFW, NRCS, CPA
habitat loss/ degradation/ fragmentation	nutrient loading	animal waste storage facilities	migratory birds, fish	work on regulations with VDEQ; comment on discharge permits; review USDA BMP specs	EC, PFW, VDEQ, USDA
habitat loss/ degradation/ fragmentation	nutrient loading	agricultural fertilizer	migratory birds, fish	restore/protect habitat buffers	Coastal Program, NAWCA, PFW, NRCS, SWCD, Southern Tip Partnership, NOAA
habitat loss/ degradation/ fragmentation	contaminants	spills (on and off shore)	all species, NWR lands	spill prevention/planning; respond to spills; work with others on training for spill response	EC, CPA, ES, NWRS, USCG, VDEQ, NOAA, EPA,
habitat loss/ degradation/ fragmentation	contaminants	agricultural (poultry/ row crops) run-off	migratory birds, fish	buffer restoration and protection; conduct EC special studies to evaluate poultry waste	EC, PFW, USGS
habitat loss/ degradation/ fragmentation	shifts in native communities/ species composition (including non-natives)	climate change	all species	restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/ funding decisions to consider climate change; control invasives	NOAA, NAWCA, all, NWRS, NRCS, Southern Tip Partnership
habitat loss/ degradation/ fragmentation	human migration/ relocation	climate change	all species	restore habitat/protect lands	NOAA, NAWCA, PFW, Coastal Program, NWRS, NRCS, Southern Tip Partnership
habitat loss/ degradation/ fragmentation	sea level rise	climate change	all species	restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/ funding decisions to consider climate change; planning; education/outreach to localities	NOAA, NAWCA, PFW, Coastal Program, NWRS, NRCS, Southern Tip Partnership

habitat loss/ degradation/ fragmentation	increased drought/ increased rainfall/ temperature change	climate change	all species	work with VDEQ on water supply planning to include trust resource needs; restore habitat/ protect lands	VDEQ, PFW, Coastal Program, NWRS, NRCS, Southern Tip Partnership
habitat loss/ degradation/ fragmentation	increased storm events resulting from climate change	climate change	all species	restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/ funding decisions to consider climate change; planning; education/outreach to localities	NOAA, NAWCA, PFW, Coastal Program, NWRS, NRCS, Southern Tip Partnership
habitat loss/ degradation/ fragmentation	habitat alteration/ fragmentation (including migration impacts)	deforestation	migratory birds, fish, listed species	work with VDOF, NRCS to restore forests and strategically reduce fragmentation; outreach and education to forest landowners	PFW, Coastal Program, VDOF, VDCR, NRCS, TNC, VDEQ, NGOs, NWRS, Southern Tip Partnership, private landowners
habitat loss/ degradation/ fragmentation	shoreline alteration	sea level rise	all species	restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/ funding decisions to consider climate change; planning; education/outreach, primarily to localities	Coastal Program, NOAA, NAWCA, PFW, NWRS, NRCS, Southern Tip Partnership
habitat loss/ degradation/ fragmentation	shoreline alteration	increased storm events	all species	restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/ funding decisions to consider climate change; planning, education/outreach, primarily to localities	Coastal Program, NOAA, NAWCA, PFW, NWRS, NRCS, Southern Tip Partnership
habitat loss/ degradation/ fragmentation	shoreline alteration	bulkheads/ riprap	coastal species	permit review to encourage less destructive measures and minimize impacts; look for funding to assist landowners to offset their costs for alternate shoreline protection (living shoreline); outreach/ education to public, localities, permitting agencies; buy shoreline habitat; encourage shoreline protection/planning in a regional context	Coastal Program, NOAA, NAWCA, CPA, ES, TNC, VIMS, Corps, VMRC, localities
non-native/ problematic native species and diseases	intentionally left blank	climate change	all species	implement appropriate control measures; planning; habitat restoration; outreach/education with landowners and Plant Natives campaign; monitoring for disease outbreaks	Coastal Program, NAWCA, PFW, EC, NWRS, USDA, USGS, VDGIF, localities, NOAA, VIMS
non-native/ problematic native species and diseases	intentionally left blank	habitat disturbance (forestry, development, agriculture, etc.)	all species	implement appropriate control measures; planning, habitat restoration; outreach/education; monitoring for outbreaks; comment on permits	Coastal Program, NAWCA, PFW, EC, NWRS, USDA, USGS, VDGIF, localities, NOAA, VIMS, CPA

*Assessment of threats includes impact occurring now and likelihood of occurrence in near-term future.

**See species lists associated with this geographic priority area.

***Significant outreach and inreach efforts are inherent in many activities and species actions are noted.

****All refers to all programs in Ecological Services.

**GREAT DISMAL SWAMP NATIONAL WILDLIFE REFUGE THREATS ASSESSMENT
HIGH LEVEL THREATS***

Priority Area - Partners for Fish and Wildlife and Environmental Contaminants Programs

Threat	Stressor	Cause	Trust Resources Affected**	What PFW/EC Can Do***	Who Can Address Problem****
habitat loss/ degradation/ fragmentation	hydrologic alterations	fill for roads, historic side-casting for ditches	all species	install culverts to reconnect hydrology; inreach to NWR hydrologist and staff	PFW, NWRS, Coastal Program, NAWCA, DU, VDGIF
habitat loss/ degradation/ fragmentation	hydrologic alterations	water control structure operation and maintenance	all species	provide technical assistance; comment on CCP; work with Corps and NWR on Feeder Ditch WCS and locks; coordinate with NWR hydrologist; fund replacement of failing structures	PFW, NWRS, TNC, DU, Corps, Coastal Program, VDGIF, USGS
habitat loss/ degradation/ fragmentation	hydrologic alterations	ditches	all species	restore wetlands; install water control structures; land protection; coordinate with NWR hydrologist	USGS, Coastal Program, NAWCA, NWRS, PFW, CPA, TNC, NRCS, VDGIF
habitat loss/ degradation/ fragmentation	hydrologic alterations	climate change	all species	protect/restore recharge areas; monitor plant and animal communities	Coastal Program, NAWCA, PFW, USGS, NRCS, TNC, NWRS, VDCR, VDGIF
habitat loss/ degradation/ fragmentation	hydrologic alterations	land use conversion (increased impervious surface and runoff)	all species	work with localities on low impact development and comprehensive planning; work with state agencies on BMP development and implementation; land protection	CPA, VDCR, localities, VDEQ, PFW, TNC, Coastal Program, NWRS, Corps
habitat loss/ degradation/ fragmentation	contaminants	spills	all species	spill prevention/planning, respond to spills; work with others on training for spill response; inreach and public outreach	EC, CPA, ES, NWRS, VDEQ, NOAA, EPA
habitat loss/ degradation/ fragmentation	contaminants	air pollution (including mercury)	all species	EC special study; promote carbon sequestration; permit review; work with VDEQ and EPA on Hg regulations; inreach and outreach to community through the 2010 College of William and Mary Mercury Expo	EC, PFW, NWRS, CPA, EPA, VDEQ, NADP/ MDN
habitat loss/ degradation/ fragmentation	contaminants	hydrologic manipulation that releases mercury	all species	EC special study; work with NWR to minimize Hg releases, inreach with Refuge	EC, NWRS, USGS, VDGIF, VDEQ, Corps, NWR
habitat loss/ degradation/ fragmentation	shifts in native communities/ species composition (including non-natives)	climate change	all species	restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/funding decisions to consider climate change; controls invasive	NWRS, NOAA, NAWCA, all, NRCS, TNC
habitat loss/ degradation/ fragmentation	human migration/ relocation	climate change	all species	restore habitat/protect lands	NOAA, NAWCA, PFW, Coastal Program, NWRS, NRCS, TNC

habitat loss/ degradation/ fragmentation	sea level rise	climate change	all species	restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/funding decisions to consider climate change; planning	NOAA, NWRS, NAWCA, PFW, Coastal Program, NRCS, TNC
habitat loss/ degradation/ fragmentation	increased drought/ increased rainfall/ temperature change	climate change	all species	restore habitat/protect lands	PFW, Coastal Program, NWRS, NRCS, TNC
habitat loss/ degradation/ fragmentation	increased storm events	climate change	all species	restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/funding decisions to consider climate change; planning	NOAA, NAWCA, PFW, NWRS, Coastal Program, NRCS, TNC
demographic constraints	genetics, isolated populations, small population size, etc.	hydrologic alteration	all species	review CCP; restore habitat/protect lands; prioritize conservation actions/decisions to promote connectivity; planning; work with NWR hydrologist	Coastal Program, NAWCA, PFW, NWRS, TNC, USGS
demographic constraints	genetics, isolated populations, small population size, etc.	residential/ commercial development	migratory birds	land protection; encourage local zoning; permit review; work with counties to leave corridors intact	Coastal Program, NOAA, NAWCA, PFW, NWRS, NRCS, CPA
non-native/ problematic native species and diseases	intentionally left blank	climate change	all species	implement appropriate control measures; planning; habitat restoration; inreach to NWR and outreach/ education; monitoring for disease outbreaks	Coastal Program, NOAA, NAWCA, PFW, EC, NWRS, USDA, USGS, VDGIF, localities, NOAA, VIMS

*Assessment of threat includes impact occurring now and likelihood of occurrence in near-term future.

**See species lists associated with this geographic priority area.

***Significant outreach and inreach efforts are inherent in many activities and specific actions are noted.

****All refers to all programs in Ecological Services.

HOLSTON RIVER WATERSHED THREATS ASSESSMENT
HIGH LEVEL THREATS*
Priority Area – All Ecological Services Programs

Category	Threat	Stressor	Trust Resources Affected**	What Ecological Services Can Do***	Who Can Address Problem****
agriculture	sediment runoff	sedimentation	aquatics	restore/protect habitat; work with NRCS and SWCDs to improve and implement BMPs; develop enhanced E&S controls; outreach on BMPs to farmers	USDA, VDEQ, SWCD, PFW, VDGIF, ES, USGS, VDCR, localities, EC, VDACS, landowners
agriculture	livestock	nutrient loading, chemical contamination, sedimentation, stream instability, trampling	aquatics	restore/protect habitat; work with NRCS and SWCDs to improve and implement BMPs; outreach on BMPs and cost share programs to farmers	NRCS, SWCD, PFW, VDGIF, ES, VDCR, NGOs, localities, landowners
agriculture	pasture and cropland development/maintenance	habitat degradation, fragmentation, and loss	all species	habitat restoration and protection; encourage BMPs; outreach to farmers	ES, PFW, USDA, SWCD, VDCR, landowners
climate change	climate change	change in instream temperatures	aquatics	assess threat; habitat restoration/protection; proactive planning regarding habitat availability, habitat/species shifts; promote alternative energy usage; public outreach on climate change and benefits of energy conservation and alternative energy development	PFW, ES, VDGIF, USGS, NOAA, TNC, VA Tech, EPA, VDEQ, VDMME, OSM, FERC
climate change	climate change	change in flow/hydrologic regime	all species	work with partners on models and research projects to inform; assess potential need for refugia populations; promote alternative energy usage; habitat restoration and protection; water conservation and supply planning; public outreach on climate change and benefits of energy conservation and alternative energy development	PFW, ES, VDGIF, USGS, NOAA, TNC, FERC, VDMME, OSM, localities, VA Tech, VDEQ, EPA
climate change	climate change	shift in native species/ non-native species/ diseases	all species	identify the threat and monitor for occurrence; conduct vulnerability assessments and develop response plans; habitat restoration/protection; public outreach on climate change and benefits of energy conservation and alternative energy development	VDACS, USGS, VDGIF, Corps, VDEQ, localities, VDOT, PFW, ES, NGOs, CPA, USDA, TVA, EC
climate change	human migration/relocation	pollution, habitat loss	all species	habitat restoration/protection; public outreach on climate change and benefits of energy conservation and alternative energy development	PFW, EC, ES, NGOs

power generation	carbon-burning power plants	contaminants (air and water), habitat loss/ fragmentation	all species	consult where there is a federal nexus; encourage EPA/ VDEQ involvement; monitor, work with industry to minimize impacts; EC special studies; coordinated review with NPS and USFS for air pollution permits; outreach on environmental impacts of carbon-burning plants and benefits of energy conservation and alternative energy development.	EC, ES, CPA, EPA, VDEQ, industry, Corps, VSCC, localities, USGS, NPS, USFS
recreation	caving/vandalism	habitat loss/ degradation, direct mortality, disease vector	bats	promote cave gating; research associated with disease vectors; work with landowners to control cave access; outreach to cavers and landowners about disease vectors and caving impacts	caving groups, ES, VDGIF, VDCR, USGS, universities, USFS, DMLR, NPS, TNC, BCI, PFW, landowners
transportation	spills	contaminants	aquatics	respond to spills as needed, follow through with NRDAR where appropriate; work with agencies/industry on rail, bridge, and road design; outreach on signs at bridge crossings and watershed divides (e.g., "Entering UTRB Watershed") and via brochures and websites with links on how to report spills	EC, VDOT, industry, FHWA, CPA, ES, Federal Rail Administration, localities, citizens
transportation	highway, airport, and rail development/ maintenance (including runoff and pesticide applications)	habitat loss/ degradation/ fragmentation, contaminants	all species	section 7 consultations; work with localities; BMPs; karst protection; planning to avoid sensitive areas; stormwater management; monitoring to assess contaminant levels; outreach to transportation industry and public via signage (see cell above)	EC, CPA, ES, VDOT, localities, VDCR, UTRR, FHWA, FRA, FAA
urbanization and commercial/ industrial development	point and non-point waste (e.g., lawn care)	nutrient loading, contaminants, sedimentation	aquatics	develop permits limits; support erosion and sediment regulations; develop BMPs and enhanced erosion and sediment control for listed species; monitoring to assess contaminant levels; work with localities on planning and zoning; address straight pipes; outreach to localities on impacts and BMPs	landowners, ES, PDCs, Industrial Development Authorities, USDA, RC&Ds, SWCD, CDBG, UTRR, CPA, EC, VDOF, TNC, VDEQ, VDGIF, universities, USGS, localities, VDMME, Corps, landowners
urbanization and commercial/ industrial development	legacy point and non-point industrial discharges	mercury (Saltville), contaminants	all species	continue NRDA and work with EPA through the BTAG; comment on TMDLs; NRDA/EC studies on legacy sites	EC, EPA, VDEQ, industry, localities, landowners
demography	poor demography	low reproductive viability in existing patchy habitat, small population size, genetic drift, demographic stochasticity	all species	propagation and reintroduction to suitable habitat; conduct population modeling and viability analysis and perform candidate assessments; assess threat; assess genetic differences among remaining populations; outreach to funding sources and interagency groups on problem	ES, universities, USGS, VDGIF, VDCR, TVA, Fisheries, NGOs, TWRA, NRDAR

right-of-way development and maintenance	utility corridors	habitat loss/ fragmentation/ degradation	all species	support erosion and sediment regulations; develop enhanced erosion and sediment control for listed species; consult and plan to avoid sensitive areas; permit reviews; work with localities on planning and zoning; outreach to industry on impacts and to public on benefits of energy conservation and alternative development (e.g., passive and local stored solar)	localities, ES, CPA, FERC, VSCC, industry, TVA, Corps, VDGIF, VDCR, VDEQ, USDA, VDOT
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**See species lists associated with this geographic priority area.

***Significant outreach and inreach efforts are inherent in many activities and species actions are noted.

****All refers to all programs in Ecological Services.

JAMES SPINYMUSSEL THREATS ASSESSMENT
HIGH LEVEL THREATS*
Priority Area – All Ecological Services Programs

Threat	Stressor	Cause	What Ecological Services Can Do**	Who Can Address Problem
habitat loss/ degradation/ fragmentation	sedimentation, temperature, downstream scour	large dams/ reservoirs (operation and maintenance of existing dams, construction of new dams)	comment/consult on new projects and relicensing and operations; work with localities on watershed/water supply and comprehensive planning; regional HCPs; conservation agreements; public outreach	ES, PFW, Coastal Program, TNC, VDNH, localities, FERC, dam owners, Corps, CPA, Fisheries, NRCS, VDGIF, VDEQ, VDMME?
habitat loss/ degradation/ fragmentation	sedimentation/ suspended solids	poor land practices (e.g., small dams, residential and industrial development, forestry, agriculture) and transportation/ utilities	riparian and stream restoration; work with localities on comprehensive planning; work with state agencies on relevant regulatory changes; regional HCPs; conservation agreements; comment/consultation on projects; public outreach at annual mussel event	EC, VDEQ, ES, localities, CPA, NRCS, SWCDs, Coastal Program, PFW, VDGIF, VDCR, Corps, VDOT, VDOF, USFS
habitat loss/ degradation/ fragmentation	contaminants	spills	spill prevention/planning; respond to spills; work with others on training for spill response; identify sensitive areas; work with NRCS and SWCDs on potential threats; assist in threat removal/ reduction; comment on NRCS standard practices	EC, VDEQ, ES, EPA, NRCS, SWCDs, PFW, VDGIF, CPA, localities, VDOT
habitat loss/ degradation/ fragmentation	hydrologic alteration	climate change	restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/funding decisions to consider climate change; planning; education/public outreach; work with localities to support low impact development; work with VDEQ on water supply planning to include trust resource needs	ES, TNC, VDEQ, Coastal Program, PFW, VDGIF, NRCS, SWCDs, Corps, CPA, localities
demographic constraints	genetics, isolated populations, small population size, etc.	movement barriers for fish host and mussel (e.g., dams, cold water releases, lentic habitat, culverts, low water crossings, embeddedness)	remove/modify barriers; provide fish passage; evaluate translocation/augmentation/reintroduction; restore riparian habitat; coordinate with FERC on relicensing and downstream management; permit reviews; regional HCPs	ES, PFW, CPA, FERC, VDGIF, Corps, VDEQ, Fisheries, NRCS, universities, VDOT, dam owners
demographic constraints	genetics, isolated populations, small population size, etc.	spills	spill prevention/planning; respond to spills; work with others on training for spill response, including locally; identify potential threats; work with NRCS and SWCDs on potential threats; assist in threat removal/ reduction; comment on NRCS standard practices; evaluate translocation/augmentation/reintroduction; public outreach	EC, VDEQ, ES, EPA, NRCS, SWCDs, PFW, VDGIF, CPA, localities, VDOT, courts, RC&D
demographic constraints	genetics, isolated populations, small population size, etc.	Allee effect	evaluate this threat; conduct PVA; improve our understanding of demographics; further develop augmentation/reintroduction approach; assess genetic diversity in remaining populations to facilitate recovery	ES, universities, USGS, VDGIF, Fisheries, surveyors

non-native/ problematic native species	shifts in species composition	climate change	restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/funding decisions to consider climate change; control invasives; evaluate stressor; identify problem species and vectors; implement appropriate control measures	PFW, Coastal Program, NRCS, VDGIF, ES, LCCs, TNC, Fisheries, USDA-APHIS, EC, VDACS, TNC, USFS, USGS, NWRS, localities
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MADISON CAVE ISOPOD THREATS ASSESSMENT

HIGH LEVEL THREATS*

Priority Area – All Ecological Services Programs

Threat	Stressor	Cause	What Ecological Services Can Do**	Who Can Address Problem
habitat loss/ degradation/ fragmentation	hydrologic alterations	fill (sinkholes, fissures etc)	outreach to landowners, stress that it's a water quality issue; clean out sinkholes	landowners, VDOT, NRCS, ES, PFW, CPA, VDNH, localities, NGOs, TCF
habitat loss/ degradation/ fragmentation	hydrologic alterations	impervious surface and runoff	stormwater management; outreach to promote low impact site development (i.e., pervious surfaces, rain gardens); habitat restoration/protection; identify recharge areas of known occurrences, outreach to landowners, stressing importance of recharging local aquifers	NPS, localities, PFW, VDCR, NRCS, VDOF, ES, VOF, TCF
habitat loss/ degradation/ fragmentation	hydrologic alterations	water withdrawal/ inter intra basin transfer (conversion of ground water to surface water)	investigate the severity of this threat; work with VDEQ on permits, regulations, and policies; water supply planning	VDEQ, ES, universities, VDCR, USGS, localities, CPA, TCF
habitat loss/ degradation/ fragmentation	hydrologic alterations	climate change	assess and monitor affects of climate change; habitat restoration/ protection	VOF, ES, PFW, CPA, VDCR, LCC, USGS, localities
habitat loss/ degradation/ fragmentation	nutrient loading	agricultural fertilizer/ biosolids application	permit reviews; work with VDEQ on regulations; work with NRCS/ VDCR on standards and specs; restore/protect habitat buffers; work with NRCS and SWCDs to implement BMPs	EC, NGOs, PFW, NRCS, SWCD, VDEQ, VDCR, landowners, localities, ES
habitat loss/ degradation/ fragmentation	contaminants	spills	spill prevention/planning; respond to spills; work with others on training for spill response	EC, CPA, ES, VDEQ, EPA,
habitat loss/ degradation/ fragmentation	contaminants	biosolids	permit reviews, work with VDEQ on regulations; restore/protect habitat buffers; work with NRCS and SWCDs to implement BMPs; EC special studies	EC, NGOs, PFW, NRCS, SWCD, VDEQ, VDCR, landowners, localities, ES
habitat loss/ degradation/ fragmentation	contaminants	non-point source (e.g., roads, pesticides)	develop application BMPs; buffer restoration and protection work with VDACS; section 7 consultation; work with VDOT, localities, and NRCS on BMPs to avoid sensitive areas; identify most significant threats; develop a list of approved pesticides	industry, PFW, SWCD, VDACS, VDOT, ES, NRCS, localities, EC, VDCR, USGS, TCF
demographic constraints	genetics, isolated populations, small population size, etc.	loss of connectivity and genetic diversity (e.g., hydrologic alteration, habitat degradation/ loss, spills)	work with USGS-Leetown Science Center and other researchers to further knowledge of the genetics of each population; assess the threat level of this stressor; land protection; encourage local zoning; permit review; review county water supply plans; work with counties to leave corridors intact	ES, USGS, universities, VDCR, TCF
lack of info on species	intentionally left blank	intentionally left blank	determine connectivity of aquifers and identify recharge zones; determine range and conduct rangewide survey; genetic information; life history information	ES, TCF, USGS, universities, VDCR

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NORTHEASTERN BEACH TIGER BEETLE THREATS ASSESSMENT

HIGH LEVEL THREATS*

Priority Area – All Ecological Services Programs

Threat	Stressor	Cause	What Ecological Services Can Do**	Who Can Address Problem***
habitat loss/ degradation/ fragmentation	shoreline modification (changes in sand transport and placement of structure and change in habitat conditions)	bulkhead/ riprap	permit review to encourage less destructive measures and minimize impacts; look for funding to assist landowners to offset their costs for alternate shoreline protection (living shoreline); outreach to public, localities, and permitting agencies; buy shoreline habitat; encourage shoreline protection/planning in a regional context; evaluate adjacent impacts	ES, Corps, landowners, VIMS, NOAA, localities, VDNH, VMRC, contractors, TNC, Coastal Program, PFW
habitat loss/ degradation/ fragmentation	shoreline modification (changes in sand transport and placement of structure and change in habitat conditions)	groins/ jetties	permit review to encourage less destructive measures; look for funding to assist landowners to offset their costs for alternate shoreline protection (living shoreline); outreach to public, localities, and permitting agencies; buy shoreline habitat; encourage shoreline protection/planning in a regional context; evaluate adjacent impacts	ES, Corps, landowners, VIMS, NOAA, localities, VDNH, VMRC, contractors, TNC, Coastal Program, PFW
habitat loss/ degradation/ fragmentation	shoreline modification (changes in sand transport and placement of structure and change in habitat conditions)	construction/ upland disturbance	comment on projects; work with localities on comprehensive planning; regional HCPs; conservation agreements; public outreach	ES, PFW, Coastal Program, TNC, VDNH, localities
habitat loss/ degradation/ fragmentation	contaminants	spills (off shore)	spill prevention/planning; respond to spills; work with others on training for spill response	EC, NWRS, USCG, VDEQ, ES
habitat loss/ degradation/ fragmentation	climate change	shifts in native communities/ species composition, including non- natives	restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/funding decisions to consider climate change; control invasives	PFW, Coastal Program, NOAA, ES, TNC, VDNH, NWRS
habitat loss/ degradation/ fragmentation	climate change	human migration/ relocation	restore habitat/protect lands; education/outreach	PFW, Coastal Program, NOAA, ES, TNC, VDNH, NWRS
habitat loss/ degradation/ fragmentation	climate change	sea level rise	restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/funding decisions to consider climate change; planning; education/outreach	PFW, Coastal Program, NOAA, ES, TNC, VDNH, NWRS
habitat loss/ degradation/ fragmentation	climate change	increased storm events (number and severity)	restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/funding decisions to consider climate change; planning; education/outreach	PFW, Coastal Program, NOAA, ES, TNC, VDNH, NWRS
demographic constraints	genetics, isolated populations, small populations, etc.	spills	spill prevention/planning; respond to spills; work with others on training for spill response; respond and assess effects	EC, ES, USCG, VDEQ, EPA, NWRS, NOAA, localities

demographic constraints	genetics, isolated populations, small populations, etc.	development/shoreline alteration	land protection; encourage local zoning; permit review; work with counties on comprehensive shoreline management plans and to promote protection of shoreline habitats	ES, Coastal Program, PFW, localities, NWRS, TNC, VDNH, NOAA
demographic constraints	genetics, isolated populations, small populations, etc.	human activities (e.g., driving, foot traffic)	assess threat; implement appropriate control measures; planning; habitat restoration; public outreach; local ordinances to prevent use during appropriate times	ES, Coastal Program, PFW, localities, NWRS, TNC, researchers, VDNH, NOAA
demographic constraints	genetics, isolated populations, small populations, etc.	storm events	restore/protect habitat; maintain connectivity of sites; population augmentation; genetic augmentation; genetic research; intensive population management	ES, Coastal Program, PFW, localities, NWRS, TNC, VDNH, NOAA, researchers, FEMA

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NOTTOWAY RIVER WATERSHED THREATS ASSESSMENT
HIGH LEVEL THREATS*
Priority Area – All Ecological Services Programs

Threat	Stressor	Cause	Trust Resources Affected**	What Ecological Services Can Do***	Who Can Address Problem****
habitat loss/ degradation/ fragmentation	hydrologic alterations	climate change	all species	establish (protect/restore) habitat corridors; work with localities on watershed planning	Coastal Program, NAWCA, PFW, CPA, TNC, NOAA, ES
habitat loss/ degradation/ fragmentation	contaminants	spills	all species	spill prevention/planning; respond to spills; work with others on training for spill response; work with DoD	EC, CPA, ES, NWRS, USCG, VDEQ, NOAA, EPA, CMI (Va Tech), DOD
habitat loss/ degradation/ fragmentation	shifts in native communities/ species composition (including non-natives)	climate change	all species	restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/funding decisions to consider climate change; control invasives	NOAA, NAWCA, all, NRCS, TNC
habitat loss/ degradation/ fragmentation	human migration/ relocation	climate change	all species	restore habitat/protect lands; education/outreach	NOAA, NAWCA, PFW, Coastal Program, NRCS, TNC
habitat loss/ degradation/ fragmentation	sea level rise	climate change	all species	restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/funding decisions to consider climate change; planning; education/outreach	NOAA, NAWCA, PFW, Coastal Program, NRCS, TNC
habitat loss/ degradation/ fragmentation	increased drought/ increased rainfall/ temperature change	climate change	all species	work with VDEQ on water supply planning to include trust resource needs; restore habitat/protect lands	VDEQ, PFW, Coastal Program, NRCS, TNC
habitat loss/ degradation/ fragmentation	increased storm events	climate change	all species	restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/funding decisions to consider climate change; planning; education/outreach	NOAA, NAWCA, PFW, Coastal Program, NRCS, TNC
demographic constraints	genetics, isolated populations, small population size, etc.	spills	all species	spill prevention/planning; respond to spills; work with others on training for spill response	EC, CPA, ES, NWRS, USCG, VDEQ, NOAA, EPA
non-native/ problematic native species and diseases	intentionally left blank	climate change	all species	implement appropriate control measures; planning; habitat restoration; outreach/education; monitoring for disease outbreaks	Coastal Program, NOAA, NAWCA, PFW, EC, NWRS, USDA, USGS, VDGIF, localities, NOAA, VIMS

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**See species lists associated with this geographic priority area.

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RAPPAHANNOCK RIVER VALLEY NATIONAL WILDLIFE REFUGE THREATS ASSESSMENT
HIGH LEVEL THREATS*
Priority Area - Environmental Contaminants Program

Threat	Stressor	Cause	Trust Resources Affected**	What EC Can Do***	Who Can Address Problem
poor water quality	intentionally left blank	point source discharges (municipal or industrial wastewater treatment plants - endocrine disruptors, personal care products, pharmaceuticals, etc.) and non-point source discharges (ag land runoff)	aquatics	VDEQ permit review; work with NWR; EC special study; work with EPA on regulations; public education	VDEQ, EC, USGS, localities, NWRS, EPA, NOAA

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**See species lists associated with this geographic priority area.

***Significant outreach and inreach efforts are inherent in many activities and specific actions are noted.

ROANOKE LOGPERCH THREATS ASSESSMENT

HIGH LEVEL THREATS*

Priority Area – All Ecological Services Programs

Threat	Stressor	Cause	What Ecological Services Can Do**	Who Can Address Problem
habitat loss/ degradation/ fragmentation	intentionally left blank	large dams/ reservoirs (operation and maintenance of existing dams, construction of new dams)	comment on new projects and relicensing and operations; work with localities on watershed/water supply and comprehensive planning; regional HCPs; conservation agreements	ES, PFW, Coastal Program, TNC, VDNH, localities, FERC, dam owners, Corps, CPA, Fisheries, NRCS, VDGIF
habitat loss/ degradation/ fragmentation	sedimentation/ suspended solids	poor land practices (e.g., dams, residential and industrial development, forestry, agriculture) and transportation/ utilities	riparian and stream restoration; comment on projects; work with localities on comprehensive planning; work with state agencies on relevant regulatory changes; regional HCPs; conservation agreements; outreach to private landowners on sediment effects in-stream	EC, VDEQ, ES, localities, CPA, NRCS, SWCDs, Coastal Program, PFW, VDGIF
habitat loss/ degradation/ fragmentation	contaminants	spills	spill prevention/planning; respond to spills; work with others on training for spill response; identify potential threats; work with NRCS and SWCDs on potential threats; assist in threat removal/reduction; comment on NRCS standard practices; conduct outreach	EC, VDEQ, ES, EPA, NRCS, SWCDs, PFW, VDGIF, CPA, localities
habitat loss/ degradation/ fragmentation	movement/ migration barriers	dams, pipelines, large sections of unsuitable habitat, culverts, low water crossings	provide passage/remove dams; restore habitat; remove/replace culverts; comment on permits; remove/re-route/bury pipelines; identify which impediments are problematic; fund additional studies (e.g., cues to movement); conduct outreach to localities and dam/utility owners on instream effects	PFW, ES, TNC, VDEQ, FishAmerica, Coastal Program, ES, Fisheries, NOAA, VDGIF, NRCS, SWCDs, Corps, CPA
habitat loss/ degradation/ fragmentation	hydrologic alteration	climate change	restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/funding decisions to consider climate change; planning; education/outreach; work with localities to support low impact development; work with VDEQ on water supply planning to include trust resource needs	ES, TNC, VDEQ, Coastal Program, ES, VDGIF, NRCS, SWCDs, Corps, CPA, localities
demographic constraints	genetics, isolated populations, small population size, etc.	movement barriers (e.g., dams, cold water releases, lentic habitat, culverts, low water crossings, embeddedness)	remove/modify barriers; provide fish passage; evaluate translocation/augmentation/reintroduction; restore riparian habitat; coordinate with FERC on relicensing and downstream management; permit reviews; regional HCPs; conduct outreach with VDOT, localities, and private landowners	ES, PFW, CPA, FERC, VDGIF, Corps, VDEQ, Fisheries, NRCS, universities, VDOT
demographic constraints	genetics, isolated populations, small population size, etc.	spills	spill prevention/planning; respond to spills; work with others on training for spill response; identify potential threats; work with NRCS and SWCDs on potential threats; assist in threat removal/reduction; comment on NRCS standard practices; evaluate translocation/augmentation/reintroduction; conduct outreach	EC, VDEQ, ES, EPA, NRCS, SWCDs, PFW, VDGIF, CPA, localities, VDOT, courts

non-native/ problematic native species	shifts in species composition	climate change	restore habitat/protect lands; establish/protect habitat corridors; prioritize conservation actions/funding decisions to consider climate change; control invasives	PFW, Coastal Program, NRCS, VDGIF, ES, TNC, NOAA, Fisheries
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*Assessment of threat includes impact occurring now and likelihood of occurrence in near-term future.

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APPENDIX 6 – FY 2012 CONSERVATION ACTIONS

Virginia Ecological Services FY 2012 Annual Work Plan

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Blackwater River Watershed	Priority Migratory Bird Species Red-cockaded Woodpecker	Biological Planning	PFW and partners will develop a GIS base map with shapefiles for all known LLP locations in Virginia.	Habitat loss/fragmentation/degradation Demographic constraints Non-native/ problematic native species Disease
Blackwater River Watershed	Priority Migratory Bird Species	Biological Planning	Participate in RRT and USCG spill planning and preparedness meetings and exercises.	Transportation
Blackwater River Watershed	Priority Migratory Bird Species Red-cockaded Woodpecker	Conservation Design	PFW and partners will develop a GIS base map with shapefiles for all known LLP locations in Virginia.	Habitat loss/fragmentation/degradation Demographic constraints Non-native/ problematic native species Disease
Blackwater River Watershed	Priority Migratory Bird Species	Conservation Delivery	Review General and individual VPDES permits; solid waste and biosolids application permits; pesticide use applications. Work with DEQ to introduce IPaC and VAFO project review process.	Habitat loss/fragmentation/degradation

Virginia Ecological Services FY 2012 Annual Work Plan

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Blackwater River Watershed	Priority Migratory Bird Species	Conservation Delivery	Coordinate with EPA and VDEQ on CWA regulatory issues related to delegated water programs (VPDES CWA 402, Water Quality Standards, CWA 401, total maximum daily loads, Biosolids, Virginia WQS Triennial Review technical advisory committee) and coordinate with EPA and VDACS on pesticide use issues.	Habitat loss/fragmentation/degradation
Blackwater River Watershed	Priority Migratory Bird Species	Monitoring, Research, and Planning	PFW and partners will monitor the survival of LLP plantings.	Habitat loss/fragmentation/degradation
Clinch and Powell Rivers Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 28	Biological Planning	Participate in RRT and USCG spill planning and preparedness meetings and exercises.	Transportation
Clinch and Powell Rivers Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 28	Conservation Design	Coordinate conservation and recovery activities with TNC Conservation Action Plan.	Agriculture Climate change Mining Gas Extraction Power Generation Recreation Transportation Urbanization and commercial/industrial development Demographic constraints Right-of-way development and maintenance

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Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Clinch and Powell Rivers Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 28	Conservation Design	Work with NWRs and others to plan and develop UTRB refuge.	Agriculture Climate change Mining Gas Extraction Power Generation Transportation Urbanization and commercial/industrial development Demographic constraints Right-of-way development and maintenance
Clinch and Powell Rivers Watershed	Multiple Listed Karst Species 4	Conservation Design	Develop strategic conservation plan for the Cedars karst area.	Agriculture Climate change Transportation Urbanization and commercial/industrial development Demographic constraints Right-of-way development and maintenance
Clinch and Powell Rivers Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 28	Conservation Delivery	Review Individual Coal VPDES Permits (new and renewals)	Mining
Clinch and Powell Rivers Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 28	Conservation Delivery	Review General and individual VPDES permits; solid waste and biosolids application permits; pesticide use applications. Work with DEQ to introduce IPaC and VAFO project review process.	Gas Extraction

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Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
				Power Generation Urbanization and commercial/industrial development
Clinch and Powell Rivers Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 28	Conservation Delivery	Coordinate with EPA and VDEQ on CWA regulatory issues related to delegated water programs (VPDES CWA 402, Water Quality Standards, CWA 401, total maximum daily loads, Biosolids, Virginia WQS Triennial Review technical advisory committee) and coordinate with EPA and VDACS on pesticide use issues.	Agriculture Climate change Mining Gas Extraction Power Generation Transportation Urbanization and commercial/industrial development Right-of-way development and maintenance
Clinch and Powell Rivers Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 28	Conservation Delivery	Through the Lone Mountain NRDAR settlement, and through TNC, acquire 293-acre property along Powell River, expanding the Cedars Conservation Area.	Urbanization and commercial/industrial development
Clinch and Powell Rivers Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 28 Multiple Listed Karst Species 4	Conservation Delivery	Implement NRCS CCPI funds in Copper Creek watershed.	Agriculture Climate change

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Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Clinch and Powell Rivers Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 28	Conservation Delivery	Review and contribute to Straight Creek TMDL (Powell River tributary) to ensure adequate protection of listed fish and mussel populations.	Mining
Clinch and Powell Rivers Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 28	Conservation Delivery	Review and contribute to Upper Clinch River TMDL.	Mining
Clinch and Powell Rivers Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 28	Conservation Delivery	Review and contribute to Powell River TMDL.	Mining
Clinch and Powell Rivers Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 28	Conservation Delivery	Review AML reclamation projects for ESA compliance as submitted.	Mining
Clinch and Powell Rivers Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 28	Conservation Delivery	Continue coordinated project reviews through Virginia Interagency Coal Meetings.	Mining
Clinch and Powell Rivers Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 28	Conservation Delivery	Consult with federal agencies on actions related to permitting and operating coal-fired plants, coal combustion byproducts disposal.	Power Generation
Clinch and Powell Rivers Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 28 Multiple Listed Karst Species 4	Conservation Delivery	Work with VDOT to develop bridge and roadway design BMPS to prevent contaminants/spills from entering waterways.	Transportation
Clinch and Powell Rivers Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 28	Conservation Delivery	Implement Certus NRDA contract with VT and VDGIF to propagate and restore mussel populations in upper Clinch River and Indian Creek.	Demographic constraints
Clinch and Powell Rivers Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 28	Conservation Delivery	Implement Lone Mountain NRDA contract with CFI to propagate and restore yellowfin madtom populations in the Powell River.	Demographic constraints

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Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Clinch and Powell Rivers Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 28	Conservation Delivery	Implement Lone Mountain NRDA contract with VDGIF to propagate and restore mussel populations in Powell River.	Demographic constraints
Clinch and Powell Rivers Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 28	Conservation Delivery	Review and update captive propagation and reintroduction plans for UTRB species.	Demographic constraints
Clinch and Powell Rivers Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 28	Conservation Delivery	Implement and refine online project review process to aid in planning and ensuring consideration of listed species.	Right-of-way development and maintenance
Clinch and Powell Rivers Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 28	Monitoring, Research, and Planning	USGS SSP: Bayesian population dynamics modeling to guide population restoration and recovery of endangered mussels in the Clinch and Powell Rivers, Tennessee and Virginia.	Demographic constraints
Clinch and Powell Rivers Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 28	Monitoring, Research, and Planning	Survey for slender chub and pygmy madtom in the upper Clinch and Powell rivers.	Demographic constraints
Clinch and Powell Rivers Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 28	Monitoring, Research, and Planning	EC program Off-Refuge Investigation: Virginia, Tennessee – Assessment of mussel declines in the Clinch and North Fork Holston Rivers using histological evaluations of vital organs.	Agriculture Urbanization and commercial/industrial development Mining Demographic constraints Transportation

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Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Clinch and Powell Rivers Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 28	Monitoring, Research, and Planning	Recent precipitous declines of endangered freshwater mussels in the Clinch River: <i>An in situ</i> assessment of water quality stressors related to energy development and other land-use	Mining Transportation Urbanization and commercial/industrial development Agriculture
Clinch and Powell Rivers Watershed	Multiple Listed Karst Species 4	Monitoring, Research, and Planning	Complete hydrological study of Lee County cave isopod habitat.	Demographic constraints
Clinch and Powell Rivers Watershed	Multiple Listed Karst Species 4	Monitoring, Research, and Planning	Monitor populations and habitat of Lee County cave isopod, cooperative agreement with DNH.	Demographic constraints
Clinch and Powell Rivers Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 28	Monitoring, Research, and Planning	Complete SSP: Review and provide input on USGS Report – Assessing the sensitivity of endangered freshwater mussels to coal mining effluents to enhance recovery efforts in biodiversity hotspots of the Tennessee and Cumberland River drainages.	Mining
Clinch and Powell Rivers Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 28	Monitoring, Research, and Planning	Develop a simplified template for assessment and restoration of trust resources potentially injured by the release of hazardous substances within frequent mining-related “grey water” and “black water” spill events.	Mining

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Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Eastern Shore	Priority Migratory Bird Species	Biological Planning	Participate in RRT and USCG spill planning and preparedness meetings and exercises.	Transportation
Eastern Shore	Priority Migratory Bird Species	Biological Planning	Complete environmental contaminants special study to evaluate effects of mercury on saltmarsh sharp-tailed sparrows (<i>Ammodramus caudacutus</i>).	Habitat loss/fragmentation/degradation
Eastern Shore	Multiple Listed and Candidate Species 11	Biological Planning	Participate with Chincoteague NWR on their CCP planning team.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases
Eastern Shore	Multiple Listed and Candidate Species 11	Conservation Design	Participate with Chincoteague NWR on their CCP planning team.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases
Eastern Shore	Multiple Listed and Candidate Species 11 Priority Migratory Bird Species	Conservation Design	Continue to work with conservation partners on Southern Tip Ecological Partnership to identify high priority properties for land protection.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases
Eastern Shore	Multiple Listed and Candidate Species 11	Conservation Design	Initiate efforts to work with county wetlands boards on comprehensive shoreline management planning or HCPs.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases
Eastern Shore	Multiple Listed and Candidate Species 11	Conservation Design	Identify high priority sites for establishment of living shoreline projects for beach and shoreline stabilization to benefit listed species.	Habitat loss/fragmentation/degradation

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Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
				Non-native/problematic native species and diseases
Eastern Shore	Multiple Listed and Candidate Species 11 Priority Migratory Bird Species	Conservation Delivery	PFW will continue to work with conservation partners on Southern Tip Ecological Partnership to implement land protection and habitat restoration at high priority properties.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases
Eastern Shore	Multiple Listed and Candidate Species 11	Conservation Delivery	Utilize web-based technical assistance streamlining process to address requests for species lists and technical assistance.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases
Eastern Shore	Multiple Listed and Candidate Species 11 Priority Migratory Bird Species	Conservation Delivery	PFW will work with partners to obtain funding for future habitat restoration work.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases
Eastern Shore	Priority Migratory Bird Species	Conservation Delivery	PFW will continue to conduct outreach to other partners and the community by conducting site visits on completed habitat restoration projects.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases
Eastern Shore	Multiple Listed and Candidate Species 11	Conservation Delivery	ES program will give presentation at county wetlands board meetings about beach and shoreline management.	Habitat loss/fragmentation/degradation

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Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Eastern Shore	Priority Migratory Bird Species	Conservation Delivery	PFW will continue to conduct outreach to other partners and the community by conducting site visits to Oyster, Virginia living shoreline project completed in FY09.	Habitat loss/fragmentation/degradation
Eastern Shore	Priority Migratory Bird Species	Monitoring, Research, and Planning	PFW will monitor the survival of reforestation projects completed under STEP 3 NAWCA grant.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases
Eastern Shore	Priority Migratory Bird Species	Monitoring, Research, and Planning	PFW will monitor living shoreline completed in FY09 near Oyster, Virginia.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases
Eastern Shore	Multiple Listed and Candidate Species 11	Monitoring, Research, and Planning	Continue monitoring of Clarke breakwater project and its effects on beach habitat in conjunction with VIMS and Corps.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases
Eastern Shore	Multiple Listed and Candidate Species 11	Monitoring, Research, and Planning	Conduct tiger beetle genetics analysis to help delineate functional tiger beetle populations.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases

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Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Great Dismal Swamp National Wildlife Refuge	Priority Migratory Bird Species	Biological Planning	PFW and NWR will develop GIS assessment of current hydrology on NWR.	Habitat loss/fragmentation/degradation
	Red-cockaded Woodpecker			Demographic constraints
Great Dismal Swamp National Wildlife Refuge	Priority Migratory Bird Species	Biological Planning	Participate in RRT and USCG spill planning and preparedness meetings and exercises.	Transportation
Great Dismal Swamp National Wildlife Refuge	Priority Migratory Bird Species	Biological Planning	Work with Refuge staff to determine the need for a study to evaluate effects from the recent fire on the levels and distribution of mercury.	Habitat loss/fragmentation/degradation
Great Dismal Swamp National Wildlife Refuge	Priority Migratory Bird Species	Biological Planning	Work with others to establish a long-term national-scale mercury monitoring program to track long-term trends of atmospheric mercury deposition and mercury levels.	Habitat loss/fragmentation/degradation
Great Dismal Swamp National Wildlife Refuge	Priority Migratory Bird Species	Conservation Design	Based on GIS/data assessments during Biological Planning stage and monitoring of 9,500 acres restored in FY12, PFW and NWR staff will identify target locations for hydrology restoration efforts for maximum benefit to forest migratory birds.	Habitat loss/fragmentation/degradation Demographic constraints Non-native/problematic native species and diseases

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Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Great Dismal Swamp National Wildlife Refuge	Red-cockaded Woodpecker	Conservation Design	Based on GIS/data assessments during Biological Planning stage and monitoring restored sites, PFW and NWR staff will identify target locations for hydrology restoration efforts for maximum benefit to planned red-cockaded woodpecker colony establishment.	Habitat loss/fragmentation/degradation Demographic constraints Non-native/problematic native species and diseases
Great Dismal Swamp National Wildlife Refuge	Priority Migratory Bird Species Red-cockaded Woodpecker	Conservation Delivery	PFW staff will coordinate and provide technical assistance to NWR and with NWR hydrologist to plan and implement hydrology restoration activities.	Habitat loss/fragmentation/degradation
Great Dismal Swamp National Wildlife Refuge	Priority Migratory Bird Species Red-cockaded Woodpecker	Conservation Delivery	PFW will seek funds/develop grants and partnerships to pursue additional hydrology and fire restoration at Great Dismal Swamp.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases
Great Dismal Swamp National Wildlife Refuge	Priority Migratory Bird Species Red-cockaded Woodpecker	Monitoring, Research, and Planning	PFW and NWR will monitor extent and duration of hydrology restored on 9,500 acres in FY12.	Habitat loss/fragmentation/degradation Demographic constraints Non-native/problematic native species and diseases

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Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Biological Planning	Participate in RRT and USCG spill planning and preparedness meetings and exercises.	Transportation
Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Conservation Design	Coordinate conservation and recovery activities with TNC Conservation Action Plan.	Agriculture Climate change Power Generation Recreation Transportation Urbanization and commercial/industrial development Demographic constraints Right-of-way development and maintenance
Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Conservation Design	Work with NWR program and others to plan and develop UTRB NWR.	Agriculture Climate change Power Generation Transportation Urbanization and commercial/industrial development Demographic constraints Right-of-way development and maintenance
Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Conservation Delivery	Provide "riverkeeper" services by monitoring watershed for pollution and alerting appropriate entities about problems encountered.	Agriculture

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Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
				Urbanization and commercial/industrial development Transportation
Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Conservation Delivery	Coordinate with EPA and VDEQ on CWA regulatory issues related to delegated water programs (VPDES CWA 402, Water Quality Standards, CWA 401, total maximum daily loads, Biosolids, Virginia WQS Triennial Review technical advisory committee) and coordinate with EPA and VDACS on pesticide use issues.	Agriculture Urbanization and commercial/industrial development Power Generation
Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Conservation Delivery	Review General and individual VPDES permits; solid waste and biosolids application permits; pesticide use applications. Work with DEQ to introduce IPaC and VAFO project review process.	Agriculture Urbanization and commercial/industrial development
Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Conservation Delivery	Provide technical support to EPA through BTAG on the development of remedial alternatives to address ecological risk from mercury in the North Fork Holston River, and with VDEQ on the development and implementation of the mercury TMDL for North Fork Holston River.	Urbanization and commercial/industrial development

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Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Conservation Delivery	Continue to work on NRDAR settlement negotiations for the Saltville NPL Site with the Trustee Council (VA, TN, TVA, and Service) and Olin Corporation for ecological restoration actions for bats, (Indiana and gray), fish, migratory birds, and freshwater mussels injured within the North Fork Holston River by legacy and on-going industrial contamination.	Urbanization and commercial/industrial development
Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Conservation Delivery	Conduct consultation and provide conservation planning assistance on water supply planning and development projects.	Climate change
Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Conservation Delivery	Consult with federal action agencies and coordinate with non-Federal project proponents on energy projects.	Power Generation
Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Monitoring, Research, and Planning	Implement Saltville NPL Site NRDAR injury Study "Evaluation of Histologically Prepared Organ Tissues of Villosa iris held at selected site in the NFHR, Saltville, VA."	Demographic constraints Urbanization and commercial/industrial development
Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Monitoring, Research, and Planning	EC program Off-Refuge Investigation: Virginia, Tennessee – Assessment of mussel declines in the Clinch and North Fork Holston Rivers using histological evaluations of vital organs.	Transportation Agriculture Urbanization and commercial/industrial development

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Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
				Demographic constraints
James Spiny mussel	James Spiny mussel	Biological Planning	Revise Recovery Action Team Annual Action Plan; conduct quarterly Recovery Action Team planning meetings.	Habitat loss/fragmentation/degradation Demographic constraints Non-native/problematic native species
James Spiny mussel	James Spiny mussel	Biological Planning	Begin to gather data to conduct population viability analyses for selected populations	Demographic constraints
James Spiny mussel	James Spiny mussel	Biological Planning	Complete draft James spiny mussel conservation plan for the Dick's/John's/Little Oregon Creek population and management area.	Habitat loss/fragmentation/degradation Non-native/problematic native species Demographic constraints
James Spiny mussel	James Spiny mussel	Biological Planning	Participate in RRT and USCG spill planning and preparedness meetings and exercises.	Transportation
James Spiny mussel	James Spiny mussel	Conservation Design	Work with NiSource to identify conservation sites and develop mitigation/conservation plan for priority areas.	Habitat loss/fragmentation/degradation Non-native/problematic native species Demographic constraints
James Spiny mussel	James Spiny mussel	Conservation Design	Develop preliminary potential habitat layer for the species.	Habitat loss/fragmentation/degradation Non-native/problematic native species Demographic constraints

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Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
James Spiny mussel	James Spiny mussel	Conservation Delivery	Review General and individual VPDES permits; solid waste and biosolids application permits; pesticide use applications. Work with DEQ to introduce IPaC and VAFO project review process.	Habitat loss/fragmentation/degradation Non-native/problematic native species Demographic constraints
James Spiny mussel	James Spiny mussel	Conservation Delivery	Coordinate with EPA and VDEQ on CWA regulatory issues related to delegated water programs (VPDES CWA 402, Water Quality Standards, CWA 401, total maximum daily loads, Biosolids, Virginia WQS Triennial Review technical advisory committee) and coordinate with EPA and VDACS on pesticide use issues.	Habitat loss/fragmentation/degradation Non-native/problematic native species Demographic constraints
James Spiny mussel	James Spiny mussel	Monitoring, Research, and Planning	Assess habitat at known occurrences to characterize the species' "optimal environmental envelope" and use information to refine potential habitat layer.	Habitat loss/fragmentation/degradation Non-native/problematic native species Demographic constraints

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Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Madison Cave Isopod	Madison Cave isopod	Biological Planning	Develop management guidelines to provide landowners, land managers, and localities recommendations and general land management practices to avoid impacts to Madison Cave isopod and its habitat.	Habitat loss/fragmentation/degradation Demographic constraints
Madison Cave Isopod	Madison Cave isopod	Biological Planning	Continue surveys of southern extent of population.	Habitat loss/fragmentation/degradation Demographic constraints Lack of information on species
Madison Cave Isopod	Madison Cave isopod	Biological Planning	Work with American University on a genetic study to determine population structure and connectivity.	Habitat loss/fragmentation/degradation Demographic constraints Lack of information on species
Madison Cave Isopod	Madison Cave isopod	Biological Planning	Land protection on priority site.	Habitat loss/fragmentation/degradation Demographic constraints
Madison Cave Isopod	Madison Cave isopod	Biological Planning	Coordinate with other members of recovery group.	Habitat loss/fragmentation/degradation Demographic constraints Lack of information on species
Madison Cave Isopod	Madison Cave isopod	Biological Planning	Participate in RRT and USCG spill planning and preparedness meetings and exercises.	Transportation

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Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Madison Cave Isopod	Madison Cave isopod	Conservation Design	Incorporate Madison Cave Isopod restoration alternatives into DuPont NRDAR settlement negotiations.	Habitat loss/fragmentation/degradation
Madison Cave Isopod	Madison Cave isopod	Conservation Delivery	Coordinate with EPA and VDEQ on CWA regulatory issues related to delegated water programs (VPDES CWA 402, Water Quality Standards, CWA 401, total maximum daily loads, Biosolids, Virginia WQS Triennial Review technical advisory committee) and coordinate with EPA and VDACS on pesticide use issues.	Habitat loss/fragmentation/degradation
Madison Cave Isopod	Madison Cave isopod	Conservation Delivery	Review General and individual VPDES permits; solid waste and biosolids application permits; pesticide use applications. Work with DEQ to introduce IPaC and VAFO project review process.	Habitat loss/fragmentation/degradation
Madison Cave Isopod	Madison Cave isopod	Conservation Delivery	Complete management guidelines for Madison Cave isopod in Virginia.	Habitat loss/fragmentation/degradation
Madison Cave Isopod	Madison Cave isopod	Conservation Delivery	Work with VDCR on mark re-capture study to determine population size at site and connectivity.	Demographic constraints Lack of information on species
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Biological Planning	Planning shoreline stabilization project Bavon Beach/Chesapeake Shores in Mathews County.	Habitat loss/fragmentation/degradation Demographic constraints
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Biological Planning	Population surveys (adult beetles) of eastern and/or western shorelines of Chesapeake Bay.	Habitat loss/fragmentation/degradation Demographic constraints

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Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Biological Planning	Develop genetic tools for conservation and planning (USGS).	Habitat loss/fragmentation/degradation Demographic constraints
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Biological Planning	Coordinate with Mathews County in the development of a countywide HCP.	Habitat loss/fragmentation/degradation Demographic constraints
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Biological Planning	Coordinate with tiger beetle recovery partners.	Habitat loss/fragmentation/degradation Demographic constraints
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Biological Planning	Initiate development of a rangewide tiger beetle captive propagation/translocation plan.	Habitat loss/fragmentation/degradation Demographic constraints
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Biological Planning	Pursue funding to refine and revise tiger beetle PVA.	Habitat loss/fragmentation/degradation Demographic constraints
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Biological Planning	Participate in RRT and USCG spill planning and preparedness meetings and exercises.	Transportation
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Conservation Design	PFW will continue to work with conservation partners on Southern Tip Ecological Partnership to identify high priority properties for land protection and habitat restoration.	Habitat loss/fragmentation/degradation Demographic constraints
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Conservation Design	Continue to work with Mathews County to develop conservation plans/measures that will benefit the tiger beetle. Expansion of this effort is planned for additional counties.	Habitat loss/fragmentation/degradation Demographic constraints

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Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Conservation Delivery	Utilize web-based technical assistance streamlining process to address requests for species lists and technical assistance.	Habitat loss/fragmentation/degradation Demographic constraints
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Conservation Delivery	PFW will continue to work with conservation partners on Southern Tip Ecological Partnership to implement land protection and habitat restoration at high priority properties.	Habitat loss/fragmentation/degradation Demographic constraints
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Conservation Delivery	Landowner education.	Habitat loss/fragmentation/degradation Demographic constraints
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Conservation Delivery	Develop and promote alternative shoreline stabilization designs and methods that protect property and maintain beetle habitat.	Habitat loss/fragmentation/degradation Demographic constraints
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Conservation Delivery	Work with counties to develop large-scale conservation plans that will maintain beetle habitat.	Habitat loss/fragmentation/degradation Demographic constraints
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Conservation Delivery	Provide technical assistance to the Corps and NWRs on the development and implementation of remedial alternatives for munitions at Plum Tree Island NWR to ensure impacts to tiger beetle are minimized.	Demographic constraints
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Conservation Delivery	Hold public meeting with Mathews County and other interested counties.	Demographic constraints

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Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Monitoring, Research, and Planning	Continue monitoring breakwater project at Savage Neck to evaluate long-term effects and expected effects from project.	Habitat loss/fragmentation/degradation Demographic constraints
Nottoway River Watershed	Multiple Listed Aquatic Species 2	Biological Planning	PFW will determine feasibility of completing assessment of stream impediments within the watershed.	Habitat loss/fragmentation/degradation Demographic constraints Non-native/problematic native species and diseases
Nottoway River Watershed	Priority Migratory Bird Species	Biological Planning	PFW and partners will develop a GIS base map with shapefiles for all known LLP locations in Virginia.	Habitat loss/fragmentation/degradation Demographic constraints Non-native/problematic native species and diseases
Nottoway River Watershed	Multiple Listed Aquatic Species 2	Biological Planning	Participate in RRT and USCG spill planning and preparedness meetings and exercises.	Transportation
Nottoway River Watershed	Priority Migratory Bird Species Multiple Listed Aquatic Species 2	Conservation Design	PFW and partners will coordinate with SE LLP Initiative to develop large-scale acreage goals for LLP habitat restoration in the Southeast.	Habitat loss/fragmentation/degradation Demographic constraints Non-native/problematic native species and diseases

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Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Nottoway River Watershed	Multiple Listed Aquatic Species 2	Conservation Delivery	Review General and individual VPDES permits; solid waste and biosolids application permits; pesticide use applications. Work with DEQ to introduce IPaC and VAFO project review process.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases
Nottoway River Watershed	Multiple Listed Aquatic Species 2	Conservation Delivery	Coordinate with EPA and VDEQ on CWA regulatory issues related to delegated water programs (VPDES CWA 402, Water Quality Standards, CWA 401, total maximum daily loads, Biosolids, Virginia WQS Triennial Review technical advisory committee) and coordinate with EPA and VDACS on pesticide use issues.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases
Nottoway River Watershed	Multiple Listed Aquatic Species 2	Monitoring, Research, and Planning	Identify priority dwarf wedgemussel habitats within the watershed and pursue funding for surveys within these areas to evaluate populations and identify potential threats.	Habitat loss/fragmentation/degradation Demographic constraints Non-native/problematic native species and diseases
Nottoway River Watershed	Priority Migratory Bird Species	Monitoring, Research, and Planning	PFW and partners will monitor the survival of LLP plantings.	Habitat loss/fragmentation/degradation Demographic constraints

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Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
				Non-native/problematic native species and diseases
Rappahannock River Valley National Wildlife Refuge	Fishes of Conservation Concern	Conservation Delivery	Work with VDEQ on development and implementation of TMDL for Rappahannock River. This work is contingent upon funding for a GS-9 FTE.	Poor water quality
Rappahannock River Valley National Wildlife Refuge	Rappahannock River Valley National Wildlife Refuge	Conservation Delivery	Coordinate with EPA and VDEQ on CWA regulatory issues related to delegated water programs (VPDES CWA 402, Water Quality Standards, CWA 401, total maximum daily loads, Biosolids, Virginia WQS Triennial Review technical advisory committee) and coordinate with EPA and VDACS on pesticide use issues.	Poor water quality
Roanoke Logperch	Roanoke logperch	Biological Planning	Monthly recovery action team meetings or as needed.	Habitat loss/fragmentation/degradation Demographic constraints Non-native/problematic native species
Roanoke Logperch	Roanoke logperch	Biological Planning	Participate in RRT and USCG spill planning and preparedness meetings and exercises.	Transportation
Roanoke Logperch	Roanoke logperch	Conservation Design	PFW will work with partners to acquire the Rocky Mount Power Dam property and obtain dam removal cost and feasibility information.	Habitat loss/fragmentation/degradation Demographic constraints

Virginia Ecological Services FY 2012 Annual Work Plan

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Roanoke Logperch	Roanoke logperch	Conservation Delivery	Coordinate with EPA and VDEQ on CWA regulatory issues related to delegated water programs (VPDES CWA 402, Water Quality Standards, CWA 401, total maximum daily loads, Biosolids, Virginia WQS Triennial Review technical advisory committee) and coordinate with EPA and VDACS on pesticide use issues.	Habitat loss/fragmentation/degradation
Roanoke Logperch	Roanoke logperch	Conservation Delivery	Review General and individual VPDES permits; solid waste and biosolids application permits; pesticide use applications. Work with DEQ to introduce IPaC and VAFO project review process.	Habitat loss/fragmentation/degradation
Roanoke Logperch	Roanoke logperch	Conservation Delivery	Work with private landowners and other partners to obtain funds to implement stream restoration and dam removal in locations determined to be priority sites, especially where habitat corridors can be linked.	Habitat loss/fragmentation/degradation Demographic constraints
Roanoke Logperch	Roanoke logperch	Conservation Delivery	Complete Blacksburg Country Club NRDA Restoration projects #3 on the North Fork Roanoke River.	Habitat loss/fragmentation/degradation Demographic constraints
Roanoke Logperch	Roanoke logperch	Conservation Delivery	Work with VDEQ on development and implementation of TMDLs in Roanoke River basin.	Habitat loss/fragmentation/degradation

Virginia Ecological Services FY 2012 Annual Work Plan

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Non-Geographic Focus	Non-Species Focus	Conservation Delivery	Provide review of the Service's Information, Planning, and Conservation System (IPaC) and assist with maintaining accurate information in this system for Virginia.	
Non-Geographic Focus	Non-Species Focus	Conservation Delivery	Maintain and improve project review website.	
Non-Geographic Focus	Non-Species Focus	Conservation Design	Attend Food Security Act State Technical Committee meetings on a quarterly basis to provide technical recommendations and agency perspectives on Conservation Programs of the Farm Bill; actively participate in subcommittees.	
Non-Geographic Focus	Non-Species Focus	Conservation Design	Provide technical support to South Atlantic LCC, as requested.	
Non-Geographic Focus	Priority Migratory Bird Species	Conservation Delivery	Work on injury determination and quantification for Dupont NRDAR	Contaminants
Non-Geographic Focus	Priority Migratory Bird Species	Biological Planning	Develop and research restoration options for Dupont NRDAR	Contaminants
Non-Geographic Focus	Priority Migratory Bird Species	Conservation Delivery	complete the Preliminary Estimate of Damages for Avtex NRDAR	Contaminants
Non-Geographic Focus	Priority Migratory Bird Species	Biological Planning	Work with co-trustees on Atlantic Wood NRDAR and EPA on developing potential remedial action for Superfund site	Contaminants
Non-Geographic Focus	Priority Migratory Bird Species	Conservation Delivery	Provide technical assistance and agency recommendations to EPA's BTAG on trust resource issues at 15 Superfund and other hazardous waste sites in Virginia	Contaminants

Virginia Ecological Services FY 2012 Annual Work Plan

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Non-Geographic Focus	Priority Migratory Bird Species	Conservation Delivery	Provide technical assistance to EPA and Elizabeth River Project on sediment remediation and restoration issues in Elizabeth River	Contaminants
Non-Geographic Focus	Priority Migratory Bird Species	Conservation Delivery	Develop and research restoration options for Avtex NRDAR.	Contaminants

APPENDIX 7 – FY 2013 CONSERVATION ACTIONS

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Blackwater River Watershed	Priority Migratory Bird Species	Biological Planning	Participate in RRT and USCG spill planning and preparedness meetings and exercises.	Transportation
Blackwater River Watershed	Priority Migratory Bird Species Red-cockaded Woodpecker	Conservation Design	PFW and partners will coordinate with SE Longleaf Pine Initiative to develop large-scale acreage goals for LLP habitat restoration in the Southeast.	Habitat loss/fragmentation/degradation Demographic constraints Non-native/ problematic native species Disease
Blackwater River Watershed	Priority Migratory Bird Species Red-cockaded Woodpecker	Conservation Design	PFW and partners work with Region 4 Service to apply existing Decision Support Tool methodology for LLP restoration site selection to Virginia range.	Habitat loss/fragmentation/degradation Demographic constraints Non-native/ problematic native species Disease
Blackwater River Watershed	Priority Migratory Bird Species Red-cockaded Woodpecker	Conservation Design	PFW and partners will update a GIS base map with shapefiles for all known LLP locations in Virginia.	Habitat loss/fragmentation/degradation Demographic constraints Non-native/ problematic native species Disease
Blackwater River Watershed	Priority Migratory Bird Species	Conservation Delivery	Review General and individual VPDES permits; solid waste and biosolids application permits; pesticide use applications. Work with DEQ to introduce IPaC and VAFO project review process.	Habitat loss/fragmentation/degradation

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Blackwater River Watershed	Priority Migratory Bird Species	Conservation Delivery	Coordinate with EPA and VDEQ on CWA regulatory issues related to delegated water programs (VPDES CWA 402, Water Quality Standards, CWA 401, total maximum daily loads, Biosolids, Virginia WQS Triennial Review technical advisory committee) and coordinate with EPA and VDACS on pesticide use issues.	Habitat loss/fragmentation/degradation
Blackwater River Watershed	Priority Migratory Bird Species	Monitoring, Research, and Planning	PFW and partners will monitor the survival of LLP plantings.	Habitat loss/fragmentation/degradation
Clinch and Powell Rivers Watershed	Multiple listed, Proposed, Candidate Aquatic Species 28 Priority Migratory Bird Species	Biological Planning	Participate in RRT and USCG spill planning and preparedness meetings and exercises.	Transportation
Clinch and Powell Rivers Watershed	Multiple listed, Proposed, Candidate Aquatic Species 28	Conservation Design	Coordinate conservation and recovery activities with TNC Conservation Action Plan.	Agriculture Climate change Mining Gas Extraction Power Generation Recreation Transportation Urbanization and commercial/industrial development Demographic constraints Right-of-way development and maintenance
Clinch and Powell Rivers Watershed	Multiple listed, Proposed, Candidate Aquatic Species 28	Conservation Design	Work with NWRs and others to plan and develop UTRB refuge.	Agriculture Climate change

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
				Mining Gas Extraction Power Generation Transportation Urbanization and commercial/industrial development Demographic constraints Right-of-way development and maintenance
Clinch and Powell Rivers Watershed	Multiple listed, Proposed, Candidate Aquatic Species 28	Conservation Delivery	Review Individual Coal VPDES Permits (new and renewals)	Mining
Clinch and Powell Rivers Watershed	Multiple listed, Proposed, Candidate Aquatic Species 28	Conservation Delivery	Review General and individual VPDES permits; solid waste and biosolids application permits; pesticide use applications. Work with DEQ to introduce IPaC and VAFO project review process.	Gas Extraction Power Generation Urbanization and commercial/industrial development
Clinch and Powell Rivers Watershed	Multiple listed, Proposed, Candidate Aquatic Species 28	Conservation Delivery	Coordinate with EPA and VDEQ on CWA regulatory issues related to delegated water programs (VPDES CWA 402, Water Quality Standards, CWA 401, total maximum daily loads, Biosolids, Virginia WQS Triennial Review technical advisory committee) and coordinate with EPA and VDACS on pesticide use issues.	Agriculture Climate change Mining Gas Extraction Power Generation

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
				Transportation Urbanization and commercial/industrial development Right-of-way development and maintenance
Clinch and Powell Rivers Watershed	Multiple listed, Proposed, Candidate Aquatic Species 28 Multiple Listed Karst Species 4	Conservation Delivery	Implement NRCS CCPI funds in Copper Creek watershed.	Agriculture Climate change
Clinch and Powell Rivers Watershed	Multiple listed, Proposed, Candidate Aquatic Species 28	Conservation Delivery	Review AML reclamation projects for ESA compliance as submitted.	Mining
Clinch and Powell Rivers Watershed	Multiple listed, Proposed, Candidate Aquatic Species 28	Conservation Delivery	Continue coordinated project reviews through Virginia Interagency Coal Meetings.	Mining
Clinch and Powell Rivers Watershed	Multiple listed, Proposed, Candidate Aquatic Species 28	Conservation Delivery	Consult with federal agencies on actions related to permitting and operating coal-fired plants, coal combustion byproducts disposal.	Power Generation
Clinch and Powell Rivers Watershed	Multiple listed, Proposed, Candidate Aquatic Species 28 Multiple Listed Karst Species 4	Conservation Delivery	Work with VDOT to develop bridge and roadway design BMPS to prevent contaminants/spills from entering waterways.	Transportation
Clinch and Powell Rivers Watershed	Multiple listed, Proposed, Candidate Aquatic Species 28	Conservation Delivery	Implement Certus NRDA contract with VT and VDGIF to propagate and restore mussel populations in upper Clinch River and Indian Creek.	Demographic constraints
Clinch and Powell Rivers Watershed	Multiple listed, Proposed, Candidate Aquatic Species 28	Conservation Delivery	Implement Lone Mountain NRDA contract with VDGIF to propagate and restore mussel populations in Powell River.	Demographic constraints
Clinch and Powell Rivers Watershed	Multiple listed, Proposed, Candidate Aquatic Species 28	Conservation Delivery	Review and update captive propagation and reintroduction plans for UTRB species.	Demographic constraints

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Clinch and Powell Rivers Watershed	Multiple listed, Proposed, Candidate Aquatic Species 28	Conservation Delivery	Assist Cookeville Field Office with interagency programmatic consultation on TVA transmission line right-of-way management.	Right-of-way development and maintenance
Clinch and Powell Rivers Watershed	Multiple listed, Proposed, Candidate Aquatic Species 28	Conservation Delivery	Complete erosivity model as a planning tool to inform and guide implementation of appropriate E&S controls.	Right-of-way development and maintenance
Clinch and Powell Rivers Watershed	Multiple listed, Proposed, Candidate Aquatic Species 28	Monitoring, Research, and Planning	USGS SSP: Bayesian population dynamics modeling to guide population restoration and recovery of endangered mussels in the Clinch and Powell Rivers, Tennessee and Virginia.	Demographic constraints
Clinch and Powell Rivers Watershed	Multiple listed, Proposed, Candidate Aquatic Species 28	Monitoring, Research, and Planning	EC program Off-Refuge Investigation: Virginia, Tennessee – Assessment of mussel declines in the Clinch and North Fork Holston Rivers using histological evaluations of vital organs.	Agriculture Urbanization and commercial/industrial development Mining Demographic constraints Transportation
Clinch and Powell Rivers Watershed	Multiple listed, Proposed, Candidate Aquatic Species 28	Monitoring, Research, and Planning	Recent precipitous declines of endangered freshwater mussels in the Clinch River: An <i>in situ</i> assessment of water quality stressors related to energy development and other land-use	Mining Transportation Urbanization and commercial/industrial development Agriculture

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Clinch and Powell Rivers Watershed	Multiple Listed Karst Species 4	Monitoring, Research, and Planning	Monitor populations and habitat of Lee County cave isopod, cooperative agreement with DNH.	Demographic constraints
Eastern Shore	Multiple Listed and Candidate Species 11	Biological Planning	PFW and partners will participate with Chincoteague NWR LPP, as needed	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases
Eastern Shore	Priority Migratory Bird Species	Biological Planning	Participate in RRT and USCG spill planning and preparedness meetings and exercises.	Transportation
Eastern Shore	Multiple Listed and Candidate Species 11	Conservation Design	Continue to work with conservation partners on Southern Tip Ecological Partnership to identify high priority properties for land protection.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases
Eastern Shore	Multiple Listed and Candidate Species 11 Priority Migratory Bird Species	Conservation Delivery	PFW will continue to work with conservation partners on Southern Tip Ecological Partnership to implement land protection and habitat restoration at high priority properties.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases
Eastern Shore	Multiple Listed and Candidate Species 11	Conservation Delivery	Utilize web-based technical assistance streamlining process to address requests for species lists and technical assistance.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Eastern Shore	Multiple Listed and Candidate Species 11 Priority Migratory Bird Species	Conservation Delivery	PFW will work with partners to obtain funding for future habitat restoration work.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases
Eastern Shore	Priority Migratory Bird Species	Conservation Delivery	PFW will continue to conduct outreach to other partners and the community by conducting site visits on completed habitat restoration projects.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases
Eastern Shore	Priority Migratory Bird Species	Conservation Delivery	PFW will continue to conduct outreach to other partners and the community by conducting site visits to Oyster, Virginia living shoreline project completed in FY09.	Habitat loss/fragmentation/degradation
Eastern Shore	Priority Migratory Bird Species	Monitoring, Research, and Planning	PFW will monitor the survival of reforestation projects completed under STEP 3 NAWCA grant.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases
Eastern Shore	Priority Migratory Bird Species	Monitoring, Research, and Planning	PFW will monitor living shoreline completed in FY09 near Oyster, Virginia.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases
Eastern Shore	Multiple Listed and Candidate Species 11	Monitoring, Research, and Planning	Continue monitoring of Clarke breakwater project and its effects on beach habitat in conjunction with VIMS and Corps.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Eastern Shore	Multiple Listed and Candidate Species 11	Monitoring, Research, and Planning	Develop consistent sea turtle management and monitoring protocols.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases
Eastern Shore	Multiple Listed and Candidate Species 11	Monitoring, Research, and Planning	Conduct tiger beetle genetics analysis to help delineate functional tiger beetle populations.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases
Great Dismal Swamp National Wildlife Refuge	Priority Migratory Bird Species	Biological Planning	Participate in RRT and USCG spill planning and preparedness meetings and exercises.	Transportation
Great Dismal Swamp National Wildlife Refuge	Priority Migratory Bird Species	Biological Planning	Work with others to establish a long-term national-scale mercury monitoring program to track long-term trends of atmospheric mercury deposition and mercury levels.	Habitat loss/fragmentation/degradation
Great Dismal Swamp National Wildlife Refuge	Priority Migratory Bird Species	Conservation Design	Based on GIS/data assessments during Biological Planning stage and monitoring of 9,500 acres restored in FY12, PFW and NWR staff will identify target locations for hydrology restoration efforts for maximum benefit to forest migratory birds.	Habitat loss/fragmentation/degradation Demographic constraints Non-native/problematic native species and diseases

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Great Dismal Swamp National Wildlife Refuge	Red-cockaded Woodpecker	Conservation Design	Based on GIS/data assessments during Biological Planning stage and monitoring restored sites, PFW and NWR staff will identify target locations for hydrology restoration efforts for maximum benefit to planned red-cockaded woodpecker colony establishment.	Habitat loss/fragmentation/degradation Demographic constraints Non-native/problematic native species and diseases
Great Dismal Swamp National Wildlife Refuge	Priority Migratory Bird Species Red-cockaded Woodpecker	Conservation Delivery	PFW staff will coordinate and provide technical assistance to NWR and with NWR hydrologist to plan and implement hydrology restoration activities.	Habitat loss/fragmentation/degradation
Great Dismal Swamp National Wildlife Refuge	Priority Migratory Bird Species Red-cockaded Woodpecker	Conservation Delivery	PFW will seek funds/develop grants and partnerships to pursue additional hydrology and fire restoration at Great Dismal Swamp.	Habitat loss/fragmentation/degradation
Great Dismal Swamp National Wildlife Refuge	Priority Migratory Bird Species Red-cockaded Woodpecker	Conservation Delivery	PFW will seek funds/develop grants and partnerships to pursue additional hydrology and fire restoration at Great Dismal Swamp.	Non-native/problematic native species and diseases
Great Dismal Swamp National Wildlife Refuge	Priority Migratory Bird Species Red-cockaded Woodpecker	Monitoring, Research, and Planning	PFW and NWR will monitor extent and duration of hydrology restored on 9,500 acres in FY12.	Habitat loss/fragmentation/degradation Demographic constraints Non-native/problematic native species and diseases

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Great Dismal Swamp National Wildlife Refuge	Priority Migratory Bird Species Red-cockaded Woodpecker	Monitoring, Research, and Planning	PFW and NWR will update GIS assessment of hydrology on NWR.	Habitat loss/fragmentation/degradation Demographic constraints Non-native/problematic native species and diseases
Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Biological Planning	Participate in RRT and USCG spill planning and preparedness meetings and exercises.	Transportation
Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Conservation Design	Coordinate conservation and recovery activities with TNC Conservation Action Plan.	Agriculture Climate change Power Generation Recreation Transportation Urbanization and commercial/industrial development Demographic constraints Right-of-way development and maintenance
Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Conservation Design	Work with NWR program and others to plan and develop UTRB NWR.	Agriculture Climate change Power Generation Recreation Transportation Urbanization and commercial/industrial development Demographic constraints

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
				Right-of-way development and maintenance
Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Conservation Delivery	Provide “riverkeeper” services by monitoring watershed for pollution and alerting appropriate entities about problems encountered.	Agriculture Urbanization and commercial/industrial development
Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Conservation Delivery	Coordinate with EPA and VDEQ on CWA regulatory issues related to delegated water programs (VPDES CWA 402, Water Quality Standards, CWA 401, total maximum daily loads, Biosolids, Virginia WQS Triennial Review technical advisory committee) and coordinate with EPA and VDACS on pesticide use issues.	Agriculture Urbanization and commercial/industrial development Power Generation
Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Conservation Delivery	Review General and individual VPDES permits; solid waste and biosolids application permits; pesticide use applications. Work with DEQ to introduce IPaC and VAFO project review process.	Agriculture Urbanization and commercial/industrial development Power Generation

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Conservation Delivery	Provide technical support to EPA through BTAG on the development of remedial alternatives to address ecological risk from mercury in the North Fork Holston River, and with VDEQ on the development and implementation of the mercury TMDL for North Fork Holston River.	Urbanization and commercial/industrial development
Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Conservation Delivery	Continue to work on NRDAR settlement negotiations for the Saltville NPL Site with the Trustee Council (VA, TN, TVA, and Service) and Olin Corporation for ecological restoration actions for bats, (Indiana and gray), fish, migratory birds, and freshwater mussels injured within the North Fork Holston River by legacy and on-going industrial contamination.	Urbanization and commercial/industrial development
Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Conservation Delivery	Conduct consultation and provide conservation planning assistance on water supply planning and development projects.	Climate change
Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Conservation Delivery	Consult with federal action agencies and coordinate with non-Federal project proponents on energy projects.	Power Generation
Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Conservation Delivery	Provide "riverkeeper" services by monitoring watershed for pollution and alerting appropriate entities about problems encountered.	Transportation
Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Conservation Delivery	Assist Cookeville Field Office with interagency programmatic consultation on TVA transmission line right-of-way management.	Demographic constraints
Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Monitoring, Research, and Planning	Implement Saltville NPL Site NRDAR injury Study "Evaluation of Histologically Prepared Organ Tissues of Villosa iris held at selected site in the NFHR, Saltville, VA."	Demographic constraints

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
				Urbanization and commercial/industrial development
Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Monitoring, Research, and Planning	EC program Off-Refuge Investigation: Virginia, Tennessee – Assessment of mussel declines in the Clinch and North Fork Holston Rivers using histological evaluations of vital organs.	Transportation Agriculture Urbanization and commercial/industrial development Demographic constraints
James Spiny mussel	James Spiny mussel	Biological Planning	Participate in RRT and USCG spill planning and preparedness meetings and exercises.	Transportation
James Spiny mussel	James Spiny mussel	Biological Planning	Revise Recovery Action Team Annual Action Plan; conduct quarterly Recovery Action Team planning meetings.	Habitat loss/fragmentation/degradation Demographic constraints Non-native/problematic native species
James Spiny mussel	James Spiny mussel	Biological Planning	Continue to gather data to conduct population viability analyses for selected populations	Demographic constraints
James Spiny mussel	James Spiny mussel	Conservation Delivery	Review General and individual VPDES permits; solid waste and biosolids application permits; pesticide use applications. Work with DEQ to introduce IPaC and VAFO project review process.	Habitat loss/fragmentation/degradation Non-native/problematic native species Demographic constraints

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
James Spiny mussel	James Spiny mussel	Conservation Delivery	Coordinate with EPA and VDEQ on CWA regulatory issues related to delegated water programs (VPDES CWA 402, Water Quality Standards, CWA 401, total maximum daily loads, Biosolids, Virginia WQS Triennial Review technical advisory committee) and coordinate with EPA and VDACS on pesticide use issues.	Habitat loss/fragmentation/degradation Non-native/problematic native species Demographic constraints
Madison Cave Isopod	Madison Cave isopod	Biological Planning	Participate in RRT and USCG spill planning and preparedness meetings and exercises.	Transportation
Madison Cave Isopod	Madison Cave isopod	Biological Planning	Pursue funding to continue surveys of southern extent of population.	Habitat loss/fragmentation/degradation Demographic constraints Lack of information on species
Madison Cave Isopod	Madison Cave isopod	Biological Planning	Pursue funding for continued genetic studies to determine population structure and connectivity.	Habitat loss/fragmentation/degradation Demographic constraints Lack of information on species
Madison Cave Isopod	Madison Cave isopod	Biological Planning	Land protection on priority site.	Habitat loss/fragmentation/degradation Demographic constraints
Madison Cave Isopod	Madison Cave isopod	Biological Planning	Coordinate with other members of recovery group.	Habitat loss/fragmentation/degradation Demographic constraints Lack of information on species

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Madison Cave Isopod	Madison Cave isopod	Conservation Design	Incorporate Madison Cave Isopod restoration alternatives into DuPont NRDAR settlement negotiations.	Habitat loss/fragmentation/degradation
Madison Cave Isopod	Madison Cave isopod	Conservation Delivery	Coordinate with EPA and VDEQ on CWA regulatory issues related to delegated water programs (VPDES CWA 402, Water Quality Standards, CWA 401, total maximum daily loads, Biosolids, Virginia WQS Triennial Review technical advisory committee) and coordinate with EPA and VDACS on pesticide use issues.	Habitat loss/fragmentation/degradation
Madison Cave Isopod	Madison Cave isopod	Conservation Delivery	Review General and individual VPDES permits; solid waste and biosolids application permits; pesticide use applications. Work with DEQ to introduce IPaC and VAFO project review process.	Habitat loss/fragmentation/degradation
Madison Cave Isopod	Madison Cave isopod	Conservation Delivery	Investigate groundwater withdrawal permits in Madison Cave isopod potential habitat to evaluate threat and assess options to reduce threat.	Habitat loss/fragmentation/degradation
Madison Cave Isopod	Madison Cave isopod	Conservation Delivery	Work with USGS to secure funding for project titled "Assessing the Vulnerability of Threatened Macroinvertebrates in Karst Using Paleohydrologic Indicators of Climate Change."	Habitat loss/fragmentation/degradation
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Biological Planning	Participate in RRT and USCG spill planning and preparedness meetings and exercises.	Transportation
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Biological Planning	Continue to develop genetic tools for conservation and planning (USGS).	Habitat loss/fragmentation/degradation Demographic constraints
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Biological Planning	Continue to coordinate with Mathews County in the development of a countywide HCP.	Habitat loss/fragmentation/degradation

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
				Demographic constraints
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Biological Planning	Coordinate with tiger beetle recovery partners.	Habitat loss/fragmentation/degradation Demographic constraints
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Biological Planning	Continue to develop a rangewide tiger beetle captive propagation/translocation plan.	Habitat loss/fragmentation/degradation Demographic constraints
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Biological Planning	Pursue funding to refine and revise tiger beetle PVA.	Habitat loss/fragmentation/degradation Demographic constraints
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Conservation Design	PFW will continue to work with conservation partners on Southern Tip Ecological Partnership to identify high priority properties for land protection and habitat restoration.	Habitat loss/fragmentation/degradation Demographic constraints
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Conservation Design	Continue to work with Mathews County to develop conservation plans/measures that will benefit the tiger beetle. Expansion of this effort is planned for additional counties.	Habitat loss/fragmentation/degradation Demographic constraints
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Conservation Delivery	Utilize web-based technical assistance streamlining process to address requests for species lists and technical assistance.	Habitat loss/fragmentation/degradation Demographic constraints
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Conservation Delivery	PFW will continue to work with conservation partners on Southern Tip Ecological Partnership to implement land protection and habitat restoration at high priority properties.	Habitat loss/fragmentation/degradation Demographic constraints

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Conservation Delivery	Landowner education.	Habitat loss/fragmentation/degradation Demographic constraints
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Conservation Delivery	Work with counties to develop large-scale conservation plans that will maintain beetle habitat.	Habitat loss/fragmentation/degradation Demographic constraints
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Conservation Delivery	Provide technical assistance to the Corps and NWRs on the development and implementation of remedial alternatives for munitions at Plum Tree Island NWR to ensure impacts to tiger beetle are minimized.	Demographic constraints
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Conservation Delivery	Hold public meeting with Mathews County and other interested counties.	Demographic constraints
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Monitoring, Research, and Planning	Continue monitoring breakwater project at Savage Neck to evaluate long-term effects and expected effects from project.	Habitat loss/fragmentation/degradation Demographic constraints
Nottoway River Watershed	Priority Migratory Bird Species Multiple Listed Aquatic Species 2	Biological Planning	Participate in RRT and USCG spill planning and preparedness meetings and exercises.	Transportation
Nottoway River Watershed	Priority Migratory Bird Species Multiple Listed Aquatic Species 2	Conservation Design	PFW and partners work with Region 4 Service to apply existing Decision Support Tool methodology for LLP restoration site selection to Virginia range.	Habitat loss/fragmentation/degradation Demographic constraints

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
				Non-native/problematic native species and diseases
Nottoway River Watershed	Multiple Listed Aquatic Species 2	Conservation Delivery	Review General and individual VPDES permits; solid waste and biosolids application permits; pesticide use applications. Work with DEQ to introduce IPaC and VAFO project review process.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases
Nottoway River Watershed	Multiple Listed Aquatic Species 2	Conservation Delivery	Coordinate with EPA and VDEQ on CWA regulatory issues related to delegated water programs (VPDES CWA 402, Water Quality Standards, CWA 401, total maximum daily loads, Biosolids, Virginia WQS Triennial Review technical advisory committee) and coordinate with EPA and VDACS on pesticide use issues.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases
Nottoway River Watershed	Multiple Listed Aquatic Species 2	Conservation Delivery	If feasibility assessment of stream impediments proposed for FY12 is successful, PFW will develop protocols to determine which impediments are highest priority for conservation action.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases
Nottoway River Watershed	Multiple Listed Aquatic Species 2	Monitoring, Research, and Planning	Continue to identify priority dwarf wedgemussel habitats within the watershed and pursue funding for surveys within these areas to evaluate populations and identify potential threats.	Habitat loss/fragmentation/degradation Demographic constraints Non-native/problematic native species and diseases

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Nottoway River Watershed	Priority Migratory Bird Species	Monitoring, Research, and Planning	PFW and partners will monitor the survival of LLP plantings.	Habitat loss/fragmentation/degradation Demographic constraints Non-native/problematic native species and diseases
Rappahannock River Valley National Wildlife Refuge	Fishes of Conservation Concern	Conservation Delivery	Work with VDEQ on development and implementation of TMDL for Rappahannock River. This work is contingent upon funding for a GS-9 FTE.	Poor water quality
Rappahannock River Valley National Wildlife Refuge	Fishes of Conservation Concern	Conservation Delivery	Contingent upon results from Regionwide Environmental Contaminants Endocrine Disruptor study, design environmental contaminants study to further study impacts of endocrine disrupting chemicals on fish in Rappahannock River.	Poor water quality
Rappahannock River Valley National Wildlife Refuge	Fishes of Conservation Concern	Conservation Delivery	Coordinate with EPA and VDEQ on CWA regulatory issues related to delegated water programs (VPDES CWA 402, Water Quality Standards, CWA 401, total maximum daily loads, Biosolids, Virginia WQS Triennial Review technical advisory committee) and coordinate with EPA and VDACS on pesticide use issues.	Poor water quality
Roanoke Logperch	Roanoke logperch	Biological Planning	Participate in RRT and USCG spill planning and preparedness meetings and exercises.	Transportation
Roanoke Logperch	Roanoke logperch	Biological Planning	Monthly recovery action team meetings or as needed.	Habitat loss/fragmentation/degradation Demographic constraints Non-native/problematic native

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
				species
Roanoke Logperch	Roanoke logperch	Conservation Design	PFW will work with partners to continue to obtain dam removal cost and feasibility information.	Habitat loss/fragmentation/degradation Demographic constraints
Roanoke Logperch	Roanoke logperch	Conservation Delivery	Coordinate with EPA and VDEQ on CWA regulatory issues related to delegated water programs (VPDES CWA 402, Water Quality Standards, CWA 401, total maximum daily loads, Biosolids, Virginia WQS Triennial Review technical advisory committee) and coordinate with EPA and VDACS on pesticide use issues.	Habitat loss/fragmentation/degradation
Roanoke Logperch	Roanoke logperch	Conservation Delivery	Review General and individual VPDES permits; solid waste and biosolids application permits; pesticide use applications. Work with DEQ to introduce IPaC and VAFO project review process.	Habitat loss/fragmentation/degradation
Roanoke Logperch	Roanoke logperch	Conservation Delivery	Work with private landowners and other partners to obtain funds to implement stream restoration and dam removal in locations determined to be priority sites, especially where habitat corridors can be linked.	Habitat loss/fragmentation/degradation
Roanoke Logperch	Roanoke logperch	Conservation Delivery	Work with private landowners and other partners to obtain funds to implement stream restoration and dam removal in locations determined to be priority sites, especially where habitat corridors can be linked.	Demographic constraints
Roanoke Logperch	Roanoke logperch	Conservation Delivery	Begin implementation of Blacksburg Country Club NRDA Restoration projects #2 on the North Fork Roanoke River.	Habitat loss/fragmentation/degradation Demographic constraints

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Roanoke Logperch	Roanoke logperch	Conservation Delivery	Work with VDEQ on development and implementation of TMDLs in Roanoke River basin.	Habitat loss/fragmentation/degradation
Roanoke Logperch	Roanoke logperch	Monitoring, Research, and Planning	Post-removal fish and habitat monitoring for Veterans Park Dam removal.	Habitat loss/fragmentation/degradation Demographic constraints Non-native/problematic native species
Non-Geographic Focus	Non-Species Focus	Conservation Delivery	Provide review of the Service's Information, Planning, and Conservation System (IPaC) and assist with maintaining accurate information in this system for Virginia.	
Non-Geographic Focus	Non-Species Focus	Conservation Delivery	Maintain and improve project review website.	
Non-Geographic Focus	Non-Species Focus	Conservation Design	Attend Food Security Act State Technical Committee meetings on a quarterly basis to provide technical recommendations and agency perspectives on Conservation Programs of the Farm Bill; actively participate in subcommittees.	
Non-Geographic Focus	Non-Species Focus	Conservation Design	Provide technical support to South Atlantic LCC, as requested.	
Non-Geographic Focus	Non-Species Focus	Conservation Delivery	Initiate a Refuge Cleanup for Potomac Rivers Complex NWR former firing range.	Contaminants
Non-Geographic Focus	Non-Species Focus	Biological Planning	Submit a proposal to characterize the former hog waste lagoons at Back Bay NWR.	Contaminants
Non-Geographic Focus	Priority Migratory Bird Species	Conservation Delivery	Work on injury determination and quantification for Dupont NRDAR	Contaminants
Non-Geographic Focus	Priority Migratory Bird Species	Biological Planning	Develop and research restoration options for Dupont NRDAR	Contaminants

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Non-Geographic Focus	Priority Migratory Bird Species	Conservation Delivery	Provide technical assistance and agency recommendations to EPA's BTAG on trust resource issues at 15 Superfund and other hazardous waste sites in Virginia	Contaminants
Non-Geographic Focus	Priority Migratory Bird Species	Conservation Delivery	Provide technical assistance to EPA and Elizabeth River Project on sediment remediation and restoration issues in Elizabeth River	Contaminants
Non-Geographic Focus	Priority Migratory Bird Species	Conservation Delivery	Develop and research restoration options for Avtex NRDAR.	Contaminants

APPENDIX 8 – FY 2014 CONSERVATION ACTIONS

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Blackwater River Watershed	Priority Migratory Bird Species	Biological Planning	Participate in RRT and USCG spill planning and preparedness meetings and exercises.	Transportation
Blackwater River Watershed	Priority Migratory Bird Species Red-cockaded Woodpecker	Conservation Design	PFW and partners will update a GIS base map with shapefiles for all known LLP locations in Virginia.	Habitat loss/fragmentation/degradation Demographic constraints Non-native/ problematic native species Disease
Blackwater River Watershed	Priority Migratory Bird Species	Conservation Delivery	Review General and individual VPDES permits; solid waste and biosolids application permits; pesticide use applications. Work with DEQ to introduce IPaC and VAFO project review process.	Habitat loss/fragmentation/degradation
Blackwater River Watershed	Priority Migratory Bird Species	Conservation Delivery	Coordinate with EPA and VDEQ on CWA regulatory issues related to delegated water programs (VPDES CWA 402, Water Quality Standards, CWA 401, total maximum daily loads, Biosolids, Virginia WQS Triennial Review technical advisory committee) and coordinate with EPA and VDACS on pesticide use issues.	Habitat loss/fragmentation/degradation
Blackwater River Watershed	Priority Migratory Bird Species Red-cockaded Woodpecker	Conservation Delivery	PFW and partners will develop 25-year acreage goal for LLP habitat restoration in Virginia.	Habitat loss/fragmentation/degradation Demographic constraints Non-native/ problematic native species Disease
Blackwater River Watershed	Priority Migratory Bird Species	Monitoring, Research, and Planning	PFW and partners will monitor the survival of LLP plantings.	Habitat loss/fragmentation/degradation

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Clinch and Powell Rivers Watershed	Multiple listed, Proposed, Candidate Aquatic Species 28	Biological Planning	Participate in RRT and USCG spill planning and preparedness meetings and exercises.	Transportation
Clinch and Powell Rivers Watershed	Multiple listed, Proposed, Candidate Aquatic Species 28	Conservation Delivery	Review Individual Coal VPDES Permits (new and renewals)	Mining
Clinch and Powell Rivers Watershed	Multiple listed, Proposed, Candidate Aquatic Species 28	Conservation Delivery	Review General and individual VPDES permits; solid waste and biosolids application permits; pesticide use applications. Work with DEQ to introduce IPaC and VAFO project review process.	Gas Extraction Power Generation Urbanization and commercial/industrial development
Clinch and Powell Rivers Watershed	Multiple listed, Proposed, Candidate Aquatic Species 28	Conservation Delivery	Coordinate with EPA and VDEQ on CWA regulatory issues related to delegated water programs (VPDES CWA 402, Water Quality Standards, CWA 401, total maximum daily loads, Biosolids, Virginia WQS Triennial Review technical advisory committee) and coordinate with EPA and VDACS on pesticide use issues.	Agriculture Climate change Mining Gas Extraction Power Generation Transportation Urbanization and commercial/industrial development Right-of-way development and maintenance
Clinch and Powell Rivers Watershed	Multiple listed, Proposed, Candidate Aquatic Species 28	Conservation Delivery	Implement NRCS CCPI funds in Copper Creek watershed.	Agriculture

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
	Multiple Listed Karst Species 4			Climate change
Clinch and Powell Rivers Watershed	Multiple listed, Proposed, Candidate Aquatic Species 28	Conservation Delivery	Review AML reclamation projects for ESA compliance as submitted.	Mining
Clinch and Powell Rivers Watershed	Multiple listed, Proposed, Candidate Aquatic Species 28	Conservation Delivery	Consult with federal agencies on actions related to permitting and operating coal-fired plants, coal combustion byproducts disposal.	Power Generation
Clinch and Powell Rivers Watershed	Multiple listed, Proposed, Candidate Aquatic Species 28	Conservation Delivery	Implement Certus NRDA contract with VT and VDGIF to propagate and restore mussel populations in upper Clinch River and Indian Creek.	Demographic constraints
Clinch and Powell Rivers Watershed	Multiple listed, Proposed, Candidate Aquatic Species 28	Monitoring, Research, and Planning	EC program Off-Refuge Investigation: Virginia, Tennessee – Assessment of mussel declines in the Clinch and North Fork Holston Rivers using histological evaluations of vital organs.	Agriculture Urbanization and commercial/industrial development Mining Demographic constraints Transportation
Clinch and Powell Rivers Watershed	Multiple listed, Proposed, Candidate Aquatic Species 28	Monitoring, Research, and Planning	Recent precipitous declines of endangered freshwater mussels in the Clinch River: An <i>in situ</i> assessment of water quality stressors related to energy development and other land-use	Mining Transportation Urbanization and commercial/industrial development Agriculture

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Clinch and Powell Rivers Watershed	Multiple Listed Karst Species 4	Monitoring, Research, and Planning	Monitor populations and habitat of Lee County cave isopod, cooperative agreement with DNH.	Demographic constraints
Clinch and Powell Rivers Watershed	Multiple listed, Proposed, Candidate Aquatic Species 28	Monitoring, Research, and Planning	Analyze existing species surveys and YSI monitor data to evaluate effectiveness of the 5-year CCPI grant.	Agriculture
Eastern Shore	Priority Migratory Bird Species	Biological Planning	Participate in RRT and USCG spill planning and preparedness meetings and exercises.	Transportation
Eastern Shore	Multiple Listed and Candidate Species 11	Biological Planning	PFW and partners will participate with Chincoteague NWR LPP, as needed	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases
Eastern Shore	Priority Migratory Bird Species Multiple Listed and Candidate Species 11	Conservation Design	Continue to work with conservation partners on Southern Tip Ecological Partnership to identify high priority properties for land protection.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases
Eastern Shore	Multiple Listed and Candidate Species 11 Priority Migratory Bird Species	Conservation Delivery	PFW will continue to work with conservation partners on Southern Tip Ecological Partnership to implement land protection and habitat restoration at high priority properties.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases
Eastern Shore	Multiple Listed and Candidate Species 11	Conservation Delivery	Utilize web-based technical assistance streamlining process to address requests for species lists and technical assistance.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Eastern Shore	Multiple Listed and Candidate Species 11 Priority Migratory Bird Species	Conservation Delivery	PFW will work with partners to obtain funding for future habitat restoration work.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases
Eastern Shore	Priority Migratory Bird Species	Conservation Delivery	PFW will continue to conduct outreach to other partners and the community by conducting site visits on completed habitat restoration projects.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases
Eastern Shore	Priority Migratory Bird Species	Conservation Delivery	PFW will continue to conduct outreach to other partners and the community by conducting site visits to Oyster, Virginia living shoreline project completed in FY09.	Habitat loss/fragmentation/degradation
Eastern Shore	Priority Migratory Bird Species	Monitoring, Research, and Planning	PFW will monitor the survival of reforestation projects completed under STEP 3 NAWCA grant.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases
Eastern Shore	Priority Migratory Bird Species	Monitoring, Research, and Planning	PFW will monitor living shoreline completed in FY09 near Oyster, Virginia.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases
Eastern Shore	Multiple Listed and Candidate Species 11	Monitoring, Research, and Planning	Continue monitoring of Clarke breakwater project and its effects on beach habitat in conjunction with VIMS and Corps.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Great Dismal Swamp National Wildlife Refuge	Priority Migratory Bird Species Red-cockaded Woodpecker	Biological Planning	PFW and NWR will assess climate change influence on future hydrology and predict likely outcomes for the Great Dismal Swamp.	Habitat loss/fragmentation/degradation Demographic constraints Non-native/problematic native species and diseases
Great Dismal Swamp National Wildlife Refuge	Priority Migratory Bird Species	Biological Planning	Participate in RRT and USCG spill planning and preparedness meetings and exercises.	Transportation
Great Dismal Swamp National Wildlife Refuge	Priority Migratory Bird Species Red-cockaded Woodpecker	Conservation Design	Based on climate change outcomes predicted in Biological Planning stage, PFW, ES, and NWR will determine priority mitigative actions.	Habitat loss/fragmentation/degradation Demographic constraints Non-native/problematic native species and diseases
Great Dismal Swamp National Wildlife Refuge	Priority Migratory Bird Species Red-cockaded Woodpecker	Conservation Delivery	PFW staff will coordinate and provide technical assistance to NWR and with NWR hydrologist to plan and implement hydrology restoration activities.	Habitat loss/fragmentation/degradation
Great Dismal Swamp National Wildlife Refuge	Priority Migratory Bird Species Red-cockaded Woodpecker	Monitoring, Research, and Planning	PFW and NWR will monitor extent and duration of hydrology restored on 9,500 acres in FY12.	Habitat loss/fragmentation/degradation Demographic constraints Non-native/problematic native species and diseases
Great Dismal Swamp National Wildlife Refuge	Priority Migratory Bird Species Red-cockaded Woodpecker	Monitoring, Research, and Planning	PFW and NWR will update GIS assessment of hydrology on NWR.	Habitat loss/fragmentation/degradation Demographic constraints

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
				Non-native/problematic native species and diseases
Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Biological Planning	Participate in RRT and USCG spill planning and preparedness meetings and exercises.	Transportation
Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Conservation Delivery	Coordinate with EPA and VDEQ on CWA regulatory issues related to delegated water programs (VPDES CWA 402, Water Quality Standards, CWA 401, total maximum daily loads, Biosolids, Virginia WQS Triennial Review technical advisory committee) and coordinate with EPA and VDACS on pesticide use issues.	Agriculture Urbanization and commercial/industrial development Power Generation
Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Conservation Delivery	Review General and individual VPDES permits; solid waste and biosolids application permits; pesticide use applications. Work with DEQ to introduce IPaC and VAFO project review process.	Agriculture Urbanization and commercial/industrial development Power Generation
Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Conservation Delivery	Provide technical support to EPA through BTAG on the development of remedial alternatives to address ecological risk from mercury in the North Fork Holston River, and with VDEQ on the development and implementation of the mercury TMDL for North Fork Holston River.	Urbanization and commercial/industrial development

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Conservation Delivery	Continue to work on NRDAR settlement negotiations for the Saltville NPL Site with the Trustee Council (VA, TN, TVA, and Service) and Olin Corporation for ecological restoration actions for bats, (Indiana and gray), fish, migratory birds, and freshwater mussels injured within the North Fork Holston River by legacy and on-going industrial contamination.	Urbanization and commercial/industrial development
Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Conservation Delivery	Conduct consultation and provide conservation planning assistance on water supply planning and development projects.	Climate change
Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Conservation Delivery	Consult with federal action agencies and coordinate with non-Federal project proponents on energy projects.	Power Generation
Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Conservation Delivery	Assist Cookeville Field Office with interagency programmatic consultation on TVA transmission line right-of-way management.	Demographic constraints
Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Monitoring, Research, and Planning	Implement Saltville NPL Site NRDAR injury Study "Evaluation of Histologically Prepared Organ Tissues of Villosa iris held at selected site in the NFHR, Saltville, VA."	Demographic constraints
Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Monitoring, Research, and Planning	Implement Saltville NPL Site NRDAR injury Study "Evaluation of Histologically Prepared Organ Tissues of Villosa iris held at selected site in the NFHR, Saltville, VA."	Urbanization and commercial/industrial development
Holston River Watershed	Multiple Listed, Proposed, Candidate Aquatic Species 21	Monitoring, Research, and Planning	EC program Off-Refuge Investigation: Virginia, Tennessee – Assessment of mussel declines in the Clinch and North Fork Holston Rivers using histological evaluations of vital organs.	Transportation Agriculture

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
				Urbanization and commercial/industrial development Demographic constraints
James Spiny mussel	James Spiny mussel	Biological Planning	Revise Recovery Action Team Annual Action Plan; conduct quarterly Recovery Action Team planning meetings.	Habitat loss/fragmentation/degradation Demographic constraints Non-native/problematic native species
James Spiny mussel	James Spiny mussel	Biological Planning	Continue to gather data to conduct population viability analyses for selected populations	Demographic constraints
James Spiny mussel	James Spiny mussel	Biological Planning	Participate in RRT and USCG spill planning and preparedness meetings and exercises.	Transportation
James Spiny mussel	James Spiny mussel	Conservation Delivery	Review General and individual VPDES permits; solid waste and biosolids application permits; pesticide use applications. Work with DEQ to introduce IPaC and VAFO project review process.	Habitat loss/fragmentation/degradation Non-native/problematic native species Demographic constraints
James Spiny mussel	James Spiny mussel	Conservation Delivery	Coordinate with EPA and VDEQ on CWA regulatory issues related to delegated water programs (VPDES CWA 402, Water Quality Standards, CWA 401, total maximum daily loads, Biosolids, Virginia WQS Triennial Review technical advisory committee) and coordinate with EPA and VDACS on pesticide use issues.	Habitat loss/fragmentation/degradation Non-native/problematic native species

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
				Demographic constraints
James Spiny mussel	James Spiny mussel	Conservation Delivery	Collaborate with Appalachian Partnership Coordinator Office and partners to implement NRCS Cooperative Conservation Partnership Initiative grant for tributaries of the Upper James identified as high priority areas for James spiny mussel.	Habitat loss/fragmentation/degradation Non-native/problematic native species Demographic constraints
Madison Cave Isopod	Madison Cave isopod	Biological Planning	Pursue funding to continue surveys of southern extent of population.	Habitat loss/fragmentation/degradation Demographic constraints Lack of information on species
Madison Cave Isopod	Madison Cave isopod	Biological Planning	Pursue funding for continued genetic studies to determine population structure and connectivity.	Habitat loss/fragmentation/degradation Demographic constraints Lack of information on species
Madison Cave Isopod	Madison Cave isopod	Biological Planning	Land protection on priority site.	Habitat loss/fragmentation/degradation Demographic constraints
Madison Cave Isopod	Madison Cave isopod	Biological Planning	Coordinate with other members of recovery group.	Habitat loss/fragmentation/degradation Demographic constraints Lack of information on species
Madison Cave Isopod	Madison Cave isopod	Biological Planning	Participate in RRT and USCG spill planning and preparedness meetings and exercises.	Transportation

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Madison Cave Isopod	Madison Cave isopod	Conservation Delivery	Coordinate with EPA and VDEQ on CWA regulatory issues related to delegated water programs (VPDES CWA 402, Water Quality Standards, CWA 401, total maximum daily loads, Biosolids, Virginia WQS Triennial Review technical advisory committee) and coordinate with EPA and VDACS on pesticide use issues.	Habitat loss/fragmentation/degradation
Madison Cave Isopod	Madison Cave isopod	Conservation Delivery	Review General and individual VPDES permits; solid waste and biosolids application permits; pesticide use applications. Work with DEQ to introduce IPaC and VAFO project review process.	Habitat loss/fragmentation/degradation
Madison Cave Isopod	Madison Cave isopod	Conservation Delivery	Work with USGS to secure funding for project titled "Assessing the Vulnerability of Threatened Macroinvertebrates in Karst Using Paleohydrologic Indicators of Climate Change."	Habitat loss/fragmentation/degradation
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Biological Planning	Participate in RRT and USCG spill planning and preparedness meetings and exercises.	Transportation
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Biological Planning	Continue to develop genetic tools for conservation and planning (USGS).	Habitat loss/fragmentation/degradation Demographic constraints
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Biological Planning	Continue to coordinate with Mathews County in the development of a countywide HCP.	Habitat loss/fragmentation/degradation Demographic constraints
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Biological Planning	Coordinate with tiger beetle recovery partners.	Habitat loss/fragmentation/degradation Demographic constraints

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Conservation Design	PFW will continue to work with conservation partners on Southern Tip Ecological Partnership to identify high priority properties for land protection and habitat restoration.	Habitat loss/fragmentation/degradation Demographic constraints
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Conservation Design	Continue to work with Mathews County to develop conservation plans/measures that will benefit the tiger beetle. Expansion of this effort is planned for additional counties.	Habitat loss/fragmentation/degradation Demographic constraints
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Conservation Delivery	Utilize web-based technical assistance streamlining process to address requests for species lists and technical assistance.	Habitat loss/fragmentation/degradation Demographic constraints
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Conservation Delivery	PFW will continue to work with conservation partners on Southern Tip Ecological Partnership to implement land protection and habitat restoration at high priority properties.	Habitat loss/fragmentation/degradation Demographic constraints
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Conservation Delivery	Landowner education.	Habitat loss/fragmentation/degradation Demographic constraints
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Conservation Delivery	Work with counties to develop large-scale conservation plans that will maintain beetle habitat.	Habitat loss/fragmentation/degradation Demographic constraints

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Conservation Delivery	Provide technical assistance to the Corps and NWRs on the development and implementation of remedial alternatives for munitions at Plum Tree Island NWR to ensure impacts to tiger beetle are minimized.	Demographic constraints
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Conservation Delivery	Hold public meeting with Mathews County and other interested counties.	Demographic constraints
Northeastern Beach Tiger Beetle	Northeastern Beach Tiger Beetle	Monitoring, Research, and Planning	Continue monitoring breakwater project at Savage Neck to evaluate long-term effects and expected effects from project.	Habitat loss/fragmentation/degradation Demographic constraints
Nottoway River Watershed	Priority Migratory Bird Species	Biological Planning	Participate in RRT and USCG spill planning and preparedness meetings and exercises.	Transportation
Nottoway River Watershed	Multiple Listed Aquatic Species 2	Conservation Delivery	Review General and individual VPDES permits; solid waste and biosolids application permits; pesticide use applications. Work with DEQ to introduce IPaC and VAFO project review process.	Non-native/problematic native species and diseases Habitat loss/fragmentation/degradation
Nottoway River Watershed	Multiple Listed Aquatic Species 2	Conservation Delivery	Coordinate with EPA and VDEQ on CWA regulatory issues related to delegated water programs (VPDES CWA 402, Water Quality Standards, CWA 401, total maximum daily loads, Biosolids, Virginia WQS Triennial Review technical advisory committee) and coordinate with EPA and VDACS on pesticide use issues.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Nottoway River Watershed	Priority Migratory Bird Species	Conservation Delivery	PFW and partners will develop 25-year acreage goal for LLP habitat restoration in Virginia.	Habitat loss/fragmentation/degradation Non-native/problematic native species and diseases
Nottoway River Watershed	Priority Migratory Bird Species	Monitoring, Research, and Planning	PFW and partners will monitor the survival of LLP plantings.	Habitat loss/fragmentation/degradation Demographic constraints Non-native/problematic native species and diseases
Rappahannock River Valley National Wildlife Refuge	Rappahannock River Valley National Wildlife Refuge	Conservation Delivery	Contingent upon funding, implement environmental contaminants study to further study impacts of endocrine disrupting chemicals on fish in Rappahannock River.	Poor water quality
Rappahannock River Valley National Wildlife Refuge	Rappahannock River Valley National Wildlife Refuge	Conservation Delivery	Coordinate with EPA and VDEQ on CWA regulatory issues related to delegated water programs (VPDES CWA 402, Water Quality Standards, CWA 401, total maximum daily loads, Biosolids, Virginia WQS Triennial Review technical advisory committee) and coordinate with EPA and VDACS on pesticide use issues.	Poor water quality
Roanoke Logperch	Roanoke logperch	Biological Planning	Participate in RRT and USCG spill planning and preparedness meetings and exercises.	Transportation
Roanoke Logperch	Roanoke logperch	Biological Planning	Monthly recovery action team meetings or as needed.	Habitat loss/fragmentation/degradation Demographic constraints Non-native/problematic native species

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Roanoke Logperch	Roanoke logperch	Conservation Design	Adopt or develop a potential habitat model for the species.	Habitat loss/fragmentation/degradation Demographic constraints Non-native/problematic native species
Roanoke Logperch	Roanoke logperch	Conservation Delivery	Coordinate with EPA and VDEQ on CWA regulatory issues related to delegated water programs (VPDES CWA 402, Water Quality Standards, CWA 401, total maximum daily loads, Biosolids, Virginia WQS Triennial Review technical advisory committee) and coordinate with EPA and VDACS on pesticide use issues.	Habitat loss/fragmentation/degradation
Roanoke Logperch	Roanoke logperch	Conservation Delivery	Review General and individual VPDES permits; solid waste and biosolids application permits; pesticide use applications. Work with DEQ to introduce IPaC and VAFO project review process.	Habitat loss/fragmentation/degradation
Roanoke Logperch	Roanoke logperch	Conservation Delivery	Work with private landowners and other partners to obtain funds to implement stream restoration and dam removal in locations determined to be priority sites, especially where habitat corridors can be linked.	Habitat loss/fragmentation/degradation Demographic constraints
Roanoke Logperch	Roanoke logperch	Conservation Delivery	Complete Blacksburg Country Club NRDA Restoration projects #2 on the North Fork Roanoke River.	Habitat loss/fragmentation/degradation Demographic constraints
Roanoke Logperch	Roanoke logperch	Conservation Delivery	PFW will assess feasibility and potential recovery implications for a dam removal project at Martinsville on the Smith River.	Habitat loss/fragmentation/degradation Demographic constraints

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Roanoke Logperch	Roanoke logperch	Conservation Delivery	Begin implementation of Blacksburg Country Club NRDA Restoration project #4 and 5 on the North Fork Roanoke River.	Habitat loss/fragmentation/degradation Demographic constraints
Roanoke Logperch	Roanoke logperch	Conservation Delivery	Work with VDEQ on development and implementation of TMDLs in Roanoke River basin.	Habitat loss/fragmentation/degradation
Roanoke Logperch	Roanoke logperch	Conservation Delivery	Contingent on cost and feasibility information, PFW will devise funding strategy to support full removal of Power Dam.	Habitat loss/fragmentation/degradation Non-native/problematic native species
Roanoke Logperch	Roanoke logperch	Monitoring, Research, and Planning	Survey for logperch for additional locations.	Habitat loss/fragmentation/degradation Demographic constraints Non-native/problematic native species
Roanoke Logperch	Roanoke logperch	Monitoring, Research, and Planning	Determine impediments to upstream movement in upper Roanoke using swim performance study results.	Habitat loss/fragmentation/degradation Demographic constraints Non-native/problematic native species
Roanoke Logperch	Roanoke logperch	Monitoring, Research, and Planning	Post-removal fish and habitat monitoring for Veterans Park Dam removal.	Habitat loss/fragmentation/degradation Demographic constraints Non-native/problematic native species

Priority Area	Species/Species Group	Step of SHC	Conservation Action	Threat Being Addressed
Roanoke Logperch	Roanoke logperch	Monitoring, Research, and Planning	Determine effects of instream construction activities on life stages of logperch.	Habitat loss/fragmentation/degradation Demographic constraints Non-native/problematic native species
Non-Geographic Focus	Non-Species Focus	Conservation Design	Attend Food Security Act State Technical Committee meetings on a quarterly basis to provide technical recommendations and agency perspectives on Conservation Programs of the Farm Bill; actively participate in subcommittees.	
Non-Geographic Focus	Non-Species Focus	Conservation Design	Provide technical support to South Atlantic LCC, as requested.	
Non-Geographic Focus	Non-Species Focus	Conservation Delivery	Finalize the Refuge Cleanup for Potomac Rivers Complex NWR former firing range.	Contaminants
Non-Geographic Focus	Non-Species Focus	Conservation Delivery	Pending funding, characterize the former hog waste lagoons at Back Bay NWR.	Contaminants
Non-Geographic Focus	Priority Migratory Bird Species	Biological Planning	Develop and research restoration options for Dupont NRDAR	Contaminants
Non-Geographic Focus	Priority Migratory Bird Species	Conservation Delivery	Provide technical assistance and agency recommendations to EPA's BTAG on trust resource issues at 15 Superfund and other hazardous waste sites in Virginia	Contaminants

APPENDIX 9 – KEY TO ACRONYMS

Key to Acronyms

ACUB – Army Compatible Use Buffer
All – all U.S. Fish and Wildlife Service’s Ecological Services programs
APCO – U.S. Fish and Wildlife Service’s Appalachian Coordinator Office
APO – Adjacent Property Owner
BCI – Bat Conservation International
BMP – Best Management Practice
CCP – U.S. Fish and Wildlife Service National Wildlife Refuge Comprehensive Conservation Plan
CCPI – U.S. Department of Agriculture’s Cooperative Conservation Partnership Initiative
CDBG – Housing and Urban Development Community Development Block Grant
CFI - Conservation Fisheries Incorporated
CMI – Conservation Management Institute
Coastal Program - U.S. Fish and Wildlife Service’s Coastal Program
Corps – U.S. Army Corps of Engineers
CPA – U.S. Fish and Wildlife Service’s Conservation Planning Assistance Program
CWA – Clean Water Act
DEQ – Virginia Division of Environmental Quality
DMLR – Virginia Department of Mine Land Reclamation
DMME – Virginia Department of Mines, Minerals and Energy
DNH – Virginia Division of Natural Heritage
DoD – U.S. Department of Defense
DU – Ducks Unlimited
E&S – Erosion and Sedimentation
EC – U.S. Fish and Wildlife Service’s Environmental Contaminants Program
ES – U.S. Fish and Wildlife Service’s Endangered Species Program
EPA – U.S. Environmental Protection Agency
ESA – Endangered Species Act
FAA – Federal Aviation Administration
FEMA – Federal Emergency Management Agency
FERC – Federal Energy Regulatory Commission
FHWA – Federal Highway Administration
Fisheries – U.S. Fish and Wildlife Service’s Fisheries Program
FRA - Federal Rail Administration
HCP – Habitat Conservation Plan
HRSD – Hampton Roads Sanitation District
HUD – Housing and Urban Development
INRMP – Integrated Natural Resources Management Plan
LCC – Landscape Conservation Cooperative
LE - U.S. Fish and Wildlife Service’s Office of Law Enforcement
LLP – Logleaf Pine
Localities – counties, municipalities, cities, local governments
MDN - Mercury Deposition Network
Migratory Birds - U.S. Fish and Wildlife Service’s Migratory Bird Program
NADP - National Air Deposition Program
NAWCA – North American Wetlands Conservation Act
NC State Parks – North Carolina State Parks

NCDOF – North Carolina Department of Forestry
 NCDOT – North Carolina Department of Transportation
 NEPA – National Environmental Policy Act
 NGOs – Non-Governmental Organizations
 NOAA – National Oceanic and Atmospheric Administration
 NPS – National Park Service
 NRCS – U.S. Department of Agriculture’s Natural Resource Conservation Service
 NRDA - U.S. Fish and Wildlife Service’s Natural Resource Damage Assessment Program
 NRДАР - U.S. Fish and Wildlife Service’s Natural Resource Damage Assessment and Restoration Program
 NWRS – U.S. Fish and Wildlife Service’s National Wildlife Refuge System
 O&M – Operation and Maintenance
 OSM – U.S. Office of Surface Mining
 PDC – Planning District Commission
 PFW - U.S. Fish and Wildlife Service’s Partners for Fish and Wildlife Program
 RC&D – Resource Conservation and Development program
 Service - U.S. Fish and Wildlife Service
 SHA – Safe Harbor Agreement
 SVFO – U.S. Fish and Wildlife Service’s Southwestern Field Office
 SWCD – Soil and Water Conservation District
 TCF – The Conservation Fund
 TNC – The Nature Conservancy
 TPL – Trust for Public Land
 TVA – Tennessee Valley Authority
 TWRA – Tennessee Wildlife Resources Agency
 USCG – U.S. Coast Guard
 USDA – U.S. Department of Agriculture
 USFS – U.S. Forest Service
 USGS – U.S. Geological Survey
 UTRR – Upper Tennessee River Roundtable
 VA Tech – Virginia Polytechnic Institute and State University
 VAFO – U.S. Fish and Wildlife Service’s Virginia Field Office
 VDACS – Virginia Department of Agriculture and Consumer Services
 VDCR – Virginia Department of Conservation and Recreation
 VDEQ – Virginia Department of Environmental Quality
 VDGIF – Virginia Department of Game and Inland Fisheries
 VDGIF LE - Virginia Department of Game and Inland Fisheries’ Office of Law Enforcement
 VDNH – Virginia Department of Conservation and Recreation, Division of Natural Heritage
 VDOF – Virginia Department of Forestry
 VDOH – Virginia Department of Health
 VDOT – Virginia Department of Transportation
 VIMS – Virginia Institute of Marine Science
 VMRC – Virginia Marine Resource Commission
 VOF – Virginia Outdoors Foundation
 VPDES – Virginia Pollution Discharge Elimination System
 VSCC – Virginia State Corporation Commission
 WCS – Water Control Structure